



Republic of Uganda

Ministry of Water and Environment

INTEGRATED WATER MANAGEMENT AND DEVELOPMENT PROJECT

**ENVIRONMENT AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE
PROPOSED LARGE SOLAR POWERED PIPED WATER SUPPLY AND SANITATION
SYSTEM IN MUTUNDA RURAL GROWTH CENTRE, KIRYANDONGO DISTRICT**



ENVIRONMENTAL AND SOCIAL IMPACT STATEMENT

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AUGUST 2022



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MAMBO BADO,
NAKAWA DIVISION, NAKAWA DIVISION,
LUZIRA, KAMPALA

NOTICE DT-2074

Notice Date :

Taxpayer BRN

Taxpayer TIN

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Payment Registration Number

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NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY -> ENVIRONMENT IMPACT			
Tax Head : ASSESSMENT -> FEES PAYABLE ON PROJECTS -> Total Value is more than 5billion but does not exceed 70bn-EIA Submission fees			
Amount (In UGX) :	1,054,203	Base Value (In UGX) :	0.00
Gross Amount :	5,020,011,868.00	Identity Proof Type :	NA
BPAF Serial Number :	NA	Identity Proof Number :	NA
Application Reference	MUTUNDA WATER SUPPLY	Reference Date :	15/07/2022
Country Of Registration:	-		

CHEQUES ONLY

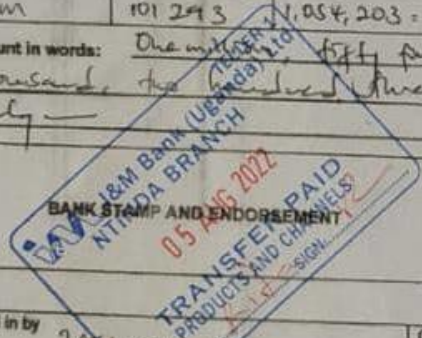
Bank	Cheque No	Amount (UGX)
ESB	101 293	1,054,203 =

Amount in words: One million five hundred thirty four thousand two hundred three only

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Currency	Amount
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20,000/=	
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PLOT M 193/4 NAKAWA INDUSTRIAL AREA, URA TOWER, 8TH FLOOR, KAMPALA



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LIST OF ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
EHS	Environment Health and Safety
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FDG	Focus Group Discussions
GBV	Gender Based Violence
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
HC	Health Centre
IUCN	International Union for the Conservation of Nature
IWMDP	Integrated Water Management and Development Project
KII	Key Informant Interview
MBGL	meters below ground level
MoGLSD	Ministry of Gender, Labour and Social Development
MWE	Ministry of Water and Environment
MoH	Ministry of Health
NEMA	National Environment Management Authority
NUWS	Northern Umbrella of Water and Sanitation
NGOs	Non-Government Organization
OHS	Occupational Health and Safety
OPM	Office of the Prime Minister, Government of Uganda
PCR	Physical Cultural Resources
PLA	Participatory Learning & Action
RAP	Resettlement Action Plan
RGC	Rural Growth Centre
RWC	Refugee Welfare Council
SEA/SH	Sexual Exploitation and Abuse and Sexual Harassment
SEP	Stakeholder Engagement Plan
ToR	Terms of Reference
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNHCR	United Nations High Commission for Refugees
UTM	Universal Transverse Mercator
VECs	Valued Environmental Components
WASH	Water, Sanitation and Hygiene
WCS	Wildlife Conservation Society
UCSAP	Uganda Climate Smart Agricultural Project

The Ministry of Water and Environment (MWE) together with National Water and Sewerage Corporation (NWSC) are implementing the Integrated Water Management and Development Project (IWMDP) with funding from the World Bank and Government of Uganda. The project aims at improved access to water supply and sanitation services, capacity for integrated water resources management and the operational performance of service providers. Under component 1.2 of the IWMDP, districts that host about 70% of refugees will be supported with provision of piped water supply and sanitation services. The target areas include Yumbe, Arua, Moyo (including Obongi district newly created from Moyo), Adjumani in West Nile, Lamwo in Northern and Kiryandongo in Central Uganda. In Kiryandongo district, there will be 3 large solar powered piped water supply systems and 10 public toilets to serve both refugee and host communities located in 3 Rural Growth Centres (RGCs) namely Nyakabaale, Gaspa and Mutunda.

As a requirement in the National Environment Act, 2019 and the World Bank Safeguards policies, MWE contracted JBN Consults and Planners Limited to undertake the Environment and Social Impact Assessment (ESIA) for the proposed water and sanitation system in Mutunda RGC. The ESIA studies were conducted between November and December 2021. It was aimed at preparing a framework to ensure that environmental and social impacts and risks accruing from the proposed infrastructure are identified and mitigation measures put forward. Basing on the ESIA findings, the proposed IWMDP project triggered several WB-OPs namely – Environmental Assessment (OP4.01), Natural Habitats (OP4.04), Physical Cultural Resources (OP 4.11), Involuntary Resettlement (OP4.12). This report therefore presents the findings of the ESIA exercise undertaken by the Consultant to assess the likely environmental and social impacts of the proposed project in Mutunda RGC.

By description, the project will be located in Mutunda RGC (Kakwokwo, Okwece, Alero, Nanda and Nyamahasa parishes) in Mutunda, Nyamahasa and Diima Sub Counties in Kiryandongo District. It will cover a core beneficiary area of 13 villages. By design, it will have 2 water sources (2 borehole DWD 77379 with 5.2m³/hr yield; and DWD 77378 with 50.5m³/hr yield). It will have other components namely - a submersible pump and pump house, transmission mains, 2 storage reservoirs with 350m³ total capacity (cold pressed steel tanks elevated on steel towers), sump and booster station by gravity (30m³ capacity), distribution network (29km / 29,060m) in length; 200 start-up domestic connections including yard taps; 35 new public stand points, (PSPs), 2 VIP Latrines at institutions, 1 waterborne public toilet in Mutunda trading centre, intensification lines and a DOSATRON online proportional chemical dozer. The electricity supply at the water sources and booster station will comprise of multi crystalline PV solar panels rated at 280pW 24 Volts DC cells with a control unit and other system support structures. There is no hydroelectricity in the Project Area, however, erection of poles is underway to extend the national electricity grid which will be tapped into to power up the electric components of the system. The Northern Umbrella of Water and Sanitation (NUWS) is proposed to operate and manage the water supply system. The project has a Capital Investment Cost Estimate of US\$ 5,020,011,888 (Exclusive of VAT and Contingency). The ESIA team assessed the baseline conditions in all the site locations, engaged stakeholders and identified impacts and risks, as well as alternatives to the design and ESMP.

The Physical Environment baseline conditions show that the project area lies in Kamudini catchment in the Upper Nile Water Management Zone. It's generally a plateau land with an average elevation of 1,295 meters above sea level. It has a bi-modal rainfall pattern with an annual long-term average rainfall of 1200mm. The area is divided into three major climatic zones of high, medium and low rainfall. The drainage system consists of extensive wetlands, predominantly Nanda which drains eastwards towards the Victoria Nile, the largest surface water source in the district.

The soils are mainly sandy loam soils, a number of rocky/stony patches, with observable Laterite rock outcrops while some areas are loose due to modification by agricultural activities hence susceptible to erosion. The hydrogeology is characterized by crystalline bedrocks of the Precambrian era containing water in fractures and fissures. The aquifer is constituted of weathered Precambrian formation (regolith) the potential of which is greatly enhanced by the under laying fractured crystalline bedrock of the same age. The average annual rainfall of the area is approximately 1,400 mm per annum, approximately 10% of which recharges the aquifers annually. The groundwater flows in the same manner as surface water, westerly towards Victoria Nile. In the southern parts, groundwater flows south towards Gaspa and then to Victoria Nile. The air quality baseline measurements for Particulate matter, NO₂, SO₂, CO and VOCs were within the required limits except for PM₁₀. Noise levels were above the maximum permissible noise limits except at a sampled church location site (422905E, 231872 N). This was mainly attributed to the vibrant human activity in the area.

The Biological Environment studies undertaken at the borehole site, reservoir and water supply network corridors (covering about 3.43 km² of the project area of influence) indicate that there are 174 plant species distributed among 43 families in the project area. Fifteen of the encountered species were identified as invasive. Out of the 174 plant species encountered, only one species (*Milicia excelsa* / Mvule in Moraceae) is globally listed as Near threatened on the IUCN Redlist of Uganda of 2016, and raises a great conservation concern. There are 20 butterfly species of least concern representing four families and fourteen genera. Four species of Dragon flies all belonging to the family Libellulidae and four genera were recorded and are categorised as least concern. Four species of amphibians, listed as species of least concern (1 toad and 3 frogs - all representing three families and three genera). Seven reptile species, listed as species of least concern, were recorded during the survey. Two species were lizards, one species was skink and four species were snakes. Forty-One species of birds were positively identified, representing 26 families and 38 genera. One bird species, Goliath Heron *Ardea goliath*, was identified as Near-Threatened regionally and categorised as vulnerable by the National Red List for Uganda. Six mammal species, listed as species of least concern, belonging to five families and six genera were registered in the project area.

The Socio-Economic baseline conditions indicate 7,839 household living in all the 4 beneficiary parishes of Kakwoko, Alero, Okwece and Nyamahasa. The area has an average household size of 5 which is slightly higher than the country's household size of 4.7. 68.3% of the population are dependent on subsistence farming as their major occupation. The dominant crops grown include root tubers (cassava, sweet potatoes), cereals (maize, rice, sorghum), tobacco, coffee and plantains, while the animals reared for income majorly include local chicken and livestock (cattle,

goats, sheep, piggery). It has been notable that water scarcity is rampant and directly linked to Incidence and prevalence of water related diseases. Between 2015 – 2021, there were 365,549 reported cases (OPD) for diseases and illness related to Cough or Cold, Malaria, Diarrhoea, Intestinal worms, Gastrointestinal Disorders, Pneumonia, STIs, GBV related injuries, Typhoid, Stomach Aches, HIV/AIDs, Covid19 (DHO/HMIS2, 2015-2021). However, the burden of water related diseases is likely to reduce due to provision, access and utilization of safe and clean water.

Secondary data from MWE / Water Atlas 2016 show that access to safe water in Kiryandongo district stands at 71%, with rural access at 77% and urban access at 48%. Within Mutunda SC, there are 152 domestic water points (7 protected springs; 50 shallow wells; 90 deep boreholes; 5 valley tanks; no PSP). River Nile is a major open water source as well. By type of technology, 58% of household population are served by deep boreholes, 40% by shallow wells, 2% by protected springs and none by rain water harvest. From a gender perspective, women and children take a heavy burden of full-filling reproductive and productive roles at household and community level, and this mainly involves collection of water, and other related tasks such as collecting firewood for cooking, washing utensils among other domestic chores. This exposes them to extreme vulnerability.

Further still, in order to obtain timely baseline data, the ESIA team conducted a socioeconomic survey. Findings of the survey indicate that 68.5% of the households (HHs) walk a distance above 500 meters to nearest water source; 13.7% move 300-500 meters; 9.9% move 100-300 meters; 5.6% move 50-100 meters and 2.3% move less than 50 meters. In terms of time for water collection, 49.5% HHs collect in morning hours of between 10.00am and 2.00pm; 41.6% collect between 7.00am-10.00am; 7.9% between 2.00pm-7.00pm; 1% between 5.00am-7.00am. About 60.4% HHs spend at least less than 30 minutes waiting at a water source point; 28.7% HHs spend at least 1 hour; 8.9% spend at-least 2 hours and 2% spend at-least between 2-4 hours. In terms of how often communities pay for water, 50.5% pay on monthly basis; 44.6% pay on weekly basis; 5% daily. In terms of consumption 30.7% of the households indicated use at least 100 litres of water per day; 26.7% use 80 litres of water per day; 12.9% use 60 litres; 11% use 120 litres per day; 7.9% use 40 litres; 6.9% use 140 litres; 4% use 20 litres of water per day. Further still, the survey findings show that 78.2% of the respondents said YES they are willing to pay for piped compared to 7.9% who said NO. In many of health facilities, there is no water within all treatment wards and in waiting areas. This implies a lower status of WHO minimum standards for water, sanitation and hygiene services in health facilities. Much as the World Bank has supported some education facilities with rain water harvesting tanks, in most of the schools there is no reliable source of water, no menstrual health facilities such as private rooms, sanitary pads, disposal pits, etc. Additionally, much as latrine coverage is low, the uptake of water borne toilets and septic tanks will increase upon completion of piped water supply. It's also anticipated that there will be an increase deliberate emptying of faecal sludge into storm drainage and swamps and this will consequently cause environmental and health-related problems. The operation and maintenance of the solar piped water system may invoke local governments and refugee administration units to enforce and/or pass new laws and regulations regarding eligibility of connections, operation and maintenance.

The assessment of project environmental and social impacts considered identification and analysis of positive and negative impacts expected from all the project phases. For positive impacts, enhancement measures were recommended in order to realise maximum benefits from these impacts. The major positive impacts identified were: Social acceptability, community involvement and ownership of the project before project construction, short-term employment opportunities for local communities during the construction phase, and improved / increased access to safe and clean water within communities, improved public health conditions and health security, reduction in gender-based violence, improved education outcomes due to access to safe water in schools and early childhood development centres, improved provision and utilization of water services, reduced extreme water vulnerabilities among rural and urban host and refugee communities, rural transformation through improved living conditions (reliable and affordable piped water supply) and improved local governance and social accountability during the operation phase of the project.

The analysis further indicated that there were no major negative impacts expected from the project for both the construction and operation phases, except for depletion of groundwater resources that may arise from water over abstraction as a result of increased demand of water in the RGC. This impact will, however, be mitigated by acquiring abstraction permits from DWRM to facilitate adherence to agreed rates of abstraction, and limiting issuance of abstraction permits in the project vicinity, ground water level monitoring, and developing and implementing a catchment management plan for the Victoria Nile in which the project lies and a source protection plan specific to the project water sources.

Other analysed project negative impacts include moderate rated impacts (generation of solid waste, increased risk of road accidents, influence on child labour & young worker (14-17 years), risk of sexual exploitation and abuse and sexual harassment, risk of contracting and spreading covid-19, and destruction of physical cultural resources), and minor rated impacts (impacts on land use/cover and ownership, deterioration of landscape and visual aesthetics, susceptibility to soil erosion, loss of vegetation cover, loss of habitat for fauna, disturbance and degradation of wetland ecosystems, noise and vibrations, and air pollution) for the construction phase, and moderate impacts (risk of pollution from mismanagement of sanitation facilities and loss of jobs for water vendors) and minor impact (solid waste generation, increased cost per unit / reduced affordability and Occupational Health and Safety Risks) during the project operation phase.

Cumulatively, over abstraction of water due to increased water demand leading to depletion of ground water resources may also be expected. However, similar to the operation phase major impact, the same mitigation measures are recommended to sustainably manage the ground water aquifers.

The ESIA also conducted an Analysis of Alternatives. The identification, consideration and analysis of alternatives is a very essential component of an ESIA. Different project alternatives were considered with the primary objective of determining the best economic, environmental and social option. The alternatives analysed included the Do-Nothing Option. With the “No Project” alternative, the existing poor water supply and sanitation in the area would continue to exist. The No Project Alternative would avoid the negative impacts aforementioned but also is the least

preferred from the socio-economic perspective because the population would not get the much-needed potable water supply and sanitation services. In the long term, the no-project scenario would be detrimental as the majority of the population in Mutunda RGC would continue using unsafe water, consequently putting them at high risk of contracting and spreading waterborne related diseases. This would also have local, national and regional implications given that the project area is a major refugee and IDP hosting district in the country. The perceived project benefits outweigh the perceived negative impacts. Therefore, the analysis of alternatives focussed on project sites and technology. Different alternative water sources including surface water from the Victoria Nile were considered, alternative water reservoir configurations, different water treatment methods and alternative sanitation systems. With the pros and cons of each analysed to inform the selection process, options were considered based on the environmental and social acceptance, the cost and the skills requirement for operation and maintenance of the technology.

In terms of Stakeholder Consultation and Information Disclosure, relevant and adequate project information were provided to stakeholders to enable them to understand project risks, impacts and opportunities so as to allow them to participate in the project and offer comments. The methods of consultation such as interviews, in-depth interviews and Focus Group Discussions and questionnaires were used to consult the following stakeholders: - The district technocrats consulted included; Chief Administrative Officer (CAO), District Planners, District Education Officer, District Environmental Officer, District Water Officer and the District Community Development Officer. At local level, the L.C. 1 Chair persons of Popara West, Kisura, Mutunda A, Mutunda B, Kakwoko, Teyago and Kawiti communities as well as residents within the Project Impacted Areas were consulted. The consulted stakeholders at all levels endorsed the project. They perceive the project as a source of employment, an opportunity to improve access to safe and clean water, improvement in hygiene and sanitation particularly in Mutunda RGC, improvement of health and the elimination of water borne diseases, increased revenues and incomes. However, they noted that the project might displace people from their land without adequate compensation and, insecurity might result because of influx of migrant workers. Also, they were concerned about the increase in conflict between the cattle keepers and the rest of the community in competition for the limited water resources. The views of the stakeholders were collected and considered during identification of project impacts and development of mitigation measures. Details of impacts and the mitigation measures including the stakeholder attendance are in Section 8 and Annex 4 respectively.

Furthermore, an Environment and Social Management Plan (ESMP) was prepared that elaborates the measures to be implemented in order to mitigate or optimize the project's identified potential impacts. For each measure, responsibilities and costs are provided. An Environmental and social management and monitoring plan (ESMMP) was prepared in order to ensure that mitigation measures are effectively implemented. It considered key monitoring indicators which include (but not limited to) - Vegetation loss and remedial restoration measures instituted; Noise, and air pollution control measures in place and how they operate; Erosion control measures; Control measures for traffic accidents; OHS measures for workers; Public health observance; Solid waste management measures; Employment opportunities; Gender Based Violence; Sexual Exploitation

and Abuse (SEA) and Defilement; Violence Against Children (Child Labour); Control of Spread of COVID 19; and HIV/AIDS interventions and related sexual behaviours among workers Labour recruitment and GBV aspects.

In conclusion, the proposed development of water supply systems and sanitation facilities in Mutunda RGC, Kiryandongo District will improve the capacity to deliver effective Water, Sanitation and Hygiene services to the refugee and host communities of the district. The benefits to the local economy will be in addition to reduced morbidity, increased enrolment of children in educational institutions, increased productivity of households and reduced incidences of domestic violence. The positive outcomes of implementing the project will infer positive change to the climate change, gender, health and educational vulnerabilities associated to water supply in the area. The negative environmental and social impacts of the proposed project in both the construction and operation phase can be mitigated through implementation of the provisions in the ESMP to address stakeholder concerns, so as to have a minimal or no effect on the natural environment as well as cultural and social functions and processes of the project affected communities. The project is an intervention of the Central government (MWE) with support from the World Bank that will require collective action from stakeholders such as the Local government and regional actors in the WASH sector for its effective implementation. MWE will spear head the supervision of the construction contractor and the operator to ensure negative impacts from the project are minimised. This should entail among others, undertaking of annual environmental and social audits following provisions of the ESMP to ensure continuous improvement of the project's processes and products.

1 INTRODUCTION

1.1 BACKGROUND

The Ministry of Water and Environment (MWE) together with National Water and Sewerage Corporation (NWSC) are implementing the Integrated Water Management and Development Project (IWMDP) with funding from the World Bank and Government of Uganda. The Project Development Objective is to improve access to water supply and sanitation services, capacity for integrated water resources management and the operational performance of service providers in project areas. In particular under Component 1.2, IWMDP provides support to Refugee and Host Communities, with financing from the IDA 18 Refugees Sub-Window. The sub-component supports activities designed to improve the sustainable provision of water supply and sanitation services to refugee settlements and host communities. The sub-component's target districts are: Yumbe, Arua, Moyo (including Obongi district newly created from Moyo), Adjumani in West Nile, Lamwo in Northern and Kiryandongo in Central Uganda, where about 70 percent of the refugees in Uganda are being hosted. MWE is directly responsible for implementation of IWMDP in small towns and rural growth centres whereas the National Water and Sewerage Corporation is responsible for the same in large towns.

For the proposed 3 large solar powered piped water supply systems and sanitation facilities in refugee settlement and host communities of Kiryandongo district, MWE contracted JBN Consults and Planners to undertake the Environment and Social Impact Assessment (ESIA), in accordance with the National Environment Act, 2019. This report therefore presents the findings of the ESIA exercise undertaken for the proposed water and sanitation system in Mutunda RGC. The Consultant assessed the likely environmental and social impacts of the proposed project in line with the Guidelines for Environmental Impact Assessment in Uganda" (NEMA, July 1997), the National Environmental Impact Assessment Regulations, 2020 and the World Bank environmental and social safeguards policies.

1.2 PROJECT JUSTIFICATION

Uganda is the principal refugee hosting country in Africa and one of the top five in the world. According to the United Nations High Commission for Refugees (UNHCR)/ Office of the Prime Minister (OPM) data¹, by 30th September 2021, Uganda was host to 1,524,352 refugees, of which 72,833 (about 4.8% of the total refugee population) were living in Kiryandongo District. With a total population of about 322,300 individuals, Refugees make up about 23% of Kiryandongo District's population. The current large inflow of refugees into the district has exerted substantial stress on the social infrastructure and services. As such, there are exceptional constraints on the district's capacity to deliver effective Water, Sanitation and Hygiene (WASH) services to the refugee and host communities, giving rise to the need for collective action from the Central government and development partners to address the WASH challenges therein.

In order to address the water supply and sanitation gaps in Kiryandongo District, 3 solar powered piped water supply systems and 10 toilets have been proposed. These water supply and sanitation infrastructure will be implemented in the RGCs of Nyakabale, Gaspa and Mutunda as part of the

¹ <https://data2.unhcr.org/en/country/uga> (Accessed on 9th November 2021)

strategy to improve access to clean water, improved sanitation and hygiene in the refugee settlements and host communities.

1.3 RATIONALE OF ESIA

The National Environment Act, 2019, section 113 (1) requires that, any developer who proposes to undertake a new project which falls within Schedule 5 of the Act is required to undertake an Environmental and Social Impact Assessment (ESIA) as prescribed by and reiterated in the National Environment (Environmental Impact Assessment) Regulations 2020, section 3(a)(ii). The proposed development of water supply systems and sanitation facilities in Kiryandongo District are under the categories of “Utilization of Water Resources and Water Supply” as well as “Waste Management Facilities” which are listed under schedule 5 section 4 (i) and schedule 4 Part 2 section 9(d) respectively of the Act, that requires mandatory environmental and social impact assessment before implementation. Therefore, an Environmental and Social Impact Study was conducted before approval of the proposed project activities by the National Environment Management Authority (NEMA) for implementation.

Furthermore, this ESIA was carried out in pursuance of the World-Bank Safeguards policies {Environmental Assessment (OP/BP/GP 4.01), Natural Habitats (OP/BP 4.04), Physical Cultural Resources (OP 4.11), Involuntary Resettlement (OP/BP 4.12) etc.} for investment project financing and the World Bank Group Environmental, Health, and Safety (EHS) Guidelines. This project falls under Environmental Assessment Category B given that Environmental and Social impacts are localized, site specific and small to moderate in scale.

1.4 OBJECTIVES AND TECHNICAL SCOPE OF THE ESIA

The consultant undertook ESIA studies for the proposed development of water supply systems and sanitation facilities in Mutunda RGC located in Kiryandongo District. The overall objective of the assignment is to detail the potential adverse bio-physical and socio-economic impacts of the proposed Water Supply and Sanitation System and propose mitigation measures.

In undertaking this assignment, the consultant aimed to provide the following:

- (i) Description of the Policy, Legal and Regulatory Frameworks;
- (ii) Description of the Administrative/Institutional framework;
- (iii) Description of baseline environment and social conditions of potentially affected areas, including a detailed environmental and social baseline;
- (iv) Description of project's potential impacts, including (direct, indirect and cumulative impacts);
- (v) Identification and analysis of project's potential impacts (positive and negative) and recommendation of feasible measures to avoid, minimize or mitigate the negative impacts and severity;
- (vi) Propose mitigation measures, assess their expected effectiveness and any residual enhance the positive impacts;
- (vii) Analysis of proposed alternatives identified during the feasibility study;
- (viii) Evidence based meaningful public consultation/Stakeholder engagement and disclosure;
- (ix) Impact assessment on any auxiliary/associated facilities that may be impacted upon by the project;

- (x) Social risk assessment and identification of existing service centres including but not limited to gender issues, vulnerable groups aspects, and labour influx, including Social conflict, Gender Based Violence (GBV), Violence against children (VAC);
- (xi) Develop chance finds procedures to facilitate the handling of any unknown or known physical cultural resources, recommend grievance redress mechanism to facilitate the handling of any complaints that may arise during project implementation;
- (xii) Development of an Environmental and Social Management plan (ESMP) clearly identifying institutional roles and responsibilities for implementing the mitigation measures, including potential gaps in capacity to implement the measures and how such gaps will be addressed;
- (xiii) Development of an environmental monitoring plan with clear monitoring indicators and institutional roles for tracking the implementation of and compliance with the proposed mitigation measures; and
- (xiv) Description of Inter-Agency coordination.

1.5 ESIA REPORT STRUCTURE

The ESIA report is structured as summarized herein with section-based explanatory highlights.

Table 0-1: ESIA Report Structure

Chapter	Highlight on section content
Executive Summary	Executive Summary of the project and its activities, ESIA study methods, key findings and impacts as well as proposed mitigation measures.
Chapter 1	Introduction with details of project background, objective, justification and categorization of the Project.
Chapter 2	Project description which gives details of project components, location, and the proposed project activities, area of influence, project management, project proponents and cost estimates.
Chapter 3	Description of ESIA approach and methodology
Chapter 4	Outline of different laws, policies, regulations and international guidelines and conventions relating to implementation activities of the proposed project as well as ESIA study.
Chapter 5	Description of Biophysical and Socioeconomic baseline information of the project area
Chapter 6	Public consultation and stakeholder engagement processes and the outcomes of such meetings
Chapter 7	Analysis of project alternatives, a comparison of the options and their significance
Chapter 8	Description of the project anticipated environmental and social impacts and their mitigation measures
Chapter 9	The Environmental and Social Management Plan (ESMP) as well as the Environmental and Social Monitoring Plan
Chapter 10	Conclusion
Chapter 11	References
Chapter 12	Annexes

2 PROJECT DESCRIPTION

IWMDP intends to undertake construction of a water supply system and sanitation facilities in refugee settlement and host communities, Kiryandongo district. These water supply and sanitation infrastructure will be implemented as part of the strategy to improve access to clean water, improved sanitation and hygiene in Mutunda RGC.

2.1 PROJECT PROPONENT AND COST ESTIMATES

Project Proponent and Contacts

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Project Cost Estimates

The project has a Capital Investment Cost Estimate of US\$ 5,020,011,888 (Exclusive of VAT and Contingency) as evidenced by a certificate of the valuation of capital investment of the project issued by a qualified and registered valuer as in annex 12.

2.2 PROJECT LOCATION

The proposed water supply systems and sanitation facilities will be located in Kiryandongo District in the Mutunda RGC, covering areas in the Sub counties of Mutunda, Nyamahasa and Diima (**Figure 0-1**).

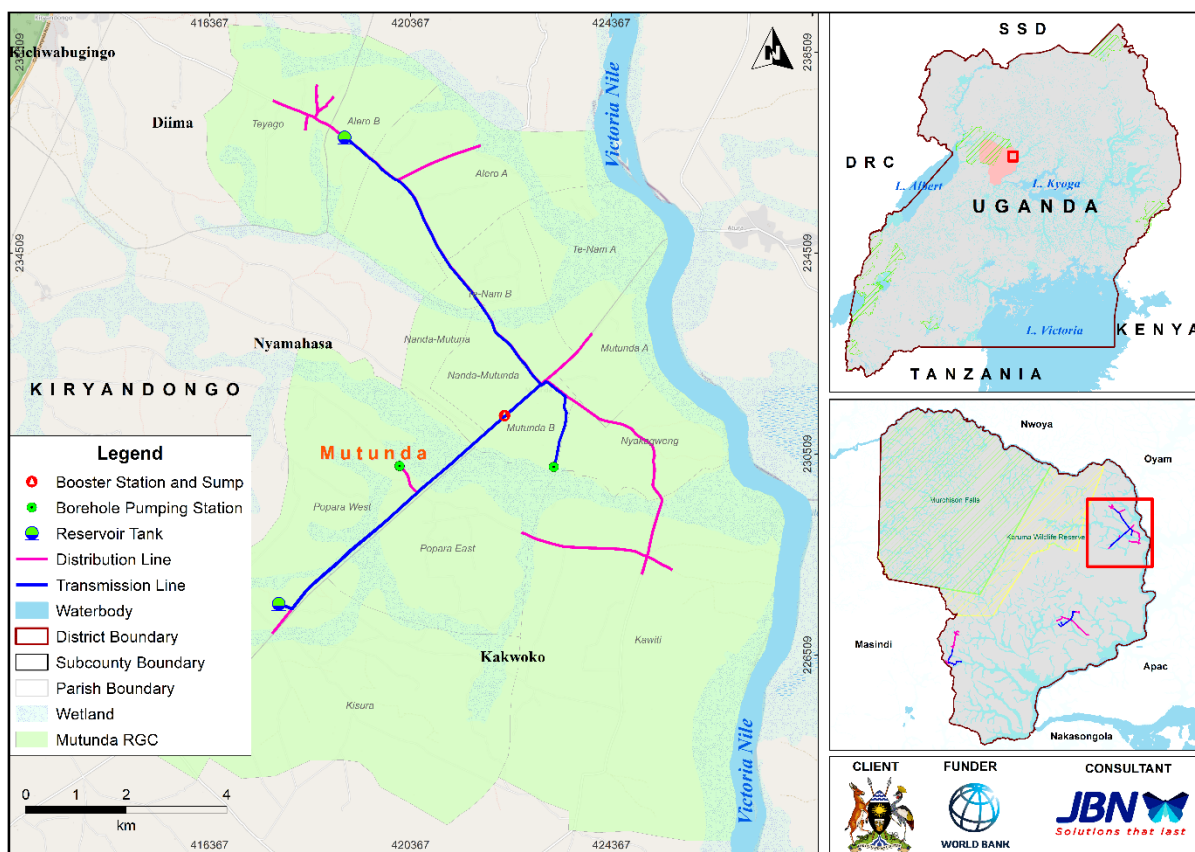


Figure 0-1: Location of the proposed water supply systems and sanitation facilities

2.3 PROJECT AREA OF INFLUENCE

The proposed piped water supply and sanitation project covers Mutunda RGC which is located about 12 km off Kampala – Gulu Highway. It comprises of 5 parishes and 13 villages in Mutunda sub counties. The parishes in the RGC are Diima, Nyamahasa and Kakwoko (Error! Reference source not found.). There, supply will also cover a number of as education, health and religious institutions in the RGC (Error! Reference source not found.) among others.

Table 0-1: Administrative structure (zoning) of the project area of influence

Sub county	Parish	Village	Project Component
Mutunda	Kakwoko	Kawiti	D, I
	Kakwoko	Mutunda A	D, I
	Kakwoko	Mutunda B	S,T,D,I
	Kakwoko	Nyakagweng	T,D, I
	Kakwoko	Popara East	D, I
Diima	Okwece	Te-yago A	D, I
Nyamahasa	Alero	Alero A	D, I
	Alero	Alero B	T,R,D,I, SF

	Alero	Nanda	T, D, I
	Alero	Te-Nam A	D, I
	Alero	Te-Nam B	D, I
	Nanda	Lavor-Ongur C	SF
	Nyamahasa	Popara West	S, T, R, D, I, E

S=Water Source, T=Transmission, R=Reservoir, D=Distribution, I=Network Intensification, O=Office block, E=Electricity Line and SF=Sanitation Facility.

Table 0-2: Institutions in the Project area of influence

Subcounty	Parish	Village	Institution Name
Nyamahasa	Nyamahasa	Popara West	St. Catherine Kakwoko Catholic Church
			St. Paul Popara Catholic Church
	Alero	Nanda	Mutunda Primary School
			St. Peter Catholic Church
		Te-Nam B	Mutunda Mosque
		Alero A	St. James Church of Uganda Alero
		Alero B	Alero Seventh-Day Adventist Church
			St. Joseph Balikudembe Catholic Church Alero
			Ogunga Primary School
		Samaria Church Of Uganda Alero B	
Nanda	Lavor-Ongur C	Yabweng Health Centre II	
Mutunda	Kakwoko	Kawiti	Kawiti Catholic Church
		Mutunda B	Mutunda Subcounty
			Mutunda Health Centre III
Diima	Okwece	Te-yago A	Christ Disciple Church

2.3.1 WATER DEMAND IN THE PROJECT AREA

The water supply system was designed in reference to a 20-year design period starting with the year 2023. The population growth rate for Kiryandongo District is estimated at 2.97%. The Average Day Demand which depicts the daily water consumption by domestic and nondomestic consumers is subject to seasonal climatic variations, harvest seasons, and other factors such as transient population, and religious and cultural festivals. To allow for increased demands during these seasons, a maximum day peak factor of 1.3 was applied to the system design capacities.

Table 0-3 below summarizes the projected daily water demand for the design period in the project area.

Table 0-3: Projected water demand in the project area

Year	2021	2023	2028	2033	2038	2043
Estimated Total Population	12,365	13,110	15,176	17,570	20,340	23,544
Projected Water Demand (m³/day)	331.49	351.48	406.86	509.92	591.42	685.93

Source: MWE, Feasibility Study and Design Report, 2021

2.4 MAIN PROJECT COMPONENTS

2.4.1 SOLAR POWERED PIPED WATER SUPPLY SYSTEMS

2.4.1.1. WATER SOURCES

The proposed water sources DWD 77378 and DWD 77379 (**Table 0-4**) are located in Mutunda B village and Popara West village respectively. At the water sources, a submersible pump with capacity specified in Table 2 2 will be installed at the borehole, complete with control kit and dry run protection. The construction of these boreholes was completed on June 17th, 2021 and the test pumping of the same boreholes was completed on July 20th, 2021. This translates to a potential lifespan of 20 years for the aquifer given the projected water demand of 685.93 m³/day in the RGC by the year 2043 according to the project's Feasibility Study and Design Report (MWE, 2021). The water quality as shown in the water quality analysis Section (5.2.8) shows that the water quality from these boreholes conforms to the national drinking water standards.

A pump-house will be constructed and detailed including plastering and painting, fitted with steel panel doors, windows and ventilation units; including security lights. A Perimeter fence of dimension (30m x 30m) will be constructed using G12 chain link and barbed wire fastened to G.I poles of dimension 75 x 75 x 3mm at a spacing of 2.5m c/c. G.I poles will be secured in a concrete foundation. Paspalum grass will be planted in the compound area to stabilize the surrounding areas.

Table 0-4: Details of water sources

RGC	Borehole Yield	GPS Coordinates	Pump Capacity	Daily (16 hours pumping regime)	
Mutunda	DWD 77379 (5.2m ³ /hr)	420071E, 230567N	Head 220m, Flow 5.2m ³ /hr	83.2	803.2
	DWD 77378 (50.5m ³ /hr)	423140E, 230549N	Head 190m, Flow 45.0m ³ /hr	720	

Source: MWE, Feasibility Study and Design Report, 2021



Figure 0-2: Project Water Source Sites

2.4.1.2 WATER RESERVOIRS

The water supply system in Mutunda RGC will include 2 reservoirs comprised of cold pressed steel tanks elevated on steel towers as detailed in

Table 0-5. The storage reservoirs will provide for fluctuations in consumer demand during the day (e.g. the hourly peak flow), without having to design the pumping mains to match the peak flow. Furthermore, the storage will provide for a fairly constant residual pressure and flow to the consumers. 30% of the maximum day demand was adopted for storage as stipulated by the MWE Water Supply Design Manual (2013).

The Main Storage Reservoir is the Popara West reservoir tank with a capacity of 250m³. The required storage capacity is 252m³ entailing 50% of the maximum day demand for Kakwokwo supply area and 20% of the maximum day demand for the Diima supply area. The pressed steel tank will be erected on a 20m tower height with square 1.22m panels measuring 9.76m long, 7.32m wide, and 3.66m high.

The storage reservoir for the Alero B reservoir tank will have a capacity of 100m³, providing storage equivalent to 50% of the maximum day demand given the required storage capacity of 114m³. The

pressed steel tank will be erected on a 15m tower height with square 1.22m panels measuring 6.10m long, 4.88m wide, and 3.66m high.

Table 0-5: Specifications of the reservoirs

RGC	Reservoir	GPS Coordinates	Capacity (m ³)	Tower Height (m)
Mutunda	Popara West Reservoir	415137E, 226916N	250	20
	Alero B Reservoir	419057E, 236711N	100	20

Source: MWE, Feasibility Study and Design Report, 2021



Figure 0-3: Proposed reservoir site in Alero B Village, Mutunda RGC



Figure 0-4: Proposed reservoir site in Popara Village, Mutunda RGC

2.4.1.3 TRANSMISSION AND DISTRIBUTION

Water will be pumped from the boreholes using independent transmission mains into the main storage reservoir at Popara West. From there, pumping mains will convey the water to the sump and booster station by gravity, from which it will be pumped into the second reservoir at Alero B. The distribution network will be fed by gravity from the storage reservoirs. The distribution mains were designed with adequate capacity to meet the peak hour demands of the consumers being supplied. The transmission and distribution corridor will be gained by use of existing public roads and proposed access roads, as the pipes will be buried in the road reserves. The piping network will traverse Kawiti, Mutunda A, Mutunda B, Nyakagweng, Popara East, Te-yago A, Alero A, Alero B, Nanda, Te-Nam A, Te-Nam B and Popara West villages

Table 0-6: Specification of transmission system and distribution network

RGC	Transmission Length (m)			Distribution Total Length (m)
	Source 1	Source 2	Pumping Mains	
Mutunda	4,374	9,040	13,360	29,319

2.4.1.4 NETWORK INTENSIFICATION

As a measure to increase the densification of the distribution networks as a drive to increase the customer base, and allow a neater layout of the service connection pipes, some pipe work intensification will be required. The intensification lines will be demand-driven, and installed where there are adequate applications for connections. An estimated 12 km of pipe work is planned for intensification in the villages of Kawiti, Mutunda A, Mutunda B, Nyakagweng, Popara East, Te-yago A, Alero A, Alero B, Nanda, Te-Nam A, Te-Nam B and Popara West villages. The location of the service pipes will not be known until applications for connections are received.

2.4.1.5 SUMP AND BOOSTER STATION

The system in Mutunda RGC will include a booster station and sump of 30m³ capacity in Nanda-Mutunda village (GPS Coordinates: 422183E, 231236N). The booster station and sump will be fed by a gravity transmission main from the Popara West Reservoir. Water will be pumped from the booster station to the Alero B reservoir. The Booster Station will have 2No. horizontal centrifugal pumps (1No. duty and 1No. standby) with a flow of 10.6m³/hr. at 99m head; and transmission main of HDPE - OD 90 PN16, 7,350m long.



Figure 0-5: Proposed site for booster station and sump in Nanda-Mutunda Village

2.4.1.6 DISINFECTION FACILITIES

Disinfection of the water from the wells will be effected by the installation of a DOSATRON online proportional chemical dozer at the Popara West distribution reservoir. A pipe manifold will be constructed to receive the water from the borehole before disinfection is effected prior to entry into the tank. A chemical house will be constructed adjacent to the reservoir to house the dozer and serve as a chemical storage, mixing and dosing place.

2.4.1.7 ACCESS ROADS

Access to majority of the project components will be gained through existing public roads, given their convenient location in close proximity to the existing road network. However, some components, not located in close proximity to the existing road network, have been identified to require access roads as detailed in **Table 0-7**. The land tenure system in the area is customary which will necessitate compensation due to the land take as captured in the project RAP.

Table 0-7: Access roads for project components

RCG	Project Component	Land Requirements
Mutunda	Borehole DWD 77379 Access Road	978m ² (163m long, 6m wide)
	Borehole DWD 77378 Access Road	876m ² (146m long, 6m wide)
	Booster Station and Sump Access Road	60m ² (10m long, 6m wide)
	Popara West Reservoir Access Road	252m ² (42m long, 6m wide)

	Alero B Reservoir Access Road	534m ² (89m long, 6m wide)
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Figure 0-6: Access path to Borehole DWD 77379 in Mutunda RGC



Figure 0-7: Access Road to Borehole DWD 77378

2.4.1.8 POWER SUPPLY

The water supply system will be powered by solar power augmented by hydroelectricity.

2.4.1.8.1 SOLAR POWER SUPPLY

The power requirements at the pump stations would be provided using:

Borehole DWD 77378: The system will consist of multi crystalline PV solar panels rated at 280pW 24 Volts DC, 33No. cells, with a control unit, support structure, and electrical accessories and cabling at the pump station; and 1No. 25 KVA 11,000 Volts / 433Volts, 50Hz, 3 phase transformer; a 0.7 Km extension of the 33KV overhead power line with 3-line conductors at the pump station.

Borehole DWD 77379: The system will consist of multi crystalline PV solar panels rated at 280pW 24 Volts DC, 231No. cells, with a control unit, support structure, and electrical accessories and cabling

at the pump station; and 1No. 150 KVA 11,000 Volts / 433Volts, 50Hz, 3 phase transformer; a 1.5 Km extension of the 33KV overhead power line with 3-line conductors at the pump station.

Booster Station: The system will consist of multi crystalline PV solar panels rated at 280pW 24 Volts DC, 59No. cells, with a control unit, support structure, and electrical accessories and cabling at the pump station; and 1No. 50 KVA 11,000 Volts / 433Volts, 50Hz, 3 phase transformer; a 0.1 Km extension of the 33KV overhead power line with 3-line conductors at the pump station.

2.4.1.8.2 HYDROELECTRICITY POWER SUPPLY

There is no hydroelectricity in the Project Area, however, erection of poles is underway to extend the national electricity grid to Mutunda Project Area. The location of the drilled boreholes will necessitate extension of the power grid. In addition, a transformer will be installed at the pump stations. The backup power requirements at the pump stations will be provided using:

Borehole DWD 77379: This requires the supply and installation of 1No. 25 KVA 11,000 Volts / 433Volts, 50Hz, 3 phase transformer; a 0.7 Km extension of the 33KV overhead power line with 3-line conductors at the pump station; and 415Volts, 50Hz, 3 phase diesel electric generator with prime rating of 15 KVA.

Borehole DWD 77378: This requires the supply and installation of 1No. 150 KVA 11,000 Volts / 433Volts, 50Hz, 3 phase transformer; a 1.5 Km extension of the 33KV overhead power line with 3-line conductors at the pump station; and 415Volts, 50Hz, 3 phase diesel electric generator with prime rating of 150 KVA.

Booster Station: This requires the supply and installation of 1No. 50 KVA 11,000 Volts / 433Volts, 50Hz, 3 phase transformer; a 0.1 Km extension of the 33KV overhead power line with 3-line conductors at the pump station; and 415Volts, 50Hz, 3 phase diesel electric generator with prime rating of 150 KVA.

2.4.1.9 WATER OFFICE BLOCK

The water office block will be constructed at Mutunda Subcounty headquarters, for running the day to day operations of the water supply system. The water office block will consist of a reception area and operations office furnished with working benches, shelves and lockable cabinets.

2.4.2 SANITATION FACILITIES

The project will construct 4 VIP Latrines at institutions at Ogunga Primary School and Yabweng Health Centre II. All sanitation facilities will be inclusive gender segregated (male, female & disability). The proposed sanitation interventions in Mutunda RGC are detailed in **Table 0-8** below.

Table 0-8: Sanitation Facilities

Location	GPS Coordinates	Type of Facility	Number of	
			Facilities	Stances
Ogunga Primary School	419255E, 236739N	VL	2	5
Yabweng Health Centre II	415139E, 232757N	VL	2	5

VL= VIP Latrine.

2.5 AUXILIARY FACILITIES

2.5.1 CAMP SITES

It will be necessary for the contractor to establish workers camp to provide accommodations for experts that might come outside the project area as well as project offices for the contractor and supervising consultants. Other facilities with the camp shall include: parking yard, material storage yard, kitchen, sanitary facilities, site clinic etc. The identification, selection, construction and operation shall be in line with the provisions in NEA 2019 and other relevant statutory requirements. All the auxiliary facilities shall be subjected to independent and comprehensive Environmental and social impact assessment and approvals shall be secured.

2.5.2 MATERIALS SOURCES

Where there is need for local materials such as water, sand, aggregates and gravels, the contractor shall be required to get from legally existing and authorized sources.

2.5.3 WASTE HANDLING AND DISPOSAL

During the construction, the contractor shall generate both hazardous and non-hazardous wastes including vegetation stripped from site, soil excavated from foundation sites, packaging waste (cement bags, paper, polythene sheets, and wood pallets), metal scrap, wire cuttings, wooden planks, polyethene sheets, PET water bottles, empty paint and solvent containers and waste oil from construction equipment or vehicles. Some of the waste materials such as paints, cement, adhesives, waste oil and cleaning solvents contain hazardous substances. The generated waste must be managed in by a licenced waste handler in accordance with the national environment (waste management) regulation 2020 and Local Government Act (Amended) 1997).

2.6 PROJECT MANAGEMENT

During construction phase, the project shall have a supervising consultant who shall oversee the implementation of the project on behalf of the developer. The supervising consultant will have in place an environmental and social safeguards team comprising of Gender and GBV officer, Health & Safety officer, environmental safeguards officer, social safeguards officer, among others.

The proposed operation and management option is to handover the water supply system and public sanitation facilities to the Northern Umbrella of Water and Sanitation (NUWS). Within the decentralization framework, the experience and capacity of Umbrella organization, applied directly to the management of the newly constructed facilities will increase the likelihood of sustainable commercial operations and management of the town systems in the next 5-10 years. The Umbrellas organisation is under the Urban water department of the Ministry of Water and Environment and can effectively plan and manage budgets agreed within a contract framework. It can use experience gained elsewhere in the past 5-years to extend services to rural & urban poor areas.

2.6.1 LABOR FORCE

For the proposed solar motorized piped water supply project, several staff for the contractor (approximately 100 workers), Supervising consultant (approximately 10 workers), Stakeholder Engagement Consultant (approximately 10 workers) and MWE staff (approximately 5 staff) will be required during the construction phase. The major categories will include key staff, skilled, semi skilled and unskilled workers.

3.1 GENERAL APPROACH

This ESIA was carried out in line with requirements of the legal, policy and regulatory framework of Uganda as well as the World Bank Operation Policies. The ESIA methodology presented is in line with the Environmental Impact Assessment Regulations, 2020, the National Environment Act 2019 (**Figure 0-1**), the manual for EIA Guidelines for Water Resources Related Projects in Uganda (MWE, 2011); Environmental and Social Management Framework for the IWMDP and the World Bank's general Environment Health and Safety Guidelines (EHSGs), with specific reference to the EHSGs for Water and Sanitation Projects. The World Bank policy requirements, in instances that they were more comprehensive, were addressed over and above the requirements of the regulatory framework of Uganda. Reference was also made to the NEMA Conditions of Approval of the ESIA Terms of Reference (**Annex 1**).

The ESIA study involved the following steps:

- i. Determining the issues/scope that the ESIA should address (scoping study);
- ii. Review the applicability of legal and institutional framework to the proposed projects;
- iii. Discussion of proposed project alternatives;
- iv. Consultation with stakeholders;
- v. Baseline surveys in form of data collection field surveys to establish the baseline environment, supplemented by desk-based data collection to fill any data gaps;
- vi. Impact identification and the evaluation of significance (Identification of mitigation measures (where required) to reduce the significance of, or avoid, any identified adverse impacts, evaluation of impacts, post-mitigation, to determine the significance of residual impacts, and assessment of cumulative impacts with other past, present and reasonably foreseeable future developments and plans);
- vii. Identification of appropriate monitoring requirements; and
- viii. Preparation of the ESIA study reports.

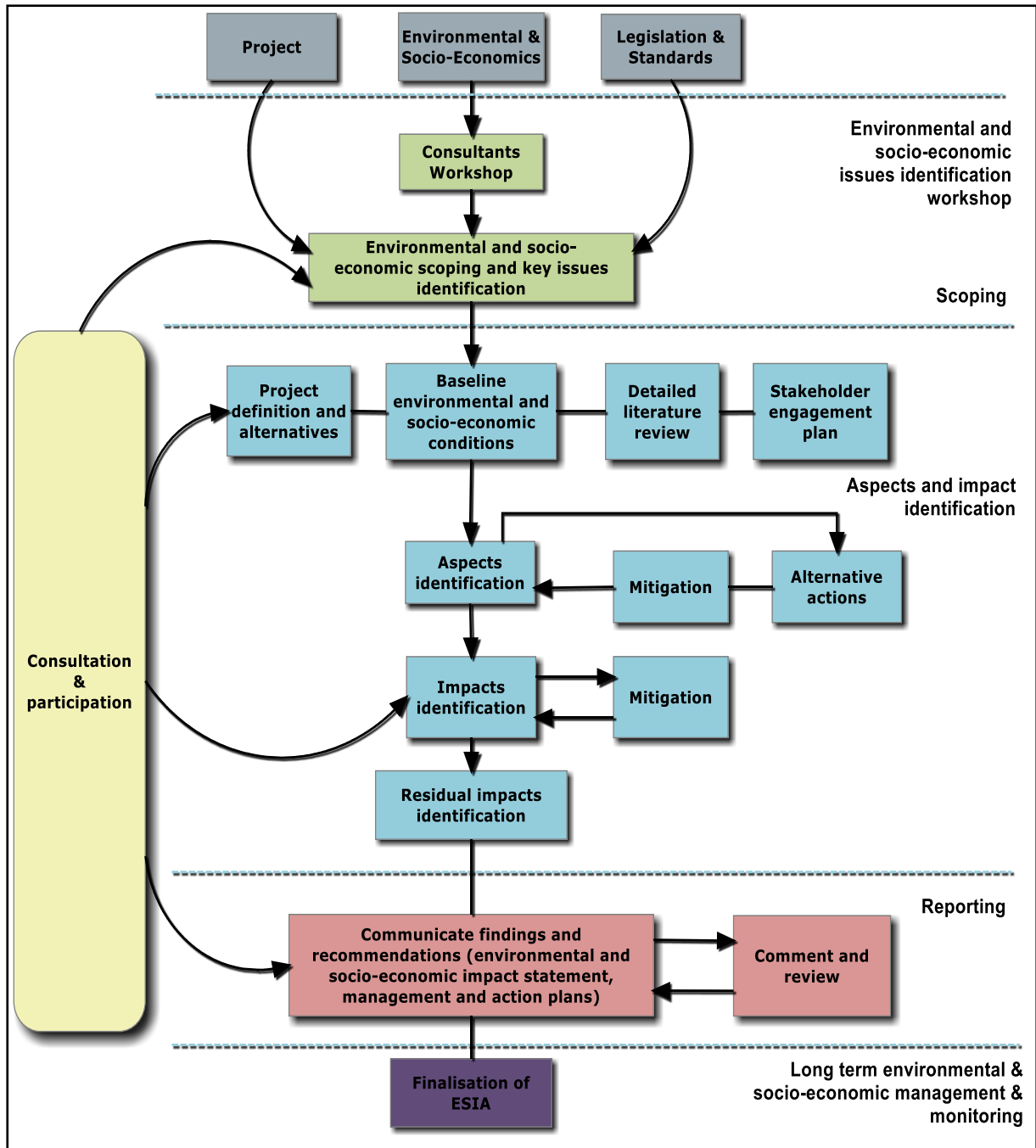


Figure 0-1: ESIA Approach

Pursuant to this approach, the following sections provide detail on how each stage of the ESIA process was applied to the proposed project.

3.2 DOCUMENT REVIEW

To gain a clear insight on baseline parameters and project characterization, a number of planning, regulatory documents, and reports were reviewed as presented below.

- i) Relevant policies and legislation of Uganda;
- ii) Relevant international covenants;
- iii) IWMDP Environmental and Social Management Framework;

- iv) IWMDP Resettlement Policy Framework;
- v) IWMDP Project Appraisal Document;
- vi) Water Resources Assessment Reports for Mutunda RGC;
- vii) Borehole Drilling & Test Pumping Reports for Mutunda RGC;
- viii) Feasibility Study Reports for Mutunda RGC;
- ix) Draft Engineering designs for the proposed project components;
- x) Kiryandongo District Development Plan (FY 2020/21-2024/25); and
- xi) UBOS National and District Statistical Abstracts for 2014, 2018 and 2021.

3.3 SCOPING STUDY

The purpose of the scoping phase was to identify key sensitivities and those activities with the potential to contribute to, or cause, potentially significant impacts to environmental and socioeconomic receptors and resources and to evaluate siting, layout and technology alternatives for the proposed Projects.

This stage determined the most important issues, problems, and alternatives that should be addressed in further environmental and social analyses. The consultant gathered an initial identification of the relevant environmental policies, laws, and regulations of Uganda. Also, an initial review of capacity issues concerning the prevention and mitigation of environmental impacts for individuals (in communities, professional associations and organizations, policy makers, etc.), for organizations (government departments, NGOs, private sectors etc.) and as regards an enabling environment (policies, laws, regulations, incentives, partnerships, etc.) was conducted by the consultant. The output of this stage facilitated the consultant to develop the tasks for the ESIA through consultation so as to ensure that the process and output are focused on the key issues.

The E&S scoping report formed a basis for development of Terms of reference that define the scope of the proposed impact assessment was submitted to NEMA on 13th December 2021 and was approved. The approved E&S scoping report/ Terms of Reference by NEMA (**Annex 1**) formed a basis for the detailed field studies for the proposed project.

3.4 BASELINE DATA COLLECTION AND SURVEYS

The description of the baseline environmental and socio-economic conditions provides information on receptors and resources that were identified during scoping as having the potential to be significantly affected by the proposed Project activities. It also describes baseline conditions that have been used to make the assessment.

3.4.1 BIODIVERSITY ASSESSMENT

3.4.1.1 FLORA ASSESSMENT

To study the vegetation structure and composition of Mutunda RGC, a combined methodology of field observations and sampling, guided by a Global Positioning System (GPS Garmin 62CSx) was used to locate plots along the proposed project pipeline alignment, Borehole sites and Reservoir site. The systematic sampling technique was utilised as it ensures that each unit has equal probability of inclusion in the sample. In this method of sampling, the first unit was selected with the help of random numbers and the remaining units were selected automatically according to a predetermined pattern.

Plots were laid within the limits of 30m alternating along the proposed transmission and distribution routes. Standard nested circular plots were located across all the study areas, 0.5 km intervals were used along water transmission and distribution lines from the Boreholes to the Reservoir site (Figure 0-2) and random sampling technique was applied to sample vegetation at the proposed reservoir, sump and borehole sites. Circular nested plots consisted of a 10m radius plot (where trees ≥ 10 cm of DBH (Diameter at breast height) were identified and counted), 5m radius plot (where lianas, shrubs and trees ≤ 10 cm DBH but greater than or equal 2.5 cm DBH were identified and counted) and a 2 m radius plot (where all grasses and herbs were identified). Sample specimens for Plant species that could not be instantly identified were collected, photographed and pressed on site for further confirmation at Makerere University Herbarium (MHU) where identification and archiving were done.

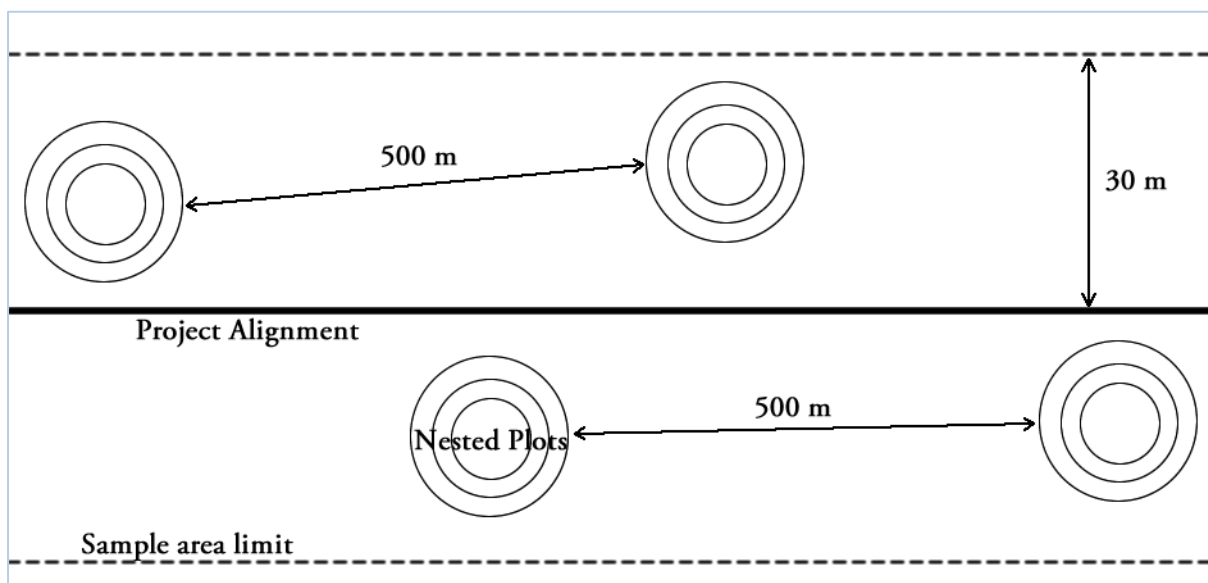


Figure 0-2: Illustration of the flora sampling technique

Although nested plots can register reasonable data on the distribution, diversity, and abundance of the various plant stratum according to the land use types of the area, a cumulative list was compiled from both the nested plots and opportunistic encounter that were recorded as they were encountered in the project Area (**Annex 6**).

3.4.1.2 FAUNA ASSESSMENT

Three main approaches were employed in conducting the baseline survey. The approaches include:

- 1) Literature review, 2) Informal community consultations, and 3) Use of field scientific sampling methods

3.4.1.2.1 LITERATURE REVIEW

Literature was reviewed to understand the project area and also to establish known fauna in the project area.

3.4.1.2.2 INFORMAL COMMUNITY CONSULTATION

During the field visit, the fauna specialist informally consulted the community members. The purpose was to collect data on existing on fauna which the fauna specialist may not be able to get during field

sampling. Discussions with the community members revolved around faunal groups / species that occur in and along the project alignment.

3.4.1.2.3 FIELD SAMPLING

Field sampling was conducted using known scientific methods and international best practices. The methods described below were used to survey the fauna along the project alignment. Six fauna groups were surveyed in the project area for their presence. The groups include Butterflies, Dragonflies, Amphibians, Reptiles, Birds and Mammals.

Butterflies

Butterflies were surveyed using Pallard's sweep net method (Gall, 1985; New, 1991; Warren, 1992; De Vries 1997) along established transects within a radius of 200m of sampling point. The method was used to document the butterfly species richness, as well as estimate their relative abundance.

At each of the sampling point, transects of 10m wide and 100m long were sampled. The fauna ecologists moved through the transect along a fixed line with 5m stretch on either side of the data collectors left and right hand. The ecologist moved at a slow and uniform / even pace of approximately 1km/h (Pellet 2007) through the transect, recording individuals sighted within the 10m width. Sampling was conducted between 9am-5pm when weather warmed up (13-17°C).

On spotting an individual butterfly, the fauna ecologist swept the net back and forth to capture the spotted butterfly. On anticipation of a capture, the net was flipped, with the bag hanging over the rim, trapping the individual fly. Trapped butterflies were gently removed from the net and identified. The captured individuals were released once identity was ascertained. If identity of an individual butterfly was not known, the butterfly was photographed and placed in collection envelopes, with details of GPS coordinates, Time and the photograph number written on the labels and taken to Makerere University Museum for identity determination. All trapped butterflies were identified to species level.

Data collected was analysed by (1) Estimating species richness based on recorded species presence or absence at the different sites sampled. (2) Estimating species relative abundance by counting and recording the number of individuals of the different butterfly species that were encountered while sampling. (3) by ascertaining species conservation status from the 2020 published IUCN red data list and the National red list of Uganda's threatened species (Wildlife Conservation Society 2016).

A standard field guide by Larsen (1991) was used to identify specimens to species level, and also by matching with Makerere University Museum collections. The species were arranged into families (Hesperiidae, Lycaenidae, Nymphalidae, Paeridae, Papilionidae) and genera.

Dragonflies

Pallard's sweep net method (Gall, 1985; New, 1991; Warren, 1992; De Vries 1997) was also used to survey dragonflies at the different project sites. Same design and analysis as for butterflies was adopted (see above). Sampling was conducted when weather warmed up. Each sampling event was conducted between 09:00h to 17:00h time and lasted about 1hour at each sampling point. All dragonflies that were flying or be perched within 5m of transect routes were recorded. All flying species were easily detected within the project area and an aerial net was swept through the

vegetation to elicit a flight response from less conspicuous, resting individuals. Same amount of sampling effort (time for searches) was applied at each site.

Herpetofauna (Amphibians and Reptiles)

Herpetofauna (reptiles and amphibians) were surveyed using a combination of scientifically tested methods as described by Heyer et al, (1994); Fellers and Freel, (1995); Halliday, (1996); and Olson, et al, (1997). The methods included the following:

- i) Visual Encounter Surveys (VES): The method involved moving through a habitat watching out for, and recording surface-active herpetofauna species. VES was complimented by visual searches, by examining under logs, leaf litter, in vegetation and crevices. Species encountered were recorded and where possible photographed.
- ii) Audio Encounter Surveys (AES): This method uses species-specific calls / vocalizations / sounds / advertising calls made by breeding males. The identity of the amphibian species heard calling and their numbers were counted and recorded.
- iii) Dip netting: Using a dip net, ponds, pools, and streams and other water collection points were dip netted. Adult amphibians and tadpoles encountered were recorded.
- iv) Opportunistic Encounters: Herpetofauna species encountered opportunistically while moving in the project area were also recorded.

The methods were used within 200 m radius around forty-four (44) pre-geo-referenced points chosen basing on the different types of habitats represented in the project area including wetlands, woodlands and farmlands / gardens. Sampling was only undertaken during the day because of the curfew imposed by the government of Uganda as one of the restrictions to control the spread of COVID-19 pandemic.

Reptiles were identified using (Schjøtz, 1975, 1999; Stewart, 1967) while amphibians were identified using Channing and Howell (2006). Data was analyzed by 1) compiling Species checklist, 2) determining the species conservation status using IUCN 2019 published Red List of threatened species as well as using the National Red List for Uganda published by Wildlife Conservation Society in 2016.

Birds

A combination of Timed Species Counts (TSCs), transect walks and opportunistic observations was used to survey bird fauna diversity within the project area (Bibby et al., 2000 and Voříšek et al., 2008). The survey targeted the different habitats identified in project locations including forest, grassland and wetlands.

The fauna ecologist walked along the transect searching for the presence of birds. Each TSC lasted one hour, during which time all bird species seen or heard were recorded in order of detection. The Timed Species Counts (TSCs) and transect walks were supplemented with opportunistic observations by recording species found present within the project area outside the time of the count. Species identified through visual observations and species identified by their vocalizations were also recorded. The fauna ecologists' eye was aided by a 10 x 40 binocular. Efforts were made to sample the different habitats represented in the project area. Sampling was conducted in the early morning

and towards the evening. All identifications were made to species level. Birds that were recorded during the survey were ecologically characterized using the following criteria:

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	Palaeartic	Species breeding in Europe or Asia
	Ap	Afro-Palaeartic	Species with both Palaeartic and Afrotropical populations

Data analysis was done by 1) compiling Species checklist, 2) determining the species conservation status using IUCN 2020 published Red List of threatened species as well as use of the National Red List for Uganda published by Wildlife Conservation Society in 2016.

Mammals

The mammals were surveyed using three main methods:

- i) Direct observation/opportunistic encounters: This entailed the collection of direct evidence of fauna activity (e.g. sightings, vocalizations). All mammals that were seen or opportunistically sighted or heard vocalizing while moving in and around the project area were identified, counted and recorded;
- ii) Use of Signs e.g. footprints and/or dung or calls: This entailed the collection of indirect evidence (e.g. faeces or dung, footprints). Mammal species whose signs / indirect evidence were recognized were recorded for their presence; and;
- iii) Local consultations: The fauna specialist held discussions with local residents in and around sampling points about the availability of mammal species in the project area.

Nocturnal mammals were excluded since the survey was conducted during day light hours. Mammal identification was based on Kingdon (1974), Delany (1975) and Kingdon et al. (2013). The conservation status of the encountered mammal species was ascertained using the 2020 version of the IUCN Red List of Threatened Species.

3.4.2 NOISE, AIR QUALITY AND VIBRATION ASSESSMENT

3.4.2.1 NOISE MEASUREMENT

Ambient noise measurements were undertaken at four (4) sites: St. Peter's Church Mutunda, Ogunga Primary School, Kawiti Trading Centre and Kakwokwo Primary School, selected through purposive

sampling based on information gathered about the project footprint and the location of sensitive receptors. Using an Acoustic sound level calibrator type CEL-251 for every point measured, a duly calibrated Casella CEL-633B Environmental & Occupational Noise Meter was used for the assessment. The equipment was placed on a tripod stand (1.4m high) from ground and switched on to set up the run mode. The equipment does simultaneously recordings for all noise functions it completes and also makes periodic or cumulative data measurements, and stores acquired data on a set recurring interval of time. The noise readings were logged at an interval of 30 minutes and the results later downloaded to a computer for further analysis using the Casella Insight software.

All sound pressure level measurements as presented in the following section, were benchmarked against the National Environment (Noise Standards and Control) Regulations, 2003.

3.4.2.3 AMBIENT AIR QUALITY MONITORING

Ambient air quality monitoring for particulate matter (PM10 & PM2.5) and gas parameters namely: NO₂, SO₂, CO and VOCs was undertaken using a Portable Aeroqual S500 Monitor mounted on a tripod stand about 1.5m above the ground, at selected locations including St. Peter's Church Mutunda, Ogunga Primary School, Kawiti Trading Centre and Kakwokwo Primary School, where pollution impacts including dust nuisance would likely be of concern during project implementation. The Aeroqual S500 Monitor was switched on, allowed 3 minutes of zeroing and 7 minutes of stabilizing readings at every site. The monitor was set to start data logging at a frequency of five (5) minutes for per site. Purposive sampling was used to ascertain the selected locations based on information gathered about the project footprint and the location of sensitive receptors (**Annex 7**).

All ambient air quality measurements as presented in the following sections, were benchmarked against the World Health Organisation Air Quality Guidelines (WHO AQG), 2006 and the International Finance Corporation of the World Bank Group (IFC) Environmental, Health, and Safety Guidelines: Environmental Air Emissions and Ambient Air Quality (2007).

3.4.3 SOCIO-ECONOMIC ASSESSMENT

The consultant applied a Mixed Methods approach in collecting and analysing data and information. Survey questionnaire as a quantitative method was applied during November 2021. In terms of qualitative methods, the ESIA applied focus group discussions (FGDs), key informant interviews (KIIs), in addition to integration of Participatory Learning and Action (PLA) methods.

3.4.3.1 SAMPLING PROCEDURES

Study Area & Population: The study covered Mutunda RGC area located in the Sub counties of Mutunda, Nyamahasa and Diima. The area has a study population of 1,698 households (in 4 beneficiary parishes).

Sample Size: A sample size of 101 respondent households were sampled out of the 313 target sample size representing 33.2% (101 out of 313) sample coverage (statistically sound). The Sample Size Determination Table developed by Morgan and Krejcie (1970) was used as shown in **Annex 9**.

Sampling Methods: The ESIA applied 1) Probability (random) sampling methods that included a) Stratified random (divided households into strata based on location, beneficiary area; b) Simple random 2) Non-probability (non-random) sampling methods - a) Purposive sampling using pre-

determined characteristics such as proximity to proposed water facility (production well, reservoir, pipes), water source, trading centre, etc; b) Cluster sampling by identifying a manageable number of respondent households within a zone or micro catchment; d) Convenience sampling by picking respondents that are easily accessible.

Sampling Plan: A representative study sample using a two (2) stage stratified sampling method was used. In the first stage, it involved identifying and sub dividing beneficiary villages and non-beneficiary areas, and the second stage it involved identifying respondent household members, Key Informants and groups.

Sampling Methods	Total	REMARKS
Probability (random) sampling methods		
a) Stratified random	101	This sampling methods overlaps in all the others.
b) Simple random	68	
Non-probability (non-random) sampling methods		
c) Purposive sampling	23	Applied after stratified sampling
d) Cluster sampling	10	Applied after stratified sampling

3.4.3.2 DATA COLLECTION INSTRUMENTS

- 1) Survey Questionnaire: The consultant applied Survey Questionnaire to collect baseline data on socio-economic characteristics that include water, sanitation & hygiene, among others. Analysed data had corresponding GPS Coordinates which were stored in GIS Database for detailed GIS mapping and analysis.
- 2) Using Digital Tools (KOBO COLLECT): The structured questionnaire was converted, validated, loaded and aggregated them into a digital form called KOBO COLLECT FORM. The form was loaded and uploaded on mobile devices (smart phones or tablets), used to collect the data. This process increases efficiency, minimize errors and ensures timely collection and analysis of data.
- 3) Qualitative tools - Consultative meetings discussion guides; Focus Group Discussion (FGD) guide; Key Informant Interview (KII) guide; Direct Observation checklist; Photography guide; Document Review Checklist.
- 4) Participatory Learning & Action (PLA) tools - Transect walks / drives; Timeline & Trend Analysis; Seasonal calendar; Pairwise Ranking.

3.4.3.3 DATA ANALYSIS METHODS

Data was analysed using a) Thematic Analysis for qualitative findings obtained from FGDs, KIIs, etc; b) Statistical Analysis using Ms Excel for quantitative findings obtained using KoboCollect. All Likert Type Data was analyzed by determining the frequency and percentage of Likert Type Items for selected variables. The Likert Items included (but not limited) Highly Agree, Agree, Disagree, among others.

3.4.3.4 DATA QUALITY MANAGEMENT

The consultant ensured proper quality management of all data processes, protocols and methods i.e., design and pretest of tools, collection, handling, processing, analysis, interpretation and

reporting consistently followed appropriate data life-cycle requirements. The consultant ensured that all data collected is sufficient, accurate, reliable, valid and acceptable to serve the purposes for which it is gathered. All the 6 stages of data management cycle was properly managed and controlled namely data sources, data collection, data collation, data analysis, data reporting and data usage.

3.4.3.5 QUALITY CONTROL & ASSURANCE

Quality Control (QC) and Quality Assurance (QA) was done to ensure defect detection and prevention respectively. This was through pre-testing survey tools; training research team; debriefing of research assistants; applying mixed methods in same study areas; timely deployment of research assistants. Research ethics and principles were adhered to such as creating rapport and obtaining informed consent from respondents through use of introductory letters; ensuring cultural sensitivities such as language, dress code and conduct. At the same time, the CSA team adhered to the JBN Code of Professional Conduct.

3.4.4 HEALTH AND SAFETY ANALYSIS

The H&S assessment study assessed the likely direct and indirect safety and health effects of the project activities during both the project construction and operation phases. The study reviewed the project designs, relevant secondary information relating to the project. Additionally, consultative meetings were undertaken with key stakeholders such as Government Ministries and Departments (OSH Department, Ministry of Gender, labour and Social Development, Uganda Police Force), statutory agencies and non-statutory agencies like schools, administrative offices etc.

Generally, OSH assessment targeted both workers' safety and health and community/public safety and healthy parameters within the direct and indirect impact areas and some of the focus parameters included:

- a) Community Health and Safety
 - Life and fire safety from construction and operation works.
 - Traffic safety especially by material haulage fleet (hotspot areas; - schools, markets, trading centres and junctions etc.)
 - Transport of hazardous materials
 - Disease prevention
 - Emergency preparedness and Response
- b) Occupational safety and health
 - Communication and training
 - Hazards (physical, chemical, biological, radiological) and risk management
 - Personal protective equipment
 - Labour and working conditions
 - Construction equipment/machinery safety
- c) Safety and Health Management Systems

3.5 IMPACT DESCRIPTION AND ASSESSMENT

The assessment identifies the intensity of the predicted impacts resulting from construction and operation of the project and the resulting level of effect against identified sensitive receptors. These

impacts and effects occur a result of an interaction between project works and the identified baseline. To determine the level of effect (severity or significance), the likely intensity of the impact and the sensitivity of the receptor are defined.

3.5.1 IMPACT INTENSITY

The intensity of an impact takes into account all the various impact characteristics in order to determine whether an impact is negligible or significant (Table 0-1).

Table 0-1: Criteria for rating impact intensity

Criteria	Intensity Description (considering duration of the impact, spatial extent, reversibility, ability of comply with legislation, etc)	Rating scales
Intensity of the impact)	Very Low - where the impact affects the environment in such a way that natural, and /or cultural and social functions and processes are negligibly affected and valued, important, sensitive or vulnerable systems or communities are negligibly affected.	1
	Low - where the impact affects the environment in such a way that natural, and/or cultural and social functions and processes are minimally affected and valued, important, sensitive or vulnerable systems or communities are minimally affected. No obvious changes prevail on the natural, and / or cultural/ social functions/ process as a result of project implementation.	2
	Medium - where the affected environment is altered but natural, and/or cultural and social functions and processes continue albeit in a modified way, and valued, important, sensitive or vulnerable systems or communities are moderately affected.	3
	High - where natural and/or cultural or social functions and processes are altered to the extent that they will temporarily or permanently cease, and valued, important, sensitive or vulnerable systems or communities are substantially affected. The changes to the natural and/or cultural / social-economic processes and functions are drastic and commonly irreversible.	4

3.5.2 IMPACT SENSITIVITY

Sensitivity is generally site specific and criteria the was developed from baseline information gathered. The sensitivity of a receptor was determined based on review of the population (including proximity, numbers, vulnerability, among others) and presence of features (sensitive ecosystems), such as rare and endangered species, unusual and vulnerable environments, architecture, social or cultural setting, major potential for stakeholder conflicts on the site or the surrounding area. The sensitivity of the receiving environment was determined by specialists based on the baseline data collected during the study, and the generic criteria outlined in Table 0-2.

Table 0-2: Criteria for rating impact sensitivity

Criteria	Sensitivity Description	Rating scales
Very Low	Vulnerable receptor (human or ecological) with good capacity to absorb proposed changes or and good opportunities for mitigation	1
Low	Vulnerable receptor (human or ecological) with some capacity to absorb proposed changes or moderate opportunities for mitigation	2
Medium	Vulnerable receptor (human or ecological) with limited capacity to absorb proposed changes or limited opportunities for mitigation.	3
High	Vulnerable receptor (human or ecological) with little or no capacity to absorb proposed changes or minimal opportunities for mitigation.	4

3.5.3 IMPACT EVALUATION AND DETERMINATION OF SIGNIFICANCE OR SEVERITY

Impact severity describes the actual change that is predicted to occur to the receptor. The significance of an impact is based on expert judgement of the sensitivity (importance or vulnerability) of a receptor and the intensity of the effect that will be caused by a project-induced change. Impacts were identified and significance was attributed considering the interaction between intensity and sensitivity criteria as in the significance matrix (Table 0-3). The impact severity is then calculated as the product of the two numerical descriptors;

$$\text{Impact Severity/Significance} = \text{Impact Intensity (I)} \times \text{Impact Sensitivity (S)}$$

The results are equivalent to **negligible, minor, moderate or major**. This is a semi-qualitative method designed to provide a broad ranking of the different potential impacts of a project. More details are provided in Table 0-4.

Table 0-3: Determination of impact severity

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Table 0-4: Impact Severity

Impact Rating	Impact Description	Rating scales
<p>Major: the impact is unacceptable and further mitigation measures must be implemented to reduce the significance</p>	<ul style="list-style-type: none"> • Highly noticeable, irreparable effect upon the environment • Significant, widespread and permanent loss of resource • Major contribution to a known global environmental problem with demonstrable effects • Causing mortality to individuals of a species classified as globally or regionally endangered • Major expedience of water/air quality and noise guidelines representing threat to human health in long and short term • Causing widespread nuisance both on and off site 	<p>> or = 12</p>
<p>Moderate: Impact is considered tolerable but efforts must be made to reduce the impact to levels that are as low as reasonably practical</p>	<ul style="list-style-type: none"> • Noticeable effects on the environment, reversible over the long-term Localised degradation of resources restricting potential for further usage • Sub-lethal effects upon a globally or regionally endangered species with no effect on reproductive fitness and/or resulting in disruption/disturbance to normal behaviour returning to normal in the medium term • Elevated contribution to global air pollution problem partly due to preventable releases • Frequent breaches of water/air quality and noise guidelines • Causing localised nuisance both on and off site 	<p>> or = 6 but < or = 9</p>
<p>Minor: Impact is considered acceptable</p>	<ul style="list-style-type: none"> • Noticeable effects on the environment, but returning naturally to original state in the medium term • Slight local degradation of resources but not jeopardising further usage • Disruption/disturbance to normal behaviour of a globally or regionally endangered species returning to normal in the short term • Small contribution to global air problem through unavoidable releases 	<p>> or = 2 but < or = 4</p>

	<ul style="list-style-type: none"> • Elevation in ambient water/air pollutant levels greater than 50% of guidelines • Infrequent localised nuisance 	
Negligible: Impacts is almost not felt	<ul style="list-style-type: none"> • No noticeable or limited local effect upon the environment, rapidly returning to original state by natural action • Unlikely to affect resources to noticeable degree • No noticeable effects on globally or regionally endangered species • No significant contribution to global air pollution problem • Minor elevation in ambient water/air pollutant levels well below guidelines • No reported nuisance effects 	= 1

3.5.4 CUMULATIVE IMPACT ASSESSMENT (CIA)

The combined, incremental effects of human activity, referred to as cumulative impacts, pose a serious threat to the environment. While they may be insignificant by themselves, cumulative impacts accumulate over time, from one or more sources, and can result in the degradation of important resources.

Step 1: Scoping Phase I – VECs, Spatial and Temporal Boundaries

This involved identification and establishment VECs, spatial and temporal boundaries of assessment. It further involved identification and agreement on VECs in consultation with stakeholders, determining the time frame and establishing the geographic scope. This guided on knowing whose involvement is key; which VEC resources, ecosystems, or human values are to be affected by the development (based on prior sectoral assessments or the project’s ESIA); known or anticipated cumulative impact issues within the region; concerns for cumulative impacts identified in consultation with stakeholders, including potentially affected communities (these may exist at distance from the planned development); regional assessments prepared by governments, multilateral development banks (MDBs), and other stakeholders (if any); CIAs prepared by sponsors of other developments in the region and any other Information from NGOs.

Step 2: Scoping Phase I - Other Activities and Environmental Drivers

This involved identification of other past, existing, or planned activities within the analytical boundaries. Assessment of their potential presence of natural and social external influences and stressors (e.g., wildfires, droughts, floods, predator interactions, human migration, and new settlements). This guided on knowing if there are any other existing or planned activities affecting the same VEC and if there are any natural forces and/or phenomena affecting the same VEC

Step 3: Establish Information on Baseline Status of VECs

This involved definition of the existing condition of VEC; understanding VEC's potential reaction to stress, its resilience, and its recovery time through assessment of trends. This is because determination of the trend of change in the baseline condition of a given VEC over time may indicate the level of concern for cumulative impacts. Therefore, it was helpful; to know what is the existing condition of the VEC; establish the indicators to be used to assess such conditions; identify any other additional data are needed and know those who may already have this information required. Data that are needed focus on the most important VECs though the collection of baseline data tends on these VECs was limited and targeted to indicators that would allow determination of any changes in VEC conditions as it provides a baseline condition that integrates the collective effects of all existing developments and exogenous pressures.

Step 4: Assess Cumulative Impacts on VECs

This involved estimating the future state of the VECs that may result from the impacts they experience from various past, present, and predictable future developments through identification of potential environmental and social impacts and risks; assessment expected impacts as the potential change in condition of the VEC (i.e., viability, sustainability) and identification of any potential additive, countervailing, masking, and/or synergistic effects. This guided on answering the questions on key potential impacts and risks that could affect the long-term sustainability and/or viability of the VEC; the known or predictable cause-effect relationships and interaction of these impacts and risks to each other.

Step 5: Assess Significance of Predicted Cumulative Impacts

Determination of impact significance and overall agreement among affected communities and other relevant stakeholders strengthens mitigation measures and monitoring programs, focusing on expected probable cumulative impacts. The significance of all CIs was evaluated not in terms of the amount of change, but in terms of the potential resulting impact to the vulnerability and/or risk to the sustainability of the VECs assessed implying evaluation of CIs in the context of ecological thresholds. Therefore, appropriate thresholds and indicators were defined to determine impact and risk magnitude and significance in the context of past, present, and future actions including identification of identify trade-offs hence establishment of how these impacts will affect the sustainability and/or viability of the resource and/or VEC and the consequences and/or trade-offs of taking the action versus no action.

Step 6: Management of Cumulative Impacts – Design and Implementation

Depending on the context in which the development impacts occur (i.e., the impacts from other projects and natural drivers that affect the VECs) and the characteristics of the development's impacts, mitigation measures were proposed as a result of views and actions of multiple

stakeholders. This involved utilisation of the mitigation hierarchy to design management strategies to address significant cumulative impacts on selected VECs; engage other parties needed for effective collaboration or coordination; propose mitigation and monitoring programs on how to manage uncertainties with informed adaptive management. This included aspects of how cumulative impacts can be avoided, minimized, and/or mitigated; how can the effectiveness of proposed management measures be assessed and what are the triggers for specific adaptive management decisions, among others.

3.6 FORMULATION OF THE ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

The Environmental and Social Management Plan (ESMP) specified mitigation measures and monitoring actions with time frames, specific responsibilities assigned, and follow-up actions defined in order to check progress and the resulting effects on the environment by the project's implementation activities. The objectives of the ESMP included:

- a. To ensure that all the recommendations in the approved ESIA report are adhered to by the relevant lead agencies/institutions;
- b. To ensure that the prescribed environmental and social mitigation measures as well as the enhancement actions are well understood and communicated to all project stakeholders;
- c. To ensure that the proposed environmental and social corrective/offset measures are implemented throughout the project implementation phases;
- d. To evaluate the effectiveness of environmental and social mitigation/offset measures; and
- e. To evaluate the effectiveness of various evaluation techniques and procedures.

The ESMP is included in **Chapter 0** of this report.

4 POLICY LEGAL AND REGULATORY FRAMEWORK

This chapter presents an overview of the key policies, laws, regulatory and institutional framework relevant to the environmental and social aspects of the proposed solar powered piped water supply system and sanitation facilities. It also identifies relevant agencies, departments, and institutions responsible for the monitoring and enforcement of legal requirements specified therein.

4.1 NATIONAL LEGISLATIONS AND REGULATIONS

The following is a summary of key policy, legal and regulatory requirements governing the proposed project:

Table 0-1: Summary of policies and plans applicable to the proposed project

Policies or Plans	Brief description and its key provisions	Relevance in the Project
The National Environment Management Policy, 1994	The overall policy goal is sustainable development, which maintains and promotes environmental quality and resource productivity for socio-economic transformation. One of the key principles guiding policy development and implementation include the need to conduct and ESIA for projects that are likely to have potential impacts on the environment.	The developer has undertaken an ESIA for the proposed project, for which this ESIS has been prepared.
The National Policy on Conservation and Management of Wetland resources 1995	The overall goal of this policy is to maintain an optimum and sustainable diversity of uses and users and consideration of other stakeholders when using wetland resources. The objectives of this policy include establishing the principles by which wetland resources can be optimally used now and in future; to end practices, which reduce wetland productivity; maintaining the biological diversity of natural or semi natural wetlands; maintaining wetlands functions and values; and integrating wetlands concerns into the planning and decision making of other sectors. This policy outlines guidelines for wetland resource developers.	The proposed project will have transmission and distribution lines crossing wetlands. Also, some material source sites might be in or adjacent to wetlands. All proposed project implementation activities have to adhere to this policy requirements and undertake proper impact assessment to ensure adverse impacts on the wetland ecosystems are adequately mitigated.
The National Water Policy, 1999	The objective of the policy is to provide guidance on development and management of the water resources of Uganda in an integrated and sustainable manner, so as to secure and provide water of adequate quantity and quality for all social and economic needs, with full participation of all stakeholders and mindful of the needs of future generations.	The contractor under the supervision of the project management team (DWD and District local government) will undertake routine monitoring of all water sources to prevent their contamination by project activities in line with this policy.

Policies or Plans	Brief description and its key provisions	Relevance in the Project
National Policy on Elimination of Gender Based violence, 2016	The policy emphasizes early intervention to prevent re-victimization of and long-term effects for girls, including interpersonal violence, sexual coercion, alcohol and drug abuse and mental health problems, reporting cases of violence against children immediately.	The contractor in liaison with Local Council officials (especially Subcounty Community Development Officers) will undertake initiatives to do away with Gender Based Violence-GBV cases relating to project implementation activities.
The Uganda National Land Policy, 2013	The land policy addresses the contemporary land issues and conflicts facing the Country. The vision of the policy is: “Sustainable and optimal use of land and land-based resources for transformation of Ugandan society and the economy” while the goal of the policy is: “to ensure efficient, equitable and sustainable utilization and management of Uganda’s land and land-based resources for poverty reduction, wealth creation and overall socio-economic development”.	All the land acquisition for project components which are to be installed on private land will be conducted following an approved Resettlement Action Plan (RAP), while involvement and discussions with UNRA and the District Local government are required to streamline the implementation of components like transmission pipes in the road reserve (public land).
National Climate Change Policy, 2015	<p>Climate change is a global challenge that requires a concerted effort by all nations. This National Climate Change Policy (NCCP) is Uganda’s integrated response to climate change. It has been prepared and designed within the context of the country’s vision and national development priorities; it provides a clearly defined pathway for dealing with the challenges of climate change within the socio-economic context of Uganda, and looks ahead to the opportunities and benefits of a green economy.</p> <p>The goal of the policy is to ensure a harmonized and coordinated approach towards a climate- resilient and low-carbon development path for sustainable development in Uganda. The overarching objective of the policy is to ensure that all stakeholders address climate change impacts and their causes through appropriate measures while promoting sustainable development and a green economy.</p>	National Climate Change Policy, 2015
The National Equal Opportunities Policy 2006	The goal of the National Equal Opportunities policy is to provide avenues where individuals and groups’ potentials are put to maximum use by availing equal opportunities and affirmative action.	Discrimination and stigmatization, which acts as a barrier for marginalized and other groups of people in the project area to accessing employment and support opportunities will be eliminated throughout

Policies or Plans	Brief description and its key provisions	Relevance in the Project
	<p>The policy objectives amongst others are to:</p> <ol style="list-style-type: none"> a. Guide the planning processes, affirmative action, and implementation of programmes and allocation of resources to all stakeholders. b. Guide the establishment of legal, policy and institutional frameworks of all stakeholders. c. Provide a framework for assessing responsiveness of programmes and activities to equal opportunities, in redressing any imbalances therein. d. Empower marginalized and vulnerable groups for their full participation in all development processes. e. Enhance capacity of implementing agencies to provide quality services with a view to monitoring compliance with affirmative action and the constitutional provisions 	<p>all project implementation phases. This entails equitable access to services by workers employed at the project.</p>
<p>The National Environment Health Policy 2010</p>	<p>This policy establishes the environmental health priorities of the Government of Uganda and provides a framework for the development of services and programmes at national and local government levels. It has been developed in support of the National Health Policy and primarily concerns the role of the Ministry of Health. However, environmental health is a cross-cutting discipline, and the policy therefore has implications for other departments and agencies.</p>	<p>Environmental health encompasses a wide range of subjects but in the Ugandan context is concerned primarily with water supply, sanitation, and hygiene promotion; solid, liquid, hazardous waste management; air pollution control; food safety and hygiene; the control of insect vectors and vermin; occupational.</p>
<p>National Policy on HIV/AIDS and the world of work, 2007</p>	<p>The policy obliges developing entities to mainstream HIV/AIDS interventions to their planned development interventions.</p>	<p>The contractor will institute structures with human and financial capacity to undertake HIV/AIDS sensitization and prevention of new infections among the project workers and local community throughout all the project implementation phases in line with the provisions of this policy.</p>
<p>Uganda Gender Policy 2007</p>	<p>The Uganda Gender Policy mandates the Ministry of Gender, Labour and Social Development and other line Ministries to mainstream gender in all sectors.</p>	<p>The contractor will be encouraged to adopt an equal opportunity employment policy and to incorporate gender aspects and considerations in the recruitment process for both skilled and non-skilled labour force as far as applicable during the project lifecycle.</p>

Policies or Plans	Brief description and its key provisions	Relevance in the Project
The National HIV/AIDS Policy, 2004	The policy aims at guiding multi-sectoral approach to HIV/AIDS control in the country. Section 3.4 of the policy talks about Impact mitigation at individual to community level. The policy aims at providing psychosocial and economic support to all those infected and directly affected by HIV & AIDS. The epidemic has severe short- and long-term effects on various population categories on development efforts at household, community, sector, and national levels. The impact on the labour force in the various sectors in communities and households affects productivity, household income and savings. Objective of this section in the policy is to minimize the socio-economic consequences of HIV & AIDS on the population and promote involvement of the infected and affected in the development efforts. Subsection I under Policy Strategies it specifically requires workplace policies in both public and non-public formal and informal sectors to be appropriately reviewed to cater for HIV&AIDS prevention & care issues in the workplace.	In line with this policy, the contractor in liaison with different local council and Local government officials such Community Development Officers and HIV/AIDS Focal Personnel among others will ensure mainstreaming HIV/AIDS interventions into project plans and implementation activities. The measures are aimed at stemming the new infections, curtailing their spread and stigmatization of victims of HIV/AIDS among the project workforce and neighbouring communities
National Policy on Disability 2006	The National Policy on Disability in Uganda aims at promoting equal opportunities for enhanced empowerment, participation, and protection of rights of PWDs irrespective of gender, age and type of disability. This is in recognition that PWDs can perform to their full potential given the same conditions and opportunities irrespective of their social, economic, and cultural backgrounds. The Policy is to guide and inform the planning process, resource allocation, implementation, monitoring and evaluation of activities with respect to PWDs concerns at all levels.	With limited skills characteristic of most PWDs, accessing employment is a major challenge. Most potential employers do not give chance to PWDs to compete for employment even where they have the necessary qualifications and experience. During recruitment of workers to be employed to undertake construction activities, some PWDs will apply for some jobs and the contactor should give consideration to the PWDs applicants who qualify for such jobs
The Uganda National Culture Policy 2006	It provides strategies to enhance the integration of culture into development. These strategies include advocating for culture, ensuring capacity building, ensuring research and documentation, promoting collaboration with stakeholders, and mobilizing resources for culture. These strategies are an integral part of the Social Development Sector Strategic	Cultural leaders and local leaders need to be involved and consulted during the ESIA process for the proposed project activities so that they can help guide the process especially on which natural-historical and traditional collections could be preserved based on their cultural importance or

Policies or Plans	Brief description and its key provisions	Relevance in the Project
	Investment Plan (SDIP) whose mission is to create an enabling environment for social protection and social transformation of communities.	historical relevance in the project implementation process.
Uganda Vision 2040	Uganda’s Vision is to have “A transformed Ugandan society from a peasant to a modern and prosperous Country within 30 years”, from 2010. This involves changing from a predominantly low income to a competitive upper middle-income country within 30 years. It is envisaged that the country will graduate to the middle-income segment by 2017 and reach a per capita of USD 9,500 by 2040. For the country to achieve its Vision 2040, it is necessary to increase access to appropriate and adequate sanitation as well clean and safe water.	The proposed project is aligned to Vision 2040, by improving access to appropriate and adequate sanitation as well clean and safe water in the project area.
The National Development Plan III	The plan provides guidance to the nation in delivering the aspirations articulated in Uganda Vision 2040 for the period 2020/21 – 2024/25. The Goal of NDPIII is attaining Increased Household Incomes and Improved Quality of Life of Ugandans, under the theme: “Sustainable Industrialization for inclusive growth, employment and wealth creation”. NDPII aims to stop, reduce and reverse environmental degradation and the adverse effects of climate change as well as improve utilisation of natural resources for sustainable economic growth and livelihood security.	The project implementation will follow the ESMP put forward in this ESIS to ensure sustainable utilisation of natural resources and mitigation of likely impacts on the environment.

Table 0-2: Summary of laws applicable to the proposed project

Laws	Brief description and its key provisions	Relevance in the Project
The Constitution of the Republic of Uganda, 1995	The Constitution requires that the project be implemented without endangering human health and the environment.	The proposed project activities will be undertaken while ensuring safe and healthy environment is maintained as provided for in the Constitution.
The National Environment Act 2019	Specifically, its Fifth Schedule lists projects that require mandatory ESIA to be done before implementation, hence the need for this ESIA to be prepared for the proposed project.	The proposed project falls under Schedule 5 for projects which require mandatory ESIA before implementation, as such, the need to conduct this study.

