ENVIRONMENTAL AND SOCIAL IMPACT STATEMENT

FOR THE PROPOSED FEACAL SLUDGE MANAGEMENT FACILITY IN CENTRAL UGANDA TOWN OF KIGUMBA, KIRYANDONGO DISTRICT (ASSIGNMENT 1)

PROCUREMENT REFERENCE NUMBER: MOWE/CONS/18-19/00046/1

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August 2021

LOCATION DETAILS AND COORDINATES FOR THE PROPOSED KIGUMBA CLUSTER TOWNS FAECAL SLUDGE MANAGEMENT FACILITY

Site Name	Location Details	GPS Coordinates			
Central Region		(WGS 84) 36 N			
		Points	Eastings	Northings	Elevation
Kigumba	Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District	Pt. 1	391415.00 mE	200744.00 mN	1069 metres above sea level
		Pt.2	391412.00 mE	200808.00 mN	1068 metres above sea level
		Pt. 3	391373.00 mE	200873.00 mN	1066 metres above sea level
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		Pt. 6	804979.00 mE	9903044.00 m S	1376 metres above sea level
		Pt. 7	805071.00 mE	9903158.00 m S	1390 metres above sea level
		Pt. 8	805239.00 mE	9903199.00 m S	1399 metres above sea level
		Pt. 9	8095267.00 mE	9903059.00 mS	1409 metres above sea level
		Pt. 10	805288.00 mE	9903038.00 m S	1411 metres above sea level
		Pt. 11	805266.00 mE	9903008.00m S	1416 metres above sea level
		Pt. 12	805266.00 mE	9902996.00 m S	1418 metres above sea level

DECLARATION STATEMENT

I………………………………………………………………. commissioned the Environmental and Social Impact study on behalf of Studio Galli Ingegneria (SGI) and do acknowledge that I have read this Environmental and Social Impact (ESIS) and understood its content and do hereby commit myself and our organization to comply with the suggested mitigation / enhancement measures stated in the Environmental and Social Management and Monitoring Plan (ESMMP) to address the potential impacts associated with the development phases and actual implementation of the project.

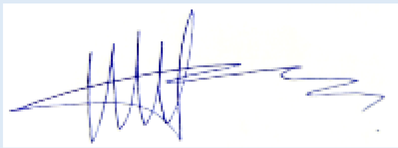
Designation: ……………………………………………………………….

Signature: ……………………………………………………………….

Date: ……………………………………………………………….

AUTHORS OF THIS ENVIRONMENTAL AND SOCIAL IMPACT STATEMENT

Studio Galli Ingegneria (SGI) sought the services of the following Environmental Practitioners to undertake the Environmental and Social Impact Assessment and prepare this Environmental and Social Impact Statement.

Name and Role on the Team	Signature
Mr. Samuel David Wafula (CEP) ESIA Team Leader/ Infrastructure/Land use Specialist	
Mr. Richard Bavakure (CEP) Natural Resource Management / Waste Management Specialist	
Ms Rasheedah Agero (CEP) Environment Management Specialist / Stakeholder Identification and Engagement	

The above experts were assisted by the following experts:

Ms. Esther Nassonko Kavuma	Sociologist;
Mr. David Mukungu	Socio-Economist;
Ms. Jalia Kayemba	Biodiversity Specialist;
Mr. Solomon Ojiambo	Environmental/ Geographical Information System Expert; and
Mr. Enock Nyende	Industrial Systems / Occupational Health and Safety Expert

ACKNOWLEDGEMENT

The Environmental and Social Impact Statement has been prepared to guide in environmental compliance and conformance to industrial best practices and Ugandan laws. The environmental and social impact assessment team is pleased with the staff and personnel of Ministry of Water and Environment, Occupational Health and Safety Department (OHSD) – Ministry of Gender, Labour and Social Development (MoGLSD), Kiryandongo District Local Government Officials and Kigumba Town Council officials for the cooperation during assessment period and the local community of Kihura LCI for the information provided during the compilation of this Environmental and Social Impact Statement.

LIST OF ABBREVIATIONS AND ACRONYMS

ABR	Anaerobic Baffled Reactor
BOD5	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
CSDA	City Service Delivery Assessments
EC	Electric Conductivity
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FS	Faecal Sludge
FSM	Faecal Sludge Management
FSTP	Faecal Sludge Treatment Plant
GoU	Government of Uganda
KDLG	Kiryandongo District Local Government
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MGLSD	Ministry of Gender, Labour and Social Development
MWE	Ministry of Water and Environment
NEMA	National Environmental Management Authority
NGO	Non-Governmental Organisation
NWSC	National Water and Sewerage Corporation
O&M	Operation and Maintenance
RD	Regional Directorates
SFD	Shit Flow Diagram
SVI	Sludge Volume Index
SWOT	Strengths, Weaknesses, Opportunities and Threats
TN	Total Nitrogen
ToR	Terms of Reference
TS	Total Solids

TSS	Total Suspended Solids
UBOS	Uganda Bureau of Statistics
WSDF	Water and Sanitation Development Facility

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EXECUTIVE SUMMARY

0.1. Introduction

The Government of Uganda (GoU) has adopted the Uganda Vision 2040; and has committed to improving the socio-economic status of Ugandans through key interventions like improved delivery of water and sanitation services. Recent Government efforts to promote the delivery of household and public sanitation facilities, coupled with behaviour change campaigns have resulted in increased access to sanitation (about 86%) in urban areas. Over 90 per cent of the existing sanitation facilities are on-site and lack safe means of faecal sludge chain management (emptying, transportation, and disposal or re-use). The situation is exacerbated by the steady population growth due to the increasing rate of urbanization (approximately 5.3%).

A nationwide sector assessment supported by World Bank Water and Sanitation Program (WSP) in 2014, identified fifty (50) potential clusters of small towns to be provided with shared FS treatment/disposal infrastructure to help improve faecal sludge (FS) service chain management across Uganda. To date, less than 40% of the number of clustered towns has been provided with the needed treatment facilities but without improved collection capacity. The Ministry is therefore directing its efforts towards improving the situation by providing additional treatment facilities and improving collection capacity to ensure universal access to all small towns' dwellers by 2030, in line with Government development aspirations and the Sustainable Development Goals (SDGs).

In addition, the existing potential for reuse is not adequately explored to maximize the related economic benefits. Several initiatives on FS reuse exist but are not coordinated to derive synergies and draw lessons to improve performance. Reuse benefits can contribute to the partial recovery of operation and maintenance costs, and the creation of job opportunities to improve livelihoods, particularly for the urban poor. A systematic and coordinated assessment of FS reuse market potential, together with the development of strategies for promotion, marketing and sales would provide the opportunity to maximize related economic benefits.

To ensure sustainable delivery of infrastructure and services along the entire sanitation value chain (containment, collection, treatment and reuse), it is necessary that each link along the chain be developed based on appropriate business models, supported by relevant and effective regulation and institutions. Given a supportive environment, and based on experience in Kampala, this is likely to attract private sector participation and financing to accelerate delivery along the chain, once the business models are demonstrable and can result in achieving some margin of profit.

At the request of the Government of Uganda, the African Water Facility has provided funding support for consultancy services to undertake stakeholder consultations and prepare feasibility studies, detailed designs and investment plans for faecal sludge management in un-sewered urban centres in Uganda.

The results of the studies and designs will inform stakeholders and development partners on the investments required and will help mobilize resources to finance-related infrastructure and services.

In a bid to fulfil the above-mentioned assignment, The Ministry of Water and Environment contracted M/s SGI, Studio Galli Ingegneria to provide consultancy services for the Feasibility Studies and Detailed Design for Faecal Sludge Service Chain Management in Selected Un-Sewered Urban Centres in Uganda Covering Central and South-Western Towns of Kigumba, Wobulenzi, Kiira, Kanungu and Kyazanga under assignment 1.

It is against this background that the Ministry of Water and Environment (MoWE) intends to develop faecal sludge management facility in Central Uganda Town of Kigumba, Kiryandongo District.

0.2. Project Objectives

The ESIA objectives include:

a) To improve the sanitation within Kigumba Cluster – Towns of Kiryandongo District;
b) Promotion and development of appropriate sanitation facilities Kigumba Cluster – Towns of Kiryandongo District;
c) Improvement of health conditions through promotion of improved hygiene and sanitation practices leading to reduction in water borne diseases
d) Environmental protection through the use of appropriate technologies.
e) Empowerment of communities through decentralization, participatory, bottom-up approach with high degree of community organization for O&M of installed facilities.
f) Ensuring that gender issues are incorporated in project implementation.

0.3. Methodology

The ESIA was developed on the basis of the standard ESIA practice which included: Literature review; reference to relevant legislation in Uganda and development partners; Spatial Studies and Investigations including bio-physical; field reconnaissance surveys through on spot assessments; use of professional judgment acquired through a number of years in professional practice and stakeholder/community consultations. The community consultations stretched from February - - June 2021.

0.4. Project Description

The faecal sludge treatment process for the proposed Faecal Sludge management facilities in Central Uganda Town of Kigumba will involve the following steps:

(i) Screening the faecal sludge to remove floating and suspended solids wastes using a bar screen.
(ii) Passing the faecal sludge through the grit chamber to remove inorganic/grit/sand particles.
(iii) Removal of suspended solids by sedimentation using a settling thickening tank.

(iv) Settled FS from Settling thickening tank will be dewatered using unplanted sludge drying beds, where evaporation of water and drainage of the liquid through a sand/gravel media happens.
(v) The dried sludge from the beds will be stored in a dried sludge store to be later processed for soil conditioning.
(vi) Primary treatment of the faecal sludge from the thickening tank will be the removal of organic pollutants (COD and BOD).
(vii) Secondary treatment of the wastewater using facultative ponds to further reduce the TSS and BOD.
(viii) Secondary treatment of the wastewater from the facultative pond with maturation ponds in series to reduce the pathogens and stabilisation of the faecal sludge effluent.

Table 0-1: Location details of the proposed Faecal sludge management facility

Site Name	Location Details	GPS Coordinates			
Central Region		(WGS 84) 36 N			
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Capital Cost Estimates

The capital investment costs for implementing the proposed Kigumba Faecal sludge management facility for Central Uganda Town of Kigumba Cluster. The key project component is to be located in Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District is approximately Six Billion Nine Hundred Ninety-Eight Million Six Hundred Eighty-One Thousand Eight Hundred Fifty-Eight Uganda Shillings (**6,998,681,858/=).**

0.5. Institutional, Legal and Policy Framework

Reference was made to a number of national policies and legislation e.g., the National Environment Policy (1994), Water Policy (1999), National HIV/AIDS Policy (2007), Policy on Conservation and Management of Wetland Resources (1995), The constitution of the Republic of Uganda (1995), National Environment Act No.5, 2019, Water Act (Cap 152), Occupational Health and Safety Act (2006), Local Government Act (1997), Physical Planning Act (2010) etc. Relevant environmental regulations were reviewed including some international protocols that Uganda is signatory to.

0.6. Description of the affected Environment

Kiryandongo District (Kigumba Cluster Towns) stands at 266,197 people of which 132,882 (49.9%) as males and 134,647 (50.1%) females. (UBOS 2014). The vegetation in the proposed project site has savanna woodland including dry and humid Savannah with elephant grass prolific in some areas. This type of vegetation provides a diverse habitat for a variety of birds and animals. The proposed site lies within Kihura wetland that is partly cultivated and has an intact section The population living close to wetlands are mostly engaged in the informal activities and subsistence agriculture. The project site is largely in a flat area with infrastructural services like access roads, electricity, schools and telecommunication networks.

0.7. Project Alternatives

One of the objectives of an ESIA is to investigate alternatives to the proposed development. There are two types of alternatives - Fundamental Alternatives and Incremental Alternatives. The concept of alternatives is aimed at ensuring that the best among all possible options is selected. Various options for the Sanitation Project in Kigumba Cluster Towns have been considered during scoping based on land availability and environmental implications, limitations in acceptable operating cost and requirements in energy, chemicals and technical equipment.

0.8. Project Impacts associated with the proposed development

The ESIA helps identify some of the glaring likely negative impacts and recommends appropriate mitigation measures to minimize/ offset the impacts. The proposed faecal sludge management project in Kigumba Cluster Towns will have a number of positive impacts (e.g., social-economic) and some negative impacts. Some of the key impacts will include; sanitation infrastructure improvement and the health of the locals; employment opportunities during construction and operation among others. The major likely negative impacts of the project will occur during construction and these will include land take, clearance of vegetation, noise, dust, vibration, production of waste, accidents and health risks and soil contamination and pollution issues. The likely major impact during operation will arise from the transportation of the faecal matter to the treatment plant. This impact will likely lead to odour, obstruction of traffic and may lead to accident-related risks. The other key operation impact will be the discharge of waste water from the treatment of faecal sludge.

0.9. Conclusion and Recommendations

The overall aim of this ESIA was to evaluate impacts associated with the construction and operation of the proposed faecal sludge management facility for Kigumba Cluster Towns in Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District. Specifically, the assessment identified all likely positive and negative environmental and social impacts due to the proposed development and proposes appropriate mitigation measures for the attention of all stakeholders for incorporation into the construction and operational phases; compiles an Environmental and Social Impact Statement including an Environmental and Social Management Plan (ESMP) for all aspects of the proposed development for submission to the National Environment Management Authority (NEMA) for consideration for approval.

The predicted negative impacts of this project have been considered and mitigation measures to be implemented for the preparation, construction and operation stages suggested in this report.

Conclusion

Improving the sanitation in Kigumba Cluster Towns (Kigumba, Kiryandongo and Bweyale) through construction of the faecal sludge treatment plant. The establishment of the Faecal Sludge treatment plant will largely help in reducing diseases related to poor sanitation, lead to reduction in pollution of water bodies by faecal matter, reduce bad odour in the Towns and suburbs. The major likely negative impacts of the project will occur during construction and these will include land take, clearance of vegetation, noise, dust, vibration, production of wastes (i.e., domestic and hazardous), obstruction of access, accidents and health risks and soil contamination and pollution issues. The likely major impact during operation will arise from the transportation of the faecal matter to the treatment plant. This impact will likely lead to odour, obstruction of traffic and may lead to accident-related risks. The other key operation impact will be the discharge of waste water from the treatment of faecal sludge into the environment (land and wetland).

The charges for collecting faecal sludge should be set such that lower income group will pay less, and that they will to some extent be cross-subsidized by the other users.

It is important to realize that the key to success lies in effective management of the system. This will require intensive training and support by the relevant and responsible district authorities.

Recommendation

- ✓ All stakeholders involved in the implementation of the sanitation system for the faecal sludge management facility for Kigumba cluster town project should ensure that all issues of land ownership issues are sorted out to avoid any delays during the construction;
- ✓ There is need to sensitize the communities and institutions on improved household and sanitation systems;
- ✓ The relevant stakeholders will ensure that the proposed Environmental Social Management and Monitoring Plan, which provides mitigation measures, a monitoring schedule and responsibility for monitoring, are implemented. The stakeholders in liaison with the contractors will also ensure that any other adverse impacts that may come up in the course of implementation of the project are addressed immediately.
- ✓ All other lead agencies should undertake monitoring of the project activities and ensure compliance with all relevant environment regulations and guidelines as stipulated in the ESMP.

In compliance with Environmental and Social Impact Assessment Regulations of 2020 and Environmental and Social Audit Regulations of 2020, regular environmental and social audits of the sanitation project should be carried out at least once every year preferably by a competent environmental and social auditor (s) and reports submitted to NEMA for review to ascertain compliance with NEMA EIA Approval Conditions contained in the Approval Certificate (once the project is granted approval), donor requirements and with the environmental regulations and suggested mitigation measures.

1 INTRODUCTION

1.1 Background

The Government of Uganda (GoU) has adopted the Uganda Vision 2040; and has committed to improving the socio-economic status of Ugandans through key interventions like improved delivery of water and sanitation services. Recent Government efforts to promote the delivery of household and public sanitation facilities, coupled with behaviour change campaigns have resulted in increased access to sanitation (about 86%) in urban areas. Over 90 per cent of the existing sanitation facilities are on-site and lack safe means of faecal sludge chain management (emptying, transportation, and disposal or re-use). The situation is exacerbated by the steady population growth due to the increasing rate of urbanization (approximately 5.3%).

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At the request of the Government of Uganda, the African Water Facility has provided funding support for consultancy services to undertake stakeholder consultations and prepare feasibility studies, detailed designs and investment plans for faecal sludge management in un-sewered urban centres in Uganda. The results of the studies and designs will inform stakeholders and development partners on the investments required and will help mobilize resources to finance-related infrastructure and services.

In a bid to fulfil the above-mentioned assignment, The Ministry of Water and Environment contracted M/s SGI, Studio Galli Ingegneria to provide consultancy services for the Feasibility Studies and Detailed Design for Faecal Sludge Service Chain Management in Selected Un-Sewered Urban Centres in Uganda Covering Central and South-Western Towns of Kigumba, Wobulenzi, Kiira, Kanungu and Kyazanga under assignment 1.

It is against this background that the Ministry of Water and Environment (MoWE) intends to develop faecal sludge management facility in Central Uganda Town of Kigumba, Kiryandongo District.

1.2 The Environmental and Social Impact Assessment Process

The International Association for Impact Assessment (1999) defines an Environmental Impact Assessment (EIA) as, "the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals before major decisions being taken and commitments made."

The EIA process in Uganda is guided by the National Environment Act No. 5, 2019 specifically Section 113 and the EIA regulations, 2020 and these regulations set out the procedures and criteria for the submission, processing and consideration of and decisions on applications for the approval of projects.

The EIA process in Uganda is divided into three main phases (see Figure 1.1 below), which are the Screening Phase, the Environmental and Social Impact Study (ESIS) Phase and the Decision-Making Phase. A detailed description of the ESIA process in Uganda in general can be obtained from the "Guidelines for Environmental Impact Assessment in Uganda" (NEMA, July 1997).

The proposed development project is currently in the Environmental and Social Impact phase

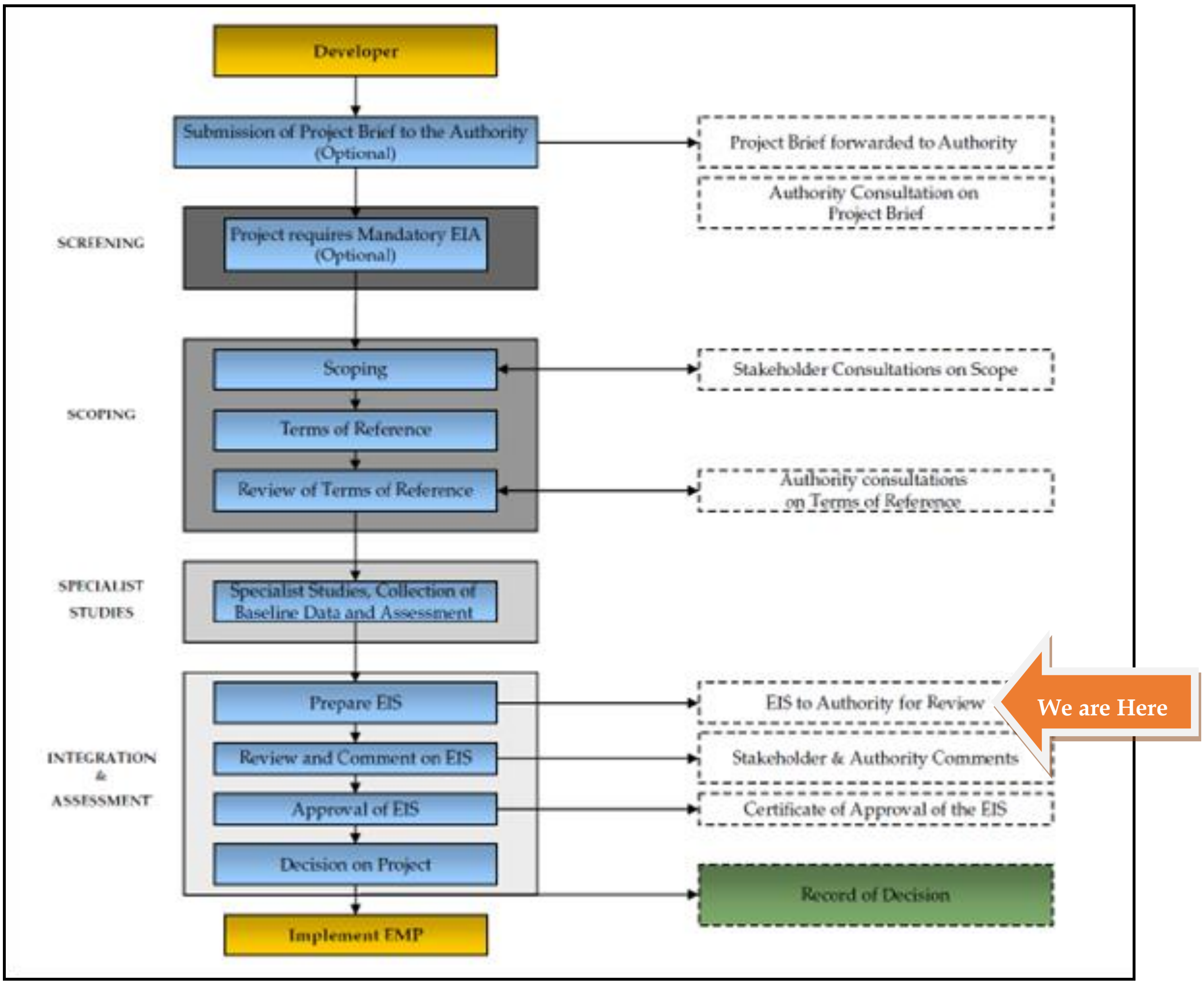

Figure 1-1: ESIA process in Uganda

1.2.1 Scoping

A comprehensive scoping study was conducted for the proposed faecal sludge management facility and associated infrastructure at Kihura LCI, Kihura Ward C, Kigumba Town Council, Kiryandongo District was conducted in February **2021**. During the scoping exercise, numerous site visits were conducted and these involved stakeholder consultations undertaken and initial baseline surveys. A scoping report and accompanying Terms of Reference (ToR) were submitted to the client for onward submission to NEMA (Competent Authority) **in March 2021,** for consideration and make a decision on the application for authorization with regards to the proposed faecal sludge management facility and associated infrastructure for review and comment. This was done in fulfillment of Regulation 10 (1) and (2) of the EIA Regulations (1998) which state that *"an environmental impact study shall be conducted in accordance to the terms of reference prepared by the Client (**M/s SGI, Studio Galli Ingegneria**) in consultation with the authority and the lead agency";* and *The Terms of reference included all matters* *required to be included in the environmental impact statement as provided in Regulation 14 and such other matters as the Executive Director may provide in writing''* respectively.

Further to this, and according to Regulations 11 (1) and (2) of the EIA Regulations (2020), which state that ''The developer shall submit to the Executive Director, the names and qualifications of persons who shall conduct the study'' and ''The Executive Director may approve or reject the name of any person submitted and require that another name be submitted within the period as specified by the Executive Director in writing''.

It should be noted that following the submission of the Scoping Report and Terms of Reference in March 2021 to the Competent Authority, a formal approval issued to that effect in a letter dated **6th July 2021** which is attached in **Appendix 3**.