Laws	Brief description and its key provisions	Relevance in the Project
The Land Acquisition Act, 1965	This Act provides for acquisition of land after its valuation and along approved procedures which ensure adequate, fair, and timely compensation to the landowners. The Act requires that adequate, fair, and prompt compensation is paid before taking possession of land and property. Dispute arising from the compensation to be paid should be referred to the court for decision if the Land Tribunal cannot handle	The key consideration regarding this Act in the project is to ensure landowners affected by the project are adequately and timely compensated.
The Land Act, Cap 227, of 1998	The Land Act, Cap 227 of 1998 provides for the tenure, ownership, and management of land. Under Section 44 the Government or the local government shall hold land in trust for the people and protect natural lakes, ground water, natural streams, wetlands and any other land reserved for ecological purposes for the common good of Ugandans.	Proposed project activities will be implemented with the footprint covering both private and public land. Therefore, land acquisition needs to follow the provisions of the Act.
The Physical Planning Act 2010 and The Physical Planning (Amendment) Act 2020	<p>An Act to consolidate the provisions for the orderly and progressive development of land, towns, and other areas, whether urban or rural. In respect of every area declared to be a planning area under section 5, there shall be a planning committee or planning committees. This planning committee shall be the municipal council or shall consist of such persons as the board, after consultation with any local authority concerned, shall appoint for town areas and rural areas respectively.</p> <p>Section 2A of the Amendment provides a right to clean and health environment. And every Ugandan has a duty to create, maintain and enhance a well-planned environment. Any result of act or omission by any person likely to breach a physical development plan or physical planning standard report to relevant authorities or file a civil suit against any person whose act or omission has breached or likely to breach a physical development plan or physical planning standard.</p>	This is a relevant Act to the proposed project activities. Different provision of this act will be implemented during the different phases (construction and operation) of the proposed project.

Laws	Brief description and its key provisions	Relevance in the Project
National Climate Change Act, 2021	The Act gives the force of law in Uganda to the United Nations Framework Convention on Climate Change, the Kyoto Protocol, and the Paris Agreement; provides for climate change response measures; provides for participation in climate change mechanisms; provides for measuring of emission, reporting and verification of information; provides for institutional arrangements for coordinating and implementing climate change response measures; provides for financing for climate change; and for related matters.	The project design needs to ensure measures are put in place to manage the effects of climate change. When the District Climate Action Plan is developed, implementation activities will have to ensure alignment.
The Uganda Wildlife Act, 2019	In order to support sustainable utilization of wildlife for the benefit of the people of Uganda, the purpose of the Act among others is to provide for the conservation of wildlife throughout Uganda so that the abundance and diversity of their species are maintained at optimum levels commensurate with other forms of land use.	<p>Karuma wildlife reserve is located north of the project area at approximately 4.5 km from the nearest beneficiary area (Apodorwa trading centre) where water supply will be implemented. However, during stakeholder consultations there was no concerns raised related to human-wildlife conflicts in the latest past. In addition, the project shall take into consideration to prohibit any worker in possession of unauthorised wildlife meat or products.</p> <p>Considering that some of the water pipes will go through remote section of the countryside involving clearing of vegetation, and excavation of land to create holes etc, this Act is quite relevant, and relevant provisions should be complied forthwith for project implementation.</p>
The Historical Monuments Act, 1968	The Act provides for the preservation and protection of historical monuments and objects of archaeological, paleontological, ethnographical, and traditional interest and for other matters connected therewith. The Act requires that any chance finds encountered during project construction shall be preserved by the Department of Monuments and Museum in the Ministry of Tourism, Wildlife and Antiquities.	Some objects of cultural and/or historical significance might be encountered/affected during project implementation and their preservation is called for by this act.

Laws	Brief description and its key provisions	Relevance in the Project
The Public Health Act, Cap 281	Under this Act, the Minister may cause to be made such inquiries as he or she may see fit in relation to any matters concerning the public health in any place. When such a directive is made, the person directed to make the inquiry shall have free access to all books, plans, maps, documents and other things relevant to the inquiry and shall have in relation to witnesses and their examination and the production of documents similar powers to those conferred upon commissioners by the Commissions of Inquiry Act, and may enter and inspect any building, premises or place, for the purpose of inquiry.	The provisions of this Act will be relevant for the project implementation activities such as construction civil works, establishment of ancillary facilities such as workers camps, material holding areas, equipment storage/parking yards as well as maintenance of project machinery to control incidences occupational health and safety accidents, among others. Construction activities will take all possible mitigations to make sure that, all impacts to human and environment are avoided and where not possible or in case of accident, there will be compensation.
The Water Act Cap, 152	The Act provides for the use, protection and management of water resources and supply in Uganda. The Water Resources Regulations of 1998 established under this Act stipulates a requirement to apply for a permit to construct, own, occupy or control any works on or adjacent the land as per Regulation 10.	Abstraction of water for the project will follow the provisions of the Act including obtaining an abstraction permit from the DWRM. Any disposal of waste shall also need to be in line with the waste discharge regulations; proper management of fuel/oil spills is essential for minimizing chances of water contamination
The National Forestry and Tree Planting Act, 2003	The Act provides for the conservation, sustainable management and development of forests for the benefit of the people of Uganda. It also provides that the Central Government or local government shall hold in trust for the people and protect forest reserves for ecological, forestry and tourism purposes for the common good of the citizens of Uganda.	The project will encourage tree planting as part of its integrated catchment protection and management measures.
Traffic and Road Safety Act, Cap.361	Section 119 of the Traffic and Road Safety Act stipulates that every person who uses, parks or stands a motor vehicle, trailer or engineering plant on any road carelessly or without reasonable consideration for other persons using the road commits an offence.	The contractor will ensure that all project machinery (construction equipment and material haulage fleet) observe traffic and road safety procedures including observing minimum speed limits, routine maintenance and observing road signs among others. Additionally, more safety measures such as traffic guides/controllers, humps and road signage will be adopted to ensure safety of all road users during project implementation activities as guided by this Act.

Laws	Brief description and its key provisions	Relevance in the Project
The Roads Act, 2019	The Act prohibits erection of any building or planting of any trees or placing of pipelines within the road reserve except with a written permission of an appointed road authority.	The project developer will apply to the appointed road authority to carry out activity in the road reserve while also stipulating measures for restoration upon completion of project activity.
The Occupational Safety and Health Act, 2006	The Occupational Safety and Health Act of 2006 makes provisions for the health, safety, welfare, and appropriate training of persons employed in workplaces.	The employer (contractor) must protect the health and safety of all project workforce by providing them with all requisite PPEs, safety training, clean and healthy work environment, sanitary conveniences, washing facilities, First Aid facilities, clean drinking water, and meals among others throughout the project implementation phases in accordance with this act.
The Workers' Compensation Act, Cap. 225	The Act outlines matters of compensation for injuries and accidents as well as the responsibility of employees to take care of their health and safety while on the project.	The employer (contractor) must protect the health and safety of all project workforce by providing them with all requisite PPEs, safety training, clean and healthy work environment. The Act seeks to safeguard the workers and ensure that they are appropriately compensated in case of injuries resulting from project implementation activities.
The Employment Act, 2006	This Act is the governing legal statutory instrument for the recruitment, contracting, deployment, remuneration, management, and compensation of workers. It provides for matters governing individual employment relationships in terms of circumstances of provision of labour. It is quite explicit on matters of forced labour that, no one should be forced to work, there should be no discrimination with regard to recruitment process, and it prohibits sexual harassment in employment.	This Act is relevant in that, it addresses matters of engagement of workers and their rights while at work. The contractor shall adhere to the provision of this Act for all project-related recruit of workforce.
Children Act Cap 59	The Act defines a child as a person below the age of 18. It lists the right for children to be with their parents, circumstances under which they should not, foster care and adoption procedures as well as mandates of local authorities and roles of community.	Child labour is to be prohibited during project implementation activities i.e., no employment of children below 18 years for all the project implementation activities.
Domestic Violence Act 2010	The Act provides for the protection and relief of victims of domestic violence; provides for the punishment of perpetrators of domestic	This act gives guidance to the contractor and their workers on how to handle cases of domestic violence.

Laws	Brief description and its key provisions	Relevance in the Project
	<p>violence and spells out procedures and guidelines to be followed by the courts in relation to the protection and compensation of victims of domestic violence as well as matters relating to cases of domestic violence in general.</p>	
The Survey Act, 1964	<p>Section 23 of the Act also points out compensation for injury done by clearance during the act of survey. For the purpose of the topographic survey of the project site this act will be relevant in this project.</p>	<p>In line with the project footprint and land requirements, it is necessary to undertake land survey for this project, as guided by the Act and conducted by a registered surveyor authorized by the commissioner for surveys in Ministry of Lands, Housing and Urban Development.</p>
Access to information Act 2005	<p>The Act aims to promote an efficient, effective, transparent and accountable Government; give effect to article 41 of the Constitution by providing the right to access to information held by organs of the State, other than exempt records and information; protect persons disclosing evidence of contravention of the law, maladministration or corruption in Government bodies; promote transparency and accountability in all organs of the State by providing the public with timely, accessible and accurate information; and empower the public to effectively scrutinise and participate in Government decisions that affect them.</p> <p>Section 5 of the Act highlights the right of access to information and records in the possession of the State or any public body, except where the release of the information is likely to prejudice the security or sovereignty of the State or interfere with the right to the privacy of any other person.</p>	Access to information Act 2005

Table 0-3: Summary of regulations and standards applicable to the proposed project

Regulations or standards	Brief description and its key provisions	Relevance in the Project
The National Environment (Environmental and Social Assessment) Regulations, 2020	The National Environment Management Authority (NEMA) issued Environmental Impact Assessment Regulations, 2020, for conduct of ESIA's, which are now part of the Environmental Legislation of Uganda.	The developer has undertaken this ESIA study with particular focus on the content specified within the Second Schedule of these Regulations and any other development or changes shall have to follow the same assessments.
Water Resources Regulations, 1998	The Regulations apply to motorized water abstraction from boreholes or surface watercourses or diverting, impounding, or using more than 400m ³ of water within a period of 24 hours.	The project implementation will follow the conditions set out in the regulations. The Contractor will be required to abide by provisions of this law in regard to water usage and conservation during use for construction civil works and associated project facilities such material yards, workers' camps among others.
The National Environment (Wetlands, Riverbanks and Lakeshores Management) Regulations 2020.	These Regulations guide on the development procedures to be followed where developments are to be undertaken in wetlands, riverbanks, and lakeshores.	<p>The some of the proposed project components will cross through wetlands. Likewise, the material source sites might be in or adjacent to wetlands.</p> <p>All proposed project implementation activities have to adhere to these regulations requirements and undertake proper impact assessment to ensure adverse impacts on the wetland ecosystems are adequately mitigated.</p> <p>In addition, where applicable the project will acquire wetland use permits for any activity specified in the second schedule of the regulations.</p>
Draft National Air Quality Standards, 2006	Considering that construction equipment and machinery are powered by diesel/ gasoline engines, pollutants such as CO ₂ , NO _x , SO _x , VOC, and particulates are expected to be emitted. The draft National air quality standards provide the following regulatory limits for these emissions.	A number of proposed project activities such as material haulage, material extraction of both murrum and stones, construction works among others will likely impact on the local ambient air quality. Guided by provisions of these standards, the contractor will adopt appropriate measures to minimize, mitigate and prevent air quality deterioration resulting from project implementation activities.

Regulations or standards	Brief description and its key provisions	Relevance in the Project
The National Environment (Waste Management) Regulations, 2020	These Regulations apply to all categories of hazardous and non-hazardous waste, storage and disposal of hazardous waste and their movement into and out of Uganda and to all waste disposal facilities, landfills, and sanitary fills and to incinerators.	Certainly, waste will be generated during project implementation activities especially from contractor facilities such as camps, material yards, among others. The contractor guided by these regulations will ensure that all generated wastes throughout all project implementation phases are appropriately managed/disposed of.
National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, 2020	These regulations provide standards for effluent discharge. Schedules 2, 3 and 4 detail maximum permissible limits for regulated contaminants, which must not be exceeded before effluent is discharged into water or on land.	Proposed project activities will certainly generate effluent waste. The contractor should employ appropriate measures to manage effluent waste generated by project activities especially ancillary facilities such as workers' camps, material yards, mechanical workshops and construction site among others.
The National Environment (Noise Standards and Control) Regulations, 2003	Part III Sec. (1) requires machinery operators to use the best practicable means to ensure that the emission of noise does not exceed the permissible levels.	Indisputably, implementation of proposed project activities and other associated activities will trigger noise generation. These standards shall however be applied to keep the noise levels in permissible limits as well as mitigating noise generation at the source.
National Environment (Control of Smoking in Public Places) Regulations, 2004	According to WHO, Second-hand smoke (SHS) is a human carcinogen for which there is no "safe" exposure level 1. To avoid public health risk from SHS, Uganda enacted this Regulations to regulate 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". These places include, office buildings, workplaces, eating areas, toilets and public service vehicles. The regulations task owners of such places to designate "NO SMOKING" and "SMOKING AREAS" in premises. In this project, these regulations will apply to areas communally	Requirements of these regulations should be fulfilled by the contractor through instituted structures especially within construction site and workers' facilities such as changing rooms, resting areas, dinning among others, to avoid exposure of workers to tobacco Second Hand Smoke and associated health risks.

Regulations or standards	Brief description and its key provisions	Relevance in the Project
	used by construction workers such as site offices, eating areas in camps and workers transport vehicles.	

4.2 REQUIRED APPROVALS, PERMITS AND LICENSES

Several approvals and licenses will be required before commencement of construction activities while some prior to particular activities during project implementation. Securing of approvals requires preparation of the relevant documentation and payment of fees. This needs to be done during mobilization to ensure that all approvals are secured in a timely manner to avoid construction delays. It is important to ensure that all materials (sand and aggregates) are sourced from quarries, borrow pits and sand mines approved by NEMA and compliant with environmental laws. For all new materials sites to be opened up, NEMA approval must be secured while all existing sites should undertake/provide proof of having undertaken environmental compliance audits. The following permits and licenses may be required by the project as presented in **Table 0-4**.

Table 0-4: Approvals, permits and licenses potentially required by the project

Approvals, Permits and Licenses Required	Issuing Authority	Party responsible for acquiring permit/license	Legal Framework
Water Abstraction Permit	DWRM	MWE & Contractor	Water Act, cap 152
Waste Disposal Permit	NEMA	MWE & Contractor	National Environment Act 2019; National Environment (Waste Management) Regulation 2020
Waste Transportation License	NEMA	Contractor	National Environment Act 2019; National Environment (Waste Management) Regulation 2020

ESIA Approval for Campsites and hoarding areas	NEMA	Contractor	National Environment Act 2019
Permit to carry out a Regulated activity in a Wetland, Riverbank, Lakeshore (River Nile)	NEMA	Contractor & MWE	National Environment Management (Wetland, Riverbank, Lakeshore) Regulation 2020
License to emit noise in excess of permissible noise levels	NEMA	Contractor	National Environment Act 2019
Mining Permit, Extraction of minerals, opening up of quarries and sand pits	DGSM/ MEMD/ NEMA approval	Contractor	Mining Act, Cap 148
Permit for Storage of Petroleum Products and dispensing license	PSD/MEMD	Contractor	Petroleum Act, Cap 2003
Work Place Registration Permit	MGLSD	Contractor	OHS Act, 2006
Work Permits	Ministry of Internal Affairs	Contractor & Supervising, Consultant/ MWE	Immigrations Act, Cap 66
Statutory Certification of equipment	MGLSD, UNBS	Contractor	OHS Act, UNBS Act
Permit if the water transmission line is to cross the UNRA road (Road Permits)	UNRA	MWE	The Uganda National Roads Authority (General) Regulations 2017
Traffic Diversions consent	Uganda Police	Contractor	Traffic and Road Safety Act 1998
RAP approval conditions for this project	CGV	MWE	The Land Act Cap 227

4.3 INTERNATIONAL PROTOCOLS AND CONVENTIONS

The relevant international protocols and conventions for which Uganda is a signatory to as presented in **Table 0-5** below.

Table 0-5: Summary of international protocols and conventions applicable to the proposed project

Protocol or Convention	Purpose
African Convention on the Conservation of Nature, 1968	Encourages individual and joint action for the conservation, utilisation and development of soil, water, flora and fauna for the present and future welfare of mankind, from an economic, nutritional, scientific, educational, cultural and aesthetic point of view.
United Nations Framework Convention on Climate Change (UNFCCC), 1992	The Convention requires parties to avoid adverse effects on the environment and adopt measures and policies to control carbon dioxide emissions in technologies, taking into account their common, yet differentiated responsibilities, as well as their specific national and regional development priorities, objectives and circumstances. They are required 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.
United Nations Convention to Combat Desertification (UNCCD), 1994	Binding international agreement linking environment and development to sustainable land management. The Convention addresses specifically the arid, semi-arid and dry sub-humid areas, known as the drylands, where some of the most vulnerable ecosystems and peoples can be found. In the 10-Year Strategy of the UNCCD (2008-2018) that was adopted in 2007 with a view to <i>forge a global partnership to reverse and prevent desertification/land degradation and to mitigate the effects of drought in affected areas to support poverty reduction and environmental sustainability.</i>
Montreal Protocol for the Protection of the Ozone Layer, 1987	The protocol was designed to protect the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion. All of the ozone depleting substances controlled by the Montreal Protocol contain either chlorine or bromine (substances containing only fluorine do not harm the ozone layer). The provisions of the Protocol include the requirement that the Parties to the Protocol base their future decisions on the current scientific, environmental, technical, and economic information that is assessed through panels drawn from the worldwide expert communities
Stockholm Convention on Persistent Organic Pollutants, 2001	Protects human health and environment from Persistent Organic Pollutants that remain intact in the environment for long periods and can become widely distributed geographically and accumulate in the fatty tissue of humans and wildlife, which can lead to serious health effects.

Protocol or Convention	Purpose
Strategic Approach to International Chemicals Management, 2006	Fosters sound management of chemicals and to ensure that by the year 2020, chemicals are produced and used in ways that minimise significant adverse impacts on the environment and human health.
International Labour Organisation Convention, 1998	Sets out basic principles and labour rights at work, based on international best practise.

4.4 WORLD BANK OPERATIONAL POLICIES (OPS)

The large solar powered piped water supply system and sanitation facilities to be constructed under IWMDP interventions in Kiryandongo will be funded by the World Bank, which has Environmental and Social Safeguard policies that are designed to avoid, mitigate, or minimize adverse environmental and social impacts of projects supported by the World Bank. The operational policies triggered in this project are summarized in **Table 0-6** below:

Table 0-6: Summary of how the planned project activities trigger WB OPs

Safeguard Policies	Triggered/ Not Triggered	Remarks
Environmental Assessment OP/BP 4.01	Triggered	The proposed project may have adverse environmental and social impacts through its infrastructure activities, particularly civil works for water supply and sanitation. The project alignment goes through rural growth centres with a number of activities and therefore potential impacts relating to influx of labour, drainage, traffic, noise generation among others are likely. In general, the project falls under Category B of the World Bank's Environmental Assessment classification of projects requiring an ESIA/ESMP given that its potential of moderate environmental and social impacts will be site specific, few if any are irreversible, and in most cases mitigation measures can be readily designed.
Natural Habitats OP/BP 4.04	Triggered	There will be potential loss or degradation of natural habitats including riparian and wetland habitats, due to the planned construction works for transmission and distribution lines in these ecologically sensitive areas. The likely impacts on the natural habitats have been assessed as part of the ESIA and appropriate mitigation measures included in the ESMP
Forests OP/BP 4.36	Not Triggered	The proposed site for project implementation and the immediate neighbourhood do not have any forest or land gazetted as forest reserve.
Pest Management OP 4.09	Not Triggered	No application of pesticides is envisaged in the project.

Safeguard Policies	Triggered/ Not Triggered	Remarks
Physical Cultural Resources OP/BP 4.11	Triggered	The project will involve excavations and there are chances of inadvertently finding PCRs. Chance Finds Procedure has been developed as part of the ESIA to guide in managing of PCRs should they be found during project implementation.
Indigenous Peoples OP/BP 4.10	Not triggered	No known Indigenous Peoples exist within the project area.
Involuntary Resettlement OP/BP 4.12	Triggered	The project will involve land acquisitions for sites planned for the water sources, reservoirs and sump/ booster station. Therefore, the project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons; and in particular, for this project, economic loss is possible. Acquisition of land should be through free, prior and informed consent; and the potentially affected persons should have the right to refuse land acquisition or restrictions on land use that can result into displacement. In order to guide proper implementation of the involuntary resettlement aspects of the project, a Resettlement Action Plan has been prepared in parallel with this ESIA.
Safety of Dams OP/BP 4.37	Not Triggered	This OP is not triggered because the project works do not involve dam related works.
Projects on International Waterways OP/BP .50	Not Triggered	The project does not affect international water ways. The source of water supply for this project are two boreholes.
Projects in Disputed Areas OP/BP 7.60	Not Triggered	There are no disputed areas along the project corridor.
World Bank Policy on Access to Information (2015)	Triggered	There is need for disclosure of information to all the project stakeholders through the sharing of information with stakeholders such as district technocrats, Town council/ Sub County leaders, Local council leaders, and communities among others during the consultations process. Project information will remain accessible by them.

4.4.1 GAP ANALYSIS BETWEEN THE KEY WORLD BANK SAFEGUARD POLICIES AND GOVERNMENT OF UGANDA'S ENVIRONMENTAL AND SOCIAL REQUIREMENTS (AS ADOPTED AND UPDATED FROM THE IWMDP ESMF (2018) AND UCSAP ESMF (2022))

The platform upon which Uganda's country system has been built is the Constitution, which commits government to protecting natural resources on behalf of the people. It explicitly encompasses the concept of sustainability, including meeting the needs of present and future

generations. The State is also committed to preventing or minimising environmental damage and upholding the right of “every Ugandan to a clean and healthy environment”. This represents the highest-level commitment to sustainability. The NEA 2019 is the key legislation for environmental (and to a lesser extent, social) risk management.

From an environmental perspective, Uganda’s institutions have well-enough defined mandates and adequate enabling legislation, albeit with some gaps, overlaps and weaknesses. For the most part, policies, laws, regulations, and guidelines are adequately aligned with regards to the World Bank Environmental and Social Safeguards Policies, especially given that the National Environment Act 2019 (NEA 2019) has been revised and significantly improved, and that new Environmental and Social Impact Assessment (ESIA) regulations have been revised following Good International Industry Practice, with participation of the World Bank.

It is worth noting that environmental management in Uganda has been largely supported by the World Bank, right from the development of the National Environment Management Policy in 1994, the National Environment Act in 1995 (updated in 2019) and the accompanying Regulations, including the establishment of NEMA. Owing to this, most of the environmental requirements are largely influenced by the World Bank’s Environmental and Social Safeguard Policies. Most of the provisions of OP 4.01 were adopted and as such the E&S screening and assessment methodology is virtually the same as seen in the Uganda’s EIA Guidelines of 1997 and Regulations 2020.

Some of the differences include the following: first and foremost, the Ugandan Laws do not provide for Framework Approach (ESMF and RPF) but rather only specific instruments (ESIA, ESMP, Environmental Audits, RAPs). Whilst Uganda’s ESIA systems are relatively strong on biophysical considerations, they are weaker regarding assessment of social and related issues. Whereas the WB Policies provide for independent review mechanism (the Inspection Panel), there is no explicit requirement for independent review of ESIA reports under Uganda’s laws, though the ESIA Regulations (2020) provide for a reference to relevant experts who may be consulted to provide specialist knowledge and to assist with understanding and interpreting technical aspects of the project. Furthermore, there is no applicable legislation on a minimum wage. Aspects of the Employment Act contradict other Ugandan laws, by allowing for the employment of children aged 14 for “light work” under adult supervision, in contradiction to Section 7 of the Children (Amendment) Act (2016) which sets the employment age at 16. The Employment Act does not clearly define hazardous employment. The legal framework also fails to provide penalties for the violation of laws prohibiting the employment of minors, contributing to high school drop-out rates, teenage pregnancies, and health issues as children find work on project sites.²

Under OP 4.04 Natural Resources, Uganda lacks Regulations to implement the National Forestry and Tree Planting Act and the Wildlife Act. Therefore, OP 4.04 and OP 4.36 on Forests shall be used to assess any impacts on natural habitats. On OP 4.11 Physical Cultural Resources, the Ugandan legal framework is limited in scope. For example, it does not cover certain aspects such as the intangible heritage. The other area is under OP 4.12 (Involuntary Resettlement) whereby Uganda’s Land Act legal framework is restricted to fair, adequate and prompt compensation

² Uganda Social Risk Management (SRM) Technical Paper (2019)

(cash), while the World Bank policy requires the need to provide alternative land, resettling the Project Affected Persons (PAPs) to levels or standards of livelihood similar to or better than before compensation. The Ugandan legislation also does not provide for restoration of livelihoods, resettlement assistance and compensation at replacement value. Under circumstances like these regarding short-comings in the Uganda law on compensation and ESMF process, the provisions of OP 4.12 shall be applied.

The existing gaps are summarized in Table 0-7 below:

Table 0-7: Summary of Gap Analysis between Uganda and World Bank Safeguards

World Bank's Safeguard Policies	Uganda's Legal and Regulatory Framework	Gaps identified in Uganda legal and regulatory framework	Provisions for this ESIA
Environmental Assessment (OP 4.01)	<ul style="list-style-type: none"> • National Environment Management Policy, 1994. • National Environment Act No.5 of 2019. • National Environment (Environmental and Social Assessment) Regulations, 2020. 	<ul style="list-style-type: none"> • Independent review is not specifically provided for under ESIA Regulations of Uganda and as a result, the review of ESIA's is commonly reviewed by government agencies; • In the EIA review process, there is no specific legal/regulatory framework that caters for examination of the quality of the ESIA reports. Only conditions of approval/reasons for non-approval of ESIA's are provided by NEMA; • There are no administrative mechanisms for appealing a decision taken on an EIA. 	The WB (as a financing agency has to review reports to ensure compliance with E&S regulations and approve them before releasing the funding)
Natural Habitats (OP 4.04) and Forests (OP 4.36)	<ul style="list-style-type: none"> • The Constitution 1995 as amended; • the National Environment Act No.5 of 2019; • The National Forestry and Tree Planting Act, 2003; • The Uganda Wildlife Act 2019; • The Land Act Cap 227; • The Fish Act Cap 197; • The Plant Protection Act Cap 31. 	There are general gaps which include lack of Regulations to implement the National Forestry and Tree Planting Act and the Wildlife Act.	UWA has been proposed as one of the responsible institutions over the wildlife incise animals are identified in the project area

Physical Cultural Resources (OP 4.11)	<ul style="list-style-type: none"> • The Constitution 1995 as amended • The National Environment Act, 2019 • The Historical Monuments Act, Cap 46 • The Institution of Traditional or Cultural Leaders Act, 2011 	<ul style="list-style-type: none"> • The legal framework is limited in scope. For example, it does not cover certain aspects such as the intangible heritage; • There is no strong institution to regulate and manage heritage resources; • The sites and monuments are not adequately maintained, documented and in addition, some of the antiquities are not collected; • There is limited enforcement of the legal framework related to Physical Cultural Resources in Uganda because most developers and government officials do not understand the importance of conserving physical cultural resources. 	A Chance Findings Procedure (CPF) has been developed and included under section 9.3.13 to guide on the process
<p>The current Historical Monuments Act is being reviewed to provide for an efficient law for the protection of the cultural resources of the country. The new law shall be inclusive of all aspects of culture, the tangible, intangible heritage of the country. The revised Environmental and Social Impact Assessment Regulations provide that risk assessment should include risks to cultural heritage.</p>			

Table 0-8: Gaps between World Bank and Ugandan legislation applicable to OP 4.12 Involuntary Resettlement

(Adopted from the Uganda Climate Smart Agricultural Project-RPF)

Category of PAPs/ Type of Lost Assets/ Impact	Ugandan Law	OP 4.12	Gap Analysis	Provisions for this ESIA and ensuing RAPs
Land Owners	The Constitution of Uganda, 1995 recognizes four distinct land tenure systems, Customary tenure, Freehold	World Bank Policy recognises the rights of those affected people:	The Ugandan law does not compensate those without legal right or claim to the land.	Alternative land (wherever available) or Cash compensation at full replacement value or

Category of PAPs/ Type of Lost Assets/ Impact	Ugandan Law	OP 4.12	Gap Analysis	Provisions for this ESIA and ensuing RAPs
	<p>tenure, Leasehold tenure and Mailo land tenure.</p> <p>Land is valued at open market value and a 15% to 30% disturbance allowance must be paid if six months or less notice is given to the owner.</p> <p>Cash compensation is the recommended option.</p>	<ul style="list-style-type: none"> • Who have formal legal rights to the land or assets they occupy or use. • Who do not have formal legal rights to land or assets, but have a claim to land that is recognized or recognizable under national law. • Who have no recognizable legal right or claim to the land or assets they occupy or use. <p>Compensation of lost assets at full replacement costs.</p> <p>Cash compensation is recommended where there are active land markets and livelihoods are not land based.</p>	<p>WB OP 4.12 does not consider disturbance allowance.</p> <p>Uganda laws and the WB OP 4.12 are consistent in compensation at full replacement cost and cash compensation.</p>	<p>(based on market value + 15% to 30% disturbance allowance).</p> <p>All forms of tenancy based on formal or informal rights.</p> <p>In kind compensation should be offered as an option to the PAPs where (alternative land is available for the PAPs).</p>

Category of PAPs/ Type of Lost Assets/ Impact	Ugandan Law	OP 4.12	Gap Analysis	Provisions for this ESIA and ensuing RAPs
Land Tenants	Leasehold tenure is created either by contract or by operation of the law. The landlord grants the tenants or lease exclusive possession of the land, usually for a period defined and in return for a rent. The tenant has security of tenure and a proprietary interest in the land. Cash compensation is based upon market value of land and disturbance allowance (15-30%). Entitled to compensation based upon the amount of rights they hold upon land.	Must be compensated, whatever the legal recognition of their occupancy.	The Ugandan law does not compensate those without legal right or claim to the land.	Land owners Compensate for land and all assets at full replacement cost or replacement of land at equal/ greater value and compensate for other assets. World Bank OP 4.12 does not recognize depreciated value for replacement of assets (which should be replaced at market value). Additionally, 15% disturbance allowance will be given to the PAPs on top of the compensation.
Land squatters	Leasehold tenure is created either by contract or by operation of the law. The landlord grants the tenants or lease exclusive possession of the land, usually for a period defined and in return for a rent. The tenant has security of tenure and a proprietary interest in the land. Cash compensation is based upon market value of land and disturbance allowance (15-30%). Entitled to compensation based upon the amount of rights they hold upon land.	Must be compensated, whatever the legal recognition of their occupancy	The Ugandan law does not compensate those without legal right or claim to the land.	Squatters are only entitled to compensation for the development on the land and ample time will be given to the PAPs to harvest their crops. Additionally, 15% disturbance allowance will be given to the PAPs on top of the compensation.

Category of PAPs/ Type of Lost Assets/ Impact	Ugandan Law	OP 4.12	Gap Analysis	Provisions for this ESIA and ensuing RAPs
Owners of non-permanent buildings such as kiosks, butchery shops, wooden shacks for food vendors etc.	Cash compensation based upon rates per m2 established at District level, disturbance allowance (15% or 30%).	Recommends in-kind compensation or cash compensation at full replacement cost. Recommends resettlement assistance.	OP 4.12 does not provide for the disturbance allowance. Ugandan law does not provide for resettlement assistance.	District compensation rates + 15% disturbance allowance. Cash compensation. Livelihood restoration, including identification of alternative sites.
Owners of permanent buildings.	Valuation based on replacement value and guidance from CGV & disturbance allowance (15% or 30%).	Compensation at full replacement cost.	The Ugandan laws are consistent with OP 4.12 in regard to replacement cost.	Cash Compensation at replacement value + 15% disturbance allowance.
Perennial Crops	Cash compensation based upon rates per m2/bush/tree/plant established at District Level and disturbance allowance (15% or 30%).	Compensation at full replacement cost. Income restoration.	OP 4.12 does not provide for the disturbance allowance.	Cash compensation using affected District rates + disturbance allowance.
Seasonal crops	No compensation. 3-6 months' notice given to harvest crops.	No specific provision		No compensation is expected for crops to be harvested. However, in the event that livelihoods are lost compensation will be given.
Loss of income	No specific provision	Livelihoods and living standards are to be restored in real terms to pre-displacement levels or better	The Ugandan legislation does not provide for restoration of livelihoods.	In the context of this project, practical livelihood restoration measures have been proposed.
Vulnerable groups	The 1995 Uganda Constitution stipulates that: "the State shall take affirmative action in favour of groups marginalised on the basis of gender, age, disability or any other reason [...] for the purpose of redressing imbalances which exist against	Particular attention should be paid to the needs of vulnerable groups among those displaced such as those below the poverty line, landless, elderly; women and children and indigenous peoples and ethnic minorities.	Both the Ugandan Constitution and WB OP 4.12 favour vulnerable groups. However, the Ugandan law, vulnerable groups are not fully described in the context	Special attention will be paid to vulnerable persons affected and necessary measures will be provided in the entitlement matrix of the RAP.

Category of PAPs/ Type of Lost Assets/ Impact	Ugandan Law	OP 4.12	Gap Analysis	Provisions for this ESIA and ensuing RAPs
	them". This regulation is not fully described in the context of resettlement and land acquisition.		of resettlement and land acquisition.	
Relocation and Resettlement	Both the Constitution, 1995 and The Land Act, 1998 give the government and local authorities, power to compulsorily acquire land. The Constitution states that "no person shall be compulsorily deprived of property or any interests in or any right over property of any description except" if the taking of the land is necessary "for public use or in the interest of defence, public safety, public order, public morality or public health."	Avoid or minimize involuntary resettlement and, where this is not feasible, assist displaced persons in improving or at least restoring their livelihoods and standards of living in real terms relative to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.	There is no requirement under the Ugandan law to minimize land acquisition.	Measures to minimize involuntary resettlement shall be considered in the RAP following a WB mitigation hierarchy.
Livelihood restoration and assistance	There are no explicit provisions under resettlement or relocation for livelihood assistance.	Livelihoods and living standards are to be restored in real terms to pre-displacement levels or better	Ugandan policy and legislation would need to be aligned with Bank policy to effectively guarantee rights of all affected persons of involuntary resettlement.	The project will provide transition allowance.
Consultation and disclosure	There are no explicit provisions for consultations and disclosure but there are guidelines issued by separate ministries (e.g. roads and energy). The Land Acquisition Act,	Consult project-affected persons, host communities and local NGOs, as appropriate. Provide them opportunities to participate in the planning, implementation, and	While the consultation requirement is inherent in the ESIA, it contains several differences with the requirements of Bank policy.	No gap.

Category of PAPs/ Type of Lost Assets/ Impact	Ugandan Law	OP 4.12	Gap Analysis	Provisions for this ESIA and ensuing RAPs
	however, makes provision for an enquiry whereby the affected person can make formal written claim and the assessment officer is obliged to conduct a hearing before making his award.	monitoring of the resettlement program, especially in the process of developing and implementing the procedures for determining eligibility for compensation benefits and development assistance (as documented in a resettlement plan), and for establishing appropriate and accessible grievance mechanisms.		
Grievance mechanism and dispute resolution	The Land Act, 1998 states that land tribunals must be established at all districts. The Land Act empowers the Land Tribunals to determine disputes and it provides for appeal to higher ordinary courts. The Land Acquisition Act provides for the aggrieved person to appeal to the High Court.	Establish appropriate and accessible Grievance Redress Mechanism.	GRC structures exist within the Local Councils of Governance in Uganda, but in most cases, they are dysfunctional and ineffective given the limited projects knowledge.	Grievance committees to be instituted within the procedure and will not replace the existing legal process in Uganda; rather it seeks to resolve issues quickly so as to expedite receipt of entitlements and smooth resettlement without resorting to expensive and time-consuming legal action. If the grievance procedure fails to provide a settlement, complainants can still seek legal redress.
Calculation of compensation and valuation	According to the Land Act, Cap 227 (section 77), the value of	Bank policy requires: (a) prompt compensation at full replacement cost for loss of assets attributable to the project;	There is no equivalent provisions on relocation assistance, transitional	Market value is based on recent transactions and thus if alternative property is purchased within a reasonable period of the

Category of PAPs/ Type of Lost Assets/ Impact	Ugandan Law	OP 4.12	Gap Analysis	Provisions for this ESIA and ensuing RAPs
	<p>Customary land shall be the open 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.</p> <p>The crops and buildings of a non-permanent nature are compensated at rates set by District Land Boards</p>	<p>(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.</p>	<p>support, or the provision of civic infrastructure.</p> <p>The basis of compensation assessment is not stated in the Land Acquisition Act (an old law due for review), although the Constitution provides for 'prompt, fair and adequate' compensation. (article 26).</p>	<p>payment of compensation, it is likely that market value will reflect full replacement value.</p> <p>However, local inflation in price land or construction materials can affect what is determined as replacement cost. If this is not reflected in recent transactions, market value may not reflect replacement value.</p>

4.5 WORLD BANK EHS GUIDELINES

The World Bank has a number of sector-based EHS guidelines below, many of which are applicable to various components of the proposed project namely:

- i. Water and Sanitation
- ii. Air emissions
- iii. Hazardous waste management
- iv. Noise
- v. Occupational health and safety.
- vi. Community health and safety including traffic safety such as during project construction or disease prevention
- vii. Construction and decommissioning.

While most of above WBG guidelines apply to the proposed project in one way or the other, in sections below are discussed five environmental, health and safety (EHS) guidelines that are of relevance to the proposed project, namely:

- a. EHS Guidelines - Water and Sanitation
- b. EHS Guidelines - Air Emissions and ambient air quality
- c. EHS Guidelines - Waste Management
- d. EHS Guidelines - Hazardous Materials Management
- e. EHS Guidelines - Construction and decommissioning

The study explicitly and adequately evaluated all the occupational health and safety aspects of the proposed project activities for all implementation phases including health and safety aspects of project workforce and the general public (construction phase). Appropriate mitigation measures have been recommended for adoption at relevant stages of project implementation.

4.5.1 WBG EHS GUIDELINES: WATER AND SANITATION

The EHS Guidelines for Water and Sanitation include information relevant to the operation and maintenance of:

- (i) Potable water treatment and distribution systems
- (ii) Collection of sewage in centralized systems (such as piped sewer collection networks) or decentralized systems (such as septic tanks subsequently serviced by pump trucks) and treatment of collected sewage at centralized facilities.

The EHS guidelines outline Industry specific-impacts and their management that comprise;

- (i) Environmental issues associated with water and sanitation projects may principally occur during the construction and operational phases, depending on project-specific characteristics and components
 - a) Drinking water – water withdrawal, water treatment, water distribution,
 - b) Sanitation – faecal sludge and septage collection, sewerage (Domestic wastewater discharges, Industrial wastewater discharges, Leaks and overflows), Wastewater and Sludge Treatment and Discharge (Liquid effluents, Solid waste, Air emissions and odours, Hazardous chemicals, Ecological impacts).

- (ii) Occupational Health and Safety during the construction and decommissioning of Water and Sanitation facilities. Occupational health and safety impacts associated with the operational phase of water and sanitation projects primarily include the following:
 - a) Accidents and injuries
 - b) Chemical exposure
 - c) Hazardous Atmosphere
 - d) Exposure to pathogens and vectors
 - e) Noise
- (iii) Community health and safety impacts during the construction of water and sanitation projects are discussed including;
 - a) Drinking Water - Water Intake (Water Supply Protection), Water Treatment (Drinking Water Quality and Supply, Hazardous Chemicals) and Water Distribution.
 - b) Sanitation - Wastewater and Septage Collection (Preventing sewerage system overflows, Preventing build-up of potentially toxic and explosive gases in the sewer), Wastewater and Sludge Treatment (Liquid effluents, Air emissions and odours, Physical hazards)

4.5.2 WBG EHS GUIDELINES: AIR EMISSIONS AND AMBIENT AIR QUALITY

4.5.2.1 GENERAL APPROACH

These guidelines require projects with “significant” sources of air emissions, and potential for significant impacts to ambient air quality to prevent or minimize impacts by ensuring that emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards (or in their absence, the current WHO Air Quality Guidelines, or other internationally recognized sources). Uganda currently has (draft) national air quality standards applicable to this project.

In these guidelines “significant” refers to sources which can contribute a net emission increase of one or more of the following pollutants within a given air shed:

- i. Particulate matter of size 10 microns (PM10): 50 tons per year (tpy).
- ii. Oxides of nitrogen (NOx): 500 tpy.
- iii. Sulphur dioxide (SO₂): 500 tpy; or as established through national legislation.
- iv. Equivalent heat input of 50 MWt or greater.

This ESIA study exhaustively explore the air quality aspects relating to project implementation, most importantly, the major air pollutions sources (gaseous and dust emissions), receptors and elaborate on mitigation and monitoring measures to curb/prevent air quality impacts.

The study further recommends continuous monitoring to regularly track the deviations in air quality parameters and thus apply appropriate mitigation measures in a timely manner.

4.5.3 WBG EHS GUIDELINES: WASTE MANAGEMENT

4.5.3.1 GENERAL APPROACH

In relation to the proposed water supply and sanitation project works, this guideline provides for construction waste generated by and throughout all implementation phases. Large waste

volumes will be generated especially at project/construction site, material holding/stockpile yards, site workshop and construction equipment parking lot, batching plant, temporarily contractor workforce shelters among others. The guidelines advocate for waste management planning where waste should be characterized according to composition, source, types, and generation rates. These guidelines call for implementation of a waste management hierarchy that comprises prevention, recycling/reuse, treatment, and disposal. The guidelines require segregation of *conventional waste* from *hazardous waste* streams. Examples of hazardous construction waste are waste oil from vehicles and machinery paint waste, thinners, and concrete wash water (e.g., from cleaning concrete mixers).

4.5.3.2 IMPLICATION FOR THIS PROJECT

Improper management of construction waste would pose environmental and public health impacts. The contractor will have a contractual obligation to ensure proper construction waste management.

4.5.4 WBG EHS GUIDELINES: HAZARDOUS MATERIALS MANAGEMENT

4.5.4.1 APPLICATION AND APPROACH

These guidelines apply to projects that use, store, or handle any quantity of hazardous materials (Hazmats), defined as materials that represent a risk to human health, property, or the environment due to their physical or chemical characteristics. Hazmats can be classified according to the hazard as explosives; compressed gases, including toxic or flammable gases; flammable liquids; flammable solids; oxidizing substances; toxic materials; radioactive material; and corrosive substances.

4.5.4.2 GENERAL HAZARDOUS MATERIALS MANAGEMENT

Facilities which manufacture, handle, use, or store hazardous materials should establish management programs that are commensurate with the potential risks present. The main objectives of projects involving hazardous materials should be the protection of the workforce and the prevention and control of hazardous chemicals releases and accidents. These objectives should be addressed by integrating prevention and control measures, management actions, and procedures into day-to-day business activities. Implementation of the proposed project activities involves handling of hazardous materials such as fuel and lubricants, paint, compressed gas cylinders especially at the construction site, fuel storage area and mechanical workshop among others.

4.5.5 WBG EHS GUIDELINES: CONSTRUCTION AND DECOMMISSIONING

These provide guidance, specific guidance on prevention and control of community health and safety impacts that may occur during new project implementation activities. By thematic categories, they address three major aspects (environment, OHS and community health and safety) below.

1) Environment:

- **Noise and Vibration:** During construction and decommissioning activities, noise and vibration may be caused by the operation of material haulage fleet, earth moving and

excavation equipment, concrete mixers, cranes and the transportation of equipment, materials, and people.

- **Air Quality:** Project will involve excavations and handling of construction materials such as aggregates, sand, cement among others and this could generate fugitive dust affecting adjacent environs. A secondary source of emissions may include exhaust from diesel engines of earth moving equipment, as well as from open burning of construction waste.
- **Solid Waste:** During project implementation, non-hazardous solid waste generated at construction sites including domestic waste and other wastes such as wood and metals.
- **Hazardous Materials:** Fuel, lubricating oils and other forms of hazardous waste may be encountered.

2) Occupational Health and Safety

Likely OHS risks during the proposed project include over-exertion, slips, and falls, work at heights, hot works (welding), and electrocution, being struck by objects, injury by moving machinery and dust from demolition and construction activities.

3) Community Health and Safety

The guidelines recommend implementation of risk management strategies to protect the general community from physical, chemical, or other hazards associated with sites under demolition, construction, and decommissioning.

4) Traffic Safety

Project activities may result in a significant increase in movement of heavy vehicles for the transport of construction materials and equipment increasing the risk of traffic-related accidents and injuries to workers, local communities and road users.

4.6 INSTITUTIONAL FRAMEWORK

4.6.1 MINISTRY OF WATER AND ENVIRONMENT

The Ministry of Water and Environment (MWE) has the overall mission: to promote and ensure the rational and sustainable utilization, development and effective management of water and environment resources for socio-economic development of the country. The ministry has three directorates: Directorate of Water Resources Management (DWRM), Directorate of Water Development (DWD) and the Directorate of Environmental Affairs (DEA). MWE shall take lead on implementation of the project and shall ensure all recommendations contained in the mitigation plan are implemented.

4.6.1.1 DIRECTORATE OF WATER RESOURCES MANAGEMENT

The Directorate of Water Resources Management (DWRM) is responsible for developing and maintaining national water laws, policies and regulations; managing, monitoring and regulation of water resources through issuing water use, abstraction and wastewater discharge permits; Integrated Water Resources Management (IWRM) activities; coordinating Uganda's participation in joint management of transboundary water resources and peaceful cooperation with Nile Basin riparian countries. DWRM issued the water abstraction permits for the project and will monitor compliance to the conditions of the permits throughout the project's lifetime.

4.6.1.2 WETLANDS MANAGEMENT DEPARTMENT

Wetlands Management Department (WMD) is mandated to manage wetland resources and its goal is to sustain the biophysical and socio-economic values of the wetlands in Uganda for present and future generations.

WMD will issue wetland use permits for activities to be carried out in wetlands and monitor compliance to the conditions of the permit, so as to ensure sustainable utilisation of wetland resources.

4.6.2 NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

National Environment Management Authority (NEMA) was designated under the National Environment Act No.5 of 2019 as the principal agency in Uganda charged with the responsibility of coordinating, monitoring, regulating and supervising environmental management in Uganda. In this context, NEMA will be responsible for review and approval of this environmental impact assessment, ensuring proposed mitigation measures are implemented, monitoring compliance with approval conditions, and ensuring any other impacts that may arise are mitigated.

4.6.3 UGANDA WILDLIFE AUTHORITY

Uganda Wildlife Authority (UWA) is mandated to ensure sustainable management of wildlife resources and supervise wildlife activities in Uganda both within and outside the protected areas. UWA will provide guidance for instances where wildlife is encountered during project implementation and undertake any wildlife capture and relocation activities.

4.6.4 OFFICE OF THE PRIME MINISTER

The Office of the Prime Minister (OPM) through its Department for Refugees is mandated to lead and enhance National Response Capacity to Refugee Emergency Management through:

- i) Receiving and granting asylum to refugees in accordance with both international and national legal frameworks;
- ii) Settling refugees granted asylum, developing and implementing humanitarian interventions;
- iii) Advising government and other stakeholders on refugee matters;
- iv) Providing physical protection to refugees;
- v) Improving the physical infrastructure of the Refugee settlements, ranging from roads; staff accommodation, offices, reception centres among others; and
- vi) Enhancing the Refugee livelihoods through provision of Income Generating Activities (IGAs).

In parallel, OPM is implementing and coordinating activities under the Uganda Development Response to Displacement Project (DRDIP), whose Project Development Objective (PDO) is to improve access to basic social services, expand economic opportunities, and enhance environmental management for refugees and communities hosting refugees in the target areas of Uganda. OPM is a key stakeholder in the proposed project as it will impact refugee hosting communities, and their involvement could avail lessons learnt and contacts that can facilitate smooth project implementation.

4.6.5 MINISTRY OF LANDS, HOUSING AND URBAN DEVELOPMENT

The Mandate is “To ensure a rational: sustainable and effective use and management of land and orderly development of urban and rural areas as well as safe, planned and adequate housing for socioeconomic development”. The MoLHUD, through the Office of the Chief Government Valuer, and the District Land Boards, provided guidance on land acquisition and property valuation, where required. MoLHUD will also issue certificates of titles for land purchased by and registered to the Government under this project.

4.6.6 UGANDA NATIONAL ROADS AUTHORITY

The mandate of UNRA is to develop and maintain the national roads network, advise Government on general roads policy and contribute to addressing of transport concerns, among others. Some of UNRA responsibilities include: management of the National Roads Network; maintenance and development of the national roads network; and establishing and maintaining road reserves among others. UNRA is a key stakeholder under the project because the transmission and distribution line run along the road reserves of Katulikire – Mutunda Road and Mutunda – Diima Road. UNRA will authorise construction of project components in the road reserve as well as provide guidance and supervision for the project contractor in constructing service ducts for the pipe crossing on roads.

5.6.7 MINISTRY OF GENDER, LABOUR AND SOCIAL DEVELOPMENT

Ministry of Gender Labour and Social Development is mandated to empower communities to harness their potential through skills development, labour productivity and cultural growth. This ministry sets policy direction and monitoring functions related to labour, gender and general social development. Its OHS Department in the ministry is responsible for inspection and monitoring occupational safety in workplaces and this could be during project construction and operation of the laboratory facilities. It is responsible for work place registration and certification of equipment.

The OHS Department in this Ministry will be responsible for undertaking inspections of construction sites to ensure safe working conditions; issue certification of equipment in compliance with the OHS act and registration of work places

4.6.8 KIRYANDONGO DISTRICT LOCAL GOVERNMENT

The 1997 Local Government Act provides for decentralization and devolution of government functions, powers and services from the central to Local Governments and sets up the political and administrative functions of local governments. The Local Governments are responsible for the protection of the environment in their respective areas of jurisdiction. Local Governments were consulted on projects to be located within their jurisdiction and on matters that affect their environment. Local government structures are important for mobilising support for the project as well as monitoring its social-environmental impacts both during construction, and operation phases. At the District Level, the District Environmental Officers, District Water Officer, District Engineer, Community Development Officers in the respective areas of project implementation will participate in monitoring the projects to ensure that mitigation measures are adequate and

advise or point out additional compliance requirements following their inspections. The District Land Boards and Lands Officers will provide support on matters of compensation or land acquisition.

5 ENVIRONMENTAL AND SOCIAL BASELINE

This section describes environmental and social baseline conditions of the area in which the proposed water supply project is to be located and in which impacts may be experienced.

5.1 ADMINISTRATIVE SET UP AND DESCRIPTION OF KEY PROJECT SITES

The service areas for the project are well within the boundaries of Kiryandongo district in Mutunda, Diima and Nyamahasa Sub counties (**Figure 0-1**).

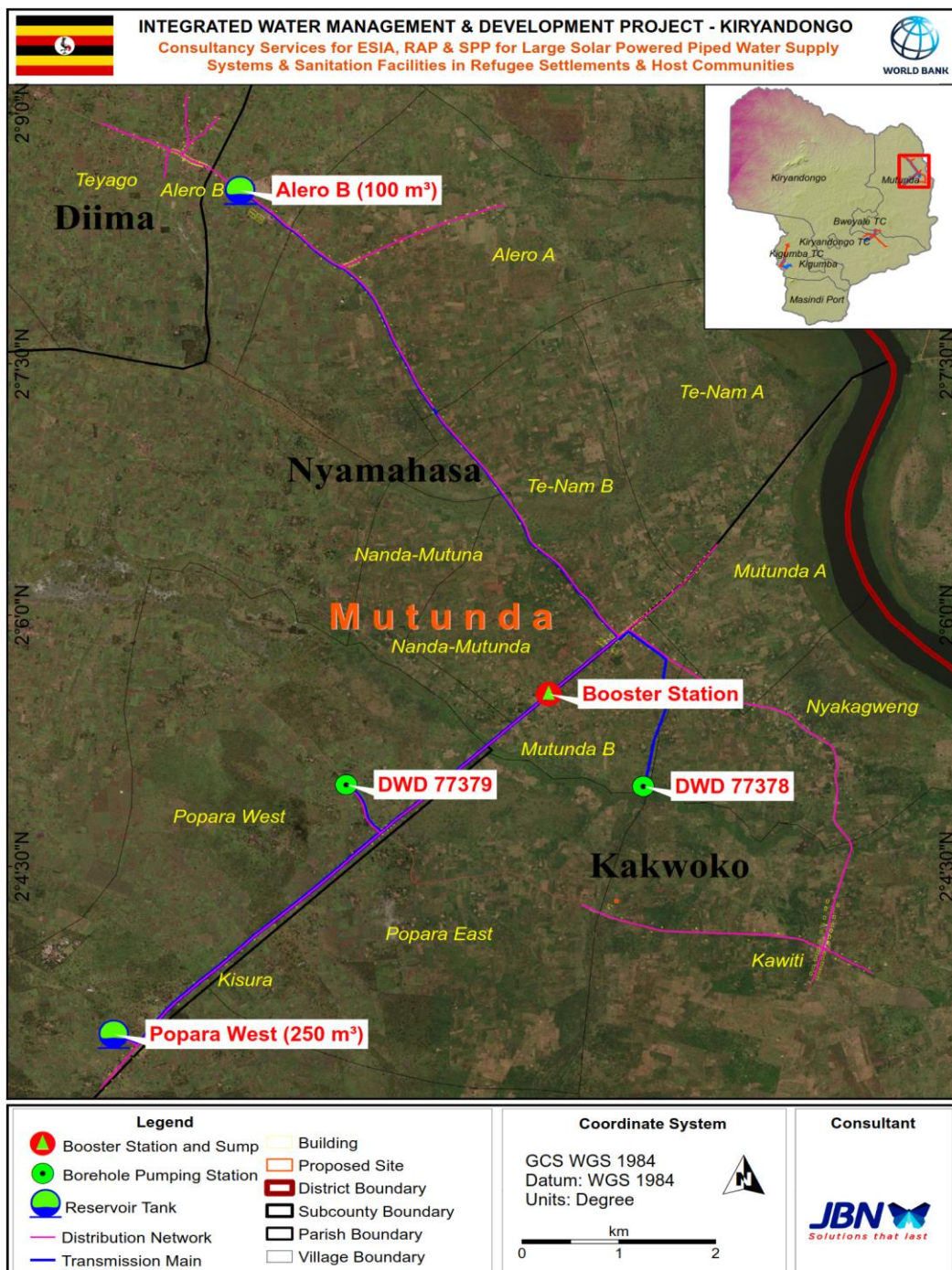


Figure 0-1: Map of layout of the proposed infrastructure system for Mutunda RGC

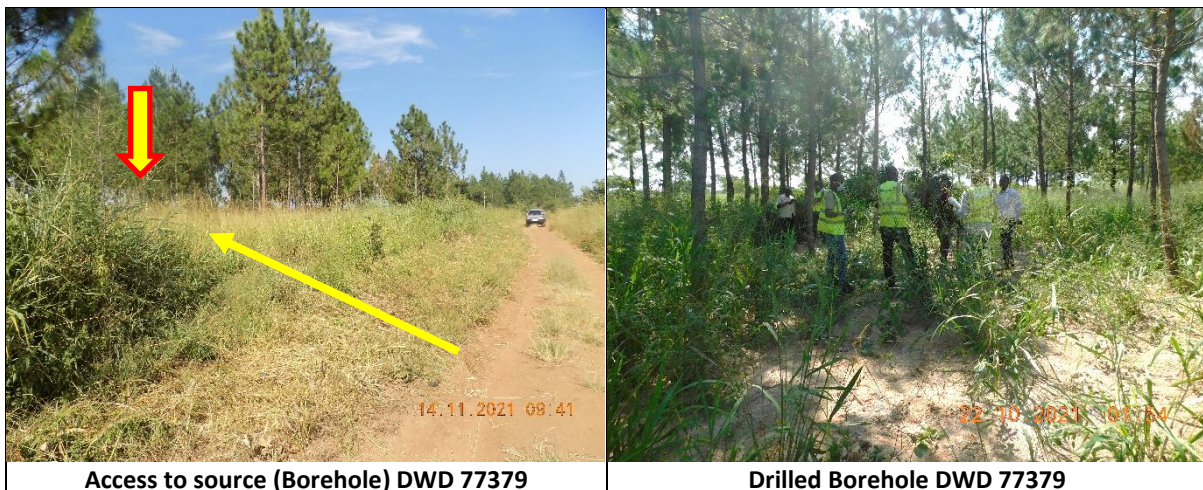
5.1.1 BOREHOLES (WATER SOURCES)

5.1.1.1 BOREHOLE DWD 77379 (5.2M³/HR YIELD)

Source DWD 77379 is located in Popara village, Nyamahasa parish and Mutunda subcounty about 0.68km off Katulikire – Mutunda Murram Road (Popara trading centre) (**Figure 0-2**). The access to the site is possible through an unpaved road (narrow at some points and needs an upgrade/widening during implementation) which is relatively flat with points prone to floods during the rainy seasons. There is no immediate site access road for about 25m which needs to be opened up. There is no special habitation onsite since the first nearby home is 100m from the borehole. The site surrounding is characterized by a Pine Forest and short grasses (**Figure 0-3**). Borehole DWD 77379 will be fitted with a submersible pump with a flow of 5.2m³/hr. at 220m head, with a borehole riser pipe of DN40 Steel PN16, 105m long and transmission main of HDPE-OD75 PN16, 10,292m long.



Figure 0-2: Location of Borehole DWD 77379 and its environs



Access to source (Borehole) DWD 77379

Drilled Borehole DWD 77379

Figure 0-3: Location, surrounding and access of water source (Borehole) DWD 77379

5.1.1.2 BOREHOLE DWD 77378 (50.5M³/HR)

Source DWD 77379 is located in Mutunda B village, Kakwoko parish and Mutunda subcounty about 2km from Mutunda trading centre and about 1.5km off Mutunda – Kawiti unpaved road (**Figure 0-4**). The site is bordered by River Nanda to south and bush in rest of the directions. The access to the site is possible through an unpaved Mutunda - Kawiti unpaved road (about the first 0.5km) and a very narrow and non-rehabilitated 1.5km road which needs an opening up/widening during implementation. The borehole area is relatively flat with points prone to floods during the rainy seasons. There is no special habitation onsite since the first nearby home is 0.25km from the borehole (across river Nanda). The site surrounding is characterized by a bush and scattered and shrubs (**Figure 0-5**).

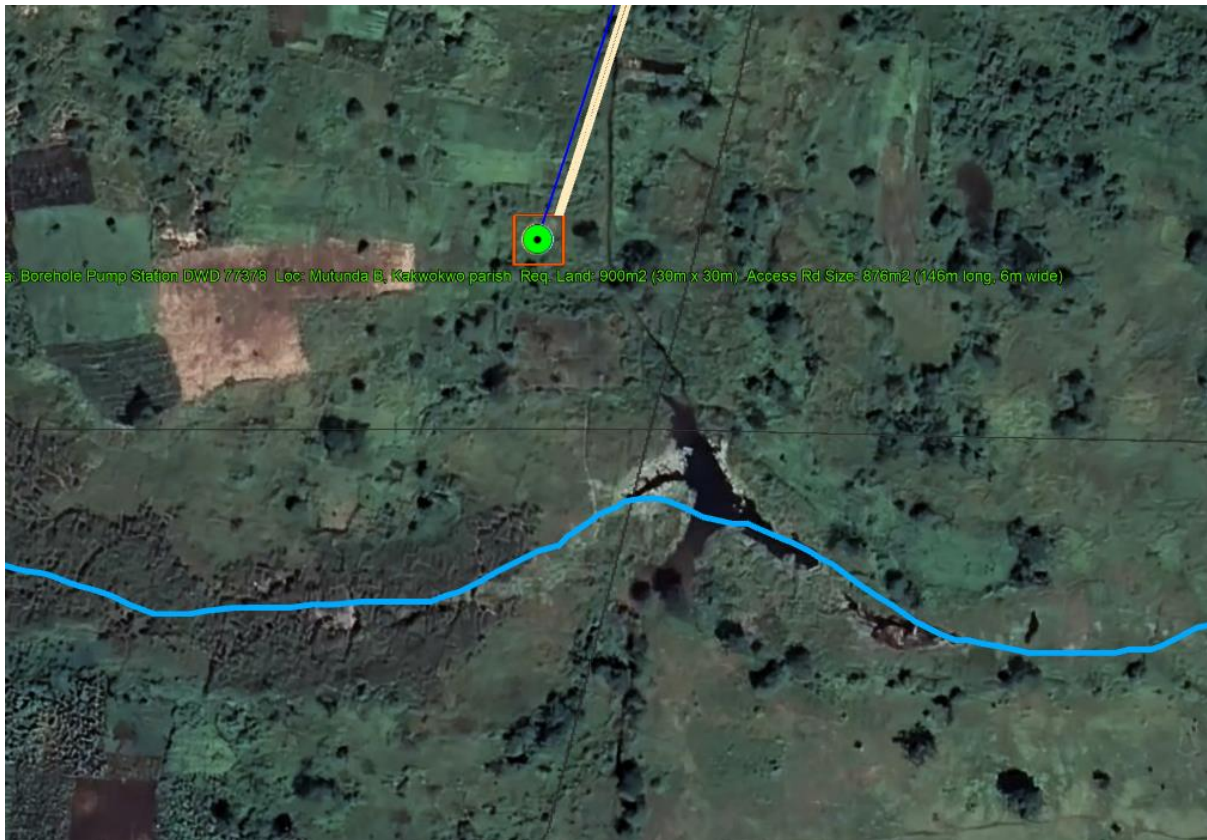


Figure 0-4: Location of Borehole DWD 77378 and its environs

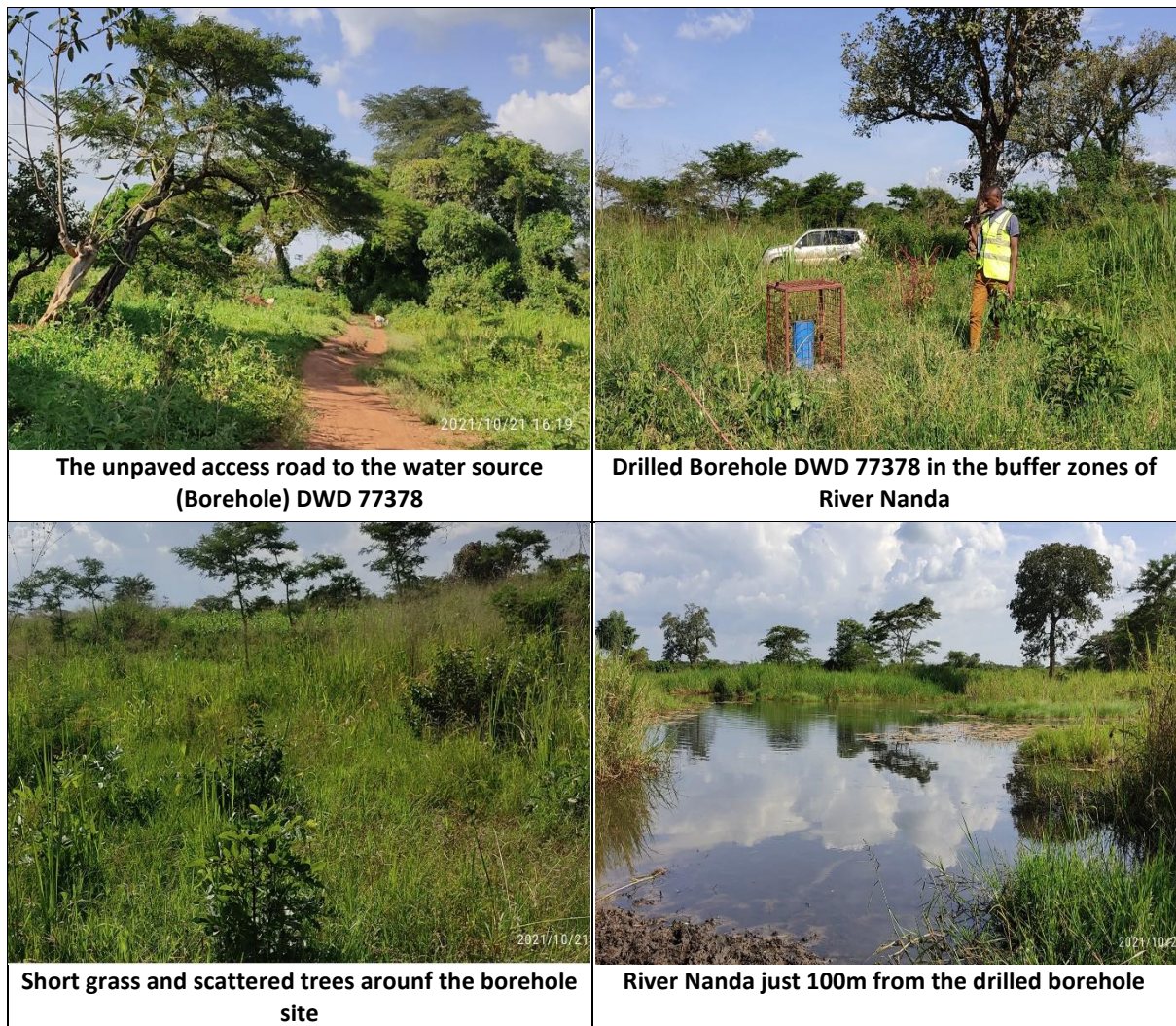


Figure 0-5: Existing environment and access of the water source (Borehole) DWD 77378

5.1.2 RESERVOIRS TANKS

Mutunda RGC will have two reservoir tanks located in Popara West and Alero B Popara West Reservoir Tank. The chosen tank site is located on a flat land in Popara West Village in Nyamahasa Parish about 0.3km off the Kitulikire – Mutunda Murram road at E417770, N227513 and 1067 m.a.s.l on a privately-owned land (**Figure 0-6**). The access to the site is possible through a footpath traversing the compound of Kisura C.O.U opposite Kakwoko Primary School, maize gardens and bush. However, there is a need to open up the access road to the site during implementation period. The site is used as a cultivation ground for food crops (currently maize garden) neighbored by three homesteads and bush (**Figure 0-7**). This is the main storage reservoir for Option IV. It will have a required tank storage capacity of 50% of the maximum day demand for Kakwokwo supply area and 20% of the maximum day demand for the Diima supply area. The required storage capacity is 252m³ and the proposed storage reservoir will be a 250m³ reservoir tank. This will be an erected pressed steel tank with square 1.22m panels measuring 9.76m long, 7.32m wide, and 3.66m high. Due to the topography of the RGC and the pressures experienced in the distribution network around the tank and in the far reaches of the network, the reservoir tank

will be erected on a 20 m steel tower. The area has neither sensitive ecosystems nor endangered species.

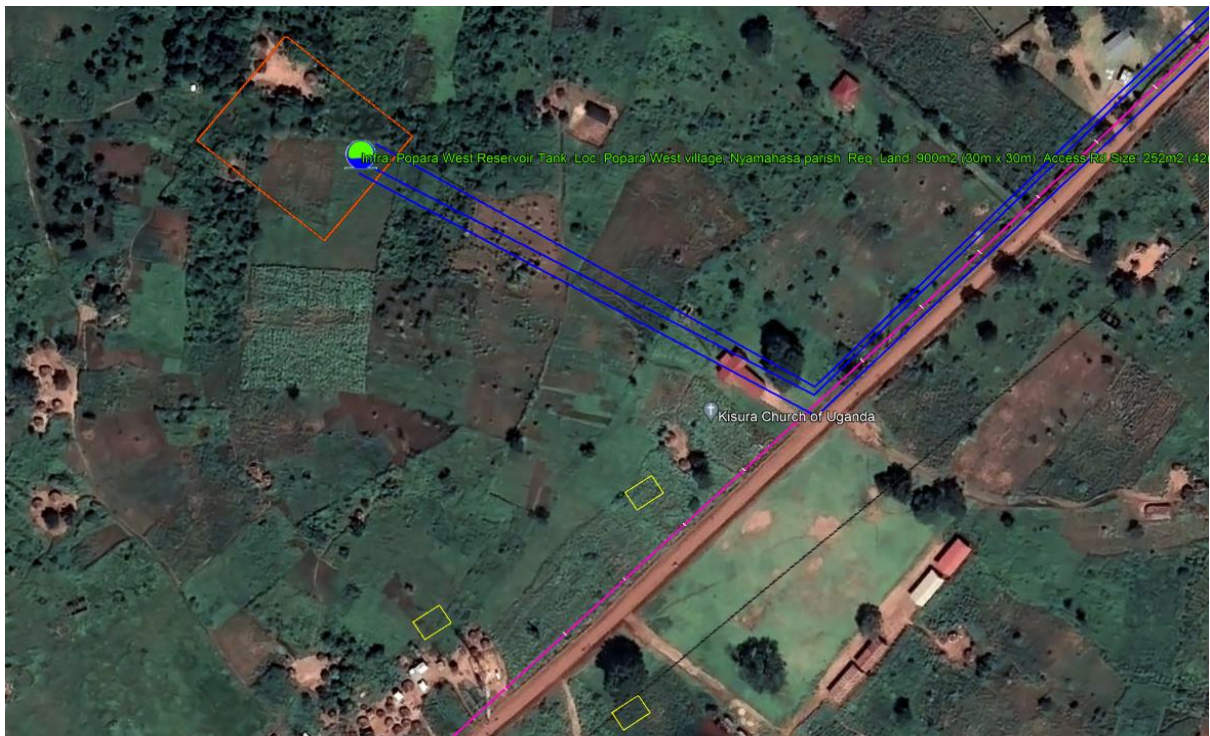


Figure 0-6: Location of Popara West reservoir tank and its environs



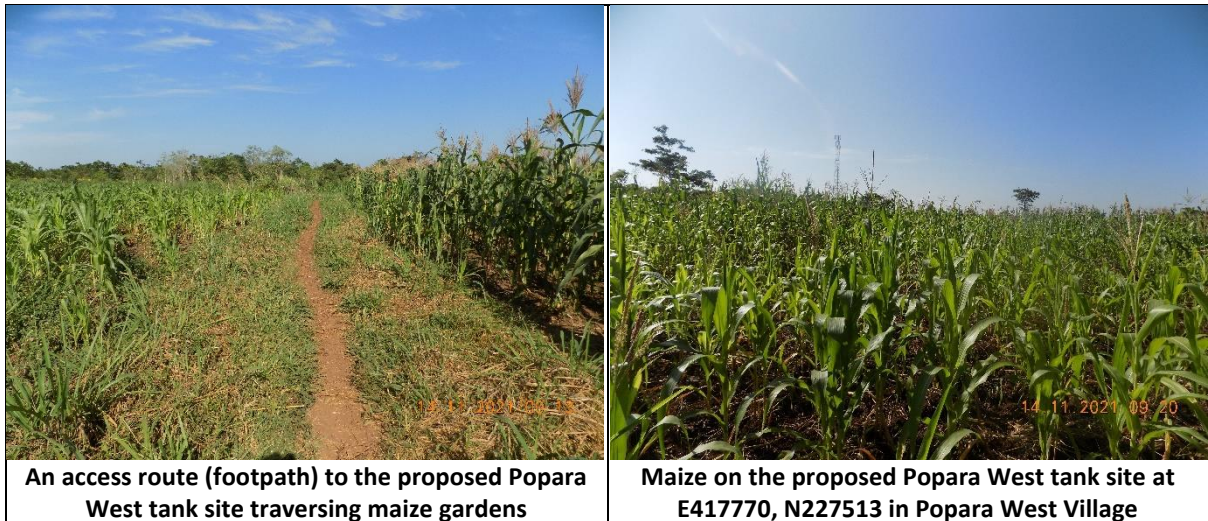


Figure 0-7: Existing environment and access of Popara West reservoir tank

5.1.2.1 ALERO B RESERVOIR TANK

The proposed Alero B site is located on top of a hill between Ogunga P/S and Teyago trading centre in Alero B village, Nyamahasa Parish at E419057, N236812 and 1077 m.a.s.l on a privately-owned land. The access to the site is through Mutunda – Diima unpaved road. However, there is a need to open up the access road to the site during implementation period (**Figure 0-8**). The site is used as a cultivation ground for food crops (currently maize garden) neighbored by several homesteads along the unpaved road (**Figure 0-9**). The storage reservoir for the Diima reservoir tank will provide storage equivalent to 50% of the maximum day demand. The required storage capacity is 114m³ and the proposed storage reservoir will be a 100m³ reservoir tank. It will be an erected pressed steel tank with square 1.22m panels measuring 6.10m long, 4.88m wide, and 3.66m high. Due to the topography of the RGC and the pressures experienced in the distribution network around the tank and in the far reaches of the network, the reservoir tank will be erected on a 15m steel tower. The area has neither sensitive ecosystems nor endangered species.



Figure 0-8: Location of Alero B reservoir tank and its environs



Figure 0-9: Existing environment and access of Alero B reservoir tank

5.1.2.2 BOOSTER STATION AND SUMP

The proposed booster station and sump site will be located in the middle of a small undulating hill in Nanda-Mutunda village (Walomakweli trading centre) at E422244, N231269 and 1056 m.a.s.l on a privately owned land (**Figure 0-10**). A booster station shall be constructed to meet the design demands for the years 2033 (169.8 m³/day) and 2043 (228.6 m³/day) with pumps installed in phases to meet those demands since electromechanical equipment have a life span of 10 years. The capacity of the sump is 30m³ and the booster station will have 2No. horizontal centrifugal pumps (1No. duty and 1No. standby) with a flow of 10.6 m³/hr or 3 l/s at 99m head; and transmission main of HDPE - OD 90 PN16, 7.35 km long. For both 2033 and 2043 pumps, flow rates will be 10.6 m³/hr or 3 l/s and 14.3 m³/hr or 4 l/s, static lift of 37.04 (m), velocities of 0.69 m/s and 0.93 m/s, total head from water sump to reservoir of 99 m and 145m and efficiency of 60%. The proposed site is about 6 km from Popara West Reservoir and 0.95 km before the junction in Mutunda trading centre. The access to the proposed site is possible through Katulikire – Mutunda murram road. Currently, the site seems to be of no economic use there is no cultivation on ground. The nearest homesteads are on the opposite side of the road (south east) while others about 90m away to the north west along the unpaved road (**Figure 0-11**). A booster station and sump will be fed by a gravity transmission main from the Popara West Reservoir and water will be pumped to the Alero B reservoir 7.35 km away. The area has neither sensitive ecosystems nor endangered species.



Figure 0-10: Location of Alero B reservoir tank and its environs

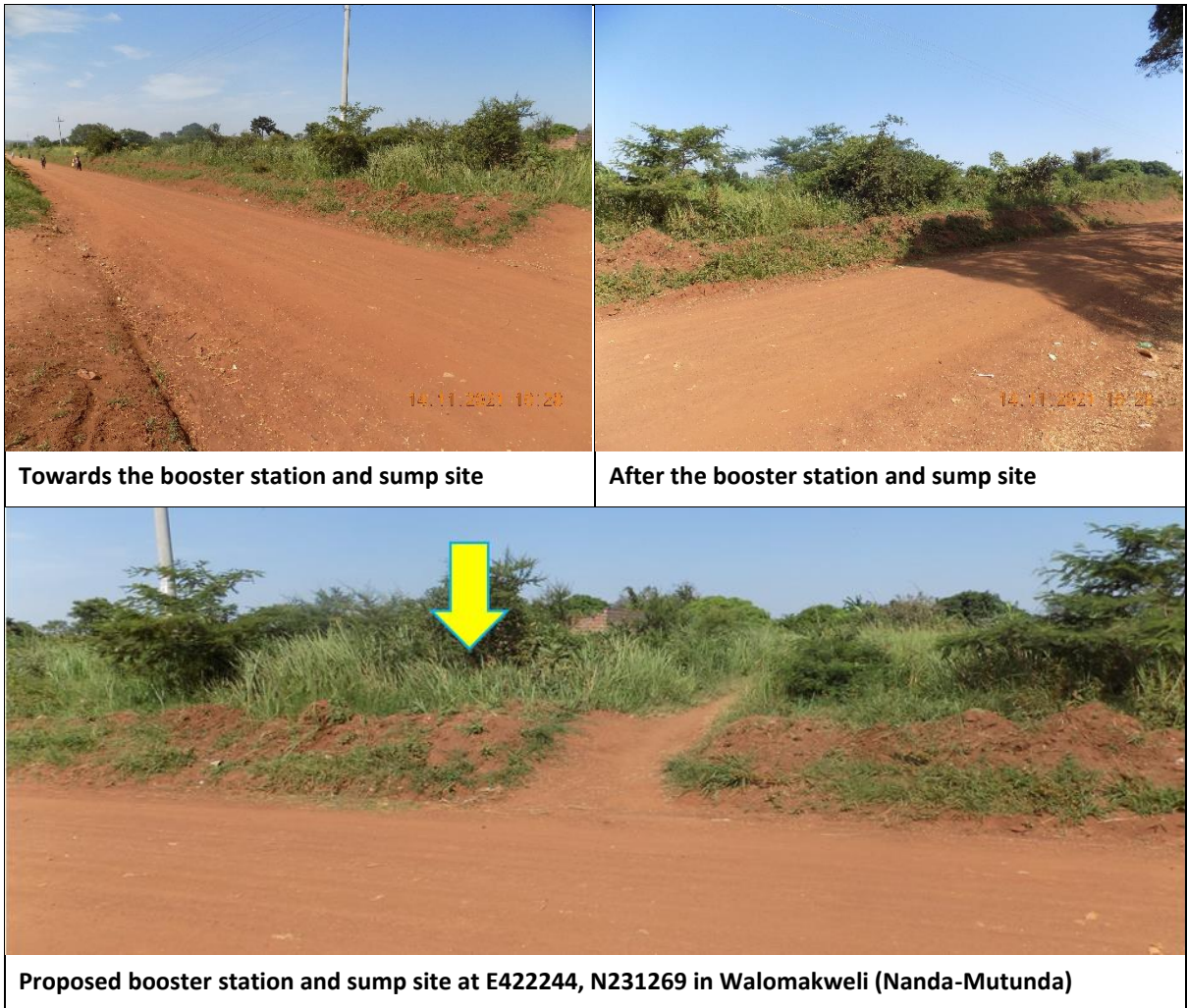


Figure 0-11: Existing environment and access of Alero B reservoir tank

5.1.3 TRANSMISSION SYSTEM

5.1.3.1 TRANSMISSION MAIN FROM WATER SOURCES TO THE MAIN TANK

The borehole pumping mains will deliver water from the boreholes to the water reservoir independently (**Table 0-1** and **Figure 0-12**). The water in the transmission main from Source DWD 77378 will flow through an OD 160 uPVC PN16 from ground level at borehole to inlet level of reservoir covering a chainage of 9.04 km, head of 113m and crossing 3 villages of Mutunda B, Nanda-Mutunda and Popara West. The pipe will move along a small access road (that needs opening) while traversing the bushland with scattered tall trees for about 1.44km before reaching the main road (Mutunda – Kawiti). This will maintain the left side of the road reserve up to Mutunda trading centre up to chainage 2.05 km where it will make its first major road crossing to the right side of the road reserve (Katurikire – Mutunda road) at Mutunda HC III (**Figure 0-13**).

At this point (chainage 2.08 km), the transmission main (1) from the borehole will move in the same corridor with transmission 4 (flowing in opposite direction) i.e., Popara West Main tank to Alero B reservoir tank and the distribution line (2) for about 6.7 km along the road before branching off (chainage 8.76 km) to Popara tank. At 3.05 km and 5.32 km, the lines will the Booster station in Nanda-Mutunda village and the transmission main from Source DWD 77379, respectively, which also takes water to Popara West main tank. The lines will cross a swamp (River Nanda) between chainage 3.84km and 4.0km. The biggest section of transmission line corridor is dominantly characterized by bushland along the road and a few patches of gardens. At chainage 8.76 km, the pipes will traverse the compound of Kisura C.O.U, gardens and bushes before reaching Popara West main reservoir tank site at chainage 9.04 km in Popara West village (**Figure 0-13**).

The water from Source DWD 77379 will flow through an OD 63 HDPE PN10 from ground level at borehole to inlet level of reservoir covering a chainage of 4.374 km, head of 89m and within Popara West village. The pipe will move along the right side of the community access road (that needs widening) while traversing the bushland for about 0.64km before reaching the main road junction (Mutunda – Kawiti) at the Popara trading and joins the transmission main from source DWD 77378 (**Figure 0-13**).

Table 0-1: Proposed transmission Network for Mutunda RGC

Source	Destination	Pipe Details	Length (km)
Source DWD 77378	Popara West Tank	OD 160 uPVC PN16	9.040
Source DWD 77379	Popara West Tank	OD 63 HDPE PN10	4.374
Popara West Tank	Booster Station	OD 90 HDPE PN10	5.590
Booster Station	Alero B Tank	OD 90 HDPE PN16	7.350

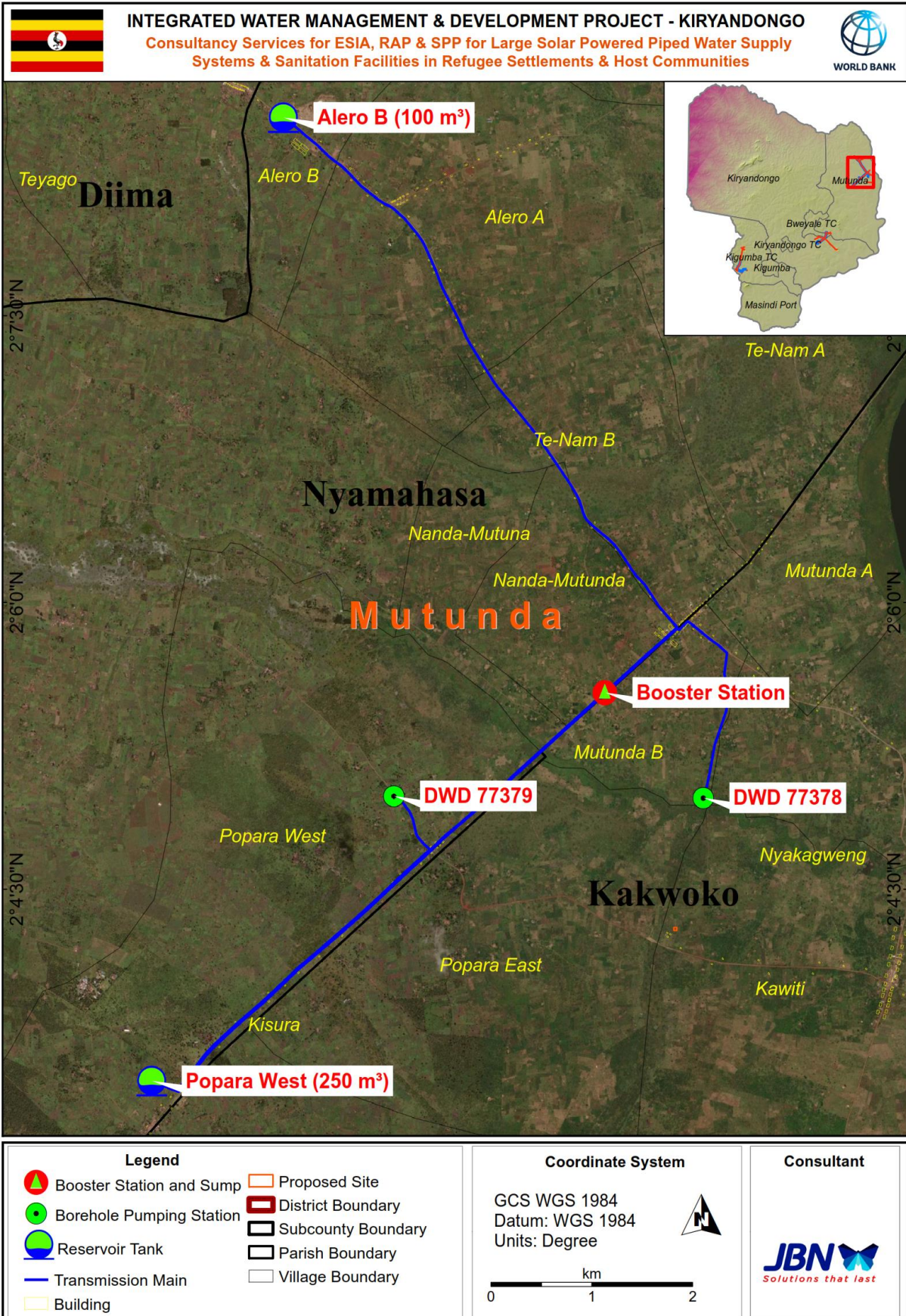


Figure 0-12 Transmission network layout for Mutunda RGC

Source DWD 77378 to Popara West Main Reservoir Tank

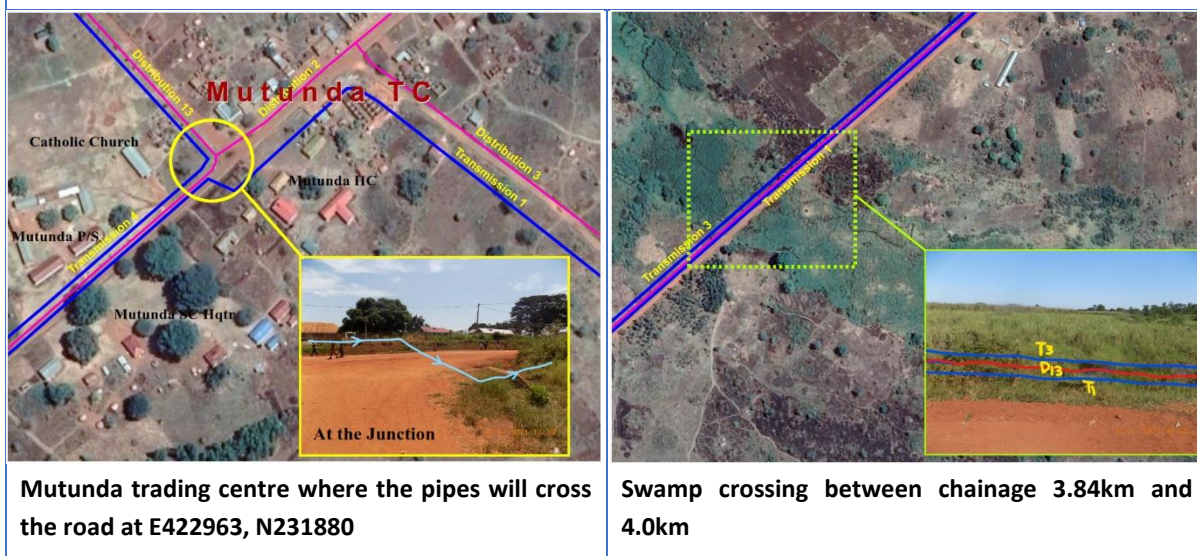


Figure 0-13: Key features along the transmission from Source DWD 77378 to Popara West Main Reservoir Tank

5.1.3.2 TRANSMISSION POPARA WEST MAIN RESERVOIR TANK TO ALERO B RESERVOIR TANK

The water from Popara West main reservoir tank will be transmitted through an OD 63 HDPE PN10 for 6.01km to reach the booster station in Nanda-Mutunda by gravity. Beyond this station, the water will cover 13.36 km for 2033 pumps, the water will flow at a rate of 10.6 m³/hr and velocity of 0.69 m/s while for 2043 pumps, flow rate will be 14.3 m³/hr and velocity of 0.93 m/s up to Alero B reservoir tank in Alero B village. The pipe will move along the right side of the Katurikire – Mutunda and Mutunda – Teyego road traversing the bushland and patches of gardens for before reaching Mutunda trading. At some points, the line will cross lowland with swamps at 5.0 – 5.12km and 2.48 – 2.64km.

5.1.4 DISTRIBUTION NETWORK

The distribution network(s) for the project area will be gravity fed from the respective Storage Reservoir tanks. The networks were designed for the year 2043 at a peak hour factor of 2.0. Both the uPVC and HDPE of various specifications as specified in the feasibility study report (MWE, Feasibility Study and Design Report, 2021) will be used to distribute water in the project area covering a total of 8.157 and 21.162 km for Diima and Kakwokwo respectively (Table 0-2). The areas where distribution lines will pass have neither sensitive ecosystems nor endangered species and will distribute to different villages and trading centres (Figure 0-14).

Table 0-2: Proposed distribution Network for Mutunda RGC

Pipe Details	Length (km)	
	Diima	Kakwokwo
OD 225 uPVC PN10	0	0
OD 160 uPVC PN10	0	6.972
OD 110 uPVC PN10	0.015	1.655
OD 90 HDPE PN10	0	6.463

OD 75 HDPE PN10	1.105	1.400
OD 63 HDPE PN10	2.856	0.825
OD 50 HDPE PN10	4.181	3.848
Total	8.157	21.162

Source: MWE, Feasibility Study and Design Report, 2021





Teyago trading centre

Aerial view of Teyago and Alero B areas

Kawiti trading centre

Aerial view of Kawiti area

Figure 0-14: Areas to be supplied under Mutunda RGC

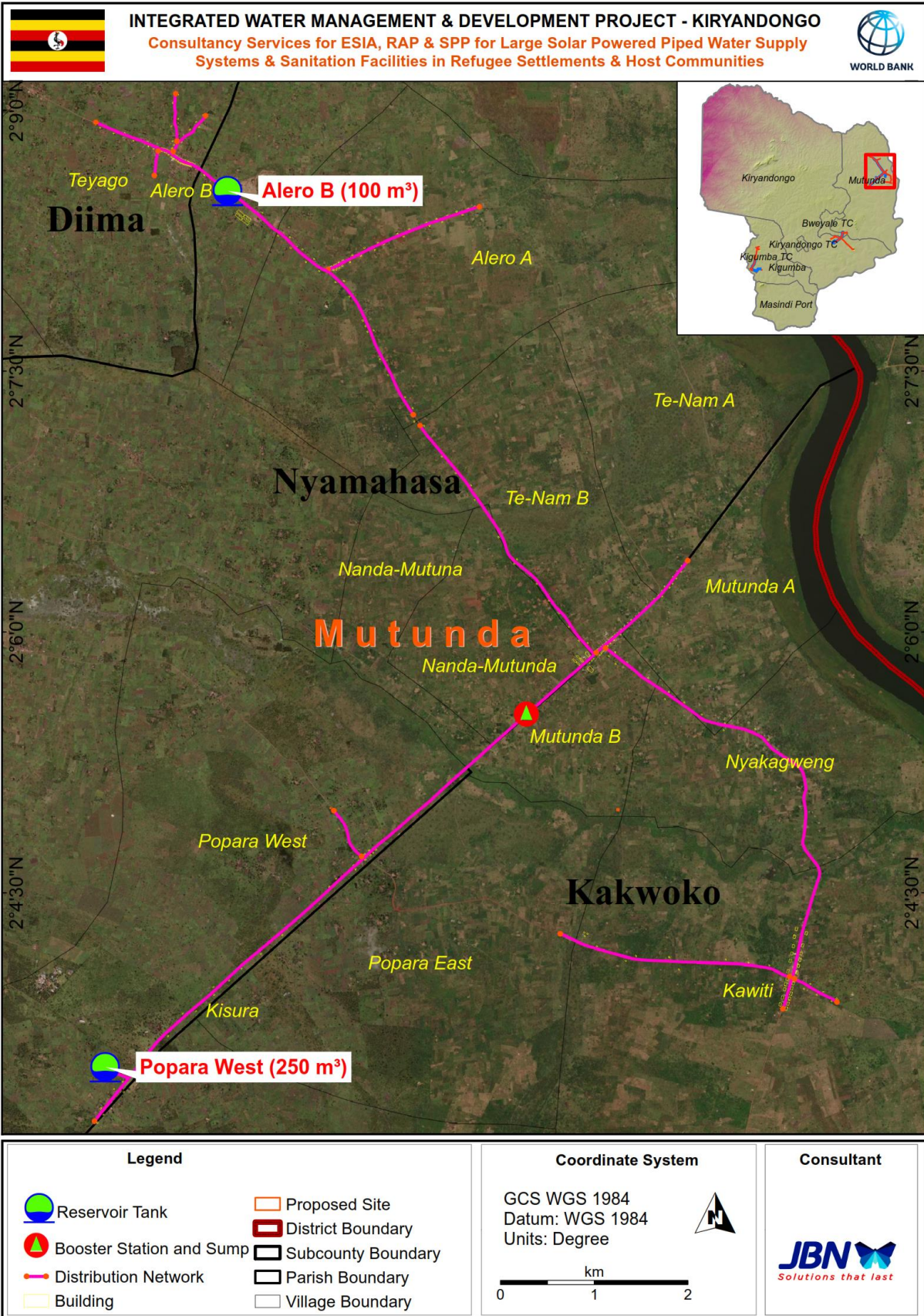


Figure 0-15: Distribution network layout for Mutunda RGC

5.2 PHYSICAL ENVIRONMENT

5.2.1 CLIMATE AND WEATHER

Kiryandongo District (project area) is located in climatic zone I with a reported annual average rainfall of 1340mm. The nearest operational weather station close to the project area is Masindi port station (MWE, Feasibility Study and Design Report, 2021). The rainfall distribution in the project area is bimodal characterized by one rainfall season with two peaks from March - May and a long one from August – November. The sub counties of Kigumba, Kiryandongo and Mutunda receive between 800 to 1000mm. Masindi Port Sub County receives less than 800mm of rainfall per annum.

The dry season is experienced from December - February. The annual rainfall averages about 1372 mm during the which is quite favourable. The **Figure 0-16** below shows the distribution of the average monthly rainfall, temperature and evapotranspiration in the project area. The hot season lasts for 2.0 months, from January to March, with an average daily high temperature above 32°C and the hottest month of the year is February, with an average high of 34°C and low of 20°C. The cool season lasts for about six (6) months, from April to November 20, with an average daily high temperature below 28°C whereas the coldest month of the year is July, with an average low of 20°C and high of 28°C. The annual average evapotranspiration in the project area based on FAOCLIM database is about 1435 mm and exceeds rainfall especially in the dry season. Using Thornthwaite Climate Classification System (1948), the climate is classified as “moist sub-humid” and is characterized by “a large water surplus during the rainy seasons and only moderate water deficiencies during the dry season”. Hence, the climate is generally favourable. Daily minimum temperatures are in the range of 18 – 19 °C. Maximum temperatures range between 28 – 32 °C with the highest temperatures experienced in February. Average temperatures range between 23 – 26 °C.

Relation of baseline to the project: Kiryandongo experiences a favourable climate for implementation of the project both construction and operation phases). During the construction phase, works sensitive to climate, such as excavation and earth works are favourable in moderate rainy days and sunny days/ months to reduce on the impact of soil erosion, and dust and air quality nuisance from the sites.

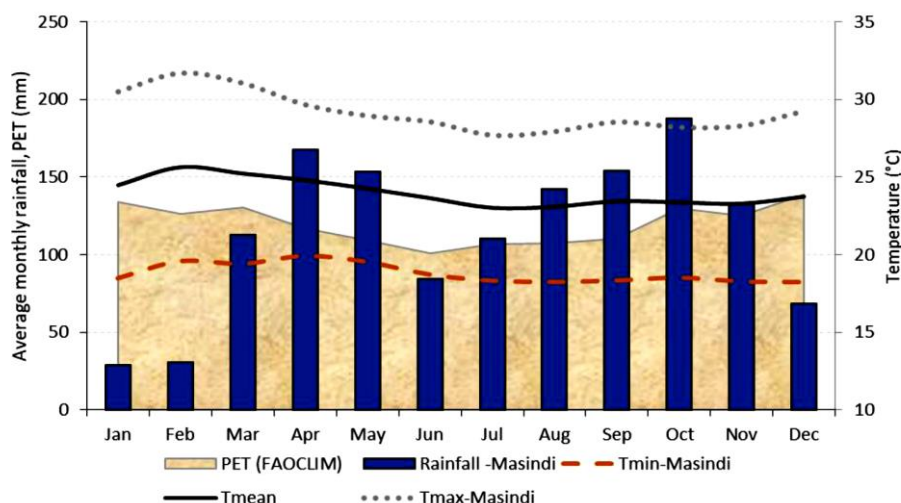


Figure 0-16: Monthly distribution of climatic variables

5.2.2 WATER RESOURCES AND HYDROLOGY

Uganda has four (4) main Water Management Zones (WMZs) (Upper Nile, Kyoga, Victoria and Albert) and eight (8) river basins (Albert Nile, Aswa, Kidepo, L. Kyoga, L. Victoria, L. Edward, L. Albert and Victoria Nile). Kiryandongo district has both surface and ground water resources. According to the data for existing boreholes in the Kiryandongo, borehole yields in the project area is very good ranging between 3 – 48 m³/hr with an average of 8.65 m³/hr. The district (project area) is located in the Albert WMZ and Victoria Nile Basin. Victoria Nile is a section of the River Nile that connects Lake Victoria, Lake Kyoga and Lake Albert as it flows downstream from Lake Victoria. Kiryandongo district is also gifted with several wetlands in numerous locations. The most outstanding wetlands are Nanda wetland in Mutunda (**Figure 0-18**). However, due to the flat nature of the area i.e., a raised plateau with a relatively uniform elevation indicating devoid of water reserves during the dry season, these wetlands are largely seasonal. Wetlands are also facing degradation from agriculture and settlements in Mutunda subcounty. The biggest part of the district including the RGCs and the above-mentioned wetlands drain eastwards towards Victoria Nile which is the largest surface water source in the district. The section between Lake Kyoga to Lake Albert is commonly called the Kyoga Nile and about a distance of 2.5 km from Mutunda, RGC. The main surface water body in the project area is Victoria Nile. The river flows along the eastern boundary of the district. Victoria Nile is about 25 Km south east of Nyakabaale RGC, 13 Km south of Gaspa RGC and 2.5 Km east of Mutunda RGC.



Figure 0-17: Surface and ground water resources in Mutunda RGC project area

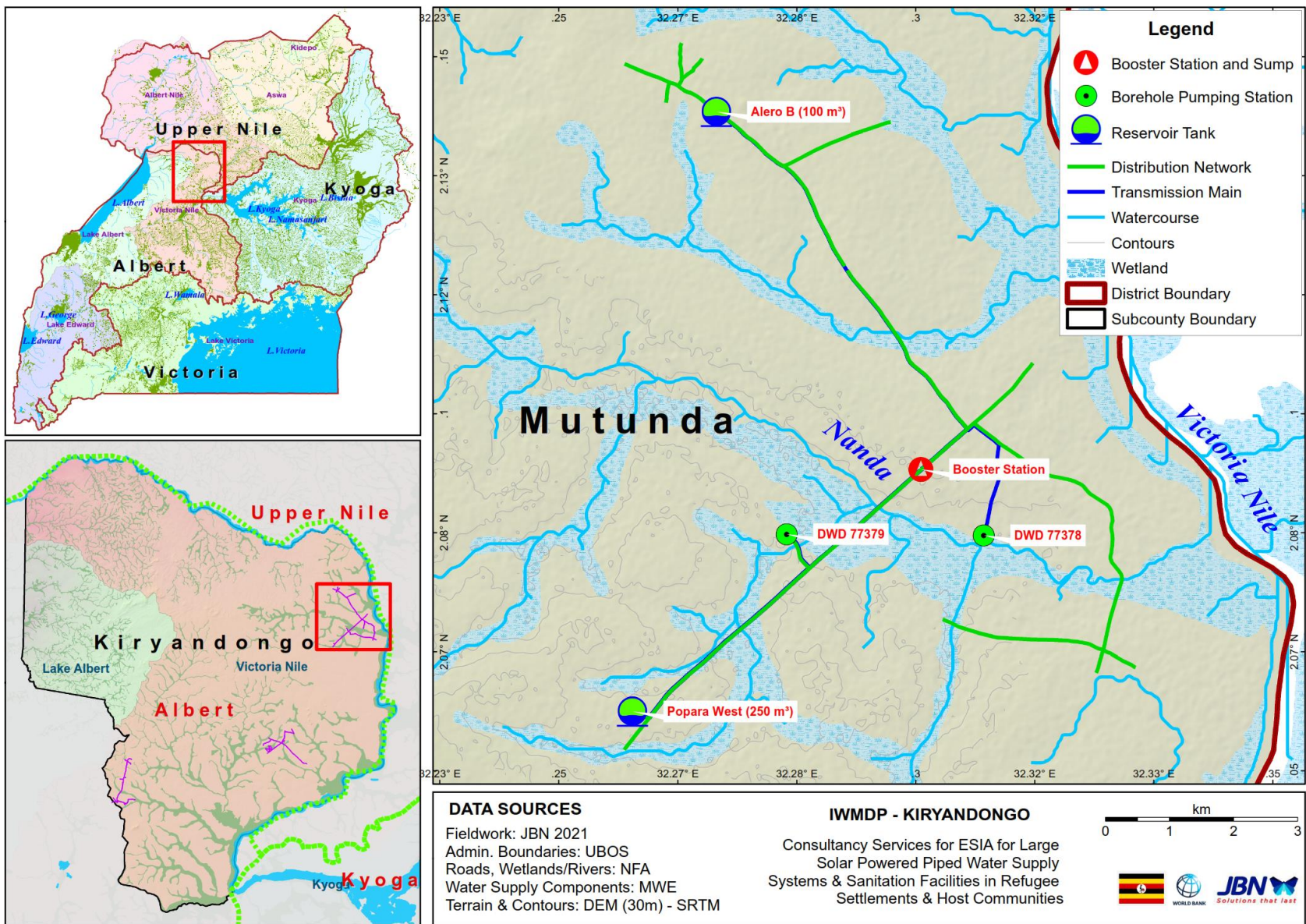


Figure 0-18: Water resources and drainage network of Mutunda RGC project area

5.2.3 TOPOGRAPHY

Kiryandongo district is generally a plateau land with an average elevation of 1,295 meters above sea level. The district has undulating hills with high points in some localities. In Mutunda RGC, the topography is generally gently sloping with only modest variations in elevation. The lowest and highest elevations are 1029m above 1060m the sea level. The area has a maximum elevation change of 63m and an average elevation above sea level of 1060m (Figure 0-19).

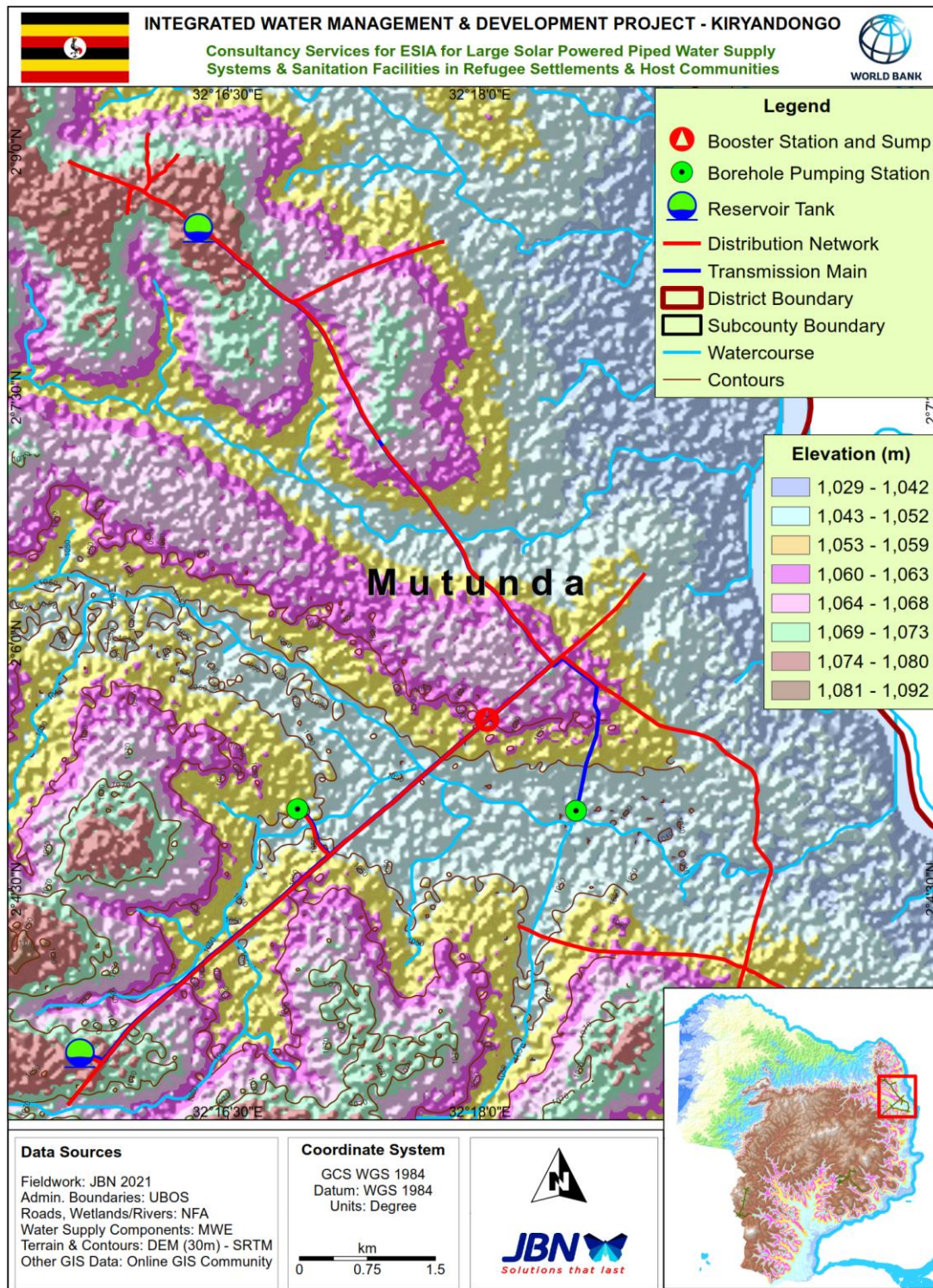
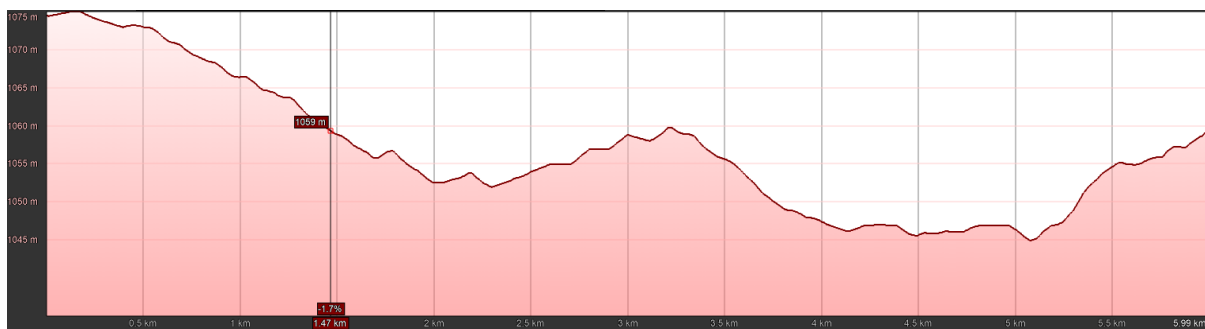


Figure 0-19: Elevation map of Mutunda RGC

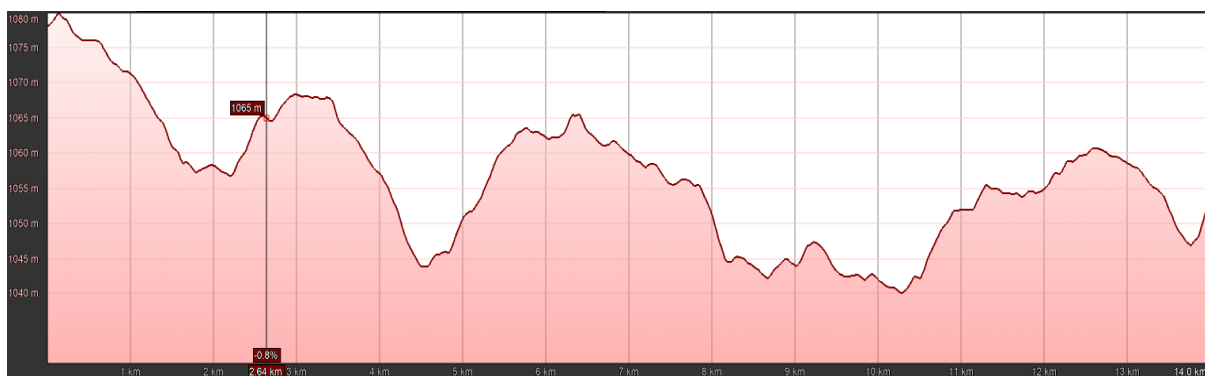
The gradient of the distribution main increases with distance from the Reservoirs **Table 0-3** and **Figure 0-20**. Mutunda and Popara trading centres have maximum and minimum head difference of 15m and 8m with distance of 6.3km and 0.9km from the reservoir respectively thus providing enough pressure for water flow.

Table 0-3: Distance, elevation and head differences from Reservoir

Location	Distance from Reservoir (km)	Elevation (m) amsl	Difference from Reservoir (m)
Alero B Reservoir	0	1080	0.0
Mutunda trading Centre	6.34	1065	15
Kawiti	14	1050	30
Teyago	1.65	1075	5
Popara Reservoir	0	1076	0.0
Nanda-Mutunda	5.98	1060	16
Popara Trading Centre	0.9	1068	8



Popara Reservoir to Popara and areas around



Alero B Reservoir Mutunda to Kawiti

Figure 0-20: Elevation profile of the Water pipe line for distribution lines of Mutunda RGC

The changes in meters with distance from reservoir are reflected in the elevation profile in **Figure 0-20**. From the profile it was observed that Mutunda RGC with Mutunda, Kawiti and Teyago trading centres downhill from the Alero B reservoir, while Nanda-Mutunda and Popara Trading Centre are downhill from the Popara Reservoir. The trading centres are at lower elevations that can be served well from the respective reservoirs tank.

5.2.4 TECTONICS AND SEISMOLOGY

The site is largely located on an unfairly stable geological unit with high seismic hazard (risk levels) above the Albertine environment (western rift valley). Although, numerous faults exist within the country and tremors due to earthquakes that do occur, the site area is located within the shield area, but only approximately 30 – 70 km from the western rift and about 80 km south of the Aswa Fault Zone. It is therefore susceptible to the potential effect of major tectonic features of regional scale. The site is in the main, located in Zone 1 of the Seismic Zoning of Uganda, implying a high risk (**Figure 0-21**). According to US 319:2003 Uganda Standard for Seismic code of practice for structural designs, the seismic zoning factor of Zone 1 is 1.0 (Z_{max}). Therefore, appropriate design of seismic acceleration values consistent with Contract Technical Specifications and National standards should be adopted during structural foundation designs due to the high likelihood of earthquake occurrence in the area.

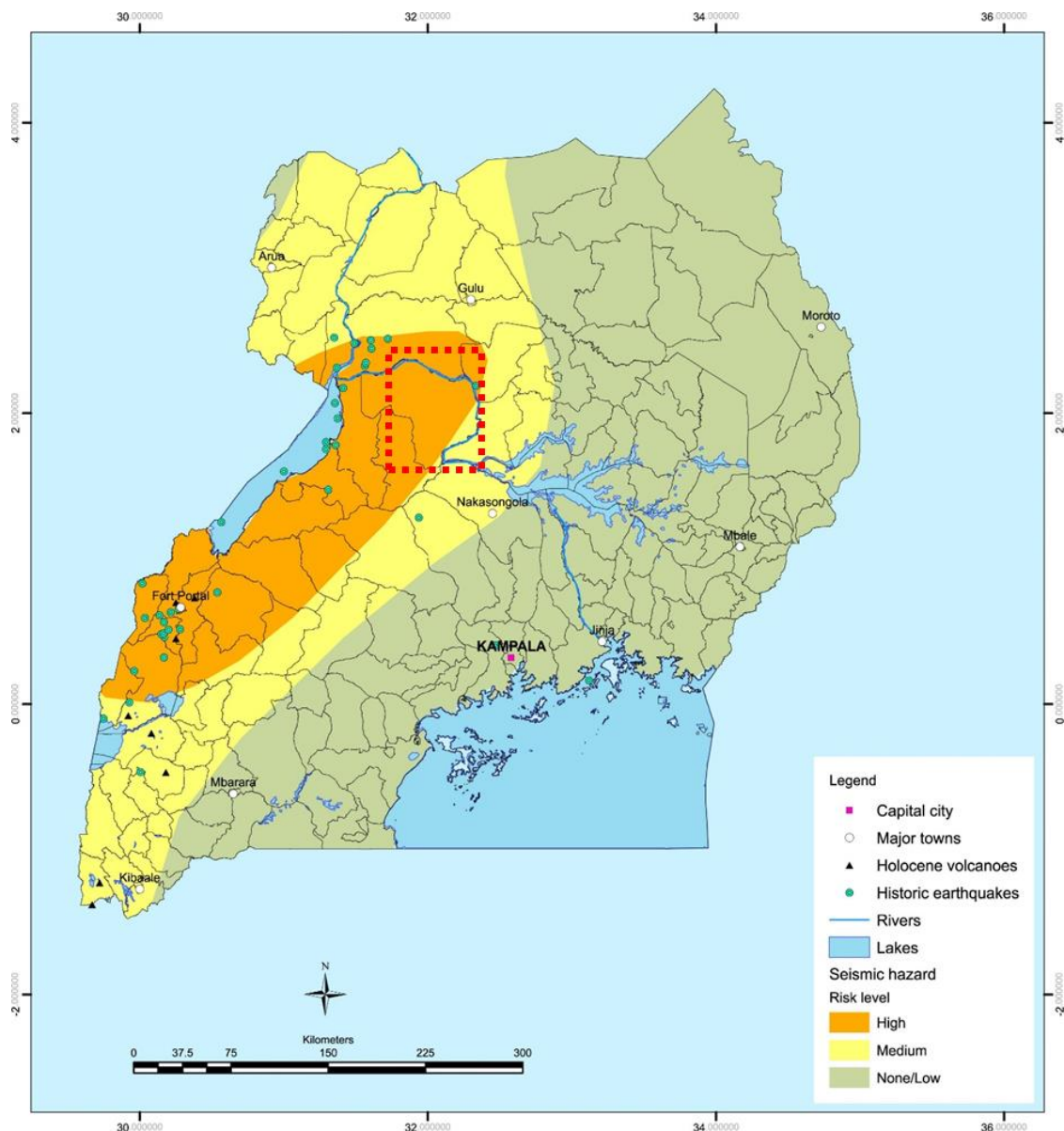


Figure 0-21: Seismic hazard zonation map of Uganda:

Source: Office of the Prime minister (OPM)

5.2.5 GEOLOGY AND GEOMORPHOLOGY

Geology of Uganda is composed predominantly of Archaean basement rocks formed mainly between >3.08 Ga and 2.55 Ga³. Kiryandongo district lies in the North Uganda Terrane (NUT) of Uganda's geology which comprises of both the Mesoarchaeon and Neoarchaeon rocks which are further divided into two (2) building blocks; the Karuma Complex (a Mesoarchaeon phase of crust formation, mainly composed of granulitegrade metasediments) and Neoarchaeon Complex (further divided into five (5) supracrustal rock units of the Amuru Group and into 22 rock units of deformed granitoids, gneisses and migmatites of igneous or uncertain origin). The southern part of Kiryandongo is covered by the Mesoproterozoic rocks. The general project area is composed of Bunyoro Group (shale, slate, phyllite, sandstone and quartzite) of Neoproterozoic rocks (541 – 1000 Ma) towards Kyoga; Igisi Group (mica schist, quartzite and ironstone) of Mesoproterozoic rocks (1000 – 1600 Ma); Metagabbro, Amuru Group (gneiss and amphibolite) and Variable gneissic granitoid (2591 ± 27 Ma and 2652 ± 8 Ma) of Neoarchaeon rocks (2500 – 2800 Ma) and Karuma Group (felsic and mafic granulite) of Mesoarchaeon rocks (2800 – 3200 Ma) (**Figure 0-22**).

The geology of Mutunda RGC project area is mainly underlain by the Variable gneissic granitoid (2591 ± 27 Ma and 2652 ± 8 Ma) which are comprised of the undifferentiated gneisses and granulites facies rocks in the north (Basement Complex) (**Figure 0-23**). The geomorphology of area is majorly formed of rock formation and types that form the remnants of the low surfaces and scarps related to rift sediments of the western rift valley (warped basin lake) (**Figure 0-24**).

Clay suitable for good quality roofing tiles and building bricks is found to occur in almost all parts of the district. Stone quarrying in several rocks has also been identified and are said to be of good quality for building and construction industries.

³ Geology and Geodynamic Development of Uganda with Explanation of the 1:1,000,000 -Scale Geological Map.

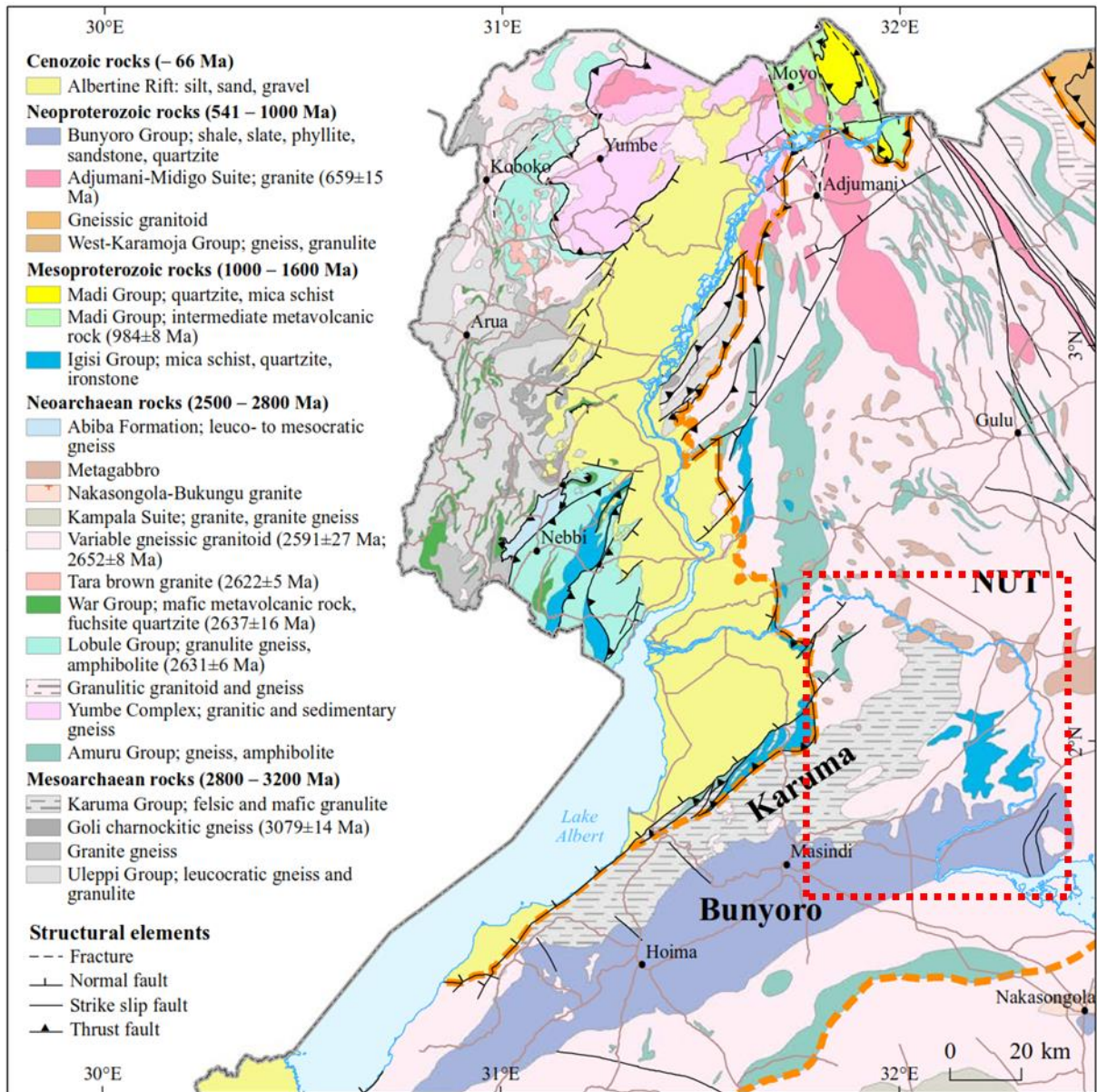


Figure 0-22: Geological outline of the western part of the North Uganda Terrane (NUT)

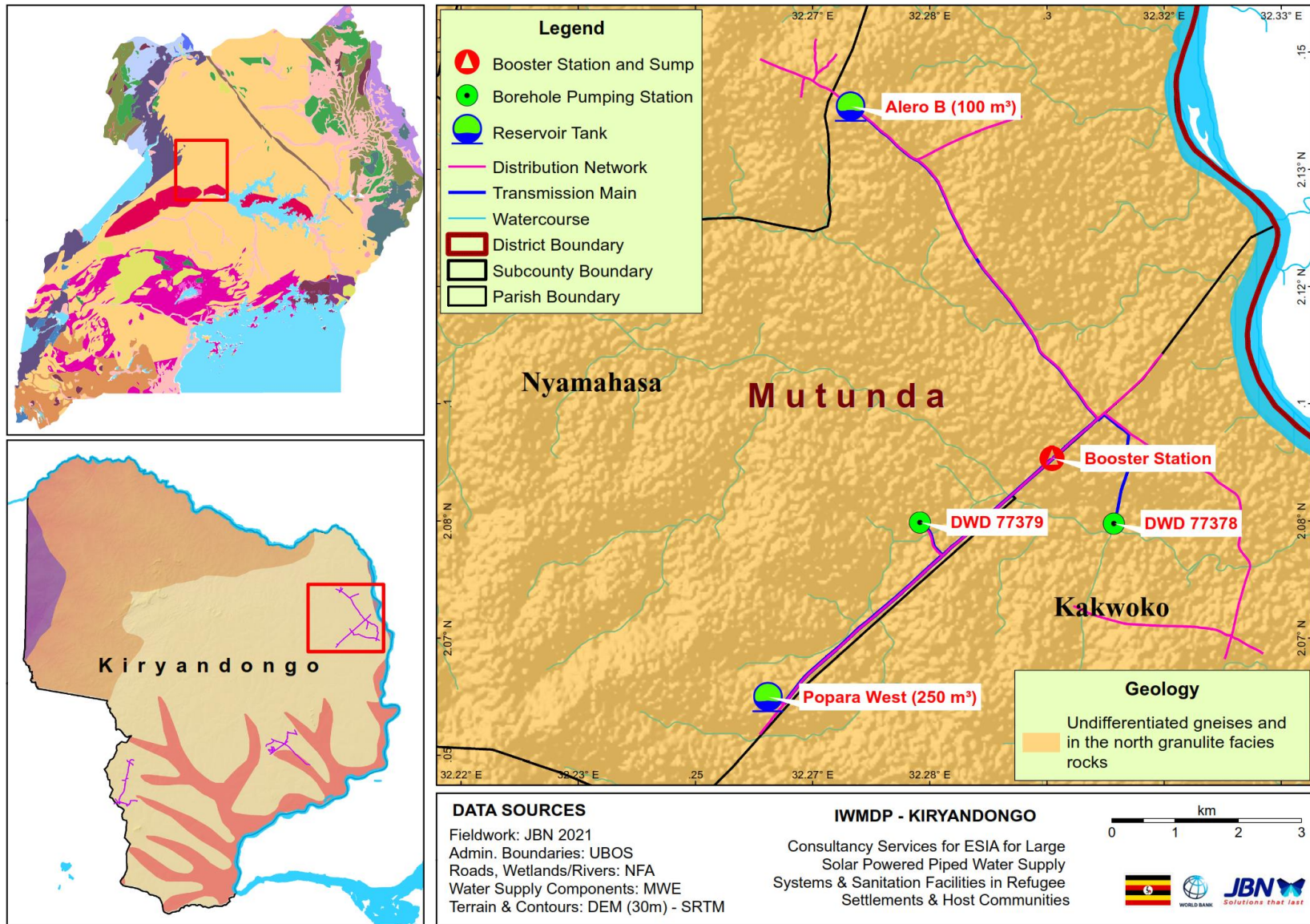


Figure 0-23: Geology of Mutunda project area

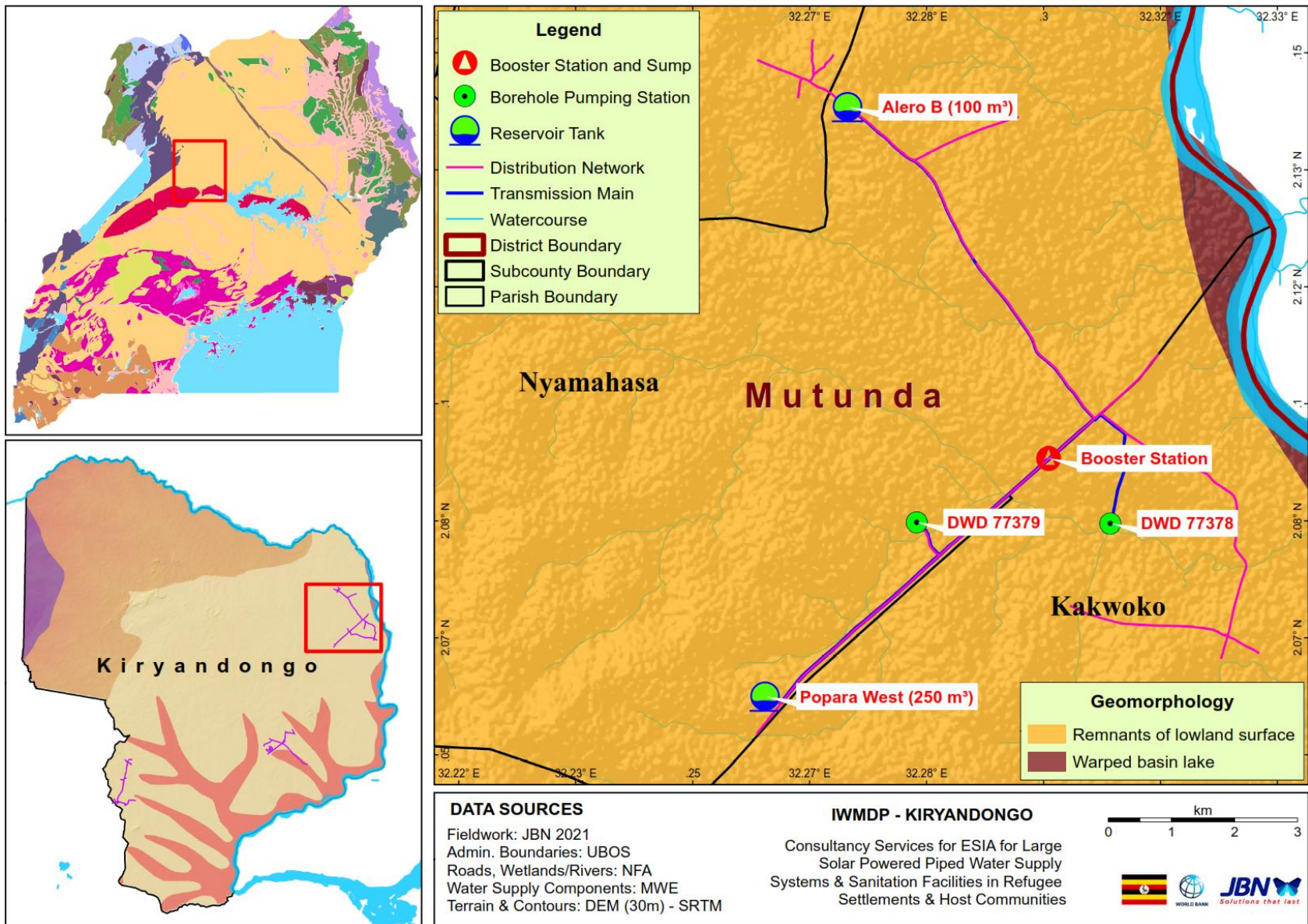


Figure 0-24: Geomorphology of Mutunda project area

5.2.6 SOILS

According to Langlands (1974) classifications, the soil consists of ferruginous soil (rocks changed into clay soil (kaolinite) and sesquioxides. In some areas, the soils have a high percentage of sandy and sandy loam soils and therefore susceptible to erosion while in others they are heavily textured ranging from clay loam to clay. Due to its sandy nature, the soil has low water retention capacity and high rate of water infiltration. The soils are usually deep with little differentiation into clearly defined zones and possess fine granular structure, others moulded into large, weak coherent clods that are very porous. Kiryandongo district is also endowed with vast fertile soils which can support quite a number of both cash/food crops. The soils in the project area are mainly ferrosols and are characterized with a reddish colour. The soils are moderately productive in terms of agriculture. Such soils are also susceptible to runoff and logging. The district is predominantly covered by the Acric Ferralsols (54%), Leptosols (19%), Petric Plinthosols (Acric) (16%), Gleysols (7%), Leptosols (2%), Arenosols (1.3%), Histosols (1.1%) and water or lake (0.2%) (**Figure 0-25**).

Acric Ferralsols: Dark red clay loams occasionally lateritized and Red sandy clay loams over laterite and granite formed from Karagwe - Ankolean Phyllites and granite e.g. the Kitonya Catena and Kigumba Catena soil mapping units. Reddish and reddish brown gritty clay loams and shallow brown sandy loams over rock or laterite formed from basement complex granites, gneisses and schists e.g. the Rukiri Complex and Anaka Complex soil mapping units. Shallow dark brown or black sandy loams often very stony formed from granites, gneisses, schists, amphibolites eg the Bugangari Series soil mapping unit. These soils are Vulnerable to erosion.

Arenosols: e.g. the Bukora, Mulembo and Lwampanga Series

Gleysols: Dark brown sandy loams over dark grey clays and Black and grey clays often calcareous formed from recent river alluvium. Examples are soils in the Bukora Series and Undifferentiated Alluvium mapping units respectively. This soil is non-vulnerable to erosion.

Histosols: Peat or peaty sands and clays formed from papyrus residues and river alluvium. Examples are the papyrus Peat soils.

Leptosols: Shallow brown sandy loams over old alluvial and Shallow skeletal loams often on steep slopes formed from Basement complex gneisses. Examples are soils in the Palabek Complex and Metu Complex mapping units respectively.

Lixic Ferralsols: Reddish-brown sandy loams with occasional ironstone formed from Kaiso sands and clays e.g. Paraa Series soils.

Petric Plinthosols (Acric): Reddish brown sandy loams and loams on laterite formed from basement complex gneisses and granites e.g. Buruli Catena soils mapping unit. This soil is Vulnerable to erosion.

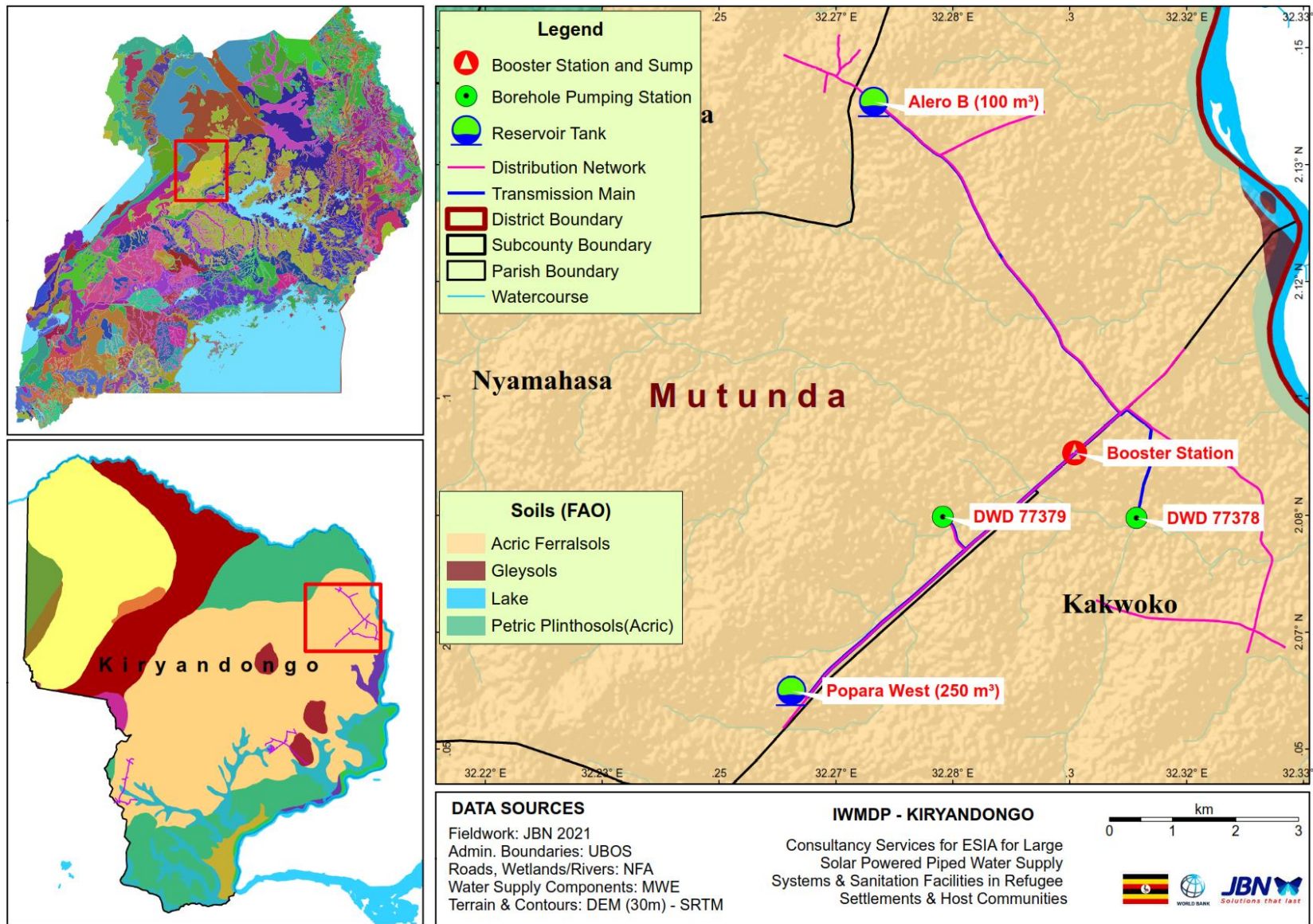


Figure 0-25: Soils of the Mutunda project area

5.2.7 HYDROGEOLOGY

The hydrogeology of Uganda and a large part of the east African region in the tropics is characterized by crystalline bedrocks of the Precambrian era (gneiss granitoids). These rocks usually contain water in fractures and fissures in rocks and are able to sustain groundwater supply especially in rural areas. The wells yields are usually less than 1 l/s (3.6 m³/hr). The weathered regolith overlying the crystalline bedrock is also an important source of aquifer that provides water for rural communities and has been shown to have better yields than the fractured aquifers. Groundwater accessed from deep fractured or fissured zones can however provide higher yields for large scale water supply.

Groundwater data obtained from the National groundwater database in Entebbe was used to reconstruct the hydrogeology of the project area (**Figure 0-26** and **Figure 0-27**). The data indicated that:

- The depth to the bedrock varies from 28 meters below ground level (mbgl) in the north in Diima parish to 39 in Kakwokwo parish with an average of 33m. Therefore, the weathered zone thickens from north to south of the sub-county.
- The overlying layer above the rock is a weathered regolith consisting of mainly laterite near the surface and sandy clay and clayey soils up to the weathered rock.
- The depth of the first water strike varies from 27 mbgl in the north (Diima parish) to 68 mbgl in the south (Kakwokwo parish) with an average of 46m. This implies that groundwater in Mutunda mainly occurs within the upper fissured or fractured bedrock zone. Hence, most aquifers in the project area are bedrock aquifers.
- The depth to static water level varies from 13 mbgl in the north to 36.5 mbgl in the south, with an average of 24.3 m, so that most static water levels in drilled wells occur within the weathered zone.
- The hard/fresh basement rock is about 80 m deep (**Figure 0-26**).
- The constant discharge varies from 2.09 m³/hr in the north of the RGC to 1.81 m³/hr in the south of the RGC, with an average of 1.8 m³/hr (very good for rural boreholes but slightly low for motorized boreholes).
- The average thickness of the overburden regolith (first water strike – fresh bedrock depth) is about 34 m.

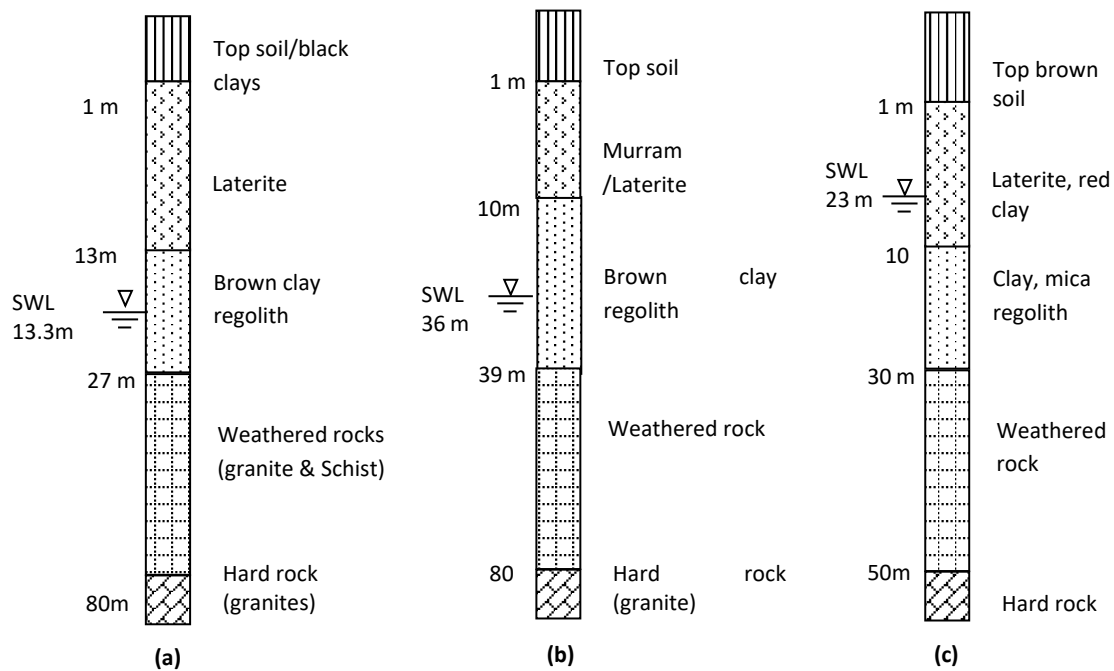


Figure 0-26: Representative lithology of the project areas (a) Diima parish (b) Kakwoko parish and (c) Nyamahasa parish in Kiryandongo district

Source: MWE, Feasibility Study and Design Report, 2021

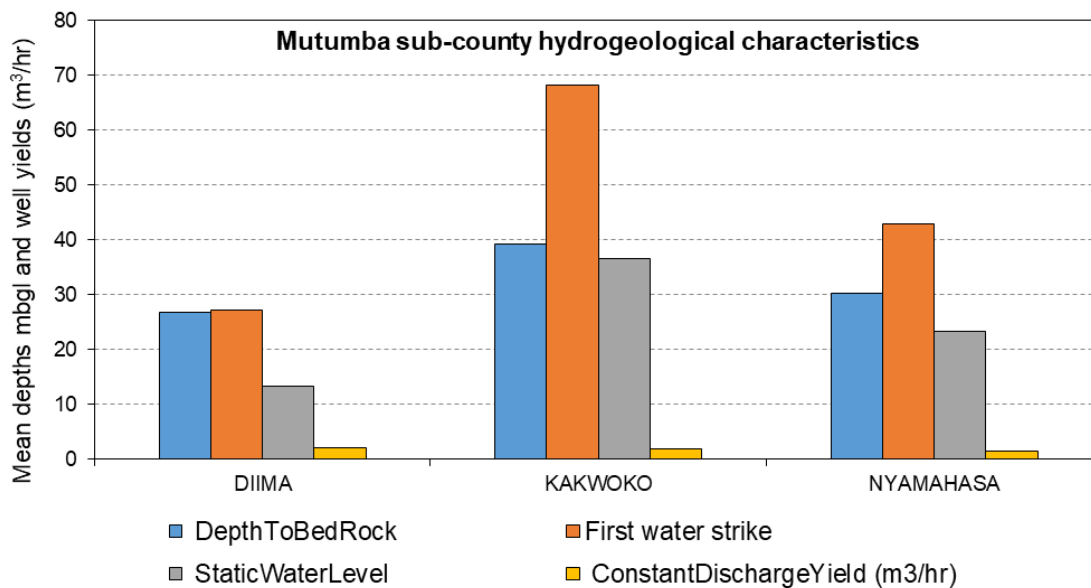


Figure 0-27: Summary of hydrogeological characteristics in the Project area

Figure 0-28 show the geo-statistical analysis of well yields in the entire district with respect to their geological formations. The average well yield in the district is 5.9 m³/hr. The best formation to exploit appears to be the granite-gneiss formation with yields as a high as 70 m³/hr possible (Figure 0-28). The formation with the least yields recorded was Mica schists.

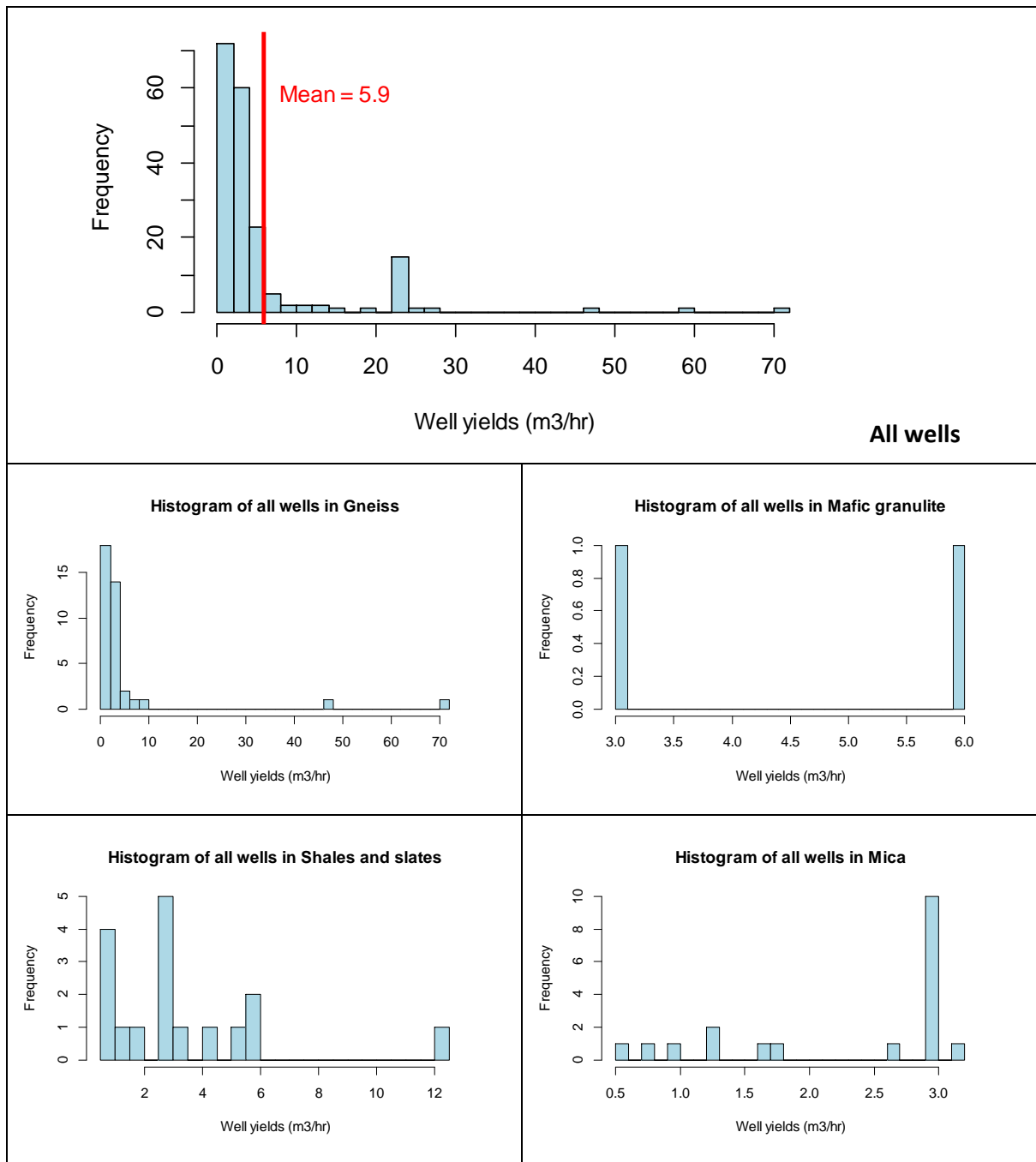


Figure 0-28: Statistical distribution of well yields in Kiryandongo district

Source: MWE, Feasibility Study and Design Report, 2021

Two boreholes were drilled and constructed to supply water for the project with their summary of attributes indicated in **Table 0-4**. The recommended long-term operation submersible pump installation depth for DWD 77378 is 56.0mbgl when pumping at 60.0m³/hr and that for DWD 77379 is 90.0mbgl when pumped at 5.0m³/hr. All in due consideration of a pumping regime of 7 hours for a Solar Powered and 16 hours for electricity powered water supply system.

Table 0-4: Hydrogeological attributes of Project Boreholes

Borehole	GPS Coordinates	Depth (m)	Regolith Depth (m)	1st Water Strike (m)	Main Water Strike (m)	Driller's yield (m ³ /hr)
DWD 77378	E417770, N227513	96.42	32.4	38.2	38-42, 50.8-87, 88-96	50.50
DWD 77379	E419057, N236812	133.26	44.0	40	40-66m	5.20

The feasibility assessment report (MWE, Feasibility Study and Design Report, 2021) asserts that groundwater flows towards Victoria Nile. For a large part of Mutunda sub-county, groundwater flows westerly towards Victoria Nile near Mutunda. For the southern parts, groundwater flows south towards Gaspa and then to Victoria Nile. Groundwater flows from a higher position to lower position by gravity in the same manner as surface water.

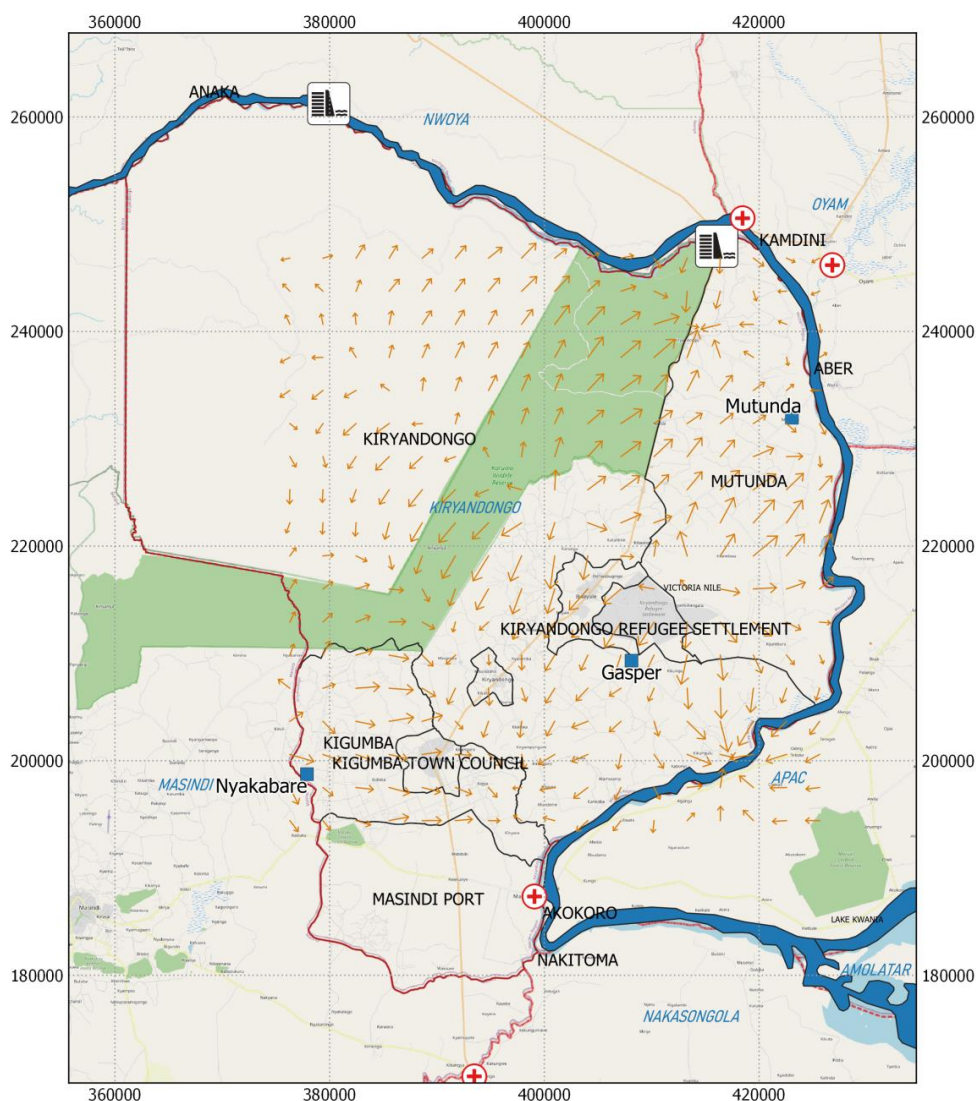


Figure 0-29: Groundwater flow direction in the project area.

Source: MWE, Feasibility Study and Design Report, 2021

Test pumping was conducted on the two boreholes DWD 77378 and DWD 77379 to ascertain the depth at which the submersible pumps will be installed and sustainable abstraction rates.

Step-drawdown tests were carried out at a 90-minute interval for borehole DWD 77378 (in Mutunda B) at a 35.00 m³/hr, 50.00 m³/hr, 65.00 m³/hr and 80.00m³/hr. The borehole was then allowed to recover to 79.0% of the created drawdown in 3hours. It was then pumped at a Constant discharge rate of 60.00m³/hr for 72hours (three consecutive days).and recovery monitored up to 70.0% of the created drawdown in 4.5 hours

The borehole at Popara West DWD 77379 was also subjected to a 90-minute interval step-drawdown tests of 3.50, 5.00, 6.50 and 8.00m³/hr and allowed to recover to 91.0% of the created drawdown in 2hours. It was then pumped at a Constant discharge rate of 5.00m³/hr for 72 hours (three consecutive days). and recovery monitored up to 95.0% of the created drawdown in 2.33 hours.

Table 0-5: Test Pumping Results of the Drilled Boreholes

Borehole	Draw Down (m)	Time for Recovery (hr)	Level of Recovery (%)
DWD 77378	24.67	4.5	70%
DWD 77379	66.10	2.3	95%

The duration of the test pumping of the two boreholes was longer than the planned duration of abstraction by the proposed water supply project. This means that if the boreholes DWD 77378 and DWD 77379 are pumped at the planned abstraction rates of 45.0 m³/hr and 5.2 m³/hr respectively, they will be able to sustainably supply the Mutunda water supply system.

The boreholes feeding the water supply systems of Nyakabale and Gaspa are located in different micro catchments situated 53km and 25km away respectively from Nyakabale micro catchment (**Figure 0-30**) Based on the location of the boreholes, there will be no cumulative impacts related to abstraction of groundwater. This is based on the fact that in crystalline / fractured situations, the aquifer boundary mimics the (micro) catchment area of surface water.

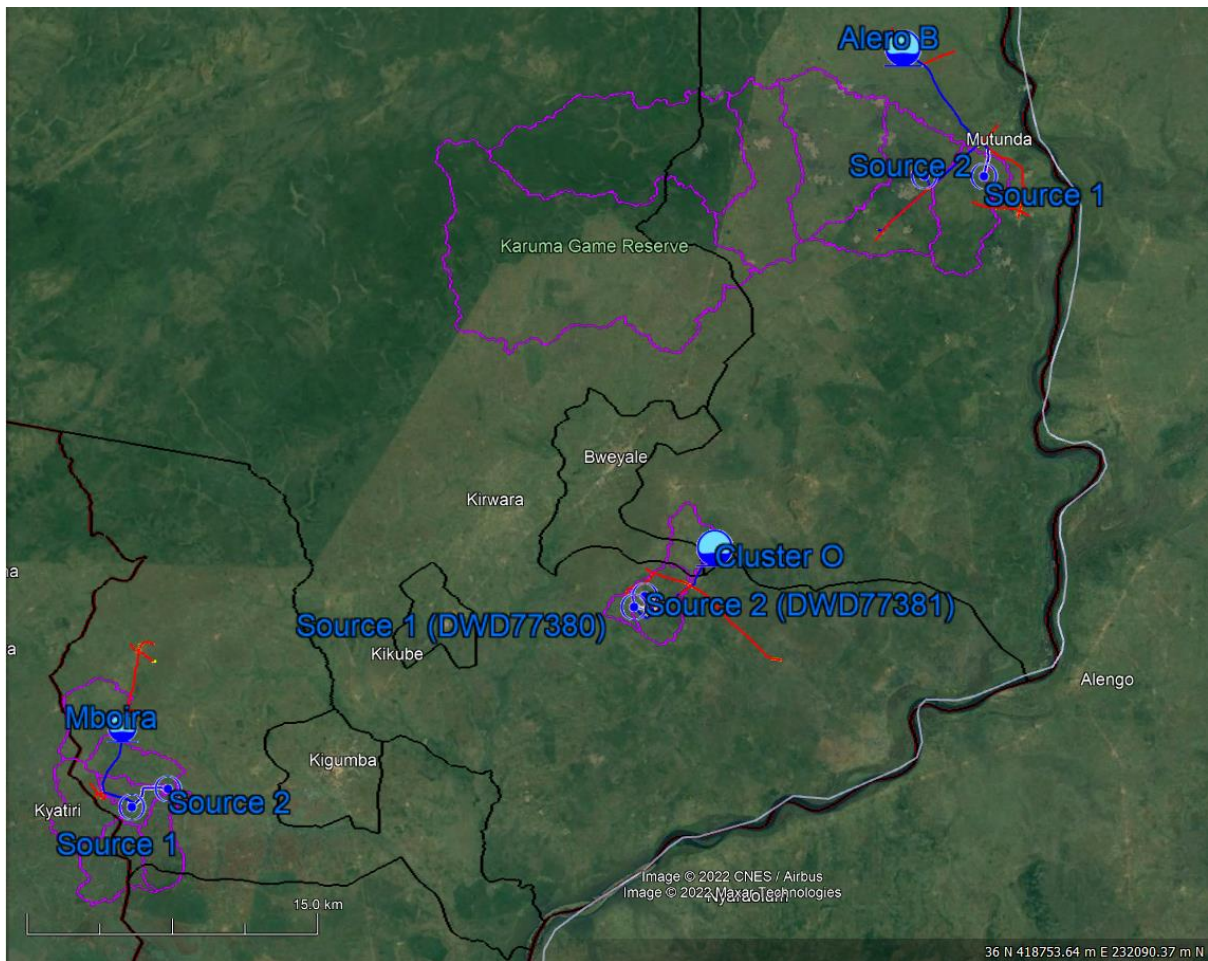


Figure 0-30: Water source micro catchments of Nyakabale, Gaspa and Mutunda water supply systems

5.2.8 WATER QUALITY

In water quality assessment, both the identified surface water and groundwater sources were considered based on its proximity to the Mutunda RGC borehole location. Water quality sampling was conducted on 14th and 15th November 2021 for laboratory analysis. The sampling followed recognized and conventionally acceptable protocols. For groundwater, one (1) sample was collected from a nearest existing borehole to the drilled borehole in the project area. For surface water sampling, a sample was picked from both the upstream and downstream of each identified stream nearby the drilled borehole. Samples for laboratory analysis were collected in 1 litre sterilized plastic bottles and kept in a cool box at 4 °C until analysis (Figure 0-31 and Table 0-6).

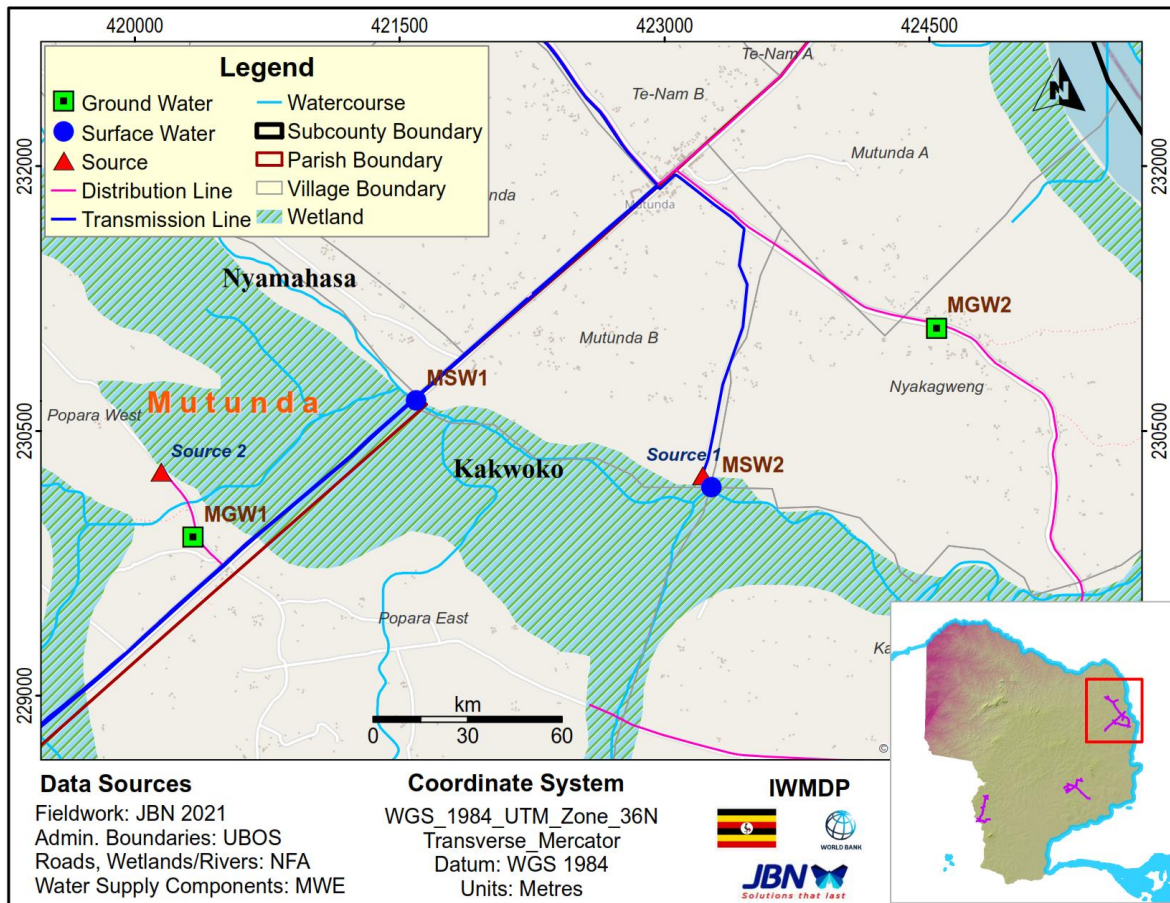


Figure 0-31: Map of water quality sampling sites in Mutunda RGC

The water quality analysis of the proposed water sources was done in accordance with both the Ugandan drinking water standards (US EAS 12: 2014) and the Rural Drinking Water Standards for Uganda. These parameters were analyzed at the National Water Quality Reference Laboratory (NWQRL) of the Water Quality Management Department (WQMD) in the Directorate of Water Resources Management (DWRM), Ministry of Water and Environment (MWE) in Entebbe. Water samples were analyzed for physical, chemical and micro-biological parameters. These included E.coli, pH, Turbidity, TDS – Total Dissolved Solids, Nitrite (NO₂), Nitrate (NO₃), Sulphate, Fluoride (Fe), Chloride (Cl), Manganese (Mn), Iron total (Fe), Hardness (CaCo₃) and E.Conductivity⁴.

According to the water quality analysis results, copy of which are attached to this report, the water quality of the borehole water was found to be in conformity with the National Drinking water standards. The National Water Quality Standards is based on the WHO Water Standards that has been domesticated in the context of the prevailing local conditions.

Table 0-6: Surface and ground water quality sampling sites and their respective Mutunda RGC boreholes

ID	Sample	Village	Parish	Sub county	Location UTM	RGC Borehole
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⁴ Framework and Guidelines for Water Source Protection (MWE, 2013), Volume 3: Guidelines for Protecting Water Sources for Point Water Supply Systems: Rural Drinking Water Standards for Uganda.

1	MSW1 - River Nanda	Popara West/Nanda-Mutuna	Nyamahasa	Mutunda	421593 E 230673 N	Source 2 (DWD 77379)
2	MGW1 - Existing Borehole	Popara West			420329 E 229900 N	
3	MWS2 - River Nanda	Mutunda B	Kakwoko	Mutunda	423264 E 230181 N	Source 1 (DWD 77378)
4	MGW2 - Existing Borehole	Nyakakyeri			424541 E 231084 N	

*MSW – Mutunda Surface Water

*MGW – Mutunda Ground Water



Figure 0-32: River Nanda (MWS1) in Popara West village - Mutunda sub-county



Figure 0-33: Community borehole (MGW1) in Popara West village - Mutunda sub-county



Figure 0-34: River Nanda (MWS2) near the drilled borehole in Mutunda B (Source 1 – DWD 77378)



Figure 0-35: Community borehole (MGW2) in Nyakakyeri village - Mutunda sub-county

According to the laboratory analysis results for the samples collected by the ESIA team (**Table 0-7**), all parameters for ground water sample MGW1 were within national standard limits for drinking water. The ground water analysis revealed that the turbidity for sample MGW2 was above the standard. On the other hand the results of the surface water indicated that where as total iron and E.coli for sample MSW2 were above the standard, Sample MSW1 had only E. coli above the standard. The potential causes of high E.coli could be due to open defecation as well as animal excreted especially from cattle. The high iron content could be associated with the geological composition. The high turbidity in sample MGW2 could be associated with poor hand pump borehole management practices that result in contamination. Details are provided in the water quality certificate in **Annex 5**.

Table 0-7: Water Quality Analysis Results

Parameter	Units	Sample Source				Drinking Water Standards (DEAS 12:2018 Maximum Permissible for Natural Portable Water)
		Surface Water		Ground Water		
		MSW1 - River Nanda	MSW2 - River Nanda	MGW1 - Existing Borehole (Popara West)	MGW2 - Existing Borehole (Nyakakyeri)	
Turbidity	NTU	0.6	0.9	1.8	37.7	25
pH	Units	8.57	8.09	7.11	8.27	5.5-9.5
Electrical Conductivity	µS/cm	258	298	291	1181	2500
Total Dissolved Solids	mg/L	165	191	186	756	1500
Total Hardness as CaCO ₃	mg/L	98	115	110	400	600
Flouride	mg/L	0.14	0.18	0.28	0.38	1.5
Sulphates	mg/L	5.1	5.9	5.4	27	400
Chlorides	mg/L	19	22	25	91	250
Nitrates – N	mg/L	0.16	0.15	0.12	0.19	10
Nitrites – N	mg/L	<0.002	<0.002	<0.002	<0.002	0.003
Manganese	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Total Iron	mg/L	0.17	0.69	0.23	0.14	<0.5
E.Coli	CFU/100ml	7	18	<1	<1	<1

Results of the water quality tests that were carried out for the 2 water sources during the feasibility study were also explored to examine their fitness to supply water for domestic use (**Table 0-8**). The results of the analysis of the water samples from the boreholes indicated the parameters were within the limits. Details are provided in the water quality certificate in **Annex 5**.

Table 0-8: Borehole Water Quality Analysis Results

Parameters	Units	DWD 77378	DWD 77379	National Potable water standards
Alkalinity: Total	mg/L	52	58	500
Bi-Carbonate	mg/L	102	114	500
Calcium Ca ²⁺	mg/L	14.5	10.2	150
Chloride	mg/L	8	6	250
Colour (True)	TCU	20	21	50
Electrical Conductivity (EC)	uS/cm	282	287	2500
Fluoride	mg/L	0.5	0.3	1.5

Parameters	Units	DWD 77378	DWD 77379	National Potable water standards
Hardness: Total	mg/L	66	64	600
Iron: Total	mg/L	0.094	0.090	0.3
Magnesium Mg ²⁺	mg/L	5.2	5.4	100
Manganese	mg/L	0.0	0.0	0.1
Nitrate-N	mg/L	3	2	45
pH	-	6.67	6.63	5.5 – 9.5
Sulphate	mg/L	0	0	400
Total Dissolved Solids (TDS)	mg/L	260	264	1500
Total Suspended Solids (TSS)	mg/L	0	0	0
Turbidity	NTU	2.6	2.5	25

Source: MWE, Feasibility Study and Design Report, 2021

Overall, the ESIA has established that water samples from the proposed production wells for the project were within the National drinking water quality standards for Uganda.

5.2.9 AIR QUALITY BASELINE

5.2.9.1 PARTICULATE MATTER

The ambient average levels for PM₁₀ ranged from 0.025mg/m³ to 0.069mg/m³ while ambient average levels for PM_{2.5} ranged from 0.009mg/m³ to 0.023mg/m³.

The recorded average levels for PM_{2.5} and PM₁₀ at most sites were within the WHO Standards except for PM₁₀ at Ogunga Primary School. The low levels of particulate matter recorded can be attributed to location of sampled sites being in rural agricultural areas with less vehicular traffic along the marram roads.

Additionally, the PM levels were mainly influenced by weather, during the assessment weather at St. Peter's Church and Kakwokwo P/S were cloudy with less wind leading to low temperatures. This therefore reduced resuspension of particulate matter well as decreasing the dispersion rates. At Ogunga P/S, Particulate matter levels were slightly high due to high temperatures during the time of the assessment that led to resuspension of PM into the surrounding air, thereby increasing levels of PM recorded.



Figure 0-36: Dust emission caused by Bodaboda traffic along Mutunda – Diima road

Table 0-9: Summary of Baseline Particulate Matter Readings for Mutunda RGC

Location	Date and Time	Coordinates	PM10 (mg/m ³)				PM2.5 (mg/m ³)			
			Min	Max	Aver	WHO AQG	Min	Max	Aver	WHO (AQG)
St. Peter's Catholic Church	9/11/2021 11:57am-3:57pm	422905E, 231872 N	0.014	0.253	0.039	0.05	0.006	0.029	0.009	0.025
Ogunga Primary School	9/11/2021 4:31pm-6:21pm	419349E, 236447N	0.014	0.172	0.069	0.05	0.006	0.016	0.011	0.025
Kawiti Trading Centre	11/11/2021 10:24am-2:04pm	425094E, 228531N	0.017	0.140	0.044	0.05	0.009	0.014	0.023	0.025
Kakwokwo Primary School	11/11/2021 2:45pm-4:45pm	417983E, 227251N	0.014	0.069	0.025	0.05	0.008	0.023	0.010	0.025

WHO AQG: PM2.5: 0.025 mg/m³(24hr averaging), PM10: 0.050 mg/m³ (24hr averaging)

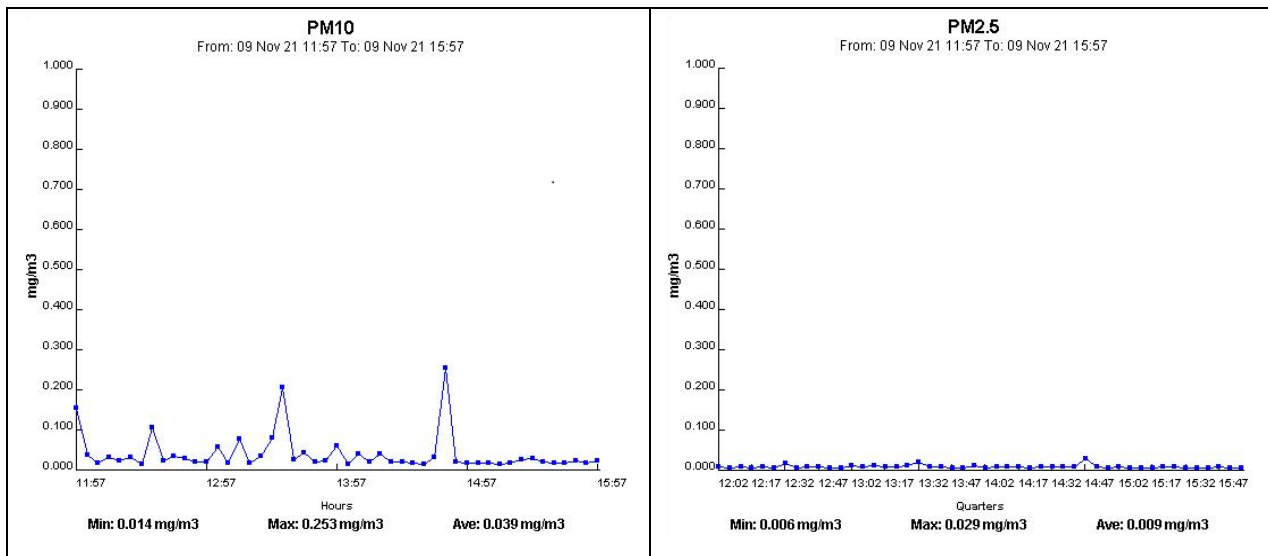


Figure 0-37: Variation of Particulate matter with time of the day at St. Peter's Catholic Church Mutunda

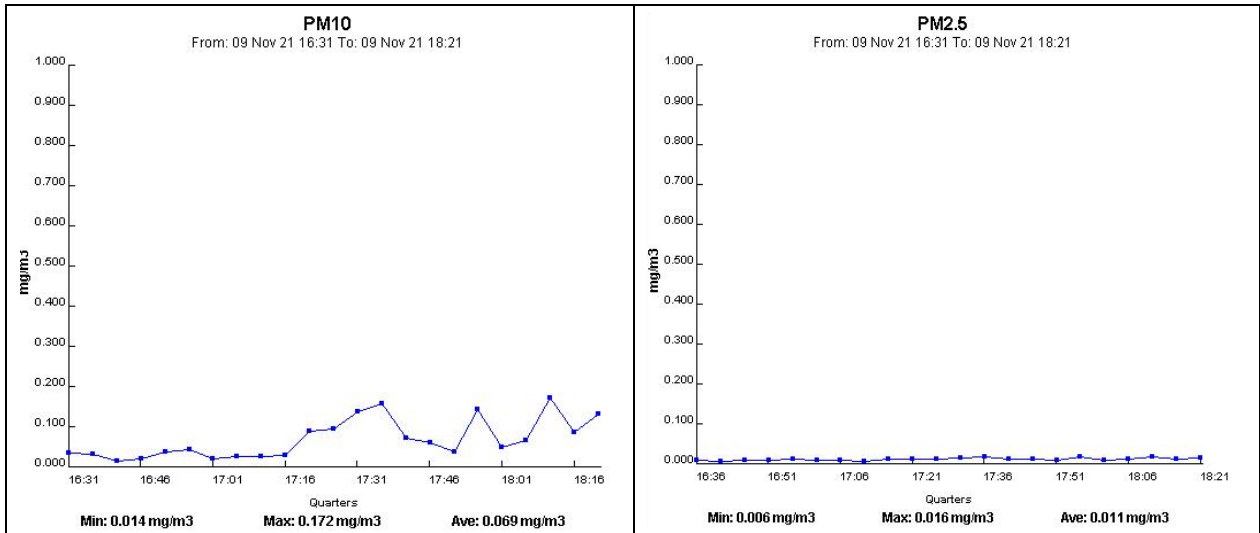


Figure 0-38: Variation of particulate matter levels with time of the day at Ogunga Primary School

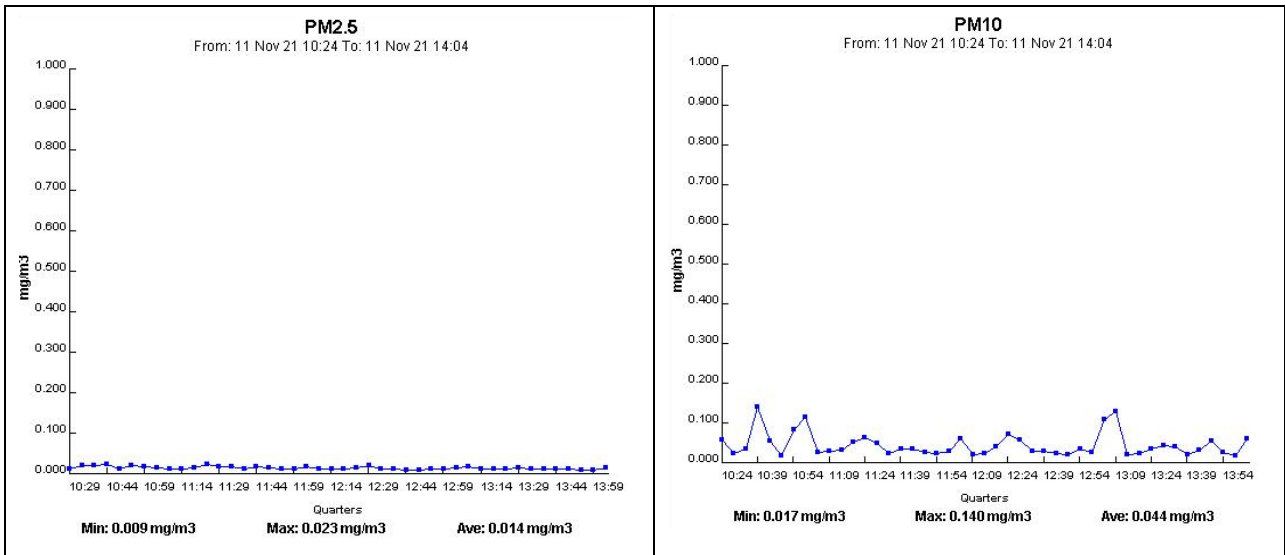


Figure 0-39: Variation of Particulate matter levels with time of the day at Kawiti Trading Centre

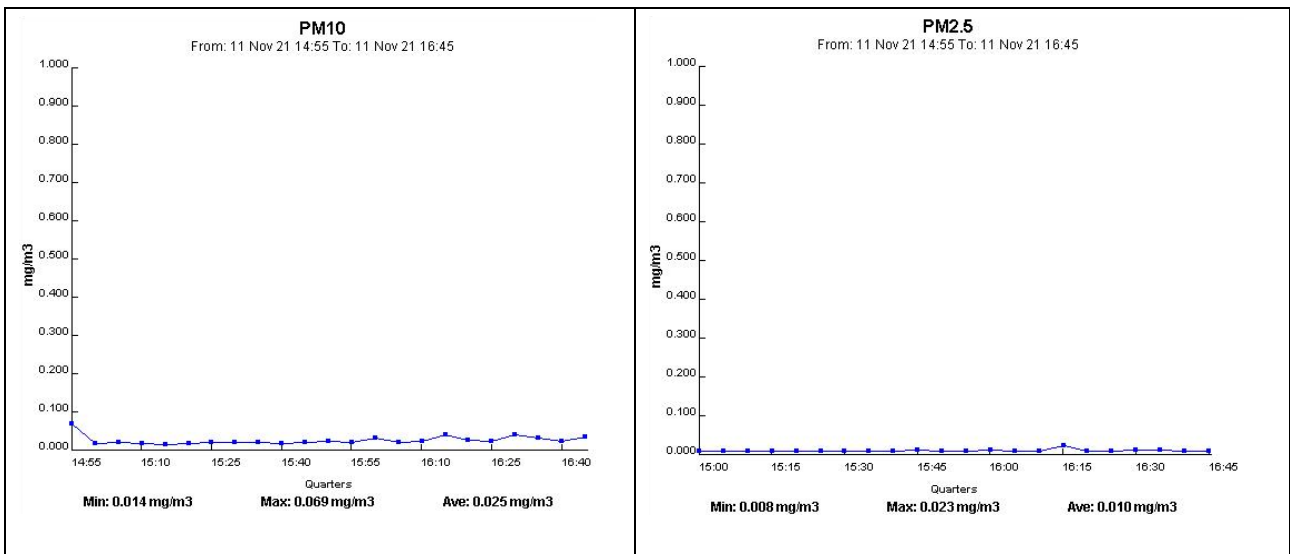


Figure 0-40: Variation of Particulate matter levels with time of the day at Kakwokwo Primary School

5.2.9.2 GAS EMISSIONS BASELINE

The four, most common gas emissions considered during the assessment included NO₂, SO₂, CO and VOC. By volume, ambient air contains 78.09% Nitrogen, 20.95% Oxygen, 0.93% Argon, 0.04% CO₂ plus a host of other gases in small amounts (SO_x, CO_x & VOC).

At all the four (4) sites monitored, Nitrogen Dioxide (NO₂) average values ranged from 0.083ppm to 0.098ppm, Sulphur Dioxide (SO₂) average values ranged between 0.033ppm – 0.140ppm, Carbon Monoxide (CO) average values ranged from 0.026ppm to 0.029ppm m and VOCs average values ranged from 0.00ppm to 0.03ppm.

Average values for all gases across the different sites monitored did not vary significantly and were very low compared, conforming to the WHO Ambient Air Quality standards at the time of the survey although there are no standards for VOCs yet. The low levels of gases can be attributed to limited activities at the sites monitored as these are located in rural areas with little traffic with exception of trading centers.

VOCs are products of combustion of fossil fuels (coal, gas, wood, kerosene, tobacco products and oil) especially fuel used in cars. VOCs can also come from personal care products such as perfume and hair spray, cleaning agents, dry cleaning fluid, paints, lacquers, varnishes, hobby supplies and from copying and printing machines.

Table 0-10: Summary of Baseline Gas Emissions Readings for Mutunda RGC

Location & Details (e.g., school, hospital, residence, etc.)	Date & Run time	Readings			
		NO ₂ (ppm)	SO ₂ (ppm)	CO (ppm)	VOCs (ppm)
	Limits	0.106ppm/1h	0.2ppm/10min	9ppm/8h	
Site 1: St. Peter's Catholic Church Mutunda	9/11/2021 11:57am-3:57pm	Min: 0.000 Ave: 0.083 Max: 0.110	Min: 0.040 Ave: 0.066 Max: 0.150	Min: 0.00 Ave: 0.26 Max: 5.42	Min: 0.00 Ave: 0.00 Max: 0.00
Site 2: Ogunga Primary School	9/11/2021 4:31pm-6:21pm	Min: 0.052 Ave: 0.089 Max: 0.111	Min: 0.010 Ave: 0.140 Max: 0.250	Min: 0.00 Ave: 0.26 Max: 2.42	Min: 0.00 Ave: 0.00 Max: 0.00
Site 3: Kawiti Trading Centre	11/11/2021 10:24am-2:04pm	Min: 0.056 Ave: 0.098 Max: 0.126	Min: 0.09 Ave: 0.150 Max: 0.22	Min: 0.00 Ave: 0.29 Max: 2.97	Min: 0.02 Ave: 0.03 Max: 0.05
Site 4: Kakwokwo Primary School	11/11/2021 2:45pm-4:45pm	Min: 0.00 Ave: 0.00 Max: 0.00	Min: 0.000 Ave: 0.033 Max: 0.120	Min: 0.00 Ave: 0.00 Max: 0.00	Min: 0.00 Ave: 0.00 Max: 0.00
WHO AQG: NO₂: 0.2mg/m³ or 0.106ppm (1-hour averaging) WHO AQG: SO₂: 0.5mg/m³ or 0.2ppm (10-minute averaging) WHO, 1999: CO: 10mg/m³ or 9ppm (8-hr averaging)					

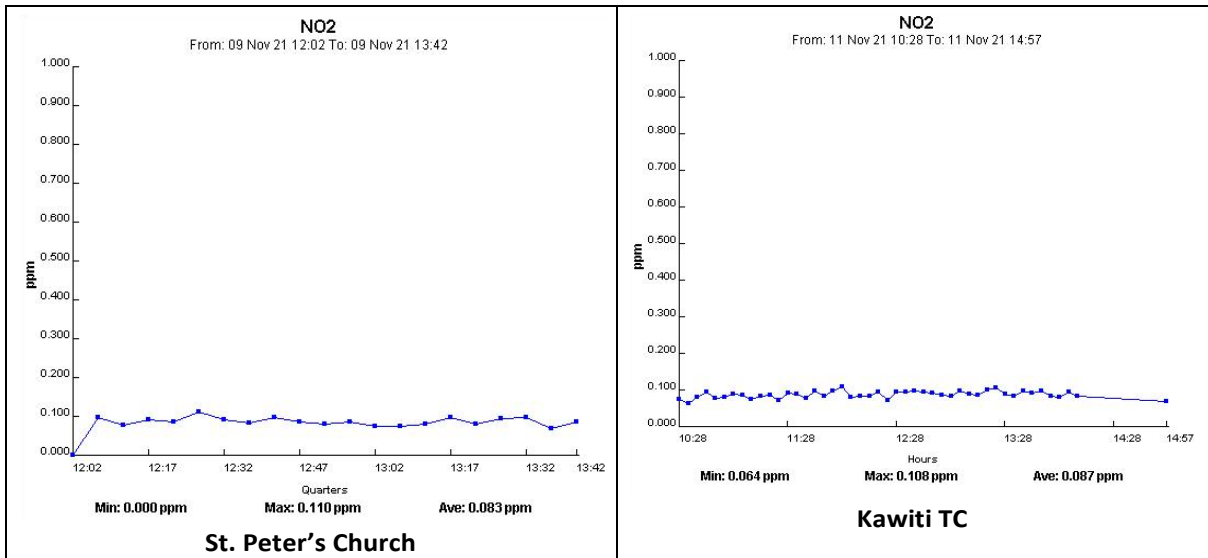


Figure 0-41: Variation of NO2 levels with Time of the day at St. Peter's Church and Kawiti TC

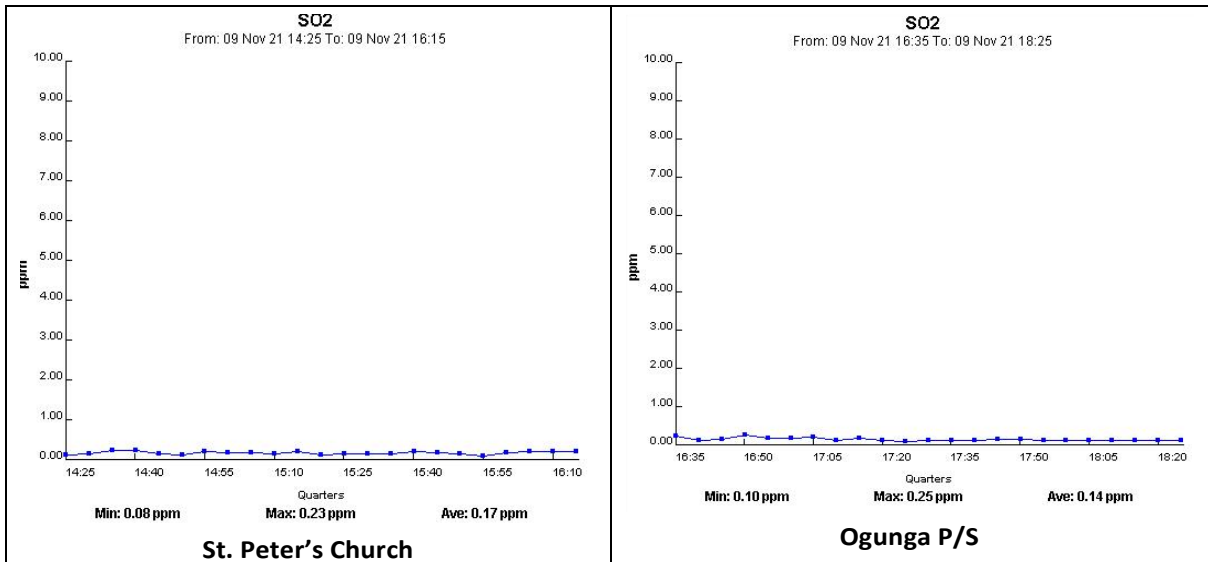


Figure 0-42: Variation of SO2 levels with time of the day at St. Peter's Church and Ogunga P/S

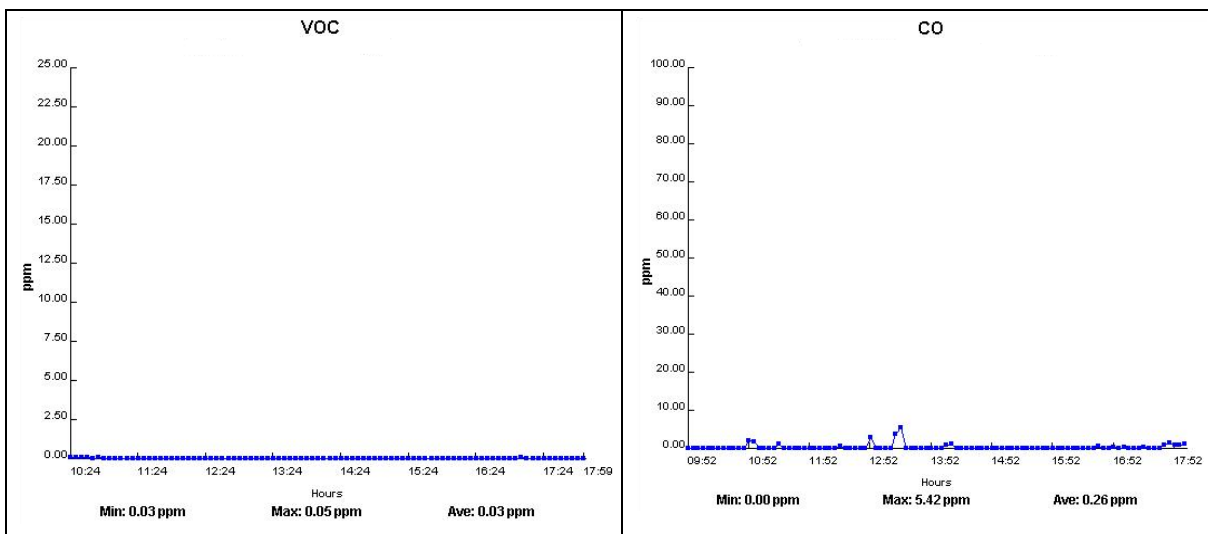


Figure 0-43: Variation of VOCs and CO levels with time of the day

5.2.9.3 NOISE MEASUREMENT RESULTS

The noise levels recorded at these different sampled receptors varied depending on the noise sources at a specific monitoring time of the day. These noise levels (LAeq) for the monitored sites ranged from 46.4dBA (Site 4: Kakwokwo P/S in a residential setup) to 55.3dBA (Site 2: Ogunga Primary School, residential area). The baseline noise levels measured were slightly above the recommended permissible day noise limits for such receptors.