1.2.2 Environmental and Social Impact Study

The proposed development is currently in the ESIStudy phase. The overall aim of the ESIS is to conduct a comprehensive evaluation and study which addresses all the issues raised in the Scoping report and Terms of Reference, in order to produce a report (i.e. the Environmental and Social Impact Statement) that contains all the relevant information that is necessary for the Competent Authority (i.e. NEMA) to consider the application and to reach a decision envisaged in Regulation 25 of the EIA Regulations (2020). This report is one of the final reports to be produced in the EIA process (the others being the Scoping and Terms of Reference Report). The ESIStatement has been produced in accordance with the requirements as stipulated in Regulation 14 of the EIA Regulations (1998), which outlines the contents of the Environmental Impact Statement and Part 4.0: Guidelines for Use by EIA Practitioners: Procedures for Conducting the EIStudy and Preparing EIS of the document ''Guidelines for Environmental Impact Assessment in Uganda'' (NEMA 1997).

This ESIS therefore includes the following steps: -

Detailed studies identified for further consideration following scoping which include the assessments identified in the ToRs and any other studies required by the authorities. This involved the gathering of baseline information on specific issues and to assess the impacts and make recommendations to mitigate the negative impacts and enhance the positive impacts. The resulting information formed a basis of the Environmental and Social Impact Statement (ESIS).

Environmental and Social Impact Statement whose overall purpose was to gather and analyse environmental data as well as evaluate the overall environmental impacts associated with the proposed development, to consider mitigation measures, and suggest recommendations on the best measures to be implemented. The ESIS also identifies mitigation measures and recommendations to minimise the negative impacts and optimise. Also included in the ESIS are comments, issues and concerns from the several stakeholders consulted during the ESIA.

Environmental Social Management Plan: This informs the developer and the technical team of the guidelines which will need to be followed during the project lifetime (i.e., construction, operation and decommissioning) in order to ensure that there are no effects of the negative impacts of the activities attributed to the above-mentioned project phases on the environment.

Following the approval of Terms of Reference by NEMA (See NEMA ToR approval letter in **Appendix 3**), the proposed faecal project is currently in the ESIS phase

1.3 Purpose of the Environmental and Social Impact Assessment

In accordance with the requirements of the Fifth Schedule of the National Environment Act No.5, 2019, under Sections 49 (1) and (2), 113 (2) and (3), 176 (1), 177(1), 126(2) and (3) and 181 (2) the proposed biogas to electricity generation plant utilizing waste falls in the category of projects for which an Environmental and Social Impact Assessment (ESIA) is required. **Particularly Category 22 Waste Management facilities** and specifically in *subsection (c) Construction of waste management facilities, including (v) wastewater/effluent treatment plants and (VI). Sewage treatment plants.*

This study will provide to Ministry of Water and Environment (MoWE), SGI Studio Galli Ingegneria and the identified Local Governments (Municipal / Town / Urban Councils) as well as the contracting company (ies) and other stakeholders with practical advice on the mitigation of any potentially adverse environmental and social impacts that will arise during the construction and operation phases of the Faecal sludge management facilities. A key output of the Environmental and social impact assessments will be respective Environment and Social Management Plans (ESMPs) to be implemented by both the appointed contractor(s) for the construction of Faecal Sludge management facility and associated infrastructure as well as the operator(s) of the facility upon completion of the construction of the facility.

1.4 Objectives of the Environmental and Social Impact Assessment

Environmental and Social Impact Assessment (ESIA) is a planning tool that permits the integration of environmental and social concerns into the project planning process at the earliest possible planning and design stages and helps provide management of the project with practical advice on the mitigation of any potentially adverse environmental and social impacts of the project. The objectives of the proposed ESIA studies are, therefore:

- To ensure that environmental and social factors are considered in the decision-making process;
- To inform the public and local government authorities about the proposed development so that their views and concerns are captured and addressed during the project cycle;
- Facilitate the design of management and monitoring program for the projects;
- Ensure that the developer designs a more publicly acceptable infrastructure;
- To identify all likely positive and negative environmental and social impacts due to the proposed faecal sludge management facilities in Central and South Western Uganda Towns of Kigumba, Wobulenzi, Kiira, Kanungu and Kyazanga Towns;
- To identify and evaluate all significant negative environmental and social impacts, and propose appropriate mitigation measures for the attention of Ministry of Water and Environment (MoWE)

and their appointed contractors, for incorporation into the construction and operational phases of the faecal sludge management facilities; and

- To compile Environmental and Social Impact Statements for each of the identified sites incorporating Environmental Management and Monitoring Plans for all aspects of the proposed faecal sludge management facilities for submission to NEMA for consideration and approval.

1.5 Methodology for undertaking the Environmental and Social Impact Assessment

In the course of conducting this study, the EIA team used several tools in the process of gathering and synthesizing the information contained in this ESIS and these included: Literature reviews, Consultation with stakeholders, Quantitative and qualitative methods. The criteria employed during this study is based on the requirements of the National Environment Act 2019, The National Environment (Environmental and Social Impact Assessment) Regulations 2020, and in accordance with the approved Terms of Reference attached in **appendix 3**. These methods and criteria used during the study are discussed extensively in **Chapter 2**.

1.6 Developer's Contacts

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1.7 Project Cost

The capital investment costs for implementing the proposed Kigumba Faecal sludge management facility for Central Uganda Town of Kigumba Cluster. The key project component is to be located in Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District is approximately Six Billion Nine Hundred Ninety-Eight Million Six Hundred Eighty-One Thousand Eight Hundred Fifty-Eight Uganda Shillings (**6,998,681,858/=).**

1.8 Structure of the Environmental and Social Impact Statement

This Environmental and Social Impact Statement is divided into the following chapters:

Chapter 1: Gives an introduction and scope of the ESIStatement.

Chapter 2: Presents the approach to the environmental and social impact assessment in assessing the impacts identified.

Chapter 3: Outlines the relevant policy, legal and institutional framework with a bearing to the proposed faecal sludge management facility and associated infrastructure at Kihura LCI, Kihura Ward C, Kigumba Town Council, Kiryandongo District.

Chapter 4: Project Description (Location, sources of materials, technology to be used, site location issues etc.).

Chapter 5: Presents the existing environmental and social baseline conditions on the proposed faecal sludge management facility and associated infrastructure.

Chapter 6: Presents a summary of public and stakeholder consultation framework for the proposed faecal sludge management facility and associated infrastructure.

Chapter 7: Presents a discussion of project needs and Alternatives to the proposed faecal sludge management facility and associated infrastructure.

Chapter 8: Presents the Identified and predicted impacts and provides an evaluation of these impacts on the environment and the proposed mitigation measures associated with the proposed faecal sludge management facility and associated infrastructure.

Chapter 9: Presents an Environmental, Social Management and Monitoring Plan (ESMMP) and an Environmental monitoring plan (EMP).

Chapter 10: Presents major recommendations and conclusions.

References: Cites all the literature used to compile this ESIStatement

Appendices: Appends all the relevant documents used in the Study

2 APPROACH TO THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

2.1 Introduction

This chapter of the Environmental and Social Impact Statement details the approach to the ESIS phase of the proposed Faecal sludge management facility in Central Uganda Town of Kigumba, Kiryandongo District with particular focus on the main aspects of the methodology such as impact significance evaluation.

2.2 General Approach

The study was based on literature reviews, stakeholder consultations, site visits/physical inspections, and the integration and assessment of this information.

2.2.1 Literature Review

Several documents were reviewed in order to address the various aspects of the assignment. Some of these documents included; The National Environment Management Policy for Uganda; Environmental Legislation of Uganda Handbook; Environmental Impact Assessment Regulations for Uganda; related IFC Environmental Health and Safety Guidelines & performance standards; National Environment Act No.5, 2019 Environmental Legislation for Uganda Handbook; Environmental Impact Assessment Regulations for Uganda; Occupational Safety and Health Act 2006., Physical planning Act 2010, Kiryandongo District Development Plan 2015 – 2020 and Kiryandongo District State of Environment Report (s), Other documents that were deemed to be of fundamental importance to the study such as the Feasibility and Preliminary Design Report - Kigumba Cluster Towns, September 2020, site layout plans, land acquisition documents and other documents key to the assignment were also reviewed.

2.2.2 Stakeholder Consultations

A number of stakeholders were consulted as part of a '*Stakeholder Identification and Engagement Plan*'. The details of these are described in **Chapter 6**.

2.2.3 Site Visits and Physical Inspection

Site visits and physical inspections were key aspects of the study. The site for the proposed faecal sludge site and associated infrastructure was visited as part of the ESIA process and the relevant baseline surveys conducted and data collection undertaken. Specific details on this aspect of the methodology have been provided under this chapter of this report based on each of the specialist studies. It is worth noting that although the specialists were given free reign on how they conducted their research and obtained their information, they were required to provide the reports in a specific layout and structure, so that a uniform report could be produced. Considerable time was spent ensuring that the reports are of the highest possible standard.

In addition to the above, in order to ensure that a direct comparison could be made between the various specialist studies, a set methodology was used by all the specialists when evaluating the significance of impacts as outlined in **Section 2.4**.

2.3 Quantitative and Qualitative Methods

2.3.1 Biodiversity Assessment

2.3.1.1 Floral Assessments

The above ground vegetation was assessed using a combined methodology comprising literature review, GIS and remote sensing techniques, alongside field observations and plant diversity surveys. A GPS unit was used to take coordinates of plots and individual plants sampled at the different sites. Inventories of demarcated plots have been widely used in floristic sampling and ecological studies (Poulsen 1997). The use of one size plot is usually not adequate to collect frequency data on all the species life forms within a community. A plot size appropriate for life form may not be appropriate for another. The nested plot concept is a simple approach to collecting plant data on two or more different sized plots at one time. Several different sized plots are placed inside each other in a smallest to largest sequence (Bill Coulloudon *et al.* 1997).

A total of eight (8) quadrats were placed randomly at the site. Placement of quadrants enabled sampling of the different vegetation types. Nested quadrants were placed opportunistically since the site is partly modified due to cultivation. All plots were coded and geo-referenced.

Herbs were identified independently and sampled in a 2m-by-2m quadrat; shrubs and liana in a 15m-by-15m quadrat; and trees in 20 by 20m quadrats.

2.3.1.2 Fauna Assessments

Avi-fauna

Two (2) Timed Species Counts (TSCs) were made around the project area, covering the key habitats. Each TSC consists of all the birds recorded within the habitat during a 1-hour walk, which aims to record as many species as possible within that time Freeman *et al*, 2003). Species are listed in the order that they are heard or seen, and the time noted at ten-minute intervals. Then scores are allocated to each species according to those times, 6 for species recorded in the first ten minutes, down to 1 for those recorded in the last ten minutes.

Almost all identifications were made in the field, on the spot; in a few cases, the standard field guide, Stevenson and Fanshawe (2002) and the bird atlas (Carswell *et al*, 2005) were consulted, the latter indicating the likelihood of a species occurring in this area.

The TSC scores give an indication of relative abundance (Freeman *et al*, 2003) but other attributes are also relevant to the assessment of the importance of particular habitats to the various species. Most bird species need trees, the most specialized of which are virtually confined to those that form forests interiors (Bennun *et al,* 1996). Aerial feeders, such as swallows, are also of conservation concern, since they depend upon small flying insects, and there is evidence of decline in the numbers of these birds. Some species migrate, and would only be expected at certain times of year. Palearctic migrants, mainly from NW Asia and the Middle East, may either winter in East Africa, as with the Northern Wheatear, or pass through on their way to and from wintering grounds further south, as with most Barn Swallows.

In addition to the categories just outlined, some species are known to be rare and/or declining, and are 'red-listed'. There is a global list for such species, but none of these was recorded during this survey. However, several regionally-listed species were recorded; these are categorised in the same way as those of global concern, and are listed by Bennun and Njoroge (1996).

2.3.1.3 Small Mammals

A number of methods were employed to study, such as recording faecal encounter surveys, and interviews with members of the local community signs for presence rodents within the project area.

2.3.2 Physical Assessment

2.3.2.1 Air quality Assessment

National Environment (Noise Standards and Control) Regulations, 2003 define noise as "any unwanted and annoying sound that is intrinsically objectionable to human beings or which can have or is likely to have an adverse effect on human health or the environment". High Noise is a form of energy which affects humans and animals and is referred to as noise pollution. The most studied effects have been on humans where it can lead to hearing damage, which may be partial or complete. The potential damage in humans does not only depend on its level but also on exposure duration.

Noise is a pollutant, which affects the environment and poses health and communication hazards. The intensity of noise is measured in decibel (dB). The intensity of more than 85 dB becomes alarming from pollution point of view. Ear protection/safeguard measures must be adopted so that the noise pollution effect can be minimized or mitigated.

Noise assessment was carried out at various project potential receptors to assess the existing noise levels of emissions at the proposed faecal sludge management facilities. This measurement was done through instantaneous spot measurements using a CEM DT-8852 Sound Level Meter with Data Logger Sound Level Meter set at 114 dB (A) range for forty-five minutes (45minutes) each sampling points. Details of the background noise measurements in form of LAeq, LAF max, LAF Min, within the vicinity of the project components.

Table 2-1: Equipment's used during the Air quality and Noise pollution assessment.

No	Type of Equipment	Activity	Photo
1.	Altair 4x Multi gas detector	Real Time gas monitor for Carbon Monoxide, Volatile Organic Compounds, LEL (combustible gases), Oxygen and Hydrogen Sulphide. Sulphur dioxide, Nitrogen Dioxide	
2.	Temtop Airing-1000 detector.	Temtop Airing-1000 Professional Laser Air Quality Monitor for Humidity, temperature and PM2.5/PM10 Detector Particle Counter Dust Meter Real Time Display High Accuracy.	
3	CEM DT-8852 Sound Level Meter with Data Logger.	This is a brand new CEM DT-8852 CE certified digital sound / noise level meter. This meter has a built-in USB port which connects to a PC for downloading the sound level data recorded over a period of time. This is an ideal instrument for noise monitoring in factories, schools, business and traffic areas. This meter conforms to the IEC61672-1 Class 2 and ANSI S1.4 Type 2 standards. With its internal memory and battery, this unit can record sound levels over a period of time as a standalone device. This device operates on a 9V battery (about 30 hours) or an AC adapter (included). It is very accurate (+/- 1.4 dB) and durable, an ideal companion for your field projects. A heavy-duty carrying case is	

No	Type of Equipment	Activity	Photo
		also included for the protection of the device and for your convenience. The difference between the DT-8852 and DT-8851 is that the DT-8852 has internal memory, so the sound level can be recorded without a computer. The recorded data stored in the DT-8852 can be uploaded to a PC at a later time.	

In addition, Table 2-2 shows the air quality parameters analysed, selection rationale and data source:

Table 2-2: Air Quality Parameters Analyzed, Selection Rationale and data Source

Parameter	Basis for Selection	Relation to Regulatory Drivers	Baseline Data for EIA
Particulate Matter, Inhalable Particulate Matter, SO_2, N_2O	Indicators of potential project effects from diesel engines and fugitive dust emissions Parameters of concern with respect to human and environmental health.	Criteria Air Contaminants under National Ambient Air Quality Objectives	Project-specific data for emission rates National data for ambient air quality Quantitative data

Below are pictorials of the air quality assessments


Figure 2-1: Air quality assessments field activities

2.3.2.2 Soil samples and Geotechnical Investigation studies

Two (02) disturbed and one (01) undisturbed sample were picked from each test pit, one disturbed sample was collected from 1.0m and the other at 3.0m together with the undisturbed soil sample being picked from the extreme bottom of each test pit. This kind of sampling applied to all the test pits. In addition, two bulk disturbed samples were picked from the areas of the proposed access roads at 0.5-1.0m from TP1 and TP3 in order to determine the subgrade properties. Samples were properly packed and safely transported to the laboratory for carrying out classification, CBR, compaction & soil chemical tests on disturbed samples; and direct shear box, permeability and consolidation tests on Undisturbed samples.

Table 2-3: Showing location of exploration points and sampling criteria

Test pit/exploration point	Sample type/Depth (m)	Depth (m)	Coordinates
TP 01	Disturbed	1.0	36N 0391279 UTM 0200728
	Disturbed & Undisturbed	3.0	
TP 02	Disturbed	1.0	36N 0391352 UTM 0200749
	Disturbed & Undisturbed	3.0	
TP 03	Disturbed	1.0	36N 0391405 UTM 0200765
	Disturbed & Undisturbed	3.0	

Figure 2-2: Conducting of the DPL test at site

Detailed geotechnical investigations were conducted by the consultant on the proposed faecal sludge management facility and the Geo-Technical Investigation Report and the accompanying results are attached in **appendix 4**. Results from the field assessment are discussed extensively in section 5.3.5 of this Environmental and Social Impact Statement.

2.3.3 Economic Impact Assessment

Economic impact analysis (EIA) was conducted with the intention to estimate or measure the increase in the level of economic activity as a result of the Sanitation Improvement Infrastructure in Kigumba Cluster Towns. Hence the ESIA estimated the economic importance of implementing the sanitation project to the economy of the Kiryandongo District and its environs. The ESIA examined various measures of economic activity including output, level of employment opportunities and property value to determine the project's total economic impact on the resident economies. The project impact was decomposed into various effects basing on the project effect that causes the impact. The following were the various effects of the project referred to:

The direct effects; these were perceived as the effects that are as a result of money initially spent on the construction and operation of the water and sanitation project. This could be in form of payments of salaries and wages, supplies, raw materials and operating expenses.

The indirect effects; these viewed at as the effects that would result from business-to-business transactions indirectly caused by direct effects. These effects would not occur if the project was not established and would result into an increase in the inter-business activities; for example, when the suppliers of the project materials, employees and land that directly benefit from the project increase their spending to the local businesses.

The induced effects; these would be the effects that are as a result of increase in the personal income caused by direct and indirect effects. This would involve businesses benefiting from sanitation project increase in their payroll expenditures through hiring more employees and increasing employee wages, which enable households to increase their spending on the local businesses. Hence induced effects increase household to financially support business activities.

2.3.4 Cultural Heritage Methodology

It is common knowledge that understanding the origins and development of human societies is of fundamental importance to humanity in identifying its cultural and social roots. It is therefore important to protect our cultural/ archaeological heritage. The study was aimed at capturing issues concerning the cultural / archaeological heritage existing close or within the vicinity of the proposed faecal sludge treatment plant in the informal settlements of Kigumba Town Council and the greater Kiryandongo District. Several methods were used to detect the presence of any archaeological heritage. These included;

2.3.4.1 Literature Review

In the field of archaeology, past records are very important, so in an area like the Bunyoro region which has some archaeological work on record, it was very important to have a look at the available data for information.

2.3.4.2 Interviews and Focus Group Discussions

Meeting and interviews with community leaders, Kiryandongo District and Kigumba Town officials and the local people were a major source of information about the current socio-cultural lives of the people living in and around the proposed sanitation project area. In such discussions members were made to have a better understanding of different heritage properties, with the hope that they will in turn inform the working team of such properties in the area.

2.3.5 Visual Impact Assessment

In order to map the visual basin of given Target Points close to the proposed faecal sludge treatment sites, a specific application was developed, based on the following procedure: "beams of light" were spread from the target point towards the surrounding terrain. When a direct beam of light meets a point on a given topography this point is included by definition in the Visual Basin. The visual impact study methodological tool was used in this Environmental and Social Impact Study:

a) A geometrical phase which identified the area from which the sanitation facilities project area could be observed;
b) A simulation phase, which was responsible of presenting the appearance of proposed faecal sludge management facility site/ area within the target site, was undertaken; and

c) An experiential phase, which evaluated the impact of the planned proposed faecal sludge management facility site/ area on people's visual experience, while staying or moving in the visual basin was also conducted

2.4 Impact Assessment Methodology

The potential environmental and social impacts (adverse and positive) of all planned water and sanitation (i.e., faecal sludge plant) project activities were assessed to identify where the interactions between relevant project activities and the natural/physical environmental aspects and the social aspects were considered to determine whether the interaction may create a potential impact.

The potential impacts of the baseline conditions were evaluated according the following criteria:

Table 2-4: Impact Valuation Criteria/Matrix

Criteria	Further Description of Criteria	Indicative Assessment Thresholds to be used for each Rating	
		Threshold	**Typical Descriptions**
Characterization of Impact	Direction of the impact.	Positive	Impact is an improvement on the current situation or is desirable
		Negative	Impact is a worsening over the current situation or is not desirable.
Type of Impact		Direct	Project results in a direct impact upon aspect/receptor/resource (i.e., generally within the Project footprint with a relevant
		Indirect	Indirect effect upon aspect/receptor/resource.
		Cumulative	Cumulative effect upon
Reversibility	Reversibility is the ability for a physical parameter, biological or social community to return to the conditions that existed	Reversible	The effect is reversible.
		Irreversible	The effect is potentially permanent and not reversible.
Geographic Extent	Describes the area over which the particular impact will occur and is related to the spatial boundaries of the assessment.	Local	Impact is limited to specific individuals or population groups/communities or environmental receptors at or close to the water and sanitation project sites
		Regional	Impact extends across the entire Kigumba Cluster Area
		National or Trans boundary	Impact extends through much or all of Uganda
Time when the impact occurs	Associated with when the impact will occur.	Immediate	Effect occurs immediately following project activity/action.
		Delayed	Effect delayed and occurs sometime after project activity/action
Duration	Refers to how long an impact will occur and is closely related to the project phase or activity that could cause the impact.	Short-term	Impact is expected to last in the short-term (e.g. less than two years).
		Medium-term	Impact is expected to last in the medium-term (e.g. between two and five years).
		Long-term	Impact extends throughout operation of the proposed Water and Sanitation Improvement Infrastructure in the In Formal Settlements of Kampala (TIC) and/or beyond 10 years.

Criteria	Further Description of Criteria	Indicative Assessment Thresholds to be used for each Rating	
		Threshold	Typical Descriptions
Likelihood of appearance	The likelihood that the impact will occur.	Unlikely	The impact can be considered to be unlikely
		Probable	The impact can be considered to have a medium likelihood of occurring.
		Certain	The impact can be considered to have a high likelihood of occurring.
Magnitude	Describes the nature and extent of the social or environmental impact, and is quantified in terms of the amount of change.	Negligible/No change	Does not have a measurable impact.
		Low	Has a distinguishable low level impact on the environmental component or on individuals within the local population/social aspects. For *Negative* Impacts: Some measurable change in resource or its quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements. For *Positive* impacts: Minor benefits to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on resource or reduced risk of negative impact occurring.
		Medium	Impacts are both distinguishable and measurable and affect the majority of the local population/social aspects or environment. *For Negative Impacts:* Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements. *For Positive Impacts:* Benefit to, or addition of, key characteristics, features or elements; improvement of receptor/resource quality.
		High	Has a measurable and sustained positive or negative impact on social or environmental aspects. *For Negative Impacts:* Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements. *For Positive Impacts:* Large scale or high improvement of resource quality; extensive restoration or enhancement; major improvement in receptor/resource quality.

Table 2-5: Criteria used for evaluation of impacts

Criteria	Classification	Description	Rating
Nature/ characterisation of	**Positive**	Changes that benefit the environment	-
	Negative	Adverse environmental changes	-
Geographic Extent	**Local**	Proposed Project area	1
	Regional	The entire Kiryandongo District (Kigumba	2
	National	Uganda	3
Duration	**Short - term**	Within a period of less than 2 years	1
	Medium -	Within a period of 2 years to 10 years	2
	Long - term	More than 10 years	3
Magnitude	**Low**	Natural/social processes and functions of the site are small and disturbance is almost insignificant	1
	Moderate	Natural/social processes and functions of the site continue but with some changes	2
	High	Natural/social processes and functions of the site change	3

The Consequence is calculated as the sum of all the criteria mentioned above:

Consequence = (Geographic Extent + Duration + Magnitude)

Depending on which interval the result is, the consequence of the impact occurrence will vary.