Table 0-11: Summary of noise results at measured receptors

Location & Details (e.g., school, hospital, residence, etc.)	LAFmin (dB)	LAFmax (dB)	LAeq (dB)	Maximum Permissible Noise Limits Day (dBA)
Site 1: St. Peter’s Mutunda Catholic Church	30.8	89.4	46.6	55
Site 2: Ogunga Primary School	27.1	89.3	55.3	45
Site 3: Kawiti Trading Centre	40.1	75.8	51.1	45
Site 4: Kakwokwo Primary school	30.2	72.4	46.4	45

High noise levels at Ogunga Primary school were attributed to noise emissions from a nearby cereal grinding machine, children playing soccer at the school field and vehicular traffic along the Mutunda-Diima road. For Kawiti trading center and St. Peters Church Mutunda noise emission sources including high volume music from bars and shops, running generators, speeding vehicular traffic (heavy trucks and boda bodas) as well as noise generated by trading centre dwellers. For institutions like schools, during the time of assessment most of them had resident children utilising the school field to play soccer thereby emitting a sizeable amount of noise.

5.3 BIOLOGICAL ENVIRONMENT

5.3.1 LANDUSE/LAND COVER

The spatial analysis of the landuse indicated that the dominant land cover/use type as shown in **Table 0-12**, **Figure 0-44** and **Figure 0-45** below is crop land/agriculture followed by grassland and Woodland at 60.5%, 16.3% and 11.2% respectively. The landuse of the project area is divided into six broad subdivisions: Bushland, Crop land, Forest, Grassland, Other land (settlement), wetland and woodland.

Table 0-12: Land use/cover of Mutunda

Land use/cover	Area (ha)	% cover
Bushland	787.4	6.4
Cropland	7396.4	60.5
Forests	366.9	3.0
Grassland	1989.5	16.3
Otherland	3.9	0.0
Water Body	182.1	1.5
Wetland	90.9	0.7
Woodland	1398.9	11.5
Total	12215.9	100.0

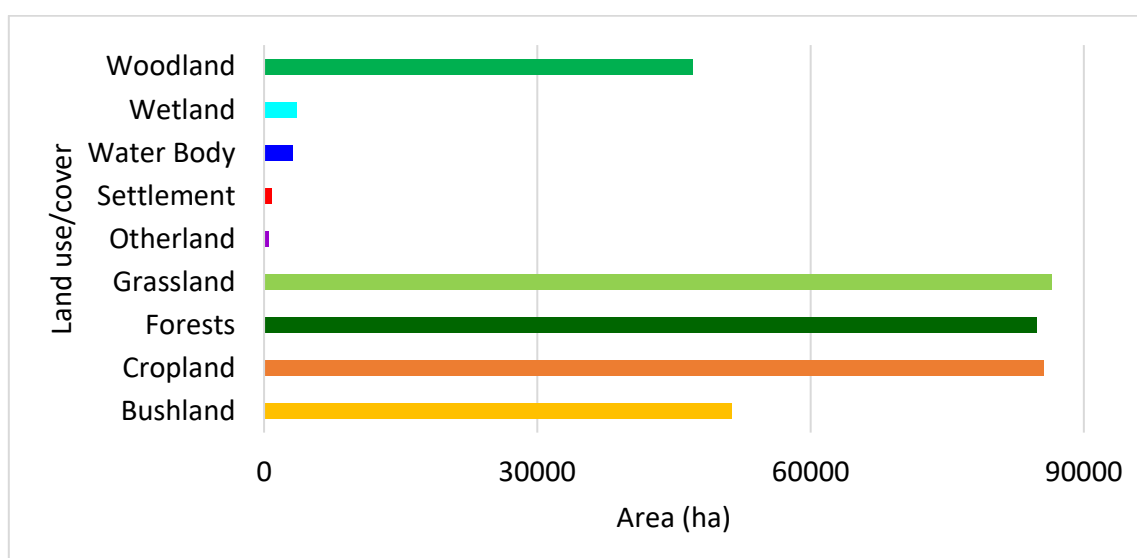


Figure 0-44: Land use/cover of Mutunda

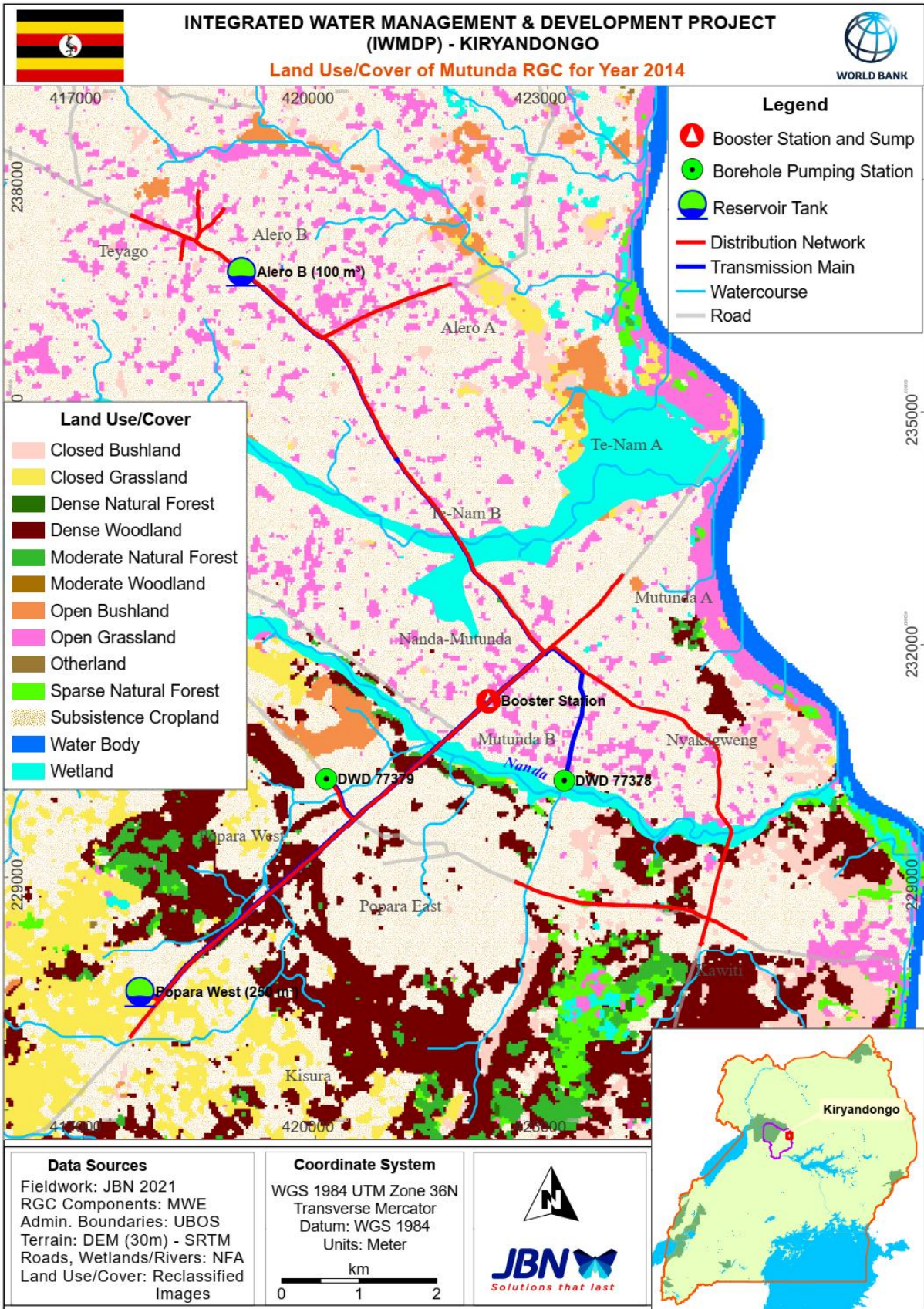


Figure 0-45: Land use/land cover of Mutunda RGC

5.3.1.1 ECOLOGICALLY SENSITIVE AREAS

Karuma wildlife reserve is one of the ecologically sensitive areas in the district. It is located west of the project area at approximately 4.7 km from the nearest trading center where water supply will be implemented. Therefore, there is no likely hood of project impact on the Karuma wildlife reserve.

5.3.2 FLORA

5.3.2.1 HABITAT DESCRIPTION

In general, the entire project footprint is largely covered by modified habitats (accounting for about 85% of the land cover) reflective to natural habitats (15%) of the green cover habitat such as;- swamps, bushes, and fallows, which is a reflective of the significant human activities within the vicinity of the project area. Land use/habitat coverage present within the project footprint are; - Monoculture (Maize fields covering almost 60%), settlement and trading center infrastructures, agro-pastoral, and open fallow and subsistence farmland. These are described below in more details; -

- (i) **Monoculture:** Within the entire proposed sites for the water reservoir, and the two boreholes i.e. water source 1 (Borehole DWD 77378) and water source 2 (Borehole DWD 77379) are characterized by monotype agriculture practices as observed throughout the all district. About four (4) common species of annual and perennial crops were located within the project area includes; - *Zea mays* (maize) contributing about 60%. Apart from maize, most crops are grown on small pieces of land at the period this field work was conducted. Other monoculture species include: - Coniferous forests (plantations) of *Pinus oocarpa*, and *Eucalyptus ssp.*
- (ii) **Settlements:** A significant proportion of the project foot print lies within areas that have undergone through several vegetation transform and currently these natural habitats are considered as secondary with degraded due to several anthropogenic factors such as; - the infrastructure like schools, health centers, homestead, sub county and trading centers such as Mutunda, Kawiti, Aleero, and others. Water source 2 is located in a Pinus plantation and water source 1 in a fallow at the edge of a wetland. The entire Kiryandongo district is devoid of natural habitats, however small fragments of modified habitats (i.e. open falls with remnant trees vegetation verges, mixed gardens, degraded swamps and wetlands with crumps of shrubs) provide refuge points for the few remaining wildlife mainly the birds and small mammals.
- (iii) **Agro-pastoral:** The second dominant modified habitat types within the project footprint are agro-pastoral and open fallow land which are generally located near settlements, and in degraded swamps.

Open fallow and pastoral land consisted herbaceous plants and several species were registered but only these dominated the open fallow areas. *Hyparrhenia filipendula*, *Panicum maximum*, *Imperata cylindrical*, *Sporobolus pyramidalis*, *Cynodon nlemfuensis*, *Cynodon dactylon*, *Synedrella nodiflora* associated with some shrubs or small trees such as; *Combretum collinum*, *Ficus cornrui*, *Combretum molle*, *Annona senegalensis*, and *Acacia polyacantha* growing at swamp edges.

Agro-land of consisted small scale gardens, about seventeen (17) common species of annual and perennial crops which were registered within these places during the field visit and these includes;- *Manihot esculenta* (cassava), *Dossypium hirsutum* (cotton), *Helianthus annuus* (sunflower), *Glycine max* (soyabean), *Sorghum bicolor*, *Musa ssp* (banana), *Eleusine coracana* (finger millet), *Oryza sativa* (rice), *Sesamum indicum* (simsim), *Phaseolus vulgaris* (bean seeds), *Solanum melongena*, *Solanum lycopersicum*, *Citrullus lanatus* (melon), *Cucurbita pepo*, *Vigna subterranean*, *Cajanus cajan*, and *Arachis hypogaea*.

5.3.2.2 VEGETATION DESCRIPTION

The general vegetation described of an ecosystem depend on the species available which is sometimes area influenced by the prevailing environmental conditions such as; -land form, soils, microclimate and anthropogenic factors such as fire, logging, mining, settlements, agriculture and farming methods etc. The proposed water project lies within areas which has undergone through several land transformations from its primary vegetation settings into Extensive maize, woodlots and crop and fallow. Open fallows are used as livestock grazing areas. The vegetation of the entire area for the proposed water project, is uniform and can be classified as secondary; -

- **Open savannah woodland mosaics:** with compositional of short trees such as; - *Terminalia schiperiana*, *Combretum molle*, *Combretum collinum*, *Ficus cornraui*, *Piliostigma thonningii*, *Lannea barteri*, *Acacia polyacantha*, mixed with remnant trees *Milicia excelsa*, *Albizia coriaria*, and *Ficus sycomorus* associated with medium height grasses such as *Hyparrhenia ssp*, *Panicum maximum*, *Imperata ccylindrica*, and *Pennisetum purpureum*. Current land use consists of extensive farmland and exotic tree plantations of coniferous species dominated by two species of *Pinus sp* and *Eucalyptus*.
- **Wetlands:** These consisted of permanent and seasonal swamps. Four wetlands were recorded within and along the proposed water distribution routes. All the wetlands/swamps were almost similar in terms of species composition with minimal difference.
 - (i) Nanda wetland was located along Mutunda-Kisula distribution route;
 - (ii) Nana swamp, along Mutunda-Kawiti to Kikwoko route;
 - (iii) Seasonal swamp between Kawiti and Kikwoko; and
 - (iv) Swamp along Mutunda-Teyago.

Nanda and Nana wetlands were almost similar in terms species composition and were categorized with three vegetation stratum:

- (i) The region of shallow water depth, which can be categorized as swamp edge characterized by herbaceous species such as; - *Leersia hexandri* contributing 35%, *Cynodon dactylon* 30%, *Sporobolus pyramidalis* 15% and *Imperata cylindrical*, associated with *Acacia polyacantha*, *Piliostigma thonningii*, *combretum collinum* and clumps of *Grewia mollis*;
- (ii) The region of floating rhizomatous mat was dominated by colonies of *Phragmites mauritianum* 20%, *Cyperus papyrus* 5%, *Echinochloa pyramidalis* 60% mixed with

Mimosa pigra, *Polygonum strigosum*, and two species of vines *Cayratia ibuensis* and *Ipomoea wightii*; and
(iii) The region of free water columns covered with *Nymphaea muculata*.



Nanda wetland: E-421587, N-230672

Figure 0-46: Floating rhizomatous mat and a water column with floating *Nymphaea muculata*



Figure 0-47: Seasonal swamp *Oryza barthii* growing near the water column

5.3.2.3 STRUCTURES AND PHYSIOGNOMY

The description of the vegetation structure and physiognomy of the study areas of Kiryandongo for the water supply project, can be described as secondary. The vegetation, formerly typically savanna woodland, wooded grass with wetlands and swamps with remnant tall trees. The current status of these natural habitats was depleted and replaced by farmlands characterized by extensive maize fields and open fallows, exotic tree plantations, commercial centres and homesteads. Some few natural trees were observed and located around the livestock ranch of the proposed routes for the water distribution to Mutunda to Kisula. The physiognomic structure is composed of both native and exotic tree species. Trees and shrubs were present, partially distributed along the routes and the physiognomic classification of an area depends on the woody plant species. As observed, large trees of ≥ 50 cm of diameter at breast height (Dbh) were very few within the proposed project areas. Tree diameter at breast height (Dbh) ranged from 2.5-130cm. Large trees observed included; *Milicia excelsa* (Mvule tree), *Acacia abyssinica*, *Ficus sycomorus*, and *Ficus natalensis* at Mutunda health centre III, Subcounty and school. The herbaceous plants were at a height of about 10cm – 3.0 meters tall. Common weeds considered to be the shortest were; *-Brachiaria comate*, *B. documbens*, *Cynodon dactylon*, *Parthenium hysterophorus* and *Panicum maximum* with maximum height of 70cm. *Phragmites mauritianus*, *Cyperus papyrus* and *Zea mays* were considered to be the tallest ranging between 1.5 and 4 meters.

The Vertical structure

In terms of the vertical structure, the savanna of the study areas of Mutunda water systems, is less complex type of vegetation since most natural habitats in the proposed project areas haven been replaced and dominated with crop fields leaving a few of them in clumps of bushes or in terms fallows. The profile shows a tree stratum of 2.3-35m high for the natural trees and 12 meters of height in plantations. Canopy cover was 75% open and closed in plantations where about 85% of the canopy is closed. The proposed sites recorded very few large trees, which were the *Milicia excelsa*, *Ficus sycomorus* and *Ficus natalensis* at Mutunda health center, Pinus/Eucalyptus plantation were recorded at water source 2 and along Mutunda to Kisula route with an average height of about 10 meters for the exotics and 35m for *Milicia excelsa*.



1-*Cassia siamea*

2-*Milicia excelsa* (*Mvule*)

Figure 0-48: Trees at Mutunda Health centre III (E-422970 N-231904)

5.3.2.4 FLORISTIC COMPOSITION, DISTRIBUTION, DENSITY AND DIVERSITY OF MUTUNDA WATER SYSTEM

From all the surveyed three sites, a total of one hundred, seventy-four (174) individual species were recorded from forty-four (44) families. Herbaceous species recorded the highest individuals with ninety-one (91) contributing 53%, followed by trees/shrubs with sixty-two (62) representing 32%, and lastly liana with only fourteen (14) species contributing only 11% of the species lifeform. The number of species recorded in any geographical location depends more on time factor and sample size before other factors such as; ecological and anthropogenic activities. All the proposed areas differed in area covered, a factor which determined the number sampling units. Transmission and Distribution route of Mutunda-Kisula, recorded the highest number of individual species with one hundred, twelve (112), followed by Water source 1& access road with sixty (60), Mutunda-Kawiti with forty-six, Mutunda-Teyago with thirty-five, water source 2 and access road with thirty-one and lastly Teyago T-off 1 & 2 with twenty-two (22).

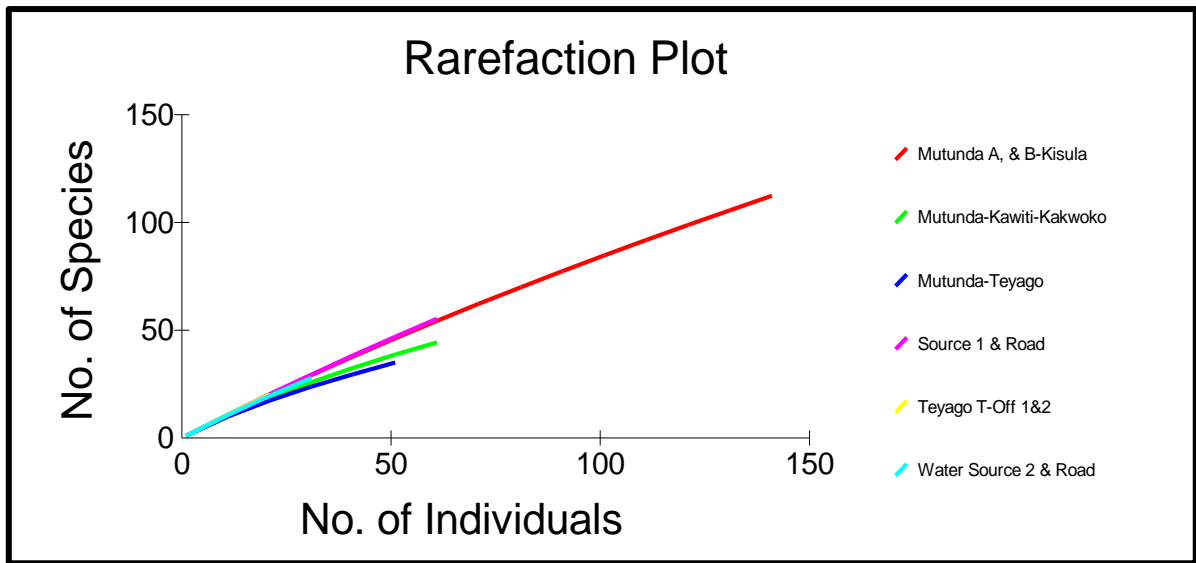


Figure 0-49: Rarefaction curve

The **Figure 0-49** above, shows sampling intensity and species richness in plots from all the study routes and sites. The figure reveals low species richness accumulatively from the sampled routes. All the sites and routes for the distribution and Transmission of water had been modified and replaced with maize fields and that affected the species diversity of the flora.

Table 0-13: Shannon-Wiener and Alpha diversity values for plants from Mutunda water system

Index	Mutunda A, & B-Kisula	Mutunda-Kawiti-Kakwoko	Mutunda -Teyago	Source 1 & Road	Teyago T-Off 1&2	Water Source 2 & Road
Shannon H' Log Base 10.	2.008	1.616	1.475	1.767	1.336	1.475
Shannon Hmax Log Base 10.	2.053	1.672	1.544	1.785	1.342	1.491
Alpha	256.323	72.906	49.215	285.61	248.997	130.189

Diversity of an area is considered to the number of different species. From the field survey conducted in Mutunda water system project footprint, diversity was considered to be low according to the log series. The Poaceae (Graminae) family registered the highest number of species with 30, followed by Fabaceae 24, Asteraceae (Compositae) 15, Moraceae 9, Euphorbiaceae 8, Veberaceae 7, Solanaceae 6, Combretaceae and Solanaceae registered 5 respectively, the rest registered 4 or less. (**Annex 6**).

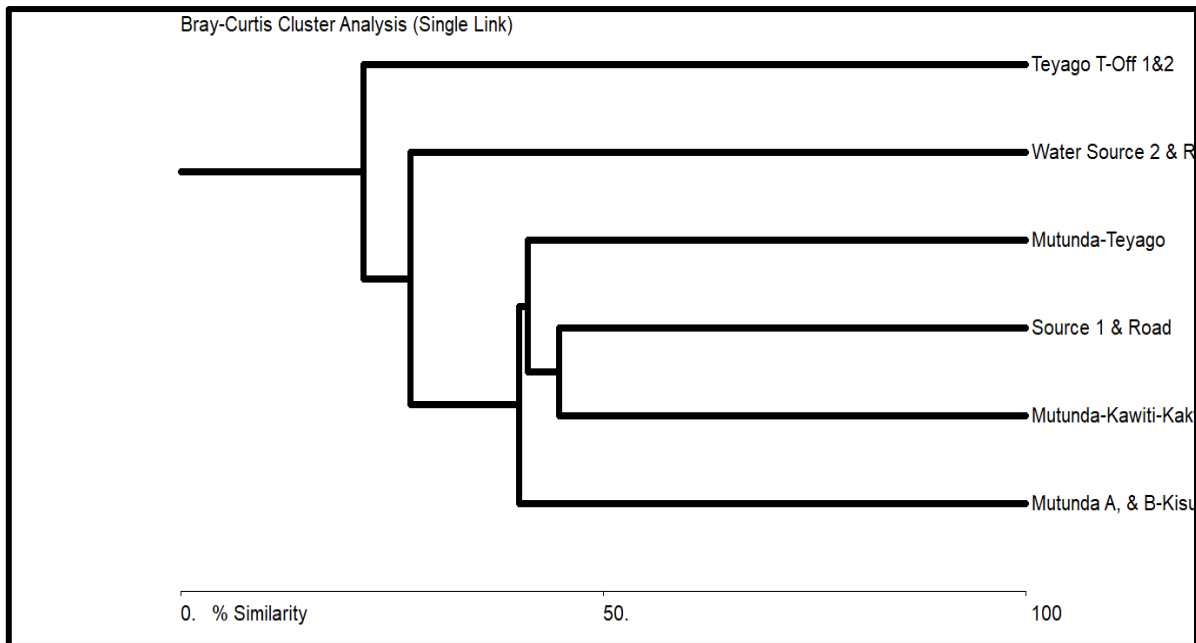


Figure 0-50: Similarities in species composition from different the study areas for plants

All the sampled areas were dissimilar at only 20%. Mutunda-Kawiti-Kakwoko, and Water source 1 and access road were the most similar in terms of plant communities and species composition. Mutunda A & B to Kisula was closer to Mutunda-Teyago by a small margin. Water source 1, access road and Teyago T-offs were the most dissimilar in terms species composition.

5.3.2.5 CONSERVATION STATUS OF THE SPECIES

Out of the one hundred, seventy-five (174) plant species encountered in all study areas, only one species has been listed on the IUCN Redlist of 2016. Therefore, the species raises a great conservation concern in the country and in the region. *Milicia excelsa* (Mvule) in Moraceae family, globally listed as Near threatened and nationally as Endangered (EN A2acd). Two large trees were recorded at Mutunda health centre III and the water distribution project may not cause any major threat to the endangered species because the tree are located 25 and 50m from off the road.

5.3.2.6 ECONOMIC PLANTS

The economic importance of these plants varies and they include their uses as; income generating, fuelwood, timber, vegetable, edible fruits, seed bank, medicinal and religious believes. A checklist of the common economic plants encountered within the study areas of Mutunda have been presented in Tables below reflecting the densities for each species. The density of the economic plants in all the study sites and routes was not calculated and no actual density was given. The economic plants encountered in the study area were *Pinus oocarpa*, and *Eucalyptus ssp*, as wood lots. Water source 2 was located inside a pine plantation arrange of Dbh from 10-18cm, height of 10 meters, and density of 1082/Ha. Other economic plants in terms of fruit, or ornamental and these included; - *Artocarpus heterophyllus* (Jackie fruit tree), *Mangifera indica* (mango tree) and *Persea americana* (ovacado).

Table 0-14: Checklist of woody economic plants Encountered Mutunda water system

S/N	Family	Scientific Name	Size	Size
1	Moraceae	Artocarpus heterophylla	Fruits	Small scale
2	Anacardiaceae	Mangifera indica	Fruits	Small scale
3	Lauraceae	Persea americana	Fruits	Small scale
4	Myrtaceae	Eucalyptus grandis	Wood	150 x 200m
5	Pinaceae	Pinus oocarpa	Commercial	Large scale

Table 0-15: Checklist of Crops encountered Mutunda water transmission area (Nov, 2021)

S/N	Scientific Name	Common Name	Importance	Range of farm size	Mutunda
1	Zea mays	Maize	Commercial	Extensively	✓
2	Manihot esculenta	Cassava	Food	Small scale	✓
3	Ipomoea batatas	sweet potatoes	Food	Small scale	✓
4	Phaseolus vulgaris	Beans	Food	Small gardens	✓
5	Eleusine coracana	Millet	Food	rare	✓
6	Cucurbita ssp	Pumpkin	Food	rare	✓
7	Solanum lycopersicum	Tomato	Food	rare	✓
8	Brassica oleracea	Cabbage	Food	rare	✓
9	Arachis hypogaea	Groundnuts	Food	Small scale	✓
10	Sesamum indicum	Sim sim	Food	Small scale	✓
11	Cajanus cajan	Pigeon pea	Food	Small scale	✓
12	Sorghum bicolar	Sorghum	Food	Small scale	✓
13	Oryza sativa	Rice	Food	Small scale	✓
14	Musa ssp	Banana	Food	Small scale	✓
15	Helianthus annuus	Sunflower	Food	Small scale	✓
16	Glycine max	Soyabean	Food	Small scale	✓



Figure 0-51: Sorghum bicolor in Mirima village (E-405187 N-208235)



Figure 0-52: Sunflower, cassava mixed with maize garden in Kikwoko (E-422663 N-228900)

5.3.2.7 INVASIVE PLANTS

The term invasive has been defined differently. Cronk and Fuller (1995) refer to natural area weeds as invasive plants and the non-native plants as aliens. Mosango et al (1999) refer to weeds as invasive and any plant growing where it is not wanted and interfering with human activity to be a weed. Aliens (exotics) are non-endemic plants spreading naturally without the direct

assistance of man in natural or semi natural habitat, to produce a significant change in terms of composition, structure or ecosystem processes.



Figure 0-53: *Parthenium hysterophorus*, a frequently encountered invasive plant (E-417517 N-237572)

The **Figure 0-53** shows the invasive plant species recorded from Mutunda area. Water source 1 and access road had the highest number of invasive plants with 8, followed Mutunda-Kawiti, and Mutunda-Kisula with 7 respectively, Mutunda-Teyago with only 4

Table 0-16: A list of invasive species encountered in Mutunda water distribution areas

S/N	Family	Species	Mutunda A, & B-Kisula	Mutunda-Kawiti-Kakwoko	Mutunda-Teyago	Source 1 & Road	Teyago T-Off 1&2	Water Source 2 & Road	Status
1	Amaranthaceae	Alternanthera pungens	1	1	X	X	X	X	Invasive
2		Alternanthera sessilis	1	X	X	X	X	X	Invasive
3	Asteraceae	Acanthospermum hispidum	1	X	X	1	1	1	Invasive
4		Bidens pilosa	1	X	1	1	X	X	Invasive
5		Chromolaena odorata	1	1	X	1	X	X	Invasive
6		Parthenium hysterophorus	X	X	X	X	X	1	Invasive
7		Tithonia diversifolia	X	1	1	X	X	X	Invasive
8	Canaceae	Cana indica	X	X	1	X	X	X	Invasive
9		Acacia hockii	1	1	X	1	X	X	Invasive
10		Mimosa pigra	1	1	X	1	X	X	Invasive
11		Senna spectabilis	X	1	X	1	X	X	Invasive
12		Sida acuta	X	X	X	X	X	X	Invasive
13		Broussonetia papyrifera	X	X	X	1	X	X	Invasive
14		Oryza barthii	X	X	1	X	X	X	Invasive
15		Lantana camara	X	1	X	1	X	X	Invasive

Colour Legend:

	Species is listed worldwide (and in Uganda) as invasive and dangerous to the ecosystem
	Species is listed worldwide (and in Uganda) as invasive but with minimal impact on the ecosystem
	Species is listed worldwide (and in Uganda) as invasive but with minimal impact on the ecosystem and also useful in the community

5.3.2.8 PROJECT AFFECTED TREES

The project alignment will affect 3 tree species at 8 locations as indicated in **Table 0-17** and **Figure 0-54**.

Table 0-17: Project affected trees

N/S	Location	Eastings	Northings	Family	Species	Conservation Status	2,5-10	10-30cm	30-50cm	50+	Lifefor m
1	Mutunda A, Mutunda B-Kisula	423270	232132	Moraceae	<i>Milicia excelsa</i>	Globally listed as NT and nationally as (EN A2acd					Tree
2	Mutunda A, Mutunda B-Kisula (Eucalyptus plantation)	422567	231549	Moraceae	<i>Milicia excelsa</i>				1		Tree
3	Mutunda A, Mutunda B-Kisula	420290	229548	Moraceae	<i>Milicia excelsa</i>					1	Tree
4	Mutunda A, Mutunda B-Kisula	418116	227541	Asclepiadaceae	<i>Mondia whitei</i>						Liana
5	Mutunda A, Mutunda B-Kisula	418085	227507	Moraceae	<i>Milicia excelsa</i>			2			Tree
6	AleroWater source			Moraceae	<i>Milicia excelsa</i>			1			Tree
7	Alero T-Off 1 (Fallow)	418320	237239	Fabaceae	<i>Tamarindus indica</i>		3				Tree
8	Alero T-Off 2	418448	237203	Fabaceae	<i>Tamarindus indica</i>				1		Tree

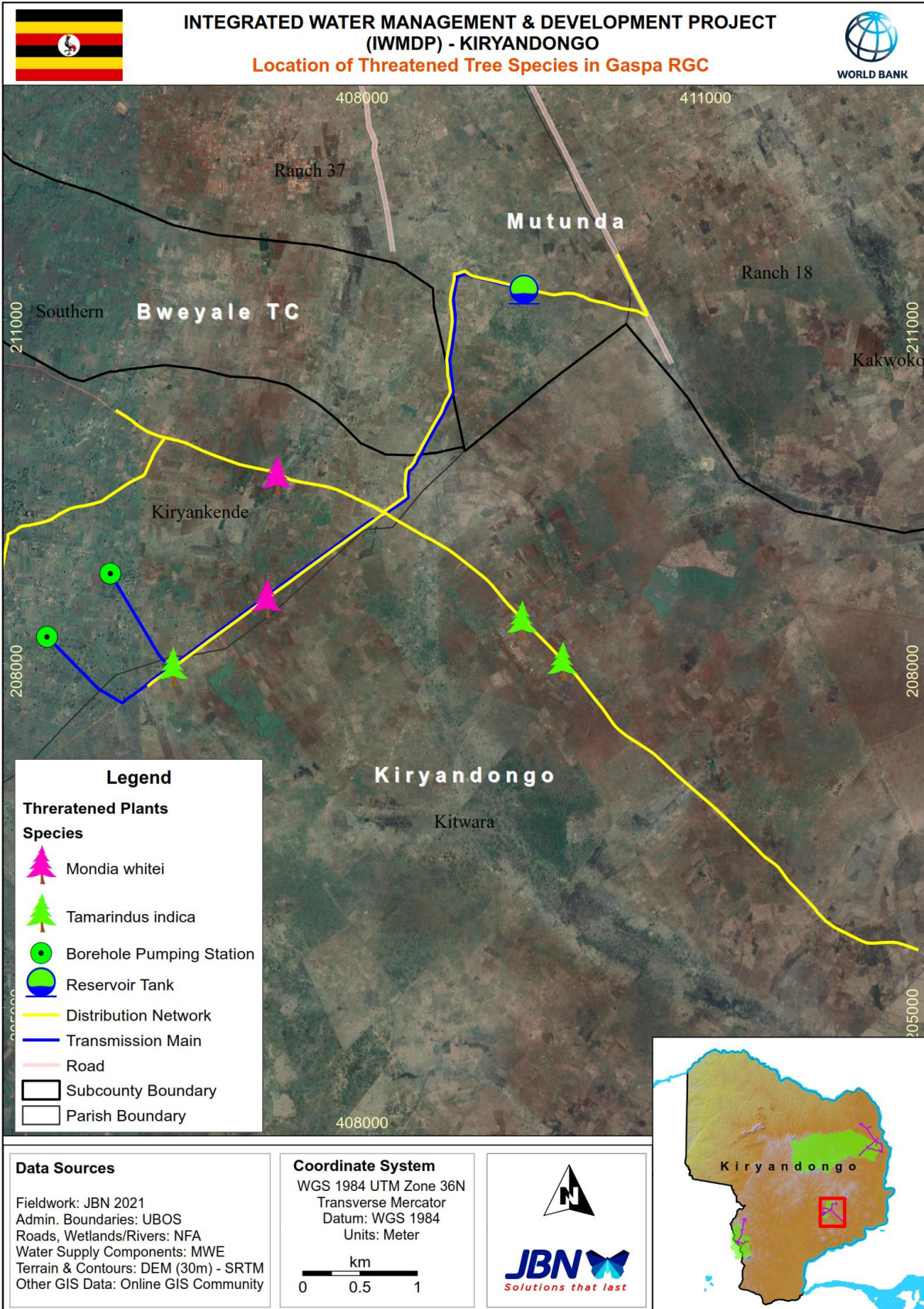


Figure 0-54: Location of project affected trees

5.3.3 INSECTS

A total of 44 sampling points established at the different infrastructure sites and along the supply and distribution network were surveyed for Butterflies and Dragonflies.

5.3.3.1 BUTTERFLIES

Twenty (20) species of butterflies were recorded at the different locations in the project area (**Table 0-18**). The species represent four families and fourteen genera. The more time you spend in an area, the more species you encounter. Butterflies also appear at different times of the year depending on season. Family Nymphalidae was the most represented with eleven species, while genus *Junonia* was the most represented with five species registered. In terms of ecological characterisation, Eight of the species recorded are migratory in nature (**Table 0-19**). Eight species are widespread and occur in a wide range of habitats. Two species are Forest edge/woodland species and are more often encountered in a variety of forest edge, degraded forest and woodland habitats. One species was a forest generalist and one species an open habitat species. The Scalloped Sailer *Neptidopsis ophione* occurs in forest, woodland and riverine areas. African Migrant *Catopsilia florella* is a fast-flying butterfly that moves swiftly between flowers. It often engages in mud-piddling and is at times seen migrating in numbers.

Table 0-18: Butterflies encountered during the survey

Family	Species recorded	No. Counted	IUCN Red List Status
Lycaenidae	<i>Euchrysops Osiris</i> African Cupid - W	2	Least Concern
Lycaenidae	<i>Tarucus rosaceus</i> Pierrots - O	1	Least Concern
Nymphalidae	<i>Acraea serena</i> Orange Acraea - W	5	Least Concern
Nymphalidae	<i>Acraea sotikensis</i> Sotik Acraea - F	12	Least Concern
Nymphalidae	<i>Danaus chrysippus</i> African Queen - M	16	Least Concern
Nymphalidae	<i>Hypolimnas misippus</i> Diadem - M	1	Least Concern
Nymphalidae	<i>Junonia sophia</i> Little Commodore – W	7	Least Concern
Nymphalidae	<i>Junonia hierta</i> Yellow Pansy - M	1	Least Concern
Nymphalidae	<i>Junonia oenone</i> Blue Pansy - W	10	Least Concern
Nymphalidae	<i>Junonia stygia</i> Brown Pansy – f	18	Least Concern
Nymphalidae	<i>Junonia terea</i> Soldier Commodore - W	2	Least Concern
Nymphalidae	<i>Neptidopsis ophione</i> Scalloped Sailer – f	6	Least Concern
Nymphalidae	<i>Tirumala petiverana</i> African Blue Tiger - M	1	Least Concern
Papilionidae	<i>Papilio demodocus</i> Citrus Swallowtail – M	5	Least Concern
Pieridae	<i>Belenois aurota</i> Brown Veined White – M	10	Least Concern
Pieridae	<i>Belenois creona</i> Common White – M	3	Least Concern

Pieridae	<i>Catopsilia florella</i> African Migrant – M	24	Least Concern
Pieridae	<i>Colotis euipe</i> Round-Winged Orange Tip - W	3	Least Concern
Pieridae	<i>Eronia leda</i> Orange-and-lemon – W	3	Least Concern
Pieridae	<i>Eurema desjaridinsi</i> Angled Grass Yellow W	36	Least Concern

Table 0-19: Butterflies and their ecological types

Ecological Type	No. of species	Species names
Migratory species (M)	8	<i>Danaus chrysippus</i> African Queen – M, <i>Hypolimnas misippus</i> Diadem – M, <i>Junonia hierta</i> Yellow Pansy – M, <i>Tirumala petiverana</i> African Blue Tiger – M, <i>Papilio demodocus</i> Citrus Swallowtail – M, <i>Belenois aurota</i> Brown Veined White – M, <i>Belenois creona</i> Common White – M and <i>Catopsilia florella</i> African Migrant – M.
Widespread species (W)	8	<i>Euchrysops</i> Osiris African Cupid – W, <i>Acraea serena</i> Orange Acraea – W, <i>Junonia sophia</i> Little Commodore – W, <i>Junonia oenone</i> Blue Pansy – W, <i>Junonia terea</i> Soldier Commodore – W, <i>Colotis euipe</i> Round-Winged Orange Tip – W, <i>Eronia leda</i> Orange-and-lemon – W and <i>Eurema desjaridinsi</i> Angled Grass Yellow – W.
Forest edge/woodland species (f)	2	<i>Junonia stygia</i> Brown Pansy – f and <i>Neptidopsis ophione</i> Scalloped Sailer – f
Forest generalist's species (F)	1	<i>Acraea sotikensis</i> Sotik Acraea - F
Open habitat species (O)	1	<i>Tarucus rosaceus</i> Pierrots - O

Three species were more common relative to others. The species include Angled Grass Yellow *Eurema desjaridinsi*, African Migrant *Catopsilia florella* and Brown Pansy *Junonia stygia*. Thirty-six, twenty-four and eighteen individuals of each were registered respectively. The least common include Pierrots *Tarucus rosaceus*, Diadem *Hypolimnas misippus*, Yellow Pansy *Junonia hierta* and African Blue Tiger *Tirumala petiverana*. Only one individual of each was registered during the survey. No butterfly species of conservation significance were registered during the study. IUCN Red List of Threatened species categorizes them as Least Concern. The national red list for Uganda also categorizes the registered butterflies as Least Concern.

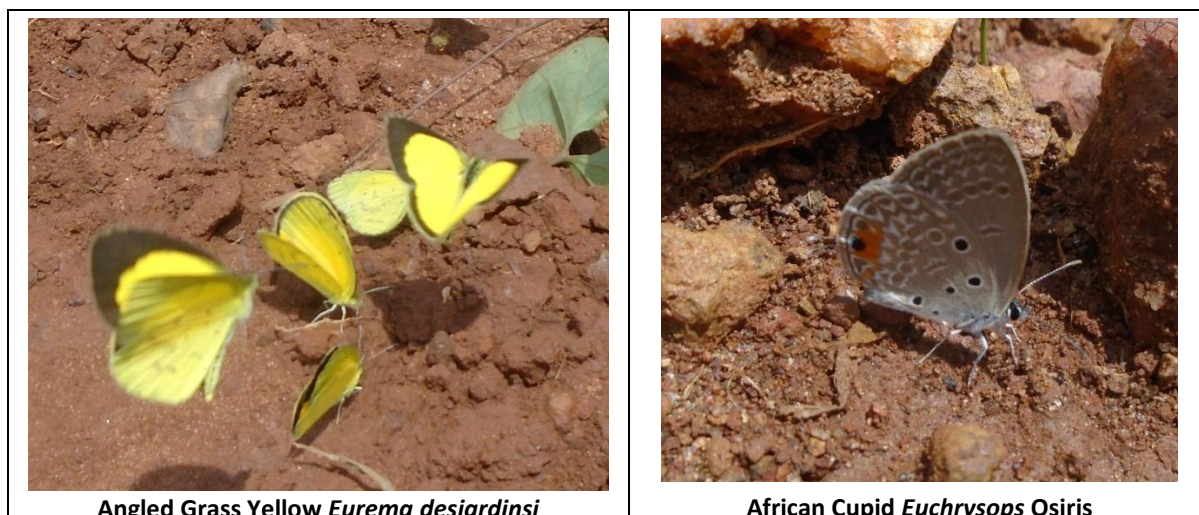


Figure 0-55: Some of the butterfly species recorded in the project area

5.3.3.2 DRAGONFLIES

Uganda scores highly in terms of dragonfly species because of its position between two important biogeographical regions and its extensive wetlands and forest areas. It hosts a total of 231 dragonfly species. Four (4) species were registered in the project area. Southern Banded Groundling *Brachythemis leucosticta*, Little Scarlet *Crocothemis sanguinolenta*, Eastern Blacktail *Nesciothemis farinosa* and Julia Skimmer *Orthetrum Julia*. All the species belong to one family namely Libellulidae. The dragonflies belong to four genera. Southern Banded Groundling *Brachythemis leucosticta* is one of Africa's most common odonates species. Little Scarlet *Crocothemis sanguinolenta* is encountered in or near fresh water in a wide variety of habitats, from semi-arid bush to tropical forest. Julia Skimmer *Orthetrum Julia* is commonly sighted along rivers and streams near woodland habitats. Dragonflies face several threats, including water pollution and habitat destruction.

Little Scarlet *Crocothemis sanguinolenta* registered the highest relative abundance with 12 individuals encountered during the survey. The species that registered the lowest abundance relative to others was the *Nesciothemis farinosa* Eastern Blacktail. Only one individual was encountered during the survey.

None is of the species recorded during the survey are of conservation importance. The encountered species are listed as least concern (LC) by IUCN 2020 Red list of threatened species. Modification of the natural landscape through settlement, agricultural encroachment, and the subsequent alteration of wetlands and temporary water bodies by erosion and siltation, may be some of the main threats to Odonata in the project area. Measures that avoid or minimize landscape modification will go a long way in promoting dragonfly conservation (Dijkstra *et al.* 2011).

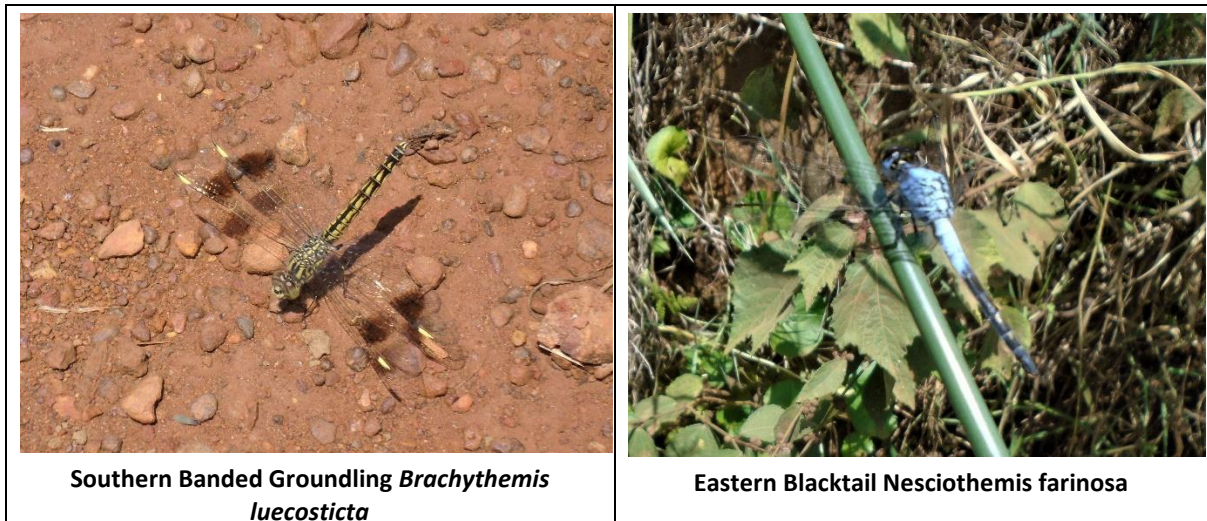


Figure 0-56: Catalogue of some of the Dragonflies recorded in the project area

5.3.4 HERPETOFAUNA

A total of 44 sampling points established at the different infrastructure sites and along the supply and distribution network were surveyed for Amphibians and Reptiles.

5.3.4.1 AMPHIBIANS

Four species of amphibians were recorded during the survey. One was a toad and three were frogs. The species represent three families and three genera. Family Phrynobatrachidae was the most represented with two species recorded. The species recorded during the survey include the Eastern Groove-crowned Bullfrog *Hoplobatrachus occipitalis*, Dwarf Puddle Frog *Phrynobatrachus mababiensis*, Natal Puddle Frog *Phrynobatrachus natalensis* and Steindachner's Toad *Bufo steindachneri*. Steindachner's Toad *Sclerophrys steindachneri* was the most common amphibian species recorded during the survey with six individuals recorded during the survey. Amphibians were mainly recorded in areas that are moist especially around wetland areas, rivers/streams and wet culvert points. Amphibians are secretive creatures and they require ample time if a complete species list is to be compiled for the project area. *Hoplobatrachus occipitalis* is usually collected near or in water (Rödel 2000). In the dry season it lives in rivers, water pools, ponds and permanent wetlands / swamps. It is found practically in all freshwater habitats. The species tend to migrate during the dry season to the edge of rivers and the in wet season to surroundings of ponds (Spieler 1997).

No species of conservation significance was registered during the survey. All the species encountered are categorized as least concern according to 2020 IUCN Red List of threatened species. The IUCN regards the species as widespread and common over much of their range (Rödel. 2000).

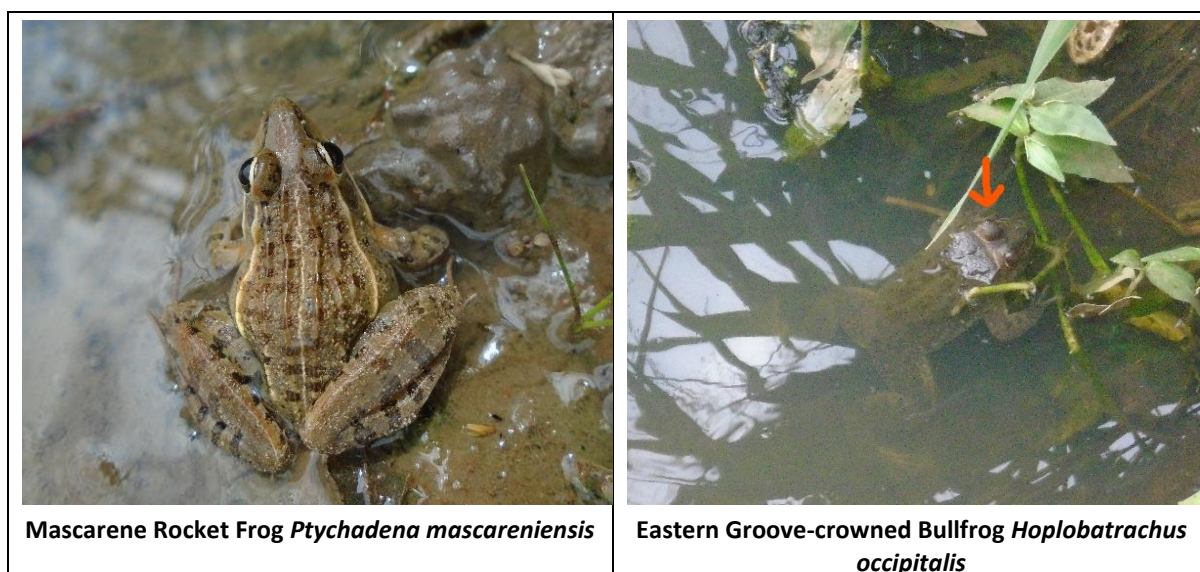


Figure 0-57: Photographic Catalogue of some species encountered during the survey

5.3.4.2 REPTILES

Seven species were recorded during the survey. Two species were lizards, one species was skink and four species were snakes (Table 0-20). The species represent seven (7) families and seven (7) genera. Sampling was limited to an area within a radius of 200m in and around the project infrastructure. Two species were encountered and five species were reported by the local people found working in the areas sampled or the village leaders we met. Of those encountered, the Red-Headed Rock Agama *Agama agama* was the most common with a relative abundance of 4 individuals recorded during the survey. The community reported presence of green snakes but their description could not help the fauna ecologist to arrive at any conclusive identity of the exact species.

Table 0-20: List of reptile species encountered during the survey

Family	Species and Common Name	No. Recorded	IUCN Red List Status
Agamidae	<i>Agama agama</i> Red-Headed Rock Agama	4	Least Concern
Elapidae	<i>Naja nigricollis</i> Black-Necked Spitting Cobra	reported	Least Concern
Pythonidae	<i>Python sebae</i> Central Africa Rock Python	reported	Least Concern
Scincidae	<i>Trachylepis striata</i> Striped Skink	2	Least Concern
Typhlopidae	<i>Typhlops punctatus</i> Spotted Blind Snake	Reported	Least Concern
Varanidae	<i>Varanus niloticus</i> Nile Monitor	reported	Least Concern
Viperidae	<i>Bitis arietans</i> Puff Adder	reported	Least Concern

None of the reptiles encountered and those reported by the community members is of conservation concern. All the species are listed as least concern by IUCN 2020 Red List of threatened species. The Central Africa Rock Python *Python sebae* and the Nile Monitor Lizard

Varanus niloticus are listed under the Endangered Species Decree of 1985, which means that international trade of the species is prohibited. The Species are listed under CITES Appendix II (Branch 1998). However, in Uganda the two species were down listed from Appendix II because the two species are still abundant and wide spread in the Country.

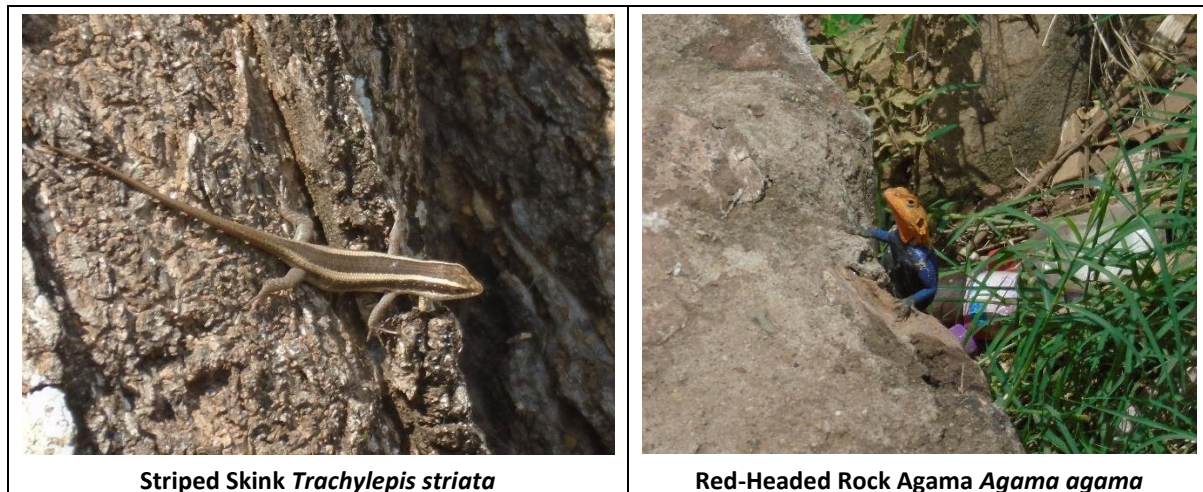


Figure 0-58: Photographs of some of the reptile species encountered during the survey

5.3.5 AVIFAUNA

A total of 44 sampling points established at the different infrastructure sites and along the supply and distribution network were surveyed for Birds.

Uganda is one of the richest birding destinations on continental Africa as it holds more than 50% of Africa’s bird fauna. During the survey of the project area. Forty-One (41) species of birds were positively identified (**Table 0-21**). The avi-fauna is diverse as it represents 26 families and 38 genera (**Table 0-22**). Almost each species belongs to its own genera. The diversity may be attributed to the different habitats represented in the project area. Unfortunately, all of the habitats have been modified by human activity. The other attribute that may account for the high diversity may be the project area proximity to Karuma Wildlife Reserve (KWR). Ecological characterization of the encountered species revealed that one species was a forest specialist and one species was a forest generalist (**Table 0-23**). Thirteen species were forest visitors. These three categories of birds prefer trees as an ecological feature. Four (4) bird species were recorded in wetlands and floodplains / seasonal wetlands rivers and streams. These were either wetland specialists or wetland visitors. Twenty species were categorized as open habitat or grassland species. Three species are categorized as widespread and can be encountered in a wide range of habitats. One of the species registered (*Halcyon senegalensis* Woodland Kingfisher) was an Afro-tropical Migrant and two of the species recorded (Barn Swallow *Hirundo rustica* and Lesser Grey Shrike *Lanius minor*) were Palearctic Migrant. The Afro-tropical migrants come from other African countries to Uganda while the palearctic migrants come from European countries during time of winter to Uganda. Habitat loss therefore is the greatest threat to birds.

Table 0-21: Bird species encountered Mutunda water and sanitation Project area

Family	Species Recorded	No. of individuals encountered	Species Red List Status
ALAUDIDAE	489 - <i>Mirafraga rufocinnamomea</i> Flappet Lark - G	4	Least Concern
ALCEDINIDAE	375 - <i>Halcyon senegalensis</i> Woodland Kingfisher - O	2	Least Concern Afro-tropical Migrant
APODIDAE	358 - <i>Cypsiurus parvus</i> African Palm Swift - O	5	Least Concern
APODIDAE	365 - <i>Apus affinis</i> Little Swift - Widespread	3	Least Concern
ARDEIDAE	17 - <i>Bubulcus ibis</i> Cattle Egret - G	6	Least Concern
ARDEIDAE	26 - <i>Ardea melanocephala</i> Black-Headed Heron - w	9	Least Concern
ARDEIDAE	<i>Ardea goliath</i> Goliath Heron - W	9	R-NT, U-VU
CISTICOLIDAE	650 - <i>Cisticola natalensis</i> Croaking Cisticola - G	7	Least Concern
CISTICOLIDAE	677 - <i>Camaroptera brachyura</i> Grey-Backed Camaroptera - f	7	Least Concern
COLLIIDAE	369 - <i>Colius striatus</i> Speckled Mousebird - O	1	Least Concern
COLUMBIDAE	270 - <i>Turtur tympanistria</i> Tambourine Dove - F	18	Least Concern
COLUMBIDAE	283 - <i>Streptopelia semitorquata</i> Red-Eyed Dove - f	1	Least Concern
COLUMBIDAE	289 - <i>Streptopelia senegalensis</i> Laughing Dove - O	8	Least Concern
CORVIDAE	855 - <i>Corvus albus</i> Pied Crow - Widespread	2	Least Concern
CUCULIDAE	323 - <i>Centropus superciliosus</i> White-Browed Coucal - O	1	Least Concern
DICRURIDAE	853 - <i>Dicrurus adsimilis</i> Fork-Tailed Drongo - f	3	Least Concern
ESTRILIDIDAE	963 - <i>Lagonosticta rubricata</i> African Firefinch - O	7	Least Concern
ESTRILIDIDAE	974 - <i>Uraeginthus bengalus</i> Red-Cheeked Cordon-Bleu - O	1	Least Concern
ESTRILIDIDAE	980 - <i>Spermestes cucullata</i> Bronze Mannikin - Widespread	12	Least Concern
ESTRILIDIDAE	981 - <i>Spermestes bicolor</i> Black-and-White Mannikin - f	34	Least Concern
HIRUNDINIDAE	513 - <i>Hirundo rustica</i> Barn Swallow - Pw	29	Least Concern & Palearctic Migrant
LANIIDAE	816 - <i>Lanius minor</i> Lesser Grey Shrike - OM	1	PM Open habitat migrant
MALACONOTIDAE	824 - <i>Malaconotus blanchoti</i> Grey-Headed Bush-Shrike - O	1	Least Concern
MALACONOTIDAE	831 - <i>Tchagra australis</i> Brown-Crowned Tchagra - O	1	Least Concern

MUSCICAPIDAE	713 - <i>Melaenornis edolioides</i> Northern Black Flycatcher - O	1	Least Concern
MUSCICAPIDAE	714 - <i>Bradornis pallidus</i> Pale Flycatcher - O	1	Least Concern
MUSOPHAGIDAE	305 - <i>Crinifer zonurus</i> Eastern Grey Plantain-Eater - f	1	Least Concern
NECTARINIIDAE	784 - <i>Cyanomitra olivacea</i> Olive Sunbird - FF	5	Least Concern
NECTARINIIDAE	787 - <i>Chalcomitra senegalensis</i> Scarlet-Chested Sunbird - f	5	Least Concern
NECTARINIIDAE	808 - <i>Cinnyris venustus</i> Variable Sunbird - f	1	Least Concern
NUMIDIDAE	142 - <i>Numida meleagris</i> Helmeted Guineafowl - G	2	Least Concern
PASSERIDAE	880 - <i>Passer cordofanicus</i> Rufous Sparrow - O	13	R-RR
PLOCEIDAE	897 - <i>Ploceus ocularis</i> Spectacled Weaver - f	2	Least Concern
PLOCEIDAE	908 - <i>Ploceus cucullatus</i> Black-Headed Weaver - O	7	Least Concern
PLOCEIDAE	928 - <i>Euplectes hordeaceus</i> Black-Winged Bishop - O	1	Least Concern
PSITTACIDAE	292 - <i>Poicephalus meyeri</i> Brown Parrot - f	1	Least Concern
PYCNONOTIDAE	562 - <i>Pycnonotus barbatus</i> Common Bulbul - f	21	Least Concern
RALLIDAE	178 - <i>Zapornia flavirostra</i> Black Crake - W	4	Least Concern
RHAMPHASTIDAE	443 - <i>Pogonornis bidentatus</i> Double-Toothed Barbet - f	1	Least Concern
STURNIDAE	872 - <i>Lamprotornis purpuroptera</i> Ruppell's Starling - O	1	Least Concern
VANGIDAE	845 - <i>Prionops plumatus</i> White Helmeted-Shrike - f	1	Least Concern

Table 0-22: Numbers of bird species recorded in the project area

No. of families	No. of genera	No. of species
26	38	41

Table 0-23: Birds and their ecological types

Ecological Type	No. of species
Forest specialists (FF)	1
Forest generalists (F)	1
Forest visitors (f)	13
Wetland/Aquatic/swamp specialists (A)	2
Wetland/Aquatic/swamp Visitors (a)	2
Open habitat or Grassland species (O)	20
Widespread species (W)	3

Black-and-White Mannikin *Spermestes bicolor*, Barn Swallow *Hirundo rustica*, Common Bulbul *Pycnonotus barbatus* and Tambourine Dove *Turtur tympanistria* were the most common species in the project area relative to others. Thirty-four (34), Twenty-Nine (29), Twenty-One (21) and Eighteen (18) individuals respectively were recorded during the survey. On the other hand, one individual each was recorded for 16 species encountered in the project area. These constituted the least common.

Woodland Kingfisher *Halcyon senegalensis* is a common species in a variety of wooded habitats with some trees, especially Acacias, including around human habitation. It prefers drier habitats and can be far from water. It is often solitary but can occur in small groups. Its population size is unknown but it's said to be stable. The northern and southern populations are migratory, moving into the equatorial zone in the dry season.

The Barn Swallow *Hirundo rustica* can be found in farmlands, suburbs, marshes and lakeshores. The IUCN Red List of Threatened Species 2020 considers the Barn Swallow a species of Least Concern due to its extremely large range and global population size of 290–487 million individuals. Barn swallows are gregarious birds and in the absence of suitable roost sites, they sometimes roost on wires and many of them were recorded roosting on wires. The Barn Swallow *Hirundo rustica* are long-distance migrants and individual birds tend to return to the same wintering locality each year.

The Lesser Grey Shrike *Lanius minor* breeds in South and Central Europe and western Asia in the summer and migrates to Africa in early autumn. World population estimated as being between two and a half and nine million individuals. Lesser Grey Shrike *Lanius minor* are spread out over a wide range and the IUCN, in its Red List of Threatened Species, lists the bird as being Least Concern. Population is said to be decreasing.

The Goliath Heron *Ardea goliath* has been categorized as Near-Threatened regionally (R-NT) and the National Red List for Uganda categorizes it as vulnerable (U-VU). Goliath Heron *Ardea goliath* is mainly found in sub-Saharan Africa, with smaller numbers in Southwest and South Asia. The population trend appears to be stable, and hence the species does not approach the thresholds for Vulnerable under the population trend criterion. *Ardea goliath* lives in large rivers, lakes,

estuaries, swamps, marshes, and other freshwater and shallow saltwater habitats. *Ardea goliath* has been evaluated by IUCN as Least Concern because of its vast range and relatively stable, large population. It could potentially be threatened by habitat destruction.

The conservation status of Rufous Sparrow *Passer cordofanicus* has been assessed as a regional responsibility (R-RR).

5.3.6 MAMMALS

A total of 44 sampling points established at the different infrastructure sites and along the supply and distribution network were surveyed for Mammals. Six (6) mammal species belonging to five families and six genera were registered in Mutunda project area. (Table 0-24). Five of the species were reported by the local residents and one was found killed by one person, possibly for meat. One that was found killed is the Gambian Giant Pouched Rat *Cricetomys gambianus*. All the mammals are listed as Least Concern by the IUCN 2020 Red List of threatened species. The project area has been degraded for cultivation and settlement. More mammals can only be compiled through long-term or repeated field survey around the study sites. It was reported that the vervet monkey, Bushpig *Potamochoerus larvatus*, Günther's dik-dik *Madoqua guentheri* and *Papio anubis* Olive baboon used to occur widely in the project area but now are rare.

Table 0-24: List of Mammals registered during the survey.

Habitat type	Fauna species recorded in and around the area	No. Counted	IUCN Red List Status
Cercopithecidae	<i>Chlorocebus pygerythrus</i> Vervet monkey	Reported	Least Concern
Cercopithecidae	<i>Papio anubis</i> Olive baboon	reported	Least Concern
Suidae	<i>Potamochoerus larvatus</i> Bushpig	reported	Least Concern
Bovidae	<i>Madoqua guentheri</i> Günther's dik-dik	reported	Least Concern
Muridae	<i>Rattus rattus</i> Black rat	reported	Least Concern
Nesomyidae	<i>Cricetomys gambianus</i> Gambian Giant Pouched Rat	1	Least Concern



Figure 0-59: A Gambian Giant Pouched Rat *Cricetomys gambianus* found killed for meat

5.4 SOCIO-ECONOMIC BASELINE

5.4.1 POPULATION AND DEMOGRAPHICS

The Mutunda RGC has a total population of 7,839 household living in all the 4 beneficiary parishes of Kakwoko, Alero, Okwece and Nyamahasa as shown in Table 0-25 below. The beneficiary households stand at 21.7% (1,698 out of 7,839) with Alero parish having a highest proportion at 29.3%. There are 12 beneficiary villages namely Popara West, Nanda, Kawiti, Popara East, Nyakagweng, Mutunda A, Mutunda B, Tenam B, Tenam A, Alero A, Alero B and Teyago A as shown in Annex 9.

Table 0-25: Beneficiary & Non-Beneficiary Areas

Sub County	Parishes	4 Beneficiary parishes		Non- Beneficiary		Overall
		Number	%	Number	%	
Mutunda	Kakwokwo	490	20.5	1,904	79.5	2,394
Nyamahasa	Alero	607	29.3	1,462	70.7	2,069
Diima	Okwece	330	22.1	1,160	77.9	1,490
Nyamahasa	Nyamahasa	271	14.4	1,615	85.6	1,886
	TOTAL	1,698	21.7	6,141	78.3	7,839

Implication on ESIA:

By comparison, the proportion of beneficiary of villages within core beneficiary parishes is lower. This implies that there are several villages in need of water but are not covered by the planned distribution network yet they are in urgent need of water. It's obvious that there will be an increase in number of villages demanding for water connections. The increase in water demand

is inevitable. One vivid example is Isunga village near the last end of distribution pipeline at Popara East as shown in **Figure 0-60** below.



Figure 0-60: Isunga trading centre located 4km away from end of pipeline in Popara East village

5.4.2 RURAL-URBAN MIGRATION AND URBANIZATION

There is increasing rural-urban migration evidenced through rapid expansion of human settlements. The driving factors are the increasing refugee population, existence of large scale infrastructural projects like Karuma Hydro Power Dam and other agro-related investments that attract migrant workers and presence of ‘vacant’ lands. The prominent trading centres include Popara West, Mutunda, Teyago and Diima. The survey findings indicated that 47% (47 out of 101) respondent household were located in urban agglomerations that are classified as trading centres.



Figure 0-61: Diima trading centre

5.4.2.1 ETHNIC COMPOSITION

Basing on findings of obtained through Key Informant Interview with Mutunda Subcounty team, the major ethnic groups that are living within the area include the Bachope, Banyoro, Langi, Basoga, Bagisu, Baganda, Banyankore, Banyarwanda, Alur, Kebu, Lugbara, Kenyans, Acholi, Sabiny, Bakiga, Bafumbira and Baluri. The major factors that attract human settlement include availability of fertile soils, grasslands for grazing livestock, inhabited lands in the lower side and River Nile attracting fishing as well as hospitality of the local communities.

Implication on ESIA:

- The project will meet the maximum day demand of 659.92m³ within the 4 parishes that make up Mutunda RGC
- There is increasing rapid expansion of human settlements and mushrooming urban agglomerations evidenced majorly through expansion of hamlets and villages into trading centres with significant trade activities and congested settlements.
- Due to the high demand for clean and safe water, households within the immediate influence zone of the project will likely to access and utilize the same piped water facilities. In the same, it's also likely that the intensification phase will cover additional villages.
- There is need to scale up intensification of line before the year ultimate year 2040.
- The improved access to safe and clean water will contribute to local economic development as an effective strategy for poverty eradication.
- According to the design report, adjustments on the supply system is planned to be expanded in the ultimate year 2040 in consideration of an increasing population within the area.

5.4.3 HUMAN SETTLEMENT & HOUSING

5.4.3.1 HUMAN SETTLEMENT PATTERNS:

The major human settlement patterns as shown in **Figure 0-62**. Below include; a) Compact or Nucleated settlements - this is common in trading centers where large number of dwellings are constructed very close to each other; b) Dispersed / dotted Settlements - here dwellings are located far apart and often scattered / dotted within a given landscape and/or village; c) Linear settlements - this is commonly seen along roads. Its common throughout the project area. The population density (people /km²) is at 123 in Mutunda SC (KDLG, 2020).



Figure 0-62: Settlement pattern of Mutunda trading center

5.4.3.2 DURATION OF SETTLEMENT

Survey findings indicated that 87% (88 out of 101) of the respondents regard themselves as local residents (born in the area). Of these, 68% (60 out of 88) have stayed in the area for more than 5 years. In comparison, 13% (13 out of 101) were self-settlers (Ugandans who migrated from other parts of the country).

5.4.3.3 HOUSING

Survey findings indicates that 43.6% (44 out of 101) households lived in semi-permanent dwellings; 31.7% (32 out of 101) live in temporary dwellings and 24.8% (25 out of 101) lived in permanent dwellings as shown in **Table 0-26** and **Figure 0-63** below.

Table 0-26: Type of dwelling units per parish - Mutunda SC

Type of house /shelter/ space?	Freq.	Percent %
Cement & brick, plastered & Iron roofed (Permanent)	25	24.8%
Mud & wattle / grass (Temporary)	32	31.7%
Not Cement & brick, plastered & grass (Semi permanent)	44	43.6%
Total	101	100%



Figure 0-63: Type of dwelling units per parish - Mutunda SC

Implications: The housing characteristics will influence the demand for domestic connections. It's likely that the need for yard taps may outstrip that for household connections for permanent dwellings given the nature of human settlement, population density and housing characteristics.

5.4.4 EMPLOYMENT AND OCCUPATIONS

5.4.4.1 EMPLOYMENT STATUS

The employment status is categorized as employed, under-employed and unemployed among the working age group (14-65 years). In reference to the International Labour Organization (ILO, 2019), unemployment among the working age group (14-64 years) is categorized as: 1) those without work, not in paid employment or self-employment; 2) those currently available for work (paid employment or self-employment); and 3) those seeking work and have taken specific steps in a specified recent period to seek paid employment or self-employment.

Survey findings indicated that 47% (47 out of 101) of the respondents considered themselves as under-employed; 32% (32 out of 101) as self-employed; 21% (22 out of 101) as unemployed. During stakeholder consultations with Mutunda Sub County Local Government Technical Officers, it was noted that unemployment affects mostly the youth. The major coping mechanism is resort to sports betting, gambling, under-paying casual labour, petty trade, dependency on remittances, water vending, artisanal fishing, commuter motorcycles (a.k.a bodaboda), alcoholism, among others.

5.4.4.2 OCCUPATIONS

Survey findings indicate that 68.3% of the households depend on subsistence farming; 22.8% carry out petty trading; 6.9% engage in transportation business (commuter motorcycle / bodaboda, taxi, lorry); 2% provide service (e.g., salon) as shown in Table 0-27 and Figure 0-64 below.

Table 0-27: Occupations for respondent households

In your view, what is your major occupation?	Freq	Percent %
Subsistence farming	69	68.3%
Petty Trading	23	22.8%
Services	2	2.0%

Transporter (bodaboda, taxi, lorry, etc)	7	6.9%
Total	101	100%



Figure 0-64: Roadside vending in Nanda - Kawiti Trading centre

Implications:

- The project will create jobs in the short, medium and long term across the implementation stages (pre-construction, construction, operation and maintenance). Locals have will be given short term jobs such as trenchers, porters, drivers, plumbers, masons, painters, electricians, as well as indirect employment opportunities. The members of the local community (especially youth and women) will be given short term jobs such as trenchers, porters, drivers, plumbers, masons, painters, electricians.
- It's been noted that other direct jobs could be PSP attendants and Yard Tap owners will also arise. It's not possible to ascertain the number of jobs to be created per category at the time of baseline assessment.
- In addition, there will also be indirect employment opportunities such as selling food stuffs, soft drinks on-site and/or near construction sites.
- There will be reduction and/or total loss of jobs for water vendors especially in Mutunda RGC. However, the project may as well create additional jobs for water vendors in other underserved areas.

5.4.5 POVERTY LEVELS

According to the NDP III 2020/21-2024/25, poverty is a major constraint for both local and national development characterized by persistent vulnerabilities such as zero/no income in both

urban and rural communities (NPA, 2021). Nationally, one indicator of poverty is the 'population (in percentage) below the poverty line of \$1 US Dollar per day. A review of Kiryandongo Sub County 5-years Development Plan (2020/2021 - 2024/2025) indicated that the major poverty conditions affecting communities include lack and/or limited income, food, water and poor housing.

Survey findings indicated that 46.5% (47 out of 101) of the respondents were earning below \$1USD (UGX 3,500/=) per day; 27.7% (28 out of 101) were earning between \$1- 2 USD dollars (UGX 3,500-7,000) per day; 14.9% (15 out of 101) were earning above \$3 US dollars (UGX 7,000 – 10,000/=) per day; 10.9% (11 out of 101) were earning between \$2-3 USD (UGX 10,000/=) per day earn as shown in Annex 9

During stakeholder consultations with communities at Popara West, Teyago and Nyariti, the common poverty conditions at household and community were raised and included the following: a) Complete lack of the means necessary to meet basic personal needs, such as food, water, clothing, lighting, shelter, sanitation facilities (e.g., pit latrine, waste disposal pit, etc); b) Lack / inadequate source of income; c) Lack or scarcity of productive resources, consumer goods; dominance of subsistence production with limited income-oriented agriculture; d) Poor households (where all members aged 5 years+) who have less than two meals a day; e) Lack / Inadequate access to safe water, amidst high incidence and prevalence of water borne diseases; f) Poor quality housing, shelter and limited connectivity to grid; g) Lack of assets (land, house, water tanks, piped water connection, PSPs, etc); h) High rate of unemployment especially among the youth, school dropouts, among others.

Implications:

- The project will positively impact on the achievement of SDG 6 that aims to achieve (Target 6.1) universal and equitable access to safe and affordable drinking water for all by 2030. At national level, GoU aims at increasing access to safe water and sanitation level in rural and urban areas (NDP III, 2020). At district levels, local governments are also endeavouring to increase water coverage.
- It's noticeable that there will be reduction in water poverty levels. In this case, Water Poverty⁵ is defined as manifestation of wide discrepancies in terms of access, availability, and utilization of safe and clean water as well as sanitation and hygiene services (Julie and Johnson, 2013⁶ and Eran and Jonathan, 2002). It also means water scarcity due to physical shortage, or scarcity due to lack of adequate infrastructure, irregular supply and inability to afford payable water services (UN Water, 2021⁷).
- Positively, the utilization of safe and clean water will increase due to ability to afford connections and pay water bills. There will be reduced water insecurity, decrease in vulnerability due to water poverty conditions by making communities more accessible to essential service.

⁵ <https://www.endwaterpoverty.org>

⁶ <http://dx.doi.org/10.1007/s11269-012-0209-8>

⁷ <https://www.unwater.org/water-facts/scarcity/>

- Negatively, the inability to pay will increase the level of substitutability. This means that those who are unable to afford resorting to free and/or cheaper sources within the area.

In a similar way, there is likelihood of using alternative sources that are free and/or cheaper such as open surface water sources (wetlands, rivers) that serve as alternatives in case of inability to afford piped water.

5.4.6 ACCESS TO WATER

By definition, access to safe water is the ratio of people served by a safe water point and piped water supply to the total population, calculated basing on the estimated number of people per water point type (DWD/MWE, 2021). Data provided by Ministry of Water and Environment indicates that access to safe water in Kiryandongo district stands at 71%, with rural access at 77% and urban access at 48%. In Mutunda RGC, access to safe water is at 64% (Uganda Water Atlas, 2021).

5.4.6.1 WATER SOURCE POINTS

A review of MWE / Water Atlas 2021 indicated that that in Mutunda Sub County, there are 152 functional water sources. Of these, 90 are deep boreholes; 50 are shallow wells; 7 are protected springs; 5 valley tanks as shown in Table 0-28 below. In contrast, there are 20 non-functional water sources in Mutunda SC. Of these, 11 are shallow wells; 6 are Rain water harvesting tanks (RWHTs) and 3 are deep boreholes as shown in Table 0-28 below. By **type of technology**, 58% are served by deep borehole; 40% by shallow well; 2% by protected spring and none by rain water harvest. The major reasons for non-functionality are diversely attributed to technical breakdown at 32%; vandalism at 18%; use of alternative sources nearby at 14%; low yield at 18%; non-functioning water and sanitation committees; water quality related at 5% and other unspecified factors at 9% (Uganda Water Atlas, 2021).

Table 0-28: No of Fuctional and Non-Functional Water sources in Mutunda Sub County

Source Points	Functional	Non- Functional	Total
Protected Springs	7	0	7
Shallow wells	50	11	61
Deep boreholes	90	3	93
Rain Water Harvesting Tanks (RWHTs)	0	6	6
Valley Dams	0	0	0
Valley Tanks	5	0	5
PSP / Kiosk, Public Stands	0	0	0
Total	152	20	172

Further to this, the survey findings indicated that 60.4% (61 out of 101) get water from deep boreholes; 35.6% (36 out of 101) obtain water from Open surface water source (ponds, wetlands, River Nile); 4% (4 out of 101) obtain from other sources as shown in Table 0-29 below.

Table 0-29: Water Source points

Main water source?	Freq.	Percent %
Borehole	61	60.4
Open source (unprotected spring, Ponds, Swamps, etc)	36	35.6
Other	4	4.0
Total	101	100



Figure 0-65: A borehole in Mutunda RGC



Figure 0-66: A borehole at Popara West

5.4.6.2 ALTERNATIVE WATER SOURCES

Survey findings showed that 83.2% (84 out of 101) of the households mentioned that they use open surface water sources such as ponds and wetlands as shown in Figure 0-67 below; compared to 16.8% (17 out of 101) who said they also depend on River Nile located 6-7km.

Implications: The level of level of substitutability to payable piped water within beneficiary villages would majorly be influenced by the inability to pay water tariffs and bills. In non-beneficiary area (immediate influence zone), the ability to use alternative open surface water sources is probably high.



Figure 0-67: Women and children collecting water at River nanda



Figure 0-68 Man fetching water from River Nanda

5.4.6.3 DISTANCE TO NEAREST WATER SOURCE POINT

Survey findings indicated that by average, 68.5% (69) of the respondents walk a distance of between 500 meters to nearest water source; 13.7% move a 300-500 meters; 9.9% move 100-300 meters; 5.6% move 50-100 meters and 2.3% move less than 50 m as shown in **Table 0-30** below.

Table 0-30: Distance to nearest water source in Mutunda RGC

Distance to nearest source point	Deep borehole	Protected spring	Unprotected spring	Open source (Ponds, River, lake, etc)	Rain Water tank	Other Sources	Average	
							Freq.	%
Less than 50 meters	2 (2%)	1 (1%)	1 (1%)	2 (2%)	6 (5.9%)	2 (2%)	2	2.3%
50-100 meters	17 (16.8%)	1 (1%)	0 (0%)	6 (6%)	9 (8.9%)	1 (1%)	6	5.6%
100-300 meters	23 (22.8%)	5 (5%)	9 (8.9%)	12 (12%)	4 (4%)	7 (6.9%)	10	9.9%
300-500 meters	30 (29.7%)	16 (16%)	12 (11.9%)	16 (16%)	5 (5%)	4 (4%)	14	13.7%
More than 500 meters	29 (28.7%)	78 (77%)	79 (78.2%)	65 (64%)	77 (76.2%)	87 (86.1%)	69	68.5%
Total (TT Freq=101)	101 (100%)	101 (100%)	101 (100%)	101 (100%)	101 (100%)	101 (100%)	101	100%

Implications: The average distance to a safe water source will be reduced to less than 500 meters within the core villages (through provision of intermediate access to onsite yard taps and PSP), and at least 1km within the influence zone (basic access within 1 km / within 30 min round-trip), as per the WHO standards for drinking water (WHO⁸, 2017).

5.4.6.4 TIME OF COLLECTION AND DURATION AT WATER SOURCE POINT

Collection time: In terms of time for water collection, 49.5% (50 out of 101) households collect in morning hours of between 10.00am and 2.00pm; 41.6% (42 out of 101) households collect between 7.00am-10.00am; 7.9% between 2.00pm-7.00pm; 1% between 5.00am-7.00am as shown in **Table 0-31** below.

Table 0-31: Time for collecting water in MUTUNDA RGC

Time of the day when water for domestic uses is collected most	Kakwoko	Nyamahasa	Total
5.00am-7.00am	1 (1.4%)	0 (0%)	1 (1%)
7.00am-10.00am	33 (46.5%)	9 (30%)	42 (41.6%)
10.00am-2.00pm	31 (43.7%)	19 (63.3%)	50 (49.5%)
2.00pm-7.00pm	6 (8.5%)	2 (6.7%)	8 (7.9%)
Total	71 (100%)	30 (100%)	101 (100%)

⁸ WHO Guidelines for Drinking-water Quality, 2017



Figure 0-69: Boy children at Mutunda RGC after collecting water at 2.00pm

Waiting time: About 60.4% (61 out of 101) households spend at least less than 30 minutes waiting at a water source point; 28.7% (29 out of 101) spend at least 1 hour; 8.9% (9 out of 101) spend at least 2 hours and 2% (2 out of 101) spend at-least between 2-4 hours.

Implications:

The project aims to improve access to water source point, sufficient volumes of good quality water that meet peak demand, as well as year-round service which is uninterrupted. In this case, the burden of going to water source point early in the morning will reduce, since consumers will be assured of reliable and low-cost water at a 24/7 basis. This will directly contribute to other human capital development parameters. Firstly, there will be reduced interference with school reporting time in the morning hence improved school attendance among school going children (boys and girls). Secondly, there will be healthy gains accruing from improved service levels more in terms of sanitation and hygiene promotion. In addition, there is likely to be a reduction to GBV related vulnerabilities that manifests in household heads (esp. men) complaining about their wives and/or children over delaying at water sources.

5.4.6.5 WHO COLLECTS WATER THE MOST

Survey findings showed 89% (89 out of 101) of respondents said all children (boys and girls) below age 17 years take the biggest burden of collecting water compared to 9.9% (10 out of 101) who said it's the women; 2% (2 out of 101) who said men / husband / father. In terms of burden of water collection among the children, 75.3% (67 out of 89) of the respondents said the Girl Child did most of the water collection at home compared to 24.7% (22 out of 89) said it's the Boy Child who carried a heavier burden.

Implications: At household level, the burden of collecting water among the children (girls and boys) has direct influence on development and gender dimensions such as gender inequality, vulnerability and marginalization, exposure to GBV, violence against children (VAC), violence against women and girls (VAWG).

5.4.5.6 AMOUNT OF WATER CONSUMED PER DAY

Survey findings indicate that 30.7% (31 out of 101) use at least 100 litres (5 jerry cans) of water per day; 26.7% (27 out of 101) use 80 litres (4 jerry cans) of water per day; 12.9% (13 out of 101) use 60 litres (3 jerry cans);); 11% use 120 litres (6 jerry cans) per day; 7.9% use 40 litres (2 jerry cans); 6.9% (7 out of 101) use 140 litres (7 jerry cans); 4% (4 out of 101) use 20 litres (1 jerry can) of water per day.

Implications: The project will be able to increase supply of water per capita. At baseline the lowest water use per capita (for all water sources) is at 20 litres reportedly consumed by about 4% of the sampled households. However, the project will provide sufficient and reliable supply of clean and safe water that conforms to the post emergency standard of 20 litres per capita per day (Design Report, 2021). Further still the system will be enough to maximum day demand is between 292.76m³/day for initial year and 659.92m³/day for ultimate year 2046 (Design Report, 2021). In addition, there are measures to ensure reliable supply of quality water. However, the contractor and utility operators will have to ensure that the taste, odour or appearance of supplied water conforms to the consumers' preferences in order to avoid a scenario where system is rejected / abandoned.

5.4.5.7 HOUSEHOLD EXPENDITURE ON WATER

Survey findings showed that 91.1% (92 out of 101) of the respondent households spend \$0.29 USD (UGX 2,000/=) per month as borehole maintenance fees; 6.9% (7 out of 101) pay above \$1 USD (UGX 3,500) and 2% (2 out of 101) spend \$0.57 USD (UGX 2,000/=). In terms of how often communities pay for water, 50.5% pay on monthly basis; 44.6% pay on weekly basis; 5% daily.

Implications: The project will provide water at affordable. The planned cost of accessing water (tariff) at house Connection, Yard Tap, PSP and Part Time Users has been determined at UGX 83/20 litres under NWSC operation areas. However, unlike the house connection, the end user collecting from a PSP and Yard tap will more likely have to pay between \$0.03 – 0.06 USD (UGX 100 – 200/=) per 20 litres jerry can in a single round. In contrast, the cost of water will be higher than the prevailing average monthly cost of \$0.011 USD per day equivalent to \$0.29 USD (UGX 1,000/=) per month (25 days).

5.4.5.8 WILLINGNESS TO PAY FOR PIPED WATER

Survey findings indicate that 78.2% (79 out of 101) of the respondents said YES, they are willing to pay for piped water; 13.92% (14 out of 101) said want free service without paying anything; and 7.9% (8 out of 101) said NO, they are not willing to pay anything.

5.4.5.9 AMMOUT THEY ARE WILLING TO PAY

Survey findings indicated that 53.5% (54 out of 101) of the respondents are willing to pay between \$0.029 USD (UGX 100/=) per jerry can of water of 20 litre capacity; 36.6% (37 out of 101) are

willing to pay \$0.057 (UGX 200/=) and 9.9% (10 out of 101) are willing to pay \$0.088 (UGX 300/=) for same.

Implications: The acceptability and willingness to pay water is among the key determinants of access and utilization of piped water systems. Since a big proportion (53.5%) are willing to pay U\$0.029 USD (UGX 100/=) per jerry can (20 litres), it's certain that the usability will be high because it's within the range of the proposed tariff of UGX 83/20 litres. However, any increase in tariff will impact on water consumption and increase water demand, hence risks of substitutability with free and/or cheaper water sources.

5.4.6.10 ACCESS TO MOBILE PAYMENT METHODS

Survey findings showed that in case paying for water tariffs required use of cash-less payment services (such as Airtel Money, MTN Mobile Money and Mobile Banking services), there are 91.1% (92 out of 101) of the households who have access to mobile money payment services, meaning they can receive, deposit and pay for any transactions e.g. utilities like water; while 8.9% (659 out of 101) don't have.

Implications: It's anticipated that since NWSC is likely to be a utility manager of the system, paying a water bill will be easier for the owners of water connections through use of cash-less mobile money payment services such as Airtel Money, MTN Mobile Money and Mobile Banking services. Note that country wide the water bills charged by NWSC are payable either by cash less payment platforms and/or direct deposit on NWSC bank account.

5.4.5 WATER IN HEALTH CARE FACILITIES

In Uganda, there 33% of health facilities with basic water supply (WHO Global Baseline Report, 2019). According to UNICEF/JMP⁹, Uganda ranks highest in terms of 'Limited' water at HCF at 65.15% in Sub Saharan Africa in terms of indicators on Water in Health Care Facilities (WinHCF). It ranked 6th in terms of having 'Basic' water at 30.81% and 10th rank for having 'No Service'.

There are 2 health facilities (MoH / GoU) namely Diima HC III and Mutunda HC III. All these facilities have on-site water supply i.e. 2 RWHTs with capacity of 10,000 litres. The average water consumption per day is about 140 litres (7 jerry cans). During a KII with Mutunda SC Health Assistant, it was noted that all government owned health facilities have a budget allocation for utilities including water supply. In this case, any additional water supply is welcomed so long as it's affordable.

5.4.6 ACCESS TO WATER IN SCHOOLS

There is high dropout rate for girls attributed to several factors including poor menstrual hygiene facilities at schools as a contributing factor to achieving quality education outcomes. In most of the schools, there is no reliable sources of water, no private rooms, sanitary pads, disposal pits, etc.). Learner and teacher attendance and absenteeism are influenced by environment and socio-economic constraints such as school feeding (food & water); housing; delayed payment; functionality of pit latrine (latrine stance - pupil ratio is at 1:163); availability of adequate

⁹ UNICEF Joint Monitoring Programme (JMP)

menstrual health facilities e.g. water, changing rooms, among others. The World Bank through DRDIP Program has supported Mutunda primary School with steel water harvesting tank. This support is a good gesture of promoting access to water in schools, and the IRMDP will likely to scale-up this effort. There about 3 UPE schools that will directly benefit from piped water supply.

The global target of achieving universal access to basic WASH services in schools by 2030 aims at extending water beyond the household to include institutional settings, such as schools, healthcare facilities and workplaces (UNICEF¹⁰, 2020). It's notable that water in schools has direct impact on education outcomes in primary, secondary and tertiary levels (MOES, 2020). A document review of Mutunda SC Development Plan (2021-2025) revealed that their government aided schools are faced with a high demand of water amidst inadequate water storage facilities.

Survey findings indicated that all 9 schools (with a total enrolment of 7,140 learners) have access to deep boreholes, with an average distance of 50 – 200 meters. Only 2 have functional rain water harvest tanks (RWHTs) as shown in Table 0-32, Figure 0-70 and Figure 0-71 below.

Table 0-32: Status of water sources, storage and capacity at schools in Mutunda RGC

	Name of school	School population (enrolment)	Major Source of water supply	Distance to source (meters)	Jerry cans per day	Litres per day	Cost month	Functional RWHTs	Capacity in Litres	Functional Pit Latrine
1	Kakwokwo P/S	871	Borehole	Onsite	20	400	1,000	0		YES
2	Isunga P/S	921	Borehole	1km	25	500	1,000	0		YES
3	Kawiti	578	Borehole	200	14	280	1,000	1	10,000	YES
4	Kawiti Nursery & P/S	387	Borehole	300	10	200	1,000	0		YES
5	Nyamahasa P/S	1,203	Borehole	100	40	800	1,000	0		YES
6	Mutunda P/S	1,321	Borehole	100	35	700	1,000	4	20,000	YES
7	Nanda P/S	875	Borehole	50	20	400	1,000	0		YES

¹⁰ <https://gdc.unicef.org/resource/drinking-water-sanitation-and-hygiene-schools>

8	Nyakagweng PS	984	Borehole	100	25	500	1,000	0		YES
9	Alero PS	788	Borehole	100	20	400	1,000	0		YES
	Total	7,140			209	4,180	8,000	5	30,000	



Figure 0-70: Steel water tanks at Mutunda primary School



Figure 0-71: RWHT at Kakwokwo P/s (Standing is LC 3 Chairperson of Mutunda SC)

Implications: There is need for more institutional connections in 9 schools as well as water storage facilities. The availability of water at school has a direct influence on a number of educational outcomes such reduction in school dropout rate; school feeding among others. The actual baseline values for education outcomes was not possibly obtained from Kiryandongo District Education Office at time of ESIA.

5.4.7 HUMAN NUTRITION (FOOD AND DRINKING WATER)

It should be noted that safe drinking water is essential for their health and survival, and drinking unsafe water can increase incidence and prevalence of water related diseases. In Mutunda RGC, the deep boreholes are the major sources of drinking water (ESIA/WASH Survey, Nov 2021). However, 69.3% (70 out of 101) DON'T boil water on daily basis; 10.9% boil on weekly basis; 8.9% boil on daily basis as shown in **Annex 9**.

Method of water treatment: 78% (78 out of 101) treat water for drinking using indigenous methods such as smoking and other methods such as water tablets; 22% boil using firewood.

Implications:

It should be noted that safe drinking water is essential human nutrition and health. Drinking unsafe water can increase incidence and prevalence of water related diseases. The project will directly contribute to increase in access to water which is easily treatable for drinking. However, there is need to promote the use of energy saving stoves that can be used in reducing the cost per capita on charcoal and firewood used in boiling water and cooking food. The increase in access and utilization of energy saving stoves will also have directly contribute to sustainable environmental management of water catchments.

5.4.8 WATER FOR PRODUCTION

The demand for water for production especially crop irrigation is increasing, amidst limited efforts on providing adequate sources e.g. valley dams and valley tanks. Majority of farmers rely on rainfall, whose patterns are changing due to climate variability. Drought and dry spells are major barriers to agricultural production and productivity, and in turn affect livelihoods especially water stress and insecurity. This is causing conflict over the limited water resources. With an increasing influx of cattle keepers in the area, there is great demand for water for production (crop and animals). Livestock is driven to any nearest open water sources, and many times herdsmen take livestock to boreholes. The severity of water scarcity is causing human migrations to water catchments such as swamps (**Figure 0-72**).



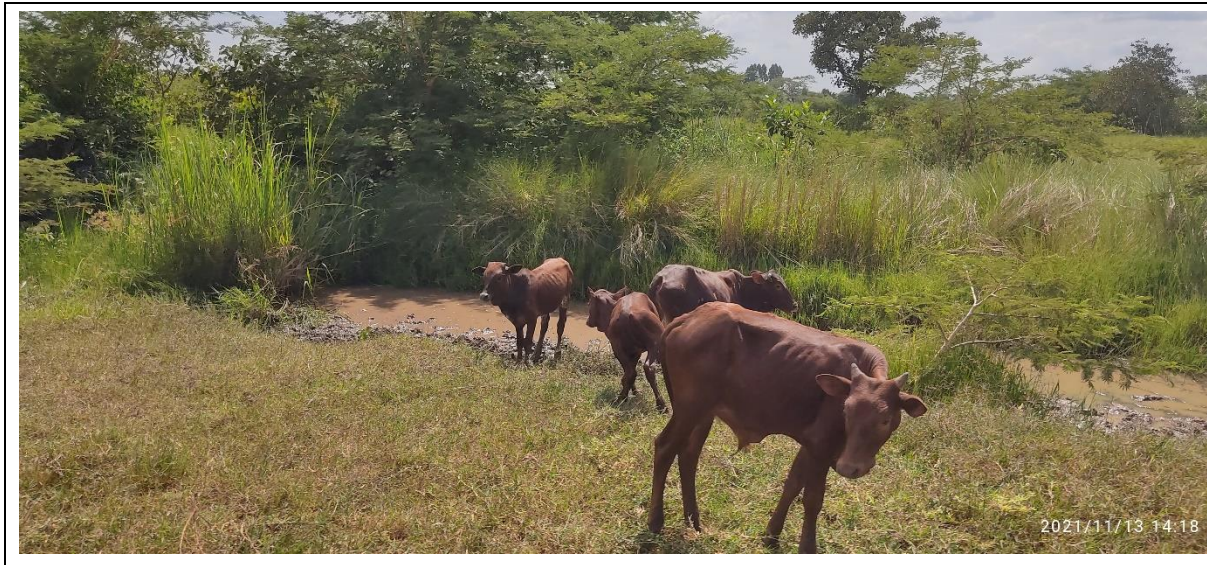


Figure 0-72: Cattle taking water from swamp along Mutunda-Diima road

5.4.8 SANITATION AND HYGIENE

5.4.8.1 PIT LATRINE COVERAGE

Pit latrine is critical sanitation facility within the households and community, and it has direct influence on the water, sanitation and hygiene (WASH). There is low latrine coverage in Mutunda SC. The common structures are uncovered and poorly constructed (**Figure 0-73**).



Figure 0-73: Poor pit latrine in Mutunda RGC

5.4.8.2 SHARING PIT LATRINE

Survey findings indicated that 21.8% (22 out of 101) share pit latrine with neighbours with a highest number being in Kakwoko parish at 23.9%. Overall, 78.2% (79 out of 101) don't share latrine as shown **Annex 9**.

5.4.8.3 OPEN DEFEICATION

There is significant evidence of open defecation especially in shrubs, roadside, crop fields and wetlands reported by at-least 51.5% (52 out of 101); 34.7% (35 out 101); 13.9% (14 out of 101) as shown in **Annex 9**.

5.4.8.4 PUBLIC TOILETS

There is no public toilet in Mutunda RGC. Survey findings indicated that 51.5% (52 out of 101) of respondents support construction of public toilet (they said YES) while 48.5% (49 out of 101) say NO, that public toilet is not relevant. Nyamahasa parish had the highest proportion that said YES at 66.7% as shown in **Annex 9**.

5.4.8.4 LINE PIT LATRINES

There is no evidence of any existing line pit latrine within Mutunda RGC. These are cemented pit latrines that make it possible for easy emptying as well as lowering the risk of underground water contamination (Yvonne, L. et al 2016¹¹). Many of the local governments have started to realize the importance of Line Pit latrines, with most of the piloting in schools, markets, health facilities.

5.4.8.5 WATERBORNE TOILETS AND SEPTIC TANKS

Survey findings indicated that there is no entity (household and/or institution) that utilizes water borne toilets and septic tanks within Mutunda RGC. It was revealed that increased access to piped water may stimulate the adoption of waterborne toilets.

Implications:

- The planned new distribution system will influence the adoption and use of water flush toilets and septic tanks.
- The adoption and/or diffusion of flush toilet system as an innovation may be slow due to several barriers at household level.
- The major anticipated challenges during operation would include risk of water shortages, blockages, high costs of maintenance (conventional emptying techniques e.g. use of cesspool trucks), poor user behaviours (e.g. use of bulk materials for anal cleansing) among others.
- In case there are conditionality of first having a functional toilet facility, then there will be an increase in construction of pit latrines in order to meet the eligibility criteria for connection. In this case its latrine coverage will increase.
- The MWE and local governments can influence the modification the redesigning of pit latrine and enforce it as well. The modified design can be that of lined pit latrine aimed at minimizing the level of contamination of underground water. This is supported by a study conducted by NCBI in 2013. It revealed that there is increasing concern about contamination of underground water due to discharges of chemical and microbial contaminants from pit latrines that in end negatively affect human health (NCBI, 2013¹²). Findings further show that although concentrations of most faecal microorganisms

¹¹ African Journal of Environmental Science and Technology; Full Length Research Paper on Modeling sludge accumulation rates in lined pit latrines in slum areas of Kampala City, Uganda

¹² <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3673197/>

decline after excretion, these microorganisms may still impair groundwater quality. The study measured faecal indicator bacteria, including total coliforms, faecal coliforms, and *Escherichia coli* (previously known as *Bacillus coli*), which can affect underground water quality (Wade et al. 2003).

- In similar way there will be an increased uptake / adaptability and usability of flush toilets and other types of water borne toilets at household and institutional levels.
- It's also anticipated that there may be deliberate emptying of faecal sludge into storm drainage and swamps, consequently leading to environmental and health-related risks.
- In order to improve adaptability, the local governments should regulate the construction of flush toilets and septic tank by inspections, enforcement and dissemination of construction specifications, and training of local masons and plumbers by contractors, IRWMD/MWE and local government.
-

5.4.8.6 HAND WASHING

Within Mutunda RGC, only 7% (7 out of 101) households have hand washing facilities with water and soap, while 93% (94 out of 101) don't have such facilities.

Implications: Hand washing is a key parameter of community and personal health. It's dependent on accessible and sufficient water supply. The high coverage of hand washing facilities at households is attributed to enforcement of Covid-19 SOP for communities and household. However, the cost of water and soap hindered their proper utilization. The project will contribute positively to hand washing.

5.4.8.7 WASTE MANAGEMENT

There is no designated landfill in Mutunda RGC. On same note, there are no known farmers who use compost as soil conditioner in their gardens. At household and community level, the common method of solid waste disposal is by throwing in garden, roadside, wetland, collection points, gunny bags among others.

Implications: In order to maximize the benefits of piped water, there is need to ensure proper waste management practices that minimize risks of environmental degradation, human disease and contamination at point of collection and storage at household, institutional and community levels. In future, there is need to demarcate dumping area for solid waste as well as utilize service providers for waste water management (e.g. cesspool).

5.4.8.8 ORDINANCES AND BYLAWS ON WASH

There is an ordinance passed by Kiryandongo district local government and Bylaw passed by Mutunda Sub County local government. Findings of the mini-survey conducted during the ESIA study indicated that 51.5% (52 out of 101) of the households are aware about ordinance & bylaw on water, sanitation & hygiene (WASH) passed by local government units (higher and lower LGs); 48.5% (49 out of 101) are not aware about the ordinances and bylaws on WASH.

Implications: The operation and maintenance of solar piped water system may invoke local governments and refugee administration units to enforce and/or pass new laws and regulations

regarding eligibility of connections, operation and maintenance. The local governments are mandated to enforce against poor water, sanitation and hygiene conditions. At Lower LG level, this function is done by the Health Inspectors, Town Agents and Parish Chiefs.

5.4.9 DISEASE BURDEN

Within Mutunda RGC, the catchment population served by Diima HC II and Mutunda HC III is affected by both communicable and non-communicable diseases, whose incidence & prevalence is partly attributed to poor water, sanitation and hygiene (WASH) conditions.

5.4.9.1 WATER RELATED DISEASES

The World Health Organisation (WHO) notes that water related diseases encompasses diseases and illness resulting from both direct and indirect exposure to contaminated water, whether by consumption or by skin exposure. These includes disease due to waterborne or water-associated pathogens and toxic substances (WHO, 2014). It also includes illness and diseases related to vectors with part of their life cycle in water habitats; and disease related to inhalation of contaminated water aerosols, as well as contamination during adverse climate events (Stanwell, R.S¹³, 2020). It notable that constraints related to safe and clean domestic water supply, access and utilization are directly linked to Incidence and Prevalence of water related diseases. These waters related diseases are both communicable and non-communicable.

A review of Kiryandongo DLG/DHO/HMIS2 data for 2020-2021 indicated that Malaria had the highest prevalence at 74%; cough or cold (no Pneumonia) at 51.3%; Intestinal Worms at 11.2%; Viral gastroenteritis at 7.2%; Skin diseases (Scabies) at 6.5%; Diarrhea at 5.3% as shown in Table 0-33 below. During community consultations at Nyariti trading centre, the herdsmen pointed out that they face risks of water borne diseases especially bilhazia because when in the bush they drink from any open surface water source that are prone to contamination. *NOTE: Disease Incidence refers to the number of new cases in a period of time usually one year. Disease Prevalence refers to the proportion of individuals who have an illness or condition at any moment over total number examined (WHO, 2004).*

¹³Royal Institute of Public Health, 2020; <http://www.eolss.net/sample-chapters/c03/e2-20a-01-01.pdf>

Table 0-33: Prevalence rate of Water related diseases in Mutunda RGC (Catchment area of Diima HC III and Mutunda HC III)

Category of water related Diseases	Description	Risk & Exposure factors	Reported Diseases & illnesses	Prevalence Rate (Source: Kiryandongo DHO/HMIS, 2020-2021)					
				Year 2020		Year 2021		Overall (Years 2020-2021)	
				Freq	%	Freq	%	Freq	%
Waterborne microbiological diseases	Diseases related to consumption of pathogens consumed in water; most due to human or animal faecal contamination of water	Ingestion of food, water, drink, or another substance into the body by swallowing or absorbing it	Cholera	0	0	0	0	0	0
			Typhoid fever	922	12	590	9	1,321	9
			Intestinal Worms	1,271	11.6	8.9	944	2,215	11.2
			Diarrhea	596	5.4	6.1	461	1,057	5.3
			Dysentery	No data	No data	No data	No data	No data	No data
Waterborne chemical diseases	Disease related to ingestion of toxic	Drinking contaminated water	No reported case	0	0		0	0	0

	substances in water								
Water hygiene diseases	Diseases whose incidence, prevalence or severity can be reduced by using safe (clean) water to improve personal and domestic hygiene	Contaminated water used for washing / personal hygiene	Skin diseases (Scabies)	808	7.4	4.2	474	1,282	6.5
			Trachoma	No data	No data	No data	No data	No data	No data
Water contact diseases	Caused by skin contact with pathogen infested water or with chemical contaminated water	Contaminated open surface / fresh water sources	Schistosomiasis (Bilharzia)	No data	No data	No data	No data	No data	No data

Water vector habitat diseases	Diseases where vector lives all or part of its life in or adjacent to a water habitat	Rivers, Streams, wetlands, bushes; Small collections of stagnant water e.g., water butts	Malaria (mosquitoes)	7,683	70	6,560	74	14,682	74
Excreta disposal diseases	Diseases related to unsanitary disposal of human waste (faeces and urine)	Diseases related to human / animal waste in drinking water; (ii) diseases related to direct/ indirect contact with faeces/ urine	Faecal-oral infections - Trachoma	No data	No data	No data	No data	No data	No data
Water aerosol diseases	Diseases related to respiratory transmission, where a water aerosol airway	water containing suspended pathogens enters residential buildings; (ii) raw water sources	Viral gastroenteritis	664	6.0	771	9	1,435	7.2
		Overall OPD Utilization Rate / Clients		10,976	55.3	8,865	44.7	19,841	

Implications: The project will contribute to reduction in incidence and prevalence of water related diseases and illness which can be avoided through

- a) Supplying sufficient quantities of clean drinking water;
- b) Good personal and food hygiene conditions and practices
- c) Hygienic excreta evacuation
- d) Ingestion of boiled food and water, uncontaminated drinks, or substance into the body by swallowing or absorbing it
- e) Malaria vector control methods such as using mosquito nets, cleaning physical environment (proper waste management practices).

However, the provision and access to safe and clean water, may not entirely translate into reduced disease burden in short run. Therefore, measuring attribution of water supply to reduction in disease burden is outside the scope of this baseline assessment.

5.4.9.2 HIV/AIDS AND STIS

By national comparison, the Mid-West region (covering project area), had an HIV/AIDs rate at 5.1% among the adult age 15-64 years by 2017 slightly lower than in rural areas at 5.8% in Central 1 region (UPHIA, 2017¹⁴). At national level, the prevalence of STI (active syphilis) is higher among rural residents at 2.3% compared to 1.6% in urban areas (PHIA, 2017). The ART initiation rate is at 88% with 46.5 % having HIV positive Individuals with presumptive TB (UPHIA, 2017).

A review of Kiryandongo DLG/DHO/HMIS2 data for 2015-2021 indicated that within the last seven years, the HIV prevalence rate lowered from 10% in 2015 to 2% in 2021 within the Mutunda RGC as shown in Figure 0-74 below and Annex 9.

Table 0-34: HIV Prevalence in Beneficiary Areas between 2015-2021

HIV Prevalence in Beneficiary Areas between 2015-2021							
Sub County & Town Council	2015	2016	2017	2018	2019	2 020	2021
Mutunda SC (Mutunda RGC)	10%	4%	3%	3%	4%	3%	2%
Kiryandongo District (Overall)	5%	5%	3%	4%	4%	3%	3%

¹⁴ Uganda Population-Based HIV Impact Assessment - https://phia.icap.columbia.edu/wp-content/uploads/2019/07/UPHIA_Final_Report_Revise_07.11.2019_Final_for-web.pdf

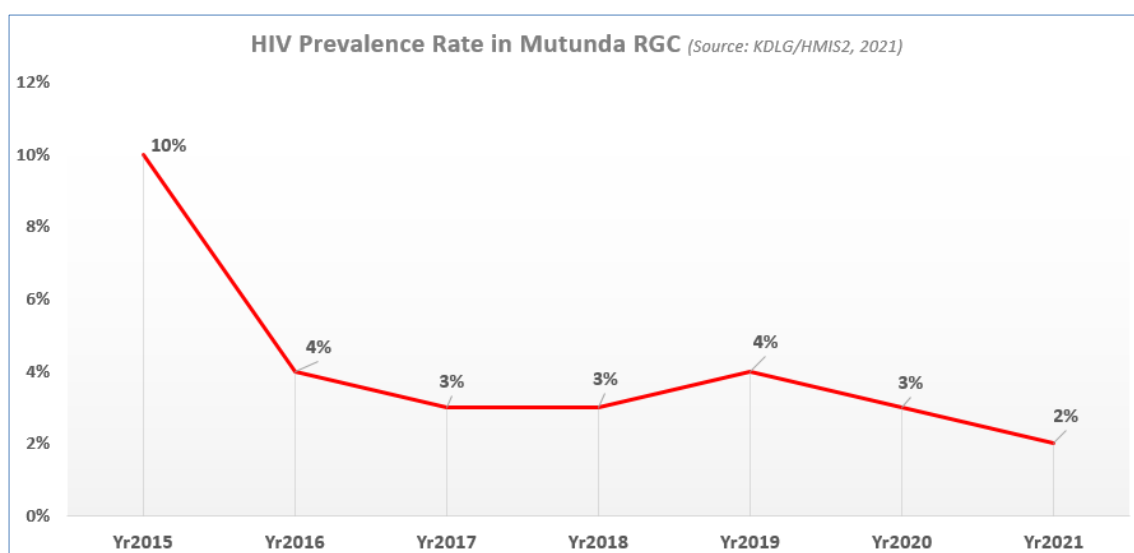


Figure 0-74: HIV Prevalence in Beneficiary Areas between 2015-2021

5.4.9.3 STIs AND OTHER RELATED CONDITIONS

According to World Health Organisation, sexually Transmitted diseases are spread predominately through unprotected sexual contact. These STIs include Genital Herpes, Chlamydia, Gonorrhea, Syphilis, HIV/AIDs and Human Papillomavirus Infection (WHO, 2021). A review of Kiryandongo DLG/DHO/HMIS2 data for 2020-2021 indicated that there was a high prevalence rate for Urinary Tract Infections (UTIs) at 9.5%; Pelvic Inflammatory Disease (PID) was at 1.2%; STIs was at 0.5%; as shown in Table 0-35 below.

Table 0-35: Prevalent STIs & related conditions within Mutunda RGC (2020-2021)

Prevalent STIs & related conditions	Risk Factors	2020		2021		OVERALL	
		Freq	%	Freq	%	Freq	%
STIs due to SGBV	Exposure of urethra to bacteria due to unprotected sexual contact exacerbated by GBV	0	0.0	0.0	0	0	0.0
STIs	Unprotected sexual contact	63	0.6	0.8	33	96	0.5
Urinary Tract Infections (UTI)	Exposure of urethra to bacteria due to unprotected sexual contact	873	8.0	9.0	1,008	1,881	9.5
Pelvic Inflammatory Disease (PID)	Exposure to STIs	139	1.3	2.2	98	237	1.2
STIs due to SGBV	Exposure of urethra to bacteria due to unprotected sexual contact exacerbated by GBV	0	0.0	0.0	0	0	0.0

5.4.9.4 DRIVERS OF INFECTIONS (HIV/AIDS & STIS)

During the key informant interview with District Health Officer (DHO) it was revealed that the major driver of infections are majorly a) risky sexual behaviours such as having unprotected sexual intercourse, including early sexual debut, multiple sexual relationships, limited and inconsistent condom use; b) rampant transactional, cross-generational and sexual activities; c) poor attitudes such as stigma; d) limited awareness about personal and/or partner HIV & STI status; e) high prevalence of sexually transmitted infections and diseases (STI/Ds); f) low utilization of antenatal care (ANC) and delivery services such as PMTCT; g) low uptake of safe male circumcision (SMC) services; h) sub-optimal scale-up of ART; i) gender inequalities including gender-based violence (GBV) exacerbated by alcohol drinking; j) exposure to risk due to effects of Covid-19 lockdown especially among young girls (adolescents and youth).

5.4.9.5 MOST AT RISK POPULATIONS

During the key informant interview with District Health Officer (DHO), it was revealed that the Most At Risk Populations (MARPs) include school going age children, adolescents, traders (transiting outside project area), bodaboda riders, Bar and lodge attendants, married couples, sex workers, migrant workers, transit traders, casual labourers, rural-urban migrants, HIV+ve persons and migrant cattle keepers.

5.4.9.6 HIV & STIS TESTING

Survey findings revealed that 43.6% (44 out of 101) of the respondents had Never taken an HIV test in the past 12 months compared to 30.7% (31 out of 101) who said YES; 25.7% (26 out of 101) said they can't not test due to fear.

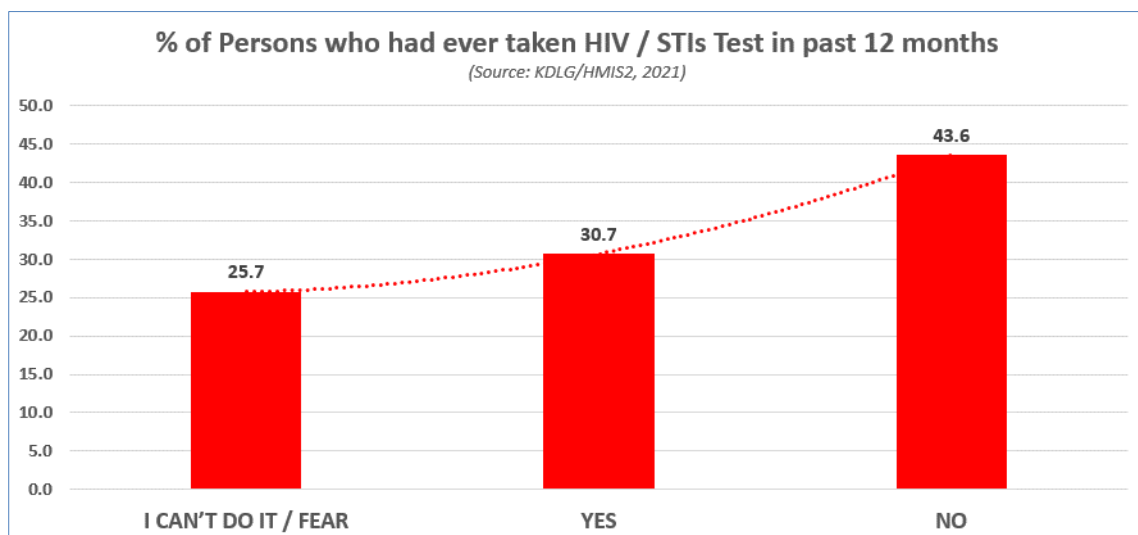


Figure 0-75: Number of Persons who had ever taken HIV / STIs Test in past 12 months

5.4.9.7 COVID19 PREVENTION

During the FGDs with Mutunda SC leaders, it was revealed that Covid19 pandemic had impacted on the communities both directly and indirectly. In terms of level of satisfaction in regard to Covid19 response by government, survey findings indicated that 69.3% (70 out of 101) of the

respondents said the measures were Satisfactory; 6.9% (7 out of 101) said Not Satisfactory; 21.8% (22 out of 101) said Highly Satisfactory and 2% (2 out of 101) said Not Sure as shown in **Table 0-36** below.

Table 0-36: Rating community readiness towards prevention of Covid19 in Mutunda RGC

Community readiness towards prevention of covid19	Frequency			Percentage %		
	Kakwoko	Nyamahasa	Total	Kakwoko	Nyamahasa	Total
Highly Satisfactory	18	4	22	25.4%	13.3%	21.8%
Satisfactory	45	25	70	63.4%	83.3%	69.3%
Not satisfactory	7	0	7	9.9%	0%	6.9%
Not sure	1	1	2	1.4%	3.3%	2%
Total	71	30	101	100%	100%	100%

Implications:

The risk of HIV/AIDs, STIs and Covi-19 spreading is predictively possible especially during construction phase due to population influx especially of workers, and locals. It's a requirement to have in place the following:

- HIV/AIDS workplace policy that emphasizes no-discrimination and/or stigmatizing HIV+ve workers, and allowing them to access ART services.
- Contractor procuring a nominated HIV service provider - condoms, VCT, male circumcision, HIV testing, BCC / IECs materials by contractor and service provider such as Kiryandongo Hospital and other community outreach service providers.
- Provide Voluntary counselling and testing (VCT) among worker and communities
- Provide condoms.
- Ensure adherence to Covid-19 prevention especially hand washing, wearing masks, among others.

5.4.10 TRANSPORT AND ROAD SAFETY

Transport services in the RGC comprise of trucks, pickups, motorcycles (bodaboda) and bicycles. According to the Kiryandongo Police Station, the most common means of transport are bicycles and motorcycles, and the most common accidents are motorcycle accidents. There has been an increasing trend in Road Traffic Accidents in Kiryandongo District as captured by the HMIS, mainly occurring on the Kampala-Gulu highway.

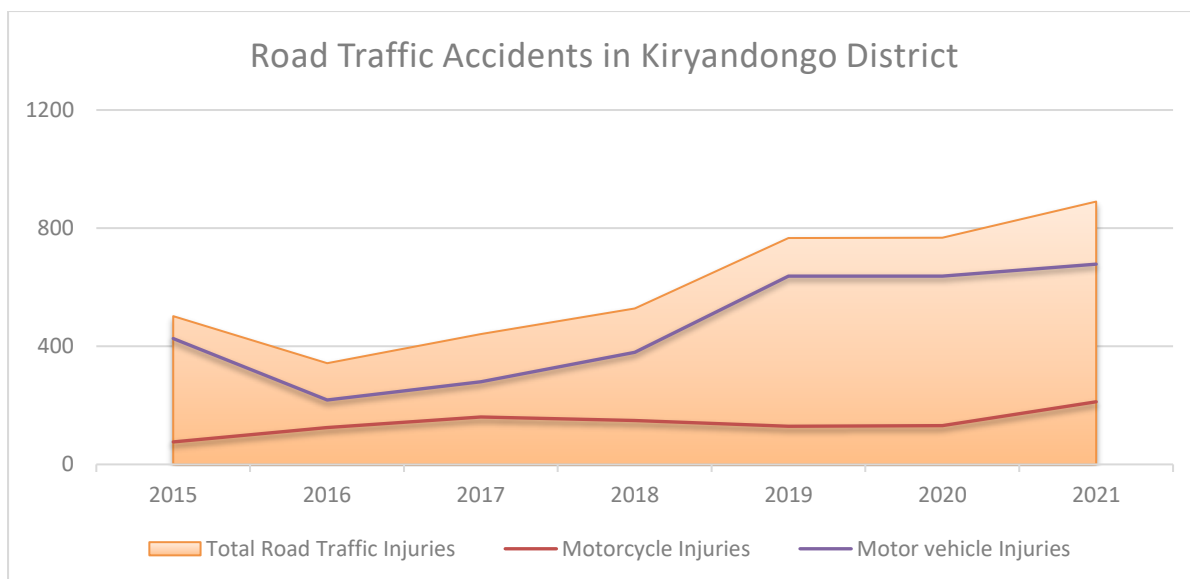


Figure 0-76: Road Traffic Accidents in Kiryandongo District From 2015 - 2021

Implications: Pipe laying for the project will follow the road reserve and while crossing busy trading centres such as Mutunda, Kawiti and Te-yago, the pipes will cross the main road, hence affecting the flow of traffic. The contractor needs to develop a traffic management plan to manage their fleet and traffic along the road during the digging and laying of pipes.

5.4.11 EMERGENCY PREPAREDNESS

5.4.11.1 MEDICAL FACILITIES

For the two water sources and Mutunda trading centre, the nearest health facility is Mutunda Health Centre III. Mutunda HCIII provides both inpatient and outpatient medical services. When patients require further attention and/or more specialised medical care, they are referred to Kiryandongo Hospital. Kiryandongo Hospital is equipped with ambulances unlike Mutunda HCIII.

5.4.11.2 FIRE READINESS

Kiryandongo district lacks a fire station, a situation that has made it difficult for the Authorities to respond to fire outbreaks and fire-related emergencies in time. According to the District Police Commander, the nearest fire station is the one in Masindi, about 30km away, serving the district and big factories like Kinyara Sugar Works Ltd.

5.4.12 LAND TAKE AND ACQUISITION

During project construction, the project developer, MWE, intends to mostly use road reserves of the existing public roads which are government land for the transmission and distribution lines. The ESIA assessed the conditions of sites, consulted the land owners to confirm whether they consent to offer the land. The risks and challenges related to land acquisition were assessed in relation (relocation, loss of residential land, or loss of shelter), economic displacement (loss of land, assets, or access to assets leading to loss of income sources or other means of livelihood); alternative sites and possibility of land conflicts.

However, the water source site, access roads and storage reservoir sites shall be located on private land whose owners will be engaged MWE in the process of land acquisition in accordance with the land act and World Bank Environmental and Social safeguard policies as well as relevant national laws. According to the RAP (2022), the project will require a permanent land take and an easement corridor (Table 0-37) from a total of 480 PAPs.

Table 0-37: Project Land Takes

Infrastructure	Site location	GPS Coordinates	Land uptake sq.m	Original Land Size	Land cover/use	Land owner	Remarks on site conditions
Borehole DWD 77379 Access Road	Popara West village, Nyamahasa parish		978m ² (163m long, 6m wide)			C/o LC 1 Popara West-Olacha Vincent 0787878811	Need to engage neighbouring Kisula Village - LC 1 Chairman, Bahemuka Bosco 0773474542
Borehole Pump Station DWD 77379	Popara West village, Nyamahasa parish	36N 420071 mE, 230567 mN	900m ² (30m square)	15 acres	Farming (Trees)	C/o LC 1 Popara West-Olacha Vincent 0787878811	Need to engage neighbouring Kisula Village - LC 1 Chairman, Bahemuka Bosco 0773474542
Popara West Reservoir Tank	Popara West village, Nyamahasa parish	36N 415137 mE, 226916 mN	900m ² (30m square)	100 acres	Farming (Maize)	C/o LC 1 Popara West-Olacha Vincent 0787878811	Need to engage neighbouring Kisula Village - LC 1 Chairman, Bahemuka Bosco 0773474542
Popara West Reservoir Access Road	Popara West village, Nyamahasa parish		252m ² (42m long, 6m wide)			C/o LC 1 Popara West-Olacha Vincent 0787878811	Need to engage neighbouring Kisula Village - LC 1 Chairman, Bahemuka Bosco 0773474542
Borehole DWD 77378 Access Road	Mutunda B, Kakwokwo parish		876m ² (146m long, 6m wide)			Byansi Geoffrey Adama Idi	0779767772 0788822233
Borehole Pump Station DWD 77378	Mutunda B, Kakwokwo parish	36N 423140 mE, 230549 mN	900m ² (30m square)	30 acres		Dawoko Paul c/o James Molo (Son)	Can be contacted through VHT Tonny Odel 0774918121
Booster Station and Sump	Nanda-Mutunda, Nyamahasa parish	36N 422183 mE, 231236 mN	900m ² (30m square)		Farmin (Maize)		

Infrastructure	Site location	GPS Coordinates	Land uptake sq.m	Original Land Size	Land cover/use	Land owner	Remarks on site conditions
Booster Station and Sump Access Road	Nanda-Mutunda, Nyamahasa parish		60m ² (10m long, 6m wide)				
Alero B Reservoir Tank	Alero B, Nyamahasa parish	36N 419057 mE, 236711 mN	900m ² (30m square)	3 acres	Farming (Trees)	Lovis Toffa (Neighbour - Moses Ematog 0760292592)	Can be contacted through LC 1 Chairperson 0786040520
Alero B Reservoir Access Road	Alero B, Nyamahasa parish		534m ² (89m long, 6m wide)			Lovis Toffa (Neighbour - Moses Ematog 0760292592)	Can be contacted through LC 1 Chairperson 0786040520



Figure 0-77: Caretakers of land for source 2 Mutunda B

5.4.13 PHYSICAL CULTURAL RESOURCES (PCR)

The physical cultural resources (graveyard) encountered were located 30 meters away from to the proposed sites for Alero B Reservoir Tank and Alero B Reservoir Access Road. These graveyards (**Figure 0-78**) are seated on land owned by woman called Lovis Toffa at Alero B village. Implication: In addition, there are significant cultural heritage attached to older-trees (**Figure 0-79**) along Mutunda-Alero B Transmission & Distribution lines that the community wants to be spared (not cut down during trenching).



Figure 0-78: PCR - Graveyards adjacent to proposed site for Alero B Reservoir tank & access road



Figure 0-79: Older trees along T/D-Lines that community attach cultural heritage/ value

5.4.14 GENDER, VULNERABILITIES AND MARGINALISATION

In order to obtain baseline conditions, a gender analysis was conducted within the project area. It assessed the roles of female and males, and their access to and control of resources related to water supply and utilization; relation and power (decision making); benefits and the constraints they face. The assessment involved data collection using survey questionnaire; direct observation; KII; FGDs while integrating gender activity profiles; gender access, control and benefits profiles. Gender, as a social construct of roles, behaviour, activities and attributes considered appropriate and ascribed to men and women, has direct linkage to water, sanitation and hygiene.

5.4.14.1 GENDER ROLES & DECISION MAKING

Gender Roles: Survey findings showed 89% (89 out of 101) of respondents said all children (boys and girls) below age 17 years take the biggest burden of collecting water compared to 9.9% (10 out of 101) who said it's the women; 2% (2 out of 101) who said men / husband / father. In terms of burden of water collection among the children, 75.3% (67 out of 89) of the respondents said the Girl Child did most of the water collection at home compared to 24.7% (22 out of 89) said it's the Boy Child who carried a heavier burden. During a meeting with women group at Mutunda SC, it was revealed that children especially girl child (Figure 0-80 and Figure 0-81) and women bear the heavy burden of collecting water, moving long distances (not matter whether conditions – dry or rainy conditions), loss time and not paid for the work done.



Figure 0-80: Adolescent female going to collect water using a bicycle in Mutunda RGC



Figure 0-81: Girl and Boy Children collecting water in Mutunda RGC

Household Decision Making: Survey findings indicated that 61.4% (62 out of 101) of the respondents said that decisions making related to purchasing household items are major done by BOTH man and women (husband and wife); 30.7 % (31 out of 101) said its mostly by men / husbands; 7.9% (8 out of 101) said women especially when they both married, single, widow, divorced or separated as shown in Annex 9.

Implications:

In all the village communities. Gender socialization is a cultural norm and practice, where girls and boys, women and men learn social roles based on their sex, which leads to different behaviours and creates differing expectations and attitudes by gender. This done by all major socialization agents namely at family, community, school, religion, media. The effect of the gender socialization is that it creates gender stereotypes that are commonly related to water. The most profound one is that girls and women do more household chores, such as fetching water, cooking and cleaning. It's notable that the project will likely not reverse the above gender socialization processes and gender stereotypes. However, it will contribute to the following:

- Improve access to safe and clean water with sufficient volumes to meet household needs (especially drinking, cooking, washing), hence lessening the burden of water collection in case of frequent shortages.
- Reduce the burden of moving long distances to collect water.
- Provide a reliable and year-round service supply of water even during peak hours, days, and seasons.
- Provide quality clean and safe water, with no contaminants that exposes women, men, boys and girls to diseases and illnesses.
- Improved levels sanitation and hygiene (household and personal hygiene)

5.4.14.2 ACCESS, CONTROL AND OWNERSHIP OF RESOURCES

A gender access, control and benefits profile (Table 0-38) was used during a meeting with women group at Mutunda SC (Figure 0-82). The purpose was to assess ownership, access, control and benefits of household and community assets related to WASH.

Household Assets: Findings showed that land is mainly controlled by men, though with equal access and benefits for all family members (women, men and children). In some households, women also have control and ownership over land. The water collection items (e.g. jerry cans, buckets) are accessed by all, controlled majorly by women, children and benefits to all. In terms of common transport means to water source, the men mainly control bicycles, with equal access and utilization to all women and children as well as benefits as seen in Figure 0-83. Both men and women have access to money because each of the genders in many households has ability to work, earn, save and/or remittances. However, men have an upper hand over money than women.

Community Resources: In terms of community resources, the deep boreholes are mainly controlled by both men and women who compose the water user committees. All genders have equal access and utilization for roads, open surface water points (e.g. River Titi, Siriba Wetland and River Nile). Both women and men equally participated in the construction of 2.2 km Kalwala-Mirima Community community access roads. However, decisions on repair and maintenance of road, boreholes and mini water system are majorly done by Local Governments dominated by men.

Table 0-38: Access, Control and Benefits Profile for water related household assets and community resources in Mutunda RGC

Household assets / Resource	Access & Utilization				Control & Ownership				Benefits			
	Men	Women	Boys	Girls	Men	Women	Boys	Girls	Men	Women	Boys	Girls
Land	✓	✓	✓	✓	✓✓	✓			✓	✓	✓	✓
Water collection items e.g. jerry cans, buckets	✓	✓	✓	✓	✓	✓✓	✓	✓	✓	✓	✓	✓
Household Utensils e.g. cups, plates	✓	✓	✓	✓	✓	✓✓			✓	✓	✓	✓
Bicycles	✓	✓	✓	✓	✓✓	✓			✓	✓	✓	✓
Money	✓	✓	✓		✓✓	✓			✓	✓	✓	✓
Radio	✓	✓	✓	✓	✓✓	✓	✓		✓	✓	✓	✓
Solar lights	✓	✓	✓	✓	✓✓	✓			✓	✓	✓	✓
Electricity	✓	✓	✓	✓	✓✓	✓			✓	✓	✓	✓
Boreholes	✓	✓	✓	✓	✓✓	✓✓			✓	✓	✓	✓
PSPs	✓	✓	✓	✓	✓✓	✓✓			✓	✓	✓	✓
Open surface water – River Titi, Siriba Wetland, River Nile	✓	✓	✓	✓	✓				✓	✓	✓	✓
Roads	✓	✓	✓	✓	✓				✓	✓	✓	✓

Note: There are no water tanks in the area



Figure 0-82: Conducting a PLA session on Access, control and benefits profile with women group



Figure 0-83: Women accessing and benefiting from bicycles to fetch water

Implications: Household assets are a major poverty and wealth indicator in many of the communities, and in this case, they have direct influence on the level of access and utilisation of piped water. It's clear that wealth household will have more assets, hence ability to afford household connections unlike the poor households with few assets. The nature of access, control and ownership is generally the same among both poor and rich households commonly based on cultural norms that prioritize patriarchal hierarchical relationships. However, the project will make significant contributions as outlined below;

- The gender needs are taken into consideration. Firstly, the Practical Gender Needs (PGNs) will be enhanced. These PGNs encompass needs required to maximise benefit of development opportunities as well as over overcome constraints. In this case, the project will contribute to enhancing PGNs by; a) improving access to water clean and safe water (availability, quantity, quality, affordability, reliability); b) increasing access to sanitation

facilities (public toilets; hand-washing); c) contribute to reduction of burden of water related diseases hence lowering morbidity and household expenditures; d) provide employment opportunities. However, concerns of menstrual health should be included into design of public toilets.

- Secondly, the project also considers Strategic Gender Needs (SGNs). These encompass the requirements of women and men to improve their position or status, by enabling all genders to have control over their lives beyond socially-defined restrictive roles. In this case, the project will contribute to enhancing SGNs by; a) provide equal access to community assets such as water source points (PSPs, public toilets); b) equal participation in project related decision making such as project design (Feasibility, ESIA, RAP) and future project events such as disclosure meetings, ground breaking, commissioning, utility operations; c) benefit from any available skills transfer opportunities. It's advisable that the both the contractor and utility operator gives priority to women and female youth, men and male youth.
- There are vulnerable and marginalised groups with in Mutunda RGC whose needs and interests need to be critically given attention such as the orphans and vulnerable children (OVC), people with disabilities (PWDs).
- The project shall ensure repair and maintenance of water supply infrastructures especially repair of broken pipes and taps.
- The water connection charges for household connections will have to be affordable, as well as the tariff.

5.4.14.3 VULNERABLE & MARGINALISED INDIVIDUALS AND GROUPS

In terms of social safeguards, the project is committed towards enhancing development opportunities among the disadvantaged or vulnerable and marginalized individuals or groups. According to the World Bank, a vulnerable individual or group is a population that has some specific characteristics that make it at higher risk of falling into poverty and constrained from maximising benefits of development opportunities than others living in areas targeted by a given project. The ESIA assessed the various categories of vulnerable and marginalised individual and groups using survey questionnaires, KII, FGD, document review, direct observations and photography.

Findings obtained during the FGD with men and women at Mutunda SC as well as non-beneficiary village of Isunga, it was noted that most vulnerable and marginalised individuals and groups who may not maximally benefit from piped water supply include majorly Poorest of the poor households (HHs) such as child headed HHs, female headed HHs and older person headed HHs, as well as communities outside project area without any single source of water. One such village is Isunga village with no nearby (<1km) safe water source e.g. borehole.

A review of UBOS 2014 Census data for Kiryandongo district (Mutunda RGC parishes) revealed that the number of children headed HHs are 0.5% (56; female headed HHs are 18.9% (2,410) and older person headed are 11.2% (1,417)). This gives a total of 3,883 HHs representing a mean / average of 31% as shown in Table 0-39 below. However, the data obtained from UBOS Census Report does not classify these households either poor or not poor. Therefore, a survey finding

give an insight on the degree of poverty (income levels) for sampled female and older persons headed HHs but not child headed HHs (because none was encountered).

Table 0-39: Vulnerable & Marginalized individuals & groups in Mutunda RGC

Vulnerable & Marginalized individuals & groups (UBOS Census, 2014)	Child Headed HHs (10-17 years)		Female Headed HHs		Older Person Headed (60+ years)		Total No. of HHs (2014)
	Number	Percent	Number	Percent	Number	Percent	Number
Diima	18	0.4	1,076	22.7	524	11.1	4,741
Kakwokwo	24	0.7	569	16.8	340	10.1	3,378
Nyamahasa	14	0.3	765	17.3	553	12.5	4,421
Mean / Average	56	0.5	2,410	18.9	1,417	11.2	12,540
Overall Total	3,883	31%					

Note: Data extracted from UBOS Report as it is

Survey findings in Table 0-40 indicate the opinions of respondents on whether the project will be helpful to vulnerable individuals and groups namely poor households headed by children, women, disabled, older persons within Mutunda RGC. The data shows that a higher proportion of 71.3% respondents who YES-Highly that poor women headed HHs will benefit; 41.6% for poor child headed HHs; 41.6% for poor older persons HHs; and 38.6% for poor PWDs headed HHs. Further consultations with local leaders at Mutunda SC revealed that the children, PWDs and older persons have limited sources of income to enable them afford basic needs including payable water. The major underlying reason is related to inability to afford water (lack / limited disposable income to buy water daily or even pay monthly fees).

Table 0-40: Opinion on how project will be useful to vulnerable groups

Survey Question per category of vulnerable HHs	Yes- Highly		Yes, but not so much		Total	
	Freq	%	Freq	%	Freq	%

In your opinion, do you think the piped water supply project will be helpful to Poor Child Headed Households (OVCs) in your area?	41.6	42	58.4	59	101	100
In your opinion, do you think the piped water supply project will be helpful to poor households headed by People with Disabilities (PWDs) in your area?	38.6	39	61.4	62	101	100
In your opinion, do you think the piped water supply project will be helpful to poor households headed by Older Persons above 65 years in your area?	41.6	42	58.4	59	101	100.0
In your opinion, do you think the piped water supply project will be helpful to poor households headed by Women in your area?	71.3	72	28.7	29	101	100



Figure 0-84: Girl child collecting water in Nanda- Kawiti area



Figure 0-85: Disabled by child at River Nanda



Figure 0-86: PWD riding in a tricycle in Mutunda RGC

Implications:

- 1) The project will enhance human rights, child rights, older persons rights, disability right and women rights. For instance, it will increase the potential for vulnerable persons to take advantage of project benefits such as
 - a) Jobs for women, PWD, older persons but not children;
 - b) Access to public services (providing safe water source points);
 - c) Access to information during disclosure and consultation process in a meaningful way.
- 2) There is likely to be no discrimination of the vulnerable and marginalized individuals that violates the legal frameworks during construction and operation phases. It notable that child labour is prohibited, so orphans and vulnerable children (OVC) will be protected.
- 3) The project has mechanisms of minimizing vulnerabilities resulting from loss of property (land, crops, fruit trees) and displacement due to construction activities (distribution lines, easement, transmission lines, water source, toilets). These mechanisms involve compensation (refer to RAP Report).
- 4) Accessibility to safe and clean water will be improved.
- 5) It may not be possible to offer ‘free water’ to vulnerable persons by the utility operator.
- 6) Scale up distribution network to cover Isunga and Panyadoli villages

5.4.14.4 GENDER BASED VIOLENCE (GBV)

Gender Based Violence (GBV) refers to “Any act that result in a bodily, psychological, sexual and economic harm to somebody just because they are female or male (MoGLSD, 2017). In view of this the ESIA assess the baseline condition in regard to GBV. The findings were obtained through survey questionnaire, KII, FGD and document review.

5.4.14.5 PREVALENCE OF GBV INCIDENTS (VICTIMS)

A review of GBV Register (2021-2022) revealed that there are 98 reported GBV incidents (victims) in Mutunda RGC representing 5.6% (98 out of 1,735) of the total number of reported GBV incidents in whole of Kiryandongo district. By category, 50% (49) were Physical Assault; 17.3% (17) were Defilement; 7.1% (7) were Denial of Resources, opportunities & services; 11.2% (11) were Psychological Abuse; 4.1% rape; 10.2% (10) were sexual assaults as shown in Table 0-41 and Figure 0-87 below.

Table 0-41: Prevalence of GBV in Mutunda RGC

GBV Incidents	DIIMA		KAKWOKO		NYAMAHASA		Grand Total	
	Freq	%	Freq	%	Freq	%	Freq	%
Defilement	4	21.1	8	13.6	5	25	17	17.3
Denial of Resources, opportunities & services	1	5.3	3	5.1	3	15	7	7.1
Forced Marriage	0	0	0	0	0	0	0	0
Physical Assault	10	52.6	30	50.8	9	45	49	50.0
Psychological Abuse	3	15.8	7	11.9	1	5	11	11.2
Rape	1	5.3	3	5.1		0	4	4.1
Sexual assaults		0	8	13.6	2	10	10	10.2
Grand Total	19	100	59	100	20	100	98	100

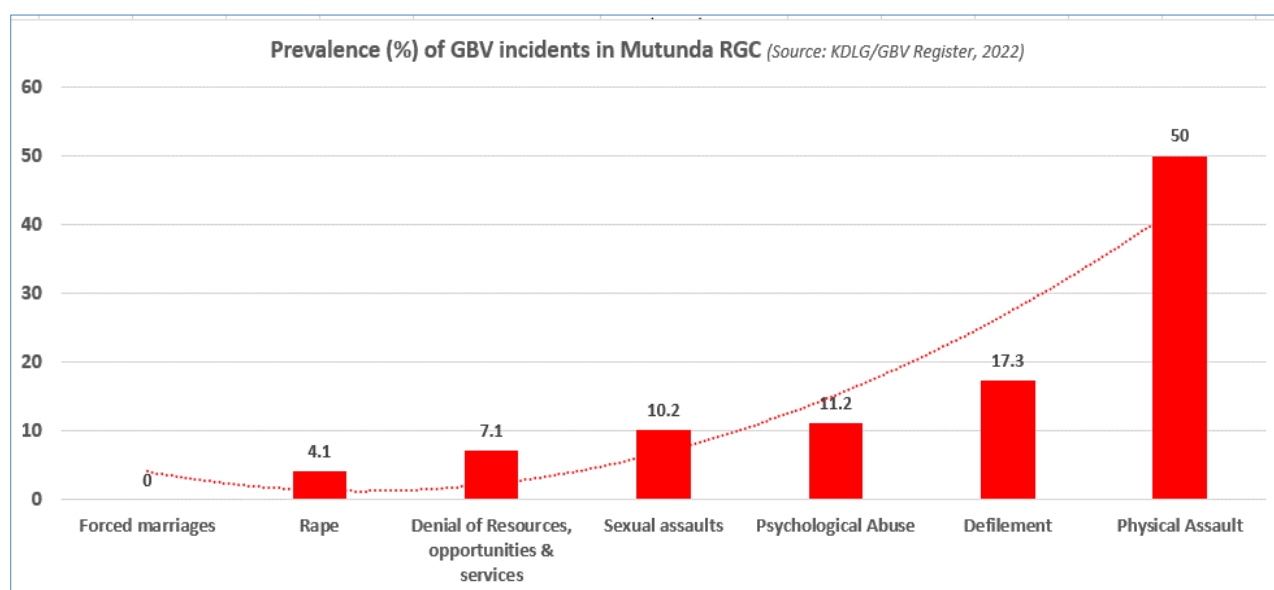


Figure 0-87: Prevalence of GBV incidents in Mutunda RGC

5.4.14.6 PERPETRATOR – VICTIM RELATIONSHIP

In terms of relationships, 41.8% are Not-Related related with the victim; 30.6% of the perpetrators are current partners; 12.2% are Neighbours; 4.1% are Local Councils; 4.1% are Fathers to the victim as shown in in Figure 0-88 below.

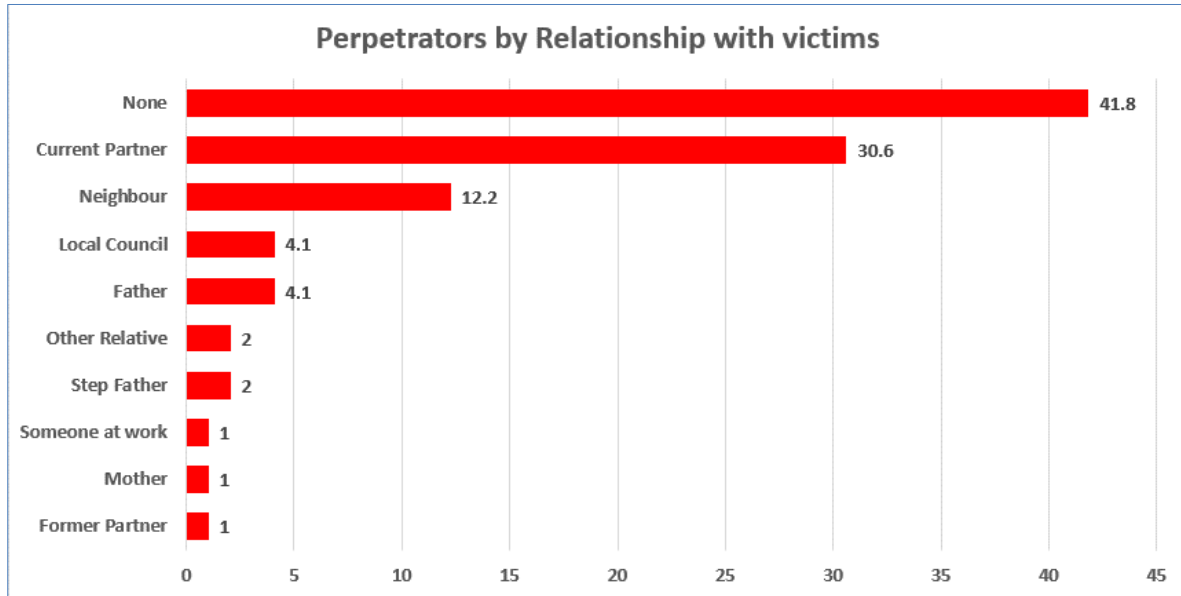


Figure 0-88: Perpetrators by Relationship with victims

5.4.14.7 GBV REFERRAL PATHWAYS

In terms of referral pathways, 52.6 % (51 out of 98) GBV incidents were handled by police; 25.8% (25 out of 98) by health centres; 18.6% (18 out of 98) by GBV Shelter; 2.1% (2 out of 98) by Community Activist; 1% (1 out of 98) by Local Councils as shown in Table 0-42 and Figure 0-89.

Table 0-42: GBV Incidents Handled by Referral Pathways

GBV Referral Pathways	DIIMA		KAKWOKO		NYAMAHASA		Grand Total	
	Freq	%	Freq	%	Freq	%	Freq	%
Community Activist	0	0	2	3.39	0	0	2	2.1
GBV Shelter	5	26.3	13	22.0	0	0.0	18	18.6
Health Centre	3	15.8	16	27.1	7	35.0	25	25.8
LC1	0	0	0	0	1	5	1	1.0
Police	11	57.9	28	47.5	12	60.0	51	52.6
Grand Total	19	100	59	100	20	100	97	100

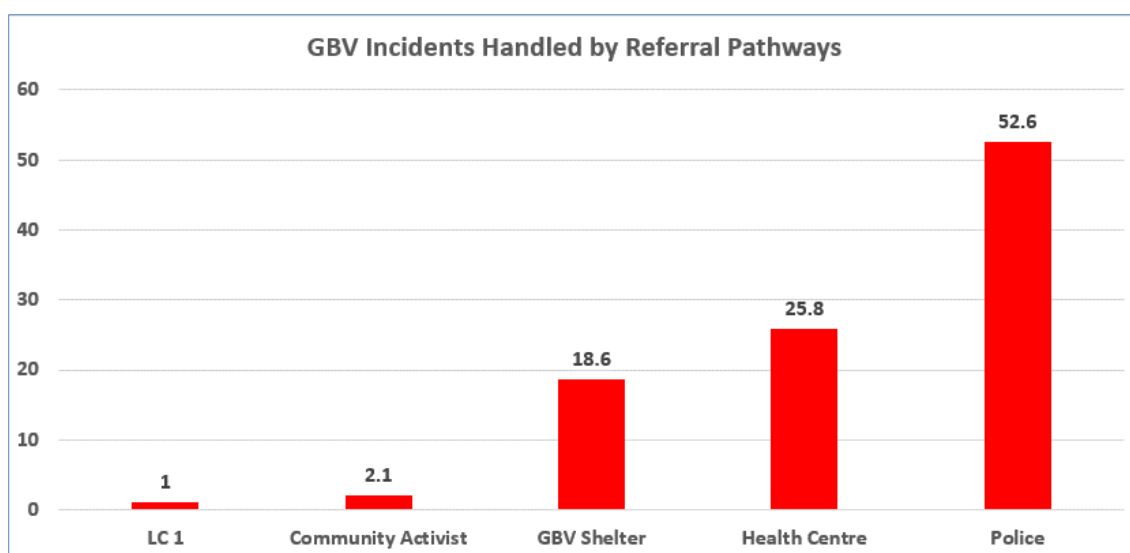


Figure 0-89: GBV Incidents Handled by Referral Pathways

5.4.14.8 VIOLENCE AGAINST WOMEN AND GIRLS (VAWG)

In terms of violence against women and girls (VAWG), there are 37.5% (6 out of 16) VAWG incidents related to Intimate partner Violence (IPV) and 62.5% (10 out of 16) were physical assaults against girls within school going age bracket (5-17 years) as shown in Table 0-43 below.

Table 0-43: Violence against Women & Girls (VAWG)

VAWG Incident	DIIMA		KAKWOKO		NYAMAHASA		Grand Total	
	Freq	%	Freq	%	Freq	%	Freq	%
Intimate Partner Violence (IPV)	6	37.5	15	33.3	9	50	30	38.0
Against women	5	31.3	13	28.9	8	44.4	26	32.9
Against men	1	6.3	2	4.4	1	5.6	4	5.1
Physical Assaults (Girls 5-17 years)	10	62.5	30	66.7	9	50	49	62.0
Grand Total	16	100	45	100	18	100	79	100

5.4.14.9 VIOLENCE AGAINST CHILDREN (VAC)

There are 28 reported VAC incidents against children below the age of 18 years between 2021 – 2022. Among the VAC incidents, 57.1% (16 out of 28) are defilement cases as shown in Table 0-44 below.

Table 0-44: VAC incidents against children below 18 years

VAC Incidents (Children <18 years)	KIKUBE		KITWARA		SOUTHERN WARD		Grand Total	
	Freq	%	Freq	Freq	Freq	Freq	Freq	Freq
Defilement	4	80.0	7	41.2	5	83.3	16	57.1
Physical Assault	1	20.0	4	23.5	0	0	5	17.9
Psychological Abuse	0	0	1	5.9	0	0	1	3.6
Rape	0	0	1	5.9	0	0	1	3.6
Sexual assaults	0	0	4	23.5	1	16.7	5	17.9
Grand Total	5	100	17	100	6		28	100

5.4.14.10 CHILD LABOUR

A 2019 study conducted by Community Driven network (CODNET15) Uganda revealed that that 8.6% of the children in Kiryandongo district are hired by different employees to do the farmer related activities (esp. tobacco production) while 59.3% of the children work to supplement on their family income. During community meeting with local leaders at Mutunda SC, it was revealed that that the common child labour conditions are related to household-based subsistence farming, in addition to market vending and cattle herding activities.

5.4.14.11 SEXUAL EXPLOITATION AND ABUSE (SEA) AND SEXUAL HARASSMENT (SH)

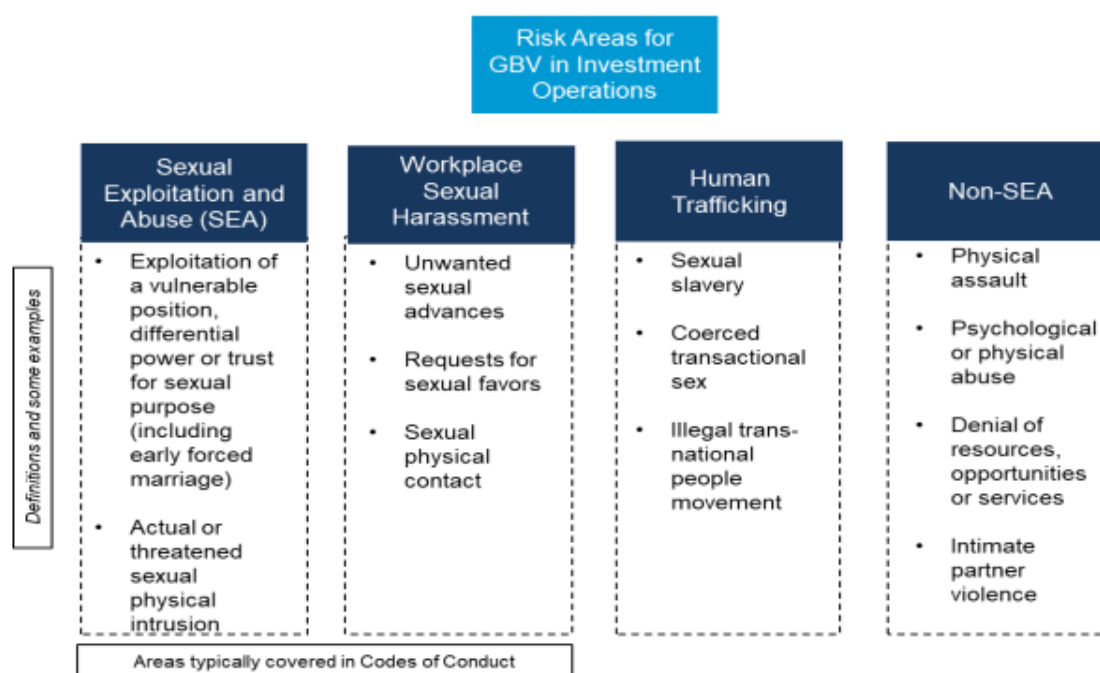
By definition, sexual exploitation and abuse (SEA) occurs against a beneficiary or member of the community while sexual harassment (SH_ occurs between personnel / staff and involves any unwelcome sexual advance or unwanted verbal or physical conduct of a sexual nature (MoGLSD, 2018). A review of GBV Register (2021-2022) indicated that there are 82.7% (5 out of 91) of the SEA & SH incidents occurred; 23.5% (19 out of 81) happened in Diima parish and 61.7% (50 out of 81) happened in Kakwokwo parish; 19.8% (16 out of 81) as shown in Table 0-45 below. There was no available data (n/d) on sexual harassment (SH) as per the GBV Register 2021-2022.

Table 0-45: SEA & SH Incidents in Mutunda RGC (2021-2022)

GBV Incidents	DIIMA		KAKWOKO		NYAMAHASA		Grand Total	
	Freq	%	Freq	%	Freq	%	Freq	%
Defilement	4	23.5	8	47.1	5	29.4	17	100
Workplace sexual harassment	0	0.0	1	100.0	0	0.0	1	100

15 <https://kkcr.urdt.net/2019/12/17/masindikiryandongo-districts-grapples-with-child-labor-in-tobacco-growing-areas-report/>

Physical Assault	10	20.4	30	61.2	9	18.4	49	100
Rape	1	25.0	3	75.0		0.0	4	100
Sexual physical contact		0.0	8	80.0	2	20.0	10	100
Grand Total	19	23.5	50	61.7	16	19.8	81	100



Implications of GBV, Child Labour, VAC, VAWG, SEA & SH

It's notable that to a large extent, the project will have positive influence on GBV, child labour, VAC, VAWG, SEA and SH. However, there is need to ensure effective environment and social safeguards against the GBV, Child Labour, VAC, VAWG, SEA & SH throughout the project phases. The appropriate mitigation measures include:

- Issuing zero tolerance on child labour policy among contractors and along supply chains such as construction materials (sand, gravel, timber, among others)
- Develop and implement comprehensive ESMP by both developer and contractors.
- Issue codes of conduct to workers
- Organise tool box meeting
- Disseminate GBV/SEA/SH Referral pathways
- Establish GRM committees

6 STAKEHOLDER CONSULTATION AND ENGAGEMENT

6.1 INTRODUCTION

This section of the report presents the objectives, process, and the outcomes of the stakeholder involvement in the process of this ESIA. Emphasis has been placed on a fully inclusive, open and transparent public participation process and the transfer of information regarding the proposed construction of Large Solar Powered Piped Water Supply Systems and Sanitation Facilities in Refugee Settlement and Host Communities of Kiryandongo District to interested and affected persons (I&APs). The provision of sufficient and useful information on an on-going basis to I&APs to allow them to participate in the project and offer comments is a cornerstone of this Environmental and Social Impact Assessment process.

The ESIA process started with a scoping exercise aimed identifying relevant issues to form focus of the ESIA study and refine the terms of reference provided by the project proponent. This chapter presents the results of stakeholder engagement activities undertaken during October 2021 for the scoping stage and for the final ESIA during November 2021 and January 2022.

6.2 OBJECTIVES OF CONSULTATION AND DISCLOSURE

Relevant and adequate project information were provided to stakeholders to enable them to understand project risks, impacts and opportunities. Consultation targeted relevant stakeholders, communities, government ministries, surrounding business/commercial entities and aimed at:

- Generate a good understanding of the project.
- Understand and characterize potential environmental, socio-economic risks/impacts of the project.
- Developing effective mitigation measures and management plans.
- Enhance local benefits from the proposed project.
- Enable affected communities to provide views hence participating in or refining project design, where applicable.

6.3 STANDARDS FOR CONSULTATION

The public consultation was guided by Ugandan guidelines as well as World Bank policy guidelines summarized in Box below.

Although no regulations exist for public consultation, national guidelines for EIA in Uganda require that the public is given full opportunity for involvement and participation throughout the EIA process. People including individuals, or groups of local communities who may be directly affected by a proposed project should be a focus for public involvement.

Since identification of the “public” likely to be indirectly affected by the proposed activity is often more difficult, it is required to exercise care in deciding who participates to ensure that a fair and balanced representation of views is obtained, and views of minority groups are not overshadowed by more influential members of the public.

The public may appropriately be involved in the EIA process through:

- i. Informing them about the proposed project.*
- ii. Open public meetings on the projects.*

- iii. *Inviting written comments on proposed project.*
- iv. *Use of community representatives.*
- v. *Comment and review of the Environmental Impact Statements; and,*
- vi. *Making relevant documents available to any interested members of the public in specified places or at the cost of reproduction.*

Three stages for public involvement in the EIA process are spelt out:

a) public consultation before EIA is done

If after receiving and screening/reviewing the developer's project brief, the Authority (NEMA), in consultation with the Lead Agency, decides that it is necessary to consult and seek public comment, it shall, within four weeks from submission of the project brief and/or notice of intent to develop, publish the developer's notification and other supporting documents or their summary in a public media. It is required that objections and comments from the public and other stakeholders shall be submitted to the Authority and to the Lead Agency within 21 days from the publication of notice.

b) public consultation during the EIA

The team conducting the EIA shall consult and seek public opinion/views on social and environmental aspects of the project. Such public involvement shall be during scoping and any other appropriate stages during the conduct of the study.

c) public consultation after EIA (EIA Review)

The EIS shall be a public document and may be inspected at any reasonable time by any person. Considering the scale and level of influences likely to result from the operation of a project, the Authority, in consultation with the Lead agency, shall decide regions where it is necessary to display the EIA report to the public.

World Bank Safeguard Policy: Stakeholder Engagement and Information Disclosure

The Policy recognizes the importance of open and transparent engagement with project stakeholders. Success of any project is hinged on level and quality of stakeholder engagement which is an inclusive process expected to occur throughout the project life cycle. Engagement is more useful when introduced in the early phases of project development and is mainstreamed into all levels of decision making. Additionally, consultations should be done in a manner that gives affected communities, opportunities to express their views on project risks and impacts and their mitigation measures.

In applying Policy, the following scope is envisaged:

- a. **Stakeholder identification and analysis:** The Policy requires the identification of key project affected parties and those with interests in the project. At this level emphasis will be on vulnerable people or groups of people whose situation are likely to be accelerated by project implementation. Identification should be able to bring out different sets of affected people and their interests.
- b. **Information Disclosure:** The borrower is obliged to undertake timely and effective disclosure of information regarding the project including its purpose, nature, scale, potential risks and impacts on the local communities and further present possible mitigation measures.
- c. **Meaningful:** Consultation is meaningful if a dialogue exists, communities and individuals should be given an opportunity to interact with respect and dignity. Interactions should be based on prior disclosure of project relevant information to all parties.

6.4 PROCEEDINGS OF STAKEHOLDER CONSULTATIONS

The emerging issues that were recorded through consultations have been detailed in the following subsections.

6.4.1 CONSULTATIONS WITH KIRYANDONGO DISTRICT LOCAL GOVERNMENT TECHNICAL TEAM (ACAO, DWO, DEO)

Date	21st October 2021	
Means of Engagement	Meeting at DLG Headquarters	
Contacts	Attendance List attached in Annexes	
QUESTION	Key Issues and Concerns Raised	RESPONSE
<i>What is the current situation on water, sanitation and hygiene among community? What are existing gaps in accessing piped water supply? Who is most affected? Who benefits from current situation? How will project benefit water vendors?</i>	<ul style="list-style-type: none"> • The water coverage in district is at 70%, which is fairly good. However, in Kiryandongo refugee settlement, water coverage stands at 52%; 65% in Bweyale Town Council. • There is some conflict over water sources in some parts especially between cattle keepers and land owners. • The most affected area is Mutunda Sub County • There are some water vendors especially in trading center but the number is no known. • There is noticeable open defecation • There is only 1 public toilet at Aduku open market in Mutunda SC 	<p>The project will support refugees</p> <ul style="list-style-type: none"> • Conflict resolution is very key in this project.
<i>What are the existing piped water supply projects? Where are pipes located? How can we obtain the GPS Coordinates / Sharpe files on water systems in this area to enable proper laying and trenching?</i>	<ul style="list-style-type: none"> • There are few piped water systems, namely – NWSC in Kigumba TC Bweyale TC, Kiryandongo Refugee Settlement, Kitwara mini-solar piped system • The GPS coordinates for piped system can be obtained from NWSC, though they don't share any planning documents with DLG. • WSDF asked for application but few were taken. 	<ul style="list-style-type: none"> • Noted
<i>How can the project contribute to inclusive economic</i>	<ul style="list-style-type: none"> • The project is very welcome. However, the culture of paying water bills is not yet favorable. • There is need for sensitization about proper user behaviors • All the multiethnic communities will benefit both directly and indirectly 	<p>Noted</p> <ul style="list-style-type: none"> • The ESIA will assess further

<i>growth and reduction of vulnerabilities among community?</i>	<ul style="list-style-type: none"> It will reduce gender-based vulnerabilities especially child pregnancies among girls. 	
<i>What are the Environmental and Social Risks and Impacts of the project? How can they be enhanced and/or mitigated? What role can different stakeholders play?</i>	<ul style="list-style-type: none"> Climate change is a big threat to the project There are many land conflicts, and hopefully the project should not trigger any land conflict. There is need to ensure proper compensation. There is misinformation as regards compensation The information disclosure is totally inadequate because even us the DLG are not fully aware on how the project will operate, when it will start. The involvement of DWO is so limited, and as a matter of fact, you the ESIA team are the first to come here for a detailed discussion. No one has ever done that. There is need for an inception workshop There is low funding for NRM, environment and climate change adaptation and mitigation actions OPM (DRDIP, NUSAF3) have helped in promoting environmental protection. However, there is still a big gap. 	<p>Noted</p> <ul style="list-style-type: none"> Noted. The RAP team will advise on that

6.4.2 CONSULTATIONS WITH LOCAL GOVERNMENT TECHNICAL OFFICERS - MUTUNDA SUB COUNTY

Date		
Means of Engagement		
Contacts	Attendance list attached in annexes	
QUESTION	Key Issues and Concerns Raised	RESPONSE
<i>What are the major problems affecting the community?</i>	<ul style="list-style-type: none"> The major problems include poverty, manifesting in low income and food insecurities; dry spell and water scarcity and diseases. During the budget conference on community needs, water was a major issue raised because humans consume more water than animals. People are competing for the available water. There are no sources of water for livestock especially cattle. There is only 1 valley tank in Kisula village, but shared by other 5 villages. Access roads are not a problem 	<ul style="list-style-type: none"> The project will contribute to reduction of poverty, water scarcity, disease burden <p>Noted</p>

	<ul style="list-style-type: none"> • There are cases of GBV at source points, arising from waiting for long hours hence fighting especially during id-day. 	<p>Noted.</p> <p>Roads to construction sites will be required / opened up</p>
<p><i>What are the anticipated benefits of the new water project? Who will benefit more? Who will lose?</i></p>	<ul style="list-style-type: none"> • Water coverage rate will increase especially in the growing trading centers • There will be reduced disease incidences, hence reduced morbidity and mortality • There will be reduced burden for women and children for collecting water • Reduced human death arising from accidents and wildlife attacks especially crocodiles on River Nile. In 2020, 3 children drowned in River Nile. In 2021, 2 people were killed by crocodiles. • Health centers and schools will have piped water. At present, only 1 health center has a water tank of 10,000-liter capacity 	<ul style="list-style-type: none"> • Noted <p>The UWA sector mangers will be consulted by the ESIA team</p>
<p><i>How best can community access piped water? How will modalities of access affect community? What are the possible risks? How can they be mitigated?</i></p>	<ul style="list-style-type: none"> • There is need to put a conditionality fall those who want piped water. • One good conditionality is foe each beneficiary has to show proof of basic WASH facilities such as functional pit latrine, hand washing tip-tap with soap, rubbish pit, among others • GBV cases may arise but minimal • Environmental degradation 	<ul style="list-style-type: none"> • YES, conditionaities can be possible <p>GBV incidents could reduce if piped water comes to area</p>
<p><i>What are the Environmental and Social Risks and Impacts of the project? How can they be enhanced and/or mitigated? What can other stakeholders do?</i></p>	<ul style="list-style-type: none"> • There is no tree nursery bed in whole of Mutunda SC. However, we have allocated space for establishing one if the water project comes. The sites are behind the SC headquarters. • The sub county plans to pass a Bylaw on environment, especially penalties on charcoal burning • There is also need to recruit an enforcement officer • NGOs that are active in environment are – SELFHELP AFRICA, BRAC, REFUGEE LAW PROJECT, OPM/DRDIP, SALVATION ARMY, WATER TRUST, SIMADOLA 	<ul style="list-style-type: none"> • Noted

	<ul style="list-style-type: none"> • In order to mitigate these risks, a mindset change plan (IEC plan) is necessary, and will cost about UGX 1,500,000 – 2,000,000/= per month • Radio and community videos are the most effective 	
		

6.4.3 CONSULTATIONS WITH WOMEN GROUPS AT MUTUNDA SUB COUNTY


Date	19 th Nov 2021	
Means of Engagement	Meeting at Mutunda Sub County Headquarters Wamera Women VSLA group	
Contacts	Attendance list attached in annexes	
Question	Key Issues and Concerns Raised	RESPONSE
What are the major challenges faced by women in Mutunda SC?	<ul style="list-style-type: none"> • Our group is called WAMARE B VSLA located in Mutunda B. We have 45 members (41 female; 4 male). • Women and children suffer most especially in search of water. Most go to River Nile and is attacked by wild animals especially crocodiles. • Children are not at school right now due to covid19 lockdown. This is posing a major problem of child pregnancies of girls. When we send them to fetch water, 	<ul style="list-style-type: none"> • Noted • The project is glad to involve women in planning processes, and identify their concerns

	<p>lines are so long and they often come back late. This possesses a risk for child pregnancies.</p> <ul style="list-style-type: none"> • Water sources are not enough 	<ul style="list-style-type: none"> • Piped water sources (PSPs) will be constructed to reduce burden among women and children
<p>How will women and children benefit from the project?</p>	<ul style="list-style-type: none"> • Those families that can afford, will have better access to clean water • If they give us PSPs, the we cannot all afford because house connections can be expensive. • There will be improved sanitation and hygiene • Health centers and Schools should be given piped water 	<ul style="list-style-type: none"> • It's unfortunate not to be able to afford water. However, the operator will advise on the affordable tariff • The DLG will be advise to ensure proper maintainance of free –safe water sources especially boreholes



6.4.4 CONSULTATION WITH BENEFICIARY COMMUNITY (CATTLE GRAZERS IN NYARITI VILLAGE – KAKWOKWO PARISH)

Date	19th Nov 2021	
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Means of Engagement	Meeting at Nyariti village, Kakwokwo Parish, Mutunda Sub County	
Contacts	Attendance list attached in annexes	
Question	Key Issues and Concerns Raised	RESPONSE
What are your major concerns about the planned piped water system in your area?	<ul style="list-style-type: none"> • We welcome the project as residents of Nyariti village. Our chairperson (Abel Kabugira) has ever raised our issues to the district leaders. We have always been worried why government ignores us • Water is a challenge especially for livestock. The major source is river Nile located 2km away and River Nanda, whose water levels drop during dry seasons • For domestic water supply, the jerrycan of water is now at UGX 500 – 1,000/=. • There are only 3 water vendors • There is need for solar to pump water for livestock and valley dam or valley tank • Piped water is better than valley dam water for livestock • we shall be able to apply for domestic connections for both human and livestock use 	<ul style="list-style-type: none"> • Noted <p>Water is aimed for human consumption not animals</p> <p>Water vendors will be consulted</p> <p>The concern about water for livestock will be channelled to top management of the project</p>
		

6.4.5 CONSULTATION WITH BENEFICIARY COMMUNITY (KISULA & POPARA WEST VILLAGES / POPARA TRADING CENTER)

Date	19th Nov 2021	
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Means of Engagement	Meeting at_Kisula & Popara west village, Kakwokwo Parish, Mutunda Sub County	
Contacts	Attendance list attached in annexes	
Question	Key Issues and Concerns Raised	RESPONSE
<p>3) What is the current situation on water, sanitation and hygiene among community? What are existing gaps in accessing piped water supply? Who is most affected? Who benefits from current situation? How will project benefit water vendors?</p>	<ul style="list-style-type: none"> • Kisula and Popara west as village are located in Kisula and Popara west respectively Mutunda parish, mutunda sub-county, Kiryandongo district. Having total number of HHs totaling to 979 of different tribes and ethnicities. However, there is a remarkable increasing population growth in the area due to new residents from in and out of settlement. • The current water situation in the two village as derived from community consultations as follows. • From a meeting held at milo 11 Centre with local council 1 leadership and the community members, the following were the main concerns, • There is high demand for clean safe water required mainly for domestic use and commercial purposes. According Orach Vincent LC I, Popara west says village only has one borehole which is even not working the community members and their livestock depends on two dams of Mr. Orachaa Vincent and Mutabazi compared to the population resulting to congesting at dam places. • According to Orach Vincent LC I Popara west said there is much and prolonged draught which has led to famine since in both of the seasons there has poor harvest. • The village has poor road network which has led poor service deliveries which has health out reaches says the LC I Popara west Mr. Orach Vincent. • In this villages, there are no water vendors since the community members already have aby- law of each HH make monthly pay and The sanitation status is that each HH according to the village by-law must have; Latrine, drying rack, rubbish pit, animal house. However, there is no public toilet in the center yet there's an evening market coming up 	<ul style="list-style-type: none"> • Noted <p>Ofcourse, population increase will continue to occur</p> <p>Noted</p> <p>The DLG will continue to maintain the boreholes</p> <p>Noted</p> <p>\noted</p> <p>Noted</p>
<p>2) What other major problems are existing among community? What conflicts have been caused by water demands? How is solid waste managed in the</p>	<ul style="list-style-type: none"> • Slightly far from above, other stress factors in the area are, high demand for wood fuel coupled with lack of technology of making ESS and Briquettes. • From the survey, fecal waste is basically managed through the use of mainly pit latrines in the home stands around and the open dumping of food waste; 	<ul style="list-style-type: none"> • Noted <p>There is no fecal sludge component for</p>

<p>host and refugee settlement?</p>	<p>street litter is mainly managed by burning the use of rubbish pit.</p> <ul style="list-style-type: none"> • According to Apio Christine chairperson water users committee Popara West say; <ul style="list-style-type: none"> ➤ No nearby health centers, ➤ High incidences of malaria, ➤ Evil attack by none known diseases, ➤ Poor money collection from 350 HH in the village at water source due to covid 19 thus leading to people to sharing dam water with livestock. ➤ Miss Lalam Christine popara west says another challenge in the village is animals destroying crops. ➤ Odwang Kenneth the mayer of the centre says there is increased number of girls getting pregnant due the covid issue thus racking the [number high. 	<p>the area under this project</p> <p>Noted</p> <p>Access to safe and clean water will contribute to reduced burden of water related diseases. However, potive human behavior is key driver.</p>
<p>3) What are the anticipated benefits of the new water project? Who will benefit more? Who will lose? How best can community access piped water? How will modalities of access affect community? What are the possible risks? How can they be mitigated?</p>	<ul style="list-style-type: none"> • Much is expected from the project ranging, from small – big to include, most extensive farmers need water for irrigation especially rice, soya and growers. • The project will have a mutual gain to the community namely; • Reduced GBV thus leading to enough time for family members that’s children and husbands. • Job employment creation especially among the youth. • The community can best access piped water through; <ul style="list-style-type: none"> ➤ Appling and having all the necessary documents required for one to access the piped water. ➤ The possible risks that would affect the modalities of access to piped water is land conflict through where the pipe lines are to pass says the Mayer of Milo 11 Mr. Odwang Kenneth, however he said such risk can be mitigated through signing of land consent forms by the land lord owners. 	<ul style="list-style-type: none"> • Noted <p>Noted</p> <p>The system operators will give updates on how to apply for water connections.</p>
<p>What are the Environmental and Social Risks and Impacts of the project? How can they be enhanced and/or mitigated? What role can different stakeholders play?</p>	<ul style="list-style-type: none"> • The Environmental and Social Risks and Impacts of the project is likely to be cutting down of trees along the space where the pipes will be passing and there is a Social Risks of STDs spread during the construction however the mitigation measure for the above will be through sensitization by the various stakeholders both at the District and the Sub County levels. 	<ul style="list-style-type: none"> • Noted
<p>What are the existing piped water supply projects? Where are pipes located? How can we obtain the GPS Coordinates / Sharpe files</p>	<ul style="list-style-type: none"> • There is no existing Piped water system in these two villages of Kisula and Popara west the existing piped water is up to Bweyale town council and incase of extension the pipes will pass through underground in 	<ul style="list-style-type: none"> • Noted

<p>on water systems in this area to enable proper laying and trenching?</p>	<p>our lands and coordinates can be obtained by getting on ground.</p>	
<p>How can the project enhance employment creation and income generation? How will women, men, children, youth, older persons, benefit from the employment opportunities e.g. short term casual jobs; water vending, etc?</p>	<p>The project will enhance employment creation and income generation through employing the youth and men on the digging where the pipe lines are to be dug and for women, children, will benefit through providing and cooking for the workers (thus temporal employment) older persons will give advices where possible.</p>	<p>Job opportunities will be created</p>
<p>How can the project contribute to inclusive economic growth and reduction of vulnerabilities among community?</p>	<p>The project will contribute to inclusive economic growth and reduction of vulnerabilities among community when it begins since all categories of persons will be inclusive when it comes to temporal job employments.</p>	<p>Noted</p>
<p>How can construction of water distribution networks affect Community Health and Safety of community? How can it be mitigated? Who can be involved?</p>	<p>The construction of water distribution networks will positively affect Community Health and Safety of community in a way that health and sanitation will improve since the community will have enough water for domestic use, commercial use thus improved livelihoods in the village.</p>	<p>All risks will be mitigated include health related ones</p>
<p>What is the land tenure in your area? Who owns the land where the pipes and tank will be constructed? What is proof of ownership? How can that land be acquired? What are the conditions / modalities of acquiring the site location?</p>	<ul style="list-style-type: none"> • The land tenure system is based on individual ownership proved by document well stamped by the LC I witnessed by the neighbors written and signed during the selling time/day. • The condition on of acquiring land is through land brokers within the village once land buyer comes and seller is connected thus land acquired officially through the LC I authorities. 	<ul style="list-style-type: none"> • The RAP Team will assess and advise on best model of land acquisition and compensation
<p>What are the most significant cultural sites in your area? Are there worship spaces, physical</p>	<p>“There are no any significant cultural sites in Kisula and Popara west villages, worship spaces are in many mainly the born-again faith churches, and for the case of trees are</p>	<p>Noted</p>

<p>cultural resources e.g. trees, graves, stone, of community importance? How will the water project affect them?</p>	<p>planted at individual levels mainly planting eucalyptus, pine, orchards like oranges, mangoes, avocados, jackfruits, and for the case of burying each HH does it at an individual level “says Mr. Behamuka Bosco the LCI Kisula village.</p> <p>The water project affects the above in a way that where trees are planted there will be constant supply of water since trees support this system of water supply.</p>	
<p>What is ethnic composition of the community? Are there some indigenous peoples? What vulnerable and marginalized group have you come across? How can water distribution reduce on the vulnerability?</p>	<p>The Villages Of Kisula and Popara west Comprises Of;</p> <p>Palow</p> <p>Alur</p> <p>Acholi</p> <p>Lugubara</p> <p>Baruri</p> <p>Banyankole</p> <p>Banyoro</p>	<p>Noted</p>
<p>What categories of stakeholders can be useful in construction of water distribution system? What information do stakeholders need to know about the project? In what format? Any concerns about project can be raised</p>	<p>The stakeholders that can be useful in construction of water distribution system according to the mayor mainly are; the LC I, LC II, LC III, Mayor, Leaders, land lords, Sub County technical persons, DIST and the District councilors headed by the district chairperson GISO, DICO, and RDC.</p>	<p>Noted</p>
<p>In your opinion, what is the main source of energy at your home / place of work (used for cooking)?</p>	<p>The main source of energy used in Kisula and Popara west is the use of firewood mainly got from ranch 5 and 9 however mostly the HH do use the remains of cassava cuttings and maize steams due to lack of trees to cut as firewood.</p>	<p>Noted</p>
<p>In your opinion, what is the main source of energy used for lighting &equipment at your home / place of work?</p>	<p>The main source of energy used for lighting &equipment is mainly solar lighting about 80% and with 20% using paraffin.</p>	<p>Noted</p>
<p>What is name of forest you commonly obtain utilize to obtain firewood, water, fruits, fish, etc?</p>	<p>“The villages have no any isolated forest used for firewood however collect the firewood from ranch 5 and 9 while others collect from personal farms get from the remains of their cassava cuttings and maize steams” says Miss Achiro Barbra women leader Kisula village.</p>	
<p>Wetland you commonly obtain utilize to obtain</p>	<p>Mr. Behamuka Bosco said, ‘The wetland commonly known and utilized is Nanda swamp and milo stream which powers</p>	<p>Noted. All wetalnds will be conserved</p>

firewood, water, fruits, fish, etc?	to River Nile that is about 8kms from Kisula and some private dams that's Mutanzi dam	
In your opinion, what other benefits do you get / obtained by others from nearby forest and Wetland?	According the verbatim quoted in the community meeting, the benefits got from wetland and forests include the following; <ul style="list-style-type: none"> • water for our livestock use • water for domestic use • Commercial use like simple irrigation and fishing sliver fish 	Noted
What climate smart farming practices do you carry out? What CSA for crop/ What CSA for livestock?	The only SCA practice crop in the village is use of fertilizers and simple irrigation.	All water sources need to be protected fro contamination (surface and underground)
In your opinion, what varieties of forage are available, harvested and used by livestock in your area? (Please CIRCLE where	The only local forage available in the village is the potatoes veins.	Noted
In what period of the year is the fodder/grass abundant or scare?	The fodders/grass is always abundant during wet seasons that's from months of March, April, May, June, August, September and October. Yet in mouths of January, February, July, November and December are away for scare fodders.	Noted
In your opinion, what are the current threats to the status of forage with in Lubigi wetland?	The current situation of the forage in the village is at the lower rate due to burning of grasses, drought and increased demand for grasses for house construction and increased demand for settlement thus grass clearance.	Noted





6.4.6 CONSULTATION WITH BENEFICIARY COMMUNITY (TEYAGO & ALERO VILLAGES)

Date		
Means of Engagement	Meeting at Teyago village, Sub County	
Contacts	Attendance list attached in annexes	
Question	Key Issues and Concerns Raised	RESPONSE
What are your major concerns about the planned piped water system in your area?	<ul style="list-style-type: none"> • The project is good, we welcome it • We are concerned about how compensation will be done • The owner of that land where the reservoir will be located is a widow. The LC 1 Chairperson of Alero village can help you understand her situation better. • There is increasing land conflicts in the area • Water scarcity is also a problem, but we welcome the project • We shall be willing to plant more trees 	<ul style="list-style-type: none"> • Noted <p>the RAP team will coordinate and do the assessment and advise</p>

	<ul style="list-style-type: none"> • We hope the project does like OPM/DRDIP under labour intensive public works program where community are given jobs and paid wages. • We shall be able to apply for domestic connections for both human and livestock use 	the sytem operator will maange the applciations for water connections
		

6.4.7 CONSULTATION WITH DEPARTMENT OF REFUGEES, OFFICE OF THE PRIME MINISTER

Date	22 nd March 2022	
Means of Engagement	Meeting	
Contacts	Attendance list attached in annexes	
Key Issues and Concerns Raised	Response	
The Kiryandongo refugee settlement land is government-owned. Therefore, any compensation activities may consider crops or structures encountered but not land.	Noted	
There are no host communities found inside the designated refugee settlement.	Noted	
Refugees should be considered for employment as laborers on the project since they had the right to work in Uganda.	Noted	
Ensure that no child (refugee or from host community) is employed on the project. Structures should be put in place for safeguards implementation.	Noted	

Conflict for water in the area has mainly been recorded amongst refugees than against or within the host community. Therefore, the project should be mindful of this.

Noted



6.4.8 CONSULTATION WITH UGANDA NATIONAL ROADS AUTHORITY

Date	25th March 2022	
Means of Engagement	Meeting	
Contacts	Attendance list attached in annexes	
Key Issues and Concerns Raised		Response
Kigumba – Masindi Road is a newly constructed project, therefore consultations with UNRA by the design consultant and contractor should be undertaken before any cross points are made.		Noted
MWE and NWSC need to interface with and provide the water network development master plan and envisaged requirements for the planned networks for decisions to be made collectively.		Noted
The design team should submit their typical road crossings and typical valve design so that these can be synchronised with UNRA’s requirements when designing and constructing roads i.e. putting into consideration the size crossing ducts and structurally sound concrete class.		Noted

UNRA's policy for utilizing the road reserve should be followed by MWE the project developer.	Noted
There should be agreements for utility owners/operators to contribute to the funds required when creating the road reserve, otherwise UNRA bears all the cost, which burden would be eased with contribution from other users of the UNRA ROW.	Noted
MWE and the design consultant need to liaise with UNRA about future road construction project especially bridges in whose close proximity, water abstraction points would be vulnerable to pollution during the construction phase.	Noted
Swamp crossing with anchors should ensure not to block the flow from culverts or trap moving debris which may result in flooding.	Noted



6.4.9 CONSULTATION WITH MINISTRY OF LABOUR GENDER AND SOCIAL DEVELOPMENT

Date	17th May 2022	
Means of Engagement	Meeting	
Contacts	Attendance list attached in annexes	
Key Issues and Concerns Raised		Response
For water supply system issues, land will have to be secured especially for the case of ground water (at abstraction and reservoir areas) and along transmission mains. Consent forms from local leaders and other concerned authorities on land ownership should be availed to address the issues of land ownership.		Noted

The contractor should construct sanitation facilities to cater for labour force to be employed different from public toilets planned for the communities.	Noted
Site layout plans and architectural designs for solar powered piped water system and all that is entailed therein, should be submitted to MoGLSD Geotechnical survey/ study reports on bearing ratio to hold the pipes should be submitted.	Noted. The Consultant is going to share accordingly
During trenching, the sites should be hoarded off with clear signage.	Noted
A traffic management plan should be in place to control the contractor's fleet. Likewise, driver competency, vehicle maintenance schedules should at all times be assessed and safe operating distances from the road addressed (50m for borrow pits and 15-20m for transmission mains). Traffic control through signage / flagmen and diversions should be done with the aid of Police and other concerned stakeholders.	Noted
Dust and noise pollution and emanating from the project should be addressed.	Noted
All permits, licenses and certification from concerned ministries and authorities such as the Directorate of water resources management, should be acquired.	Noted
Hydrogeological studies should be done in relation to ground water and sanitation facilities in order to prevent contamination of the underground aquifers.	Noted
The design lifespan of the sanitary facilities should be based on the target population and consequently size of the septic tank.	Noted
Health and Safety during construction should be observed. Risk assessments should be carried out, mitigation measures put in place and explained for preparedness of the community and workers. Personal Protective equipment should be provided based on the risk assessed. Emergency preparedness should be in place, emergency contacts displayed to know whom to contact e.g., Red cross has Ambulances to attend to emergencies on road accidents. There should be internal preparedness in case of emergencies. Firefighting mechanisms especially in camps e.g., Assembly points, fire extinguishers and smoking places should be designated.	Noted
Welfare provision based on gender ranging from accommodation and sanitation facilities should be observed.	Noted
The employment policy of the country should be followed; contracts, payment mechanisms, appointment letters should be in place. All employees should have	Noted

<p>written documentation of their contracts (explaining their salary/ wage, time-off duty etc.)</p> <p>Children should not be employed by the project.</p> <p>The contractor should be gender sensitive during the recruitment exercise to foster gender equality. And when employing, some percentage should be from the local people as part of ownership and sustainability of the project.</p> <p>The employees should have a pre-employment medical examination to determine among others their mental capabilities before engagement.</p>	
<p>HIV/AIDs services should be extended to the employees especially during the construction phase.</p>	Noted
<p>The vulnerable groups should be accounted for especially in the design of sanitary facilities.</p>	Noted
<p>Restore the sites after construction through revegetation and tree planting.</p>	Noted
<p>The redress mechanism plans should be in place to address challenges among workers, workers to community. A committee should be formed therein, having natives of the area especially LC chairperson to bridge the gap between workers and community.</p>	Noted



7 ANALYSIS OF ALTERNATIVES

7.1 SITING AND DESIGN ALTERNATIVES

This section presents the analysis of alternatives done to maximize environmental and social safety. Alternatives can take on several forms including technological options, project site options, transportation options, labour sources and type and others. This ESIA considered analysis of the various feasible alternatives of the project under different scenarios to identify and describe the potential feasible alternatives that would allow the project to reach its objectives. It also presents a comparison of the potential alternatives on the basis of several factors which can influence the choice of alternatives to be considered by a Developer i.e. technical, economic, environmental and social criteria, as well as of public views and concerns. The comparison of alternative was done to evaluate and address the design alternatives that were examined and proposed during the feasibility and pre-design study of the proposed project. Therefore, according to the 2011 EIA Guidelines for water resources related projects, the following alternatives/options were considered:

- Site Location and Design Alternatives;
- Technology Selection Alternatives; and
- Project or No Project Alternative.

7.2 WATER SOURCE ALTERNATIVES

7.2.1 SURFACE WATER FROM VICTORIA NILE

The proposed Victoria Nile water source option entailed an abstraction point located at Atura, Tenam A village, Nyamahasa parish, Mutunda Sub County and a treatment plant located in close proximity to the intake (1,100m away), a safe distance from the flood plain of the river. The main system components for sourcing water from the Victoria Nile will comprise of the following:

(i) Raw Water Intake

The intake will be located at the banks of Victoria Nile at Atura. The critical design consideration for the intake is to site the Intake pump house where space and accessibility allows and at an elevation to allow gravity flow of water from the River to the sump. Therefore, siting the suction pipes so as to minimize siltation and debris in the pipes, and the relative ease of laying the pipes into the river is a major consideration. Bathymetric readings of the river bed will be taken at detailed design along two or more profiles so as to determine the best location for the laying of the suction pipes to the raw water pumps sump.

(ii) Raw Water Pumps and Pumping Main

Submersible pumps capable of dealing with raw water will be installed inside the well. The use of submersible pumps will eliminate negative suction issues, pump priming challenges, foot valve blockages or malfunction and will keep the intake structure footprint to a minimum. A moving gantry crane will be provided to lift the pumps while the Mechanical and Electrical controls will be housed in a control panel.

There will be two raw water pumps installed in the suction well operating on one duty / one standby basis. The Raw Water submersible pumps (up to 2033) will have a flow of 52.33m³/hr. at 16m head. The Raw Water Main will be DN200 Steel to PN10, 1,394m long, installed on concrete pedestals.

(iii) Packaged Water Treatment Plant

The Treatment Plant will include:

- a) Treatment Plant Site Works;
- b) Packaged Water Treatment Plant of 1,072.51 m³/day (70.38 m³/hr for 16 hours pumping regime);
- c) Clear Water Tank;
- d) Sludge Drying Beds;
- e) Pump House;
- f) Staff Houses; and
- g) Office and Workshop.

The Packaged Water Treatment Plant will have a capacity of 70.38m³/hr. The system components will include:

- a) Coagulation- to form micro-flocs from the non-filterable suspended solids (colloids);
- b) Flocculation- to combine the micro-flocs into flocs;
- c) Sedimentation- to remove the flocs by settlement;
- d) Filtration- to remove the remaining suspended solids; and
- e) Chlorination- to disinfect the water and leave residual chlorine in the water which has to be transmitted over long distances.