Table 2-6: Impact classification

Consequence Classification	Range
Very Low	3-4
Low	5
Medium	6
High	7-9

The Probability describes the probability of an impact to occur and varies as per the Table below.

Table 2-7: Probability classification

Probability Classification	Description
Unlikely	Unlikely to occur
Probable	Can occur
Certain	Most likely to occur

The **Significance** is evaluated through the synthesis of all the above criteria:

Table 2-8: Significance assessment

		Probability			
		Unlikely	**Probable**	**Highly Probable**	**Permanent**
Consequence	**Very Low**	Insignificant	Insignificant	Low	Low
	Low	Low	Low	Moderate	Moderate
	Medium	Moderate	Moderate	High	High
	High	High	High	Very High	Very High

Activities related to the Project with the potential to cause environmental changes were studied in detail using appropriate techniques to systematize the analysis and impact assessments. Thus, a combined analysis of the following elements was undertaken:

a) Results of critical aspects and sensitive areas in accordance with the characteristics of the Project;

b) Baseline environmental situation especially of sensitive areas and critical environmental aspects; and

c) Information about the water and sanitation project, particularly with reference to activities with the potential to cause important impacts during the construction and operation phases.

All relevant changes in relation to the current situation and future evolution perspectives, directly or indirectly associated with the implementation of the proposed water and sanitation projects are considered to be impacts. The potentially significant impacts, which are naturally linked to the nature of the intervention and linked to the characteristics of the areas investigated, relate to the following biophysical aspects:

a) Qualitative and quantitative management of water resources and sanitation facilities;

b) Geological, geomorphological and landscape aspects associated with sanitation facilities like faecal sludge plant;

c) Ecological aspects such as loss of vegetation and aquatic ecosystem habitats for the Kigumba Cluster area Faecal sludge management plant.

The potential impacts were presented according to the four phases of the Project, namely pre-construction, construction, operation/maintenance and decommissioning phases as presented in chapter **Error! Reference source not found.** of this ESIA.

3 INSTITUTIONAL, POLICY AND LEGAL FRAMEWORK

3.1 Introduction

Environmental and Social Impact Assessment is a legal requirement for all proposed developments (as listed in the Fifth Schedule of the National Environment Act No. 5, 2019), which are likely to have significant impacts on the environment. The study team, therefore, undertook a preliminary review and assessment to ascertain the conformity of the proposed developments to existing policies, laws and institutional requirements, pointing out the relevant clauses for the attention of the Ministry of Water and Environment (MoWE) – the proponent of the faecal sludge management facility as highlighted below.

3.2 Institutional Framework

Table 3-1: Relevant Institutional Framework

Institutional Framework	Description	Relevance to the Proposed Kigumba Faecal sludge management facility
The Ministry of Water and Environment	The Ministry of Water and Environment is responsible for the management of the water resource development project in Uganda. The ministry also has the overall responsibility for initiating national policies and for setting national standards and priorities for water resources management and environmental regulation. A multidisciplinary team representing stakeholders and constituting the Water Policy advises the Minister on the above functions and is mandated to initiate revisions to legislation and regulations. The key functions of the MWE are to promote the rational and sustainable utilization and/or development of the water resources while conserving the relevant surrounding watershed environment in Uganda. They are several divisions within the MWE and these are: a) The Directorate of Water Development (DWD) is in charge of promoting the rational management and use of water resources of Uganda by coordinating and regulating activities that may impact water quality and quantity. b) The quality and quantity of water in watercourses is monitored and regulated by the Directorate of Water Resources Management (DWRM), which also issues permits for water abstraction and effluent disposal. c) The Wetland Department (WD) is another technical unit in the Ministry which advises the government on technical matters and policies related to sustainable wetland conservation and management. d) The Department of Meteorology is responsible for providing climate and weather information to any stakeholders engaged in national development activities in Uganda.	During the preparation of the ESIStatement, consultations were made with the Ministry of water and environment.
National Environment Management Authority (NEMA)	NEMA was created following the enactment of the National Environment Statute (NES) later Act in 1995. It is responsible for overseeing, coordinating and supervising environmental management in Uganda. Since its formation in 1996, NEMA has put a strong emphasis on developing environmental policies, laws and guidelines as evidenced by the large number of environmental regulations that have	Role in the project: NEMA will: • Review and approve the Scoping and Terms of Reference report

Institutional Framework	Description	Relevance to the Proposed Kigumba Faecal sludge management facility
	been enacted over the last few years. NEMA's overall goal is to promote sound environmental management and prudent use of natural resources in Uganda through its objectives including: a) To develop environmental policies, laws and guidelines for regulating the environment; b) To enforce environmental standards and regulations; c) To build capacity for environmental planning management and monitoring within partner institutions and districts; d) To monitor the environment and disseminate accurate and up-to-date environmental information; e) To ensure integration of environmental concerns into planning at the centre, the district and local levels; and f) To promote awareness programs and increase public knowledge about environmental issues.	
The Ministry of Gender, Labour & Social Development (MoGLSD)	This ministry handles Social Development issues. In collaboration with other stakeholders, MoGLSD is responsible for community empowerment, protection and promotion of the rights and obligations of the specified vulnerable groups for social protection and gender-responsive development.	This Ministry handles the Social Development issues. In collaboration with other stakeholders, MGLSD is responsible for community empowerment, protection and promotion of the rights and obligations of the specified vulnerable groups for social protection and gender responsive development. The faecal sludge treatment facilities have a number of socio-economic issues. The ministry in collaboration with the Contractor and other stakeholders will work towards the implementation of the labour, employment and occupational safety and health provisions as provided for under the regulatory instruments within this Ministry.

Institutional Framework	Description	Relevance to the Proposed Kigumba Faecal sludge management facility
		This ministry will be consulted during the ESIA process.
Wetlands Management Department (WMD)	The WMD falls under the Ministry of Water and Environment (MW&E). It takes the lead on all the day-to-day management issues of Wetland resources in Uganda. It implements the Wetlands Policy in collaboration with other lead agencies notably NEMA. At the district level, the Department of Environment is headed by the District Environment Officer and Director respectively. The Environmental Officer coordinates wetland work and an attempt has been made in various districts to have a Wetland Officer appointed. Even at the village level, one of the members of the village council takes care of the environment and wetland related issues.	Since some of the project components of the Faecal sludge management facilities for Kigumba are to be located in the wetland area, the WMD will be consulted during the ESIA as one of the key stakeholders.
The Ministry of Lands, Housing & Urban Development (MoLHUD)	This ministry is also very important to the proposed faecal sludge management facilities in small towns. The mandate of the Ministry of Lands, Housing & Urban Development (MoLHUD) is to ensure rational and sustainable use, effective management of land and orderly development to urban and rural areas as well as safe, planned and healthy housing for socio-economic development. MoLHUD is responsible for providing policy direction, national standards and coordination of all matters concerning lands, housing and urban development. MoLHUD is also responsible for putting in place policies and initiating laws that ensure sustainable land management, promote sustainable housing for all and foster orderly urban development in the country including zoning sites for faecal sludge.	The ministry shall be consulted during the ESIA process to ensure that the planned water and sanitation infrastructure is in line with the District Development plans and other national plans.
Kiryandongo District Local Government	The devolution of power to the local governments through the central government's **Decentralization Policy** has empowered local governments to enact by-laws that deal with the local situations among which environment matters are also addressed.	All sub-components of the proposed faecal sludge management facility fall within the jurisdiction of Kiryandongo District (in the respective host Town Council). Key offices in these administrative areas that are relevant for the project include; the Water officer, Environment/Natural Resources directorate/department, Directorate/ Department of Physical Planning/Lands,

Institutional Framework	Description	Relevance to the Proposed Kigumba Faecal sludge management facility
		Community Development Office Health Directorate/department and Agricultural Office. Equally important are village level local council administration (LCI) within Kiryandongo District particularly Kigumba Town Council Leaders at these levels of local administration are closer to residents of Kihura LCI are therefore important in effective community mobilization, sensitization and dispute resolution.

3.3 Policy Framework

Table 3-2: Relevant Policy Framework

Policy Framework	Description	Relevance to the proposed Kigumba Faecal sludge management facility
National Environment Policy, 1994	The overall goal is the promotion of sustainable economic and social development that enhances environmental quality without compromising the ability of future generations to meet their own needs. The policy states that an Environmental Impact Assessment should be conducted for a project that is likely to have impacts on the environment.	Implementation of the proposed feacal sludge management facility is likely to have negative impacts on the general environment especially the flora, soils and social environment of the proposed Kigumba, Faecal sludge management site and therefore the ESIS shall be necessary as regards to the policy.
Vision 2040	The Uganda National Vision 2040 while encouraging improved water resources management and utilization provides that efforts will be undertaken to attain a green and clean environment with no water and air pollution while conserving the flora and fauna and restoring and adding	The government of Uganda actively takes all requisite measures to protect the environment and natural resources and ensure their future sustainability as part of the international obligations, treaties and agreements.

Policy Framework	Description	Relevance to the proposed Kigumba Faecal sludge management facility
	value to the ecosystems. Sustainable utilization of the environment will be addressed in line with Uganda's commitment to the principles of the Rio Declaration on Environment and Development, the Programme for the Further Implementation of Agenda 21 and the Plan of Implementation of the World Summit on Sustainable Development (Johannesburg Declaration on Sustainable Development) among others.	Therefore, the ESIA practice continues to be one of the ways in which environmental and social impacts are minimised thus ensuring environmental sustainability.
National Wetlands Policy, 1995	The government adopted the National Policy for the Conservation and Management of Wetland Resources to promote their conservation in order to sustain their values for the present and future well-being of the people. In support of this aim, the National Wetlands Policy sets five goals: a) To establish the principles by which wetland resources can be optimally used now and in the future; b) To end practices that reduce wetland productivity; c) To maintain the biological diversity of natural or semi-natural wetlands; d) To maintain wetland functions and values; e) To integrate wetland concerns into the planning and decision making of other sectors. In particular, the policy aims at: a) Ensuring that only non-destructive uses are carried out in and around; b) Ensuring, no drainage occurs unless more important environment management requirements supersede;	The proposed faecal sludge management facility for Kigumba is to be located in or close to wetland which is a functioning areas for ecosystem and biodiversity.

Policy Framework	Description	Relevance to the proposed Kigumba Faecal sludge management facility
	c) Ensuring that wetland developments are subject to environmental impact assessment and audit; d) Maintaining an optimum diversity of uses and users and consideration for other stakeholders when using a wetland.	
The National Gender Policy, 1997	The overall goal of the National Gender Policy 1997 is to mainstream gender concerns in the national development process in order to improve the social, legal/civic, political, economic and cultural conditions of the people of Uganda in Particular women.	In the context of the water and sanitation sector (for which the Kigumba faecal sludge facility falls), it aims to redress the imbalances which arise from the existing gender inequalities and promotes the participation of both women and men in all stages of the Feacal sludge management facility project cycle, thus promoting equal access to and control over water resources.
The Land-use Policy, 2004	In support of the national objectives on poverty eradication and economic growth, while at the same time ensuring sustainable utilisation of natural resources including land and water, the National Land Use Policy's main goal is to achieve sustainable and equitable social and economic development through land utilisation in Uganda'. The specific objective of the policy is to promote land use activities that ensure sustainable utilization of natural resources for national socio-economic development; the policy emphases among others, environmentally friendly practices, community-based participatory planning, gender and land ownership.	The environmental and social Impact assessment is aimed at ensuring sustainable implementation of the sanitation projects in conformity to the land use policy.
The National Water Policy, 1999	The National Water Policy, 1999 promotes an integrated approach to the management of the water resources in ways that are sustainable and most beneficial to the people of Uganda. It stipulates that the quality of drainage water shall be such as not to pollute the receiving water or groundwater and that all measures must be taken by the users to prevent an increase in	The management of the proposed Kigumba feacal sludge management facility should be in line with this policy especially in ensuring that the community is involved in management right from the design of the project. This will promote sustainability and a sense of responsibility.

Policy Framework	Description	Relevance to the proposed Kigumba Faecal sludge management facility
	salinity levels in receiving waters, to prevent the accumulation of dangerous or toxic compounds in the subsoil, capable of contaminating underground waters.	
Ministry of Works and Transport Policies • ***(Occupational Health and Safety Policy) (OHS), 2008***	The policy seeks to: 1) Provide and maintain a healthy working environment. 2) Institutionalize OHS in the road-sector policies, programs and plans. 3) Promote efficient road safety management practices. 4) Contribute to safeguarding the physical environment. The OHS Policy Statement is guided by the Constitution of the Republic of Uganda and other global, national and sectoral regulations and policies. The Statement also takes into recognition the PEAP, the Transport Sector Policy and Strategy Paper, and the Health Sector Strategic Plan, all of which aim to improve the quality of life for all Ugandans in their living and work settings.	
• ***HIV / AIDS Policy***	The current effort to combat HIV/AIDS is characterized by the policy of openness on the side of the government. This has spread to the wider civil society, lower political and social institutions, and to an extent, the family. HIV/AIDS in the context of national development planning is attended to, through PEAP and Vision 2040. The multi-sectoral approach is also considered to be part of an integral part of PEAP. Mainstreaming HIV/AIDS in all programs including water and sanitation is an important aspect of a national overarching policy.	There is a need for the developer/contractor to educate his workforce (i.e., both migrant and local) and the general community on HIV/AIDs especially during construction of Kigumba faecal sludge management facility and associated infrastructure.

3.4 Legal Framework

Table 3-3: Relevant Legal Framework

Legal Framework	Description	Relevance to the Feacal sludge management facilities
The Constitution of the Republic of Uganda, 1995	The Constitution is the supreme law of Uganda and it provides for the protection of the environment. It provides for: a) Promote sustainable development and public awareness on the need to manage land, air, water resources in a balanced and sustainable manner for the present and future generations. b) Take possible measures to prevent or minimize damage and destruction to land, air and water resources resulting from pollution or other causes. c) Promote the rational use of natural resources to safeguard and project the bio-diversity of Uganda. Article 39 of the Constitution provides that "Every person living in Uganda has a right to a clean and healthy environment". National Environment Act also requires certain projects to undergo environmental impact assessments (EIA's). EIA's for projects with significant environmental impacts are subjected to public hearings. The utilization of natural resources like water and wetlands shall be managed in such a way as to meet the development and environmental needs of the present and future generations of Uganda.	Chapter 15, Article 237, Clauses (1) (2) (a) & (b) gives the Government the powers as guided by the Parliament to acquire land anywhere within the country and place it to the best use to benefit the citizens of the country, where deemed necessary. The development of the development of the Faecal Sludge management facilitiy in Kigumba is all aimed at sustainable development for the benefit of the locals and will be done following mitigation measures that will be suggested in the ESIA report. All land acquisitions will adhere to provisions of the 1995 National Constitution.
The National Environment Act No.5, 2019	This Act spells out principles of environmental management and the rights to a decent environment, institutional arrangements, environmental planning, environmental regulations, environmental standards, environmental restoration orders and environmental easements, records, inspection and analysis, financial provisions, environmental offences, judicial proceedings and international obligations. The National Environment Act, No.5, 2019; is the most important legal instrument in Uganda with respect	This Act prescribes projects for which ESIA is mandatory, particularly waste management facilities and specifically Faecal sludge management facilities are one of these (in Seventh Schedule of the Act).

Legal Framework	Description	Relevance to the Feacal sludge management facilities
	to environmental management, providing for an institutional framework through the establishment of the National Environment Management Authority (NEMA). It also specifies management measures, addresses pollution control and stipulates mechanisms for enforcement of the law. The process is further elaborated in the Environmental Impact Assessment Guidelines of Uganda (July 1997). The projects listed in the include transportation projects such as all major roads, which applies to this road project. The Act provides for environmental audits and inspections by NEMA's environmental inspectors and Lead Agencies. This Act requires an operator of projects or facilities to maintain records and make annual reports to NEMA to demonstrate environmental compliance.	
Local Governments Act, Cap 243	This Act provides for decentralized governance and devolution of central government functions, powers and services to local governments that have their own political and administrative set-ups. According to Section 9 of the Act, a local government is the highest political and administrative authority in its area of jurisdiction and shall exercise both legislative and executive powers in accordance with the constitution.	The Town Council where the proposed feacal sludge facility is to be located shall be responsible for ensuring the faecal sludge treatment facility project is developed in an environmentally sustainable manner
Land Act, Cap 227	It provides for the ownership and management of land. It gives power for the compulsory acquisition of land for public purposes that are taken to include land required for public water and wastewater facilities. Sections 43, 44 and 45 (1) and (2) of the Land Act (1998), Government or local government may acquire land in accordance with the provisions of Article 26 and clause (2) of Article 237 of the Constitution of the Republic of Uganda. The Act creates a series of land administration institutions consisting of the Uganda Land Commission (ULC), District and Land Boards (DLB) Section 78 of the Act gives valuation principles for compensation i.e. compensation rates to be yearly approved by DLBs. Value for customary land is the open market value. Under Section IV, the Land Act describes the different tenure systems as follows: Mailo, Freehold, Leasehold and Customary. Section 70 of the Act provides that all rights in the water of any natural spring, river, stream, watercourse, pond, or lake on or under land shall be reserved to the Government and no such water shall be obstructed, dammed, diverted, polluted or interfered with except in pursuance of permission in writing granted by the Minister responsible for water and natural resources in accordance with the Water	MWE and the appointed contractor should seek to enter into a mutual agreement with the occupier or owner of the land upon payment of compensation.

Legal Framework	Description	Relevance to the Feacal sludge management facilities
	Act. These watercourses should not be used except without requisite permission.	
The Physical Planning Act, 2010	This is the principal Act that regulates physical development in Uganda. It provides for the making and approval of physical development plans, applying for development permission and other related matters. Section 37 of the Act states that the approving authority may grant preliminary approval of a development application for which an EIA is required, subject to an applicant obtaining an EIA certificate, in accordance with the National Environmental Act. Pursuant to the provisions of this Act.	The proponent will ensure that the development complies with the District Development Plans of the host Town Councils and that all sites are restored to the original condition after the construction of the water and sanitation infrastructure. NWSC and or their appointed contractor will be required to ensure the development does not in away have an injurious impact on the environment. MWE or its appointed contractor is supposed to submit his plans to for approval.
Road Act, Cap 358	This law is important because the water component of the project will involve trenching all and across access roads which lead to disruption and in rear cases temporary closure of access roads.	This Act provides for the maintenance of the access road by empowering Kiryandongo and Kigumba Town Council local governments hosting the faecal sludge management facility.
The Occupational Safety and Health Act, 2006	The Act provides for administration and enforcement of the Act, general duties, obligations and responsibilities of employers, general duties of manufacturers, suppliers and transporters, duties, rights and responsibilities of workers, registration of workplaces, general safety requirements, fire preparedness, machinery, plant and equipment, hazardous materials, chemical safety and special provisions and offences, penalties and legal proceedings. Section 13 (1) stipulates that it's the responsibility of the employer to take, as far as is reasonably practical all measures for the protection of his or her workers and the general public from the dangerous aspects of the employer's undertaking at his or her own cost. 'It shall be the duty of the employer to set up a safety committee for a workplace with at least 20 workers.	The contractor of the proposed faecal sludge management facilitiy will be required to adhere to this provision of the labour laws.

Legal Framework	Description	Relevance to the Feacal sludge management facilities
	The committee will review the measures taken to ensure the safety and health of employees (Section 16). Section 19 requires an employer to provide adequate and suitable protective clothing and protective equipment to the workers of his or her undertaking.	
Petroleum Supply Act, 2003	This Act provides for the supervision and monitoring of transportation, supply, storage and distribution of petroleum products. The Act regulates licensing and control of activities and petroleum installations for the protection of public health and safety and control of environmental pollution. Section 3, Part (d) ensures public safety and protection of public health and the environment in all petroleum supply operations and installations. According to this Act, "petroleum products" includes asphalts and bitumen, oils as well as conventional petroleum fuel. Section 17(1) prohibits constructing a petroleum products installation without having obtained a petroleum construction permit. Section 18 provides guidance on the process leading to securing this permit. Section 32(1) requires owners of fuel facilities to comply with local and international public health and safety and environmental obligations prescribed by the Uganda National Bureau of Standards (UNBS) and NEMA. In this regard, the provision of impervious bunds around tank farms would be a standard obligation at fuel storage areas. Such bunds should have capacity enough to hold 100% volume of the largest tank in case of a spill emergency. The bunds should be constructed such as to prevent soil contamination. By interpretation of this clause, fire safety at storage areas would also be a regulatory requirement. Of equal importance would be remediation of any contaminated areas on-site, in the interest of public health and contravention of all foregoing constitutes offences according to Sections 37 and 39 of the Act. Part IV Chapter 17(a) prohibits any person from carrying out the construction or major modifications of an installation or facility without having obtained a petroleum construction permit under this Act.	In relation to this proposed Kigumba faecal sludge management facility, this Act will apply to management (construction, operation and decommissioning) of fuel handling facilities during the implementation of the water and sanitation improvement infrastructure project including fuel transportation, constructing and operation of storage tanks and consumption of petroleum products. All foregoing provisions will be important for the construction and operation of onsite fuel storage facilities during the construction of the faecal sludge management facility.
Water Act, Cap 152	The objective of the Act is to enable equitable and sustainable management, use, and protection of water resources of Uganda through supervision and coordination of public and private activities that may impact water quantity and quality. Section 18 requires that before constructing or operation of any water works, a person should obtain a permit from Water Resources Management Directorate (WRMD). Construction is herein defined to include working in the wetlands/watercourses. The Act also aims to	The Act provides for the management of water in Uganda and is under the mandate of Directorate of Water Development (DWD) in the Ministry of Water, Lands and Environment

Legal Framework	Description	Relevance to the Feacal sludge management facilities
	control pollution of water resources (Sections 20 and 31). The foregoing notwithstanding, Section 19 provides that subject to guidelines established by the Minister from time to time, the Director (of water resources management) *may* exempt a public authority or a class of persons or works from requirements in Section 18 on such conditions as he or she may deem fit. Since this decision is reached upon evaluation of an application submitted to the Directorate, Section 19 does not automatically preclude works by public agencies from applying for permits prescribed by this Act. This Act will specifically be applicable to two aspects of the proposed road project: a) Water abstraction for the faecal sludge management facilities construction and camp use. b) Activities associated with the construction of ponds in the wetlands.	
Historical Monuments Act, Cap 46	Assented to on 21st October 1967 and came into force on 15th May 1968, this Act provides for the preservation and protection of historical monuments and objects of archaeological, paleontological, ethnographical and traditional interest. The historical monuments act, Cap 46 gives a mandate to the Department of Museums and Monuments to collect the document and preserve cultural relics that have values to the community, the nation and the international community.	Chance finds objects that may be found during the construction works for the faecal sludge management facilities will, therefore, be reported to the Department of Museums and Monuments for advice and where necessary undergo a forensic assessment.
Employment Act No 6, 2006	Employment Act, 2006 repeals Employment Act, Cap 219 enacted in 2000. This Act is the principal legislation that seeks to harmonise relationships between employees and employers, protect workers' interests and welfare and safeguard their occupational health and safety through: a) Prohibiting forced labour, discrimination and sexual harassment at workplaces (Part II; Part IV) b) Providing for labour inspection by the relevant ministry (Part III) c) Stipulating rights and duties in employment (weekly rest, working hours, annual leave, maternity and paternity leaves, sick pay, etc. (Part VI)	Ugandan labour laws address matters below which will be important for employee management during the faecal sludge management facility construction: a) Contracts of Service; b) Employment of children/ child labour; c) Termination of Contracts;

Legal Framework	Description	Relevance to the Feacal sludge management facilities
	d) Continuity of employment such as continuous service, seasonal employment, etc. (Part VIII). This law revises and consolidates laws governing individual employment relations and matters related to it. Similar to the Constitution, as earlier mentioned, it makes it unlawful to discriminate against people in employment. It defines discrimination as any distinction, exclusion or making a preference on the basis of race, colour, sex, and HIV status or disability amongst others which has the effect of nullifying or impairing the treatment of a person in employment or occupation or prevents an employee from obtaining any benefit under a contract of service. Some of the stakeholders consulted reported that contractors are found of underpaying Uganda workers for a similar job as other employed foreigners. This should be discouraged and monitoring mechanisms be put in place by MWE and the contractor to make sure that such discrimination is not happening. The Employment Act also states that HIV status does not constitute fair reasons for dismissal or for the imposition of a disciplinary penalty. The Employment Act, therefore, requires to be made known to the contractor or their representatives and adhered to, to promote a healthy working environment for all those employed. Workers' welfare is one of the issues that require to be regularly monitored by the lead agency (MWE) or any other assigned agency. The Employment Act (2006) gives a provision for a Labour Advisory Board that advises on matters affecting employment and industrial relations.	d) Illness of employees; e) Sexual harassment; f) Occupational diseases; g) First-Aid; h) Dust and fumes; i) Meals in certain dangerous trades; j) Protective clothing and appliances; k) Protection of eyes in certain processes; l) Treatment of injuries and sickness; m) Drugs and medical equipment; n) Examination of employees; and, o) Failure to provide for the sick.
Regulations and Standards		
• ***The Environment Impact Assessment regulations, 2020***	• Regulation 4 (1), all projects that have or are likely to have a significant impact on the environment are required to undergo an environmental impact assessment (EIA) process prior to implementation.	The Environmental and Social Impact Assessment Regulations, 2020 (Statutory Instruments No. 143/2020), provides for environmental Audits in Part VIII, section 56 The Audits can be initiated by the Authority, a petition from a member of the public, or an environmental inspector. The project implementers and owners will keep relevant authorities informed of the status of

Legal Framework	Description	Relevance to the Feacal sludge management facilities
		implementation of this project, and prepare regular environmental audit reports where need be.
• ***National Environment (Noise Standards and Control) Regulations, 2003***	This law is important to the project because the construction or operation of sanitation facilities such as; faecal sludge treatment plants and sludge disposal sites will involve some noise generation. The regulation provides standards for: a) The maximum permissible noise levels to which a person may be exposed from a facility, activity or construction site; b) Control of noise and for mitigating measures for the reduction of noise levels; and c) Giving effect to the provisions of section 29 of the Act. Regulation 6 (1) provides that the maximum noise levels to which a person may be exposed from any area and shall not exceed the level specified in Column 2 of Part 1 of the First Schedule. Regulation 7 (1) No person shall emit or engage in any activity that emits or is likely to emit noise in excess of the permissible noise level specified in regulation 6 unless permitted by a license under these Regulations. Regulation 7 (2) any person who emits or engages in any activity that emits or likely to emit noise above a maximum permissible level specified in sub-regulation (1) commits an offence. Regulation Section 8 (1) - Duty to control noise. It shall be the duty of the owner or occupier of a facility or premise or machinery, to use the best practicable means of ensuring that the emission of noise from that machinery, facility or premises does not exceed the permissible noise levels. Sub-regulation (3) states that a person or occupier of a premise or facility or machinery or plant generating noise who fails to comply with this regulation commits an offence. Part III Section 8 (1) requires machinery operators, to use the best practicable means to ensure that the	These regulations are relevant to the projects if construction activities and operation generate noise above permitted levels.

<table>
<tr><th>Legal Framework</th><th>Description</th><th>Relevance to the Feacal sludge management facilities</th></tr>
<tr><td></td><td>emission of noise does not exceed the permissible noise levels. The regulations require that persons to be exposed to occupational noise exceeding 85 dBA for 8 hours should be provided with requisite ear protection. The regulatory noise limits at construction activity work sites are presented in Table 3.4. At construction sites, corresponding limits are 75 dBA and 65 dBA for day and night time levels respectively.

Table 3-4:Regulatory noise limits
<table>
<tr><th rowspan="2">Facility</th><th colspan="2">Noise limits dB (A) (Leq)</th></tr>
<tr><th>Day*</th><th>Night*</th></tr>
<tr><td>Construction sites</td><td>75</td><td>65</td></tr>
<tr><td>Residential areas</td><td>55</td><td>45</td></tr>
<tr><td colspan="3">*Time frame: Day 6.00 a.m -10.00 p.m; Night 10.00 p.m. - 6.00 a.m.</td></tr>
</table>
Source: The National Environment (Noise Standards and Control) Regulations, 2003.</td><td></td></tr>
<tr><td>• <u>National Environment (Waste Management) Regulations, 2020</u></td><td>• Regulation 12 requires a person who intends to carry out the business of collecting, transporting, storing, treating or disposing of waste and any other person required under these Regulations shall apply to the Authority for a licence.

• Regulation 62 (b) & (c) requires that the waste treatment or disposal facility is not located within a wetland or within five hundred meters from a riverbank, lakeshore or area immediately adjacent to fragile ecosystems; or at a distance of at least five hundred metres away from human settlements or commercial areas.

• Regulation 77 requires a waste handler to put in place appropriate measures to minimise nuisance and hazards arising.

• Regulation 97 requires a person who generates hazardous waste and a waste handler to Precautionary measures.</td><td>Therefore, if the proposed project contractors intend to store the project generated waste at their premises or to transport the project waste or to treat waste at the sites especially the sewage at the campsites, they must apply to NEMA for licenses to do so. Otherwise, they must use already licensed companies to transport waste, treat the waste and the waste must be stored in places designated by the authority for that purpose.

The project contractors will therefore be required to adopt these methods to minimize the waste anticipated be generated by the project and its facilities such as wastewaters and domestic</td></tr>
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<tr><th>Legal Framework</th><th>Description</th><th>Relevance to the Feacal sludge management facilities</th></tr>
<tr><td></td><td></td><td>wastes.</td></tr>
<tr><td>• <u>Guidelines for Environmental Impact Assessment in Uganda, 1997</u></td><td>Environment Management Authority (NEMA) issued Guidelines for Environmental Impact Assessment, on July 1997. The Guidelines list the projects, which are subject to a detailed EIA study. The projects are classified into projects that in the proposed location have negligible environmental impacts, and projects that likely to have significant environmental impacts.</td><td>The proposed Faecal sludge treatment facility by virtue of its location is listed among projects that likely to have significant environmental impacts</td></tr>
<tr><td>• <u>The Water Resources Regulations, 1998</u></td><td>Sub-regulation (1) of this regulation applies to any person who occupies land on or adjacent to which there is a motorised water pump, which whether temporarily or permanently pumps water from a borehole or waterway. Section 2 (b), of the regulation, provides that a person who at the commencement of these regulations, owns, occupies, operates, controls any works on land referred to in sub-regulation (1), shall register the works and the use of water with the director. In case of any water abstraction at the site, the developer will ensure that the provisions of these regulations are enacted before the operation.</td><td>The project implementers are as well charged with ensuring that this regulation is adhered to during the construction and operation of faecal sludge activities.</td></tr>
<tr><td>• <u>The National Air Quality Standards, 2006</u></td><td>Pollutants such as carbon dioxide, Nitrogen oxides, Sulphur oxides, Volatile Organic Compounds and particulates are expected to be emitted especially by construction vehicles. The national air quality standards provide regulatory limits for these emissions and should be adhered too during the construction of the water and sanitation project.

Construction operations will generate dust and exhaust emissions, mainly from motorized equipment. The draft national air quality standards provide the following regulatory limits for various emissions as presented in Table 3.5 below.

Table 3-5: Draft regulatory air quality limits
<table>
<tr><th>Pollutant</th><th>Averaging time for ambient air</th><th>Standard for ambient air</th></tr>
<tr><td>Carbon dioxide (CO_2)</td><td>8 hrs</td><td>9.0ppm</td></tr>
<tr><td>Carbon monoxide (CO)</td><td>8 hrs</td><td>9.0ppm</td></tr>
<tr><td>Hydrocarbons</td><td>24 hrs</td><td>5mgm-3</td></tr>
<tr><td>Nitrogen oxides (NO_x)</td><td>24 hrs</td><td>0.10 ppm</td></tr>
<tr><td>Smoke</td><td>Not to exceed 5 minutes in any one hour</td><td>Ringlemann Scale No.2 or 40% observed at 6m or more</td></tr>
</table></td><td>These standards are relevant considering that project construction will require motorised machinery powered by diesel engines hence generating pollutants such as CO_2, NOx, SOx and particulates are expected to be emitted. Dust will also be generated during excavation, construction and material/ equipment transport.</td></tr>
</table>

<table>
<tr><th>Legal Framework</th><th>Description</th><th>Relevance to the Feacal sludge management facilities</th></tr>
<tr><td></td><td><table><tr><td>Soot</td><td>24 hrs</td><td>500 µg/Nm-3</td></tr><tr><td>Sulphur dioxide (SO_2)</td><td>24 hrs</td><td>0.15 ppm</td></tr><tr><td>Sulphur trioxide (SO_3)</td><td>24 hrs</td><td>200 µg/Nm-3</td></tr></table>
Source: Draft National air quality standards, 2006. Note: ppm=parts per million, "N' in µg/Nm-3 connotes normal atmospheric conditions of pressure and temperature (25^{0}C and 1 atmosphere).</td><td></td></tr>
<tr><td>• <u>National Environment (Minimum Standards for Management of Soil Quality) Regulations, 2001</u></td><td>Regulation 3 specifies the purpose of the regulations which is;
a) To establish and prescribe minimum soil quality standards to maintain, restore and enhance the inherent productivity of the soil in the long term;
b) To establish minimum standards for the management of the quality of soil for specified agricultural practices;
c) To establish criteria and procedures for the measurement and determination of soil.

Regulation 12 (1) specifies that every responsible person shall comply with the measures and guidelines for soil conservation for the particular topography, drainage and farming systems prescribed in the Fourth Schedule.</td><td>The construction works for the faecal sludge management facility will involve the significant movement of soils from one place to another and probably with the wetlands. Furthermore, the waste soil and offcuts should be tested for chemical contents, treated adequately and make sure it does not have a significant impact on the resident environment especially the wetlands. The regulations will also be relevant in regard to the prevention of contamination of land covered by the project infrastructure. The regulations will apply to waste disposal practices of contractors during construction, operation and decommissioning.</td></tr>
<tr><td>• <u>The National Environment (Standards for discharge of effluent into water or land) Regulations, 2020</u></td><td>• Regulation 4 imposes an obligation on a person whose activities are likely to produce effluent to put in place measures to prevent and mitigate pollution.
• Regulation 8 requires a licence to own and operate an effluent treatment plant</td><td>Since the proposed project will generate wastewater especially during the construction phase of the faecal sludge facilities, at construction sites and project camp(s), the contractors for the project would have to abide by the said regulations.</td></tr>
<tr><td>• <u>The National Environment</u></td><td>Section 6 (2) details maximum permissible discharge limits for 54 contaminants, that must not be</td><td>The regulations promote cleaner production</td></tr>
</table>

<table>
<tr><th>Legal Framework</th><th>Description</th><th>Relevance to the Feacal sludge management facilities</th></tr>
<tr><td><u>(Standards for Discharge of Effluent into Water or on Land) Regulations, 2020</u></td><td>exceeded before the effluent is discharged into water or on land. Through limits on over 54 pollutants, these regulations control discharges in surface watercourses. Examples of some of the regulated pollutants are listed below in Table 3.6.

Table 3-6: National Discharge Standards for Selected Pollutant Parameters Associated with the Construction activities

<table>
<tr><th>S/N</th><th>Parameter</th><th>Maximum Permissible Limits</th><th>S/N</th><th>Parameter</th><th>Maximum Permissible Limits</th></tr>
<tr><td>1</td><td>1,1,1-Trichloroethane</td><td>3.0 mg/l</td><td>30</td><td>Magnesium</td><td>100.0 mg/l</td></tr>
<tr><td>2</td><td>1,1,2-Dichloroethyelene</td><td>0.2 mg/l</td><td>31</td><td>Manganese</td><td>1.0 mg/l</td></tr>
<tr><td>3</td><td>1,1,2-Trichloroethane</td><td>1.06 mg/l</td><td>32</td><td>Mercury</td><td>0.01 mg/l</td></tr>
<tr><td>4</td><td>1,2-Dichloroethane</td><td>0.04 mg/l</td><td>33</td><td>Nickel</td><td>1.0 mg/l</td></tr>
<tr><td>5</td><td>1,3-Dichloropropene</td><td>0.2 mg/l</td><td>34</td><td>Natrite-N</td><td>20.0 mg/l</td></tr>
<tr><td>6</td><td>Aluminium</td><td>0.5 mg/l</td><td>35</td><td>Nitrite-N</td><td>2.0 mg/l</td></tr>
<tr><td>7</td><td>Ammonia Nitrogen</td><td>10.0 mg/l</td><td>36</td><td>Nitrogen (Total)</td><td>10.0 mg/l</td></tr>
<tr><td>8</td><td>Arsenic</td><td>0.2 mg/l</td><td>37</td><td>Oil and Grease</td><td>10.0 mg/l</td></tr>
<tr><td>9</td><td>Barium</td><td>10.0 mg/l</td><td>38</td><td>pH</td><td>6.0 - 8.0 mg/l</td></tr>
<tr><td>10</td><td>Benzene</td><td>0.2 mg/l</td><td>39</td><td>Phenols</td><td>0.2 mg/l</td></tr>
<tr><td>11</td><td>BOD5</td><td>50 mg/l</td><td>40</td><td>Phosphate (Total)</td><td>10.0 mg/l</td></tr>
<tr><td>12</td><td>Boron</td><td>5.0 mg/l</td><td>41</td><td>Phosphate (Soluble)</td><td>5.0 mg/l</td></tr>
<tr><td>13</td><td>Cadmium</td><td>0.1 mg/l</td><td>42</td><td>Selenium</td><td>1.0 mg/l</td></tr>
<tr><td>14</td><td>Calcium</td><td>100.0 mg/l</td><td>43</td><td>Silver</td><td>0.5 mg/l</td></tr>
<tr><td>15</td><td>Chloride</td><td>500.0 mg/l</td><td>44</td><td>Sulfate</td><td>500.0 mg/l</td></tr>
<tr><td>16</td><td>Chlorine</td><td>1.0 mg/l</td><td>45</td><td>Sulfide</td><td>1.0 mg/l</td></tr>
<tr><td>17</td><td>Chromium (Total)</td><td>1.0 mg/l</td><td>46</td><td>TDS</td><td>1200 mg/l</td></tr>
<tr><td>18</td><td>Chromium (VI)</td><td>0.05 mg/l</td><td>47</td><td>Temperature</td><td>20 - 35 oC</td></tr>
<tr><td>19</td><td>Cirrus-1,2-Dichloroethylene</td><td>1.0 mg/l</td><td>48</td><td>Tetra-Chloroethylene</td><td>0.1 mg/l</td></tr>
<tr><td>20</td><td>Cobalt</td><td>1.0 mg/l</td><td>49</td><td>Tetra-Chloromethane</td><td>0.02 mg/l</td></tr>
<tr><td>21</td><td>COD</td><td>100 mg/l</td><td>50</td><td>Tin</td><td>5.0 mg/l</td></tr>
<tr><td>22</td><td>Clifford Organisms</td><td>10,000 counts/100 ml</td><td>51</td><td>Total Suspended Solids</td><td>100.0 mg/l</td></tr>
<tr><td>23</td><td>Color</td><td>300 TCU</td><td>52</td><td>Trichloroethylene</td><td>0.3 mg/l</td></tr>
<tr><td>24</td><td>Copper</td><td>1.0 mg/l</td><td>53</td><td>Turbidity</td><td>300 NTU</td></tr>
</table>
</td><td>methods that enable the recovery and reuse of wastes, reclamation and recycling. Further, the regulations require hazardous waste to be stored in facilities specially designed for that purpose and that such facilities obtain licenses from NEMA.</td></tr>
</table>

<table>
<tr><th>Legal Framework</th><th>Description</th><th>Relevance to the Feacal sludge management facilities</th></tr>
<tr><td></td><td>
<table>
<tr><td>25</td><td>Cyanide</td><td>0.1 mg/l</td><td>54</td><td>Zinc</td><td>5.0 mg/l</td></tr>
<tr><td>26</td><td>Detergents</td><td>10.0 mg/l</td><td>38</td><td>pH</td><td>6.0 - 8.0 mg/l</td></tr>
<tr><td>27</td><td>Dichloromethane</td><td>0.2 mg/l</td><td></td><td></td><td></td></tr>
<tr><td>28</td><td>Iron</td><td>10.0 mg/l</td><td></td><td></td><td></td></tr>
<tr><td>29</td><td>Lead</td><td>0.1 mg/l</td><td></td><td></td><td></td></tr>
</table>
Source: The National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, S.I. No 5/1999 and NEMA 2003, Environmental Legislation Handbook.
</td><td></td></tr>
<tr><td>• <u>The National Environment (River Banks, Lake Shores and Wetlands Management) Regulations, 2001</u></td><td>
The Regulation provides a list of regulated activities whose implementation in wetlands, riverbanks and lakeshores is subject to the issuance of a permit granted by NEMA in consultation with the Lead Agencies. These include brick making, recreation activities such as sport fishing, maintenance of green spaces, cultivation, drainage, commercial exploitation, sewerage filtration, fishing using fish gear and weirs, fish farming, and other aquaculture, power dam construction, construction of transport and communication facilities such as roads, railways, telephone lines, burning and any other exploitative activity which is of a commercial or trade nature, such as harvesting of papyrus for commercial purposes.
The regulations in section 34 provide that a developer desiring to conduct a project which may have a significant impact on a wetland, riverbank or lakeshore, will be required to carry out an Environmental Impact Assessment in accordance with sections 20, 21 and 22 of the National Environment Act. Environmental impact is mandatory for all activities in the wetlands, riverbanks and lakeshores and special measures are essential for the protection of riverbanks, lakeshores and wetlands of international, national, and local importance as ecological systems and habitat for fauna and flora species, and for cultural and aesthetic purposes, as well as for their hydrological functions and values for preventing soil erosion, siltation and water pollution.
Table 3-7: Relevant Environmental Quality Standards
<table>
<tr><th>Particular</th><th>National Standard</th><th>International Standard</th></tr>
<tr><td>Ambient air quality</td><td>The National Air Quality Standards, 2006</td><td>WHO Air Quality Guidelines, Global Update, 2005</td></tr>
<tr><td>Noise</td><td>National Environment (Noise Standards and Control) Regulations, 2003</td><td>WHO Guideline Values on Noise Level</td></tr>
</table>
</td><td>The proposed project sites for faecal sludge management facility in Central Uganda (i.e., Kigumba Town) is close to a wetland and most activities will be close to this sensitive environment. According to the National Environment (Riverbanks, Lakeshore and Wetlands) Regulations, the Government of Uganda or Local Governments shall hold in trust for the people and protect wetlands, riverbanks and lakeshores for the common good of the citizens of Uganda. The government or local government shall not lease out or otherwise alienate any wetlands, riverbank or lakeshore.</td></tr>
</table>

<table>
<tr><th>Legal Framework</th><th>Description</th><th>Relevance to the Feacal sludge management facilities</th></tr>
<tr><td></td><td><table>
<tr><td>Drinking water quality</td><td>National Drinking Water Quality Standards, 2006</td><td>WHO Guidelines for Drinking-water Quality, Fourth Edition, 2011</td></tr>
<tr><td>Discharge of Effluent</td><td>The National Environment (Discharge of Effluent into water or on Land) Regulations, 2020</td><td>The Environmental Protection (Standards for Effluent Discharge) Regulations, 2020</td></tr>
</table></td><td></td></tr>
<tr><td>• <u>National Environment (Audit) Regulations, 2020</u></td><td>These Regulations require an environmental audit for a project or activity for which environmental and social assessment has been undertaken.</td><td>The faecal sludge treatment plant involves construction and operation of waste management facilities which is categorised under schedule 3 to the Regulations and the developer shall carry out an environmental compliance audit.</td></tr>
</table>

4 LOCATION AND DESCRIPTION OF ACTIVITIES AT THE PROPOSED KIGUMBA FEACAL SLUDGE MANAGEMENT FACILITY

4.1 Introduction

This section provides the

- Location and extent of the proposed Faecal sludge management facility in Central Uganda Town of Kigumba; and
- Provides a description of its various components and arrangements for the proposed Faecal sludge management facility in Central Uganda Town of Kigumba.

4.2 Location and area description of the proposed Kigumba Faecal Sludge Management Facility

The proposed Kigumba Faecal sludge management facility for Central Uganda Town of Kigumba Cluster. The key project component is to be located in Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District as represented in **Table 4.1 below.**

Table 4-1: Location details of the Proposed Kigumba Faecal Sludge Management Facility for Central Uganda

SN.	Site Name	Location Details	GPS Coordinates			
	Central Region		(WGS 84) 36 N			
			Points	Eastings	Northings	Elevation
01.	Kigumba	Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District	Pt. 1	391415.00 mE	200744.00 mN	1069 metres above sea level
			Pt.2	391412.00 mE	200808.00 mN	1068 metres above sea level
			Pt. 3	391373.00 mE	200873.00 mN	1066 metres above sea level
			Pt. 4	391367.00 mE	200906.00 mN	1062 metres above sea level
			Pt. 5	391468.59 m E	200980.00 m N	1053 metres above sea level
			Pt. 6	391572.47 m E	200790.69 m N	1057 metres above sea level

Source: Field data by the consultant, 2021

4.2.1 Kigumba Cluster Towns

The towns under the Kigumba cluster are located in Kiryandongo District, which is located in Central Uganda, approximately 190km from Kampala City. The district is accessed via a tarmac road on Kampala – Gulu highway. The district is bordered by the districts of Apac to the East, Nakasongola to the South East, Masindi to the South and West, Nwoya to the North and Oyam to the North East.

The proposed towns under Kigumba cluster are Bweyale Town Council, Kiryandongo Town Council, Kigumba Town Council and Katulukire. All the towns are located in Kiryandongo District as shown in **Figure 4-1 below.**

The Proposed Faecal sludge treatment plant is to be located in Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District as shown in **Figure 4.2 below**.