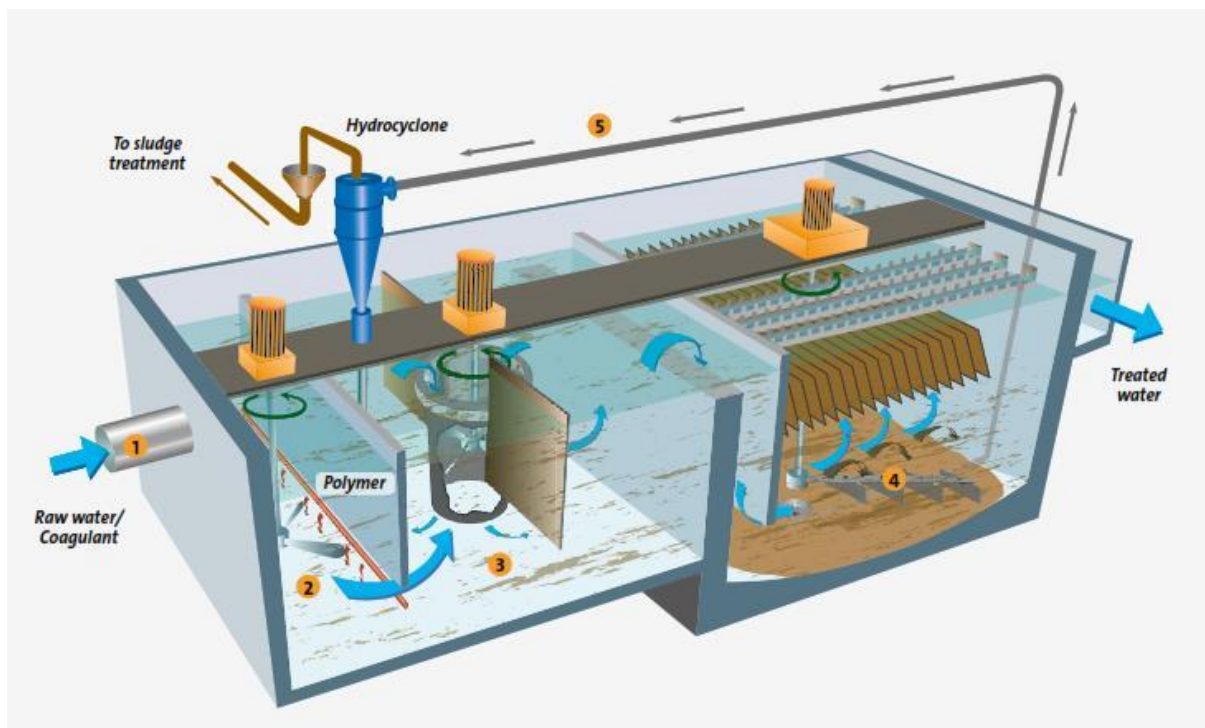


Figure 0-1: Packaged Water Treatment Plant

Source: MWE, Feasibility Study and Design Report, 2021

1. **Coagulation Stage:** where a coagulant will be added is added to the raw water
2. **Injection Tank:** where the flocs produced during coagulation stage are balloted by dense micro-sand, which is continuously reinjected into the process
3. **Maturation Tank:** which is fitted with a mixer designed to produce the optimum velocity gradients to allow flocs to swell and mature.
4. **Counter Current Lamella Clarification:** which allows a fast settling of the micro-sand balloted sludge
5. **Recirculation:** where the sludge is pumped to the hydrocyclone to be separated from micro-sand. The clean micro-sand is returned into the injection tank to minimise loss; the sludge is continuously removed for further processing

(iv) Treated Water Pumps and Mains

The treated water pumps will comprise of 2No. horizontal centrifugal pumps (1No. duty and 1No. standby) with a flow of 31.87m³/hr. at 115m head

The treated water pumping system therefore consists of:

- Clear Water pumping main uPVC OD160 to PN16, 10,162 m long from the water treatment plant to the storage reservoir; and
- Backwash pumping main HDPE OD50 to PN10 60m long to the WTP Backwash Tank.

However, this system wasn't chosen due to the difficulty in handling the post treatment waste (sludge). The required technology to treat the surface water in a WTP is advanced compared to the requirements for treating ground water. Additionally, all the above-mentioned result into high capital investment and operating cost as indicated in **Table 0-2** hence opting for the ground water option.

7.2.2 GROUNDWATER SOURCES

The project considered groundwater sources as summarised in the **Table 0-1**

Table 0-1: Summary of groundwater sources

RGC	Borehole Yield	GPS Coordinates	Pump Capacity	Daily (16 hours pumping regime)	
Mutunda	DWD 77379 (5.2m ³ /hr)	420071E, 230567N	Head 220m, Flow 5.2m ³ /hr	83.2	803.2
	DWD 77378 (50.5m ³ /hr)	423140E, 230549N	Head 190m, Flow 45.0m ³ /hr	720	

Groundwater source option was chosen mainly due to its relatively lower costs compared to the Victoria Nile water source option as summarised **Table 0-2** below.

Table 0-2: Summary cost estimation variation of the systems entailed for the respective water sources

Cost Item		Water Source Cost Estimate (UGX)	
		Victoria Nile	Groundwater
Capital Investment	Borehole Pump Houses / Intake	420,000,000	220,000,000
	Water Treatment	2,010,555,046	-
	Transmission Mains	2,351,074,823	1,683,955,431
	Mechanical and Electrical Items	3,012,000,000	900,700,000
Operating Costs	Annual Staffing	85,000,000	76,000,000
	Chemicals (UGX/ m ³)	134.87	66.69
	Energy (UGX/ m ³)	3,725.76	1,095.41
	Annual Maintenance	352,650,000	136,400,000

7.2.3 STORAGE RESERVOIR ALTERNATIVE CONFIGURATIONS

Two storage reservoir configuration options were considered in the feasibility assessment (MWE, Feasibility Study and Design Report, 2021), in which i) a single reservoir of 350 m³ capacity; and ii) 2 reservoirs of 250 m³ capacity and 100 m³ capacity were considered. In both cases the reservoirs were comprised of cold pressed steel tanks elevated on steel towers at a height of 20 m as summarised in **Table 0-3**.

Table 0-3: Summary of storage reservoir configuration options

Configuration	Reservoir Location	GPS Coordinates	Capacity (m ³)
Option 1	Alero B	419057E, 236711N	350
Option 2	Popara West	415137E, 226916N	250
	Alero B	419057E, 236711N	100

Option 2 was chosen as the configuration facilitated the effective operation of two supply areas within Mutunda RGC, namely:

- a) The core of the RGC located in the parishes of Kakwokwo and Nyamahasa (17No. villages to be served); and
- b) The fringe area of the RGC located in the parishes of Diima and Nyamahasa (8No. villages to be served).

The selected option also provides for phased construction and utilisation of the water sources in line with the water demands of the project area.

7.2.4 TECHNOLOGY SELECTION ALTERNATIVES

7.2.4.1 WATER TREATMENT PROCESS TECHNOLOGY

The type of treatment operation performed and the treatment chemicals used depend largely on the contaminants present in the source water (EPA, 2011). An analysis of water samples collected from existing boreholes in the project area indicated satisfactory water quality for drinking for both physiochemical and bacteriological quality (**Section 0**). To ensure the adherence to Uganda Drinking Water Standards disinfection was integrated in the water supply system in form of a chlorine dosing unit at the reservoir. The following is the analysis of the key technologies that could be adopted in disinfection process.

DISINFECTION H

Historically, chlorine was the disinfectant used, but more recently other chemicals such as chlorine dioxide, chloramines, and ozone have been used to purify water. Non-chemical methods of disinfection include heat and radiation (e.g. ultraviolet light (UV)). **Table 0-4** below is an analysis of the key options that could be employed in the project. The application of UV disinfection for source water treatment is limited because turbidity and suspended solids that can render it ineffective (EPA, 1999). Thus, UV has not been analysed for the project.

According to Table 0-4, ozone, the most efficient disinfectant but not a persistent disinfectant, thus from the health aspect, unsafe water consumption can occur in case of recontamination along transmission/distribution lines and reservoirs. Environmentally, it is difficult to fulfil the legal limit for the formation of bromate during the process of ozonation, thus most water treatment processes tend not to employ ozonation.

Chlorine and chloramines are more effective in secondary disinfection in comparison to chlorine dioxide (Less persistent chemical). Thus, chlorine dioxide may not be suitable for the project given the extent of piping systems. Lastly, though the combined residual from chloramines lasts longer than chlorine residuals, chloramines are not as effective as other germicidal agents.

Therefore, Chlorine which is a persistent chemical (used locally) was selected as a disinfectant.

Table 0-4: Technology analysis of disinfection types

Criteria	Disinfectant			
	Chlorine	Chloramines	Chlorine dioxide	Ozone
Persistence	Persistent chemical (used locally and for transport across long distances to the final consumers).	Persistent chemical (used locally and for transport across long distances).	Less persistent chemical (used locally and for transport across long distances).	Non-persistent chemical (used locally at production plants).
Oxidant demand rate	Chloramine > Chlorine > Chlorine dioxide > Ozone			
Disinfection efficiency	Ozone > Chlorine dioxide > Chlorine > Chloramine NB: efficiency order can be changed by local conditions e.g. disinfectant consumption rate, biofilm protection, etc.			
Disinfection by-products	More than 500 by-products identified that are formed by reaction with organic matter; most products are halogenated (Cl, Br, I) organics; most relevant organic halogenated by-products are Trihalomethanes, Haloacetic acids, Haloacetonitriles, Haloketones, and Haloaldehydes; Trihalomethanes are regulated in Europe; Both Trihalomethanes and Haloacetic Acids are regulated in the US.	Nearly no halogenated organic by-products formed; negligible reaction with organic matter, except halogen transfer to nitrogen amines; some halogenated organic byproducts formed with trace of chlorine or chlorine in excess; Ammonia is formed if used in excess, thus nitrite formed from bacterial oxidation of ammonia.	Nearly no halogenated organic by-products; significant reaction with organic matter leading to no halogen transfer; some halogenated organic byproducts formed with excess of chlorine used or chlorine formed in-situ.	Nearly no halogenated organic by-products; significant reaction with organic matter leading to no halogen transfer; some halogenated by-products formed with excess of chlorine used or chlorine formed in-situ; main halogen by-product is bromate; it's difficult to fulfil the legal limit for its formation, thus many WTPs have replaced the ozonation step.

7.2.4.2 ALTERNATIVE SANITATION SYSTEMS

There are many types of sanitation systems used in the country, each with numerous variations. Selection of the variant to be used is dependent on income which determines water consumption patterns. High income residents in medium or high-income group housing may be served by off-site sanitation and septic tanks but the majority rely on onsite sanitation technologies. The following section discusses the onsite options for the project.

PIT LATRINE

A pit latrine is one of the most common and simple forms of excreta disposal. Pit latrines consist of a slab over a pit which may be from 2 m to 12 m in depth depending on soil suitability and owner preference. Slabs should be firmly supported on all sides and raised above the surrounding ground to prevent surface water ingress. If the sides of the pit are liable to collapse, they can be lined – particularly if it is proposed to empty them in the future. A squat hole in the slab or (less often) a seat is provided so that the excreta fall directly into the pit. These facilities are deficient as they produce odour and attract flies and mosquitos. Additionally, there are chances of ground water contamination from pits which do not have a proper lining.

VENTILATED IMPROVED PIT LATRINE (VIP LATRINE)

Similar construction to the simple pit latrine but in order to reduce the fly and odour nuisance the pit is ventilated using a pipe extending from the pit to above the latrine roof with fly proof netting across the top. Furthermore, the inside of the superstructure should be kept dark although vents are provided to enable fresh air to flow into the latrine through the pit and out of the vent. These facilities too pose a great risk of contaminating ground water when not properly lined.

ECOLOGICAL SANITATION (ECO-SAN) TOILET

Ecological Sanitation (or “Eco-San”) is the name given to a group of latrine types the common feature of which is that human excreta is treated as a resource. Human excreta are processed on site and then, if necessary, further processed off site until they are completely free of disease organisms. The nutrients contained in the excreta are then recycled by using them in agriculture.

There are three ways to recover the resources in urine - diversion, separation and combined processing.

- Diversion is when urine is diverted away from faeces - they are never mixed with each other and the faeces are dehydrated.
- Separation is when urine and faeces are initially mixed together then separated from each other for re-use.
- Combined Processing is when urine and faeces are mixed together, processed together and their resource value is captured together.

Based on experience in other parts of the country the most common form of Eco-San is the urine diversion type.

As Eco-Sans do not require a pit they can therefore be cheaper and more suitable than pit latrines in areas of the Town where pit excavation is difficult; e.g. areas with poor soils, high groundwater

or rocky ground. The cost of an Ecosan toilet is high compare to pit latrines, its operation & maintenance requires additives while its proper use requires behavioural change to maintain sanitation of excreta.

SEPTIC TANKS

A septic tank is an underground watertight settling chamber into which raw sewage is delivered through a pipe from plumbing fixtures inside a house or other building. The sewage is partially treated in the tank by separation of solids to form sludge and scum. Effluent from the tank infiltrates into the ground through drains or a soak pit. The system works well providing:

- The soil is permeable and not liable to flooding or water-logging;
- The sludge is removed at appropriate intervals to ensure that it does not occupy too great a proportion of the tank capacity.

In Uganda, the predominant type is reported to be a two-chamber tank for water closet waste only (waste water goes to a separate pit) which is a reasonably efficient arrangement.

Given the need for periodic emptying of septic tanks, this option was not chosen due to the high cost of maintenance and low potential for faecal sludge treatment in the project area as described in **Section 0** below. Furthermore, the option involves additional costs for water as the medium to transport the faeces.

VAULTS AND CESSPITS

Watertight tanks called vaults are built under or close to latrines to store excreta until they are removed by hand or vacuum tanker. Similarly, household sewage may be stored in large tanks called cesspits, which are usually emptied by vacuum tankers.

Vaults or cesspits can be emptied when they are nearly full or on a regular basis. They can be cheaper than sewerage especially if waste water is disposed of separately. This form of on-site sanitation is not available in the Town.

Given the need for periodic emptying of the vaults and cesspits, this option was not chosen due to the high cost of maintenance and low potential for faecal sludge treatment in the project area as described in **Section 0** below.

FAECAL SLUDGE DISPOSAL

When the sanitation facilities are filled up, they have to be emptied and faecal sludge disposed of. This sludge is to be disposed somewhere and according to the Ministry of Water and Environment (National faecal sludge assessment for small towns, 2013). The Ministry proposed that faecal sludge treatment plants should be constructed in selected towns with in the country. The towns under WSDf-C that were considered were ranked and Clustered. From the National faecal sludge assessment for small towns report, 2013, Kiryandongo town was clustered under the Kigumba area. Mutunda RGC being located in Kiryandongo subcounty is also a potential source for Faecal sludge.

There is no faecal sludge treatment facility in Kiryandongo District. The nearest faecal sludge treatment facility is located in Masindi Town (86km), Gulu Town (98km) and Lira Town (101km).

There is a faecal sludge treatment facility under construction in Nakasongola. It will be located approximately 162km away.

African Development Bank through the African Water Facility and Government of Uganda are funding a study for the development of the Faecal Sludge Management Facility in Kigumba with the catchment areas being Kigumba, Bweyale, Kiryandongo and Katulikire. This study is being undertaken through the Urban Water and Sewerage Services Department of the Ministry of Water and Environment.

Currently there is one privately owned cesspool emptier in Kiryandongo District. The cesspool emptier has a capacity of only 4m³. There is high demand for the services and the limiting capacity of the emptier, coupled with the haulage distances, has reportedly resulted in poor disposal of the faecal sludge in swamps.



Figure 0-2: 4m³ Cesspool Emptier in Bweyale Town

Due to the long haulage distance, the faecal sludge is sometimes disposed of at the waste stabilization ponds located in Kiryandongo Hospital in Kiryandongo Town Council. The Hospital limits the volume of faecal sludge that is disposed of at the treatment facility hence illegal dumping of waste is carried out in the maturation pond, resulting in poor treatment of waste.

Given the limited access and capacity of the faecal sludge treatment plants and the low haulage potential in the area, a lot of financial and human resources would be required to build the system to cover the RGC population efficiently. This option has a high risk of resulting in pollution of the environment and was therefore not chosen.



Figure 0-3: Waste Stabilization Ponds at Kiryandongo Hospital

A combination of lined VIP latrines for institutional sanitation facilities and septic tank systems for public sanitation facilities were chosen. The VIP latrines were chosen due to their low cost, easy to construct and maintain features. Additionally, they have odour and vector control features that would minimise the health risk from the sanitation facilities. Due to the numerous users in the institutions such as pupils/ students in schools, this option also presents one with minimal water requirements i.e. mainly for hand washing and cleaning the facilities. The septic tank system was chosen for the public sanitation facilities as the locations are along the planned water distribution lines and also due to the presence of population in growing trading centres with capacity to pay a user fee to cater for maintenance of the facilities.

7.2.5 THE “NO PROJECT” ALTERNATIVE AND PROJECT JUSTIFICATION

7.2.5.1 KEY BENEFITS OF THE “NO PROJECT” OPTION

- a) The water resource potential of the proposed ground water sources would remain unchanged as water will not be extracted;
- b) Short-term impacts such as noise, dust generation, vibrations, etc., emanating from construction activities would be avoided;
- c) The loss of the relatively small amounts of agricultural land to the construction of water source facilities and storage reservoirs would be avoided;
- d) Temporary inconveniences emanating from construction activities within urban areas such as temporary road closure for pipeline crossings, would be avoided; and
- e) The health risks associated with handling of harmful water treatment chemicals would be avoided.

7.2.5.2 KEY BENEFITS OF IMPROVED WATER SUPPLY IF PROJECT IS IMPLEMENTED

- a) Easy access to potable water within homesteads at various levels – stand posts, yard taps and house connections;
- b) Reduction in incidences of diarrheal and other water borne diseases; this leads to reduction in mortality and morbidity, especially of children;
- c) Improvement in hygiene and sanitation from increased use of hand washing, personal hygiene and environmental sanitation;
- d) Reduction in hours spent searching for and fetching water from distant sources which would significantly increase the time allowed for other activities; this is expected to lead to better livelihood for women and the girl child, who are traditionally, responsible for fetching water;
- e) Reduction in domestic violence and abuse of women as people in the homestead compete for the little potable water;
- f) Reduction incidences of promiscuity which are often carried out in the guise of fetching water, some involving children; this leads to incidences of child abuse, domestic violence and early pregnancies;
- g) Possibility of improving the quality of life of refugee, IDPS and the poor neighbourhoods in the RGCs where the most vulnerable people live. The project will offer pro-poor preferential tariffs to these communities;
- h) Cleaner and more conducive environment for activities in the RGC such as sports, markets, public places, etc.;
- i) Employment opportunities at all stages of the project – from construction, operation and marketing of the services; this leads to increased skills transfers to the community;
- j) Increased revenue to the local authority and the country in general through the collection of taxes.

7.2.5.3 KEY BENEFITS OF IMPROVED SANITATION FACILITIES IF PROJECT IS IMPLEMENTED

- a) Reduced incidences of diarrheal and other water borne diseases; this leads directly to lower rates of mortality and morbidity, especially of children;
- b) Greater school attendance by the girl children since they are more comfortable with cleaner and safer toilets. This leads to increased gender awareness and improvement;
- c) Cleaner and more conducive environment for urban activities such as sports, markets, public places, etc.;
- d) Employment opportunities at all stages of the project – from construction, operation and marketing of the services; this leads to increased skills transfers to the community;
- e) Increased revenue to the local authority and the country in general through the collection of taxes.

7.2.5.4 CONCLUSION ON THE 'NO PROJECT' OPTION

Kiryandongo District is an ever-growing district both innately from the increasing resident population and the inflow of refugee and IDPs to the district, thus the urgent need of a sustainable water supply system and sanitation facilities. The existing water supply system is operating below demand. The current sanitation systems are unreliable, in sorry state and sub-standard. If this is

allowed to continue, not only will the residents be exposed to public health risks but development opportunities will continue to be stifled and curtailed.

This certainly will have local, national and regional implications given that it's a major refugee and IDP hosting district in the country. Secondary implications include continuing trends of water-related diseases, no direct or indirect employment opportunities associated with the project, and continuing degradation of the environment and water resources due to unplanned disposal of faecal sludge.

In general, the minor benefits of the No-Project option are far outweighed by the benefits to be attained on implementing the Kiryandongo Water Supply and Sanitation Project.

8 ENVIRONMENTAL AND SOCIAL IMPACT ANALYSIS, ENHANCEMENT AND MITIGATION MEASURES

One of the key components of an ESIA is to identify and analyse impacts (both positive and negative), for the various project phases, on physical/chemical, biological and socio-economic environments. This section presents the identified impacts and analysis for the pre-construction, construction and operation phases of the project. The project developer (MWE) will be required to develop a comprehensive decommissioning plan before the decommissioning exercise, analysing the impacts of project decommissioning, which will be submitted to NEMA for review and approval.

8.1 POSITIVE IMPACTS

8.1.1 PRE-CONSTRUCTION PHASE

8.1.1.1 SOCIAL ACCEPTABILITY, COMMUNITY INVOLVEMENT AND OWNERSHIP OF THE PROJECT

The social license is the level of acceptance or approval by local communities and stakeholders towards the project (World Bank, 2020). The SLO is a key factor in ensuring social accountability, which encompasses a broad range of actions and mechanisms that stakeholders (esp. citizens, beneficiary communities, media, CSO) can use to hold public sector actors (MWE/IWMDP) accountable. Some of the social accountability mechanisms have to be adhered to by the project hence social license to operate (World Bank, 2014). The level of SLO within beneficiary communities was assessed by benchmarking with key indicators for social accountability. More vividly, there is increasing social inclusion and participation, trust, acceptability of planned project activities. This is a positive pre-construction impact that often enables successful project implementation. Feedback obtained during stakeholder consultations at district, sub county, parish and village levels indicated that there is significantly favorable social license to operate (SLO) by revealing that they are eagerly waiting for the piped water supply project. The SLO is a positive impact classified as direct, short, medium, long- term, highly significant, permanent and continuous. The likelihood of occurrence of the is Certain (already happening). The impact magnitude has been assessed as High, because without SLO the project can be adversely affected.

Enhancement measures

- Organise public disclosure of design and other information before, during and after construction, and directly engage the Local government technical staff who are closely in line with the WASH sector namely DHO, DCDO, DLO, CDOs, SAS, Parish Chiefs,
- Ensure meaningful social accountability for such a public investment (piped water supply) by closely monitor service delivery.
- Engage citizen groups in monitoring the project.

8.1.2 CONSTRUCTION PHASE

8.1.2.1 SHORT TERM EMPLOYMENT OPPORTUNITIES FOR LOCAL COMMUNITIES

The project will create direct and indirect employment to local people. The possible direct jobs include community workers (casual labour) and semi-skilled such as trenchers, plumbers, masons, painters, carpenters, mechanics, electricians, mixer operators, steel benders, drivers, community educators, porters, cooks, security guards, etc.). These will be involved in construction works for laying pipes, water towers, sumps, pump stations, among others. There will be additional indirect employment opportunities such as supplier workers, petty business (e.g., food kiosks). This positive impact is classified as direct, short, highly significant, permanent and temporary. The income earned will enhance access to basic needs among the local communities. In order to maximize the above positive social impact, it will be necessary to consider the following enhancement measures.

Enhancement measures

- Involve LC 1 village leaders in identifying casual and semi-skilled workers (Offer Identification / registration forms). However, the contractor has jurisdictions over recruitment process and eligibility requirements.
- Prioritize giving jobs to water vendors to minimize the effect of loss of jobs after commission of this proposed water supply project.
- Where possible, the project should integrate social protection mechanisms such as offering casual jobs to vulnerable and marginalized people using a group model (labour intensive public works) especially women and youth groups, as well as refugees.
- Coordinate with Refugee Welfare Councils (RWCs) on sourcing of labour (casual & semi-skilled e.g., plumbers, masons).
- The labour management procedures will be provided to contractors with guidance from MWE and DLG (Labour Office)

8.1.3 OPERATION PHASE AND MAINTENANCE PHASE

8.1.3.1 IMPROVED / INCREASED ACCESS TO SAFE AND CLEAN WATER AMONG NON-REFUGEE COMMUNITIES

The project will significantly contribute to achieving global SDG 6 target that aims to 'Ensure access to water and sanitation for all' (UN¹⁶, 2021) as well as NDP III target on Water for All. Under increased access to safe water, the project will specifically contribute to the following:

- 1) **Improved physical access to safe water points / connections:** The project will construct new portable water access points in Mutunda sub county. It will improve the right to water and sanitation services that are physically accessible within, or in the immediate vicinity of, their households, workplaces, educational and health facilities. It will serve hitherto under-served areas that have been facing water stress and extreme water vulnerabilities in this rural area. The subproject will:
 - Construct 29km (29,060m) distribution network that will improve physical access to clean and safe portable water to beneficiary villages.

¹⁶ <https://www.un.org/sustainabledevelopment/water-and-sanitation/>

- Install 200 start-up domestic connections including yard taps.
- Install 35 new public stand points (PSPs).
- The **walking distance to safe water source will reduce** as per the WHO standard of 100 meters to a water source. The project shall reduce critical walking distance for a hamlet to reach a PSP to less than 2,000m /2km between each PSP. Findings of the WASH survey indicate that, presently 68.5% of households access water in distance of more than 500-1,000 meters. This will be reduced.
- **Reduced time to collect water** – At baseline, 39.6% household spend more than 1 hour to collect water from any available source especially deep boreholes. This will be reduced.

Enhancement measures

- Conduct customer education and sensitize water users and communities about operations of new water system, especially on how to access new connections.
- Scale-up the intensification of lines, especially in areas where the trunk mains are too far away for the customers to be able to connect at reasonable cost.
- Ensure effective customer relations and customer care.

8.1.3.2 JOB CREATION FOR WATER VENDORS

Though it's anticipated that the water vendors (in Kikunya / Kizibu trading center) will lose jobs, it's also anticipated that the demand for safe and clean water in non-beneficiary areas may trigger job opportunities for water vendors to sell water to underserved and/or those unable to physically collect from PSPs and yard taps.

Enhancement measures

- Provide affordable tariff for yard taps and PSPs
- Engage water vendors

8.1.3.3 PROVISION OF SUFFICIENT QUANTITIES OF PORTABLE WATER

The project will provide **better sufficient quantities of portable water** for personal and domestic uses for present and future generations by year 2046. More specifically, the project will

- Meet the maximum day demand for the Mutunda RGC piped water supply system ranging between 293m³/day in 2021 and 660m³/day in year 2046 as per feasibility report.
- Provide a reservoir (water tower) with storage capacity of 330m³ (330,000 litres) able to withstand shortages and no rationing.
- The distribution system is assumed to operate 24 hours per day. The pumping stations and water treatment plant will however operate for a maximum of 20 hours per day.

Enhancement measures

- Sensitize communities about the benefits of piped water, in order to minimise on the possible misconception and negative attitudes.
- Sensitize communities about importance of safeguarding water infrastructure and other installations, in order to ensure physical security, avoid / minimise vandalism.

- Establish / integrate water treatment system to ensure supply of quality water with acceptable colour, odour and taste free from micro-organisms, chemical substances and radiological hazards.
- Plan for expansion of the reservoir capacity by 50%-100% in case of expanded distribution network and increased population / maximum day demand.

8.1.3.4 IMPROVED PUBLIC HEALTH CONDITIONS AND HEALTH SECURITY

The improved access to safe water will directly influence better human health conditions and health security. In this regard, the project will specifically impact as follows;

- Contribute to reduction in incidence and prevalence of water related diseases and illnesses (e.g. Typhoid, diarrhoea, dysentery, bilharzia, gastronomic disorders, malaria, etc) resulting from better access to safe drinking water, sanitation and hygiene. For instance, at baseline, HMIS2 data shows that incidence of water related diseases has been increasing.
- Improved on-site supply of water in health care facilities (WinHCF) – The project will improve / increase On-site supplies of clean water in many of health facilities (within all treatment wards and in waiting areas). Nationally, the proportion of health facilities with basic water supply stands at 33% in Uganda (WHO Global Baseline Report, 2019). The UNICEF Joint Monitoring Programme (JMP) indicators on WinHCF show that Uganda ranks highest in terms of ‘Limited’ water at HCF at 65.15% in Sub Saharan Africa. It ranked 6th in terms of having ‘Basic’ water at 30.81% and 10th rank for having ‘No Service’. Within Mutunda RGC, there is no health facility with piped water. Therefore, this baseline condition will certainly improve because availability of sustainable water supply is essential to quality of care and infection prevention and control in health care facilities.
- Improve living conditions of medical staff at Health facilities – The improved access to on-site supply of water will contribute to better living conditions of medical staff that reside at health facilities. Baseline conditions show that majority fail to access water for their domestic use (e.g. bathing, washing) which in turn affects their work performance.
- Improved menstrual health for women, adolescent girls and female youth - the public toilet will have incinerator for used sanitary pads installed in the female section of the toilet.
- Reduced exposure to Covid-19 infections – The improved water access will directly contribute to better responsiveness towards COvid-19 prevention, hence health security. This will be through increase in water availability for hand washing with soap.
- Contribute to national health security plan and targets – The piped water project will directly impact on Uganda National Action Plan for Health Security (NAPHS) 2019-2023. The aims at detecting, preventing, responding and mitigating public health hazards and emergencies (such as Cholera, Covid-19, HIV/AIDs, Ebola) that are recurrent health threats for Uganda (MoH/NAPHS¹⁷, 2019). In this case, Kiryandongo district is regarded as high-risk hotspot due to its high refugee population (mostly South Sudanese), as well influx of Most At Risk Populations (MARPS) that include traders, sexual workers, truck

¹⁷ Uganda National Action Plan for Health Security (NAPHS) 2019-2023

drivers, soldiers, among others. More so, the project it will contribute to NAPHS Objective 4 (Target 12 - Improve infrastructure for water systems, isolation facilities and waste management) and Objective 3 (Objective 3: Strengthen the Healthcare-Associated Infection Prevention and Control program).

Enhancement measures

- Provide piped water connections to government health facilities (institutional connection) to all health units in Mutunda Sub County as part of the intensification lines.
- Adjust eligibility criteria for water connections by including appropriate conditionalities such as having a functional pit latrine, hand washing facility, rubbish pit / gunny bags for waste collection, community sanitation conditions (zero open defecation), among other. This will enable local leaders and potential water users to mobilize and prepare themselves before connection. It should be noted in many parts of Uganda, the water utility managing units such as WSDF/Umbrellas have often verified some of the above hygiene and sanitation conditions before establishing household connections. At the same time, given the rural nature of communities, verifying WASH conditions before any connection if done will enhance public health and safety.
- Provide water tanks to health facilities to enable them store enough water.

8.1.3.5 REDUCTION IN GENDER BASED VIOLENCE (GBV, VAC & VAWG)

Baseline conditions of the project area indicate a prevalence of violence GBV, violence against children (VAC) and violence against women and girls (VAWG). Data showed that 5.6% of the total number of reported GBV incidents in whole of Kiryandongo district happened in Mutunda RGC between years 2021-2022. There were 7.1% GBV incidents related to denial of resources, opportunities & services at household level, mostly perpetrated by fathers and current partners. The driving factors are partly linked to water, sanitation and hygiene aspects. Therefore, it's certainly possible that the project will contribute to reduction in GBV incidents through improved accessibility in terms of availability (reduce distance, time), reliability and sufficiency, affordability

Enhancement measures

- The project should take water to every homestead in the project area. In informal settlements, public tap should be located within 100 m from the homestead.
- Provide affordable connection fees and tariff.

8.1.3.6 IMPROVED EDUCATION OUTCOMES DUE TO ACCESS TO SAFE WATER IN SCHOOLS AND EARLY CHILDHOOD DEVELOPMENT CENTERS

The piped water project will contribute to improved education outcomes and targets due to increased access to safe water in schools and Early Childhood Development (ECD) centres within Mutunda RGC area. The availability of safe and clean water will enhance education outcome at primary and secondary schools. The critical indicators that will be improved include:

- Reducing the distance to water source from an average distance of between 100 - 500 meters and above, to less than 100 meters.
- Provide sufficient volumes of safe water

- Provide affordable rates for institutional connections
- Provide 2 public toilets at Ogunga Primary School and Yabweng Health Centre II
- Enhance water storage capacity at schools
- Improve menstrual health conditions for girls and female teachers (water for washing)

The above benefits will certainly have direct influence on education outcomes such as enrolment rate; Attendance rate; staff welfare, learner & teacher performance; Completion rate; Teacher performance; Reduced Absenteeism among learners and teachers; Lower Dropout rate especially for girls; improve Menstrual health conditions for girls and female teachers; improved functionality of toilet facilities.

Enhancement measures

- Provide intensified lines / piped water connections to all Early Childhood Development centres, primary schools and secondary schools.
- Provide water tanks to enable them store enough water
- Conduct sensitization on community led total sanitation (CLTS).

8.1.3.7 REDUCED EXTREME WATER VULNERABILITIES AMONG RURAL AND URBAN HOST AND REFUGEE COMMUNITIES

The project will reduce the vulnerability among poor host and IDP/refugee communities within Mutunda RGC area. There are also sub groups of people who are affected by extreme water vulnerabilities such as children, women, youth, lactating mothers, health and education facilities, urban poor, rural poor, farmers. For instance, 27% of children in Uganda are experiencing high / extremely high-water vulnerability (UNICEF¹⁸, 2021). The project will contribute to reduction of the extreme water vulnerability as follows:

- a) Reduced water scarcity – the average annual water supply availability will be at least above 500 cubic metres per person (WHO Standard).
- b) Reduced water stress based on temporal and spatial (geographical determinations) of water sources and users.
- c) Improved water security whereby communities will safeguard water access points and water catchments.
- d) Improve food security - water access/availability will have dynamic interplay on food security. The project will provide at-least 15 litres/ppp/day which is regarded as “generally food secure / usually adequate” for any household as per Global Integrated Food Security Phase Classification (IPC) classification. It should be noted that water access is a Key Reference Outcomes on human welfare and livelihoods (IPC¹⁹, 2008).
- e) Reduced exposure to SGBV resulting from inability to afford water; poor personal hygiene; poor household sanitation; sexual violence (e.g. rape & defilement).
- f) Reduced exposure to human-livestock-wildlife conflicts caused by accessing open sources such as rivers, lake, streams, ponds.

¹⁸ UNICEF Report on Water Security For All 2021

¹⁹ Integrated Food Security Phase Classification (IPC) Technical Manual 2008

- g) Reduced poverty conditions especially reduction in household expenditure on water among all categories including those below poverty line (less than \$2 a day).
- h) Improved climate resilience and adaptive pathways in case of hazards and risks (such as drought, dry spell, pests and diseases, floods) due to availability of piped water among individuals, households, communities and institutions.

Enhancement measures

- Integrate gender mainstreaming in water operations.
- Promote climate resilience and other feasible adaptive pathways among host, IDP/refugee communities such as water storage.
- Ensure continuous stakeholder consultations, information exchange and disclosure

8.1.3.8 RURAL TRANSFORMATION THROUGH IMPROVED LIVING CONDITIONS (RELIABLE AND AFFORDABLE PIPED WATER SUPPLY)

The project will contribute to Improved Quality of Life Life in line with the national targets stated under the 3rd National Development Plan (NDPIII). More specifically, the Mutunda RGC piped water system will contribute to the following:

- a. Enhance the social well-being of the population within the RGC in terms of community health (reduced incidence and prevalence of waterborne diseases and conditions (meaning adverse effects) on human health, such as death, disability, illness or disorders caused by pathogenic micro-organisms that are transmitted in water.
- b. Transform urban agglomerations from villages, trading centres / hamlets and into suburbs and towns (as categorised under urban sociology). These include Te-yago, Mutunda, Popara West and Kawiti.
 - a)
 - b) Strengthen social service infrastructures (health, educational and local administration facilities).
 - c) Appreciated value of property.
 - d) Boost local trade, leisure and hospitality sub sector.

Enhancement measures

- There is need to improve physical planning of Mutunda and Diima Trading Centers and other mushrooming ones such as Teyago and Kawiti trading centre.
- Secure funding for sewage systems to handle expected demand for faecal sludge management facility.

8.1.3.9 IMPROVED LOCAL GOVERNANCE AND SOCIAL ACCOUNTABILITY

There will be improved local governance and social accountability between the leaders and communities. The political leaders have been actively involved in lobbying for better water supply systems in Kiryandongo. The new water system will be a tangible deliverable, and will enhance the social accountability between government and the population. At baseline, water is a critical social need that often fronted as political demand.

Enhancement measures

- The operations and maintenance of new water system should be safeguarded from political undertones arising from the discrepancies between those who are connected in phase 1 and ‘those not yet connected’ in phase 2.

8.1.4 PHASE CROSSCUTTING POSITIVE IMPACTS

8.1.4.1 BENEFITS TO THE ECONOMY

The GoU will invest heavily in the construction phase of the proposed project which would involve use of locally available materials. The business community could take advantage of the proposed development to establish businesses that would otherwise be impossible without piped water. Furthermore, benefits to the Ugandan economy are foreseen to accrue during the construction and operational phases. Income will be generated through tax remittances such as Value Added Tax (VAT), With Holding Tax (WHT), Pay As You Earn (PAYE), Local Taxes, etc. The income generated will not only go the National Treasury, but equally to the District Treasury, thus directly benefiting Kiryandongo District residents.

Enhancement measures

- During the construction phase, conditions should be put in place to ensure contractors prioritise use of locally produced materials.
- The water distribution network connections should target SMEs.
- During the construction phase, all contractors and sub-contractors should be registered tax payers with the Uganda Revenue Authority (URA) and should pay applicable taxes and remittances in a timely manner.
- The project developer should ensure that engineering designs, architectural drawings and site layout plans for the various project facilities be submitted to the Physical Planning Committee of Kiryandongo District Local Government for review and approval. NUWS, the foreseen operator of key project facilities, should obtain operational licenses from Kiryandongo District Local Government once the facilities are ready for commissioning.
- The Central Government through URA should ensure that project facilities operator makes timely submissions and routinely update their tax bases.

8.1.4.2 SKILLS AND TECHNOLOGY TRANSFER

Skills and technology transfer is foreseen to take place in all phases of the project, though most importantly at the construction phase. It is anticipated that construction works will be contracted to a reputable International/Ugandan firm which will employ and train local labour. This will avail an opportunity for skills and knowledge transfer into Kiryandongo community. The operational phase will equally offer skills build-up, particularly for students from institute such as Kiryandongo Technical Institute, Kigumba Business and Vocational Institute and Kigumba Petroleum Institute through internships, with respect to the operation, management and maintenance of the various water supply and sanitation facilities.

Enhancement measures

- The terms of agreement as per the contracts given to the construction works contractor and NUWS for the project's O&M phase should emphasize knowledge transfer and the project developer (MWE) should monitor and ensure that the objectives are met.

8.2 NEGATIVE IMPACTS AND RISKS

8.2.1 CONSTRUCTION PHASE

8.2.1.1 IMPACTS ON LAND USE/COVER

The project mostly traverses farmland under cultivation along with settled and built-up areas. The project developer, MWE, intends to mostly use road reserves of the existing public roads which are government land for the transmission and distribution lines. However, the water source site, booster station and storage reservoir sites shall be located on private land as indicated in **Error! Reference source not found.**, whose owners will be engaged MWE in the process of land acquisition in accordance with the land act and World Bank Environmental and Social safeguard policies as well as relevant national laws.

Given the current land use/cover of the key project sites as described in **Section 0**, this will be converted as construction of project facilities occurs on the respective sites. The clearing of corridor, movement of equipment and contractor staff and laying of pipes may lead to spot destruction of crops. According to the baseline, the reservoirs and sources are located on cropland dominated by maize. Excavation works may result into temporary blocking of accesses to social facilities, homes and private properties through cutting, filling, dumping of gravel, heaping of spoil, barricades etc. The practise results into considerable disruption of economic and social activities in the project area and may cause stress and resentment of project activities.

The sensitivity of the receptor will be low considering that the environment is already modified. Since the scale of the activities is short term and limited in extent, the intensity of impact is considered to be 'low'. The overall impact significance is assessed as minor.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- The water transmission line routes should be as much as possible restricted within the road reserves.
- Where land take is envisaged, compensation should be adequate and timely done. All land acquired for establishment of the water sources, reservoir tanks and any other activity either by the developer or contractor shall be compensated for in accordance with land Act and World Bank Environmental and Social Safeguard Policies.

- Sensitize the community early enough about the project so that, those affected by the project will have time to relocate their businesses to secure settings. Prior to the construction phase, farmers shall be sensitised on the pending project at least 6 months in advance such that cultivation within the project sites/ components’ footprint is stopped or reduced.
- As part of the RAP, a comprehensive impact survey is being conducted by experienced valuers in association with the district land board and local leaders. The results of the RAP will indicate all affected crops within the water transmission corridor/way leave, th respective owners and the replacement costs.
- PAPs should be given financial literacy on how to use their compensation packages.
- LGs should be involved in mobilisation and sensitizing PAPs.
- Movement of equipment (vehicles, contractors and the entire construction crew) must follow designated pathways or agreed upon access roads. This will avoid unintended damages to vegetation and crops.
- Upon completion of construction activities, disturbed areas should be restored to as close to pre-project conditions as possible, using native vegetation.
- Put in place a community complaint reporting / GRM as a mechanism for managing feedback, appeal, response and resolution
-

8.2.1.2 LOSS OF LAND AND DISPLACEMENT OF ECONOMIC ACTIVITIES

During project construction, the project developer, MWE, intends to mostly use road reserves of the existing public roads which are government land for the transmission and distribution lines. However, the water source site, access roads and storage reservoir sites shall be located on private land whose owners will be engaged MWE in the process of land acquisition in accordance with the land act and World Bank Environmental and Social safeguard policies as well as relevant national laws. According to the RAP (2022), the project will require a permanent land take and an easement corridor (**Table 0-1**) from a total of 480 PAPs.

Table 0-1: Project Land Takes

Impact	Land Affected in Acres
Permanent Land Affected (Water Source Sites, Reservoir Sites, Access Roads, and Sanitation Facility Sites)	2.3966
Permanent Land Restriction (Easement for Transmission and Distribution Pipes)	22.3167
Total Land Affected	24.7133

In general, the loss of land will be direct, permanent and irreversible but non-cumulative. This will be limited to proposed sites and a long-term impact. The intensity will be low since the project foot print requires small pieces of land per component, per locality and the water pipelines will

mainly lie in the road reserve except the areas where access to the source and reservoir sites is required. The sensitivity has been assessed as medium because there is no physical displacement of human settlement, physical cultural resources and/or significant economic displacement. Therefore, the overall impact significance is moderate.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- Implement the RAP in line with Ugandan laws and the World Bank's ESS5
- Engage local communities to provide land voluntarily especially for the distribution lines
- Select land requiring minimal or no relocation at all
- Use road reserves for pipe works
- Provide a fair and prompt compensation to the affected people
- Determine the extent of property lost or destroyed and provide fair and prompt compensation to the effected people.

8.2.2 OPERATION AND MAINTENANCE PHASE

8.2.2.1 DEPLETION OF GROUNDWATER RESOURCES

The motorized abstraction of groundwater has the potential to deplete the groundwater resources if the abstraction rate exceeds the aquifer recharge rates. To alleviate this, test pumping was conducted to estimate the safe yields of the borehole. The recharge of the aquifer which depend on the rainfall regime of the area among others things and the infiltration of part of the same can be affected by human activities²⁰ that impact the amount of rainfall received in the area and the amount of infiltration.

The sensitivity of the receptors is considered to be medium while the impact intensity is considered to be medium. The overall impact significance is moderate.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Inten sity	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor

²⁰ Such activities include land use changes like deforestation, wetland drainage for agriculture

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- To ensure that the ground water resources are not depleted, the abstraction rate should not exceed the rates determined during the test pumping exercise.
- The water levels should continuously be monitored to ascertain any impact on the water level.
- Water levels should be accompanied by monitoring of the water quality to ascertain any trend in water quality change with continued abstraction.
- The developer should apply /acquire the abstraction permits which will facilitate adherence to agreed rates of abstraction on one side and also guide the DWRM while issuing abstraction permits in the vicinity, to other competing users.
- MWE, the developer has undertaken a catchment management plan for the Victoria Nile in which the project lies and a source protection plan specific to the project water sources.

8.2.2.2 DETERIORATION OF LANDSCAPE AND VISUAL QUALITY

During construction of the Mutunda water supply and sanitation project, excavation will be undertaken at the sanitation facility sites, water office and during the levelling of the reservoir site. Further to this, sourcing earth materials which are used for construction works such as murrum and gravel can pose considerable visual and socio-environmental impact if quarry pits are not properly managed or restored. Water impounded in derelict borrow pits forms a breeding ground for mosquitoes or other disease vectors, posing health risks to local communities which is a negative but reversible impact. Furthermore, Excavations and heaping of spoil soil or storage of the construction materials may be un-aesthetic to some people. Because of this, the project may attract resistance and complaints from a section of the affected people which may slow down the project implementation pace.

The potential impact receptors are assigned a low sensitivity, given that projects with similar requirements for earth materials such as road construction and maintenance go on in the area. Since the scale of the activities is short term and limited in extent, the intensity of impact is considered to be 'low'. The overall impact significance is assessed as low.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Int en	1	1	2	3	4

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
	Very low	Negligible	Minor	Minor	Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation Measures

- Murram and subsoil will be obtained preferentially from a licensed source and in accordance with any terms of the license. “Licensed” means approved by NEMA or the respective Project District Local Governments. The contractor will provide a copy of the license to MWE before the beginning of works at the murram/subsoil extraction location.
- Surface water run-off will be controlled during earthworks. Surface water features down-slope of the earthworks will be identified, and the necessary berms and drainage channels will be installed to ensure that run-off does not collect or pond in excavated areas or quarries.
- The contractor should utilise the existing approved material extraction sites and where need for new sites arises, the necessary approvals should be acquired from the pertinent Authority such as NEMA and the DLG before commencement of material extraction activities. Further to this, conditions of approval should be adhered to including the decommissioning and restoration conditions.
- Restoration of borrow pits to as close to pre-project conditions as possible will be done immediately after use in cases where they are specifically opened up for this project. Native vegetation must be used for re-seeding the excavated site.
- Excavated soil at the sanitation facility sites and reservoir site shall be heaped, secured with band and covers to control soil erosion and re-used for backfilling. In case the soil is not required for backfilling, it shall be ferried to designated waste disposal sites in Kiryandongo District.
- While laying the pipeline along the road reserve, excavation works should be implemented in a sectioned manner and the contractor should ensure that the trenches are restored before moving to the next section especially in busy centres.
- There will be close monitoring of impact on natural resources with enforcement of contract or legislative options.

8.2.2.3 SUSCEPTIBILITY TO SOIL EROSION

The site earthworks during construction of water sources, water transmission and distribution network, water storage reservoirs, sanitation facilities and water office and the booster station will reduce soil stability and hence make the soils aggregated and more susceptible to erosion especially during the rainy season. Minor excavation works will take place at the reservoir sites;

soils excavated along pipe routes will be used for backfilling. Thus, minimal loss of top soil at these localities.

The potential impact receptors are assigned a low sensitivity, given that the soils in the project area consist of mainly sandy loam soils on gentle slopes and when eroded would affect the immediate environment. For the case of the water sources, water transmission and distribution network, water storage reservoir and sanitation facilities, the surroundings are primarily covered by vegetation with potential to trap the eroded soil. Since the scale of the construction activities is short term and limited in extent, the intensity of impact is considered to be 'low'. The overall impact significance is assessed as minor.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- Vegetation clearance should be limited to localities required for development.
- Construction sites should be hoarded off before excavations and soil barriers put in place to intercept any eroded material and any soil material will remain within the site until it is taken away for proper disposal or used for backfilling to avoid loose soil being washed away by storm water.
- Topsoil should be removed prior to carrying out excavations and kept separately so that it is used last in backfilling of the excavated areas. This is to ensure that the living soil (top soil) is available for plant growth in disturbed areas.
- The Project Contractor should backfill all trenches immediately after laying the pipes and compact such areas as to near level prior to excavation.
- Excess excavated soil material which will not be used for construction works shall be removed from the site in a timely manner and deposited at an approved site
- Areas adjacent to the construction site should not be disturbed and care taken to minimize the area of impairment caused by on-site storage of construction materials and equipment.
- MWE will also ensure that proper landscaping and vegetation restoration is carried out to further reduce the possibility of soil erosion. Native vegetation must be used for re-vegetation of excavated sites.

8.2.2.4 LOSS OF VEGETATION COVER

Vegetation clearance and removal will take place at the water source sites, transmission mains and reservoir sites. The removal of trees will be minimal (only done when necessary) as indicated in **Section 0** but will contribute to increase of carbon dioxide in the atmosphere (trees fix carbon dioxide from the atmosphere). All these will contribute to the greenhouse effect that causes global warming, thus climate change. The reservoir sites and pipeline routes are mainly covered by short grass that will rejuvenate on completion of construction works. The 2 large trees (*Milicia Excelsa*) recorded at Mutunda HC III and the water distribution project may not cause any threat to the endangered species because the tree are located 25 and 50 m from off the road. Fifteen (15) invasive/alien plant species were registered in the project area and if not appropriately handled could be spread further by construction activities.

The Impact intensity is considered low since the transmission and distribution pipeline will mainly be laid in the road reserve and natural vegetation exists along the proposed pipeline route in a post cultivated form except at some swamps. The sensitivity of the receptor is rated medium given that most of the areas traversed by the project were already disturbed with human activities resulting in an overall moderate impact significance.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- Vegetation clearance should be limited to only localities required for development.
- Avoid and minimise cutting of trees at all project sites.
- The contractor should restore sites where activities will be carried out at all the project sites. This site restoration and revegetation should be carried with local plant species as the preferred biodiversity upon completion of construction works.
- The topsoil that will have been removed before pitting the trenches for the pipeline should be put back to cover the trenches so that the crops can regrow in a natural environment. Excess soil, stones and boulders should be dumped in an area that has been approved by the District Environment Officer.
- Movement of equipment (vehicles, contractors and the entire construction crew) must follow designated pathways or agreed upon access roads. This will avoid unintended damages to vegetation.

- When invasive species are encountered, they will be removed and destroyed, for example, by burning. The equipment and cars shall be inspected and cleaned to ensure that the construction activities do not contribute to the spread of the invasive species.

8.2.2.5 LOSS OF HABITAT FOR FAUNA

During project implementation, vegetation clearance, landscaping and excavations will take place resulting in habitat modification, which will bring about loss of hiding, feeding, roosting and breeding grounds for fauna. Several publications have shown that fauna species are affected by habitat modification and destruction. Butterflies are impacted indirectly when vegetation on which they depend for nutrition is cleared. Likewise, dragonflies are indirectly affected when vegetation on which they patch is cleared. Khan (1990) reports that human intervention in the natural environment affect amphibian fauna in two ways: adversely, by destroying natural habitat, and favourably, by creating new habitats. Birds also occur across a broad geographical range and in a large number of habitat types; and some species specialize within narrow habitat bands and are thus sensitive to habitat change (Davenport, T. and Howard, P. 1996). Mammals have also been observed to be affected by habitat modification and destruction.

The Impact intensity is low since the project alignment follows the road reserve where natural vegetation that provide habitat to fauna exist in a post cultivated form except at some swamps. The trees are located away from the road reserve except a water source Borehole DWD 77379. The sensitivity of the receptor is rated low given that most of the areas traversed by the project were already disturbed with human activities resulting in a moderate impact significance.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- Clearance of fauna habitat (vegetation and soils) should be limited only to localities required for development.
- Movement of equipment (vehicles, contractors and the entire construction crew) must follow designated pathways or agreed upon access roads. This will avoid unintended damages to fauna.
- The contractor should restore sites where activities will be carried out at all the project sites. The topsoil that will have been removed before pitting the trenches for the pipeline should be put back to cover the trenches so that the mobile fauna is not affected.

- All project workers should be sensitized to minimize damage to vegetation and fauna.
- If wild animals are encountered, the Contractor shall notify UWA so that it is picked and taken to a secure place.
- Trenching, pipework laying as well as well as backfilling will be done concurrently. For pits like at the booster station, the contractor shall ensure that every evening, the pits are covered with timber while being secured with a warning tape.
- Wetlands along the project alignment should be given due attention during the construction phase to avoid negative impacts by:
 - Avoiding intentional spilling of petroleum products.
 - Implementation of the water act and wetlands policy, specifically articles that prohibits pollution and dumping of waste.
 - Scare the fauna before undertaking the activities to minimize injury and burying the hiding fauna
 - Relocate those fauna species that cannot move on their own and this should be done by a trained person.
 - Adaption of ecological friendly technology to align and pass the pipes e.g., anchoring of the pipes.

The wetlands along the project alignments include:

GPS Coordinates	Habitat type
36 N 0421588, 0230671	Nanda Wetland through which the supply and distribution line will pass
36 N 0425363, 0229567	Nana River
36 N 0421968, 0233183	Abuket River / Bridge point
36 N 0566420, 0164094	Cweje River point

8.2.2.6 DISTURBANCE AND DEGRADATION OF WETLAND ECOSYSTEMS

The project transmission and distribution lines will traverse Nanda Swamp at E- 421587, N- 230683 by approximately 306m and 612m² when considering a 2m easement. They will also cross another swamp along Mutunda Teyago road at E- 421970, N- 233154 by approximately 210m and 420m². The main activities that will be undertaken in the wetlands are installation of pillars for anchoring the transmission and distribution pipelines. Anchoring and installing the water transmission system within these wetlands can increase total suspended solids. However, the impact on these wetlands is likely to be minor since no clearing of wetland vegetation will be necessary for construction. The water pipes will be suspended on top of the wetlands using concrete or metallic stands, thus, no significant biological effects including on fish and other micro-organisms are expected. Further, no Critical Habitat species was found along the proposed project route and hence no impact on critical habitat is expected to be caused by the project. There will also not be likely implications on the human activities of subsistence fishing and farming. However, the exact number and locations of concrete or metallic stands for suspending

the water transmissions pipes will be determined on the ground at the time of construction (and in consultation with Wetlands Department), to minimize social and environmental impacts.

The standard construction procedure for pedestals (pipe supports) in wetlands (swamps) is as follows

Based on the Engineers route and alignment, the Contractor undertakes a confirmatory survey to set out the actual pipeline route. Once this has been approved by the Engineer, the Contractor pinpoints (identifies) the exact locations for the pedestals. These locations are excavated and filled with hardcore until settlement ceases.

Formwork (in the shape of a square or rectangle) is placed above the hardcore.

- (i) Depending on the degree of upward seepage, a moderately dry or wet lean concrete mix is placed above the hardcore and within the confines of the hardcore and left to set for about a day. This acts as the blinding for the base steel reinforcement.
- (ii) Once approved by the Engineer – reinforcement works for the pedestal base and column are undertaken until the pedestal is ready to receive the pipe.

Impact intensity is considered low since the transmission and distribution pipeline will be installed on top of pillars which will ensure minimal disturbance to the wetland system as they require minimal vegetation clearance. The sensitivity of the receptor is rated medium given that most of the wetland areas traversed by the project are close to the already existing road reserve resulting in an overall moderate impact significance.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- Construction works across wetlands will use existing road corridors for construction and operational access wherever possible.
- Where the route requires the suspension points for the water pipes to be located in the swamp and in areas which cannot easily be accessed from existing roads or causeways, temporary access ways built from Terramats or similar structures will be used and removed after.
- Obtain wetland user permits from NEMA before constructing across or along wetlands and follow all guidelines given.
- All project workers should be sensitized to minimize damage to flora and fauna.

- Close monitoring and supervision of the construction operations to ensure compliance to the NEMA permit conditions and avoid causing further damage to undesignated project areas.

8.2.2.7 GENERATION OF SOLID WASTE

The proposed project will generate waste of various types at the construction phase including food remains, polythene bags, plastic bottles, plastic offcuts from the HDPE and uPVC pipes papers, wrappings for components to be installed, excavated soil and left overs of construction materials (timber, aggregates, sand, bricks/blocks, steel bar cuttings, glasses, cement, etc.), etc. Such waste needs to be handled reasonably and must not remain in the road reserves or along the water trenches. Inappropriate disposal of waste or spoil could have medium or long-term environmental and public health impact. Improper managing of these wastes could result in contamination of soil, air, surface water and thereby posing public health risks.

The sensitivity of receptors is assessed as 'high' given that some sites for the proposed water source are located close to the bank of River Nanda while the water transmission line traverses a number of swamps. The impact intensity is assigned 'low' rating resulting in a moderate impact significance.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- The Contractor shall develop and implement a Waste Management Plan that will ensure that:
 - The wastes are properly segregated and separated to encourage recycling of some useful waste materials, that is, some excavated material can be used as backfills.
 - Solid waste storage bins and/or skips are provided at contractor's sites and at the construction sites and ensure they are collected or emptied in time. Depending on the rate of accumulation, waste collection is made at least once in 24 hours and done in such a way to minimize nuisance of smell and dust during collection.
 - Hazardous wastes such as paints, cement, adhesives are managed through a third-party contractor certified by NEMA. The wastes shall be transported in a NEMA approved box body trucks to the NEMA approved waste disposal facility in Nakasongola.

- All sorts of waste generated during construction such as HPDE and uPVC offcuts and other accessories associated with water and sanitation projects shall be collected by the contractor and delivered to recycling facilities. Other forms of waste which are inert must be collected by NEMA gazetted waste handlers and taken to a NEMA gazetted waste disposal facilities for disposal.
- All organic waste generated at eating places during construction such as food stuffs shall be collected and transported by the contractor to designated district landfills for disposal.
- All plastic waste generated during construction, such as mineral water bottles, polyethene bags, jerricans and cups shall be collected and taken for recycling in plastic collectors in Kiryandongo for onward transmission to plastic recyclers.
- Human excreta shall be managed using a mobile toilet and then disposed at the waste stabilisation ponds at Kiryandongo Hospital.
- The contractor will work with Kiryandongo district Local government to facilitate sound waste handling and disposal. All wastes must be taken to the approved waste disposal facilities. Proof of delivery and safe disposal of waste will be provided and records maintained at all times.

8.2.2.8 RISK OF CONTAMINATION DUE TO FLOODING OF WATER SOURCE

The Source DWD 77378 is located in a flood prone lowland where infiltration of surface run-off may occur during heavy rains thus contaminating the water source. Given that the area is primarily covered by gardens the potential contaminants include nutrients and pesticides from the agricultural fields along with organisms such as microbes carried by runoff.

The sensitivity of the receptors is considered to be 'high' while the impact intensity is considered to be low given that the project design will put into consideration construction techniques for water source protection to ensure minimal risk of contamination. The overall impact significance is moderate.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- The water source (borehole) should be constructed with a water tight casing above the water table

- The design and construction of the pump house at source DWD 77383 should incorporate a raised apron slab above the ground by the required height for the predicted flood depth of the area.
- Aprons should be constructed with deep foundation edges to avoid erosion.
- Routine water quality tests should be carried out at the source and after events with potential to cause contamination, upon which appropriate water treatment should be carried out to remove the detected contaminants before its distributed to the users.
- A water source protection plan has been developed to ensure sustained water quality and quantity for the project.

8.2.2.9 NOISE AND VIBRATIONS

Noise and vibration will occur both on and off site. This will emanate from movement of trucks, excavation works, usage of equipment (compactors, generators, etc.), etc. Noise levels at three out of the four the sensitive receptors in the project area i.e. Ogunga Primary School, Kawiti Trading Centre and Kakwokwo Primary school were observed to be above the maximum permissible noise limits and this was mainly attributed to the vibrant human activity in the area. Exposure of communities and workers to high noise and vibration levels can be a health concern and needs to be mitigated in line with the National Environment (Noise) Control Regulations, 2003.

The receptor sensitivity is considered low given that most of the proposed project area is located in relatively noisy areas as indicated in the baseline, while the intensity of the impact is rated low ultimately resulting in a minor impact significance.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- No employee should be exposed to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day without hearing protection. (National Environment (Noise) Standards and Regulations). Workers operating equipment generating noise levels greater than 80 dBA over long hours must be given earmuffs.
- Workers should be provided with the necessary personal protective equipment (PPE) such as ear muffs.

- Periodic medical hearing checks should be performed on workers exposed to high noise levels.
- Sites must be hoarded to curb noise impacts to neighbouring communities.
- Works should be undertaken during day time i.e. from 8am to 6pm.
- Works near schools or health centres should be done in periods like weekends in order for noise and vibrations not to interfere with learning environment.
- Weekly monitoring of noise levels at active sites should be carried out by the contractor.

8.2.2.10 AIR POLLUTION

The most significant issues that could potentially impact on air quality and climate during construction are combustion gas emissions and nuisance dust. During the construction phase there will be an increase in road traffic associated with material and equipment haulage. Furthermore, exhaust emissions from vehicles and machinery (e.g. generators) consisting mainly of poorly burnt fuels and oils, including nitrogen oxides, carbon oxides, hydrocarbons, particulate matter, etc are expected to occur. The potential impacts are nuisance to people in the area, coverage of crops (possibly leading to reduced yields) and deposition on natural vegetation and fauna who feed on the vegetation. Due to the temporary nature of construction, dust emissions are not anticipated to have a long-term impact on local air quality. Dust nuisance will decline as stripped areas of land re-vegetate. Ambient air quality measurements indicate that the environment around the project area is currently devoid of sources of high air pollution.

The manageability of the impact is high since typical impacts are well understood in conventional infrastructure construction industry and the ability to adapt to the impact is high because construction activities have been on going on in the project area especially for access roads. Due to the intermittent and short-term nature of the activities, the intensity of impact is assessed as low and sensitivity of the receptors as low. The impact significance is therefore minor.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- Travel speeds of construction vehicles along the road especially at trading/ business centres will be controlled and should not exceed 50 km/h on the highway and 40 km/h off the highway.

- Trucks will be covered during haulage of construction materials to reduce on spillage of materials and wherever dust suppression is necessary, water will be sprayed over dusty areas.
- Workers will be provided with PPE and the use of PPE shall be enforced.
- All surfaced roads shall be subject to road cleaning and un-surfaced roads to dust suppression, the methodology and frequency of which shall be included in the Contractor's Traffic Management Plan.
- Stockpiles of friable material will be grassed in order to prevent wind erosion.
- A maintenance programme for equipment and vehicles will be implemented, to ensure air emissions like particulates, SO₂ and NO₂ are minimised.

8.2.2.11 INCREASED RISK OF ROAD ACCIDENTS

The proposed project will cut across several roads within the project area. Construction activities will involve trenching mainly in the road reserve, however, with concern about the points where the trenches cross major roads and trading centres as will be the case at Popara, Mutunda and Kawiti trading centre along Katulikire-Mutunda-Kawiti road. At these points the risk of road accidents is increased and it is therefore necessary that key precautions be undertaken at such road crossing to avoid accidents and impairing traffic activities. The movement of project vehicles while dropping workers and delivering materials may also compromise the safety of the road. Furthermore, the use of project vehicles and equipment on community access roads will expose road users to more traffic accidents.

The receptor sensitivity is considered low given that the project is being implemented in remote areas where traffic volumes are very low, and the main mode of transport is by bicycles and motorcycles while the intensity of the impact is rated medium ultimately resulting in a moderate impact significance.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- The Contractor shall develop and implement a traffic management plan
- Disruptions to public access shall be identified in the Contractor's Traffic Management Plan, under which suitable notice of intending delays and closures are given to all

concerned parties and approved prior to commencing work. All road closures shall be separately notified and agreed with the subcounty administration.

- Where access to or from an individual property is closed for a period of 2 hours or more, the owner shall be informed at least 7 days in advance.
- Vehicular access to and from hospitals, police stations, and other public institutions shall be maintained through the use of steel road plates over open trenches. Pedestrian access to schools, health facilities, and other premises frequently accessed by the public will be maintained with the use of walking boards.
- To minimize interference with traffic, half of the road shall be closed to enable vehicles use one half as the other half is being excavated and installed with pipe work. The excavated soil shall be temporarily consolidated on the sides of the road and re-used for backfilling immediately the laying of pipework is completed.
- The Design Team will continue to discuss with UNRA and DLG engineering departments to assess the designs and any other feasible options (tunnelling Vs trenching across the tarmac road) and to secure the pertinent permission for road crossings.
- All roads that are trenched during the process should be rehabilitated after laying of pipework is completed as advised by UNRA and DLG engineering teams.
- Road safety and site safety training should be done involving construction workers, police and local community.
- Conspicuous signage shall be well placed on roads and the Contractor's Traffic guides on ground shall direct traffic in case of diversions or open trenches.
- All company vehicles used in the transportation of construction workers, material and equipment to and away from the site shall be in sound mechanical conditions. Evidence shall always be provided by recording the status of the vehicle in the Daily Vehicle Inspection Form before usage.
- All drivers to be employed by the Developer or Contractor shall be qualified, skilled with valid driving permits.
- The vehicle speed shall be limited to a maximum of 30km/hr areas near sensitive facilities.
- Works near sensitive facilities like schools and health centres shall only be limited to day time (7am to 6pm).

8.2.2.12 INFLUENCE ON VIOLENCE AGAINST CHILDREN (VAC)

Its anticipated that violence against children cases like labour, child sexual abuse and exploitation practices may occur under the following circumstances; a) contracted workers engaged by third parties if any) and b) primary supply workers engaged by suppliers in providing goods and services (e.g. stone quarries, sand mining, transporters, etc); c) supply chains that engage children in extraction, processing, distribution, storage of goods and services before being delivered to contractors, or even at construction sites without contractors notice (e.g. Children vending food stuffs, drinks at / near construction sites).

However, the above-mentioned exposure factors to VAC MUST be prohibited and compliance of contractors closely monitored. If well done, the contribution of the project in reducing child labour will be HIGH.

This impact is short term and direct impact but Reversible. The receptor Sensitivity is accessed to be low because the contractor and Local governments are greatly aware of the side effects. The impact Intensity is medium especially in short run but can be handled immediately. The ultimate impact significance is moderate.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- The project implementation team should put a mechanism in place to identify the presence of all persons under the age of 18 and ensure that they are not employed on the project.
- All third parties and suppliers should be made to comply to No-Child Labour policy.
- The contractor should put up notices on work sites (NO CHILD LABOUR) in order to silence agitations
- Document all workers and issue work contracts with codes of conduct against VAC
- The Developer should engage District Education Officer, District Community Development Office (DCDO), Gender Officers, Parish Chiefs among others in monitoring school attendance in the project's area of implementation.
- Sensitization on VAC should be carried out in schools and in communities.
- Reporting mechanisms should be put in place such as a whistleblowing system. Annex 11 provides the referral pathways and reporting mechanisms for VAC, GBV and other Sexual related incidents/ allegations.
- The contractor, where a case arises, will cooperate with law enforcement agencies in investigating complaints of VAC.
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8.2.2.13 IMPACT ON SEXUAL AND GENDER BASED VIOLENCE (SGBV)

Baseline conditions of the project area indicate a prevalence of violence GBV(Violence Against Women and Girls (VAWG) and Intimate Partner Violence (IPV). Data showed that Mutunda RGC contributed 5.6% (98 out of 1,735) of the GBV incidents in the entire district in two years 2021-2022. By category, 50% (49 out of 98) were Physical Assault; 17.3% (17 out of 98) were Defilement;

7.1% (7 out of 98) were Denial of Resources, opportunities & services; 11.2% (11 out of 98) were Psychological Abuse; 4.1% (4 out of 98) rape; 10.2% (10 out of 98) were sexual assaults at household level, mostly perpetrated by fathers, as well as Intimate partners (IPV). Given that all users of the proposed piped water supply will be required to pay, there are possibilities of denial of resources (money to pay for water) among households who have less ability to afford, and this may in turn affect women and children who carry the burden of collecting water for domestic use. In addition, the benefits of cash compensation to PAPs will mostly be to the male household heads and this could stimulate exposure risks to GBV cases. Therefore, it's certainly possible that the project's influence on increasing exposure to GBV. The intensity of the impact is HIGH given that the inability to afford water bills may be continuously fluctuating (either high / low) depending on seasonalities. Sensitivity of the receptor is rated HIGH because children and women are often the victims and males are mainly perpetrators. Therefore, significance of the impact is Major.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- Contractors to develop and implement GBV codes of conduct for workers, visitors, sub-contractors and service providers
- Promote GBV/SEA/SH awareness before and during project implementation
- Strengthen GBV Referral pathways within the community (core and influence zone of project area). The referral pathways and reporting of GBV is provided under annex 11.
- There is need to engage into community policing with emphasising on prevention of GBV. This can be done by the local area police department of Family Protection Unit (FPU).
- The local government (CDO) should strengthen awareness and sensitisation against GBV.
- MWE should consider having a dedicated service provider for GBV, VAC, HIV/AIDS to provide overall mitigation implementation and management during civil works.
- The contractor, where a case arises, will cooperate with law enforcement agencies in investigating complaints of SGBV.

8.2.2.14 RISK OF CONTRACTING AND SPREADING COVID-19

Construction sites are places where people from different places can meet and interact while executing various construction activities including meetings and trainings such as daily assemblies

and toolbox meetings. Such interactions pose the risk to spread COVID-19 and other similar respiratory such as pandemic influenza. COVID-19 is a new virus that had not been previously identified in humans and therefore no population-level immunity exists. While most people with COVID-19 develop mild or uncomplicated illness, approximately 14% develop severe disease requiring hospitalization and oxygen support and 5% require admission to an intensive care unit²¹. Uganda is currently experiencing an outbreak of COVID19. The statistics as of 11th January 2022 were 150,301 confirmed cases (only Ugandans) and 98,601 cumulative Ugandan recoveries (Source: <https://www.health.go.ug/covid/>).

The duration of the impact will be short-term and the extent of the impact will be local or regional depending on origin of construction workers. The likelihood of the impact occurring is medium if the contractor adequately sensitises workers about responsible and safe behaviour. The intensity of the impact is high given that a Covid 19 outbreak would require shutdown of works, possible a local/ regional lockdown with some patients requiring hospitalisation. The sensitivity of the receptor is rated medium given that Covid 19, if contracted, is has short to mid-term effects. Therefore, significance of the impact is major.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- Sensitize all project employees about the signs and symptoms of COVID-19 as well as the ways to control its spread.
- Screen local employees/contractors for COVID-19 during recruitment.
- Screen all visitors to construction sites using a temperature gun and enforce washing of hands before entry and wearing of approved masks.
- Management of potential COVID-19 cases – in case, any workers develop the above symptoms, isolate them and immediately contact the respective District Health Officers (DHOs) to pick and transport the patients for treatment.
- Reduce site traffic – prohibit entry for any non-essential visitors. In addition, utilize staggered start and finish times for workers to limit site congestion and physical contact. Further, restrict the number of people in attendance at any site inductions, and consider holding them outdoors whenever feasible.

²¹ Ministry of Health-National Guidelines for Management of COVID-19, 2020

- Practice social distancing – Consistently monitor points of worker interactions such as dining areas to ensure social distancing guidelines (2-4 meters apart) are being met.
- Prioritize sanitation – Enforce workers to wash their hands with soap and water for at least 20 seconds or to use sanitizers before entering and after leaving the worksite, as well as before and after handling all goods, materials and equipment. Routinely clean any common contact surfaces on-site (e.g. scanners, turnstiles, screens, telephones and desks). Lastly, be sure to temporarily remove or disable any site entry systems that require skin contact (e.g. fingerprint scanners).
- Limit physical contact – Make sure that the contractor stagger break times to reduce congestion and physical contact in eating areas. Require workers to keep at least 2-3 metres of distance between one another while eating.
- Enhance whole-of-society coordination mechanisms to support preparedness and response, including the health, transport, travel, trade, finance, security and other sectors. Involve public health Emergency Operations Centres and other emergency response systems early.
- Continuously sensitize the workers and pass on any new guidelines by Government and the WHO.

8.2.2.15 DESTRUCTION OF PHYSICAL CULTURAL RESOURCES

There are currently no known archaeological sites within the immediate vicinity of the proposed project area. However, the proposed reservoir site in Alero B village is in close proximity to a graveyard. Certainly, PCR like graveyards and older-trees may be damaged during site clearance, laying of the transmission mains. Given the excavation works involved in the laying of the transmission and distribution system, the possibility that some cultural features being encountered along the alignment cannot be ruled out.

Owing to the importance of and sentiments attached to burial sites, the sensitivity of the receptors is considered to be 'high'. The impact intensity is considered to be low given that the grave yard at the proposed reservoir site is most likely not to be affected since it is located outside the project foot print. The overall impact significance is moderate.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- At the local level, additional consultations will be carried out prior to commencement of works by the contractor at the project sites.
- A 'chance find' procedure (**Section 0**) will guide actions to be taken in the event that suspected archaeological artefacts or paleontological items are encountered and they should be handed over to Ministry of trade and industry- Department of Museums and Monuments.
- Construction workers and managers should be trained in basic skills of how to identify and handle archaeological materials/artifacts before commencement of work. Such training should be administered in liaison with the Department of Museums and Monuments (DMM)
- Construction works will be designed to ensure no damage to any cultural sites or medicinal plants that may be encountered including older-trees that are culturally significant. Where such sites cannot be avoided, culturally appropriate measures will be agreed and implemented prior to the construction activities.
- Compensation of the affected sites will be undertaken before construction activities commence in accordance with World Bank requirements.

8.2.3 OPERATION AND MAINTENANCE PHASE

8.2.3.1 DEPLETION OF GROUNDWATER RESOURCES

The motorized abstraction of groundwater has the potential to deplete the groundwater resources if the abstraction rate exceeds the aquifer recharge rates. To alleviate this, test pumping was conducted to estimate the safe yields of the borehole. The recharge of the aquifer which depend on the rainfall regime of the area among others things and the infiltration of part of the same can be affected by human activities²² that impact the amount of rainfall received in the area and the amount of infiltration.

The sensitivity of the receptors is considered to be medium while the impact intensity is considered to be medium. The overall impact significance is modereate.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

²² Such activities include land use changes like deforestation, wetland drainage for agriculture

Mitigation measures

- To ensure that the ground water resources are not depleted, the abstraction rate should not exceed the rates determined during the test pumping exercise.
- The water levels should continuously be monitored to ascertain any impact on the water level.
- Water levels should be accompanied by monitoring of the water quality to ascertain any trend in water quality change with continued abstraction.
- The developer should apply /acquire the abstraction permits which will facilitate adherence to agreed rates of abstraction on one side and also guide the DWRM while issuing abstraction permits in the vicinity, to other competing users.
- MWE, the developer has undertaken a catchment management plan for the Victoria Nile in which the project lies and a source protection plan specific to the project water sources.

8.2.3.2 SOLID WASTE GENERATION

During the operation of the project, solid waste will be generated from the activities of the water office as well as activities of maintaining the water transmission and distribution lines. The wastes that will be generated include food remains, polythene bags, plastic bottles, papers, containers for treatment chemicals such as chlorine, wrappings for spare parts, etc. Wrappings/cylinders for treatment chemicals can be hazardous to humans and the environment if not safely disposed.

The sensitivity of receptors is assessed as 'low' given that the solid waste will be generated at already established sites with waste disposal facilities from the construction phase while the impact intensity is assigned low since there will be minimal activities generating waste during the operation phase and the impact of solid wastes are localized, temporary and largely reversible. This ultimately results in a minor impact significance.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- A Waste management plan for the operation phase of the project will be developed and implemented.
- Waste collection bins will be provided at strategic positions at the water offices, water source sites and reservoirs sites for temporary waste storage. The waste collection bins

should be provided with covers to avoid spillage by scavengers and clearly coded for sorting purposes.

- The water supply system operator will hire a certified waste collection company to transport the waste for final disposal to designated waste dumping sites by NEMA.

8.2.3.3 RISK OF POLLUTION FROM MISMANAGEMENT OF SANITATION FACILITIES

The project will support construction of 2 VIP Latrines at institutions to be determined by the District LG and one waterborne public toilet to serve the residents in Mutunda trading centre. The area has no sewerage system and therefore the waterborne public toilet will have a septic tank system. The septic tanks shall be emptied and treated at a site (waste treatment plant) gazetted by NEMA such as the waste stabilization ponds at Kiryandongo Hospital. Therefore, the collection, transportation and disposal of sewage must be done correctly to minimise or avoid health risks to communities. Any mismanagement of sanitary waste generated during the operation may lead to pollution of the area which may end up polluting the water sources. This may cause risk to public health.

The sensitivity of the receptors is considered to be 'high' while the impact intensity is considered to be low given that the project will use septic tank technology for handling of sanitary wastes along with proper planning for emptying and disposal. The overall impact significance is moderate.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- A Periodic maintenance regime including emptying and desludging will be put in place and implemented to prevent sewage over flows.
- Use of manifest system to ensure that the wastes are disposed off at a site (waste treatment plant) gazetted by NEMA.
- A robust management system for the sanitation facilities involving the communities, their leaders and the health workers should be put in place to monitor, detect and alert the responsible authorities to call for emptying of any septic tank that causes a danger to the community.

8.2.3.4 LOSS OF JOBS FOR WATER VENDORS

In Kiryandongo District and particularly in the proposed project area, due to the great distance to traditional water source waters, fetching water is done by water vendors. They often carry 20-litre jerry cans on motorcycles, bicycles, wheel barrows, any other bulk carriers. They sell jerry cans of 20 litre capacity and sell each between UGX 500 and 5,000 depending on prevailing circumstances (low in the rainy season and high in the dry season). The vendors are likely to have their livelihoods undermined following project implementation. By introduction of piped potable water supply, water vendors will lose their source of income within the project area as water will be accessible at homesteads and at nearby public posts.

The sensitivity of the receptors is considered to be medium since the vendors can put their effort and investments into other sources of income, while the impact intensity is considered to be low given that the water vendors can extend their services to areas not covered by the project. The overall impact significance is moderate.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- MWE should sensitise existing water vendors in the area about adapting to the new developments in the area. This would eliminate their negative attitude towards the proposed project and result in total project support.
- The MWE should work with the CDO to mobilise the local people (including water vendors) and sensitise them about the opportunities that the proposed project would bring in the area and how they can take advantage of piped water in the area to create jobs (such as washing bays) and spur development in the area.
- Vendors would be encouraged to become scheme or kiosk operators; vendors would be encouraged to tender for public water points.
- Vendors should be encouraged to be involved in casual work in the course of the construction works.

8.2.3.5 INCREASED COST PER UNIT / REDUCED AFFORDABILITY

The cost per unit is likely to be higher than the prevailing level of water affordability. Currently, majority of the households pay less than UGX 1,000 per month as borehole fees. The new piped water will likely to charge per jerry can / per unit. This will hinder affordability and utilization, hence increased substitutability.

The sensitivity of the receptors is considered to be low since household can access alternative sources (deep boreholes, no matter the distance), while the impact intensity is considered to be low given that the project developer put into consideration the economic situation of the project area when developing the project and ultimately when setting water prices for the project beneficiaries. The overall impact significance is minor.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- Alternative water sources such as the boreholes should continue to be maintained by the water user committees.
- MWE should support the district local government to continue funding construction / rehabilitation of alternative water sources such as shallow wells, boreholes, etc.
- UNHCR can provide subsidies for IDP / Refugee communities.
- NUWS under the guidance of MWE should put into consideration the project area's economic profile and vulnerability when setting affordable water prices.

8.2.4 PHASE CROSSCUTTING NEGATIVE IMPACTS

8.2.4.1 OCCUPATIONAL HEALTH AND SAFETY RISKS

Construction employees meet many occupational hazards at the workplace such as construction traffic, excavation machinery, working in water and trenches may pose accident risk to workers either when equipment is operated by inexperienced workers or when in a poor mechanical condition or falls into the trenches/ deep waters. OHS risks could also result from insufficient medical capability at the construction site; or neglect of safety equipment, precautions and procedures.

During operation and maintenance of the water treatment and supply facilities, occupational health and safety problems will arise. Workers at the facilities might experience negative health impacts, particularly during poor operation of the chemical equipment like chlorine gas or calcium hypochlorite powder. Fatal falls, suffocation and injury while working in confined places. Other causes of OHS problem include but not limited to:

- Lifting of heavy and sharp objects;
- Poor transportation of materials for maintenance;

- Improper storage as well as handling and use of dangerous substances/ chemicals;
- Inadequate lighting and ventilation in workplaces;
- Lack of adequate training (or neglect of safety precautions/ guidelines) in use of equipment and tools;
- Misuse of equipment and materials for functions they are not designed;
- Lack of safety signage in specific areas;
- Electrical hazard;
- Eye hazards such as splashes;
- Lack of adequate PPE; and
- Biological hazards (vermin, mosquitos, pathogens, etc.).

Accidents could cause considerable ecological damage, financial loss and harm to human life. While largely reversible, some impacts such as loss of human life and body injury are irreversible. The receptor sensitivity is considered low given that although such impacts may be irreversible once they occur; the workers have done similar work and have knowledge on how to avoid such incidences. The impact intensity is considered to be medium even if MWE procures a qualified contractor who is aware of OHS measures but workers do not follow OHS requirements and NUWS will be in charge of operating the facilities for which it has vast experience. Nevertheless, this gives rise to an impact of moderate significance.

		Sensitivity			
		1 Very low	2 Low	3 Medium	4 High
Intensity of Impact	1 Very low	1 Negligible	2 Minor	3 Minor	4 Minor
	2 Low	2 Minor	4 Minor	6 Moderate	8 Moderate
	3 Medium	3 Minor	6 Moderate	9 Moderate	12 Major
	4 High	4 Minor	8 Moderate	12 Major	16 Major

Mitigation measures

- The Contractor shall prepare and implement an occupational safety and health plan for all sites, approved by the developer.
- The Contractor shall provide safety guidelines to all operations prior to start of work.
- Strict adherence to safety measures and procedures are required to minimise (or eliminate) risks of accidents or hazardous developments occurring and ensure healthy and safe conditions for all persons working on the site. To ensure occupational health and safety on construction sites, the Contractor shall be obliged to comply with all applicable Ugandan construction Health and Safety Standards as required by the Occupational Safety and Health Act of 2006. These include provisions of the Factories Act, Labour Unions Act and Workman’s Compensation Act.

- Training will be conducted on how to prevent and manage incidences. This should involve proper handling of electricity, water etc. and sensitization on various modes of escape, conduct and responsibility during such incidences. All must fully be aware and mentally prepared for potential emergency.
- Regular drills will be constantly followed on various possible incidences. This will test the response of the involved stakeholders. Such drills will keep them alert and they will become more responsive in case of incidences.
- Personnel on duty shall at all times wear appropriate PPE, such as safety glasses with side shields, face shields, hard hats/helmets, and safety boots be required for all site staff.
- The Contractor shall establish emergency entrances, exits and amenities.
- The Contractor shall ensure access to first aid kits.
- The Contractor shall ensure safe working heights through provision of work platforms, scaffolds and adequate supervision by ensuring regular inspection of formwork, falsework and temporary supports before loading or pouring concrete.
- The Contractor shall secure site boundaries with hoardings as appropriate.
- The Contractor shall install caution signage around the site to discourage the public from being close to the site, for example, “falling debris”, “keep off the site” etc.
- The Client through the Construction Supervisor will continually monitor Contractors’ compliance with Health and Safety measures.
- An Accident Log will be maintained onsite to register all injuries and to investigate their causes during both the construction and operation phases of the project.
- The manufacturer's instructions and Material Safety Data Sheets (MSDS) shall be followed for the storage of all chemicals used in water treatment. Storage must conform to compatibility restrictions.
- Work force shall be subjected only to standard work shifts/hours. Overtime allowances, if applicable/warranted shall be paid with ceiling limits. Working beyond such ceiling limits shall be discouraged, even if, so desired workforce or contractor.

8.3 CUMMULATIVE IMPACTS

8.3.1 VALUED ENVIRONMENT AND SOCIAL COMPONENTS

Multiple projects currently under implementation and those planned within the spatial and temporal framework impact a set of environment resources and social systems. Although the scope of this report only covers the proposed development of the solar powered piped WSSS in Mutunda RGC, there are other projects in the project area. The identified VECs may include;

a) Material Source Areas

Projects implementing infrastructure development especially water pumping station, water reservoirs, booster stations, water office blocks and sanitation facilities shall require gravel, murrum, sand, rocks and among other products hence impacting on source areas.

b) Shared Land Corridors

Linear projects like roads, power lines and telecom cables normally share corridors. Relocation of such services is an impact and acquisition and compensation of such corridors may raise social and economic concerns.

c) Water Resources

Project implementation in Mutunda may impact water sources especially during the dry season. The influx of refugees may heighten the challenge. The proposed Mutunda borehole is near River Nanda, therefore, the surface and underground water interactions may occur leading to contamination.

d) Land and Wetlands

The project area has a number of mushrooming trading centres e.g. Kawiiti, Mutunda, Teyago, Popara, among others, which continue to expand due to the population growth as a result of refugee influx in Kiryandongo hence putting pressure on land and wetlands (cultivation, settlements and sanitation facilities). Mutunda borehole is near Nanda wetland, which renders it prone to floods during the rainy seasons from increased surface runoff in case of continuous and uncontrolled landuse activities e.g. clearing landcover and wetland degradation.

e) Social Services

The most critical service affected by multiple construction projects is health infrastructure. Increased inflow of workers may place a burden on health units. Security services may experience increased demand due to the inflow of workers.

f) Gender and Sexual Harassment

Increased inflow of migrant labour working on different projects may increase the anonymity of workers and possible offenders. Because there are many contract workers it becomes difficult to isolate those engaged in illicit sexual behaviours and further individual involved to harassment of women. There are several on-going projects and activities by Government of Uganda, NGOs and other development actors to support refugees. Possible concurrent implementation of all these projects and interventions within the same project area or in proximity of the RGC project has the potential to generate cumulative impacts.

8.3.2 IDENTIFIED CUMULATIVE IMPACTS

The key cumulative impacts and risks associated with the project are summarized below:

- The ease of water fetching as a result of the project is expected to translate into an increase in the enrolment ratio, especially for girls, and in the female literacy rate and contribute to the reduction in social conflicts related to water use such as those associated with the congestions at the existing boreholes. This impact will be enhanced through ensuring that most of the communities in the project foot-print are connected or have access to the piped water.

- However, as noted under negative impacts, the project will supply water to more than 5 small and unplanned towns in Mutunda RGC e.g. Kawiiti, Mutunda, Teyago, Popara. Improved water supply comes with an increase in the amount of wastewater generated by households and industrial or commercial facilities. Poor disposal or management of the wastewater generated will lead to land and/ or water pollution, formation of foul wastewater channels and ponds in small towns, which will become eye sores and breeding grounds for water related illnesses, lead to contamination of soil and/or groundwater and other related sanitation problems if proper treatment systems such as septic tanks are not utilized. There is therefore need to improve physical planning and conduct behaviour change campaigns to maximise benefits from the projects and deter cumulative negative impacts of the same.
- The hydrological connection between surface water (River Nanda) and groundwater (proposed borehole) may be altered. The impact of surface water on groundwater table will depend on the soil permeability (due to the proximity of about 100m) as well as the agricultural practices and climate practiced in Mutunda catchment. The infiltration of surface water into the borehole may lead to groundwater contamination which may deteriorate the water quality hence triggering the treatment costs.

9 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

The Environment and Social Management and Monitoring plan (ESMMP) proposed here specifies mitigation measures and monitoring actions with time frames, specific responsibilities assigned, and follow-up actions defined in order to check progress and the resulting effects on the environment during construction and operation phases of the project. Monitoring will begin immediately and will continue through both the construction and operation phases. One important aspect of monitoring will be to assess the effectiveness of the mitigation measures suggested, where they are found lacking, appropriate new actions to mitigate any adverse effects will be undertaken.

9.1 PHASES OF IMPLEMENTATION

Implementations of these measures will be carried out at different stages of the construction and operation phases. During the design stage, the feasibility and design consultant will incorporate proposed mitigation measures in the design and tender documents. The contractual agreement will also include clauses to enforce the management of environmental and social aspects. Construction stage activities are mainly the responsibility of the contractor and that of the construction supervision consultant. The actual physical implementation works are carried out mostly at this stage. The execution of the civil works will also include the implementation of the relevant environmental and social mitigation measures.

9.2 INTEGRATION OF SAFEGUARDS INTO CONTRACTS

The key aspects to be included in the contracts for civil works are highlighted below.

9.2.1 BILL OF QUANTITIES

The BoQs must capture all relevant safeguards aspects. The indicative costs of implementing safeguards extracted from the ESMP budget should be clearly provided as provisional sums or billable items in the Bills of Quantities. These should include safeguards staffing, documentation (CESMP, etc.), waste management, HIV/AIDS, Stakeholder engagement strategies grievance redress, gender awareness, site clean-up and landscaping, monthly ESMP reporting among others. Laxity in the provision and use of personal protective equipment is a risk to the safety of workers as well as poor working conditions and pay. The BoQs should provide a sum for PPE and supervision be done to ensure that all workers undertake works while in full PPE.

9.2.2 PROCUREMENT OF THE CONTRACTOR

Implementation of mitigation measures during construction is key to managing short- and long-term impacts and risks. As a best practice, the contracts for the civil works should include clauses on management of environment and social aspects. Sometimes, the clauses are weak and cannot be used to hold the contractors accountable. There is need to strengthen the clauses and to tailor them to the specific project safeguards aspects and management needs. The contractual agreement will also include clauses to enforce the implementation of the relevant mitigations. The clauses should be included in technical specifications in all contract documents related to the civil works. Safeguards clauses should be prescriptive and specify: what needs to be done, where

it needs to be done, when and how the actions will take place, who is responsible, the monitoring and reporting requirements, and what sanctions or legal recourse are available for work that does not meet the required specifications.

9.2.3 STAFFING

It is common for contractors to recruit unqualified safeguards staff or to assign safeguards duties to site foremen or clerks with no prior safeguards experience. Staffing requirements should be spelt out in the contracts. In addition, it may be useful to include the minimum requirements in the contracts for the civil works. Therefore, MWE through the supervising consultants must approve the contractor's Environment Officer, Health and Safety Officer and the Sociologist.

9.2.4 ESMP MONITORING AND REPORTING

Laxity in implementation and reporting on safeguards issues is common amongst contractors largely because they do not take safeguards issues seriously. This can be addressed by requiring contractors to prepare monthly environment and social monitoring reports. These should either be pay items and clearly included in the BoQs or a condition for certification of payment approvals (IPCs). Contractor safeguards reports are usually characterized by failure to include useful monitoring indicators such as safety statistics (fatalities, minor injuries, near misses, etc.), number of trees cut, and number replanted amongst others. The contractors will require training on safeguards monitoring and reporting. The contractors need to undertake proper recordkeeping of all safeguard activities. The contractors should liaise with District technical offices such as the DEO, DCDO and Physical Planner to ensure proper monitoring and timely implementation of project activities.

9.2.5 DECOMMISSIONING AND RESTORATION OF DISTURBED AREAS

At the end of the construction period, the Contractor must ensure restoration of all disturbed areas including materials sites through proper landscaping, backfilling and restoring topsoil, (re-) introduction of genetic species (e.g. natural re-grassing) similar to those destroyed in order to re-establish the natural local ecology. The final payment must be tagged to successful restoration activities.

9.3 CONTRACTOR MANAGEMENT PLANS

The Contractor will be required to prepare some standalone safeguards management plans in addition to the Contractor's Environment and Social Management Plan. Reference should always be made to the Contractor's Environmental and Social Management Plan as the overarching document that contains general Control Statements for various impacts such as air quality, solid waste, and hazardous materials, water quality and ecosystem, noise and vibration control, erosion control, waste handling and disposal and safety and occupational health. In addition to the Management Plans, the Contractor should prepare Method Statements for specific activities such as excavation works and submit for the Supervision Engineer's review and comments before commencement of works. If the Engineer notifies the Contractor that a specific method statement has failed to provide adequate mitigations, such a statement should be revised and resubmitted until when approved.

9.3.1 LABOUR FORCE MANAGEMENT PLAN

The Contractor is expected to have a clear plan for recruitment of workers to promote project ownership by the communities. The Contractor should give preference to local people by recruitment of unskilled and semi-skilled labour from project villages and this should be done through local areas councils from where those seeking employment should get letters of recommendations.

9.3.2 QUALITY MANAGEMENT PLAN

A quality management plan defines the quality policies and procedures relevant to the project for both project deliverables and project processes and who is charged with what responsibility to ensure compliance to set standards. Given the nature of this project, the contractor should have a quality management plan to guide the quality control and assurance processes to achieve the intended outcomes in terms of social, design, structural and investment outcomes in line with environmental and social safeguards policies.

9.3.3 EROSION AND POLLUTION CONTROL PLAN

Soil erosion is a very important aspect given the location of the construction site for the water sources and reservoir. In addition, the transmission and distribution lines will go through some wetlands. Erosion risks are expected to be mainly associated with vegetation clearance, construction of access roads and storage of excavated materials. In some cases, the project area may receive high amounts of rainfall that will be associated with several soil erosion and drainage impacts, such as, siltation and water stagnation that could be experienced in the direct project area. There is need to lay special strategies for managing the soil erosion.

An erosion control plan should be overlaid on the project grading plan(s) or site plan if there is not a grading plan. The erosion control plan needs to show what Best Management Practices (BMPs) will be used and where, as well as the total disturbance area. The plan must include measures to prevent erosion, contain sediment and control drainage. The erosion control plan must also include installation details of the BMPs as well as notes. Construction sites often have areas where soil disturbing activities such as clearing, grading, or cut/fill work has stopped for a period of time. Bare areas that are not actively under construction need some type of temporary cover to prevent or minimize erosion in the event of rainfall. Applicable areas include topsoil stockpiles, rough graded areas, sediment basin dikes, ditches, temporary earthen structures, and graded areas undergoing settlement. The following controls should be considered:

- Stabilization which includes a wide range of erosion prevention practices that cover exposed soil such as the use of straw, mulch, erosion control blankets, plastic sheeting or tarpaulins.
- Temporary seeding which is a soil stabilization practice involving the establishment of temporary vegetative cover to reduce erosion on construction sites that have disturbed areas that are temporarily idle.