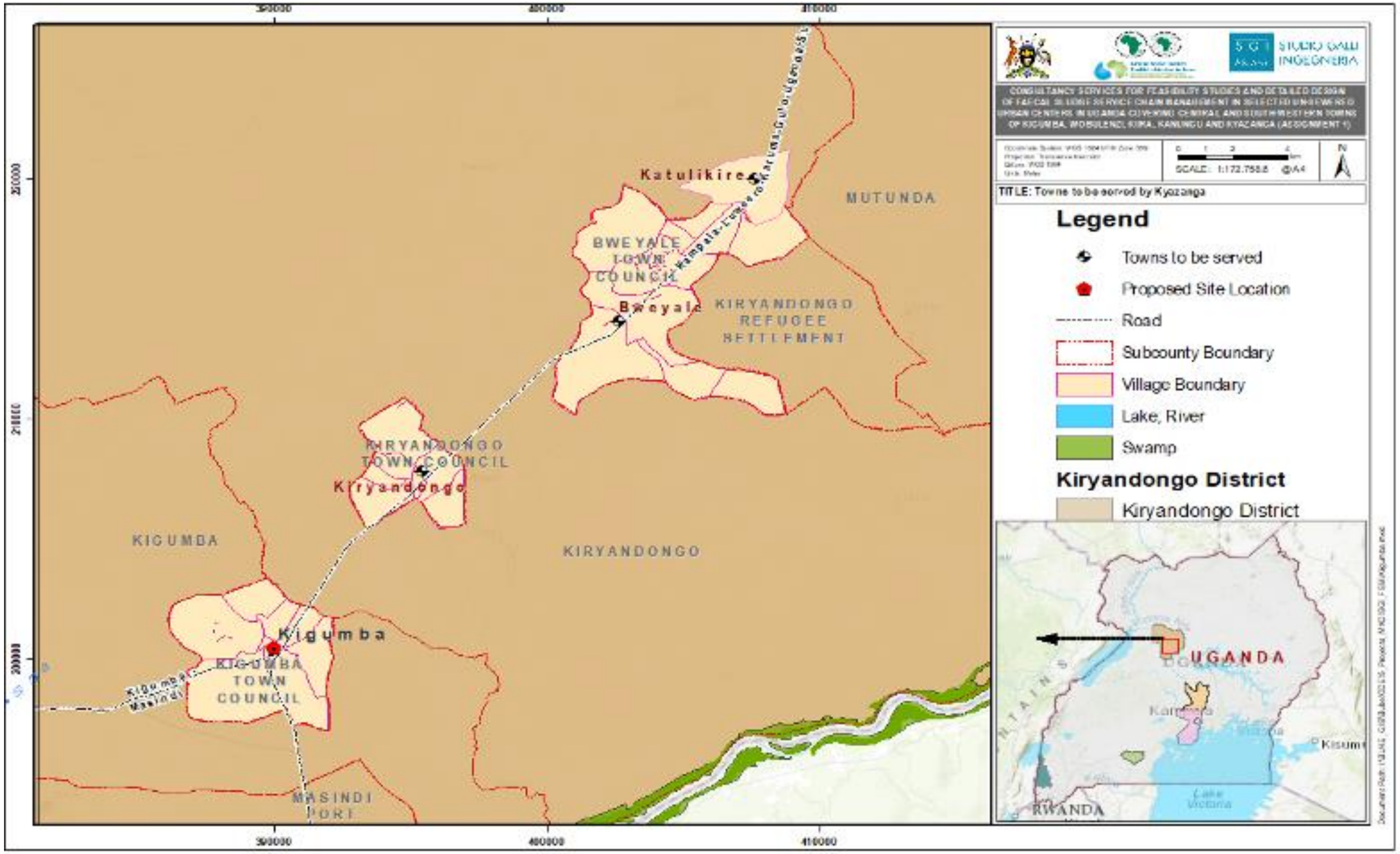


Figure 4-1: Map showing Kigumba Cluster Towns

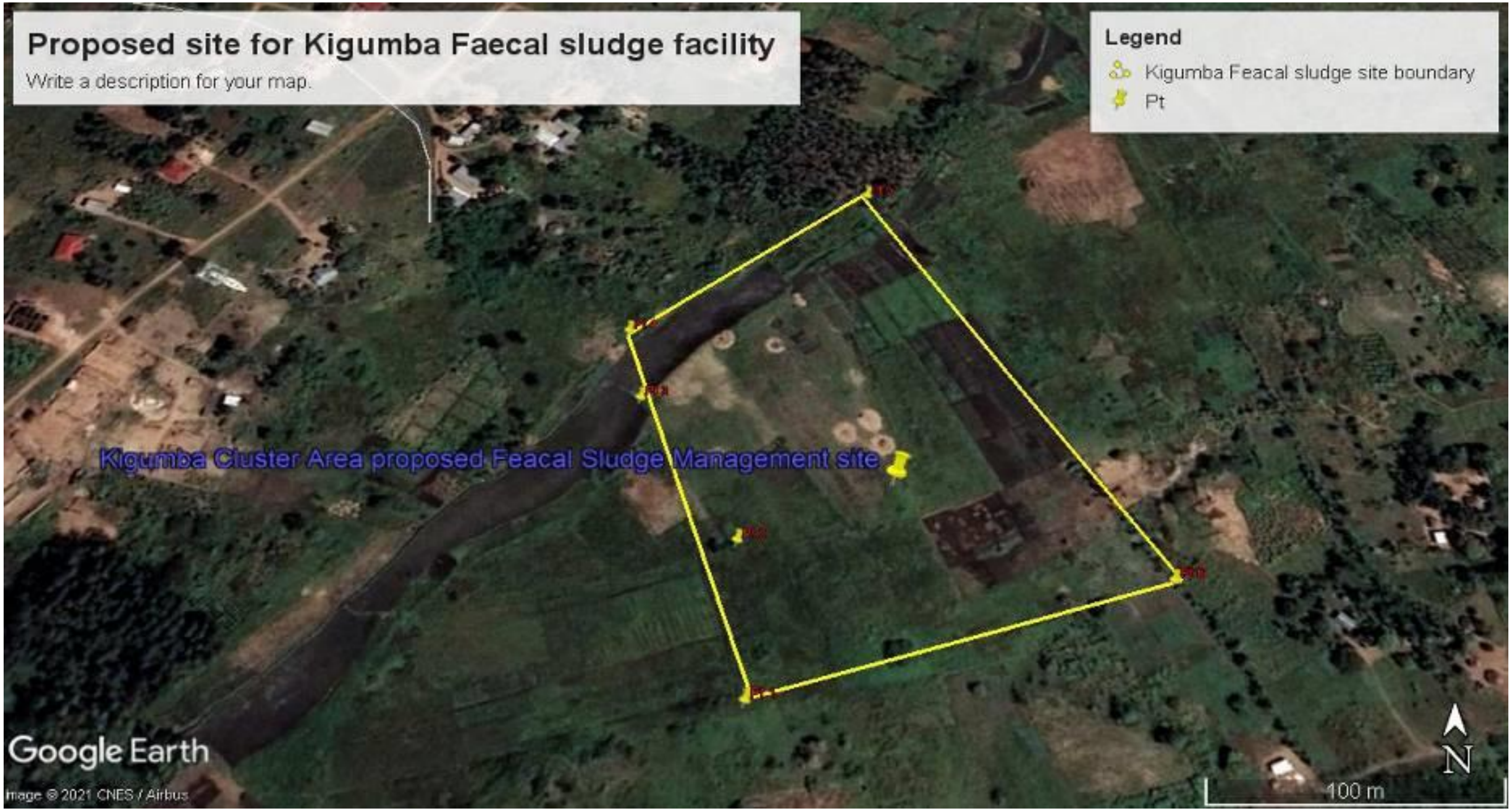


Figure 4-2: Map showing the exact location of the proposed Faecal Sludge Management Facility at Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District

4.3 Detailed Description of the activities for the proposed Feacal Sludge Management Facilities

4.3.1 Faecal Sludge Treatment Process

The faecal sludge treatment process for the proposed Faecal Sludge management facilities in Central and South Western Uganda Town of Kigumba will involve the following steps:

(i) Screening the faecal sludge to remove floating and suspended solids wastes using a bar screen.
(ii) Passing the faecal sludge through the grit chamber to remove inorganic/grit/sand particles.
(iii) Removal of suspended solids by sedimentation using a settling thickening tank.
(iv) Settled FS from Settling thickening tank will be dewatered using unplanted sludge drying beds, where evaporation of water and drainage of the liquid through a sand/gravel media happens.
(v) The dried sludge from the beds will be stored in a dried sludge store to be later processed for soil conditioning.
(vi) Primary treatment of the faecal sludge from the thickening tank will be the removal of organic pollutants (COD and BOD).
(vii) Secondary treatment of the wastewater using facultative ponds to further reduce the TSS and BOD.
(viii) Secondary treatment of the wastewater from the facultative pond with maturation ponds in series to reduce the pathogens and stabilisation of the faecal sludge effluent.

4.4 Design Criteria of FS treatment Units

4.4.1 Design FS Volume

The design assumed base year to be 2022. The design life of 15 years would make the ultimate year to be 2037. Since this close to the year for Uganda Vision 2040. The Ultimate year was set to 2040, hence making the considered design life to be 18 years.

Design faecal volumes were predicted from categories of household and institutions. The household category had three approaches and the considered value was the average of the three approaches.

The total FS produced was the sum of household and institutional FS, which was 96.49 m3/day. However, not all the potentially produced FS will be delivered to the FS treatment plant for the following reasons:

- Some will remain unemptied due to very deep unlined pits observed in the project area and the owner digs another sanitation facility.
- Many institutions in the area were still depending on unlined latrines.
- Sanitation technologies may be poorly designed and do not allow emptying
- Some people will lack finances to support emptying

- Others practice illegally dump in a freshly dug pit next a full facility
- Some emptiers do not reach treatment plant and dump in the environment.
- Some of these illegal practices call for strengthening in implementations of regulations and bye-laws.

In a view of the mentioned challenges and the considered town councils being far from the selected area, it is therefore assumed that 60% of the produced faecal sludge will be delivered to the treatment plant. The total daily volume becomes 57.90 m^3/day.

Category	FS produced (m3/d)
Household FS	12.51
Institutional FS	83.98
Total	96.49
Assume 60% reaches the treatment plant	57.90

4.4.2 Screens

Faecal sludge may contain items thrown into the pit or septic tank through the toilet interface such as old clothes, shoes, bottles, plastic carrier bags, maize cobs, menstrual hygiene products, together with gravel, stones, and even large rocks that had fallen from pit walls (Still & Foxon, 2012). Pit emptiers may separate bulky items prior to transport to the FS treatment plant but some objects are likely to remain in the FS delivered to the plant. Removal of large solids is essential since they would otherwise block pipes and destroy pumps. The design criteria is presented in the table 4.2 below.

Table 4-2: Criteria for design of screening units

Parameter	Criteria	unit	Remarks
Flow velocity	0.3 – 0.6	m/s	Not below 0.3 m/s to cause settling of floating materials and not beyond 0.6 m/s to prevent course materials to be forced through the bars
Spacing between bars	25 to 50	mm	For manually cleaned bar screen
Thickness of each bar	10	mm	
Spacing between bars	20 to 50	mm	
Angle of inclination of the bars to the horizontal	30 to60	deg	To allow for manual cleaning
Head loss through screens	150 to 300	mm	
Maximum clogging of the screen	50	%	
Minimum width of screening chamber	300	mm	To allow easy access. Preferably 450 mm
Minimum chamber depth	500	mm	Preferably 750 mm
Slope of the chamber floor	1 in 80 (1.25%)	%	To allow ant settled material washed through the screen.

4.4.3 Grit Chamber

Faecal sludge contains high concentrations of grit mainly that emptied from pit latrines or septic tanks with unlined or poorly constructed walls or floors. This high grit content will increase the rate at which sludge accumulates in tanks, ponds, pipes, and channels, and can also damage mechanical equipment such as pumps, if not removed. The criteria for its design are presented in table 4.3 below:

Table 4-3: Criteria for design of Grit chamber (Metcalf and Eddy, 2003; Tayler, 2018)

Parameter	Criteria	unit	Remarks
Flow velocity	Max = 0.3	m/s	For grit particles to settle
Grit particle settling velocity	0.03	m/s	
Channel shape	Trapezoidal		Approximation to a parabolic section
Minimum channel width at the bottom	300	mm	
Length of grit chamber	20 x maximum depth of flow		
Depth of flow	$5\,xQ_{max}/W$	mm	The grit channel geometry is such that its The cross-sectional area is proportional to the flow. The velocity of flow through the channel will, therefore, be constant at all flows. Where, W – top width of the channel

4.4.4 Settling-Thickening Tank

A settling-thickening tank will be used for solid-liquid separation. The tank will have an inlet with a baffle to ensure quiescent flow, and an outlet with a baffle to allow only the supernatant to pass through the outlet. The floor is commonly either sloped so sludge can be pumped out, or else flat with access for removal by a front loader. Total suspended solids settle out into the thickened layer and fats, oils and grease float to the scum layer. The design criteria for a settling-thickening tank is presented in table 4.4.

Table 4-4: Design Criteria for Settling-Thickening Tanks

Parameter	Criteria	unit	Remarks
Hydraulic Retention time (HRT)	12-24	h	
Settling velocity	0.5	m/h	Based on existing values for rectangular thickening tanks with SVI less than 100 $mL/gTSS$.
COD removal	50	%	(Heinss *et al.*, 1999)
TSS Settling efficiency	60 to 80	%	
Scum depth	0.4 to 0.8	m	
Supernatant depth	0.5	m	
Separation depth	0.5	m	
Thickened sludge depth			Total tank depth, $D_t = Thickened\ sludge\ depth + [Scum + Supernatant + Sep$ $D_t = \frac{V_t}{SA} + [Scum + Supernatant + Separation]\ (m)$

Parameter	Criteria	unit	Remarks
			$V_t = \frac{Q_s \, x \, C_{TSS\_in} \, x \, e \, x \, N}{C_{TSS\_out}} \; (m^3)$ $d_t = \frac{V_t}{SA} \; (m)$
Width to length ratio	1:10 to 1:5		A long and narrow tank is preferred to facilitate flow distribution.
Inlet and outlet baffles			To stop scum leaving the tank with the outlet and slowing down the influent streams.
Minimum number of tanks	2		For maintenance purposes.

4.4.5 Unplanted Drying Beds

The main treatment objective of unplanted drying beds is the dewatering and drying of faecal sludge. Two products produced will be dewatered sludge cake and the leachate. The leachate will require further treatment since the effluent nutrient and organic content from unplanted drying beds is at high concentration levels. The dewatered and dried solids will need further treatment depending on the endues. The criteria for the design of unplanted drying beds is shown in table 4.5 below.

Table 4-5: Design Criteria for unplanted sludge drying beds

Parameter	Criteria	unit
Thickness of sludge layer on the drying beds	200 to 300	mm
Sludge drying period	10 to 30	days
Loading time per bed	3	days
Unloading time per bed	2	days
Faecal sludge volume that drains as leachate	50 to 80	%
Solids loading rate	100 to 200	kg TS/m^2.yr
Sand to gravel media depths	Sand (10 to 20), Dine gravel (10) and Course gravel (15 to 20)	cm

4.4.6 Facultative ponds

Facultative ponds are the principal vehicles for waste stabilization in the pond system. Frequently they are the first in the series. Their main purpose will be to remove organic material and solids but they can also remove the ammonia that is incorporated into biomass (Mara & Pearson, 1986). When used in faecal sludge treatment, they will normally follow anaerobic ponds. If the treated effluent is to be used to irrigate crops, further treatment in maturation ponds will be required. A maturation pond is an option for pathogen removal. The BOD removal in primary facultative ponds is usually in the range of 70-90%. The process design of facultative ponds will be as follows:

Table 4-6: Design Criteria for a Facultative Pond

Factor	Criteria	Remarks
Pond Depth	1.0 to 2.5m	In practice, most ponds are 1.5 – 2m deep.

Factor	Criteria	Remarks
Length-to-width ratio	2:1 – 3:1	To prevent short-circuiting and optimal retention time.
Side slopes		Internal and external slopes are 1:3 and 1:2, respectively.
Embarkment protective lining	Concrete, clay or polyethene sheets	
Pond shape		Trapezoidal, rectangular with round corners
Minimum freeboard	0.5m	
BOD removal efficiency	70–90%	of the influent BOD (Mara et al., 1992; Mara, 2004)
TSS removal efficiency		70–80% (von Sperling, 2007).
Surface BOD loading rate, λ_S $(kg\ BOD/ha\ d)$	$\lambda_S = 350\ x\ (1.107 - 0.002T)^{(T-25)}$	where T is the mean temperature of the coldest month of the year in °C
Desludging interval	10 to 15 years	Or when sludge accumulation reaches 20 – 25% of pond volume.
Hydraulic retention time (HRT)	5 to 30 days	
Sludge accumulation	0.05 to 0.1 m3/person/year	
Effluent BOD	$L_e = L_i\left(1 - \frac{\%BOD_{rem}}{100}\right)$	L_i: Influent BOD - effluent BOD of the anaerobic pond $(mg\ BOD/L)$ L_e: effluent BOD from a facultative pond $(mg\ BOD/L)$ $\%BOD_{rem}$: percentage BOD removal through the facultative pond (assume a figure of 70% if data is not available on BOD removal in ponds treating faecal sludge under similar conditions)
Pond lining		The sides and base are normally lined. While a waterproof membrane may be used for the base, the normal practice is to line the sides with concrete, precast concrete slabs, or bricks. In all cases, a sloping ramp should be provided to allow worker access for desludging.
Operational continuity		The normal configuration of two or more ponds operating in parallel allows one pond to be decommissioned and dewatered so that it can be desludged

4.4.7 Maturation ponds

Maturation ponds are mainly designed on the basis of faecal coliform removal rather than BOD removal. Therefore, maturation ponds will follow processes that have already removed BOD and TSS. Their shallow depth, typically 1−1.5 m, will allow sunlight to penetrate to the bottom of the pond and inactivate pathogens. The sunlight will also encourage photosynthesis, and aerobic bacterial and algal growth. The design parameters for maturation ponds will be as follows (Table 4.7):

Table 4-7: Design Criteria for Maturation Ponds

Factor	Criteria
Pond depth	1.0 to 1.5m
Length-to-width ratio:	2:1 and up to 10:1 to provide better model plug flow conditions (Mara, 2004)
Pond shape	Trapezoidal, rectangular with round corners
Embarkment protective lining	Concrete, clay or polyethylene sheets
Minimum freeboard	0.5m
Hydraulic retention time	5 to 7 days
Desludging interval	No desludging required
Pathogen reduction through settling-thickening tank	50%
Pathogen removal	$N_e = \frac{N_i}{(1+K_b t_A)(1+K_b t_f)\ldots(1+K_b t_m)^n}$ N_e: number of faecal coliforms per 100ml in the effluent ($CFU/100ml$) N_i: number of faecal coliforms per 100ml in the influent (facultative pond effluent) ($CFU/100ml$) n: number of maturation ponds in series and of equal area. K_b: the first-order rate constant for faecal coliform removal (day^{-1}) t_A, t_f, and t_m: retention times in the anaerobic, facultative and maturation ponds, respectively.
Effluent BOD	$L_e = \frac{L_i}{(1+K_1 t_f)(1+K_1 t_m)^n}$ L_i: Influent BOD - effluent BOD of the anaerobic pond ($mg\ BOD/L$) L_e: effluent BOD from a facultative pond ($mg\ BOD/L$) K_1: the first-order rate constant for BOD removal (day^{-1}) t_f and t_m: retention times in the facultative and maturation ponds, respectively

4.4.8 Constructed wetland

Constructed wetlands are engineered systems designed to mimic/optimize processes found in natural wetland ecosystems. The systems will utilize wetland plants, soils and their associated microorganisms to remove contaminants from wastewater/faecal sludge effluent, as well as other sources of contamination (Wallace & Knight, 2006; Dotro et al., 2017). The design criteria is presented in table 4.8 below;

Table 4-8:Design consideration for the design of constructed horizontal flow constructed wetlands

Factor	Parameter	Criteria
Treatment step applicable		Secondary
Contaminant rei4removal efficiencies	TSS	>80%
	BOD_5	>80%
	Ammonia nitrogen	20 – 30%
	Total nitrogen (TN)	30 – 50%
	Total phosphorus	10 – 20%
	Faecal coliforms	$2log_{10}$
Background concentrations, C^* (mg/L)	BOD_5	10
	TN	1
	NH_4-N	0
Areal-based reaction rate coefficients (50th percentile): $\boldsymbol{k_A}$ – rate (m/yr)	BOD_5	25
	TN	8.4
	NH_4-N	11.4
	Thermotolerant coliform	103
Wetland Geometry	Effective depth (m)	0.5
	Length to width ratio	2 to 4
	Free board (m)	0.4
Hydraulics	Hydraulic retention time (days)	2 to 5
cross-sectional organic loading rate $(g\ BOD_5/m^2d)$		250

4.5 Ancillary works

An administration building containing an operational staff office, store, and a laboratory will be provided at the FS treatment facility. The operations building shall be constructed of reinforced concrete and hollow core concrete blocks for the walls. A generator structure will be constructed near the pump house to accommodate a standby generator.

Fencing, security lighting and site water supply system is to be installed together with drainage ditching and 2-coat bitumen and chip surface dressing of access road to and within the site. Other facilities shall include roads, walkways and parking areas. Open areas shall be covered with lawns and flowers. Trees, ornamental plants and bushes shall be selected from those species, which do not shed too many leaves nor require too much maintenance. Tall trees, which would cut down wind access to the ponds, shall be avoided.

4.5.1 Laboratory Facilities

In order to ascertain the performance of the faecal sludge treatment plant, it is prudent that there is a laboratory facility at the site. Considering the proposed treatment unit processes and unit operations, routine monitoring will be required for the following parameters: pH, TS, TSS, COD, BOD_5, Nutrients (Total Nitrogen and Total Phosphorus) and Total nitrogen of the faecal sludge.

In addition, ascertaining the quality of the dried faecal sludge will necessitate determination of pH, Moisture content, Nutrients (N & P), Calorific value (possibility for use as an energy source), Ascaris eggs (for safety) and heavy metals (Cd, Pb and Cr). It suffices to point out that except for calorific value, heavy metals and ascaris eggs, it is proposed that the rest of the parameters be undertaken at the site laboratory facility using the proposed equipment and consumables.

In order to avoid cross contamination, it is necessary that the laboratory facility is constructed in such a way that it is with separate sections for physical/chemical and microbiological analyses. There should be provision for appropriate storage of chemicals/reagents and consumables, sterilization of used glassware/containers and pertinent accessories and safe disposal of materials.

The operators at the plant and also within the laboratory should wear appropriate personal protective equipment at all times with hygiene safety given priority.

Table 4-9: Proposed Equipment for laboratory facility at the faecal sludge treatment plant

S/N	Equipment/ Consumables	Description	Purpose
1	pH/EC meter	Hach HQ30d flexi model with pH and EC probe. Calibrations solutions for pH and EC	For in-situ determination of pH, EC, ORP and temperature
2	Incubator	LEEC C157 incubator, with internal dimensions (HxWxDmm) = 573x550x500, chamber capacity 157litres, 4 shelves, power rating (Max 280), Temperature range at least more than 5ºC above ambient to +60ºC. Temperature control typically ±0.1ºC at 37ºC.	For determination of Faecal coliforms
3	Dry Oven	Memmert Universal oven Model UFB 500; Interior Heating Concept (with English manual) • Size: w x h x d = 560 x 480 x 400 mm, 108 l • easy-to-clean interior, made of stainless steel, reinforced by deep drawn ribbing with integrated and protected large-area heating on four sides • 2 stainless steel grids Temperature Range: • from +30 °C (however, at least 10 °C above ambient) up to +220 °C Voltage / Power Rating: • 230 V (+/- 10%), 50/60 Hz • ca. 2.000 W (during heating)	For determination of total solids and total dissolved solids

S/N	Equipment/ Consumables	Description	Purpose
4	BOD measurement system (3 sets)	BD 600 BOD measurement system 6 place -Product No.1200199 or 2444460. Each set includes; • BD 600, complete unit with 6 sensor heads and control unit with batteries • Power supply unit incl. Y-cable for common power supply of BD 600 and stirring unit • 1 x USB-cable • 1 x remote control • Inductive stirring unit • 6 sample bottles • 6 rubber gaskets • 6 magnetic stirring rods • 1 overflow flask, 157 ml • 1 overflow flask, 428 ml • 1 bottle, 50 ml potassium hydroxide solution • 1 bottle, 50 ml nitrification inhibitor solution • 1 instruction Manual (in English) Include the BOD system test set calibrations tablets for testing the manometric measurement BOD system above (Product No. 1151979 or 418328)	For determination of BOD_5
5	Incubator	**ET637-6** with 6 sockets Net capacity: 280 Ltr. Power consumption: 240 VA; 2,05 kWh / 24h (ambient temperature 25 °C, target temperature 20 °C with interior lighting switched on (15 W)) Weight: 82.0 kg Order Code: 2 42 82 35 Overall dimensions: 1590 H x 600 W x 600 D mm Inside dimensions: 1450 H x 515 W x 415 D mm (with 5 retractable grids and 1 bottom grid) Door with double glazed insulated in ABS frame Order code: 2 43 82 35	For determination of BOD_5
6	Spectrophotometer	DR 6000™ UV VIS Spectrophotometer without RFID; Product no. LPV441.99.00002 Includes Cuvette compatibility 2: 1 inch rectangular and round cell Cuvette compatibility 3: optional 100 mm rectangular	For readings of nutrients (N & P), Ammonium nitrogen and COD

S/N	Equipment/ Consumables	Description	Purpose
		cell with additional adapter Data Logger: 5000 data points (result, date, time, sample-ID, user-ID) Dimensions (H x W x D): 215 mm x 500 mm x 460 mm Display: TFT 7" WVGA color touch Enclosure Rating: IP20 with closed lid Includes: 1 x Power Cord (US, EU) with English manual	
7	Analytical and precision balances, 2 No. (200g capacity and 4500g capacity)	Analytical balance with a capacity of 200g, readability 0.1mg, pan size 3.5inch platform, 3 door draft shields, with dimensions 8.5"Wx1.3"Hx13.5"D (Product no. 1759 M 76). Precision balance, capacity 4500g, readability 0.01g, platform size mm (192Wx192L) with 18 weighing units including 2 user programmable custom units, automatic temperature compensation function, below pan weighing facility and with external calibration (Product no. B043-633), supplied with weigh below hook (Product no. B043-683), in-use cover (Product no. B043-689) and dust cover (Product no. B043-687).	For dependable mass measurement for solution preparation and quantitative analysis
8	Still, water, Automatic	Barnstead/Thermolyne FI-Streem II 2S Glass still with vapour trap. May be wall or bench mounted, with fully automatic controls, a level sensor, and dual feed capability, pressure 10-80psi. Dimensions 79x26x32.5cm, shipping weight 15kg, Electric supply 220Vac, 50/60Hz (Product no. 2615902)	For providing high quality distilled water for various laboratory applications
9	Autoclave, Electrical model	Autoclave complete self-contained unit with an immersion heating element, automatic thermostatic control, automatic release valve and pilot light. Model 75X (A774-356) with 1650Watt element for fast start-up times, more accurate TPI thermocouple, snaps switch and pilot light, 60-minute mechanical bell timer, with gross capacity of 39litres, internal diameter 356mm, Internal useable height 260mm, power rating 240,50/60Hz, standard working temperature 120ºC, supplied with support stand (Product no. A774-365)	For laboratory sterilizing applications
10	COD reactor	Model 45600 COD Reactor, a 25-well, dry-bath incubator that provides the 150 °C temperature environment required for chemical oxygen demand (COD) determinations. Supplied with a dial gauge	For digestion of samples for COD determination

S/N	Equipment/ Consumables	Description	Purpose
		thermometer, power cord and safety shield (15inch high, 3/16-inch-thick polycarbonate attached to a heavy steel base). Is with a 2-hour timer.	
11	Refrigerator	Lab cold Refrigerator with digital display with re-circulated air cooling, lockable door, spark free interior, automatic defrost, CFC and HCFC free, temperature set point range 0 to 8ºC, capacity 490L, with internal air circulation powered by external motor for much improved temperature uniformity, dimensions mm (760wx720dx1775h), white enamel exterior and interior, supplied with 6 plastic coated wire mesh, electric supply 230V, 50/60Hz. Supply with power surge protectors.	For laboratory storage of samples, chemicals and reagents
12	Freezer	Liebherr freezer, upright with capacity of 520L, temperature range -9 to 26ºC, 7 fixed shelves with 14 baskets, Dimension external mm (753wx720dx1705h), Electric supply 230V, 50Hz single phase. Supply with power surge protectors.	For storage of samples.
13	Stirrer, Magnetic Hotplate, Digital	For preparation of solutions/reagents for various analyses. Magnetic stirrer with heating, alarm, time and set point indicators, temperature and time control options (variable 0-999minutes), chemically resistant splash proof, wipe clean panel, aluminium hot plate material, hot plate dimension: 140mm diameter, overall dimensions mm (200wx295dx135h), heater: 400watts, voltage: 230V and digital LED display, speed: 100-1500rpm, supplied with PTFE stirring rods (1x20mm and 1x40mm) (S519-125). Supply with star bar magnetic retriever (polyethylene pick up rod with powerful magnet sealed in one end and hand up grip on other, 31cm long) (Product No. 1523200)	For preparation of solutions/reagents for various analyses
14	Blender, Electric	Household (Kitchen) blender (not exceeding 2litres).	For faecal sludge sample preparation (homogenization) prior to analysis

4.6 Associated support infrastructure

4.6.1 Access Roads

The proposed Kigumba Cluster Faecal sludge management facility is to be located in Kihura LCI, Ward C, Kigumba Town Council and can be accessed off Kampala – Gulu highway within Kigumba Town.

There are two access points with one from the town centre via the community access road measuring approximately 500 metres off the Kihura community road and the other access is off the Highway measuring approximately 1 Kilometre and will require the construction of a 150-metre access road as shown in Figure 4.3 below.

The last point of the motorable access road at Mr. Patrick Ogwok's residence

Gardens that will be traversed by the access road

The section to be traversed for the access road to the last motorable point

Figure 4-3: Pictorial impression of the access road leading to Kigumba Faecal Sludge management facility site

4.6.2 Electricity supply

Kigumba Town is connected to the national electricity grid and the proposed site can tap electricity from the nearby homesteads for the plant operations with the electricity line terminating (under construction) at Mr. Patrick Ogwok's home which is approximately 150 metres away

Figure 4-4: Electricity line under construction at Mr. Patrick Ogwok's home from which the Kigumba Faecal Sludge management facility site can tap

4.7 Project Cost Estimates

4.7.1 Capital Costs

The capital investment costs are shown in the table below. All the costs are entirely in Uganda Shillings.

Table 4-10: Summary of Capital Costs

Bill No.	Description	Amount Ugx
	GENERAL	
KIG-G-1	General Items	941,100,800
	WORK ITEMS	
KIG-FS-1	Receiving Chamber Containment Tank	97,415,790
KIG-FS-2	Screen and Grit Chamber	53,761,225
KIG-FS-3	Settling - Thickening tank	162,749,600
KIG-FS-4	Anaerobic Reactor	88,770,790
KIG-FS-5	Sludge Drying Beds	729,096,610
KIG-FS-6	Composting building	365,973,090

Bill No.	Description	Amount Ugx
KIG-FS-7	Facultative & Maturation Ponds	371,298,910
KIG-FS-8	Constructed Wetlands	769,165,820
KIG-FS-9	Administration Building	232,066,020
KIG-FS-10	Ancillary Site works	1,367,898,000
KIG-FS-11	Mechanical Installation	165,000,000
KIG-FS-12	Electrical Installation	47,600,000
	Sub-Total "A"	5,391,896,655
	Allow for Contingency (10% of Subtotal A)	539,189,666
	Sub-Total "B"	5,931,086,321
	Add VAT (18% of subtotal B)	1,067,595,538
	GRAND TOTAL	**6,998,681,858**

4.7.2 Operating Costs

The operating costs consist of the following:

- Staffing costs,
- Running costs,
- Chemical costs
- Energy costs
- Maintenance costs

The operating costs for the Town considering a Government Utility like NWSC or Umbrella Organization of Water and Sanitation managing the system are discussed below.

4.7.3 Staffing Costs

Staffing is required in the Town to operate the Faecal sludge Plant by:

- Operating the system in accordance with the service standards.
- Maintaining the system.
- Developing the system.
- Billing the consumers.
- Collecting revenue.
- Receiving applications for and making new connections.
- Making extensions to the system or assets.
- Attending to all customers.
- Keeping records of the operations of the system.
- Writing status reports for the operations of the system.

The level of staffing and the staffing costs are presented in the table 4-11 below. These are derived from the actual operation costs of National Water and Sewerage Corporation (NWSC).

Table 4-11: Staffing Schedule and Costs

Position	**Total Salary**	**Staff Required**	**Total Staff Costs**
	('000 Ugx/month)	(No.)	(Mio. Ugx /year)
Plant Manager	1,500	1	18.0
Plant Engineer	1,000	1	12.0
Technician	600	1	7.2
Plumber	800	1	9.6
Security Guards	400	1	4.8
Total		**5**	**52**
Source: *Project Estimates*			

4.7.4 Running Costs

The office running costs include stationary, utilities, cleaning and general office costs. They are summarised in the table 4-12 below. These are derived from the levels and costs in similar NWSC offices.

Table 4-12: Office Running Costs

Item	**Amount**	**Amount**
	(Ugx '000/month)	(Ugx'000/year)
Stationary	1200	14,400
Office Supplies	1200	14,400
Transport Costs	2400	28,800
Office and Utilities	1200	14,400
Cleaning Services	1000	12,000
Total		**84,000**
Source: *Project Estimates.*		

4.7.5 Energy and Chemical Costs

The power for the waste water pumps will be obtained from the national electricity grid. No Chemical costs are envisaged in the treatment of the Faecal Sludge, all treatment will be physical. The annual chemical and energy costs are shown in the table 4-13 below.

Table 4-13: Annual Energy & Chemical Costs

Item	**2020**	**2022**	**2025**	**2030**	**2032**	**2035**	**2040**
FS Produced (in '000 m^3 / year)	5.6	5.8	6.3	7.1	7.4	8.0	9.0
UnDumped FS (in '000 m^3 / year)	2.2	2.3	2.5	2.8	3.0	3.2	3.6
FS Dumped at Treatment Plant (in '000 m^3 /	3.3	3.5	3.8	4.2	4.5	4.8	5.4

Item	2020	2022	2025	2030	2032	2035	2040
year)							
Energy Costs (USh mio. / year)	0.3	0.3	0.3	0.3	0.4	0.4	0.4
Chemical Costs (USh mio. / year)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Daily FS Produced (in m^3/day)	15.2	16.0	17.2	19.4	20.4	21.9	24.7
Cost of FS Produced (in USh/m^3)	0	37,596	34,966	30,986	29,524	27,459	24,335
Source: *Project Estimates*							

4.7.6 Maintenance Costs

The annual maintenance costs are taken as a percentage of the investment costs as follows:

- Civil works - 1%
- Pipe work - 1%
- Mechanical & Electrical works - 5%

The annual maintenance costs of the UETCL Power grid are contained in the electricity tariff and are borne by UMEME, so no maintenance costs for these items have been considered. The cost estimates for the above categories are given in the table below.

Table 4-14: Investment Cost Categories

Item	**As-New Value year 2022** (million Ugx)
Civil Works	
Structures and Siteworks	4,238.20
Pipelines	0.00
Subtotal	**4,238.20**
Mechanical and Electrical Works	
Mechanical and Electrical Works	212.60
Subtotal	**212.60**
Preliminaries and Contingencies	2,547.89
Total	**6,998.68**
Notes:	
Preliminaries and Contingencies have been distributed *pro rata* across all items.	
Source: *Project Estimates*	

The annual maintenance costs would therefore be as given in the table below.

Table 4-15: Maintenance Costs

Item	**Maintenance Cost** (% of Capital Cost)	**Annual Maintenance Costs** (Million Ugx)
Structures and Siteworks	1.0%	66.64
Pipe work	1.0%	0.00
Mechanical and Electrical Works	5.0%	16.72
Total		**83.36**
Source: *Project Estimates*		

5 DESCRIPTION OF THE AFFECTED ENVIRONMENT

5.1 Introduction

This section presents a description of the environmental and social baseline conditions in which the proposed Faecal Sludge management facility in Kigumba Town, Kiryandongo District will be constructed and operated as well as in which impacts may be experienced. The description is designed to enable identification of particularly sensitive receptors and resources that may be vulnerable to impacts arising from implementation of the proposed project.

Sources of information include primary data collected by the various specialists during field surveys conducted between January, 2021 and May, 2021 (ESIA Consultant) using recognized standard survey methods as described in section 2.0 of this ESIStatement. This has been supplemented by data collected from some of the stakeholders consulted during the ESIA (Chapter 6 and **Appendix 5** of this ESIStatement). This data was used in the determination of site and specific local conditions, and to a lesser extent for Kiryandongo District conditions.

Secondary sources, including existing reports, Google Earth Maps and data obtained from government agencies and non-governmental organisations, were used for the regional context.

Secondary data sources are cited in the text and included in the reference list of this Environmental and Social Impact Statement.

5.2 Biological Environment

5.2.1 Vegetation

The natural vegetation of Kiryandongo comprises savanna woodland including dry and humid Savannah with elephant grass prolific in some areas. This type of vegetation provides a diverse habitat for a variety of birds and animals.

At the proposed site, agroforestry is also common here and the most common system of agriculture here is visibly the banana-coffee system with some intercropping of cabbages, bananas.

Figure 5-1: Cardinal view of the proposed faecal sludge management site

5.2.2 Fauna

Human activities (e.g., draining of the swamp, and cultivation within Kihura wetland) have caused a number of changes in the status of the fauna within Kihura Wetland. Most of the species present are common in disturbed, farmland and habituated areas. These included; Grey Crowned Crane (*Balearica regulorum*), Speckled Mousebird (*Colius striatus*), Hadada Ibis (*Bostrychia hagedash*) and Red-eyed Dove (*Streptopelia semitorquata*) recorded close to the proposed site. The Woodland Kingfisher (*Halcyon senegalensis*), Common Bulbul (*Pycononotus barbatus*) and Bronze Mannikin (*Lonchura cucullata*), Marabou stork (*Leptoptilos crumenifer*), and African Pied Wagtail (*Motacilla aguimp*) were recorded on the swamp fringes.

5.2.3 Environmentally Sensitive Habitat and Species of Conservation Concern

Kihura wetland where the proposed faecal sludge plant is to be sited is dominated with *Echinochloa pyramidalis*, *Cyperus papyrus, Thelypteris acuminata and Paspalum crobiculatum, Phragmites mauritianum* and *Pheonix reclinata* among others as shown in Figure 5.2 below.

According to some of the area residents interviewed, there are no known species of conservation concern that are known to exist within Kihura wetland.

Figure 5-2: Kihura wetland

5.3 Physical Environment

5.3.1 Climate

Kiryandongo district, where the site is located has the tropical savannah climate prevailing. Kiryandongo District is endowed with favourable climate conditions and has a bimodal rainfall pattern. It is warm every month with both wet and dry season. The hot season lasts for 2 months and average annual temperatures of 22.9°C with humidity of 80% and UV index of 6. The district receives an annual long-term average rainfall of 1200mm.

The highest rainfall is normally received in March-May and August –November. The district enjoys favourable weather conditions coupled with good soil fertility making it suitable for agricultural production. Based on the amount of rainfall received, the district can be divided into three major climatic zones

1. High rainfall zones: These are areas that receive more than 1000 mm of rainfall per annum. No Sub County receives this rainfall amount in Kiryandongo District.
2. Medium rainfall zones: These are areas with a total amount of rainfall ranging between 800mm – 1000mm per annum. Areas that fall under this zone include Kigumba and Kiryandongo sub-counties as well as part of Mutunda Sub County.

Lower rainfall zones: These are areas that receive less than 800mm of rainfall per annum. Localities in Masindi Port Sub County receive this rainfall amount. Major Economic activities carried out in medium rainfall zones include maize, cassava, sunflower, and cotton and tobacco production. This has contributed to improved household incomes enabling the population to sustain their livelihoods. On the other hand, the major activities carried out in low rainfall zones include pastoralism, fishing and cotton growing.

However, the district lacks a meteorological department and necessary instruments to measure rainfall received in the district which makes it difficult to determine monthly rainfall statistics and to accumulate time series to enable measurement of rainfall trend.

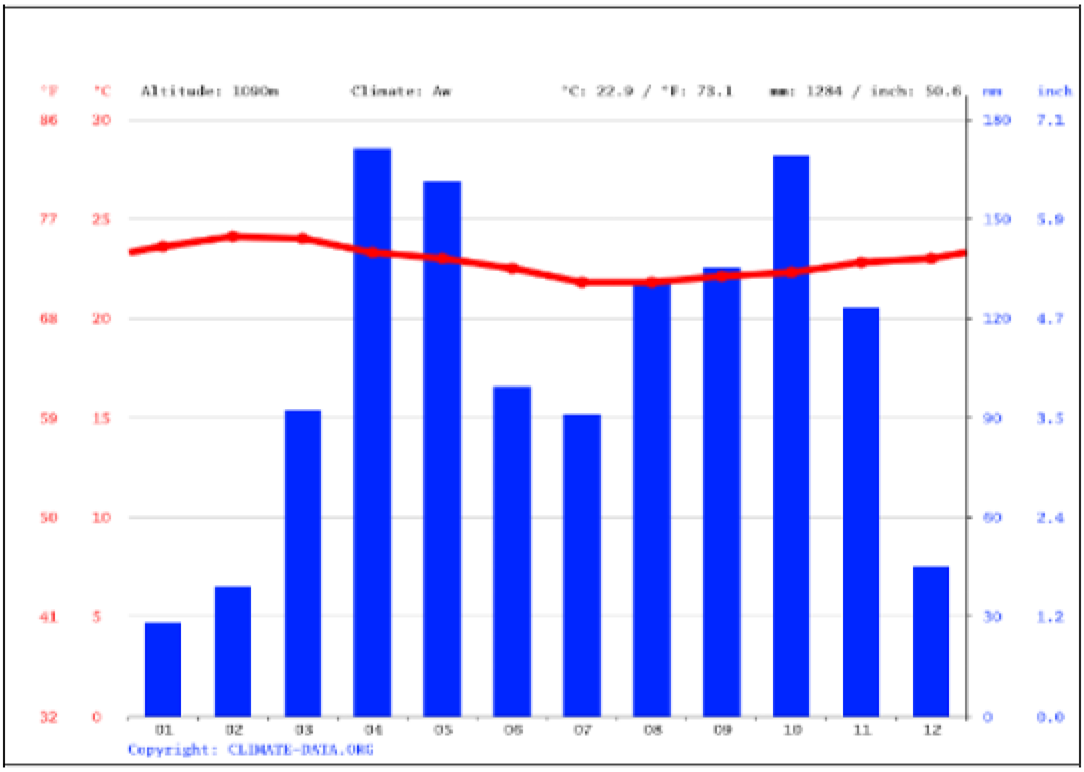


Figure 5-3: climate graph of Kiryandongo District

5.3.2 Hydrology

According to KDLG 2015, Kiryandongo District is endowed with several water resources. Additionally, the District has got adequate surface and sub-surface water reserves. However, some parts of the district are devoid of such water reserves especially during the dry season. Severe surface water shortage is experienced in whole of Masindi Port Sub County and parts of Mutunda Sub counties. It was further observed that the drainage system in the district consists of numerous wetlands in several localities. Kiryandongo District hosts Victoria Nile which harbours Ayago Falls and Karuma both of which are potentials for electric power generation.

The main permanent wetland is Titi wetland and the others identified being seasonal including Kihura wetland (See Figure 5-4 below) where the proposed Faecal sludge facility is to be situated. Most of the wetlands are known to support a diversity of plant, animal and plant species and these seasonal wetlands are facing degradation especially from agriculture and settlement hence the need for restoration.

Figure 5-4: **A section of Kihura wetland where the proposed Faecal sludge facility is to be established**

5.3.3 Topography

Kiryandongo District is generally a high and relatively flat land with an altitude of 1295 metres above sea level combining undulating hills, with Kigumba town council and Kaduku in Kigumba Sub County as one pronounced high points located in the district. The land in the Murchison Falls conservation area which lies in the North and North West of Kiryandongo District is flat.

5.3.4 Geology

Generally, Uganda is composed predominantly of Archaean basement rocks formed mainly between >3.08 Ga and 2.55 Ga. The Archaean basement is divided into five domains viz (**refer to Figure 5-5 below**):

1. Lake Victoria Terrane (LVT) which covers project areas: Busia, Mbale, Bugiri Iganga districts;
2. West Tanzania Terrane (WTT) covering Kampala, Mukono, Mpigi, Nakasongola, Wakiso, Luwero, Mityana, Mubende, Kyegegwa, Kyenjojo, Kibale, Jinja and Tororo, districts;
3. West Nile Block (WNB) which has no project area;

4. North Uganda Terrane (NUT) which underlie Gulu, Lira, Dokolo, Kumi, Soroti, Bukedea and Kaberamaido, Hoima, Kiryandongo, Masindi Districts; and,
5. Rwenzori Fold Belt (RWT) underlying Bushenyi, Mbarara, Ntungamo, Kabale, Sheema, Rubirizi, Kabarole, Kasese, Masaka, Lwengo, Lyantonde, Kalungu, and Rakai Districts.

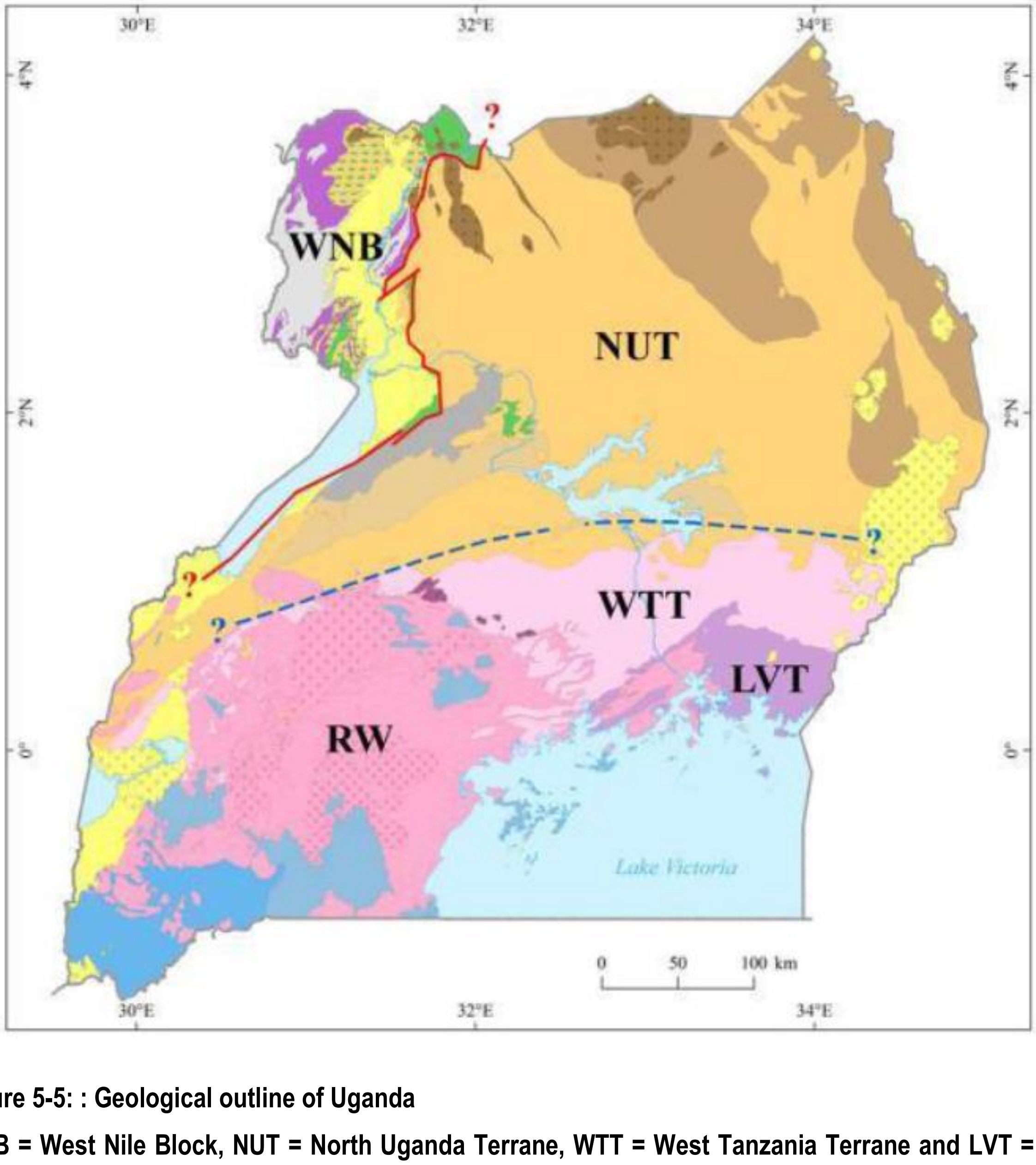


Figure 5-5: : Geological outline of Uganda

WNB = West Nile Block, NUT = North Uganda Terrane, WTT = West Tanzania Terrane and LVT = Lake Victoria Terrane. RW = Rwenzori Terrane

Kiryandongo district has undulating hills with some pronounced high points located in some localities in the district such as Kaduku in Kigumba and comprises of Laterites (QHI). The specific detailed geology description for Kiryandongo District is given in the sub-section below.