Erosion prevention practices like stabilization are generally less costly and more effective than sediment control measures, which involve settling or filtering mobilized soil particles before they are transported by runoff to surface waters. Various practices can be used for sediment removal

from dewatering discharge. Sedimentation is primarily effective at removing larger sized particles, while filtration and chemical treatment can also remove the fine particles. These approaches are less effective for dissolved nutrients and metals that are non-adsorbed. Effectiveness of chemical treatment depends greatly on the pH and temperature of the water being treated. The Contractor should ideally include a comprehensive Erosion, Sedimentation and Pollution Control Plan Checklist.

9.3.4 WASTE MANAGEMENT PLAN

The Waste Management Plan (WMP) shall be prepared to address waste management aspects associated with the construction of the markets in line with legal and regulatory requirements. The Contractor, all subcontractors, and vendors involved in the project shall have to adhere to this Plan. The Contractor is responsible for ensuring that waste is managed in accordance with this Plan by providing the necessary resources and by issuing instructions and guidance during project execution. The Contractor will implement waste management measures and practices throughout the construction period to mitigate the associated risks. The WMP will contain the following information:

- Relevant legislation and guidelines for waste management of the Project;
- The procedures and initiatives proposed to address the management of waste materials;
- Safeguards, mitigation measures and monitoring to manage waste impacts during construction;
- Roles and responsibilities of those involved in the implementation of waste management controls;
- An effective monitoring, auditing and reporting framework to assess the effectiveness of the controls implemented
- Checklists and forms for day-to-day waste management activities.

9.3.5 OCCUPATIONAL HEALTH AND SAFETY PLAN

The Contractor will have to prepare a document that presents the framework for occupational health and safety management and monitoring measures that he will undertake. The OHS plan should typically cover safety programs that will be applied for promoting health and safety, preventing harm, fatality and hazards to the employees, sub-contractors, properties and the general public.

9.3.6 HANDLING OF CHEMICALS AND OTHER POTENTIALLY HARMFUL MATERIALS

Chlorine, a harmful and toxic chemical, will be employed at the storage reservoirs during project operation. Thus, it must be safely handled to prevent any accidents, including health and safety issues. This section analyses the handling aspects of this chemical.

9.3.6.1 DESIGN AND MANAGEMENT OF CHLORINATION STORAGE AND DOSING AREAS

The following special storage and handling features should be utilized and maintained during the water supply project operation.

- a) Storage and equipment rooms be equipped with doors, opening outward to the outdoors complete with panic hardware;
- b) Viewing window into chlorine storage and equipment rooms for operator security;
- c) Visual and audible emergency alarms at the chlorine room entrance;
- d) Exhaust fans with a typical rating to air changeover every minute;
- e) A chlorine gas leak detector to generate alarms and attendant ammonia bottle to help locate a leak;
- f) A drench shower located where it is easily accessible in case of emergency, with single turn (butterfly valve) water tap;
- g) An emergency kit to repair leaking containers.

For systems that use gas chlorination:

- a) Install alarm and safety systems, including automatic shutoff valves, that are automatically activated when a chlorine release is detected;
- b) Install containment and scrubber systems to capture and neutralize chlorine should a leak occur;
- c) Use corrosion-resistant piping, valves, metering equipment, and any other equipment coming in contact with gaseous or liquid chlorine, and keep this equipment free from contaminants, including oil and grease;
- d) Store chlorine away from all sources of organic chemicals, and protect from sunlight, moisture, and high temperatures.

9.3.6.2 HANDLING OF CHLORINE DURING OPERATION

Chlorine reacts violently with hydrogen, acetylene gases and solvents creating heat (EPA, 2011b). The reaction of chlorine with ammonia can create explosive compounds and gases that are toxic to breathe. Chlorine also reacts with metals. In the presence of water, chlorine can create a highly corrosive and dangerous acid mist. Therefore:

- a) Prepare and approve standard operating procedures for its storage and handling;
- b) Never store chlorine gas and ammonia in the same building or area;
- c) Keep chlorine isolated and in different rooms from the chemicals that it reacts with;
- d) Chlorine storage areas, storage containers and process equipment and lines should be properly labelled and appropriate hazard warning should be posted in accordance with site specific operating procedures;
- e) Gas containers should be stored in separate or divided rooms separately from flammable materials and other chemicals such as ammonia and sulphur dioxide, if used elsewhere in the installation;
- f) Containers should be stored and used above ground level and always in a vertical position;
- g) Chlorine gas containers should be stored in marked areas shielded from external heat sources;
- h) The protective hood should be kept secure on all unused containers and should only be taken off only when the container is being used. All containers in use should be secured in position by chains or other methods as appropriate. Gas containers should only be lifted with suitably rated and tested equipment and never by their protective hoods;
- i) Empty cylinders should be clearly marked and segregated from unused cylinders.

9.3.7 EMERGENCY RESPONSE PLAN

The main purpose of an Emergency Response Plan (ERP) is to provide a systematic approach to the protection of employees, assets and the environment from impact of serious incidents. The plan encompasses organizing, coordinating and implementing a range of procedures to prevent, mitigate, respond to and recover from the consequences of an emergency event. The ERP covers the required actions for all situations that could generate emergency situations during the project's construction phase. It will be developed to establish general guidelines and response procedures for the management of emergency events on the Project. It will also establish an emergency management command structure and mechanisms for review, oversight and accountability. The contractor shall establish procedures to ensure that all personnel have the skills to report environment incidents. The contractor shall keep records of all incidents, investigation, and analysis and counter measures taken.

The ERP will also set out the means by which these measures will be communicated to affected communities in a culturally appropriate manner. The ERP should have Best Practices, which include working with local and national agencies like the fire brigade, police, hospitals, counter terrorism units etc. The following are key emergencies, which the project should be prepared to handle:

- Fire
- Electricity shocks and electrocution
- Bomb threat
- Civil disturbance
- Hostage
- Terrorist incident
- Death of a worker on the project site
- Suicide
- Shooting or stabbing
- Disasters e.g. earthquake, lightening, collapse of excavation walls
- Large-scale hazardous material spill
- Mass casualties
- Health epidemics
- Rapture or leak of equipment
- Flooding

9.3.8 SECURITY MANAGEMENT PLAN

The purpose of the Security Management Plan is to assure a safe and secure project environment for staff, visitors and its service providers alike and to mitigate any risk of loss/damage to project property, equipment or its infrastructure. It identifies potential security risks present in the construction phase, methods and policies to mitigate these risks, and the requirements to ensure the highest levels of safety and security in the implementation of the Project. It will therefore, set out commitment of the Project to security. The Plan will specifically deal with:

1. Security issues in the project i.e. being safe from attacks from thugs and ill motivated persons;

2. Being prepared for insecurity incidents; and
3. Decisively responding to and managing the insecurity circumstances and incidents.

9.3.9 COMMUNITY HEALTH AND SAFETY PLAN

The Plan applies to Project construction activities and the associated risks and potential impacts that these activities may have on community health and safety. The risks and potential project impacts to community health and safety can emerge from both within and outside the so-called project area of influence. Therefore, the scope of this plan focuses on the management of aspects associated with the interaction of construction activities, the workforce, and the community as well as mitigation of contagious diseases (e.g. COVID-19; Ebola etc). The Plan should include control measures designed to avoid, minimize or mitigate the adverse effects of project activities on the health and safety of the community, while at the same time, enhancing the beneficial effects and capitalize on opportunities that may contribute to improving overall community well-being.

9.3.10 STAKEHOLDER COMMUNICATIONS AND ENGAGEMENT PLAN (SEP)

In pursuit of timely, meaningful and appropriate stakeholder engagement, the contractor is expected to have a clear strategy for stakeholder engagement to assist in managing and facilitating future engagement through the various stages of the Project's life cycle from mobilization up to handover. This stakeholder engagement plan shall detail the key stakeholders to be engaged and the schedule of engagements throughout the various stages of construction, decommissioning and the defects liability period.

9.3.11 HIV/AIDS AND GENDER MANAGEMENT PLAN

The Contractor in pursuit of his commitment to health and safety will organize trainings, conduct awareness and education on the use of infection control measure in the workplace. The Contractor is expected to provide appropriate PPE to protect workers from the risk of exposure to HIV/AIDS and incorporate HIV/AIDS information in occupational health and safety inductions, provide guideline in preventing the spread of HIV/AIDS and other sexually transmitted infections (STIs), publicize knowledge related to HIV/AIDS and STIs to the work crews and the surrounding communities, provide information on good HIV prevention interventions, including promotion of the correct use of condoms and ensure sufficient resources are available for HIV programs.

9.3.12 CHILD PROTECTION AND MANAGEMENT PLAN

Contractors should be cognizant of the importance of child protection issues and their responsibility to uphold the rights of children at all times. A child protection plan should spell out measures to prevent any form of abuse of children such sexual violence, exploitative labour and sexual exploitation which include children. Additionally, the plan should have stringent punitive measures properly defined for potential perpetrators of child related abuse. This should also be signed by contractor workers as part of their contractual obligations to guard against child abuse.

The Child protection Plan shall include the following:

1. Brief Overview of Child Concerns
2. Policy, Legal and Regulatory framework governing child protection issues

3. Child Protection Risks at each site
4. Contractor's Policy on Children and Codes of Conduct
5. Child Protection Services by contractor (Prevention & Mitigation)
6. Arrangements for Referral & Linkage to Other Child protection services in area
7. Support Offered to Children to access justice
8. Mentorship & Training
9. Monitoring & Reporting
10. Schedule of Engagements such as Community Meetings and Joint Stakeholder Meetings.

9.3.13 CHANCE FINDS PROCEDURE

During excavations, chance finds may be encountered. Therefore, the contractor should have a chance finds management plan that defines the measures necessary for the overall management of any cultural heritage encountered during construction.

In order to avoid potential damage to cultural property discovered during construction, the following will apply:

- Workers must be vigilant to any relics found during excavation;
- In case of a discovery during the excavation, workers must immediately report the findings to the Foreman;
- The Foreman must stop the work immediately and communicate the findings to the Supervisor;
- The Supervisor then communicates the findings to the Contractor Manager;
- The Contractor Manager then notifies MWE Safeguards Team;
- The Department of Museums and Monument of Uganda will then be notified either via communicating with the MWE Safeguards Team via telephone or email or based on a site visit within 14 days from the time of discovery;
- Any further excavations or continuation of the infrastructure development at the Site of the discovered heritage will be undertaken only with the approval of the Department of Museums and Monuments;
- Should the Conservator of Antiquities from the Department of Museums and Monuments confirm that the discovered resource falls within the heritage resource description, he/she will report the resource to the Minister of Tourism, Heritage and Antiquities for preservation and protection;
- Rescue excavation or *in-situ* conservation will be proposed based on the disturbance likely to be caused by the project or in relation to cost vis-à-vis value of the heritage resource;
- MWE will then apply for either an excavation or preservation in-situ license of the discovered resource. The feasible proposal will then be executed. In case of in-situ conservation, the site will be managed and open to the communities and tourists that access the project area; and
- All chance finds will be recorded in the chance find form.

The project activities will then continue after the following have taken place:

1. In the case of archaeological artefacts discovery, MWE will inform the Uganda Museum and grant a period where specialists from the Department of Museums and Monuments excavate and curate the artefacts professionally;
2. In the case of discovered human remains the police will have to be notified and either the remains are taken for forensic investigation or the LC1 authorities sanction the reburial of the remains at another location. The Contractor then meets the relocation and reburial expenses which shall be claimed from MWE; and
3. In the case of an encounter with an unknown sacred site, relocation ceremonies will be undertaken by the custodians of the site and the contractor then meets the relocation expenses which shall be claimed from MWE.

Overall, the following precautions ought to be undertaken:

- A. **Site avoidance:** If the boundaries of the site have been delineated, attempt must be made to redesign the proposed development to avoid the site;
- B. **Mitigation:** If it is not feasible to avoid the site through re-design, it will be necessary to sample it using data collection program prior to its loss. This could include surface collection and/or excavation; and
- C. **Site Protection:** It may be possible to protect the site through the installation of barriers during the time of the development and/or possibly for a longer term. This could include erection of high visibility fencing around the site or covering the site area with a geotextile and then capping it with fill. The exact prescription would be site-specific.

During the implementation of the project and in the event that, a PCR is encountered, the following can be contacted:

Ministry of Tourism, Wildlife and Antiquities Rwenzori Towers 2 nd Floor, Plot 6 Nakasero Road. KAMPALA, UGANDA. P. O. Box 4241 Kampala Phone: +256 414 561 700 Email: info@tourism.go.ug	The Uganda Museum Plot 5-7 Kira Road, P. O Box 365, KAMPALA-UGANDA (+256) 414 232707. www.ugandamuseums.or.ug
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9.3.14 DECOMMISSIONING/ SITE RESTORATION PLAN

At the end of construction activities, the Contractor shall ensure restoration of the disturbed natural sites through environmental rehabilitation, backfilling and restoring topsoils, (re-) introduction of genetic species (e.g. natural re-grassing) similar to those destroyed in order to re-establish the natural local ecology.

The decommissioning phase will focus on any of the following as applicable:

- a) Workers' camp

- b) The parking yards
- c) Material stockpile areas
- d) Makeshift roads within the site premises
- e) Immediate surroundings of the access roads whose vegetation will be cleared during construction

Specifically, the process of rehabilitating and restoring the site shall follow the following sequential approach:

1. All facility structures shall be demolished; the rubble/debris shall be used for fill purposes or taken to an approved disposal site;
2. All obsolete equipment, vehicles, trucks and machinery shall be removed from sites;
3. Makeshift access roads shall be closed, scarified and revegetated;
4. Backfilling all openings with soil and leftover overburden;
5. Planting fast-growing trees and grasses to stabilize excavated areas with native species; and
6. Fencing off the re-vegetated areas should be provided until the reinstated vegetation has reached maturity.

Joint site inspections will be conducted to ensure site restoration before handover of the project in order to assess the progress of restoration activities. They will constitute the Contractor, the Client (MWE), Supervising Engineer and the District Environment Officer.

9.3.15 GRIEVANCE REDRESS MECHANISM

Effective grievance redress mechanism gives an opportunity to the organization to implement a set of specific measures to ensure good governance accountability and transparency in managing and mitigation of environmental and social issue of a particular project. The community grievance redress shall consist of grievance committees and shall be formed at the community level, construction site, Sub County/town council, District and MWE. A separate GRM for workers shall also be formed at the Construction site. The flow of grievance management is provided under Annex 10.

COMMUNITY GRIEVANCE MANAGEMENT COMMITTEE STRUCTURES

Considering the nature and extent of works, the following community grievances may arise during the construction phase of the project:

- Grievances related to Land acquisition
- Restrictions on land due to civil works, workers camps, material storage areas, material sources, etc.
- Clearance of right of way which may affect crops and trees
- Temporary displacement of road side activities in urban centers, including vendors
- Complaints related to noise, dust, and traffic incidents
- Complaints on workers behavior or conduct specially towards women, girl and boy children
- Illicit behaviors like alcoholism, smoking, drug abuse etc. of the contractor's workers
- Disruption of social set up and security
- Disputes on compensation values

- Increased pressure on social services and infrastructure, including water supply
- Contractor failure to pay workers and suppliers
- Accidents arising out of contractor's negligence to provide necessary information, protective gears and supervision

Membership and Composition of Grievance Management Committees

- GMCs at Village or Parish Levels
- Village and Parish GRM committees will be established as voluntary committees for each infrastructure to be constructed at village or parish levels depending on the community dynamics, area covered and nature of works. Community GRM Committees will have 10 members including
 - Chairperson,
 - Vice Chairperson,
 - Secretary,
 - Other Members (7) including a youth, Elderly Person, PWD and at least 3 members should be female. Quorum sitting shall be of at least five (5 members).

The LC I Chairpersons and Vice Chairpersons will be ex-officials to these committees.

NB: The committee shall be formed either at village or parish level given that linear projects traverse several communities. It is important that committees are accessible to communities at village or parish level.

GMCs at Construction Sites

Each construction site shall have a Site GMC responsible for handling all community grievances related to construction including those grievances referred by the village/ Parish GMC. The Site GMC shall comprise of the following;

- The Resident Engineer/ Supervising Consultant (Chairperson)
- The Contractor's Contract Manager
- Sociologist for the Consultant
- Sociologist for Contractor (Secretary)
- Environmentalism for the Consultant
- Environmentalism for the Contractor
- Health and Safety Officer for the Contractor
- 2 Community Representatives (1 Female and 1 Male)

This committee shall consolidate and address all grievances from the community at the site and escalate any matters appropriately to the respective Local Government and MWE.

GMC at Sub County/Town council Level

The committee will be formed at the sub-county level and its membership shall consist of;

- Local Council III (chairperson);
- The Sub County Chief,

- c) Community Development Officer (Secretary)
- d) Environment focal person
- e) Representatives of PAPs
- f) Parish Chief of the respective area where the complaint originated from.

GMC at District Level

At the District Level, the Grievances Management Committee shall consist of;

- a) LC V Chairperson (Chairman)
- b) Chief Administrative Officer or a his/ her Representative
- c) District Community Development Officer (Secretary)
- d) Head of Natural Resources
- e) District Water Officer
- f) Representative from the PAPs
- g) District Lands officer

Note: Due to complex nature of grievances, the committees can be extended to include any other relevant officers suitable for addressing the prevailing grievances.

WORKERS GRIEVANCE COMMITTEE STRUCTURES

The common anticipated Grievances for Employee may include; Unsafe physical working conditions, Failure to issue formal contracts to workers, Illegal termination of contracts, Changes without prior notice, Poor employee relations, Poor/ failure/ delayed remuneration, Violation of workers' rights, Inadequate safety, health, and welfare amenities, Labor-management hostility, Incidences of workplace favouritism and nepotism, among others.

The grievance redress system for workers shall have three major committees set up and supported. These include the Workers' Council, Site Disciplinary Committee and overall Grievance Committee.

Workers' Council

The workers' council shall be constituted on the basis of directly elected representatives on the basis of different work sections. It will have representative workers including operators, drivers, mechanics, office/administration, technicians/lab, masons, flag ladies, foremen, clinic, casual laborers, surveyors etc. The different workers' categories shall mobilize and elect a representative to form a council of 5 members.

The 5 members shall select a Chairperson, Vice Chairperson, Secretary and members.

The council shall sit on a regular basis or monthly to discuss all complaints, welfare, working conditions among others. The Supervising Consultant's Sociologist shall be the patron of the

Worker's Council and shall ensure that the members are provided with the support and protection to freely discuss and voice workers' issues.

Any issue that has not been addressed by the Workers' Council shall be escalated or referred to either disciplinary or Site Grievance Committee. The issues that disciplinary in nature shall be referred to the Disciplinary Committee while other issues that are not disciplinary shall be referred to the Grievance Committee.

Site Disciplinary Committee

During the construction phase, a number of disciplinary related cases might emerge. Hence, each Site shall have to set up site disciplinary committee to ensure self- enforcement mechanism of discipline among workers.

The committee shall comprise of;

- a) Consultant's Sociologist (Chairperson)
- b) Contractor's Human Resource Officer (Secretary)
- c) Workers' representatives (a Female and a Male).

The site disciplinary committee shall receive all disciplinary related complaints referred from the Workers' Council or from the Contractor's Management.

Overall Site Grievance Management Committee (GMC)

Each construction site shall have a Site Grievance Management Committee comprising of the following;

- a) The Resident Engineer/ Supervising Consultant (Chairperson)
- b) The Contractor's Contract Manager
- c) Sociologist for the Consultant
- d) Sociologist for Contractor (Secretary)
- e) Environmentalist for the Consultant
- f) Environmentalist for the Contractor
- g) Health and Safety Officer for the Contractor

9.3.16 STAKEHOLDER ENGAGEMENT PLAN AND MATRIX

9.3.16.1 STAKEHOLDER ENGAGEMENT PLAN

The Stakeholder Engagement Plan (SEP) is an instrument for mapping and prioritizing stakeholders across levels and regions; and for guiding planned consultations and disclosure of relevant project information to/with identified stakeholders.

- a) **Stakeholder categorization:** Three (3) categories of stakeholder to be mapped out (across three levels at the national, regional and community) as follows.
- b) **Primary level stakeholders** considered to have high influence and power in respect to the project, project area and potential impacts and project implementation. These require regular engagements and consultations throughout the project life. These include the

beneficiary communities, Mutunda, Diima and Nyamahasa SCLG, Kiryandongo DLG, OPM/UNHCR Kiryandongo Refugee Settlement

- c) **Secondary level stakeholder** considered to have either high influence but low power or high power but low influence. These will require to be initially consulted and regularly kept informed. These will require to be initially consulted and regularly kept informed. These include political leaders in area
- d) **Tertiary stakeholders** considered to have low power and low influence. These include neighbouring sub counties and town councils.

Information needs: The following information should be made available to all stakeholders, who are likely to be affected by positive and adverse environmental or social impacts from the project:

- a) Purpose, nature, objectives and scale of the project.
- b) Schedule and duration of proposed project activities.
- c) Potential project risks and impacts extracted from the ESIA.
- d) Proposed mitigation plans.
- e) Available grievance mechanisms.
- f) Envisaged consultation process, if any, and opportunities and ways in which the public can participate (via the SEP) and
- g) Time and venue of any planned public meetings.
- h) Benefits of project
- i) Possible risks and their consequences (non-technical) for public interest e.g. threats to water catchments production wells, contamination; threats to water infrastructural e.g. vandalism.

Disclosure mechanisms: A number of strategies can be used to enhance public information disclosure and stakeholder consultations including:

- i) Scheduled public hearings at community level (village and parish) for initial disclosure, disclosure of draft reports and final reports including their implementation
- ii) Dedicated and select meetings with institutional stakeholders at the central regional, district and sub-county levels at different project phases
- iii) Dedicated meetings with select social groups like livelihoods groupings and vulnerable social groups including women, youth, PWDs and local leaders.
- iv) Project Background Information Document (PBID) summaries will be prepared, translated and shared alongside other strategies described herein
- v) Non-Technical Summaries (NTS) of the ESIA will also be developed for public disclosure through print media and info-shops for the regulators, funder and project proponent.

9.3.16.2 STAKEHOLDER MAP (INTEREST & INFLUENCE GRID)

The ESIA mapped categories of stakeholders that influence, and/or exert an influence on the water supply and sanitation project in terms of its success and/or failure. Their roles and interests were mapped. A stakeholder matrix was used to assess the stakeholder interests and ranked them using Influence and Power grid (High / Low; +ve / -ve), as well as showing relationship (linkages & synergies) with the planned project as shown in **Table 0-1**. The purpose of the stakeholder mapping was to identify and assess entry points.

Table 0-1: Stakeholder mapping (Interest, Power & Influence Grid)

Category of Stakeholders	Level of Interest, Influence & Power	Main Interests, Concerns & Contribution to Kiryandongo Water Distribution Phase 3)
Primary (high influence & power)		
GoU/Executive – Presidency	High +ve	Fulfilling government / presidential priorities. Has ability to influence scale of project in case of any advocacy from local leaders & outcry from community
GoU/ Parliament (Area MPs)	High +ve / High -ve	Some incumbent MPs played key role in lobbying for piped water project, and are eager to see water flowing in their constituencies. If not, they have expressed concern, others have threatened to sabotage the project. Have strong support from communities and can lobby GoU/ Executive / Presidency over the project
GoU/ OPM	High +ve	Control all operations in IDP/ refugee communities of ranch 18; own land / sites for water facilities e.g. reservoir site
MWE (incl. WSDF-W/ North Umbrella)	High +ve / High -ve	Oversee and manage existing piped water system managers (WSDF-W/North Umbrella; IRWMD; MWE)
MWE	High +ve	Owns the project, control and manage the operation plan for the same They are the Implementing partners (IP) for Water supply in Kiryandongo refugee settlement and nearby Bweyale and Kigumba Town Councils
NEMA	High +ve	The lead agency that approves assessments and audits
UNHCR	High +ve	Oversees and directs operations of water supply services; appoint managers of water systems within Kiryandongo refugee settlement
World Bank	High +ve	Funding Kiryandongo piped water supply and sanitation / IWMDP
Beneficiaries (Host, IDPs/Refugees community)	High +ve / High -ve	They are the reason why Kiryandongo water supply and sanitation project is to be implemented, and government is accountable to them. They can support and/or downplay the project to make it a “White Elephant”. There is also a great section that don’t know / not aware about Kiryandongo water supply and sanitation project
Beneficiaries (Refugees)	High +ve / High -ve	They are additional reason why project is to be implemented. Through international conventions on refugees, government is mandated to take care of them. They can welcome the project. To a small extent, they can abandon water supply services in case it’s not user friendly and resort to cheap/ free alternatives. In end OPM/ UNHCR targets are not fully accomplished. There is also a great section that don’t know / not aware about Kiryandongo water supply and sanitation project

Water vendors	High +ve / High -ve	They are major players in current water supply value chains across the district especially in rural growth centres. Their major concern is about negative impact of project on their potential to continue selling water to communities.
Kiryandongo Higher DLGs	High +ve / High -ve	The technical managers, staff and local leaders are key influencers. A same time, they feel side-lined / not fully engaged in planning and implementing the project. They also have limited information.
Kigumba SC Lower LGs	High +ve / High -ve	They are near to the beneficiary communities, and have direct influence and power to enforce ordinances and bylaws that enhance project implementation esp. in ensuring environment and social safeguards.
Secondary stakeholders (high influence but low power or high power but low influence)		
GoU/ Parliament	High +ve	They allocate
GoU/ Other MDAs	High +ve	These implement several infrastructure and livelihood related projects e.g. OPM/DRDIP, NUSAF3 Protection of water catchments and natural resources where hosts and refugees use as open water source
Other CSOs & Humanitarian Agencies	Low +ve	They are civil society organizations (CSOs); humanitarian, emergency and relief agencies. Their services supplement government role. Their work enhances the integrity of water utilization and management in areas not yet covered, WASH infrastructure at household and communities e.g. hand washing kits, pit latrine construction, water tank construction, etc. There is also a great section that don't know / not aware about Kiryandongo water supply and sanitation project
Property / Land Owners	Low +ve / Low -ve	They own the land where water facilities will be constructed. If they decline to offer the land, it can negatively affect the project. However, in case it happens alternative sites can be identified.
Local media (Radio, TV, Print) VCC Radio (FM 103.6) KIBANDA FM (FM 89.3) K FM (FM 103.2)	Low +ve / Low -ve	They influence public opinion about the project. However, they have limited information, which in end causes misinformation and public anxiety. There is also a great section that don't know / not aware about Kiryandongo water supply and sanitation project
Tertiary Stakeholders (low power and low influence)		
Corporate Clubs (Rotary Clubs, Lions Clubs, etc.)	Low +ve	They mobilise voluntary support for communities in need especially water, sanitation and hygiene.
Religious Institutions	Low +ve	They have direct and speedy mobilization of greater section of communities, and can be influential in shaping community roles towards the project, where need be.

9.3.16.3 STAKEHOLDER ENGAGEMENT PLAN (SEP) MATRIX

In relation to the above, a Stakeholder Engagement Plan (SEP) matrix has been prepared to guide on how specific stakeholder engagements could be undertaken by the contractor, MWE as well as other Government-Ministries, Departments and Agencies (MDAs) in future (construction, Operation phases).

Project phase & Activity	Objectives	Level and type of stakeholders	Methods	Materials
Pre- Construction phase				
Organize Stakeholder Awareness events	To mobilize community /public consciousness and preparedness in relation to required roles they are supposed to play	All stakeholders esp. beneficiary community; Kiryandongo DLG (Higher & Lower); Refugees; Institutions	District level meeting of Technical Managers	Workshop / Seminars; Site Visits IEC materials e.g. Leaflets, brochures, T-shirts
			District Level meeting of Local Leaders	Radio Talk Shows (monthly / quarterly)
			Use national & Local media	Newspaper Supplement / Pull out
Construction phase				
Organise Kick-off meetings	To disseminate information about design and how local areas will be affected, how to benefit and play a role	Beneficiary communities at Sub County, Town Council & Refugee Settlements (RWC 1, 2, 3)	Meeting of Sub County Technical Officers & Local Leaders Meeting Site Specific Communities (along distribution lines e.g. trading centres)	Community meetings IEC materials (in English, French / translated into 3 major local language and dialects – Runyakitara, Luganda, Lugisu, Alur, Sudanese Arabic, Swahili) Public display of design
Organise periodic meetings	To provide updates about the progress of the construction works, mitigate challenges and options.	Technical managers, staff & Local Leaders District (higher & Lower LGs) Beneficiary communities	Quarterly meetings Site Visits Radio programme	Radio talk shows; DJ Mentions; Radio Magazines / Features TV talk show / TV Feature / site visits
Provide jobs to water vendors	To mitigate the impact of project on job loss among water vendors	Water vendors	Shortlisting vendors through their representatives (also use contacts provided in ESIA report) Organize meeting	Community meetings Registration forms

Project closure events	To sensitize about start of operations	All stakeholders	All media channels Official launch / commissioning	IECs on operations – radio, TV, print, community meetings
Operation & Maintenance (O&M)				
Customer friendly service provision to end users	To mobilise water users to pay / connect to water services	Beneficiaries (water users – new & old)	All media channels	IECs on operations – radio, TV, print, community meetings

9.3.17 ENVIRONMENTAL AND SOCIAL MITIGATION PLAN MATRIX

Table 0-2: Environmental and Social Mitigation Plan

Impact/Risk	Mitigation /Enhancement commitments	Responsibility	Estimated Cost (UGX) & Remarks
POSITIVE IMPACTS – CONSTRUCTION PHASE			
Provision of direct jobs (casual workers) for locals - youth, women and men	• Recruit locals for construction jobs according to their skills.	• Contractor	Embedded in contractor's fees
	• Promote labour-intensive construction methods to create more jobs.	• Contractor	
	• Adhere to the local labour laws of 30% women in employment and remuneration of workers above the minimum wage.	• Contractor	
	• Ringfence some jobs such as cleaning and cooking specifically for local women.	• Contractor	
	• Encourage qualified females to apply for jobs.	• Contractor	
	• Gender sensitive facilities such as bathrooms, toilets and breastfeeding spaces to be provided to create a conducive working environment.	• Contractor	5,000,000
NEGATIVE IMPACTS – CONSTRUCTION PHASE			
Land use/cover change	• Restrict water transmission and distribution lines to road reserves.	• Contractor	-
	• Compensate for land as per Ugandan laws on Land Acquisition and in line with World Bank's OP 4.12.	• MWE	304,952,275 as determined in the RAP Valuation Report.
	• Movement of vehicles and equipment must follow designated pathways or agreed upon access roads.	• Contractor	-
Land acquisition and resettlement	• Implement the RAP in line with Ugandan laws and the World Bank's ESS5	•	221,960,000 Estimate from RAP for all 3RGCs in Kiryandongo
	• Engage local communities to provide land voluntarily especially for the distribution lines	• MWE	

Impact/Risk	Mitigation /Enhancement commitments	Responsibility	Estimated Cost (UGX) & Remarks
	• Select land requiring minimal or no relocation at all	• MWE	Covered in RAP implementation budget
	• Use road reserves for pipe works	• Contractor	-
	• Provide a fair and prompt compensation to the affected people	• MWE	304,952,275 as determined in the RAP Valuation Report.
	• Determine the extent of property lost or destroyed and provide fair and prompt compensation to the effected people.	• MWE	Covered in RAP implementation budget
Deterioration of landscape and visual quality	• Obtain murrum and subsoil from a NEMA/ DLG licensed source.	• Contractor	Within contractor's bid budget
	• Install berms and drainage channels to control surface water run-off during earthworks.	• Contractor	
	• Restore of borrow pits and revegetate with native species.	• Contractor	
	• Close monitoring of impact on natural resources with enforcement of contract or legislative options.	• DLG/ MWE	10,000,000
Soil Erosion	• Limit vegetation clearance to localities required for development.	• Contractor	-
	• Hoard off construction sites and instate soil barriers before excavations to intercept any eroded material and any soil material.	• Contractor	Within contractor's bid budget
	• Remove topsoil prior to carrying out excavations and stockpile separately so that it is used last in backfilling of the excavated areas.	• Contractor	
	• Backfill all trenches immediately after laying the pipes and compact such areas as to near level prior to excavation.	• Contractor	
	• Remove excess excavated soil material which will not be used for construction works in a timely manner and deposit at an approved site	• Contractor	
	• Ensure proper landscaping and vegetation restoration is carried out using native species to further reduce the possibility of soil erosion.	• Contractor	

Impact/Risk	Mitigation /Enhancement commitments	Responsibility	Estimated Cost (UGX) & Remarks
Loss of Vegetation and degradation of Habitat	• Limit vegetation clearance to localities required for development.	• Contractor	-
	• Avoid and minimise cutting of trees at all project sites.	• Contractor	-
	• Movement of vehicles and equipment must follow designated pathways or agreed upon access roads.	• Contractor	-
	• Remove and destroy any encountered invasive species	• Contractor	-
	• Sensitise all project workers to minimise damage to vegetation and fauna.	• Contractor	Within contractor's bid budget
	• If wild animals are encountered, the Contractor shall notify UWA so that it is picked and taken to a secure place.	• Contractor	-
Disturbance and degradation of wetland ecosystems	• Use existing road corridors for construction and operational access wherever possible.	• Contractor	-
	• Where the alignment requires the suspension points for the water pipes to be located in the swamp and in areas which cannot be easily accessed, build temporary access to wetland areas not easily accessible from existing roads or causeways, that will be removed after.	• Contractor	Within contractor's bid budget
	• Obtain wetland user permits from NEMA before constructing across or along wetlands and follow all guidelines given.	• MWE	150,000
	• All project workers should be sensitized to minimize damage to flora and fauna.	• Contractor	Within contractor's bid budget
	• Close monitoring and supervision of the construction operations to ensure compliance to the NEMA permit conditions and avoid causing further damage to undesignated project areas.	• MWE	-
Generation of waste	• The Contractor shall develop and implement a Waste Management Plan	• Contractor	15,000,000
	• All sorts of waste generated during construction such as HPDE and uPVC offcuts and other accessories associated with water and sanitation projects shall be collected by the contractor and delivered to recycling facilities. Other	• Contractor	10,000,000

Impact/Risk	Mitigation /Enhancement commitments	Responsibility	Estimated Cost (UGX) & Remarks	
	forms of waste which are inert must be collected by NEMA gazetted waste handlers and taken to a NEMA gazetted waste disposal facilities for disposal.			
	<ul style="list-style-type: none"> All organic waste generated at eating places during construction such as food stuffs shall be collected and transported by the contractor to designated district landfills for disposal. 	<ul style="list-style-type: none"> Contractor 		
	<ul style="list-style-type: none"> All plastic waste generated during construction, such as mineral water bottles, polyethene bags, jerricans and cups shall be collected and taken for recycling in plastic collectors in Kiryandongo for onward transmission to plastic recyclers. 	<ul style="list-style-type: none"> Contractor 		
	<ul style="list-style-type: none"> Human excreta shall be managed using a mobile toilet and then disposed at the waste stabilisation ponds at Kiryandongo Hospital. 	<ul style="list-style-type: none"> Contractor 		10,000,000
	<ul style="list-style-type: none"> The contractor will work with Kiryandongo district Local government to facilitate sound waste handling and disposal. All wastes must be taken to the approved waste disposal facilities. Proof of delivery and safe disposal of waste will be provided and records maintained at all times. 	<ul style="list-style-type: none"> Contractor 		Within contractor's bid budget
Risk of contamination due to flooding of borehole DWD 77383	<ul style="list-style-type: none"> The production well should be constructed with a water tight casing above the water table 	<ul style="list-style-type: none"> Contractor 	Within contractor's bid budget	
	<ul style="list-style-type: none"> The design and construction of the pump house at source DWD 77383 should incorporate a raised apron slab above the ground by the required height for the predicted flood depth of the area. 	<ul style="list-style-type: none"> MWE 	Part of the Design Consultant's work	
	<ul style="list-style-type: none"> Aprons should be constructed with deep foundation edges to avoid erosion 	<ul style="list-style-type: none"> MWE 		
	<ul style="list-style-type: none"> A water source protection plan has been developed to ensure sustained water quality and quantity for the project. 	<ul style="list-style-type: none"> MWE 	Part of ESIA, RAP & SPP Consultant's work	
Noise and Vibrations	<ul style="list-style-type: none"> Workers should be provided with the necessary personal protective equipment (PPE) such as ear muffs. 	<ul style="list-style-type: none"> Contractor 	Within contractor's bid budget	
	<ul style="list-style-type: none"> Periodic medical hearing checks should be performed on workers exposed to high noise levels. 	<ul style="list-style-type: none"> Contractor 		

Impact/Risk	Mitigation /Enhancement commitments	Responsibility	Estimated Cost (UGX) & Remarks
	• Sites must be hoarded to curb noise impacts to neighbouring communities.	• Contractor	
	• Works should be undertaken during day time i.e. from 8am to 6pm.	• Contractor	-
	• Works near schools or health centres should be done in periods like weekends in order for noise and vibrations not to interfere with learning environment.	• Contractor	-
	• Weekly monitoring of noise levels at active sites should be carried out by the contractor.	• Contractor	Within contractor's bid budget
Air Pollution	• Travel speeds of construction vehicles along the road especially at trading/business centres will be controlled and should not exceed 50 km/h on the highway and 40 km/h off the highway.	• Contractor	-
	• Trucks will be covered during haulage of construction materials to reduce on spillage of materials and wherever dust suppression is necessary, water will be sprayed over dusty areas.	• Contractor	Within contractor's bid budget
	• Workers will be provided with PPE and the use of PPE shall be enforced.	• Contractor	
	• All surfaced roads shall be subject to road cleaning and un-surfaced roads to dust suppression, the methodology and frequency of which shall be included in the Contractor's Traffic Management Plan.	• Contractor	
	• Stockpiles of friable material will be grassed in order to prevent wind erosion.	• Contractor	-
	• A maintenance programme for equipment and vehicles will be implemented, to ensure air emissions like particulates, SO2 and NO2 are minimised.	• Contractor	Within contractor's bid budget
Reduced Traffic Safety	• The Contractor shall develop and implement a traffic management plan to be approved by the supervision engineer	• Contractor	11,000,000
	• All road closures shall be separately notified and agreed with the subcounty administration.	• Contractor/ Subcounty Council	-
	• Vehicular access to and from hospitals, police stations, and other public institutions shall be maintained through the use of steel road plates over	• Contractor	Within contractor's bid budget

Impact/Risk	Mitigation /Enhancement commitments	Responsibility	Estimated Cost (UGX) & Remarks
	open trenches. Pedestrian access to schools, health facilities, and other premises frequently accessed by the public will be maintained with the use of walking boards.		
	<ul style="list-style-type: none"> To minimize interference with traffic, half of the road shall be closed to enable vehicles use one half as the other half is being excavated and installed with pipe work. 	• Contractor	-
	<ul style="list-style-type: none"> Road safety and site safety training should be done involving construction workers, police and local community. 	• Contractor/ Police/ LC	-
	<ul style="list-style-type: none"> Conspicuous signage shall be well placed on roads and the Contractor's Traffic guides on ground shall direct traffic in case of diversions or open trenches. 	• Contractor	Within contractor's bid budget
	<ul style="list-style-type: none"> All company vehicles used in the transportation of construction workers, material and equipment to and away from the site shall be in sound mechanical conditions. Evidence shall always be provided by recording the status of the vehicle in the Daily Vehicle Inspection Form before usage. 	• Contractor	-
	<ul style="list-style-type: none"> All drivers to be employed by the Contractor shall be qualified, skilled with valid driving permits. 	• Contractor	-
	<ul style="list-style-type: none"> The vehicle speed shall be limited to a maximum of 30km/hr areas near sensitive facilities. 	• Contractor	-
	<ul style="list-style-type: none"> Works near sensitive facilities like schools and health centres shall only be limited to day time (7am to 6pm). 	• Contractor	-
Risk of misinformation due to failure to engage stakeholders	<ul style="list-style-type: none"> Prepare a comprehensive Stakeholder Engagement Plan (SEP); 	• Contractor	5,000,000
	<ul style="list-style-type: none"> Community liaison activities; 	• MWE	20,000,000
	<ul style="list-style-type: none"> Undertake radio talk shows to communicate progress of the project to local stakeholders. 	• MWE	3,000,000
	<ul style="list-style-type: none"> The contractor will be required to develop a Labour Influx Management Plan and/or a Workers' Camp Management Plan. 	• Contractor	7,000,000

Impact/Risk	Mitigation /Enhancement commitments	Responsibility	Estimated Cost (UGX) & Remarks
Conflicts due to influx of immigrant labour	<ul style="list-style-type: none"> contractors shall be required to have an HIV/AIDS policy and a framework (responsible staff, action plan, etc.) to implement during project execution. 	<ul style="list-style-type: none"> Contractor 	Within contractor's bid budget
	<ul style="list-style-type: none"> Create awareness local communities prior to start of construction works. 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> Efforts to be geared toward instilling attitudes of tolerance, support and understanding of labour immigrants by the local communities 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> Sensitize workers on proper social behaviour and conduct with regard to community systems and the acceptable societal norms; 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> Put in place a grievance redress committee or a Public Complaints Desk to receive any complaints about the construction activities; 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> Implement a strict employment code of conduct. 	<ul style="list-style-type: none"> Contractor 	-
Risk of violence against children (VAC)	<ul style="list-style-type: none"> Develop a strict employment code of conduct to protect the girl child. 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> Sensitize employees on dangers of molestation of children, especially the girl child. 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> Sensitize the Contractor against child labour and implement the child labour act; 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> Demand birth certificate or any identify that clearly shows the age of a job applicant; 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> Issue each worker with an applicant letter with well spelt out terms of engagement. 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> Monitoring school attendance 	<ul style="list-style-type: none"> Contractor/ DLG 	-
	<ul style="list-style-type: none"> Sensitization in schools 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> Reporting mechanisms in place such as a whistleblowing system. 	<ul style="list-style-type: none"> Contractor 	-
Risk of Sexual and Gender Based Violence (SGBV) -	<ul style="list-style-type: none"> The Contractor should have a sexual harassment policy and mainstream it to ensure strict adherence to established mechanisms to avoid the emergence of these challenges; 	<ul style="list-style-type: none"> Contractor 	-

Impact/Risk	Mitigation /Enhancement commitments	Responsibility	Estimated Cost (UGX) & Remarks
e.g. physical assault, Sexual abuse, and sexual harassment	<ul style="list-style-type: none"> • MWE should ensure that social safeguards personnel are recruited as part of the project implementation personnel to supervise contractors and to continuously engage communities; 	<ul style="list-style-type: none"> • MWE 	-
	<ul style="list-style-type: none"> • Put SGBV reporting mechanisms in place; 	<ul style="list-style-type: none"> • Contractor 	-
	<ul style="list-style-type: none"> • Community sensitization among men and women. 	<ul style="list-style-type: none"> • Contractor 	-
HIV/AIDS risks	<ul style="list-style-type: none"> • Sensitize workers on proper social behaviour and conduct with regard to community norms, HIV/AIDS and other sexually transmitted diseases. HIV/AIDS policies should be developed at the workplace. Free HIV/AIDS testing, counselling and condom distribution be encouraged for both workers, sex workers and local community. The pathways for transmission of HIV/AIDS and STIs are well known, foreseeable and can be mitigated. 	<ul style="list-style-type: none"> • Contractor 	-
	<ul style="list-style-type: none"> • Social bonds are not readily controlled, and the permanence of HIV/AIDS transmission makes this particular impact of social bonding both negative and also positive. Social bonds leading to lasting marriages and children occur in such situations; early pregnancies and sexual exploitation can also occur. It is therefore important to tackle the issue of social bonding with firmness and fairness, forbidding powerful relationships, which lead to exploitation of mostly women and children, while encouraging relationships that may lead to permanent situations. 	<ul style="list-style-type: none"> • Contractor/ DLG 	-
Risk of Contracting and Spreading COVID-19	<ul style="list-style-type: none"> • Sensitize all project employees about the signs and symptoms of COVID-19 as well as the ways to control its spread. 	<ul style="list-style-type: none"> • Contractor 	-
	<ul style="list-style-type: none"> • Screen local employees/contractors for COVID-19 during recruitment. 	<ul style="list-style-type: none"> • Contractor 	-
	<ul style="list-style-type: none"> • Screen all visitors to construction sites using a temperature gun and enforce washing of hands before entry and wearing of approved masks. 	<ul style="list-style-type: none"> • Contractor 	-
	<ul style="list-style-type: none"> • Management of potential COVID-19 cases – in case, any workers develop the above symptoms, isolate them and immediately contact the respective District Health Officers (DHOs) to pick and transport the patients for treatment. 	<ul style="list-style-type: none"> • Contractor 	-

Impact/Risk	Mitigation /Enhancement commitments	Responsibility	Estimated Cost (UGX) & Remarks
	<ul style="list-style-type: none"> Reduce site traffic – prohibit entry for any non-essential visitors. In addition, utilize staggered start and finish times for workers to limit site congestion and physical contact. Further, restrict the number of people in attendance at any site inductions, and consider holding them outdoors whenever feasible. 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> Practice social distancing – Consistently monitor points of worker interactions such as dining areas to ensure social distancing guidelines (2-4 meters apart) are being met. 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> Prioritize sanitation – Enforce workers to wash their hands with soap and water for at least 20 seconds or to use sanitizers before entering and after leaving the worksite, as well as before and after handling all goods, materials and equipment. Routinely clean any common contact surfaces on-site (e.g. scanners, turnstiles, screens, telephones and desks). Lastly, be sure to temporarily remove or disable any site entry systems that require skin contact (e.g. fingerprint scanners). 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> Limit physical contact – Make sure that the contractor stagger break times to reduce congestion and physical contact in eating areas. Require workers to keep at least 2-3 metres of distance between one another while eating. 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> Enhance whole-of-society coordination mechanisms to support preparedness and response, including the health, transport, travel, trade, finance, security and other sectors. Involve public health Emergency Operations Centres and other emergency response systems early. 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> Continuously sensitize the workers and pass on any new guidelines by Government and the WHO. 	<ul style="list-style-type: none"> Contractor 	-
	Risk of not engaging stakeholders in project monitoring	<ul style="list-style-type: none"> Bring onboard the relevant stakeholders including Kiryandongo DLG to participate in routine project monitoring. 	<ul style="list-style-type: none"> MWE
	<ul style="list-style-type: none"> Demolish all auxiliary facilities 	<ul style="list-style-type: none"> Contractor 	-

Impact/Risk	Mitigation /Enhancement commitments	Responsibility	Estimated Cost (UGX) & Remarks
Decommissioning of auxiliary facilities	<ul style="list-style-type: none"> Remove all obsolete equipment, vehicles, trucks and machinery shall be removed from sites 	• Contractor	-
	<ul style="list-style-type: none"> Backfilling all openings with overburden soil 	• Contractor	-
	<ul style="list-style-type: none"> Planting fast-growing trees and grasses to stabilize the excavated areas 	• Contractor	-
	<ul style="list-style-type: none"> Fencing off the re-vegetated areas is recommended until the reinstated vegetation has reached maturity 	• Contractor	-
	<ul style="list-style-type: none"> Clean-up of the site and safe disposal of any construction waste. 	• Contractor	-
NEGATIVE IMPACTS AND RISKS – OPERATION PHASE			
Depletion of Groundwater Resources	<ul style="list-style-type: none"> The water levels should continuously be monitored to ascertain any impact on the water level. 	• NUWS	-
	<ul style="list-style-type: none"> Water levels should be accompanied by monitoring of the water quality to ascertain any trend in water quality change with continued abstraction. 	• NUWS	Per NUWS' operation budget
	<ul style="list-style-type: none"> The developer should apply /acquire the abstraction permits which will facilitate adherence to agreed rates of abstraction on one side and also guide the DWRM while issuing abstraction permits in the vicinity, to other competing users 	• MWE	450,000
Solid Waste Generation	<ul style="list-style-type: none"> A Waste management plan for the operation phase of the project will be developed and implemented. 	• NUWS	-
	<ul style="list-style-type: none"> Waste collection bins will be provided at strategic positions at the water 	• NUWS	Per NUWS' operation budget
	<ul style="list-style-type: none"> offices, water source sites and reservoirs sites for temporary waste storage. The waste collection bins should be provided with covers to avoid spillage by scavengers and clearly coded for sorting purposes 	• NUWS	Per NUWS' operation budget
	<ul style="list-style-type: none"> The water supply system operator will hire a certified waste collection company to transport the waste for final disposal to designated waste dumping sites by NEMA 	• NUWS	Per NUWS' operation budget

Impact/Risk	Mitigation /Enhancement commitments	Responsibility	Estimated Cost (UGX) & Remarks
Risk of Pollution from mismanagement of sanitation facilities	<ul style="list-style-type: none"> • A Periodic maintenance regime including emptying and desludging will be put in place and implemented to prevent sewage over flows 	<ul style="list-style-type: none"> • NUWS 	Per NUWS' operation budget
	<ul style="list-style-type: none"> • Use of manifest system to ensure that the wastes are disposed off at a site (waste treatment plant) gazetted by NEMA 	<ul style="list-style-type: none"> • NUWS 	-
	<ul style="list-style-type: none"> • A robust management system for the sanitation facilities involving the communities, their leaders and the health workers should be put in place to monitor, detect and alert the responsible authorities to call for emptying of any septic tank that causes a danger to the community 	<ul style="list-style-type: none"> • NUWS 	-
Loss of livelihood for water vendors	<ul style="list-style-type: none"> • Provide paid employment to water vendors who will lose their livelihood 	<ul style="list-style-type: none"> • NUWS 	Per NUWS' operation budget
NEGATIVE IMPACTS AND RISKS – PHASE CROSSCUTTING			
Occupational Health and Safety Risks	<ul style="list-style-type: none"> • The Contractor shall prepare and implement an occupational safety and health plan for all sites, approved by the developer. 	<ul style="list-style-type: none"> • Contractor 	Within contractor's bid budget
	<ul style="list-style-type: none"> • The Contractor shall provide safety guidelines to all operations prior to start of work. 	<ul style="list-style-type: none"> • Contractor 	-
	<ul style="list-style-type: none"> • Strict adherence to safety measures and procedures are required to minimise (or eliminate) risks of accidents or hazardous developments occurring and ensure healthy and safe conditions for all persons working on the site. To ensure occupational health and safety on construction sites, the Contractor shall be obliged to comply with all applicable Ugandan construction Health and Safety Standards as required by the Occupational Safety and Health Act of 2006. These include provisions of the Factories Act, Labour Unions Act and Workman's Compensation Act. 	<ul style="list-style-type: none"> • Contractor 	-
	<ul style="list-style-type: none"> • Training will be conducted on how to prevent and manage incidences. This should involve proper handling of electricity, water etc. and sensitization on various modes of escape, conduct and responsibility during such incidences. All must fully be aware and mentally prepared for potential emergency. 	<ul style="list-style-type: none"> • Contractor 	-

Impact/Risk	Mitigation /Enhancement commitments	Responsibility	Estimated Cost (UGX) & Remarks
	<ul style="list-style-type: none"> Regular drills will be constantly followed on various possible incidences. This will test the response of the involved stakeholders. Such drills will keep them alert and they will become more responsive in case of incidences. 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> Personnel on duty shall at all times wear appropriate PPE, such as safety glasses with side shields, face shields, hard hats/helmets, and safety boots be required for all site staff. 	<ul style="list-style-type: none"> Contractor 	Within contractor's bid budget
	<ul style="list-style-type: none"> The Contractor shall establish emergency entrances, exits and amenities. 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> The Contractor shall ensure access to first aid kits. 	<ul style="list-style-type: none"> Contractor 	3,000,000
	<ul style="list-style-type: none"> The Contractor shall ensure safe working heights through provision of work platforms, scaffolds and adequate supervision by ensuring regular inspection of formwork, false work and temporary supports before loading or pouring concrete. 	<ul style="list-style-type: none"> Contractor 	Within contractor's bid budget
	<ul style="list-style-type: none"> The Contractor shall secure site boundaries with fences or hoardings as appropriate. 	<ul style="list-style-type: none"> Contractor 	Within contractor's bid budget
	<ul style="list-style-type: none"> The Contractor shall install caution signage around the site to discourage the public from being close to the site, for example, "falling debris", "keep off the site" etc. 	<ul style="list-style-type: none"> Contractor 	Within contractor's bid budget
	<ul style="list-style-type: none"> The Developer through the Construction Supervisor will continually monitor Contractors' compliance with Health and Safety measures. 	<ul style="list-style-type: none"> MWE 	Within supervision consultant's bid budget
	<ul style="list-style-type: none"> An Accident Log will be maintained onsite to register all injuries and to investigate their causes during both the construction and operation phases of the project. 	<ul style="list-style-type: none"> Contractor 	-
	<ul style="list-style-type: none"> The manufacturer's instructions and Material Safety Data Sheets (MSDS) shall be followed for the storage of all chemicals used in water treatment. Storage must conform to compatibility restrictions. 	<ul style="list-style-type: none"> Contractor 	-

Impact/Risk	Mitigation /Enhancement commitments	Responsibility	Estimated Cost (UGX) & Remarks
	<ul style="list-style-type: none"> Work force shall be subjected only to standard work shifts/hours. Overtime allowances, if applicable/warranted shall be paid with ceiling limits. Working beyond such ceiling limits shall be discouraged, even if, so desired workforce or contractor. 	<ul style="list-style-type: none"> Contractor 	-

9.4 ENVIRONMENTAL AND SOCIAL MONITORING PROGRAMME

9.4.1 PURPOSE OF MONITORING

A monitoring program aims to ensure that proposed mitigation and enhancement measures are implemented to generate intended results, otherwise the measures need to be modified, ceased or replaced when inappropriate. Moreover, monitoring allows assessing compliance with national standards as well as with the World Bank policies and guidelines. The Ministry has established a monitoring mechanism for supervision, monitoring and enforcement of E&S requirements. The mechanism includes the MWE teams (including the PST), the supervising consultants and contractors. Furthermore, the Ministry will procure a dedicated consultant for undertaking stakeholder engagement activities and formation, training and tooling of GRMs as well as other E&S Risk management activities and the ministry has allocated separate budget for this consultancy.

9.4.2 SCOPE OF ENVIRONMENTAL AND SOCIAL MONITORING

Environmental monitoring will be undertaken at different levels as described below

- **Surveillance:** Undertaken by the Supervision Engineer on behalf of MWE.
- **Quarterly Monitoring:** Joint by all relevant stakeholders at various levels.
- **Audit activities:** To be done by a NEMA registered Environmental Auditor.
- **Spot checks:** By Supervising Engineer, MWE, Contractor, District Leadership, NEMA.

9.4.3 MONITORING ACTIVITIES AND PROCESSES

9.4.3.1 WEATHER FORECASTS

Weather monitoring and forecast is important to ensure that the Contractor plans for activities and provides mitigation where weather especially rainfall may pose challenges. This will be critical during excavation works.

9.4.3.2 SITE INSPECTION

Routine inspections will be carried out to cover all aspects of environmental and social management on the site. Daily inspection aims to identify any environmental issues and rectify them without delay whereas weekly, monthly and quarterly inspections will verify that the daily inspections are identifying any maintenance requirements and that these requirements are being completed in an appropriate time frame. Site inspections will be carried out by the Contractor with instructions from the Supervision Consultant.

9.4.3.3 MEETINGS

Monthly site meetings are to be held to discuss project progress and, in such meetings, safeguards issues shall be sufficiently discussed and minuted. That shall include a review of the effectiveness of the mitigation measures, successes, and non-compliances. This will be a platform for the Engineer, the client (MWE) and World Bank to raise any environmental issues arising from the joint inspection and as a reaction to the contractor's presentation.

9.4.3.4 RECORDKEEPING

MWE shall ensure that all relevant monitoring and compliance records are readily available. Section 122 (6) of NEA (2019) states, “A developer shall maintain proper records of the monitoring undertaken under subsection (2), which shall be made available to the Authority or lead agency upon request” while subsection (7) states, “A lead agency or the Authority may require the developer to submit monitoring reports in a prescribed form”.

9.4.3.5 MONTHLY ENVIRONMENTAL AND SOCIAL REPORT

Either a standalone Monthly Environment and Social Report shall be prepared, or safeguards shall be sufficiently covered in the Contractor’s Monthly Progress Report in fulfilment of the Contractor’s contractual reporting obligations. The report will highlight different activities undertaken to manage environmental and social aspects of the project in line with contract specifications, laws, standards, policies, and plans of Uganda and World Bank Safeguard policies. This report will also have to be verified and approved by the supervising consultant. Planning for management of environmental aspects is typically done on a continuous basis. In that regard, every monthly progress report should include a schedule for environmental and social activities for the next month.

This Contractor’s Monthly Report is expected to summarize the following:

- a) Progress in implementing the CESMP and the standalone management plans;
- b) Status of key approvals and documentation for the project;
- c) Compliance with legal obligations and specifications;
- d) Compliance to the commitment to child protection and GBV (SEA & SH) prevention and management
- e) Findings of the monitoring programmes, with emphasis on any breaches of the control standards, action levels or standards of general site management;
- f) Summary of any complaints by the community and actions taken/to be taken; and
- g) Key environmental activities for the next month.

On a quarterly basis, the supervising consultant will prepare an Environment and Social Report covering similar thematic areas as listed above (for the quarter) that will be submitted to the developer (MWE). This report will inform the MWE quarterly report that will be shared with the World Bank and other stakeholders.

MWE should stipulate reporting requirements in the bidding documents for sourcing the project contractor and supervising consultant, and binding clauses should also be included in the subsequent contracts to ensure compliance.

9.4.3.6 ACCIDENT AND INCIDENT REPORTING

The supervising consultant and contractor shall ensure reporting of any serious and severe incidents to MWE within 24 hours of their occurrence while MWE will ensure similar reporting to the World Bank within 48 hours of their occurrence.

9.4.3.7 REPORTING CHANNELS ON SGBV/SEA-SH ON SEVERE INCIDENTS & BREACHES DURING IMPLEMENTATION

During implementation, the contractor shall follow guidelines on where and how to report SGVB/SEA-SH incidents and breaches. The ESS team will track, record, report and manage all GBV/SEA related incidents (breaches). All reports on GBV/SEA-SH shall indicate BY WHO, TO WHOM, WHAT, WHEN and TARGET / ACHIEVEMENTS. It is essential that the confidentiality and safety of victims and/or survivors will (must) be protected.

FORMANT / ISSUES TO REPORT	BY WHO	TO WHOM	WHEN
<p>The project will track and report severe GBV/SEA-SH incidents, breaches and allegations, by clearly establishing the following:</p> <ul style="list-style-type: none"> • Keep record of all incidents (GBV/SEA-SH Register) • Nature of the case; • Location; age, sex of victims and/or survivors; • Perpetrators sex, relationship to victim / survivor; origin • Project-related (Yes / No) • Whether the victims and/or survivor were referred to services. • Any other resolution of matter done 	Social Safeguards officer / GRM	MWE (who can then report to bank)	As soon as becomes known (Tracking is done continuously / daily)
<p>The GBV Service Provider (contracted to project) shall ensure continuous monthly reporting is done on following:</p> <ul style="list-style-type: none"> • Total number of GBV/SEA-SH cases received / referred, disaggregated by age and by sex; location, date of occurrence, referral status • The number of cases open, closed cases, and average time they have been open / closed • Summary data on perpetrators (location, relation to victims and/or survivors), date of occurrences 	GBV Service provider (e.g. CBO, NGO)	Contractor & MWE	Monthly
<p>The contractor (through a designated officer e.g. Supervising Engineer) shall prepare a Status Report on GBV/SEA-SH. Specifically, the report shall highlight the following issues:</p> <ul style="list-style-type: none"> • Progress on Key Indicators on GBV/SEA-SH showing Planned and Achieved Target) • GBV /SEA-SH Incident Register (Excel file) • Training done (total number of participants – workers, local leaders, community actors) 	Contractor	MWE	Monthly / Quarterly

<ul style="list-style-type: none"> • Community awareness meetings done on GBV/SEA-SH prevention and response / reporting and community feedback (minutes of the community meetings can also be shared) • Performance of GRM- how correctly for receiving and resolving complaints; GRM indicators • Status on appropriate mechanism to resolve GBV/SEA-SH complaints 			
The MWE as an implementing Agency (IA) shall prepare status reports on GBV/SEA-SH and report to World Bank.	MWE	World Bank	Monthly / Quarterly

If the aggrieved party is satisfied, the matter shall be closed and signed off with them in the complaints log book (Annex 10). The grievances on GBV, VAC, sexual harassment, among others that result into body injuries, shall be referred to nearby health centre facilities. However, in case of criminal cases, grievances on GBV, VAC, sexual harassment, among others, shall be immediately referred to Police (in respective cells) for statutory investigations and management in accordance with Uganda’s legal system.

Therefore, in a formal reporting, the following procedure will be undertaken using the report form;

- Getting the details of the Victim of GBV by GBV focal person
- Documenting the details of the Case
- Preparing witnesses to engage other Legal Actors like the Police
- Establishing the appropriate procedure including the need to for medical examination of the victim and the perpetrator
- Producing a comprehensive report to enable duty bearers assess and take appropriate actions
- Submitting the report to Duty Bearers like Uganda Police, State Attorneys and Courts
- Follow up of GBV Cases and victims to ensure appropriate services are accessed by the Victim

9.4.4 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN REVIEWS

The ESMP is a living/dynamic document subject to similar influences and changes from variations to the provisions of the project specifications. It will be reviewed at an interval of 6 months in order to identify any required amendments.

9.4.5 ENVIRONMENTAL COMPLIANCE AUDIT

MWE will take the responsibility to fulfil the requirements for an environmental and social audit, not less than 12 nor more than 36 months after project completion or commencement of

operations respectively in line with the National Environment Act 2019 and the Audit Regulations of 2020.

9.4.6 APPROVAL OF THE ESMP ACTIVITIES

Implementation of ESMP activities will be approved by MWE and safeguards compliance will be one of the bases for payment. Final payment for the contractor shall be tagged to successful restoration of all disturbed areas and clean-up of all construction sites.

9.4.7 ENFORCEMENT OF COMPLIANCE

The supervising engineer must strictly supervise implementation of the ESMP and where there are breaches, the supervising engineer should issue written instructions, cautions and warnings as applicable. Where the contractor fails to comply, contractual clauses should be invoked, and penalties or fines effected. If necessary, the civil works can be suspended if the contractor repeatedly fails to adhere to instructions. MWE should penalize the supervising consultant if he fails to supervise and enforce ESMP implementation by the contractor.

9.4.8 OPERATION PHASE MONITORING

9.4.8.1 WATER SUPPLY PLAN

MWE should develop, implement, and maintain a water safety plan taking into consideration the potential risks to the safety of the water from the supply catchment area to the consumer. A water safety plan should consist of three key components:

- a) System assessment to determine whether the drinking-water supply chain (up to the point of consumption) as a whole can deliver water of a quality that meets health-based targets;
- b) Identifying control measures in a drinking water system that will collectively control identified risks and ensure that the health-based targets are met; and
- c) Management plans describing actions to be taken during normal operation or incident conditions and documenting the system assessment (including upgrade and improvement), monitoring and communication plans and supporting programmes.

A water safety plan should include:

- a) Measures to protect the source of drinking water from risks of pollution;
- b) Measures to ensure all installations intended for the production of drinking water exclude any possibility of contamination. For this purpose and in particular:
 - The installation for collection, the pipes and the reservoirs should be made from materials suited to the water and in such a way as to prevent the introduction of foreign substances in water;
 - the equipment and its use for production should meet hygienic requirements;
- c) Measures to ensure an appropriate treatment such as pre-treatment processes, coagulation, flocculation, sedimentation, filtration and disinfection are undertaken to assure the safety of water for the consumers;
- d) Appropriate operational monitoring system including monitoring parameters that can be measured and for which limits have been set to define the operational effectiveness of

the activity; frequency of monitoring and procedures for corrective action that can be implemented in response to deviation from limits. If, during production it is found that the water is polluted, the producer shall stop all operations until the cause of pollution is eliminated; and

- e) A verification plan to ensure that individual components of a drinking-water system, and system as a whole is operating safely.

Public health surveillance (that is, surveillance of health status and trends) contributes to verifying drinking-water safety. Adequate infrastructure, proper monitoring and effective planning and management; and a system of independent surveillance are basic and essential requirements to ensure the safety of drinking-water. Surveillance should cover the total supply network from the source of untreated water to the consumer delivery points.

9.4.8.2 WATER QUALITY MONITORING PLAN

MWE will undertake water quality tests before use of the water by the communities to determine if water is safe to drink and to establish a baseline so that any future degradation can be detected. The Uganda Drinking Water Standards (**Table 0-3**) are as follows:

Table 0-3: Uganda Drinking Water Quality Standards and WHO Drinking Water Standards

Characteristic	Unit	US-201: 2008 Requirement	WHO 2011 Requirement
Physical Requirements			
Colour	Hazen units, max. Pt scale	15	No Guideline
Odour		Acceptable to consumers and no abnormal changes	No Guideline
Taste		Acceptable to consumers and no abnormal changes	No Guideline
Turbidity	NTU	5	1
Dissolved Solids	mg/l	700	No Guideline
Suspended Solids	mg/l	0	No Guideline
Electrical Conductivity (EC)	µS/cm	1500	250
Chemical Requirements			
pH		6.5 – 8.5	6.5 – 8.5
Total Hardness (as CaCO ₃)	mg/l	500	No Guideline
Calcium (as Ca)	mg/l	75	No Guideline
Sodium (as Na)	mg/l	200	200
Magnesium	mg/l	50	No Guideline
Arsenic (as As)	mg/l	0.05	0.01
Copper (as Cu)	mg/l	1.0	2.0
Chloride (as Cl)	mg/l	250	250

Characteristic	Unit	US-201: 2008 Requirement	WHO 2011 Requirement
Chromium (as Cr 6+)	mg/l	0.05	0.05
Fluoride (as Fl)	mg/l	1.0	1.5
Iron (as Fe)	mg/l	<0.30	No Guideline
Manganese (as Mn)	mg/l	0.1	0.1
Nitrates (as NO ₃)	mg/l	5	50 (Total Nitrogen)
Barium	mg/l	1.0	0.7
Aluminium (as Al)	mg/l	0.1	0.2
Sulphates	mg/l	200	250
Zinc (as Zn)	mg/l	5.0	3.0
Lead (as Pb)	mg/l	0.05	0.01
Selenium (as Se)	mg/l	0.01	0.01
Cadmium (as Cd)	mg/l	0.01	0.003
Phenolic substances (C ₆ H ₅ OH)	mg/l	0.001	No Guideline
Mercury (as Hg)	mg/l	0.001	0.001
Cyanide	mg/l	0.01	0.07
Poly nuclear aromatic substances	mg/l	nil	No Guideline
Residual free chlorine	mg/l	0.2	0.2
Mineral oil	mg/l	0.01	No Guideline
Anionic detergents	mg/l	0.2	No Guideline
Pesticides		Trace	Trace
Carbon chloroform extracts (CCE, organic pollutants)	mg/l	0.2	No Guideline

Source: Uganda Bureau of Standards, WHO Guidelines, 2011

The minimum parameters to be tested are as detailed below:

Physicochemical:

- Conductivity, or dissolved solids
- Colour
- Turbidity
- Taste
- Odour

Microbiological:

- Faecal coliform bacteria or E. coli;
- Shigella spp
- Salmonella spp

Chemical:

- Fluoride as F-
- Nitrate
- Nitrite
- pH value
- Aluminium
- Iron(total)
- Ammonia
- Residual chlorine

The frequency of sampling and surveillance will be as detailed in **Table 0-4** below:

Table 0-4: Minimum frequency of sampling of water for surveillance

Population served (P)	Frequency (minimum) of sampling
P > 100,000	10 samples every month per 100,000 of population served
25,001 – 100,000	10 samples every month
10,001 – 25,000	3 samples every month
2500 – 10,000	2 samples every month
P < 2500	1 sample every month

A sampling programme that takes into consideration appropriate international recommendations should be established and implemented. The sampling should be regular, and its frequency should mainly depend on the following factors:

- a) Quality of water harnessed including effects on the water from climatic, human and industrial activities;
- b) Type of treatment for drinking worthiness;
- c) Volume of water processed;
- d) Risks of contamination;
- e) Background of public water supply network;
- f) Population served; and
- g) Capabilities of the analytical facility (both in terms of capacity and in terms of analytical performance).

9.4.8.3 OPERATION PHASE ANNUAL COMPLIANCE AUDIT

During the operation period, MWE will take the responsibility to fulfil the requirements for an environmental and social audit in line with the National Environment Act 2019 and the Audit Regulations of 2020. MWE shall submit the environmental compliance audit report to NEMA and undertake mitigation measures to address and rectify any non-compliance detected.

ENVIRONMENTAL AND SOCIAL MONITORING PLAN MATRIX

Table 0-5: Environmental and Social Monitoring Plan

Environmental and Social Aspect	Indicators	Monitoring frequency	Sampling Area	Measurement Units	Method	Target level/ Standard	Responsibility	Annual costs estimate (UGX)
Positive Impacts – Construction Phase								
Employment opportunity	Percentage of local construction labourers	Quarterly	Project site	Percentage of local people employed in the project	Employment Records, inquiries and observation	50% of local construction labourers (men) 30% Women	MWE, LC-1 Contractor	Proj. Sup. Contract
Negative Impacts - Pre-construction Phase								
Air Quality	Dust (PM ₁₀)	Once before commencement	Project site	ppm	<i>Micro-dust Pro</i>	National Stds	MWE/ ESIA Consultant	ESIA Contract
Noise Baseline	Noise level	Once before commencement	Project site	dBA	<i>Noise Level Meter</i>	National Stds	MWE/ ESIA Consultant	ESIA Contract
Water Quality	Turbidity, TSS, Oil, PH	Once before commencement	Project site/ wetland	ppm	<i>Mobile Lab</i>	National Stds	MWE/ ESIA Consultant	ESIA Contract

Environmental and Social Aspect	Indicators	Monitoring frequency	Sampling Area	Measurement Units	Method	Target level/ Standard	Responsibility	Annual costs estimate (UGX)
Land acquisition/ displacement of land uses	PAPs	Before commencement & continuous throughout implementation	BH areas & along TL	No. of PAPs Compensated Land consent agreements	<i>RAP Implementation Report/ Grievance Log</i>	100% compensation	MWE/ RAP Consultant	Proj. Sup. RAP Budget
Negative Impacts - Construction Phase								
Land acquisition/ displacement of land uses	PAPs	Before commencement & continuous throughout implementation	BH areas & along TL	No. of PAPs Compensated Land consent agreements	<i>RAP Implementation Report/ Grievance Log</i>	100% compensation	MWE/ RAP Consultant	Proj. Sup. RAP Budget
Land use/ cover change	Area cleared; Species	Monthly	Along the TL and DL	Ha No. species	<i>Progress Reports</i>	Restricted to TL & DL Restored	MWE Contractor	12,000,000 Contract

Environmental and Social Aspect	Indicators	Monitoring frequency	Sampling Area	Measurement Units	Method	Target level/ Standard	Responsibility	Annual costs estimate (UGX)
Wetland Pollution	Siltation Turbidity	Once per month (daily inspection to be made to detect and remedy soil deposition during works in wetland area).	Wetland	TSS	<i>Sample & lab test</i>	Ntl Stds Baseline	MWE Consultant Contractor	12,000,000 Contract Contract
Waste Management	Amount of Solid waste generated	Once a week	Project site	Kg for Solid waste, Litres for Liquid waste	Observations and Measurements	0 Legal disposal	MWE DLG Contractor	4,000,000 MWE Budget Contract
Water Quality	All	Monthly	BHs, Wetland	All	Lab. Analysis	Ntl Stds	MWE Contractor	40,000,000 Contract

Environmental and Social Aspect	Indicators	Monitoring frequency	Sampling Area	Measurement Units	Method	Target level/ Standard	Responsibility	Annual costs estimate (UGX)
Air Quality	Dust (PM ₁₀)	Once per months (daily inspection to be made to detect and remedy excessive dust generation).	Project site	ppm	<i>Micro-dust Pro</i>	Ntl Stds	Contractor	Contract
Noise pollution	Noise level	Once a week	Project site	dba	<i>Noise Level Meter</i>	Ntl Stds	MWE / Sup. Consultant	8,000,000
Safety and health risks	Health and sanitation facilities in site. Documentation of instructions Record of PPE provided and staff; use of PPE on site	Daily by contractor, weekly by Consultant and Quarterly by MWE.	Project site	Number of safety measures provided	Site inspection Check for documentation Site inspection Check procedures and interview workers whether they	0	MWE Consultant Contractor	12,000,000 Contract Contract

Environmental and Social Aspect	Indicators	Monitoring frequency	Sampling Area	Measurement Units	Method	Target level/ Standard	Responsibility	Annual costs estimate (UGX)
	Supervision record Presence of signage Records of workers' orientation				are aware about the procedures Review of records of training			
GBV Cases	Nature of GBV Case	Daily by contractor, weekly by Consultant and Quarterly by MWE.	Project site	No. Reported Cases	Grievance Log Police Case Files	0	MWE Consultant Contractor	36,000,000 Contract Contract
Negative Impacts - Operation stage								

Environmental and Social Aspect	Indicators	Monitoring frequency	Sampling Area	Measurement Units	Method	Target level/ Standard	Responsibility	Annual costs estimate (UGX)
Water Quality & Quantity	All	Monthly At least once in 3 years	BHs	All	Lab. Analysis Hydrogeological analysis	Ntl Stds	MWE	40,000,000
Waste Management	Amount of Solid waste	Once a week	Project site	Kg for Solid waste, Litres for Liquid waste	Observations and Measurements	0 Legal disposal	MWE DLG	6,000,000 MWE Budget
Total monitoring costs								178,000,000 (Equivalent to 48,108 USD)

9.4.9 ROLES AND RESPONSIBILITIES IN THE ESMP IMPLEMENTATION

Ministry of Water and Environment will coordinate with NEMA on ensuring that environmental and social issues are addressed effectively throughout the lifecycle of the Project. Implementation of the different environmental issues is done through the relevant government institutions (Lead Agencies) within whose mandate the respective issues lie. Implementation of the ESMP will involve multiple institutions at all levels as detailed out below in **Table 0-6**.

Table 0-6: Institutions involved in safeguards management of the project

Institution	Mandate/ Responsibilities
Ministry of Water and Environment (MWE)	MWE will be responsible for the implementation of the Project through contractors Supervising Engineers, and consultants for Stakeholders Engagement, Environment and social risk managements. MWE will be responsible for contract management and will ensure that the contactors adhere to their contractual obligations and that they are compliant with the environmental and social standards as spelt out in their contracts. However, to augment the capacity of the Project Coordination Team, it is proposed some short-term technical assistance to back this capacity be provided for in the project.
National Environment Management Authority (NEMA)	NEMA will review and if acceptable approve this environment and social impact assessment as well as undertake compliance monitoring as per the National Environment Act 2019 Section 9 and to approve external environmental compliance audits as per the Environmental Audit Regulations (2020) section 19.
The World Bank	The World Bank will be financing the project and is therefore expected to offer implementation support supervision to the project's environmental and social performance through missions. The World Bank will designate a safeguards team that can participate in safeguards missions.
Department of Museums and Monuments, Ministry of Tourism, Wildlife and Antiquities	This will provide support in preserving the physical cultural resources within the project area and managing any chance finds encountered.
OSH Department, Ministry of Gender, Labour and Social Development	The OHS Department will undertake registration of the construction site as well as participate in periodic supervision visits to assess and monitor management of occupational health and safety issues. The Department will also undertake checks on all equipment used by the contractor.
Kiryandongo District Local Government	Kiryandongo district environment and natural resource committee will be involved in periodic monitoring of the project both during construction and operational phases. Kiryandongo District Local Government including Mutunda, Diima and Nyamahasa sub counties will be vital in implementation of the project in terms of mobilizing political goodwill and sensitizing communities about the project as well as the District Environment Officer (DEO) and District Community Development Officer (DCDO) who will participate the review of environmental and social impact assessment reports, environmental audit reports and other reports to be submitted to NEMA on a regular basis as provided for under Section 30 of the National Environment Act 2019. The DEO and DCDO will monitor environmental and social aspects of the project at district level to ensure mitigation measures are adequately implemented. It is highly recommended that the DEO and DCDO attend the monthly site meetings

	<p>for the project and be able to point out issues of concerns. Other duties will include:</p> <ul style="list-style-type: none"> • Support project as necessary as possible including community mobilisation and sensitization • Advise on compliance to law, policy & strategies (e.g. labour, women & child rights, environment, etc) • Participate in grievance redress • Prioritize and allocate funds to supplement source protection • Participate in demarcations of buffer zone • Seek support for preservation of cultural sites for tourism (Council Resolution) • Address political issues e.g. interferences (esp. District Council, RDC, Police, etc)
<p>The Local Council Leaders</p>	<p>The local council leaders in the project area will have a role on matters of helping the contractors settle in the project area and to support identification of raw materials sources. They will be key in aspects of labour identification and endorsements as well as safeguarding the cultural sites. The local leaders will support law enforcement agencies in curbing crime during project implementation.</p>

The goal of the IWMDP is to the maximum extent possible utilize existing institutional structures and capacity within the MWE and the local government to implement the Project. In order to successfully implement the ESMP, it is important to ensure that target groups and stakeholders who play a role in implementing it are provided with the appropriate and continuous Environmental and Social Safeguards capacity development.

The key institutions/group of people whose capacity needs to be enhanced to effectively implement and monitor the ESMP of this project are:

- **Beneficiary Communities:** There is a need to carry our training and awareness trainings for the key community members on the safeguard’s aspects of the project. Further, they need to be facilitated to enable them effectively monitor the ESMP implementation process.
- **Staff of the respective District Local Governments:** The staff at the district level needs to be trained on key aspects of the project. They also need to be facilitated to enable them effectively monitor the ESMP implementation process.

There is a need for the project to foster inter institutional monitoring of the implementation of the project’s ESMP. An interinstitutional monitoring committee should be formed, trained and their activities facilitated. A capacity building plan should be developed after instituting an inter institutional monitoring committee.

9.4.9.1 ROLES OF CONTRACTOR DURING PROJECT IMPLEMENTATION

During the construction phase and operation and maintenance phase, MWE will engage contractors to undertake the civil works and O&M tasks for the project respectively. Contractors will be responsible for complying with all relevant legislation and adhere to all mitigation measures specified in the ESMMP including the NEMA conditions of approval. MWE will therefore have to ensure enforcement of mitigation measures which will be enshrined under contractual

obligations. The contractors will be obliged to commit resources to ensure implementation of obligations in the contract through hiring qualified Safeguards Officers to operationalize the environmental and social requirements in the ESMP and supporting documentation. The construction contractor has not yet been procured, while the NUWS has been identified as the most suitable O&M phase contractor in the project feasibility study. However, based on experience for similar projects, the following safeguards team is recommended:

- a) Health & Safety Officer
- b) Environmentalist
- c) Sociologist
- d) Site Nurse
- e) Community Liaison Officer/Grievance Officer

MWE through the supervising consultant must approve the contractors' safeguards team. It may be useful to include the minimum requirements in the contracts for the civil works/ O&M phase. The Contractors are encouraged to sign MoUs with different service providers for safeguards related matters (waste management, HIV/AIDS, etc).

9.4.9.2 ROLE OF SUPERVISING CONSULTANT

The Supervising Consultant should have in their teams at least an Environment Specialist and a Social Specialist who will have overall responsibility of issuing guidance and instructions to the contractor including review and approval of the contractor's management plans. The Environmental Specialist and Social Safeguards Specialist will work closely with MWE Safeguards Team in supervising the contractor. In addition, the Supervising Consultant will conduct scheduled site supervisions to monitor state of safeguards compliance as documented or executed by the Contractors. The Supervising Consultant will have obligation to also oversee compliance and observation of environment, safety, health and social requirements alongside other cross-cutting issues in the project.

9.4.9.3 STAFFING REQUIREMENTS

The following personnel are proposed for each ESMP implementing stakeholder: -

Table 0-7: Personnel required to implement and monitor the ESMP

Stakeholder	Personnel required
Ministry of Water and Environment (Project Coordination Unit)	Project Support Team (PST) Specialists Water Engineer Sociologist Environmental Health Officer Health and Safety Officer
Construction Contractor	Site Engineer Site Supervisor Site Foreman Environmental Officer Sociologist

	Health & Safety Officer Site Nurse
O&M Contractor	Environmental Officer Sociologist Grievance Management Officer
Kiryandongo District Local Government	District Environmental Officer District Water Officer District Engineer District Community Development Officer
Mutunda, Diima and Nyamahasa sub counties	Community Development Officer Councilors Secretary for Health
NEMA	Monitoring Officer
OSH Department	Health and Safety Inspector supported by District Labour Officer
NGO/ CBO	Representative with skills in environmental management and conflict resolution
Department of Museums and Monuments	Archaeologist

The ESMP is based on a collaborative approach where the responsibility for the implementation and monitoring of the environmental and social management measures is shared among relevant stakeholders, to varying degrees. Successful ESMP implementation and more particularly its institutional arrangements and its environmental and social monitoring programs, will be based on a program of institutional support and capacity-building. Contractors must also be aware of the need to integrate best practices in their work.

It is the onus of each ESMP implementing stakeholder to ensure that all its personnel required in implementation of this ESMP are adequately qualified and were appointed based on their qualification and suitability for their respective roles. The ESIA Consultant recommends a training program (safeguards clinic) to enhance the environmental and social awareness of the project's key personnel. Monitoring may require the services of environmental specialists or a company with laboratory and analytical facilities (for complex environmental problems) or inspection by the local government environmental officers.

10 CONCLUSIONS AND KEY RECOMMENDATIONS

This Environmental and Social Impact Assessment evaluated the environmental and social impacts associated with the proposed water supply system and sanitation facilities in Mutunda RGC, Kiryandongo District. The proposed project will improve the capacity to deliver effective Water, Sanitation and Hygiene services to the communities of Mutunda, Diima and Nyamahasa sub counties. The no project scenario would see continuation of the hardships faced by residents of Mutunda RGC who are in severe need of clean and safe water, and existing sources are not enough to serve the increasing population and, in some cases, not protected. The benefits to the local economy will be in addition to reduced morbidity, increased enrolment of children in educational institutions, increased productivity of households and reduced incidences of domestic violence. The positive outcomes of implementing the project will infer positive change to the climate change, gender, health and educational vulnerabilities associated to water supply in the area.

The key negative impacts that will arise during the construction phase include influx of immigrants, labour land acquisition that will trigger displacement of livelihood activities and road crossings. Compensation and community health and safety are the key fears raised by the communities. Land acquisition and resettlement impacts and risks are expected to be managed through preparation and implementation of a Resettlement Action Plan. The transmission and distribution lines are expected to mainly utilize the road reserves which will significantly minimize resettlement risks. Road crossings of the transmission line especially within Mutunda trading centre are expected to pose traffic safety risks but implementation of a robust Traffic Management Plan will address such impacts. The ESMP emphasizes the need to immediately restore excavated/ disturbed areas as soon as the pipes have been laid. In general, all potential major impacts can be effectively mitigated.

The project is an intervention of the Central government (MWE) with support from the World Bank that will require collective action from stakeholders such as the Local government and regional actors in the WASH sector for its effective implementation. . The critical aspect is meaningful stakeholder mobilization and engagement as well as recruitment of an experienced team to manage the safeguards risks. MWE will spear head the supervision of the construction contractor and the operator to ensure negative impacts from the project are minimised. This should entail among others, undertaking of annual audits following provisions of the ESMP to ensure continuous improvement of the project's processes and products. MWE should use its vast experience in implementing similar water supply projects to effectively manage these potential risks.

Key Recommendations from this assessment for enhancement of the project include:

- The distribution line should be extended to provide water supply to the areas hosting the water source DWD 77278. This is aimed at promoting social equity and sustainability of the project;
- The Contractor should develop and implement a Contractor ESMP for the project's construction phase, encompassing the auxiliary footprint;
- Construction material for the project should be sourced from legally authorised sites;

- Extension of the hydroelectric power lines at the water source sites should strictly follow the access route alignment to ensure that the set-out land requirements suffice; and
- During the operation phase, the recommended number of pumping hours and abstraction rates should be maintained in order not to compromise the existing ground water sources.

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ANNEX 1: NEMA APPROVAL OF TOR



NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)

NEMA House
Plot 17,19 & 21, Jinja Road.
P.O.Box 22255, Kampala, UGANDA.

Tel: 256-414- 251064, 251065, 251068
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E-mail: info@nemaug.org

Website: www.nemaug.org

NEMA/4.5

17th January, 2022

The Permanent Secretary,
Ministry of Water and Environment,
P.O Box 20026,
KAMPALA

RE: REVIEW OF TERMS OF REFERENCE AND SCOPING REPORT FOR UNDERTAKING AN ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE PROPOSED LARGE SOLAR POWERED PIPED WATER SUPPLY SYSTEMS AND SANITATION FACILITIES IN KIRYANDONGO DISTRICT - EIATOR 8140

This is in reference to the Terms of Reference (TORs) for the above-mentioned project which was submitted to this Authority for review and consideration for approval. The review has been finalized and formal **APPROVAL** granted to undertake the Environmental and Social Impact Assessment (ESIA).

Please note that the **approval of the TORs does not constitute permission to start implementing any of the proposed project activities** as this is not a certificate of approval.


- (i) The project involves three solar powered systems in Nyakabaale, Gaspa and Mutunda Rural Growth Centers. The ESIA should therefore detail each system and its components including the GPS coordinates for the infrastructure under each system clearly indicating the boundary and delineation of the different components, the coverage (spatial and administrative boundaries), and the layout of key infrastructure. The capacity of the reservoir and booster tanks should be included, and for linear components, the length should be clearly indicated.
- (ii) The water sources should be clearly detailed in terms of location, GPS coordinates and comprehensive hydrological studies and baseline analyses of water quality undertaken of the water sources and the catchment, to determine potential impacts of the project on the area hydrology and other baseline characteristics.

Assess cumulative impacts from the three systems on the area hydrology and incorporate key findings from such studies in the report.

- (iii) Develop a comprehensive water source protection plan that shall be implemented to ensure that the water sources are protected during both construction and operation of the project. Append the plan to the ESIA report.
- (iv) Taking into account the Standard Operating Procedures (SOPs) in respect of the COVID-19 pandemic, undertake comprehensive consultations with all relevant stakeholders, especially the local communities (both host and refugee communities in the rural growth centres of Nyakabaale, Gaspa, Mutunda, and the Kiryandongo District Local Government Authorities, Ministry of Gender Labour and Social Development, including persons potentially affected by the project in the respective rural growth centres. The views/concerns of stakeholders consulted should be well documented and appended in the ESIA report.
- (v) Append clear and legible, **authentic copies of land acquisition and ownership** documents.
- (vi) Indicate the actual project (investment) cost including **cost of works, machinery/equipment and land where applicable and a certificate of valuation issued by a qualified and certified valuer in accordance with schedule 5(3f)** of the National Environment (Environmental and Social Assessment) regulations, S.I 143/ 2020, all attached to the ESIA report.
- (vii) In accordance to regulation 49 (2) of the National Environment (Environmental and Social Assessment) regulations, S.I 43/ 2020 you will be required to pay a non-refundable administration fee of thirty percent (30%) of the total fees payable on submission of the Environmental and Social Impact Statement to the Authority.

This is therefore, to recommend that you proceed with carrying out the ESIA for the proposed Large Solar Powered Piped Water Supply Systems and Sanitation Facilities in Kiryandongo District.

Looking forward to your cooperation and the receipt of a comprehensive ESIA report, for further action and consideration.