5.3.4.1 Northern Uganda Terrane

Kiryandongo, district falls within this unit. It is comprised of granites, gneisses, migmatites, granulites and charnockites as shown in **Figure 5-6 below.**

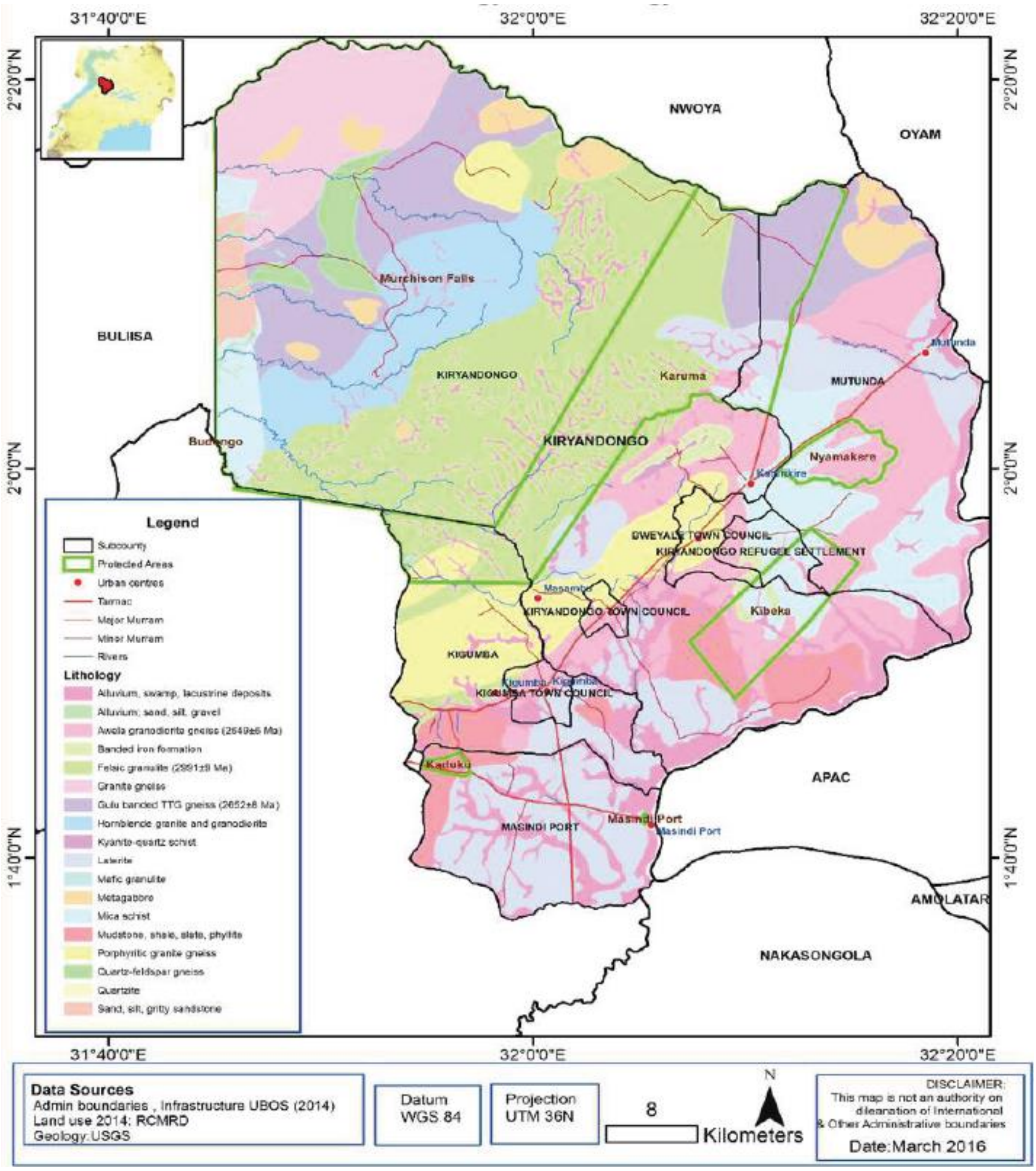


Figure 5-6: Geology of Kiryandongo District
Source: OPM 2016

5.3.5 Soils

Soil type patterns in Kiryandongo are more or less uniform throughout the district. Sandy loam soils predominate with clay loam in Kitwara Parish. Sandy soils are more pronounced in Masindi Port Sub-County. The most prominent soil types per Sub-County are given in the table 5.1 below.

Table 5-1: Soil Types and the major crops grown in Kiryandongo District

Sub-county	Type of Soil	Major Crops
Masindi Port	Sandy Loam	Cassava, Sunflower, Potatoes, Simsim, Bananas
Kigumba	Sandy Loam	Maize, Cassava, Tobacco, G/nuts, Rice
Kiryandongo	Sandy Loam	Cassava, Maize, G/nuts, Millet, Vegetables, Rice, Sweet potatoes and Millet
Mutunda	Sandy Loam	Sunflower, Cassava, Maize, Cotton, Simsim, Rice, Sweet potatoes, G/nuts and Pineapples

Source: Kiryandongo District Development Plan for FY 2015/2016 – 2019/2020

The soil stratigraphy at the site is presented in Table below for Test Pit Logs. The stratigraphy consists of three (03) major layers. There is a layer of top soil of organic clay which is underlain by silty clay, clayey silt or sandy clay. The lower layer comprises of mainly clayey sand which is the predominant layer.

Profile at TP 1	Profile at TP 2	Profile at TP 3
0.0 ~1.0m: Organic fat CLAY	0.0 ~1.0m: Organic fat CLAY	0.0 ~0.4m: Organic fat CLAY
1.0~2.3m: Silty CLAY	1.0~2.0m: Clayey SILT	0.4~1.0m: Sandy CLAY
2.3~3.0m: Clayey SAND	2.0~3.0m: Clayey SAND	1.0~3.0m: Clayey SAND

5.3.6 Seismicity

According to the Seismic code of practice for structural designs, 2003 (US 319: 2003) from the Uganda National Bureau of Standards (UNBS), the site lies in zone 1 on the seismic zoning map. This is the most seismically active zone in Uganda with a zoning factor of Zmax=1.0. The project area is considered to be prone to earthquake risk as shown in Figure 5-7 below.

The seismic zoning map above indicates contours of ground acceleration, used for seismic action calculations. The seismic zoning factor, Z for the appropriate regions or locations and for the purposes of design may be applied as follows;

- Z max = 1.0 for zone 1 (high risk area),
- Z = 0.8 for zone 2 (medium risk area) and
- Z = 0.7 for zone 3 (low risk area)

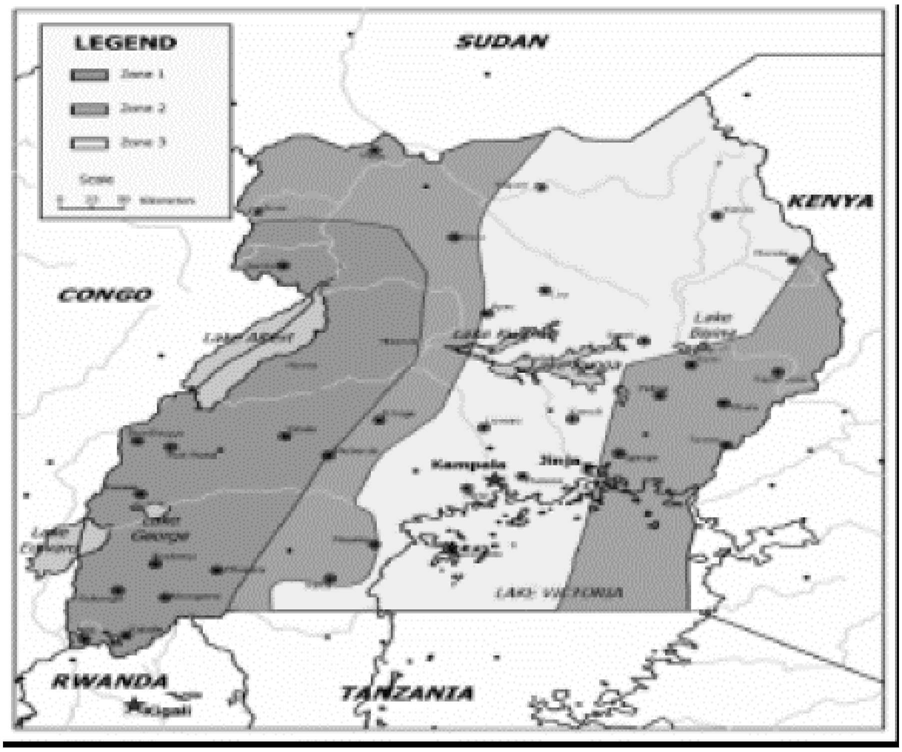


Figure 5-7: Seismic zoning map of Uganda (US319, 2003)

5.3.7 Noise Levels Assessments

Noise levels assessments were carried out at selected points around the proposed faecal sludge management facility in Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District to establish the existing baseline Noise levels. **Table 5.2** below shows the findings of Noise emissions levels for specific areas with the potential exiting potential Natural and Anthropogenic sources.

Table 5-2: Details of the background Nosie measurements in form of LAeq, LAF max, LAF Min, within the vicinity of the proposed faecal sludge management facility in Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District

Location description and coordinates	Noise limit (dB(A) LEQ)	Recorded noise level			Existing noise sources		
		LAeq	LAF Max	LAF Min	Natural	Impact rating	Anthropogenic
Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District (Kigumba site)							
North the site 391415.00mE,200744.00mN Elevation 1069 metres above sea level	75	42.6	54.1	33.2	People	Low	Motor traffic
East of the Site 391412.00mE,200808.00 mN Elevation 1068 metres above sea level	75	43.0	46.3	39.3	People	Low	Motor traffic
South of the Site 391373.00mE,200873.00mN, Elevation 1066 metres above sea level	75	38.7	49.2	35.8	People	Low	Motor traffic
West of the Site 391367.00mE,200906.00mN Elevation 1062 metres above sea level	75	45.0	56.2	46.0	People	Low	Motor traffic
center of the site 391468.59 m E,200980.00mN Elevation 1053 metres above sea level	75	44.1	48.7	39.4	People	Low	Motor traffic

Source: *Field data February 2020. Noise Limits are as prescribed for the Maximum Permissible Noise Levels (Continuous or intermittent noise from a Factory or Workshop in the National Environment (Noise Standards and Control) Regulations, 2003.*

From Table 5.2 above, the analysis of Noise emissions finding from various project sampled areas with considerations of the potential receptor areas:

- The average (LAeq) noise level assessment at all the sampled areas ranged from (**38.7-45.0**) dBA. With all areas having Low Noise level within the permissible levels. However, this Noise level emissions is likely to change in this area when construction activities commence as a results of construction equipment's and material haulage to site.

5.3.8 Air quality Assessments

Air quality assessments were carried out at selected points around the proposed faecal sludge management facility in Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District to establish the existing baseline air quality levels. **Tables 5.3 and 5.4** below show the findings of the emissions levels for specific areas with the potential exiting potential Natural and Anthropogenic sources.

5.3.8.1 Particulate Matter Levels

Particulate matter sampling was carried out at different project facilities and its support facilities to check the extent of PM level concentrations. **Table 5.3** below presents the findings of particulate matter concentrations levels for specific areas around the proposed faecal sludge management facility. The findings are influenced by various sources like the existing activities in the place at the time of sampling and daily weather conditions

Table 5-3: Readings for Particulate matter (particles/m³) measured around the proposed faecal sludge management facility in Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District

Dust Sampling Location and coordinates. Real time reading.	$PM_{2.5}$/ 25 Average Recording	PM_{10} 50 µg/m³ Average Recording	Temperature	Humidity	Impact rating	Current Weather conditions	Potential Sources/Activity
IFC 2007 and WHO Air Quality Guidelines (AQG), 2005							
Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District (Kigumba site)							
North the site 391415.00mE,200744.00mN Elevation 1069 metres above sea level	1.6	2.2	24.5	52.2	Low	Sunny day	General fine particulate matter in atmosphere.
East of the Site 391412.00mE,200808.00mN Elevation 1068 metres above sea level	2.0	2.8	24.4	60.0	Low	Sunny day	General fine particulate matter in atmosphere.
South of the Site 391373.00mE,200873.00mN, Elevation 1066 metres above sea level	3.2	4.4	23.1	64.2	Low	Sunny day	General fine particulate matter in atmosphere.
West of the Site 391367.00mE,200906.00mN Elevation 1062 metres above sea level	3.2	4.5	22.9	68.7	Low	Sunny day	General fine particulate matter in atmosphere.
center of the site 391468.59 m E,200980.00mN Elevation 1053 metres above sea	3.9	5.3	27.7	52.0	Low	Sunny day	General fine particulate matter in atmosphere.

Dust Sampling Location and coordinates. Real time reading.	$PM_{2.5/}$ 25 Average Recording	PM_{10} 50 µg/m^3 Average Recording	Temperature	Humidity	Impact rating	Current Weather conditions	Potential Sources/Activity
IFC 2007 and WHO Air Quality Guidelines (AQG), 2005							
level							
IFC general EHS guidelines recommend 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 (2007).							

(Source: Field data source: Air quality (particulate matter) assessment February 2021).

From the Table 5.3 above, the results revealed that:

- Various sampling points were taken along the proposed project facility with considerations of project potential receptors and sources. The Particulate matter concentration ranged from (**1.6-3.9)** µg/m3 at all project areas sampled for PM2.5.
- The PM10 concentrations ranged from (**2.2-5.3**) µg/m3 with most of the areas having **Low** concentration below the permissible levels of Suspended particulate matter in the atmosphere due to the on-going activities in the area for PM10.
- The exiting particulate matter is Low with much of the sources coming from the pollen grains from the plants in the area s sampled.

5.3.8.2 Gaseous Emissions

Gas emission sampling was carried out at the proposed project facility areas to establish the existing gas pollution environmental concentration levels during the preparation of Environmental and Social Impact Assessment (ESIA) report. **Table 5.4** below shows the findings of Gas emissions concentrations levels for specific areas around the proposed site with the potential exiting sources. In conclusions from the findings showed all areas with readings below detectable levels (BDL) since the potential sources of Air emissions were aren't existing at the time of sampling.

Table 5-4: Readings for Gas Emissions assessment around the proposed faecal sludge management facility in Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District

Name of Section / GPS Coordinates	Oxygen (O_2) %	Carbon Monoxide CO (PPM)	Hydrogen Sulphide (µg/m³)	LEL Methane CH_4	VOC (mgNm-3)	Impact rating	Potential Sources
National Environment (Draft Air Quality Standard for Ambient Air)	19.5-23.5	9.0	15	*	6	Low/medium/High BDL(Below Detection levels)	
Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District							
North the site 391415.00mE,200744.00mN1069 metres above sea level	20.8	0	0	0	0	BDL	Combustible process from Motor vehicle and Equipment
East of the Site 391412.00mE,200808.00mN, Elevation 1068 metres above sea level	20.8	0	0	0	0	BDL	Combustible process from Motor vehicle and Equipment
South of the Site 391373.00mE,200873.00mN,1066 metres above sea level	20.8	0	0	0	0	BDL	Combustible process from Motor vehicle and Equipment
West of the Site 391367.00mE,200906.00mN, Elevation 1062 metres above sea level	20.8	0	0	0	0	BDL	Combustible process from Motor vehicle and Equipment
center of the site 391468.59 m E,200980.00mN, Elevation 1053 metres above sea level	20.8	0	0	0	0	BDL	Combustible process from Motor vehicle and Equipment

Source: field data source February 2021. BDL (Below detectable Levels)

From the Table 5.4 above the Gas emission assessment revealed that:

- Ambient average oxygen concentrations at all sampled points was ranging from 20.8 percentage volume.
- There were no concentrations identified for compounds of Carbonmonoxide, Hydrogen and Sulphide, LEL (Methane) and VOCs during the time of sampling.

5.3.9 Waste water (Faecal sludge characteristics)

Table 5-5 below shows the results for the FS characteristics from the sampled sanitation facilities (lined pit latrines and septic tanks) in the town councils (TCs) of Bweyale, Kigumba and Kiryandongo. Included in the table are the NEMA effluent discharge standards for treated effluent, for comparative purposes. Where the quality parameters comply with the discharge standards implies the FS can be discharged, with minimal impact to the receiving environment.

5.3.9.1 pH and EC

The pH values of all samples were within acceptable NEMA effluent discharge limits of 6.0 to 8.0. Faecal sludge pH outside the range of 6.0 to 9.0 is reported to indicate upset in biological process, which could inhibit anaerobic digestion and subsequent methane production (Niwagaba *et al.*, 2014).

High EC values (1603 to 21720 µS/cm) were exhibited in FS from the sampled facilities. EC measures salinity of all the ions dissolved in FS, including the negatively and positively charged ions. The sources of salts in FS are sodium-based soaps, phosphates and nitrates present in washing powders and bathing soap, discharged in sanitation facilities. High EC can become a hazard when untreated FS is reused as soil conditioner. It can considerably reduce plants yield potential and also may lead to increased salinization, if such untreated FS is used on the soil for a long time (Morel & Diener, 2006). Such problems can occur especially when clay and loamy soils with low percolation rates are irrigated with saline FS effluents, and in arid regions with high evaporation rates. Permissible EC values for irrigation with wastewater are dependent on soil characteristics. However, Grattan (2002) suggested an EC limit value of 1,300 µS/cm above which special precautions are required if effluent is to be used for irrigation purposes.

5.3.9.2 Faecal sludge solids

All the sampled sanitation facilities had high concentrations of total and suspended solids. Specifically, TSS concentrations were 5 to 693 folds more than the acceptable effluent discharge standards of <100 mg/L (**Error! Reference source not found.**). High concentrations of TSS can lead to turbidity and may result in clogging of pipes, pumps (if any) and filter materials used in treatment processes, if FS is directly loaded onto some technologies such as drying beds. Similarly, the high proportion of TSS/TS (>50%) for all the sampled facilities, indicates that significant volume reduction in solids content can be achieved with inclusion of settling/thickening tank among the treatment technologies (Bassan *et al.*, 2013).

5.3.9.3 Sludge Volume Index (SVI)

The test was conducted with Imhoff cone. It is relevant in determining the settleability of the specific faecal sludge. All samples have SVI values between 9 and 54 (less than 100 mL/gTSS) which implies a good solids-liquid separation can be achieved, hence are suitable for settling-thickening technologies.

5.3.9.4 Organics (COD and BOD5)

FS from all the sampled sanitation facilities (lined pits and septic tanks) exhibited COD and BOD_5 concentrations beyond the recommended NEMA effluent standards of 100 and 50 mg/L, respectively. This is an indicator of high organic levels, which pose great risks when such FS is disposed of in the environment. Discharging such untreated FS in water bodies results in the consumption of dissolved oxygen, which could lead to destruction of aquatic life (Strande *et al.*, 2014).

The ratio of COD to BOD_5 was generally ranging from 1.2 to 3.9. A low COD/BOD_5 ratio of less than 2.5 indicates high biodegradability (Morel & Diener, 2006). Many samples with a ratio of less than 2.5 reflects a need for further stabilization prior to end-use or disposal of FS effluent. A biological stabilization process is required for treatment of FS from this cluster towns.

5.3.9.5 Nutrients

All the sampled sanitation facilities contained FS with total nitrogen (1190-15500 mg/L) and total phosphorus (44-233 mg/L) beyond the recommended effluent discharge standards of <10 mg/L, each. Nitrogen originates primarily from urine (which is a FS component), protein containing waste foods, protein containing shampoos, and other household products. On the other hand, dish washing and laundry detergent are the main sources of phosphorus in FS. FS contains nutrients (nitrogen and phosphorus) which result in environmental contamination such as eutrophication in surface waters and contamination of drinking water sources, if not properly managed. However, high nutrient concentration in FS can be beneficial if harnessed for resource recovery such as soil conditioning. These can be important parameters, given their fertilizing value for plants.

5.3.9.6 Pathogens

All sampled FS contained faecal coliform concentrations (indicator of faecal contamination) in the range of 3.62×10^5 to 1.58×10^7 cfu/100 mL, as opposed to the national effluent discharge permissible limit of 5×10^3 cfu/100 mL (Table 5-5 under legislation). Faecal sludge contains large amounts of micro-organisms mainly resulting from faeces, a component in FS. These micro-organisms can be pathogenic and exposure to untreated FS constitutes a significant health risk to humans either through direct contact or indirect exposure. However, pathogen concentration in FS is not as much as that in fresh excreta. This could be due to pathogen decimation because of the long retention time of FS in the onsite sanitation facilities.