 17/1/2022
Patience Nsereko
FOR: EXECUTIVE DIRECTOR

ANNEX 2: WATER SUPPLY DESIGN PARAMETERS

Borehole Pumping Main

Borehole Number	Mutunda WSS	
	DWD 77379	DWD 77378
Borehole Yield (m³/hr)	5.2	50.5
Abstracted Yield (m³/hr)	5.2	45.0
Hours of Pumping (hr)	16	16
Total Daily Delivery (m ³ /day)	83	720
Pumping Main Section No. 01 (From Pump Installation Point to Ground Level at Borehole)		
Ground Level at Borehole (m AMSL)	1046.201	1038.182
Pump Installation Depth in Borehole (m BGL)	105.000	75.000
Static Lift (m)	105.000	75.000
Cwh	120	120
Pipe Details	DN 40 Steel Pipe PN16	DN 100 Steel Pipe PN10
Pipe Diameter ND (mm)	40.00	100.00
Pipe Diameter ND (m)	0.040	0.100
Flow in Pipe (m ³ /hr)	5.200	45.000
Flow in Pipe (m ³ /s)	0.001	0.013
Velocity (m/s)	1.15	1.59
Length of Pipe Section No. 01 (m)	105.00	75.00
Friction Loss (m)	5.60	2.51
Fittings losses - 10% (m)	0.56	0.25
Total Head in Section 01 (m)	111	78
Pumping Main Section No. 02 (From Ground Level at Borehole to Inlet level of Reservoir)		
Reservoir Tank inlet level (m AMSL)	1095.336	1095.336
Ground Level at Borehole (m AMSL)	1046.201	1038.182
Static Lift (m)	49.135	57.154
Cwh	140	140
Pipe Details	OD 63 HDPE PN10	OD 160 uPVC PN16
Pipe Diameter ND (mm)	55.40	136.20
Pipe Diameter ND (m)	0.055	0.136
Flow through pipe section 02 (m ³ /day)	5.200	45.000
Flow through pipe section 02 (m ³ /s)	0.001	0.013
Velocity (m/s)	0.60	0.86
Chainage at Borehole	0+000	0+000
Chainage at Reservoir	4+374	9+040
Length of Pipe Section No. 02 (m)	4,374.00	9,040.00
Friction Loss (m)	35.87	50.44
Fittings losses - 10% (m)	3.59	5.04
Total Head in Section 02 (m)	89	113
Total Head from Borehole to Reservoir (m)	200	190
Summary of the Design		
Capacity of pump in each borehole		
Head (m)	200	190
Flow (m ³ /hr)	5	45
Flow (l/s)	1	13
Efficiency (%)	60%	60%
Power (kVA)	6	47
Source: Project estimates		

Gravity Transmission Main to Booster Station

Chainage	Section Length (Km)	Flow (lps)	Proposed Pipe		Hydraulic Gradient (m/km)	Velocity (m/s)	Headloss (m)	Elevation (m)	Hydraulic Grad.Line (m)	Residual Head (m)	Static Head (m)	Remarks
			Type OD/PN	Diameter Int. (mm)								
POPARA RESERVOIR TO BOOSTER STATION												
0+000								1091.676	1091.68	0.00	0.00	Popara Reservoir
	0.260	2.65	HDPE-90/10	79.2	4.41	0.55	1.15					
0+260								1069.676	1090.53	20.85	22.00	
	2.000	2.65	HDPE-90/10	79.2	4.41	0.55	8.83					
2+260								1046.807	1081.70	34.90	44.87	
	0.850	2.65	HDPE-90/10	79.2	4.41	0.55	3.75					
3+110								1053.545	1077.95	24.41	38.13	
	2.050	2.65	HDPE-90/10	79.2	4.41	0.55	9.05					
5+160								1037.505	1068.91	31.40	54.17	
	0.850	2.65	HDPE-90/10	79.2	4.41	0.55	3.75					
6+010								1054.963	1065.15	10.19	36.71	Booster Station

Booster Station Pumping Mains

Design Parameters	Booster Station	
	2033 Pumps	2043 Pumps
Maximum Day Demand (m³/day)	169.8	228.6
Hours of Pumping (hr)	16	16
Flow Rate (m ³ /hr)	10.6	14.3
Pumping Main Section No. 01 (From Outlet Level of Water Sump to Tank Inlet level)		
Reservoir inlet level (m AMSL)	1094.004	1094.004
Water Sump Outlet Level (m AMSL)	1056.963	1056.963
Static Lift (m)	37.041	37.041
Cwh	140	140
Pipe Details	OD 90 HDPE PN16	OD 90 HDPE PN16
Pipe Diameter ND (mm)	73.60	73.60
Pipe Diameter ND (m)	0.074	0.074
Flow through pipe section (m ³ /hr)	10.613	14.285
Flow through pipe section (m ³ /s)	0.003	0.004
Velocity (m/s)	0.69	0.93
Chainage at water sump	6+010	6+010
Chainage at Reservoir	13+360	13+360
Length of Pipe Section (m)	7,350.00	7,350.00
Friction Loss (m)	56.63	98.17
Fittings losses - 10% (m)	5.66	9.82
Total Head from water sump to Reservoir (m)	99	145
Summary of the Design		
Total Length of Transmission		
DN 65 Steel PN25 (m)	7,350	7,350
Capacity of the Booster Pump		
Head (m)	99	145
Flow (m ³ /hr)	11	14
Flow (l/s)	3	4
Efficiency (%)	60%	60%
Power (kVA)	6	11

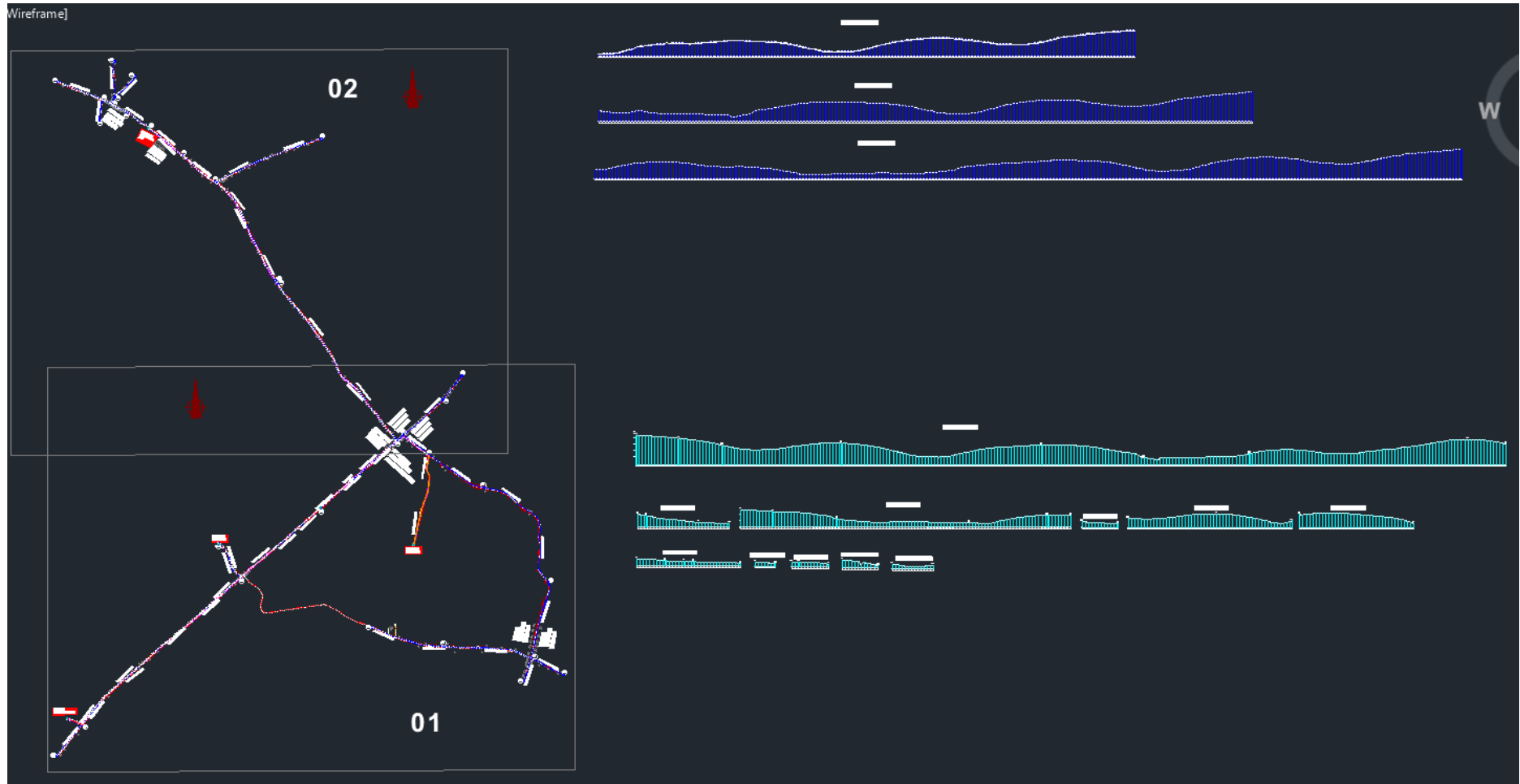
Distribution Network Pipes

Distribution Network Pipe Details								
Pipe Number	Start Node	End Node	Length	Pipe Details	Diameter	Roughness	Velocity at Peak Flow	Supply Area
Pipe 1	Mutunda_Rsvr	N01	15	OD 110 uPVC PN10	99.4	140	0.68	Diima
Pipe 2	N01	N02	665	OD 75 HDPE PN10	66	140	0.77	Diima
Pipe 3	N02	N03	680	OD 63 HDPE PN10	55.4	140	0.77	Diima
Pipe 7	N06	N07	1,667	OD 160 uPVC PN10	144.6	140	0.5	Kakwokwo
Pipe 8	N07	N08	3,433	OD 160 uPVC PN10	144.6	140	0.57	Kakwokwo
Pipe 9	N08	EP1	600	OD 50 HDPE PN10	44	140	0.68	Kakwokwo
Pipe 10	N05	N09	135	OD 110 uPVC PN10	99.4	140	0.65	Kakwokwo
Pipe 11	N09	N10	825	OD 63 HDPE PN10	55.4	140	0.53	Kakwokwo
Pipe 12	N10	EP2	482	OD 50 HDPE PN10	44	140	0.63	Kakwokwo
Pipe 13	N09	N11	520	OD 110 uPVC PN10	99.4	140	0.41	Kakwokwo
Pipe 14	N11	N12	1,000	OD 110 uPVC PN10	99.4	140	0.32	Kakwokwo
Pipe 15	N12	N13	2,080	OD 90 HDPE PN10	79.2	140	0.42	Kakwokwo
Pipe 16	N13	N14	1,235	OD 90 HDPE PN10	79.2	140	0.3	Kakwokwo
Pipe 17	N14	EP3	373	OD 50 HDPE PN10	44	140	0.17	Kakwokwo
Pipe 18	N14	EP4	575	OD 50 HDPE PN10	44	140	0.17	Kakwokwo
Pipe 19	N14	N15	1,400	OD 75 HDPE PN10	66	140	0.2	Kakwokwo
Pipe 20	N15	EP5	1,176	OD 50 HDPE PN10	44	140	0.29	Kakwokwo
Pipe 21	N03	EP6	1,809	OD 50 HDPE PN10	44	140	0.62	Diima
Pipe 22	N01	N16	440	OD 75 HDPE PN10	66	140	0.78	Diima
Pipe 23	N16	N17	296	OD 63 HDPE PN10	55.4	140	0.78	Diima
Pipe 24	N17	N18	147	OD 50 HDPE PN10	44	140	0.74	Diima
Pipe 25	N18	EP7	750	OD 50 HDPE PN10	44	140	0.12	Diima
Pipe 26	N18	EP8	321	OD 50 HDPE PN10	44	140	0.25	Diima
Pipe 27	N17	N19	120	OD 50 HDPE PN10	44	140	0.5	Diima
Pipe 28	N19	EP9	465	OD 50 HDPE PN10	44	140	0.25	Diima
Pipe 29	N19	EP10	570	OD 50 HDPE PN10	44	140	0.25	Diima
Pipe 30	N07	EP11	641	OD 50 HDPE PN10	44	140	0.54	Kakwokwo
Pipe 31	Popara_Rsvr	N08	260	OD 160 uPVC PN10	144.6	140	0.65	Kakwokwo
Pipe 4	N05	N06	1,612	OD 160 uPVC PN10	144.6	140	0.46	Kakwokwo
Pipe 5	N05	EP13	3,148	OD 90 HDPE PN10	79.2	140	0.32	Kakwokwo
Pipe 6	N03	EP12	1,880	OD 50 HDPE PN10	55.4	140	0.19	Diima

Distribution Network Nodes

Node ID	Elevation (m.a.s.l)	Base Demand (lps)	Off Peak Flows (Peak Factor=0.5)			Normal Peak Flows (Peak Factor=1.0)			Peak Flows (Peak Factor=2.0)		
			Demand (lps)	Hydraulic Gradient (m.a.s.l)	Residual Pressure (m)	Demand (lps)	Hydraulic Gradient (m.a.s.l)	Residual Pressure (m)	Demand (lps)	Hydraulic Gradient (m.a.s.l)	Residual Pressure (m)
Junc N01	1075.612	0	0	1090.34	14.73	0	1090.32	14.71	0	1090.27	14.65
Junc N02	1070.972	0.39	0.19	1089.79	18.82	0.39	1088.36	17.38	0.78	1083.17	12.19
Junc N03	1060.018	0.23	0.12	1089.11	29.09	0.23	1085.89	25.87	0.46	1074.26	14.24
Junc N05	1060.046	0.42	0.21	1090.53	30.48	0.42	1087.54	27.49	0.84	1076.74	16.7
Junc N06	1040.741	0.33	0.17	1090.73	49.99	0.33	1088.26	47.52	0.66	1079.35	38.61
Junc N07	1047.257	0.19	0.09	1090.97	43.72	0.19	1089.13	41.88	0.38	1082.5	35.24
Junc N08	1069.676	0.12	0.06	1091.61	21.94	0.12	1091.45	21.78	0.24	1090.87	21.2
Junc N09	1057.796	0.32	0.16	1090.48	32.68	0.32	1087.36	29.56	0.64	1076.09	18.29
Junc N10	1047.479	0.16	0.08	1090.06	42.59	0.16	1085.86	38.38	0.32	1070.68	23.2
Junc N11	1054.754	0.32	0.16	1090.4	35.64	0.32	1087.07	32.31	0.64	1075.03	20.28
Junc N12	1043.349	0.23	0.12	1090.3	46.95	0.23	1086.7	43.35	0.46	1073.7	30.35
Junc N13	1037.163	0.29	0.14	1089.85	52.69	0.29	1085.1	47.94	0.58	1067.93	30.77
Junc N14	1048.796	0.13	0.07	1089.71	40.92	0.13	1084.58	35.79	0.26	1066.08	17.28
Junc N15	1056.591	0.13	0.07	1089.61	33.02	0.13	1084.23	27.64	0.26	1064.8	8.21
Junc N16	1073.27	0.39	0.19	1089.97	16.7	0.39	1089	15.73	0.78	1085.51	12.24
Junc N17	1072.259	0	0	1089.67	17.41	0	1087.91	15.65	0	1081.55	9.29
Junc N18	1071.524	0.28	0.14	1089.49	17.97	0.28	1087.27	15.75	0.56	1079.25	7.72
Junc N19	1072.604	0	0	1089.6	16.99	0	1087.65	15.05	0	1080.63	8.03
Junc EP1	1061.764	0.52	0.26	1090.98	29.22	0.52	1089.17	27.41	1.04	1082.65	20.88
Junc EP2	1045.548	0.48	0.24	1089.63	44.08	0.48	1084.28	38.73	0.96	1064.98	19.43
Junc EP3	1048.855	0.13	0.07	1089.68	40.83	0.13	1084.48	35.62	0.26	1065.68	16.83
Junc EP4	1045.363	0.13	0.07	1089.67	44.3	0.13	1084.42	39.05	0.26	1065.47	20.11
Junc EP5	1045.523	0.22	0.11	1089.36	43.84	0.22	1083.32	37.8	0.44	1061.52	16
Junc EP6	1045.896	0.47	0.23	1087.53	41.64	0.47	1080.2	34.3	0.94	1053.71	7.81
Junc EP7	1068.847	0.09	0.05	1089.46	20.61	0.09	1087.16	18.31	0.18	1078.85	10
Junc EP8	1068.999	0.19	0.09	1089.44	20.44	0.19	1087.08	18.08	0.38	1078.57	9.57
Junc EP9	1068.911	0.19	0.09	1089.52	20.61	0.19	1087.38	18.47	0.38	1079.65	10.74
Junc EP10	1063.589	0.19	0.09	1089.51	25.92	0.19	1087.32	23.73	0.38	1079.42	15.84
Junc EP11	1045.961	0.41	0.2	1090.54	44.58	0.41	1087.57	41.61	0.82	1076.85	30.89
Junc EP12	1063.63	0.23	0.12	1088.97	25.34	0.23	1085.38	21.75	0.46	1072.41	8.78
Junc EP13	1063.63	0.79	0.4	1090.12	26.49	0.79	1086.06	22.43	1.58	1071.4	7.77
Resvr Mutunda Rsvr	1090.344	#N/A	-1.33	1090.34	0	-2.65	1090.34	0	-5.3	1090.34	0
Resvr Popara Rsvr	1091.676	#N/A	-2.66	1091.68	0	-5.32	1091.68	0	-10.64	1091.68	0

ANNEX 3: PROJECT LAYOUT DRAWINGS



ANNEX 4: STAKEHOLDER ENGAGEMENT RECORD



ATTENDANCE LIST

Project Name: IWMDF Kiryandongo WS/S ESIA, RAP and SPP

Location: Kiryandongo District HQ Date: 21/10/21

No	Name	Gender M/F	Designation	Contact	Email	Signature
1.	Odoch Thomas	M	SCDO	0784819809	Thomas.odoch@...	<i>[Signature]</i>
2.	MUKUMUZA SAMUEL	TA	DUTO	0772845618	samuelmukumuz@yohoo.com	<i>[Signature]</i>
3.	CHRISTINE MABAZI	F	SS MWE	0772606951	tina.mabazi@yohoo.com	<i>[Signature]</i>
4.	Jule Nkanyo Kizile	M	Socialist/Social	0751393897		<i>[Signature]</i>
5.	ASIMUSE KULUSIUS	M	Valuation Surveyor	070486854	asimusek@...	<i>[Signature]</i>
6.	Andrew Nlowasiims	M	GIS EXPERT	0787600671	nlowasiims@...	<i>[Signature]</i>
7.	Bryan WAMALI MATU	M	RAP Specialist	070108762	bryan@...	<i>[Signature]</i>
8.	Dr. Martin Kabenge	M	Environmental Engineer	0775 971979	martinkabenge@...	<i>[Signature]</i>
9.	APRONYA MARIAN	M	SETO	0782762949	marianmaria@...	<i>[Signature]</i>
10.	Daman Denis	M	PACAO	0782339114	daman@...	<i>[Signature]</i>
11.						



Plot 48, Mbogo Road 1, Najjera
Kira Municipality, Wakiso
P.O. Box 101649, Kampala, Uganda
+256200901224 / +256772458903
info@jbn.co.ug | www.jbn.co.ug

ATTENDANCE LIST

Project Name: Kiryandongo IWMDF ESIA RAP SPP

Location: KIRYANDONGO POLICE STATION Date: 11/11/2021

No	Name	F/M	Designation	Contact/ Email	Signature
	SP. Ondoga Tonny	M	DPC -	0773126608	<i>[Signature]</i>
	APP WAZIYORA MORRI	M	C-20	0779471304	<i>[Signature]</i>
	D/CPN OKURUT PAUL	M	CID	0772361779	<i>[Signature]</i>
	D/C AROLO SAMUEL	M	C.I	0773749790	<i>[Signature]</i>
	Prileba Semmy	M	Nursing office	0784046802	<i>[Signature]</i>
	Ayigi Roseline	F	DND	0785013217	<i>[Signature]</i>
	JAYEKA APOLLO	M	QPC	0782889073	<i>[Signature]</i>
	MUTERWA CHARLES	M	PC	0777294269	<i>[Signature]</i>
	OP W Godfrey	M	FIN	0773468869	<i>[Signature]</i>

Mukunda Health Centre III
Mukunda Police Office



Plot 48, Mbogo Road 1, Najjera
Kira Municipality, Wakiso
P.O. Box 101649, Kampala, Uganda
+256200901224 / +256772458903
info@jbn.co.ug | www.jbn.co.ug

ATTENDANCE LIST


Project Name: KIRYANDONGO IWMDF ESIA RAP SPP

Location: Mukunda Health Centre III Date: 11/11/2021

No	Name	F/M	Designation	Contact/ Email	Signature
01	OUELLO DENISH	M	MCO	0784762545 oelldeny@gmail.com	<i>[Signature]</i>
02	ATP ERACH VINCENT	M	BC P/POST	0772649121	<i>[Signature]</i>



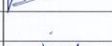




ATTENDANCE LIST

Project Name: KIRIANDONGRO IKIMBO ESIA RAP SPP
Location: Bweyale Police Station Date: 11/11/2021

No	Name	F/M	Designation	Contact/ Email	Signature
01	IP DONGE JOSEPH	M	DC OPERATIONS	0772-622880	



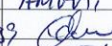
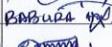

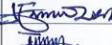

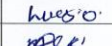
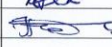




ATTENDANCE LIST

Project Name: KIRIANDONGRO IKIMBO, ESIA, RAP SPP
Location: Mutunda A Date: 11/11/2021

No.	Name	Gender M/F	Designation	Contact	Signature
01	MAGAMBO FRANCIS	M	COUNSELLOR ALDO	0784469790	
	Dwori	M	land owner	0781,063595	
	Onyera Agnes	F	mutunda west		
	ONYRAMISI BATRICK	M	Contributor	0773895079	
	Dada Dominic	M	Land owner	0784995824	
	ORACHA SINDIGA	M	C/MANAGER	0787878911	
	KIIZA KASIMIRI	M	C/PLC/NANDA	0787986586	

ATTENDANCE LIST

Project Name: KIRIANDONGRO IKIMBO ESIA RAP SPP
Location: Kisura & Popera west, Mutunda SK Date: 11/11/21

No.	Name	Gender M/F	Designation	Contact	Signature
1	BATHENKA BOSCO	M	C/MAN KISURA	0773474510	
2	OKUSA MOSES	M	MANAGER	0785446872	
3	OMONY WILLY	M	DIFFERENCE	0776290466	
4	OSWALD JOHN	M	DIFFERENCE	0782844639	
5	ACIRO BABRA	F	women leader	0786563822	
6	ONEN EMMANUEL	M	secretary LCI	0785060050	
7	OLOK VICENT	M	C.M.O. P	0784117411	
8	OKENI MARIA	M	G. secretary	0775481593	
9	JACAN WILLIAM	M	viceman popera west	0778993016	
10	OBIRA MOSES	M	Y/MAN	0760626291	
11	OYELETH LUCY	F	Popera west	0782604761	
12	OTYCK MOSES	M	KISURA	0784776252	
13	ONKELU BOSCO	M	POPARA	0784650063	

ATTENDANCE LIST

Project Name: KIRYANDONGO INMOP ESIA RAP SSP
Location: Mutunda B, Kahwoko, Mutunda J/C

Date: 11/11/2021

No.	Name	Gender M/F	Designation	Contact	Signature
01	BAGUMA ALAN	M	family member	0782194960	[Signature]
02	BISISIRA JOHN PAUL	m	Gen. Secretary	0770350116	[Signature]
03	MAYA JOHN BOSCO	m	Finance Secretary	0786639804	[Signature]
04	ARIYO MARTINA	F	W. leader/VHI	077982126	[Signature]
05	OBORO Tommy	m	Co-ordinator	0774918121	[Signature]

ATTENDANCE LIST

Project Name: Kiryandongo INMOP ESIA RAP SSP
Location: Kawiti

Date: 11/11/2021

No.	Name	Gender M/F	Designation	Contact	Signature
01	Hon Sewarto Cooldrey	m	Councilor Kakuokwo Famb	0750563182 0780209109	[Signature]
02	MUGWANZA JAMES	M	Kenya Lei	077179009	[Signature]
3	OCHAN PEITE	M	cm/c	0782605200	[Signature]
4	Sengiyumba John	m	VICE	0779728805	[Signature]
5	MUTALE TABITHA	F	T/H	0789370256	[Signature]
	TINEBAZEG	M	farmat	0725513733	[Signature]

ATTENDANCE LIST

Project Name: KIRYANDONGO INMOP ESIA RAP SSP
Location: Kawiti Let commitee

Date: 21/10/2021

	Name	Gender M/F	Designation	Contact	Email	Signature
1.	Mbabazi Monica	F	PIF	0771044662	-	[Signature]
2.	Masuma Alwoch	F	PIF	-	-	[Signature]
3.	AKANYO Mary	F	PIF	-	-	[Signature]
4.	KASIGWA MUSAHA	M	Sec	0771191288	-	[Signature]
5.	Katurebe Dan	M	PIF	0780227158	danaturebe@gmail.com	[Signature]
6.	OKOI GEORGE	M	PIF youth	0779289190	-	[Signature]
7.	MUGWANZA JAMES	M	Kenya Lei	077179009	-	[Signature]
8.	KANDIRO WALTER	M	clp youth sub	0771373779	-	[Signature]
9.	KARANJIRA ABEL	M	L.C. KAWITI	0788573787	-	[Signature]
10.	NABIMANY DAN	M	PIF	0781103933	Nabimanyo@gmail.com	[Signature]
11.	OKENO KAWIRIACE	M	PIF	0731394712	-	[Signature]
12.	Tumwine Fred	M	Information	076043710	-	[Signature]
13.	Sunday Amosi	M	PIF	0771148633	-	[Signature]
14.	MUSASIBI ENOCK	M	PIF	078534009	-	[Signature]
15.	Kakuru Fred	M	PIF	0787647286	-	[Signature]

ATTENDANCE LIST

Project Name: Kiryandongo Water Supply / PDS-MUNE
 Location: Mutunda SC

Date: 21/10/2021

No.	Name	Gender M/F	Designation	Contact	Email	Signature
1.	Munyuru Patrick David	M	Chairman LC3	0785319896		
2.	Munyanga Jane	F	Chair	0786757646	-	
3.	Tusabe Lydia	F	SACAO	0773935819	-	
4.						
5.						

ATTENDANCE LIST

Project Name: Kiryandongo WS/S ESIA RAP SPP IWMOP
 Location: Mutunda B, Kiryandongo

Date: 21/10/2021

No.	Name	Gender M/F	Designation	Contact	Email	Signature
1.	MORU JAMES	M	LANDLORD	0782675167 0773149060	JAMESMORU2@gmail	
2.	OSOK ALO-510UJ	M	"	0760086080		
3.						
4.	TULIKIMU SAVING		GROUP 22/10/2021			
5.	Muhumusa Joseph	M	Kikooza C/P	0774877918		
6.	UNA JESCA	F	" Tr	0 -		
7.	LUNGOLO TOPISA	F	" m/c	0785482562		
8.	ABIGABA JUDITH	F	" "	0780301161		
9.	ASUMWE AMOS	M	" SAC	0776840529		
10.						

ATTENDANCE LIST

Project Name: KIRYANDONGO IWMOP ESIA RAP SPP
 Location: Mutunda SIC

Date: 11/01/21

No.	Name	Gender M/F	Designation	Contact	Signature
	Munyuru Patrick David	M	Chairman LC III	0785319896	
	KIZA CHRISTOPHER	M	Vice-Chair	07749942	
	KAREEMA JUDITH	F	Secretary	07652588	

ATTENDANCE LIST

Project Name: KIRIYANDONGO I&MP, ESIA, RAP, SPP
Location: MMTUNAA HEALTH CENTRE III

Date: 13/11/2021

No.	Name	Gender M/F	Designation	Contact	Signature	
01	KLOBUSINGE SAM	M	E/N	0789641315	[Signature]	13/11/21
02	Nyolungga Francis	M	Askari	0775538500	[Signature]	13/11/21
03	Okello Denish	M	IM Charge	0784762545	[Signature]	13/11/21

ATTENDANCE LIST

Project Name: Kiryandongo, ESIA, RAP, SPP

Location: Popara Reservoir, Popara west, Nyamahasa S/C Date: 13/11/2021

No	Name	F/M	Designation	Contact/ Email	Signature
	DADA DOMINIC	M	LAND OWNER	0784995824	[Signature]

ATTENDANCE LIST

Project Name: Popara West / Kisula Villages

Date: 18/11/2021

	Name	Gender M/F	Designation	Contact	Email	Signature
1.	ONEIL EMMANUEL	M	Secretary Lc	078506052		[Signature]
2.	AWELLO JENIFER	F	member	0787267130		[Signature]
3.	BISEKE RICHARD	M	Defence	076022220		[Signature]
4.	ODWAB KENETH	M		07739768		[Signature]
5.						
6.						

JBN
SOLUTIONS THAT LAST

ATTENDANCE LIST

Project Name: IWMDP - ESIA RAP SPP Date: 19th 11-2021

Location: Popava West Village
Community

No.	Name	Gender M/F	Designation	Contact	Email	Signature
1	GRACIA VANCE	M	clm Popava-west	0792999411		
2	JACAN WILLIAM	M	vicman Popava-w	0778993016		
3	OLOK VICEINT	M	clmE PopARW	0784117411		
4	LALAM CHRISTINE	F	WOMN Leter	0785314985		
5	OHELLO DENIL	M	SECRETARY	0775043717		
6	AHELLO JENIFER	F	SECRETARY	077207750		
7	LENGA BOSCO	M	ENVIRONMENT	0779245914		
8	APIA Christine		s/p Te-olwa burehde	0772455710		
9	ODWIBA KENETH		PUPURA	077397631		
10						

JBN
SOLUTIONS THAT LAST

ATTENDANCE LIST

Project Name: IWMDP - ESIA RAP SPP Date: 19th 11-2021

Location: Kisulu S. Popava West

No.	Name	Gender M/F	Designation	Contact	Email	Signature
1	BAHEMUKA BOSCO	M	CLMAN LCII	0773474542		
2	OPLO JASPER	M	MOBILIZER	0787581661		
3	Barwa James	M	but c/ Person	0785189408		
4	OHELLO MARION	M	G. secretary	078581593		
5	OMONY WILLY	M	DIFFERENCE-14	0776290246		
6	OLUA MOSES	M	IC SURVEY	0785161687		
7	KATUSTAR	M	MEYA	078690870		
8	ACIBA BABRA WOMEN LEADER	F	WOMEN LEADER	0786563882		
9						
10						

JBN
SOLUTIONS THAT LAST

ATTENDANCE LIST

Project Name: IWMDP - ESIA RAP SPP Date: 19th 11-2021

Location: Kisulu S. Popava West

No.	Name	Gender M/F	Designation	Contact	Email	Signature
1	BAHEMUKA BOSCO	M	CLMAN LCII	0773474542		
2	OPLO JASPER	M	MOBILIZER	0787581661		
3	Barwa James	M	but c/ Person	0785189408		
4	OHELLO MARION	M	G. secretary	078581593		
5	OMONY WILLY	M	DIFFERENCE-14	0776290246		
6	OLUA MOSES	M	IC SURVEY	0785161687		
7	KATUSTAR	M	MEYA	078690870		
8	ACIBA BABRA WOMEN LEADER	F	WOMEN LEADER	0786563882		
9						
10						

NAMES OF WATER COMMITTEES KAKWERA TIC BOREHOLE

- 1- C/Person: Benzamwe Alex-
- 2- V/Person: Byamukama Juana
- 3- G/Sec: Awelo Jennifer - 0787 209730
- 4- Treasure: Alum Esther
- 5- Caretaker: Okech Wilson
- 6- Mobilizer: Opendawa Aman
(ii) Omwambe Charles
- 7- Field ext: ir. Abraham Babra - 0786 563887
0786 414224

ATTENDANCE LIST

Project Name: INMSP

Location: Kikonge, Kakwera

Date: 18/1/2021

No.	Name	Gender M/F	Designation	Contact	Email	Signature
1.	Olal Blasto	M		0775916305		
2.	M. Paimwe Jennifer	F		"		
3.	Katesigwa Richard	M				
4.	Arok Theresa	F		0779920401		
5.	Isingoma Sam	M		0789307581		
6.	Kajira Nickson	M		0780943290		
7.	Otem Alfred	M				
8.	Kinyera Godfrey	M		0775985651		
9.	Kadwa Lawrence	M				
10.	Asaba Mary	F				
11.	Owaga Robert	M		077228829		
12.	Opyemungu Charles	M		0760626423		
13.						

ANNEX 5: WATER QUALITY TEST CERTIFICATES



MINISTRY OF WATER AND ENVIRONMENT NATIONAL WATER QUALITY REFERENCE LABORATORY - ENTEBBE

Certificate of Analysis

Client Name : JBN Consults and Planners Ltd
 Client Address : Plot 48 Mbago Road, Najjera 1
 Sample Location : Kiryandongo District
 Date Sampled : 15th November 2021
 Date received : 2nd December 2021
 Analysis Completion data : 11th December 2021

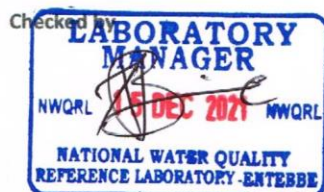
TEST RESULTS

Source Name	MSW1 RIVER NANDA	MSW2 RIVER NANDA	MGW1 POPARA WEST	MGW2 NYAKAGWERI	Drinking water standards (DEAS12:2018 Maximum permissible for Natural potable Water)	
Sample Location and Source	Mutunda Surface water	Mutunda Surface water	Mutunda Surface water	Mutunda Ground Water		
Sub County	Mutunda	Mutunda	Mutunda	Mutunda		
Lab Identifier code	E50112	E50107	E50105	E50109		
Turbidity (NTU)	NTU	0.6	0.9	1.8	37.7	25
pH	units	8.57	8.09	7.11	8.27	5.5-9.5
Electrical Conductivity	µS/cm	258	298	291	1181	2500
Total dissolved solids	mg/l	165	191	186	756	1500
Total Hardness as CaCO ₃	mg/l	98	115	110	400	600
Fluoride	mg/l	0.14	0.18	0.28	0.38	1.5
Sulphates	mg/l	5.1	5.9	5.4	27	400
Chlorides	mg/l	19	22	25	91	250
Nitrates as N	mg/l	0.16	0.15	0.12	0.19	10
Nitrites as N	mg/l	<0.002	<0.002	<0.002	<0.002	0.003
Manganese	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
Total Iron	mg/l	0.17	0.69	0.23	0.14	<0.5
E.Coli	CFU/100ml	7	18	<1	<1	<1

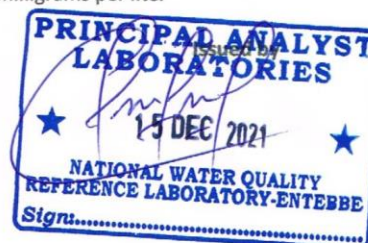
Notes;

Samples are analyzed on as received basis.

The client does bear sampling responsibility as to the representative characters of the sample delivered. Results are therefore based on the sample delivered and analyzed. mg/l-stands for milligrams per liter



Water Quality Management Department
 Directorate of Water Resources Management
Waterquality.laboratory@mwe.go.ug
 P.O Box 19, Entebbe
 Tel: 041-321342





**NATIONAL WATER AND SEWERAGE CORPORATION
CENTRAL LABORATORY-BUGOLOBI.**

P.O. Box 7053, Kampala.
Tel. 041257548/341144 Fax: 041 255441
E-mail: waterquality@nWSC.co.ug

CERTIFICATE OF ANALYSIS

Client: Sumadhura Technologies

Serial No: ES/ RF/2021/1587

Address : Kampala

Sampled by: Client's Staff

Date Sample received: 28- 7-2021

Date of Report: 30-7-2021

Table of analytical results

Parameters	Units	V- Mutunda B P- Kakokwo S/C- Mutunda C- Kibanda North D- Kiryandongo DWD: 77378	National Standards for Natural potable water
<i>Sample Number</i>	-	<i>K897/2021/C</i>	
Alkalinity: Total	mg/l	52	500
Bicarbonate	Mg/l	102	500
Calcium ;Ca ²⁺	mg/l	14.50	150
Chlorides-Cl ⁻	mg/l	8	250
Colour	Ptco	20	50
Conductivity	µs/cm	282	2500
Fluoride :F ⁻	Mg/l	0.5	1.5
Hardness: total as CaCO ₃)	mg/	66	600
Iron:total	mg/l	0.094	0.3
Magnesium : Mg ²⁺	mg/l	5.20	100
Manganese	Mg/l	0.0	0.1
Nitrate-N	mg/l	3	45
Ph(Physical-Chemical)	-	6.67	5.5- 9.5
Sulphates: SO ₄ ²⁻	mg/l	0	400
Total dissolved solids(TDS)	mg/l	260	1500
Total suspended solids(TSS)	mg/l	0	0.0
Turbidity	NTU	2.60	25

Remarks;

The water sample showed complying physiochemical characteristics compared to the National Standards for natural potable water .

AUTHORISED BY: Manager , Central Laboratory Services.....

APPROVED BY: Senior Manager, Water Quality Management Department.....

The NWSC certificate of analysis by no means constitutes a permit to any person or undertaking to conduct business. This report reflects results of the sample as received at the laboratory premises





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E-mail: waterquality@nWSC.co.ug

CERTIFICATE OF ANALYSIS

Client: Sumadhura Technologies

Serial No: ES/ RF/2021/1586

Address : Kampala

Sampled by: Clients Staff

Date Sample received: 28- 7-2021

Date of Report: 30-7-2021

Table of analytical results

Parameters	Units	V- Popopara West P- Nyamasa S/C- Mutunda C- Kibanda North D- Kiryandongo DWD:77379	National Standards for Natural potable water
<i>Sample Number</i>	-	<i>K896/2021/C</i>	
Alkalinity: Total	mg/l	58	500
Bicarbonate	Mg/l	114	500
Calcium ;Ca ²⁺	mg/l	10.20	150
Chlorides-Cl ⁻	mg/l	6	250
Colour	Ptco	21	50
Conductivity	µs/cm	287	2500
Fluoride :F ⁻	Mg/l	0.3	1.5
Hardness: total as CaCO ₃)	mg/	64	600
Iron:total	mg/l	0.090	0.3
Magnesium : Mg ²⁺	mg/l	5.40	100
Manganese	Mg/l	0.0	0.1
Nitrate-N	mg/l	2	45
Ph(Physical-Chcmical)	-	6.63	5.5- 9.5
Sulphates:SO ₄ ²⁻	mg/l	0	400
Total dissolved solids(TDS)	mg/l	264	1500
Total suspended solids(TSS)	mg/l	0	0.0
Turbidity	NTU	2.50	25

Remarks;

The water sample showed complying physiochemical characteristics compared to the National Standards for natural potable water .

AUTHORISED BY: Manager , Central Laboratory Services..... *LM*

APPROVED BY: Senior Manager, Water Quality Management Department..... *am*

*The NWSC certificate of analysis by no means constitutes a permit to any person or undertaking to conduct business.
This report reflects results of the sample as received at the laboratory premises*



ANNEX 6: FLORA SPECIES ECOUNTERED IN THE ASSESSMENT

Order	Family	Species	Mutunda A, & B- Kisula	Mutunda- Kawiti- Kakwoko	Mutunda- Teyago	Source 1 & Road	Teyago T-Off 1&2	Water Source 2 & Road	Status
1	Acanthaceae	Acanthus pubescens	X	X	1	X	X	X	LC
2		Asystasia gangetica	2	1	X	X	X	X	LC
3		Dyschoriste radicans	1	X	X	X	X	X	LC
4		Justicia diclipteroides	1	1	X	1	X	X	LC
5		Justicia exigua	1	X	1	X	X	X	LC
6	Amaranthaceae	Alternanthera pungens	1	1	X	X	X	X	Invasive
7		Alternanthera sessilis	1	X	X	X	X	X	Invasive
8		Amaranthus hybridus	X	X	X	1	X	X	LC
9	Anacardiaceae	Lannea barteri	1	X	X	X	X	X	LC
10		Mangifera indica	1	X	X	X	X	X	LC
11		Rhus vulgaris	1	1	X	X	X	X	LC
12	Annonaceae	Annona senegalensis	1	X	1	1	1	1	LC
13	Apocynaceae	Cascabela thevetia	1	X	X	X	X	X	LC
14		Rauvolfia vomitoria	X	X	1	X	X	X	LC
15	Araliaceae	Cussonia arborea	1	X	X	X	X	X	LC
16		Cussonia holstii	1	X	X	X	X	X	LC
17	Asclepiadaceae	Mondia whitei	2	X	X	X	X	X	LC
18		Pergularia extensa	1	X	X	1	X	X	LC
19		Secamone africana	1	X	X	X	X	X	LC
20	Asparagaceae	Asparagus africanus	1	X	X	X	X	X	LC
21	Asteraceae	Acanthospermum hispidum	1	X	X	1	1	1	Invasive
22		Ageratum conyzoides	1	1	X	X	1	X	LC

Order	Family	Species	Mutunda A, & B-Kisula	Mutunda-Kawiti-Kakwoko	Mutunda-Teyago	Source 1 & Road	Teyago T-Off 1&2	Water Source 2 & Road	Status
23		<i>Aspilia africana</i>	1	X	X	X	X	X	LC
24		<i>Bidens pilosa</i>	2	X	1	1	X	X	Invasive
25		<i>Chromolaena odorata</i>	2	1	X	1	X	X	Invasive
26		<i>Conyza sumatrensis</i>	1	X	X	X	X	1	LC
27		<i>Guizotia scabra</i>	1	X	X	1	1	X	LC
28		<i>Launaea nana</i>	1	X	X	X	X	X	LC
29		<i>Microglossa densiflora</i>	X	X	X	X	X	1	LC
30		<i>Parthenium hysterophorus</i>	X	X	X	X	X	1	Invasive
32		<i>Synedrella nodiflora</i>	2	X	X	X	X	1	LC
33		<i>Tithonia diversifolia</i>	X	1	1	X	X	X	Invasive
34		<i>Tridax procumbens</i>	X	X	X	X	1	X	LC
35		<i>Vernonia amygdalina</i>	1	1	X	1	1	X	LC
36		<i>Vernonia myriantha</i>	1	1	X	X	X	X	LC
37	Bignoniaceae	<i>Markhamia lutea</i>	1	X	X	1	1	X	LC
38		<i>Stereospermum kunthianum</i>	1	1	X	X	X	X	LC
39	Canaceae	<i>Cana indica</i>	X	X	1	X	X	X	Invasive
40	Celastraceae	<i>Maytenus senegalensis</i>	X	X	X	X	X	1	LC
41	Combretaceae	<i>Combretum adenogonium</i>	X	X	X	X	X	1	LC
42		<i>Combretum collinum</i>	1	2	X	1	X	2	LC
43		<i>Combretum molle</i>	1	X	X	X	X	X	LC
44		<i>Terminalia glaucescens</i>	1	X	X	X	X	1	LC
45		<i>Terminalia mollis</i>	X	X	X	X	X	1	LC
46	Convolvulaceae	<i>Ipomoea obscura</i>	X	X	X	1	X	X	LC
47		<i>Ipomoea wightii</i>	1	X	X	X	X	X	LC

Order	Family	Species	Mutunda A, & B- Kisula	Mutunda- Kawiti- Kakwoko	Mutunda- Teyago	Source 1 & Road	Teyago T-Off 1&2	Water Source 2 & Road	Status
48	Cucurbitaceae	Momordica foetida	X	X	X	X	X	1	LC
49		Telfairia occidentalis	1	X	X	X	X	X	LC
50	Cyperaceae	Cyperus dives	1	X	X	X	X	X	LC
51		Cyperus esculentus	1	X	X	X	X	X	LC
52		Cyperus papyrus	1	X	X	X	X	X	LC
53	Dioscoreaceae	Dioscorea dumetorum	2	X	X	X	X	X	LC
54		Dioscorea quartiniana	1	X	X	X	X	X	LC
55	Dracaenaceae	Sansevieria conspicua	X	X	X	X	X	1	LC
56	Euphorbiaceae	Acalypha bipartita	3	X	X	X	X	X	LC
57		Acalypha villicaulis	1	X	X	X	X	X	LC
58		Bridelia scleroneura	1	X	X	1	X	X	LC
59		Erythrococca trichogyne	X	X	X	1	X	X	LC
60		Euphorbia hetrophylla	X	X	X	X	X	1	LC
61		Euphorbia tirucalli	1	X	X	1	X	X	LC
62		Jatropha curcas	1	X	X	X	X	X	LC
63		Margaritaria discoidea	2	X	X	1	X	X	LC
64	Fabaceae	Acacia abyssinica	X	1	X	1	X	X	LC
65		Acacia hockii	1	1	X	1	X	X	Invasive
66		Acacia polyacantha	3	2	2	2	X	X	LC
67		Acacia sieberiana	X	1	1	X	X	X	LC
68		Aeschynomene abyssinica	X	1	1	X	X	X	LC
69		Albizia coriaria	1	2	X	1	X	X	LC
70		Albizia schimperiana	X	1	X	X	X	X	LC
71		Albizia zygia	1	2	3	1	X	X	LC

Order	Family	Species	Mutunda A, & B-Kisula	Mutunda-Kawiti-Kakwoko	Mutunda-Teyago	Source 1 & Road	Teyago T-Off 1&2	Water Source 2 & Road	Status
72		<i>Bauhinia petersiana</i>	1	X	X	X	X	X	LC
73		<i>Cassia hirsuta</i>	X	1	1	X	X	1	LC
74		<i>Cassia obtusifolia</i>	X	X	1	X	X	X	LC
75		<i>Desmodium triflorum</i>	1	X	X	X	X	X	LC
76		<i>Entada abyssinica</i>	X	X	X	1	X	X	LC
77		<i>Erythrina abyssinica</i>	2	X	1	2	X	1	LC
78		<i>Glycine wightii</i>	1	X	1	X	1	1	LC
79		<i>Indigofera spicata</i>	1	X	X	X	X	X	LC
80		<i>Lonchocarpus laxiflorus</i>	X	X	1	1	1	X	LC
81		<i>Mimosa pigra</i>	1	1	X	1	X	X	Invasive
82		<i>Piliostigma thonningii</i>	1	1	X	1	X	1	LC
83		<i>Senna siamea</i>	1	X	1	1	X	X	LC
84		<i>Senna spectabilis</i>	X	1	X	1	X	X	Invasive
85		<i>Tamarindus indica</i>	X	X	X	X	2	X	LC
86		<i>Teramnus micans</i>	1	X	X	X	X	X	LC
87		<i>Terminalia glaucescens</i>	1	X	X	1	X	X	LC
88		<i>Vigna membranacea</i>	1	X	X	X	X	X	LC
89	Lamiaceae	<i>Hoslundia opposita</i>	X	X	X	1	X	1	LC
90		<i>Hyptis suaveolens</i>	X	X	1	X	X	X	LC
91		<i>Ocimum gratissimum</i>	1	X	X	X	X	X	LC
92	Malvaceae	<i>Abutilon mauritianum</i>	1	X	X	X	X	X	LC
93		<i>Grewia mollis</i>	2	X	X	1	X	X	LC
94		<i>Sida acuta</i>	X	X	X	X	X	X	Invasive
95		<i>Triumfetta rhombidea</i>	1	X	1	X	1	X	LC

Order	Family	Species	Mutunda A, & B-Kisula	Mutunda-Kawiti-Kakwoko	Mutunda-Teyago	Source 1 & Road	Teyago T-Off 1&2	Water Source 2 & Road	Status
96		<i>Urena lobata</i>	X	X	1	2	X	1	LC
97	Meliaceae	<i>Ekebergia capensis</i>	1	X	X	X	X	X	LC
98		<i>Melia</i> ssp	X	X	X	X	1	X	LC
99	Menispermaceae	<i>Chasmanthera dependens</i>	1	X	X	X	X	X	LC
100		<i>Cissampelos mucronata</i>	1	X	X	X	X	1	LC
101	Moraceae	<i>Antiaris toxicaria</i>	X	1	X	X	X	X	LC
102		<i>Broussonetia papyrifera</i>	X	X	X	1	X	X	Invasive
103		<i>Ficus conraui</i>	1	X	X	X	X	X	LC
104		<i>Ficus exasperata</i>	X	X	X	1	X	X	LC
105		<i>Ficus natalensis</i>	2	X	X	X	X	X	LC
106		<i>Ficus ovata</i>	1	X	X	1	X	X	LC
107		<i>Ficus sycomorus</i>	X	3	X	1	X	X	LC
108		<i>Ficus thonningii</i>	1	X	X	1	X	X	LC
109		<i>Milicia excelsa</i>	4	X	1	X	X	X	EN
110	Moringaceae	<i>Moringa oleifera</i>	1	X	X	X	X	X	LC
111	Musaceae	<i>Musa</i> sp	X	X	1	X	X	X	LC
112	Myrtaceae	<i>Eucalyptus grandis</i>	2	X	X	X	X	1	Exotic
113		<i>Psidium guajava</i>	X	X	X	X	1	X	LC
114	Nymphaeaceae	<i>Nymphaea muculata</i>	1	X	X	1	X	X	LC
115	Olacaceae	<i>Ximenia americana</i>	X	X	X	1	X	X	LC
116	Onagraceae	<i>Ludwigia abyssinica</i>	1	X	X	X	X	X	LC
117		<i>Ludwigia leptocarpa</i>	1	X	X	X	X	X	LC
118		<i>Ludwigia stenorrhapha</i>	1	X	X	X	X	X	LC
119	Orchidaceae	<i>Aerangis kotschyana</i>	1	X	X	X	X	X	LC

Order	Family	Species	Mutunda A, & B-Kisula	Mutunda-Kawiti-Kakwoko	Mutunda-Teyago	Source 1 & Road	Teyago T-Off 1&2	Water Source 2 & Road	Status
120	Palmae	Borassus aethiopicum	X	1	X	X	X	X	LC
121		Phoenix reclinata	1	X	X	X	X	X	LC
122	Passifloraceae	Passiflora edulis	X	X	X	X	1	X	LC
123	Pinaceae	Pinus patula	X	X	X	1	X	2	LC
124	Poaceae	Brachiaria comata	X	X	X	X	X	1	LC
125		Brachiaria decumbens	4	X	3	X	1	1	LC
126		Chloris gayana	1	X	X	X	X	X	LC
127		Chloris pycnothrix	1	X	X	X	X	X	LC
128		Cynodon dactylon	1	3	X	1	X	1	LC
129		Cynodon nlemfuensis	1	1	X	X	X	1	LC
130		Digitaria ternata	X	X	X	1	X	X	LC
131		Digitaria velutina	1	X	X	X	X	X	LC
132		Echinochloa pyramidalis	1	1	1	1	X	X	LC
133		Eleusine indica	X	X	X	1	X	X	LC
134		Eragrostis tenuifolia	X	1	1	X	X	X	LC
135		Hyparrhenia bracteata	X	X	X	1	X	X	LC
136		Hyparrhenia collina	X	2	X	1	X	X	LC
137		Hyparrhenia cymbaria	1	X	X	1	X	X	LC
138		Hyparrhenia filipendula	2	X	X	1	X	X	LC
139		Imperata cylindrica	1	3	3	2	X	X	LC
140		Leersia hexandra	1	1	1	1	X	X	LC
141		Oryza barthii	X	X	1	X	X	X	Invasive
142		Panicum maximum	5	5	5	3	1	2	LC
143		Paspalum scrobiculatum	1	X	X	X	X	X	LC


Order	Family	Species	Mutunda A, & B-Kisula	Mutunda-Kawiti-Kakwoko	Mutunda-Teyago	Source 1 & Road	Teyago T-Off 1&2	Water Source 2 & Road	Status
144		<i>Pennisetum polystachion</i>	1	X	X	X	1	X	LC
145		<i>Pennisetum purpureum</i>	X	1	X	X	X	X	LC
146		<i>Phragmites mauritianus</i>	1	1	X	1	X	X	LC
147		<i>Rottboellia cochinchinensis</i>	1	X	X	X	1	X	LC
148		<i>Setaria sphacelata</i>	1	1	2	2	X	2	LC
149		<i>Sorghum arundinaceum</i>	X	2	X	1	X	X	LC
150		<i>Sorghum bicolor</i>	X	X	X	X	1	X	LC
151		<i>Sporobolus pyramidalis</i>	1	1	X	1	X	X	LC
152		<i>Stipagrostis namaquensis</i>	1	X	1	X	X	X	LC
153		<i>Zea mays</i>	1	3	3	X	1	X	LC
154	Polygonaceae	<i>Polygonum strigosum</i>	X	1	X	X	X	X	LC
155	Polypodiaceae	<i>Polygonum strigosum</i>	1	X	X	X	X	X	LC
156	Rhamnaceae	<i>Maesopsis eminii</i>	X	1	X	X	X	X	LC
157		<i>Ziziphus mucronata</i>	X	1	X	X	X	X	LC
158	Solanaceae	<i>Capsicum frutescens</i>	1	X	X	X	X	X	LC
159		<i>Physalis angulata</i>	X	1	X	X	X	X	LC
160		<i>Solanum incanum</i>	3	1	3	1	1	X	LC
161		<i>Solanum macrocarpon</i>	1	X	X	X	X	X	LC
162		<i>Solanum nigrum</i>	1	X	X	X	X	X	LC
163	Verbenaceae	<i>Clerodendrum myricoides</i>	1	X	X	X	X	X	LC
164		<i>Clerodendrum rotundifolium</i>	1	X	X	X	X	X	LC
165		<i>Clerodendrum umbellatum</i>	X	X	X	X	1	1	LC
166		<i>Gmelina sp</i>	X	X	1	1	X	X	LC
167		<i>Lantana camara</i>	X	1	X	1	X	X	Invasive

Order	Family	Species	Mutunda A, & B- Kisula	Mutunda- Kawiti- Kakwoko	Mutunda- Teyago	Source 1 & Road	Teyago T-Off 1&2	Water Source 2 & Road	Status
168		<i>Lippia javanica</i>	1	X	X	X	X	X	LC
169		<i>Vitex doniana</i>	X	X	1	X	X	X	LC
170	Vitaceae	<i>Cayratia ibuensis</i>	1	X	X	X	X	X	LC
171		<i>Cissus oliveri</i>	X	X	X	1	X	X	LC
172		<i>Cyphostemma adenocaula</i>	2	X	X	1	X	1	LC
173	Zingiberaceae	<i>Aframomum alboviolaceum</i>	1	X	X	X	X	X	LC
174		<i>Aframomum angustifolium</i>	1	X	X	X	X	X	LC
175		<i>Aframomum verrucosum</i>	0	0	0	1	0	0	LC

LC = Least Concern, EN = Endangered, X = None

ANNEX 7: SELECTED SENSITIVE RECEPTORS FOR AIR QUALITY AND NOISE MEASUREMENTS

Location details	Land use	Photo
<p>St. Peter's Church Mutunda</p>	<p>Church located in a built-up area with a number of institutions in the neighbourhood including Mutunda HCIII, Mutunda P/S and Mutunda sub-county headquarters. The church is adjacent to a marrum road connecting Mutunda to Katulikire TC.</p>	
<p>Ogunga Primary School</p>	<p>Located in rural residential area along Mutunda-Diima marram road. The school is surrounded by several gardens of maize, beans and sunflower to the upper side. The school is neighbouring the proposed site for the Water Reservoir in Alero B village.</p>	
<p>Kawiiti Trading Centre</p>	<p>Rural growth centre with several permanent and semi-permanent buildings. Main economic activities are retail businesses including merchandise shops, fresh food vending, bars, restaurants and salons. The trading centre is bisected by a marrum road from Mutunda Tc.</p>	

Location details	Land use	Photo
<p>Kakwokwo Primary School</p>	<p>School located in rural residential area along Mutunda-Katulikire road. Surrounding environs are mainly dominated by gardens of maize, bushes and scattered homesteads.</p>	

ANNEX 8: BASELINE SPL MEASUREMENTS AT SELECTED SITES

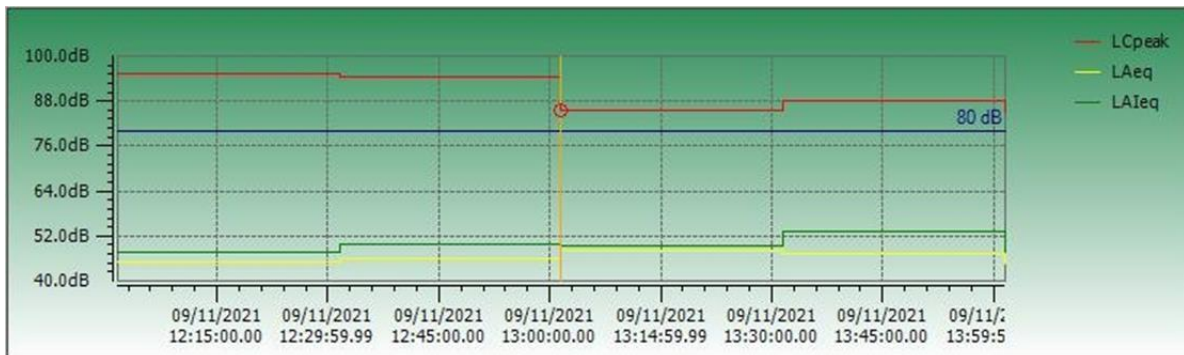
ENVIRONMENT AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR LARGE SOLAR POWERED PIPED WATER SUPPLY SYSTEMS AND SANITATION FACILITIES IN REFUGEE SETTLEMENT AND HOST COMMUNITIES OF KIRYANDONGO DISTRICT



ST. Peter's Church Mutunda Catholic Church

Instrument Model CEL-633B

LAFmin	30.8 dB	LAlmax	81.5 dB
LAFmin with Time	30.8 dB (11/9/2021 1:48:24 PM)	LCpeak	95.3 dB
LCpeak with Time	95.3 dB (11/9/2021 12:14:12 PM)	LAF 10%	48.5 dB
Run Number	19	LAF 50%	43 dB
LAFmax with Time	80.1 dB (11/9/2021 2:00:29 PM)	LAF 90%	39 dB
Start Date & Time	11/9/2021 12:01:34 PM	LAF 95%	36.5 dB
Duration	02:08:24 HH:MM: SS	End Date & Time	11/9/2021 2:09:58 PM
LCeq	63.9 dB	Calibration (Before) Date	11/9/2021 12:00:45 PM
LAeq	46.6 dB	Calibration (Before) SPL	114 dB
LAFmax	80.1 dB	Calibration (After) Date	11/9/2021 2:10:40 PM
Serial Number	2670936	Calibration Drift	0.0 dB





Report generated by Insight CEL-63x - Casella CEL Ltd - on 11/24/2021 at 11:09:56 AM

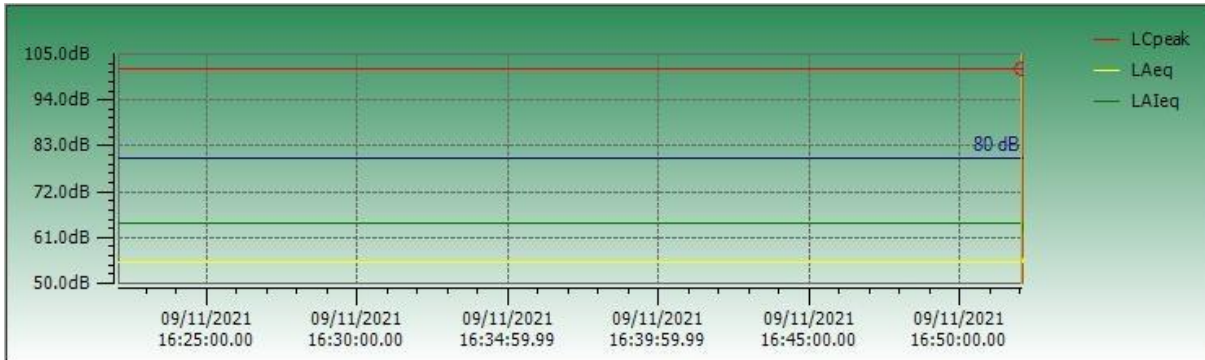
ENVIRONMENT AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR LARGE SOLAR POWERED PIPED WATER SUPPLY SYSTEMS AND SANITATION FACILITIES IN REFUGEE SETTLEMENT AND HOST COMMUNITIES OF KIRYANDONGO DISTRICT

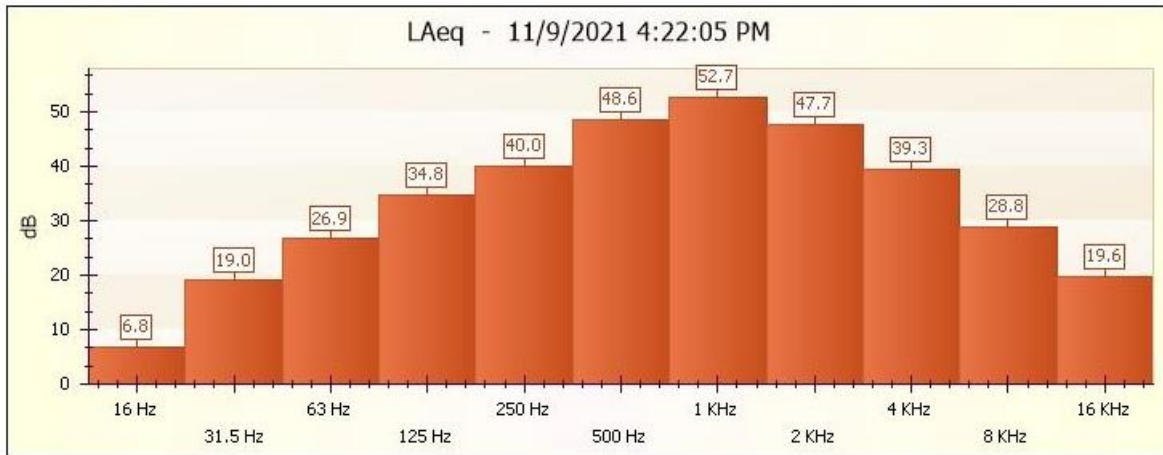
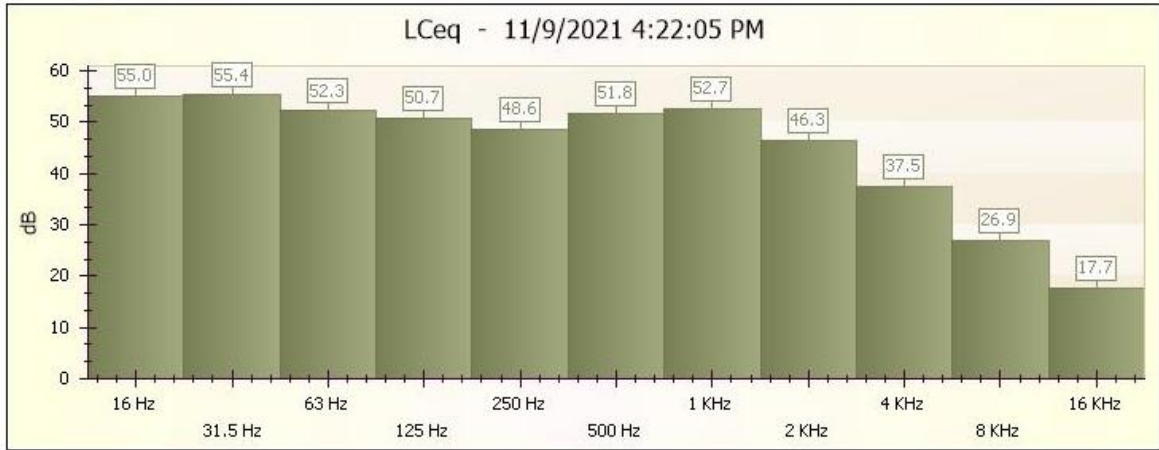


Ogunga Primary School

Instrument Model CEL-633B

LAFmin	27.1 dB	LAI _{max}	92.5 dB
LAFmin with Time	27.1 dB (11/9/2021 4:38:08 PM)	LC _{peak}	101.6 dB
Lc _{peak} with Time	101.6 dB (11/9/2021 4:43:15 PM)	LAF 10%	56.5 dB
Run Number	20	LAF 50%	45 dB
LAF _{max} with Time	89.3 dB (11/9/2021 4:43:15 PM)	LAF 90%	37 dB
Start Date & Time	11/9/2021 4:22:05 PM	LAF 95%	35 dB
Duration	01:00:00 HH:MM:SS	End Date & Time	11/9/2021 5:22:05 PM
LC _{eq}	61.6 dB	Calibration (Before) Date	11/9/2021 4:21:13 PM
LA_{eq}	55.3 dB	Calibration (Before) SPL	114 dB
LAF _{max}	89.3 dB	Calibration (After) Date	11/10/2021 10:28:16 AM
Serial Number	2670936	Calibration Drift	-0.1 dB





Report generated by Insight CEL-63x - Casella CEL Ltd - on 11/24/2021 at 11:12:27 AM

ENVIRONMENT AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR LARGE SOLAR POWERED PIPED WATER SUPPLY SYSTEMS AND SANITATION FACILITIES IN REFUGEE SETTLEMENT AND HOST COMMUNITIES OF KIRYANDONGO DISTRICT

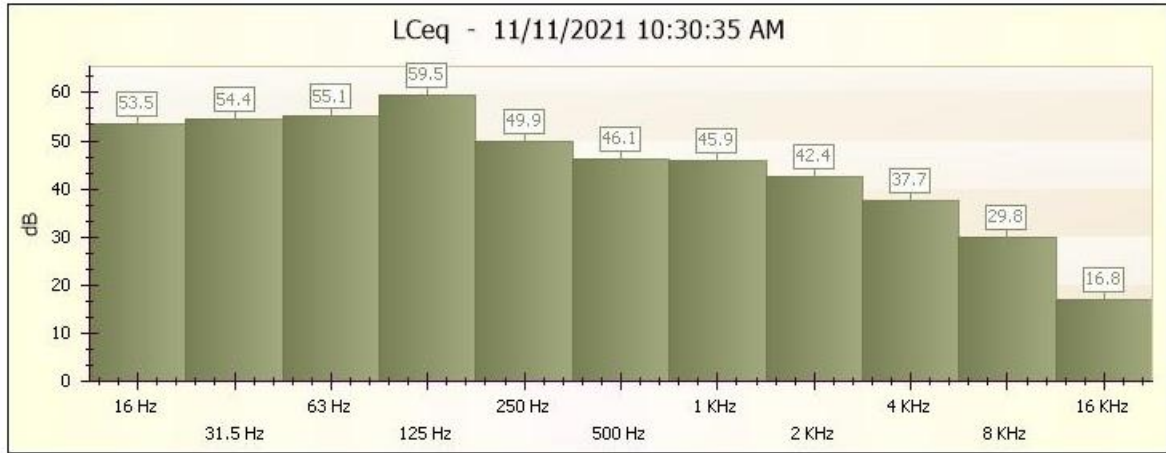


Kawiti Trading Centre

Instrument Model CEL-633B

LAFmin	40.1 dB	LAImax	80.6 dB
LAFmin with Time	40.1 dB (11/11/2021 11:53:06 AM)	LCpeak	98.8 dB
LCpeak with Time	98.8 dB (11/11/2021 11:25:57 AM)	LAF 10%	53 dB
Run Number	24	LAF 50%	46 dB
LAFmax with Time	75.8 dB (11/11/2021 12:16:32 PM)	LAF 90%	43.5 dB
Start Date & Time	11/11/2021 10:30:35 AM	LAF 95%	42.5 dB
Duration	02:14:06 HH:MM:SS	End Date & Time	11/11/2021 12:44:41 PM
LCeq	62.9 dB	Calibration (Before) Date	11/11/2021 10:27:01 AM
LAeq	51.1 dB	Calibration (Before) SPL	114 dB
LAFmax	75.8 dB	Calibration (After) Date	11/11/2021 12:46:01 PM
Serial Number	2670936	Calibration Drift	0.0 dB





Report generated by Insight CEL-63x - Casella CEL Ltd - on 11/24/2021 at 11:21:41 AM

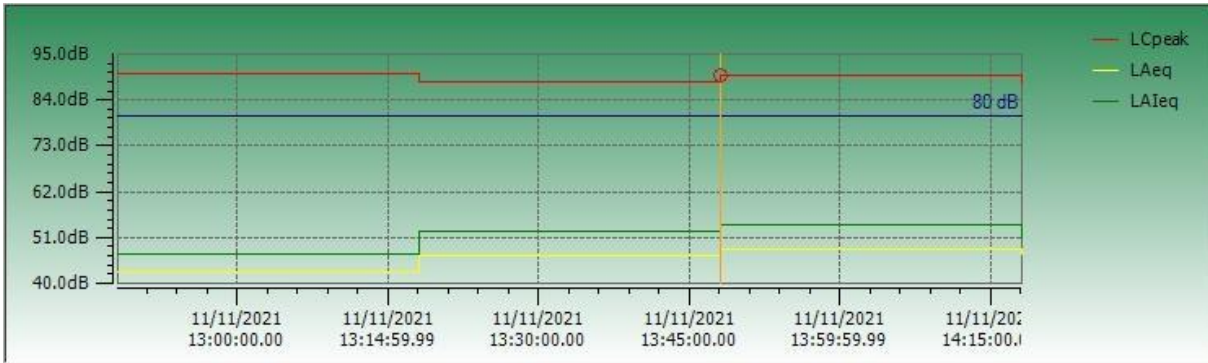
ENVIRONMENT AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR LARGE SOLAR POWERED PIPED WATER SUPPLY SYSTEMS AND SANITATION FACILITIES IN REFUGEE SETTLEMENT AND HOST COMMUNITIES OF KIRYANDONGO DISTRICT

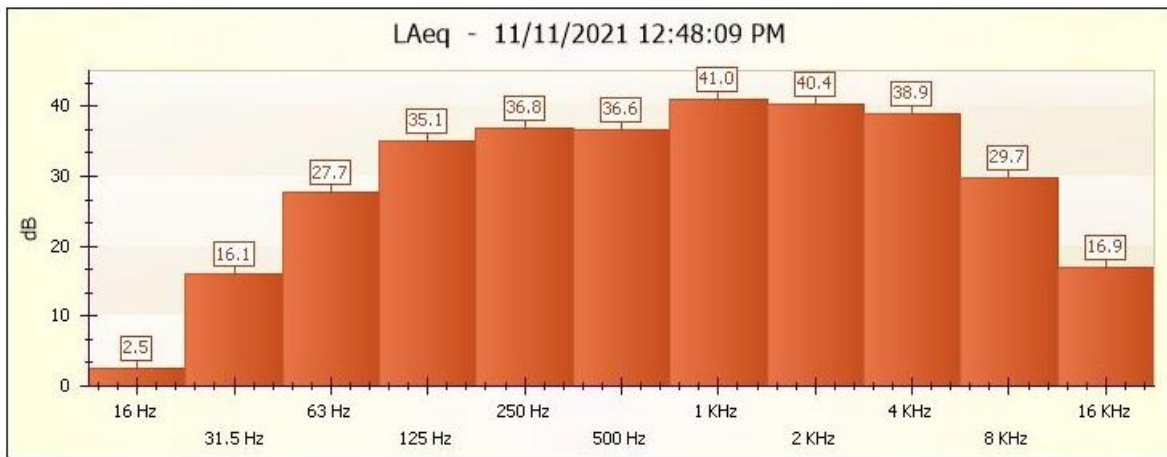


Kakwokwo Primary school

Instrument Model CEL-633B

LAFmin	30.2 dB	LAlmax	75 dB
LAFmin with Time	30.2 dB (11/11/2021 1:12:26 PM)	LCpeak	90.4 dB
LCpeak with Time	90.4 dB (11/11/2021 1:13:12 PM)	LAF 10%	47.5 dB
Run Number	25	LAF 50%	41 dB
LAFmax with Time	72.4 dB (11/11/2021 1:27:14 PM)	LAF 90%	38 dB
Start Date & Time	11/11/2021 12:48:09 PM	LAF 95%	37 dB
Duration	01:45:00 HH:MM:SS	End Date & Time	11/11/2021 2:33:09 PM
LCeq	58.5 dB	Calibration (Before) Date	11/11/2021 12:46:29 PM
LAeq	46.4 dB	Calibration (Before) SPL	114 dB
LAFmax	72.4 dB	Calibration (After) Date	11/12/2021 9:37:55 AM
Serial Number	2670936	Calibration Drift	-0.1 dB





Report generated by Insight CEL-63x - Casella CEL Ltd - on 11/24/2021 at 11:22:44 AM

ANNEX 9: SOCIOECONOMIC SURVEY RESULTS

BENEFICIARY POPULATION BY VILLAGE AND PARISH

PARISH	VILLAGE	MALE	FEMALE	TOTAL	HHs
NYAMAHASA	POPARA-WEST	261	408	668	131
NYAMAHASA	NANDA-MUTUNDA	278	436	714	140
	Sub Total	539	843	1,382	271
KAKWOKO	KAWITI	306	479	785	154
KAKWOKO	POPARA EAST	199	311	510	100
KAKWOKO	NYAKAGWENG	195	305	500	98
KAKWOKO	MUTUNDA A	111	174	286	56
KAKWOKO	MUTUNDA B	163	255	418	82
	Sub Total	975	1,524	2,499	490
ALERO	TENAM B	271	423	694	136
ALERO	TENAM A	310	485	796	156
ALERO	ALERO A	306	479	785	154
ALERO	ALERO B	320	501	821	161
OKWECE	TEYAGO A	656	1,027	1,683	330
	Sub Total	1,864	2,915	4,779	937
	TOTAL	3,377	5,282	8,660	1,698

HOUSEHOLDS WHERE (ALL MEMBERS AGED 5 YEARS+) CONSUME LESS THAN TWO MEALS IN A DAY

District	Sub county	Parish	Households where (all members aged 5 years+) consume less than two meals in a day	Percent
Kiryandongo	Kigumba	Kigumba I	128	4.3
Kiryandongo	Kigumba	Kiigya	64	2.6
Kiryandongo	Kigumba	Mboira	120	4.1
	Sub total		312	3.7
Kiryandongo	Kiryandongo	Kichwabugingo	309	6.0
Kiryandongo	Kiryandongo	Kikube	149	4.6
Kiryandongo	Kiryandongo	Kitwara	215	6.2
Kiryandongo	Kiryandongo	Kyankende	110	3.1
	Sub total		783	5.0
Kiryandongo	Kiryandongo Refugee Camp	Ranch I	94	14.9
Kiryandongo	Kiryandongo Refugee Camp	Ranch Xviii	26	4.8

Kiryandongo	Kiryandongo Refugee Camp	Ranch Xxxvii	198	17.4
	Sub total		318	12.4
Kiryandongo	Mutunda	Diima	255	5.4
Kiryandongo	Mutunda	Kakwokwo	242	7.2
Kiryandongo	Mutunda	Nyamahasa	197	4.5
	Sub total		694	5.7
	OVERALL		2,107	22.4

SHARING PIT LATRINE

Sharing latrine pit	Frequency			Percentage %		
	Kakwoko	Nyamahasa	Total	Kakwoko	Nyamahasa	Total
No	54	25	79	76.1	83.3	78.2
Yes	17	5	22	23.9	16.7	21.8
Total	71	30	101	100	100	100

OPEN DEFECAATION

People defecating in open ground grass fields bushes	Frequency			Percentage %		
	Kakwoko	Nyamahasa	Total	Kakwoko	Nyamahasa	Total
No	19	16	35	26.8	53.3	34.7
Not Sure	8	6	14	11.3	20.0	13.9
Yes	44	8	52	62.0	26.7	51.5
Total	71	30	101	100	100	100

NEED PUBLIC TOILET

In your opinion, is there need for a public toilet in your area	Frequency			Percentage %		
	Kakwoko	Nyamahasa	Total	Kakwoko	Nyamahasa	Total
No	39	10	49	54.9	33.3	48.5
Yes	32	20	52	45.1	66.7	51.5
Total	71	30	101	100	100	100

DRINKING WATER

how often do you treat water for drinking	Frequency			Percentage %		
	Kakwoko	Nyamahasa	Total	Kakwoko	Nyamahasa	Total
Daily	9	0	9	12.7%	0%	8.9%

Do not boil	46	24	70	64.8%	80%	69.3%
No response	3	4	7	4.2%	13.3%	6.9%
Not sure	3	1	4	4.2%	3.3%	4%
Weekly	10	1	11	14.1%	3.3%	10.9%
Total	71	30	101	100%	100	100

HIV TESTING

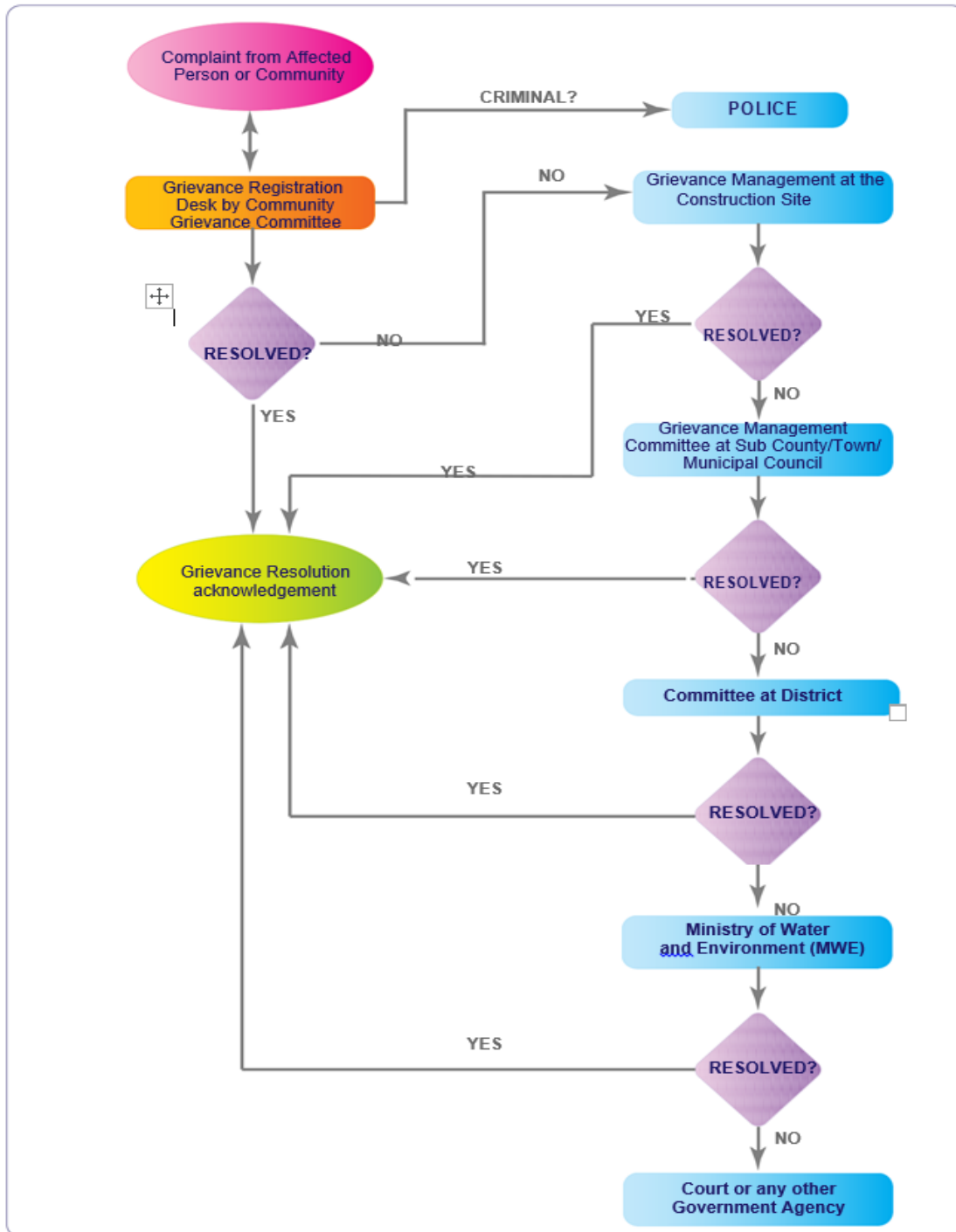
Ever taken an HIV test in the past 12 months	OVERALL	
	Freq	%
I CAN'T DO IT / FEAR	26	25.7
NO	44	43.6
YES	31	30.7
Grand Total	101	100.0

HOUSEHOLD DECISION MAKING

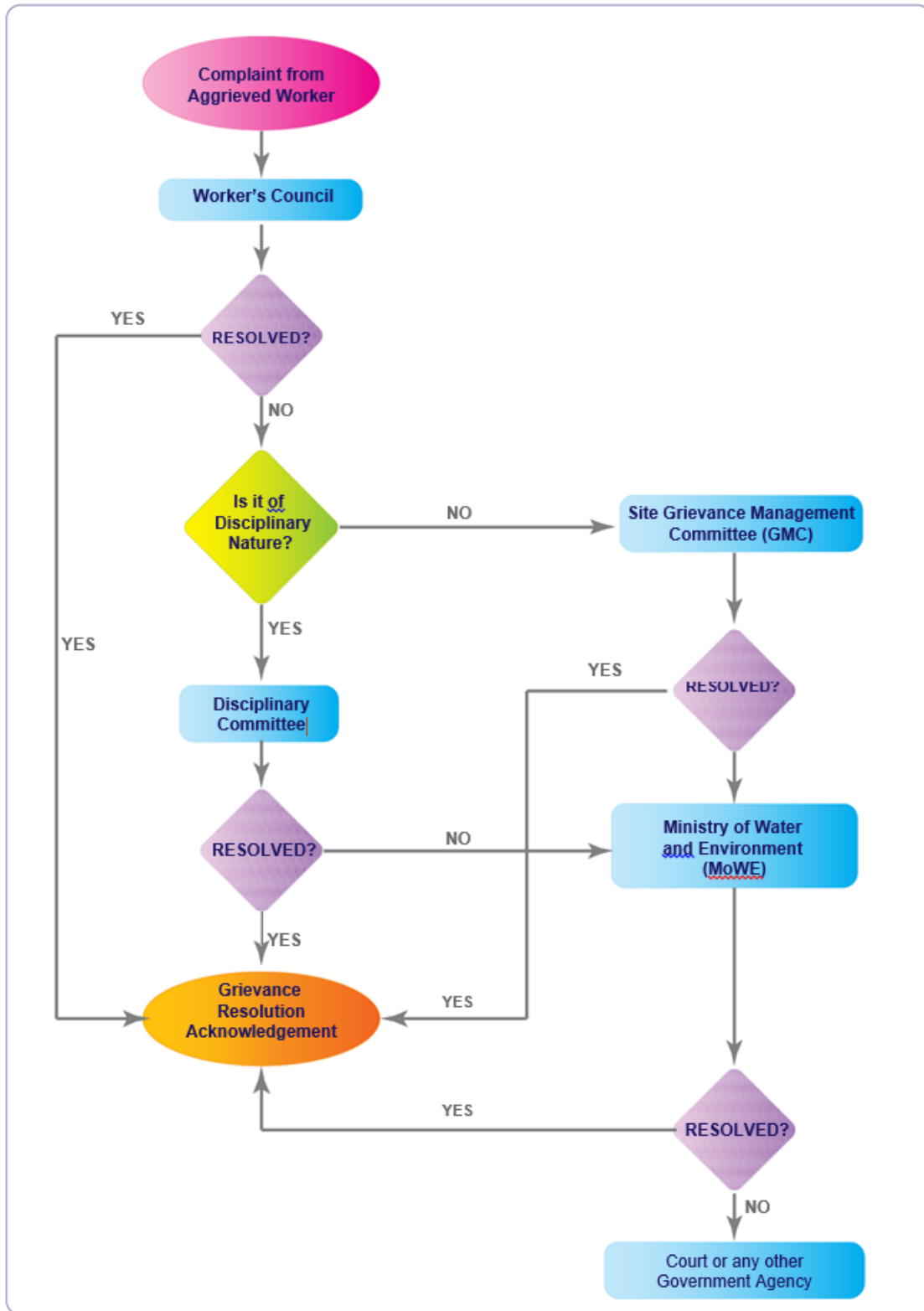
In your opinion, who decides most when purchasing household items e.g. Assets?	Grand Total	
	Freq	%
Both	62	61.4
Man / husband	31	30.7
Woman	8	7.9
Grand Total	101	100

ANNEX 10: GRIEVANCE REDRESS MECHANISMS AND FORMS

Community Grievance Flow Chart



Workers Grievance Flow Chart



Village Level GRC Reporting Template

District.....

Sub-county.....

Village.....

Indicators

SN	Indicator	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1.	No of grievances related to project activities logged per month												
2.	Number of grievances that received timely response (within 7 days)												
3.	Number of grievances received and addressed at village level												
4.	Number of recurrent complaints received (over a period of 15 days)												
5.	No. of meetings held												
6.	Number of unresolved grievances												
7.	Number of grievances referred from village to sub-county level for addressing												
8.	Number of grievances referred to other legal institutions e.g. LCs, Police, Courts of Law												

Provide details on recurrent complaints raised (attach evidence where necessary)

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Subcounty Level GRC Reporting Template

District.....

Sub-county.....

Indicators

SN	Indicator	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1.	No of grievances related to project activities logged per month												
2.	Number of grievances that received timely response (within 14 days)												
3.	Number of grievances received and addressed at sub county level												
4.	Number of recurrent complaints received (over a period of 15 days)												
5.	No. of meetings held												
6.	Number of unresolved grievances												
7.	Number of grievances referred from sub county to district level for addressing												
8.	Number of grievances referred to other legal institutions e.g. LCs, Police, Courts of Law												

Provide details on recurrent complaints raised (attach evidence where necessary)

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District Level GRC Reporting Template

District

Indicators

SN	Indicator	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1.	No. of grievances related to project activities logged per month												
2.	Number of grievances that received timely response (within 14 days)												
3.	Number of grievances received and addressed at district level												
4.	Number of recurrent complaints received (over a period of 15 days)												
5.	No. of meetings held												
6.	Number of unresolved grievances												
7.	Number of grievances referred from the district to national level for addressing												
8.	Number of grievances referred to other legal institutions e.g. LCs, Police, Courts of Law												

Provide details on recurrent complaints raised (attach evidence where necessary)

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National Level GRC Reporting Template

Indicators

SN	Indicator	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1.	No. of grievances related to project activities logged per month												
2.	Number of grievances that received timely response (within 14 days)												
3.	Number of grievances received and addressed at district level												
4.	Number of recurrent complaints received (over a period of 15 days)												
5.	No. of meetings held												
6.	Number of unresolved grievances												
7.	Number of grievances referred from the district to national level for addressing												
8.	Number of grievances referred to other legal institutions e.g. LCs, Police, Courts of Law												

Provide details on recurrent complaints raised (attach evidence where necessary)

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ANNEX 11: REPORTING AND REFERRAL OF VAC, GBV AND OTHER SEXUAL RELATED CASES ON THE PROJECT.

Stakeholder	Action and support is to be provided	Where the case should be Referred?
VAC /GBV Victim	<p>Reports to immediate persons like relatives, friends, peers, and other resourceful persons such as teacher, religious leaders, CSOs, LC, Police</p> <p>Makes a statement providing details on what happened, form of violence, perpetrator, any witnesses.</p>	<p>Immediately refer the case to LC and Police for recording and further investigation.</p>
<p>Community Persons including LCs, parents, guardians, Roads Committees, Project Management Committees, contractors' management teams, Grievance committees, Contractor's worker, Faith based member like church members, CSOs</p> <p>Police</p>	<p>Reports the case and perpetrator immediately to nearby Local Council, Contractor's supervisor, Probation Officer/ CDOs and Police for further action.</p> <p>Liaises with other actors and ensures that the survivor gets support services such as medical care and check-up, counselling and other basic needs such as food.</p> <p>Follow-up the case with LCs, Police, health services and courts of law.</p> <ul style="list-style-type: none"> • Investigates the case, Signs the PF3 forms and other sources of evidence • to support court proceedings, Supports the child survivor to access required • support services and evidence such as a medical report. 	<p>Refers the case to Police for further investigation.</p> <p>Refers the case to State Attorney for committing the perpetrator to courts of Law for hearing and sentencing</p>
Designated Medical Centre	<ul style="list-style-type: none"> • Medical Examination for bodily harm or other injuries caused, • Produces medical report for police investigations and other evidence for the courts of law, • Provides medical care for the victim survivor to ensure recovery. 	<p>Reports to the Police and to the Courts of Law as evidence against the perpetrator.</p>
Probation and Social Welfare Officer/ CDO	<ul style="list-style-type: none"> • Assess the needs of the survivor/victim and refers the victim to services providers for appropriate support services, Collects data and information on the victim for processing and management 	<p>Reports to Police</p>

Stakeholder	Action and support is to be provided	Where the case should be Referred?
<p>Courts of law</p> <p>Prison</p>	<ul style="list-style-type: none"> • Hears the case, decides on support services to the child survivor or the parents of the child victim, • Sentences the perpetrator according to the existing laws regarding the case. • Ensures that the person found guilty serves his/her sentence, • Person is rehabilitated. 	<p>Commits the person found guilty to serve his/her sentence and orders for any care and support to be provided to the victims</p> <p>Freed at the end of serving the sentence.</p>
Contractors	<p>Ensure workers are well screened for VAC&GBV before employment with involvement of LC and Police</p> <p>Ensure workers files and background information is on file for future references</p> <p>Ensure workers are trained in company policies specifically on VAC & GBV</p> <p>VAC & GBV Tool box meetings organized</p> <p>Ensure that there is a site clinic and medical service provider for workers and other victims on referral by the site clinic</p> <p>Have MoU with Police to expedite any investigations and trainings</p> <p>Create awareness to the communities on VAC & GBV risks and referral pathways</p> <p>Cooperate with law enforcement agencies and officials in detecting, investigations and managing VAC & GBV cases</p> <p>Provide any other relevant support to victims</p>	<p>Refer all allegations of VAC & GBV to the Supervising Consultant, VAC&GBV Consultant for independent investigations and reporting to Uganda Police</p>
Local Government (CDOs and other relevant Officials)	<p>Monitors cases of any GBV/VAC allegations on the project</p> <p>Participate in GBV&VAC sensitizations to project workers and communities</p>	<p>Refers to Uganda Police and existing service providers to victims and survivors of VAC & GBV</p>

Stakeholder	Action and support is to be provided	Where the case should be Referred?
	<p>Provides technical guidance to contractors and communities on any referral pathway for a specific incident</p> <p>Maintains a directory of services providers (Government and Civil Society Organizations) for survivors and victims</p> <p>Links victim and survivors for more support to existing service providers</p> <p>Follows up on the progress of judicial processes for the suspects</p>	
MWE	<p>Ensure that the Civil works contracts have strong penalties for contractors and workers involvement in VAC & GBV</p> <p>Provides effective orientation of contractors and their staff on safeguards management on the project</p> <p>Deploys dedicated service provider for VAC& GBV on the project sites</p> <p>Monitors VAC & GBV cases in the community and assesses any cases involving the contractors and their workers</p> <p>Provides reports to World Bank on any incidents related to VAC & GBV within 48 hours; provides root cause analysis (RCA) and safeguards correction action plans (SCAP)</p> <p>Make follow up to ensure that all cases are judiciously managed</p> <p>Liaise with other MDAs to ensure appropriate actions to the VAC & GBV victims and offenders</p>	Ensures zero occurrence of VAC cases in relation to the Project.

Appendix VI: Reporting form for VAC and GBV incidents on the project.

Part I: Details of the Reporter

Name of the Person reporting the case	Address: Location:	Date of reporting the case:
Designation and relationship with the child victim and survivor	Contact details; Tel. No (Landline): Tel. No (Mobile): Email:	Time of Reporting:

Part II: Details of Victim/ Survivor

S/N	Indicators	Details captured
	Name of the victim	
	Sex	
	Date of birth and Age	
	Residence	
	Contacts- telephone	
	Reference number	
	Nature/type of the alleged act of violence:	
	Location: where the incident took place	
	Number of times the victim has encountered such a form of violence	
	Other associated forms of violence the victim has encountered by the alleged perpetrator	
	Relationship of the victim with the alleged perpetrator	

	Impact of the act of violence on the victim i.e. physical, mental, health etc	
	Date or time frame of the act of violence	
	Witnesses (if any) and their observations and their willingness to appear in case of further investigations and their telephone contacts	
	Status of reporting (if there are previous efforts of reporting the case and the person/officer reported to	
	Measures or actions taken	
	Outcomes of the measures if any	
	Recommended actions and support services for the survivor/victim	
	Witnesses Name: Address: Contact number:	Describe the event as witnessed:
	Any other information found necessary to support the case- photographic or recorded evidence	
	Form compiled by: Name: ----- Signature: -----	Position----- Date-----

Part III: Details of the alleged perpetrator

Notes		Attach all the necessary supporting information or documents and remember to retain a copy for follow-up
S/N	Indicators	Details captured
1	Name of the alleged perpetrator (attach a photo) if available	
2	Sex	
3	Age (if known)	

4	Residence	
5	Marital status	
6	Contacts- telephone	
11	Consent or non-consent of the perpetrator on committing the act	
12	Previous incidents of violence committed by the alleged perpetrator	
13	Measures taken by the duty bearers and other stakeholders against the perpetrator	
14	Outcomes of the measures if any	
15	Recommended actions against the perpetrator	
16	Any other information found necessary	
17	Form compiled by: Name: ----- Signature: ----- Position:----- Date:-----	Contact details: Tel:-----Email:----- --

ANNEX 12: PROJECT INVESTMENT COST VALUATION

OUR REF: GMT|102|MWE
YOUR REF:

03th October, 2022

The Executive Director
National Environmental Management Authority
P. O. Box 22255, Plot 17/ 19/21 Jinja Road,
KAMPALA.

INVESTMENT APPRAISAL OF THE PROPOSED LARGE SOLAR POWER WATER SUPPLY AND SANITATION SYSTEM IN MUTUNDA RGC, KIRYANDONGO DISTRICT.

1. BACKGROUND

The Government of Uganda received credit from the World Bank towards implementation of the Integrated Water Management and Development Project (IWMDP). The Project Development Objective (PDO) is to improve access to water supply and sanitation services, capacity for integrated water resources management and the operational performance of service providers in project areas. The project will also contribute to the achievement of National Development Plan III objectives, Vision 2040 and Sustainable Development Goals. Under the IWMDP, funds have been provided for Environmental and Social Impact Assessment (ESIA), Resettlement Action Plan (RAP) and Source Protection Plans (SPP).

Component 1.2 Support to Refugee and Host Communities, this sub component will, with financing from the IDA 18 Refugees Sub-Window, support activities designed to improve the sustainable provision of water supply and sanitation services to refugee settlements and host communities. The sub-component will target the districts of Yumbe, Arua, Moyo (including Obongi district newly created from Moyo), Adjumani in West Nile, Lamwo in Northern and Kiryandongo in Central Uganda, where about 70 percent of the refugees in Uganda are being hosted.

In order to address the water supply and sanitation gap in Kiryandongo District, 3 solar powered piped water supply systems and 10 toilets have been proposed. These water supply and sanitation infrastructure will be implemented as part of the strategy to improve access to clean water, improved sanitation and hygiene in the refugee settlements and host communities.

The main components of the Large Solar piped water systems will include; a production well as a water source, a raw water pumping main to a reservoir, an elevated storage reservoir on a steel tower, Solar Pumps, Solar Panels, chlorine dosing unit, pump motor, pump house, distribution network, and service connections.

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2. TERMS OF REFERENCE

We received Instructions from M/S Ministry of Water and Environment to prepare a Valuation Brief advising on the Project Investment Estimate RAP for the proposed project in Mutunda Rural Growth Centres (RGCs)

3. LIMITING CONDITIONS

This Valuation Brief is subject to the following limiting conditions: -

- i. It is advisable that our approval of the form and context of this Brief Report should be sought if any altered or rephrased part of it is to appear in any published documents or circulars.
- ii. Where it is stated in the report that information has been supplied by another party, this information is believed to be reliable but we can accept no responsibility if this should prove not to be so. Where information is given without being attributed directly to another party, this information has been obtained by our own search of records and examination of documents or by enquiry from Government or other appropriate departments.
- iii. The responsibility of the firm in connection with this Valuation Brief is limited to **M/S National Environment Management Authority** to whom the Brief is addressed.
- iv. The values in this Brief are for the project described and any allocation of values between parts of the project apply only in the terms of reference and for the purpose of this Brief. The values assessed should not be used in conjunction with any other project, as they may prove incorrect if so used.
- v. This Brief is only valid if in original and without alteration and signed and sealed by us. We do not guarantee the validity or authenticity of any copies that may be presented to by any other person, organization or entity as being made from the original.
- vi. During the preparation of the Brief, we did consider the necessity of relying upon the work of a specialist, specifically an Engineer. The appropriateness and reasonableness of the assumptions and methods used by the specialist Engineer in arriving at some of the project estimates are the responsibility of the specialist. We do accept the specialist's judgment and work in this regard and believe that the specialist's assumptions or methods are unreasonable in the circumstances.

4. GENERAL DESCRIPTION

Mutunda RGC in Mutunda Sub County

Mutunda Rural Growth Center is located in Mutunda Sub County at coordinates 36N 231946E 423053N. The RGC is located approximately 25km off Kampala-Gulu Road at Katulikire Trading Center on the right. The core villages in Mutunda RGC are Mutunda A, Mutunda B, Tenam B, Nyakagwem and Nanda. Mutunda RGC is located 3km away from River Nile. The RGC has an estimated 370 households in the five villages. With an average

household size of 5.1, the community population is approximately 1,887 people. It also consists of three primary schools that is Mutunda P/S (700-1000 pupils), Mutunda Parents (350-400 pupils) and Echo P/S (370pupils). The center also harbors Mutunda sub county headquarters and Mutunda Health Center III. The center also has a seasonal market operational once a week. The area is served by three boreholes, but only two are functional. The area is supplied by water vendors that sell a 20-liter jerry can at 500 – 1000 UGX during the dry season.

5. BASES OF VALUE & VALUATION METHODOLOGY

In arriving at the figure in this valuation brief, we have adopted the following Basis of Value and Methodology as defined by the International Valuation Standards and in accordance with the terms of reference: -

- i. Investment Value. The value of an asset to the owner or a prospective owner given individual investment or operational objectives (may also be known as worth). As a basis of Value, Investment value is an entity-specific basis of value thus reflecting the circumstances and financial objectives of the entity for which the valuation is being produced.

6. VALUATION

In accordance with our terms of engagement and having regard to the contents of this Brief, we certify that the investment cost for the Mutunda RGC Solar Power Water Supply and Sanitation System Project in Kiryandongo District is approximated at **UGX 5,970,000,000/- (Five Billion Nine Hundred Seventy Million Ugandan Shillings only)** as detailed in the Engineer's Estimate contained in the Bills of Quantities (BOQ) for this project.

On behalf of
GMT Partners



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