Table 5-5: Measured characteristics of faecal sludge from selected sampled sanitation facilities in Bweyale, Kigumba and Kiryandongo TCs

Parameter	Units	Bweyale TC						Kigumba TC		Kiryandongo TC		NEMA effluent Discharge standards*
		1	2	3	4	5	6	7	8	9	10	
		Lined pit	Lined pit	Septic	Septic	Septic	Septic	Septic	Lined pit	Lined pit	Septic	
pH		7.43	7.34	6.76	6.44	6.31	6.69	6.57	7.48	6.79	6.51	**6.0-8.0**
EC	µS/cm	21720	19200	5830	2103	1705	2650	1665	21100	7580	1603	**1300++**
Temperature	°C	24.5	23.5	27.1	29.4	27.3	25.2	26.7	24.9	27.4	26.9	**20-35**
Oxygen Reduction Potential, ORP	mV	-57.4	-52.5	-19.1	-0.7	6.7	-15.7	-8.4	-60.5	-21	-5.1	
Total solids, TS	mg/L	19000	70100	80000	4120	3557	11157	3769	18819	4216	814	**ns**
Total volatile solids, TVS	%TS	99.2	83			76	68.7	66.3	53.3	22.7	26.9	
Moisture Content	%	99.3	96.6	98.4		99.6	98.9	99.6	98.2	99.6	99.9	
Total Suspended solids, TSS	mg/L	16700	69300	68700	2540	2870	9730	3110	10800	2200	503	**100**
Sludge Volume Index, SVI	mL/g TSS	37.5	44.3	22.9	40.4	27.4	27.9	53.6	8.8	22.4	51.0	**<100**
Total Nitrogen, TN	mg/L	14800	1870	14900	1320	1560	14100	1310	15500	1190	1500	**10**
Total Phosphorus	mg/L	233.2	189.34	89.9	64.62	84.36	178.2	59.1	189.24	121.04	43.62	**10**
Chemical Oxygen Demand, COD	mg/L	25200	21100	25000	4825	1750	11650	1515	16850	28650	11270	**100**
Biochemical Oxygen Demand, BOD_5	mg/L	11640	12250	18300	1230	1175	7800	1300	13100	12600	5000	**50**
Faecal Coliforms	cfu/100mL	5.35E+05	2.46E+06	2.40E+06	1.47E+06	1.58E+07	6.84E+06	5.30E+06	3.62E+05	5.82E+05	6.27E+05	**10000**
TSS/TS	%	87.9	98.9	85.9	61.7	80.7	87.2	82.5	57.4	52.2	61.8	
COD/BOD_5 ratio		2.2	1.7	1.4	3.9	1.5	1.5	1.2	1.3	2.3	2.3	**<2.5**

Note: **Uganda National Discharge Standards, 1999. ns – Not specified, NA – no separation was achieved in Imhoff cones. The grey shaded values indicate parameters that must be improved during treatment*
++ *EC limit for reuse of effluent in irrigation (Grattan, 2002).*

<u>Sample ID description</u>*; **1** – Panyabe HC III, **2** – Arnold Primary School, **3** – Bweyale main Market, **4** – Florida Guesthouse, **5** – Shell - Bweyale, **6** – Household in Bweyale, **7** – Don Ptro Satation - Kigumba, **8** – Kigumba C.O>U Primary School, **9** – Kiryandongo hospital, **10** – Kiryandongo TC Youth Centre..*

5.4 Socio-Economic Environment

5.4.1 Local Economy

The local economy within Kiryandongo District revolves around both petty trade in both the towns, trading centres and subsistence agriculture in the rural areas / suburbs of the district.

There are both commercial farms, recreational facilities (hotels, restaurants, Karuma wildlife reserve and Murchison falls national park MFNP) which provide a source of livelihood and revenue to the population in the district.

5.4.2 Road and Communication Infrastructure

According to Kiryandongo District Local Government 2015, the district has a total road network of 1, 146kms. 131.2kms are classified as national roads of which 77.2kms are tarmacked and 54kms are of gravel. 367kms are classified as District roads of which 65% are in good/fair motorable condition. 126kms are urban roads of which only 0.4kms are tarmacked. 532 kms are major community access roads having less than 30% of the access roads as motorable.

5.4.3 Population and Demographic characteristics

According to UBOS 2014, Kiryandongo population at 266,197 people of which 132,882 (49.9%) as males and 134,647 (50.1%) females. The population of the various Kigumba cluster towns is shown in **Table 5.6 below** (with Towns are shown in red). The population density stands at 74 persons per square km and **Figure 5-8** below depicts the population density of the various Town councils within the district.

Table 5-6: Population and Demographics for Kigumba Cluster Towns

District	Population	Households			
	Males	Females	Total	Households (HH)	% of HH that are female headed
Kiryandongo District	**132,822**	**133,375**	**266,197**	**52,170**	**22.4**
Bweyale Town Council	15,038	16,135	31,173	6,267	29.1
Central	9,642	10,405	20,047	4,199	28.2
Northern	1,587	1,755	3,342	617	30.8
Southern	3,809	3,975	7,784	1,451	30.9
Kigumba Sub County	22,197	21,743	43,940	8,411	19.0
Kigumba I	7,942	7,928	15,870	2,944	19.8
Kiigya	6,958	6,391	13,349	2,505	20.0
Mboira	7,297	7,424	14,721	2,962	17.4
Kigumba Town Council	8,850	9,775	18,625	4,076	28.0
Ward A	3,027	3,337	6,364	1,498	29.8
Ward B	3,378	3,882	7,260	1,610	27.8
Ward C	2,445	2,556	5,001	968	25.6

District	Population	Households			
	Males	Females	Total	Households (HH)	% of HH that are female headed
Kiryandongo Sub County	40,621	39,736	80,357	15,377	18.6
Kichwabugingo	13,426	13,299	26,725	5,134	19.8
Kikube	8,128	8,191	16,319	3,268	20.8
Kitwara	9,354	8,500	17,854	3,464	13.9
Kankyende	9,713	9,746	19,459	3,511	19.3
Kiryandongo Refugee Camp	6,796	7,273	14,069	2,302	46.7
Ranch I	1,988	2,057	4,045	630	53.5
Ranch Xviii	1,318	1,247	2,565	537	20.3
Ranch Xxxvii	3,490	3,969	7,459	1,135	55.5
Kiryandongo Town Council	2,956	3,016	5,972	1,304	30.5
Northern	1,833	1,914	3,747	740	32.3
Southern	1,123	1,102	2,225	564	28.2
Masindi Port Sub County	4,646	4,229	8,875	1,893	19.8
Kaduku	2,707	2,374	5,081	1,080	16.8
Waibango	1,939	1,855	3,794	813	23.7
Mutunda Sub County	31,718	31,468	63,186	12,540	19.2
Diima	11,779	11,877	23,656	4,741	22.7
Kakwokwo	8,715	8,004	16,719	3,378	16.8
Nyamahasa	11,224	11,587	22,811	4,421	17.3

Source: UBOS 2014

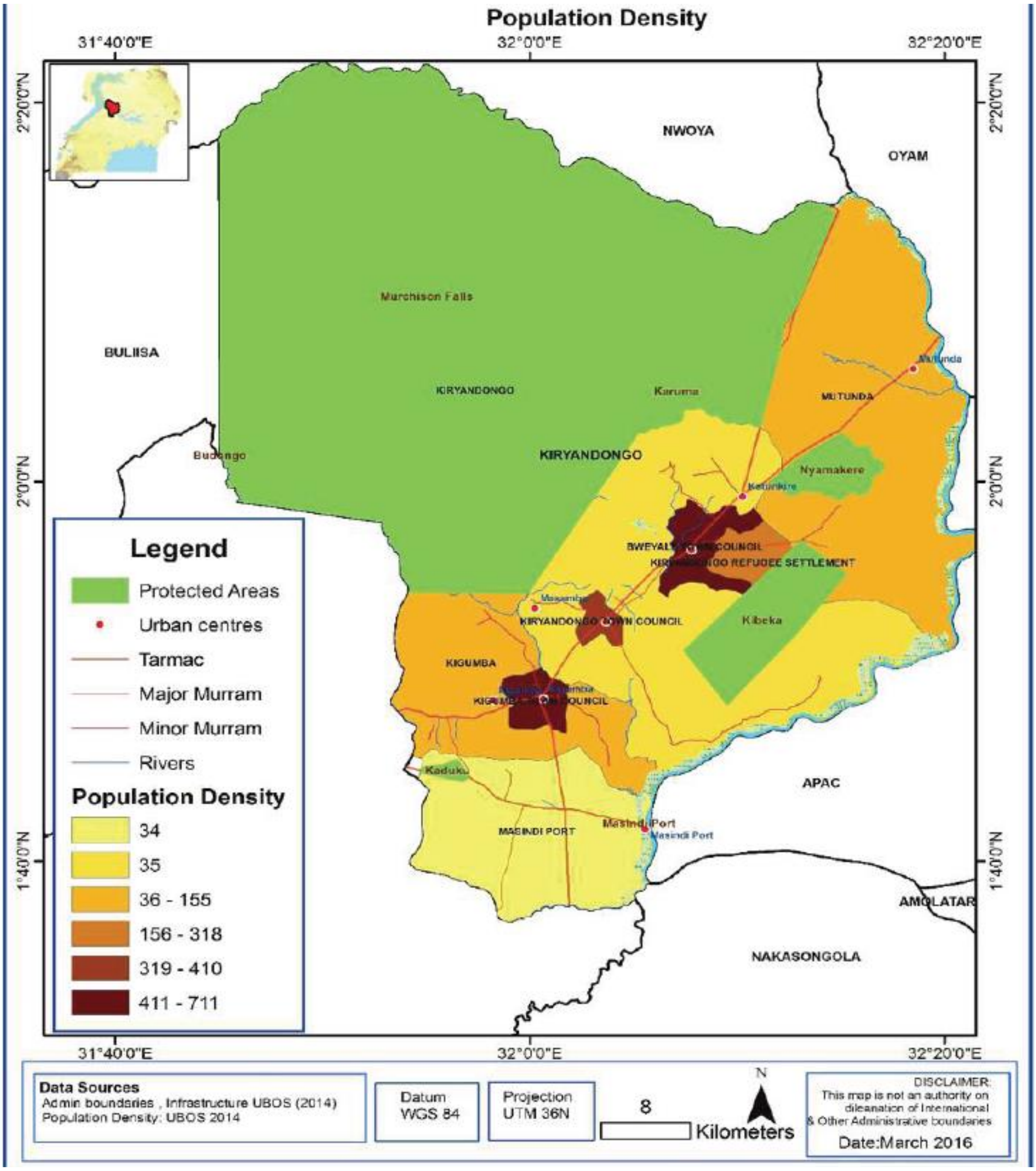


Figure 5-8: Population Density in Kiryandongo District
Source: OPM 2016

5.4.4 Housing and Settlement Patterns

Kigumba Cluster Towns comprise of Kigumba Town Council, Kiryandongo Town Council, Bweyale Town Council and Katulikire Town Council and the settlements patterns of the cluster towns are summarized in **Table 5-7 below.**

Table 5-7: Settlement Patterns in Kigumba Cluster Towns

TOWN	NOTES
KIGUMBA T/C 	The core of the Town is characterised by permanent and semi-permanent structures. The settlements are nucleated within the core of the Town and are located along the well planned tarmac and gravel access roads The fringe areas of the Town have dispersed settlements characterised by semi-permanent structures
KIRYANDONGO T/C 	The core of the Town is characterised by permanent and semi-permanent structures. The settlements are located along the well planned tarmac and gravel access roads The fringe areas of the Town have dispersed settlements characterised by semi-permanent structures
BWEYALE T/C 	The core of the Town is characterised by permanent and semi-permanent structures. The settlements are nucleated within the core of the Town and are located along the tarmac and gravel access roads The fringe areas of the Town have dispersed settlements characterised by semi-permanent structures
KATULUKIRE	The core of the Town is characterised by permanent and semi-permanent structures. The settlements are located

TOWN	NOTES
	along the gravel access roads The fringe areas of the Town have dispersed settlements characterised by semi-permanent structures

Source: MWE 2019

5.4.5 Health situation

Kiryandongo district is served by 25 health facilities that are fully operational. This includes Kiryandongo general hospital, 8 health center IIIs and 16 health center IIs. (Both government, Private and PNFPs) as shown in **Table 5.8 below.**

Table 5-8: Health facilities within Kiryandongo District

Health Facility	Level	Ownership	Status	Functionality
Hospital	HC IV	Government	Permanent	Functional
Kicwabugingo	HC II	Government	Permanent	Functional
Kitwara	HC II	Government	Permanent	Functional
Tecwa	HC II	Government	Permanent	Functional
Katuliikire	HC III	Private & Not for Profit	Permanent	Functional
Karungu	HC III	Private & Not for Profit	Permanent	Functional
Panyadoli	HC III	Government	Permanent	Functional
Panyadoli Hills	HC II	Government	Permanent	Functional
Kiroko	HC II	Government	Permanent	Functional
Diika	HC II	Government	Permanent	Functional
Nyakadoti	HC II	Government	Permanent	Functional
Kiryandongo Pri	HC II	Government	Permanent	Functional
Diima	HC III	Government	Permanent	Functional
Karuma	HC II	Government	Permanent	Functional
Mutunda	HC III	Government	Permanent	Functional
Yabweng	HC II	Government	Permanent	Functional
Apodorwa	HC II	Government	Permanent	Functional
Mpumwe	HC II	Government	Permanent	Functional
St. Mary's Kig	HC III	Private & Not for Profit	Permanent	Functional
Kiigya	HC II	Government	Permanent	Functional
Kigumba Prison	HC II	Government	Permanent	Functional

Health Facility	Level	Ownership	Status	Functionality
Kigumba	HC III	Government	Permanent	Functional
Medical Centre	HC II	Private & for Profit	Permanent	Functional
Kaduku	HC II	Government	Permanent	Functional
Masindi Port	HC III	Government	Permanent	Functional

Source: KDLG 2016

The most common diseases in the Kiryandongo district have been previously reported and remain as malaria, upper respiratory tract infections and watery diarrhoea among others.

According to UBOS 2014, in Kiryandongo District the percentage of households that have access to health care facilities within 5km or more and the Cluster Towns (in red) is detailed in Table 5.9 and Figure 5-9 below.

Table 5-9: Household access to Health facilities in Kigumba Cluster Towns

Subcounty / Town Council	HH Access to Health Care Facility ≥ 5km (%)	HH Access to Health Care Facility ≤ 5km (%)
Kigumba Town Council	86.5	13.5
Bweyale Town Council	72.4	27.6
Kiryandongo Town Council	99.7	0.3
Mutunda Sub County	55.5	44.5
Kiryandongo Sub County	45.3	54.7
Kigumba Sub County	72.5	27.5
Masindi Port Sub County	44.9	55.1

Source: UBOS 2014

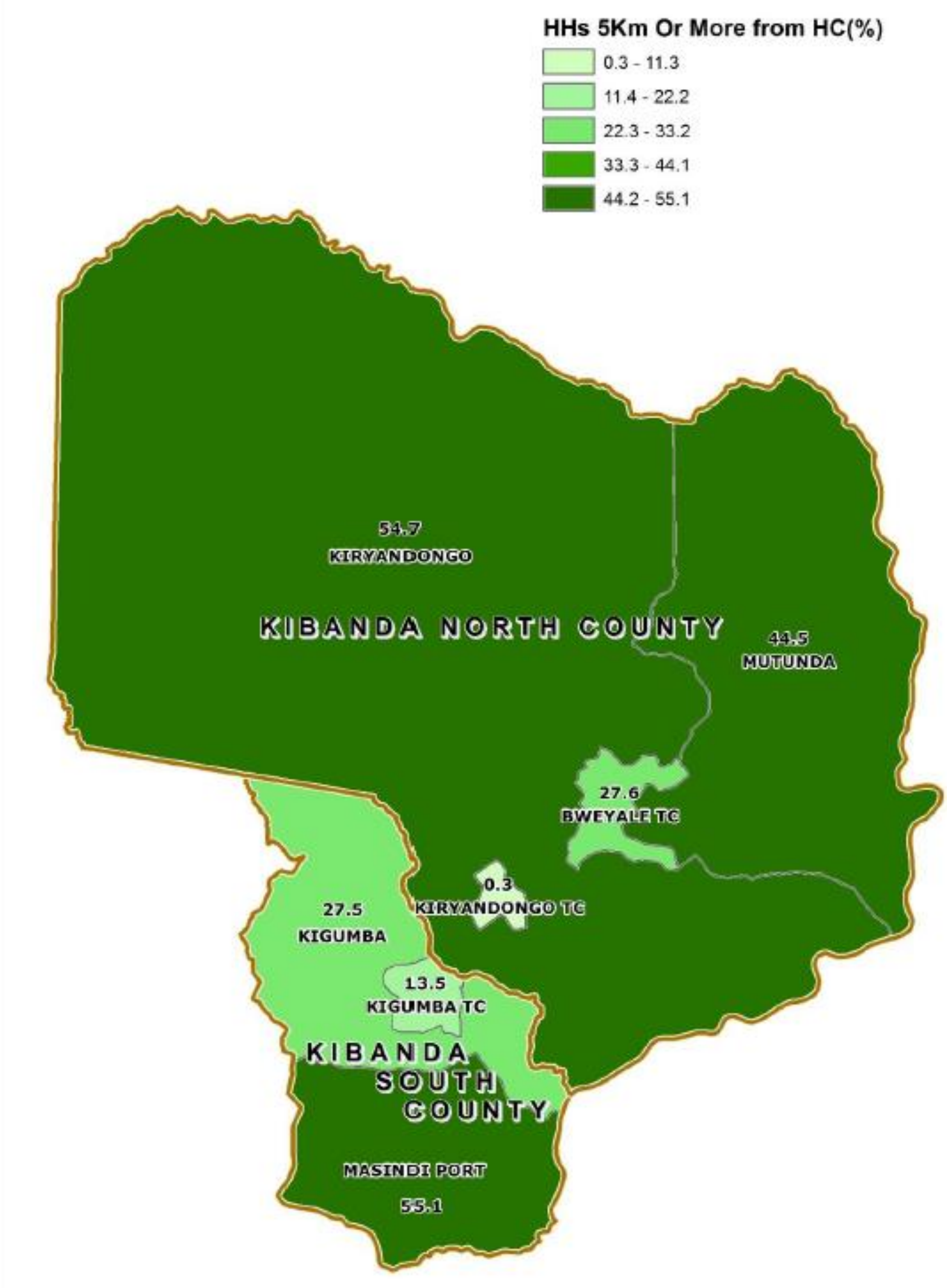


Figure 5-9: Access to Health facilities within Kiryandongo District
Source: UBOS 2014

5.4.6 Education and literacy levels

According to KDLG 2015, Kiryandongo district has seventy-three government aided primary schools; thirty-four private primary schools; four government aided secondary schools; twenty-four private secondary schools and two government tertiary institutions as well as one private tertiary institution. Furthermore, the teacher pupil ratio within the district stood at 1:63 compared to the national standard of

1:40, classroom pupil ratio was at 1:70 compared to the national standard of 1:55, desk pupil ratio was at 1:5 compared to the national standard of 1:3 and latrine stance pupil ratio is at 1:60 compared to the national standard of 1:40.

According to UBOS 2014, the level of education among the active population (18-30 years) within the various local governments in the district is as shown in **Table 5.10 and Figure 5-10 below**.

Table 5-10: Education and Literacy levels within Kiryandongo District

Subcounty / Town Council	Literacy Levels among 18-30 years (%)	Illiteracy Levels among 18-30 years (%)
Kigumba Town Council	87.5	12.5
Bweyale Town Council	82.8	17.2
Kiryandongo Town Council	83.2	16.8
Mutunda Sub County	90.1	9.1
Kiryandongo Sub County	96.1	3.9
Kigumba Sub County	94.8	5.2
Masindi Port Sub county	95	5

Source: UBOS 2014

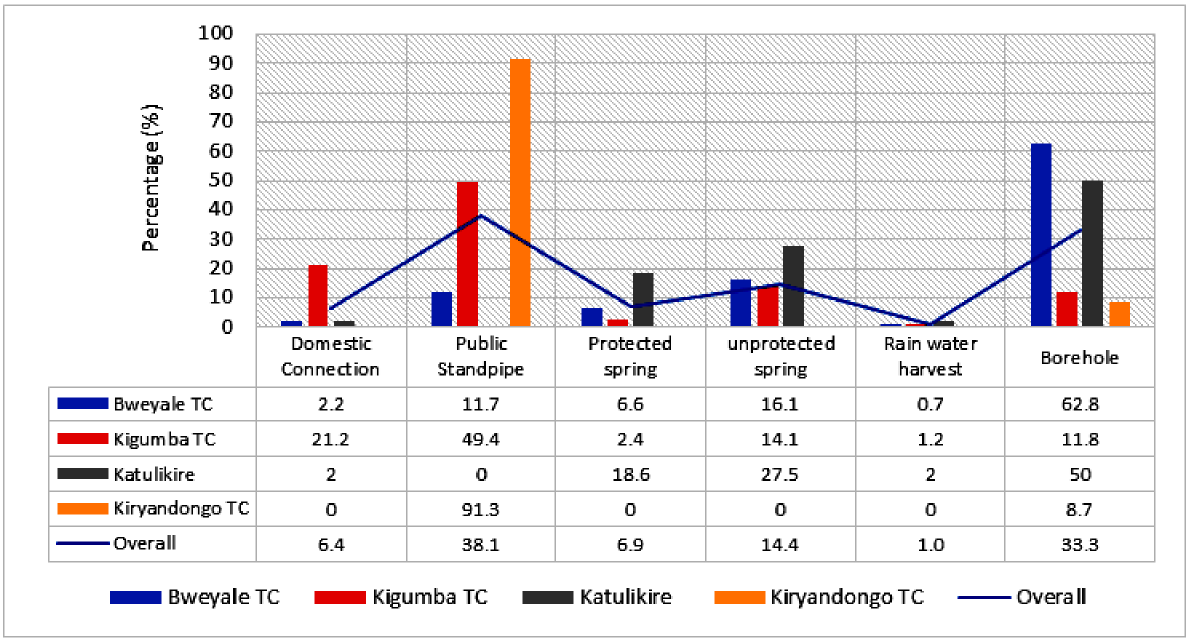
Figure 5-10: Level of Education among the population between 18-30 years within Kiryandongo District

Source: UBOS 2014

5.4.7 Water coverage

Main Sources of Water: The majority of households visited reported getting water from safe water sources that include public standpipes (38.1%) followed by boreholes (33.3%). The above notwithstanding, there is a significant section of the households (14.4%) that still relied on getting water from un-safe water sources (un-protected springs), these households were mainly found in Katulikire (27.5%) followed Byeyale TC (16. 1%). In comparison with the rest of the Country, the proposed towns are faring better than the greater part of the Country in using improved sources of drinking water – National average stands at 78%. Refer to **Figure 5-11 below.**

Description of improved sources of drinking water in Uganda include water from the following water sources: piped water, tube wells, boreholes, protected dug wells, protected springs, and rainwater.



	Domestic Connection	Public Standpipe	Protected spring	unprotected spring	Rain water harvest	Borehole
Bweyale TC	2.2	11.7	6.6	16.1	0.7	62.8
Kigumba TC	21.2	49.4	2.4	14.1	1.2	11.8
Katulikire	2	0	18.6	27.5	2	50
Kiryandongo TC	0	91.3	0	0	0	8.7
Overall	6.4	38.1	6.9	14.4	1.0	33.3

Figure 5-11: Main Water Sources for Households within Kiryandongo District
Source: *MWE 2019, Faecal Sludge Management Report – Kigumba Cluster Towns*

5.4.7.1 Access to safe water

According to UBOS 2014, the households without access to safe water are represented in Figure 5.8 below with Mutunda Sub County (28.2%), Kiryandongo Sub County (25.3%), Masindi Port sub county (16.6%), Bweyale Town Council (12.1%), Kigumba Town Council (10%), Kigumba Sub County (9.3%) and Kiryandongo Town Council (3.3%) respectively as shown in **Figure 5-12 below.**

Figure 5-12: Water coverage within Kiryandongo District
Source: UBOS 2014

5.4.8 Sanitation and Toilet coverage

5.4.8.1 Waste disposal

According to MWE 2019, the study found out that there was not any formalized solid waste management system that regulate solid waste generation, storage, collection, dumping and re-use in the proposed towns.

Many of the households (35.4%) reported dumping solid waste in open dumps, followed by 27.9% that reported dumping waste in open dumps and 26.4% that dispose garbage in bins provided by Council as shown in **Figure 5-13 below**.

The open dumping methods possess great environment and health hazards worse still even the waste that is stored in the private bins eventually end up in the open dumps.

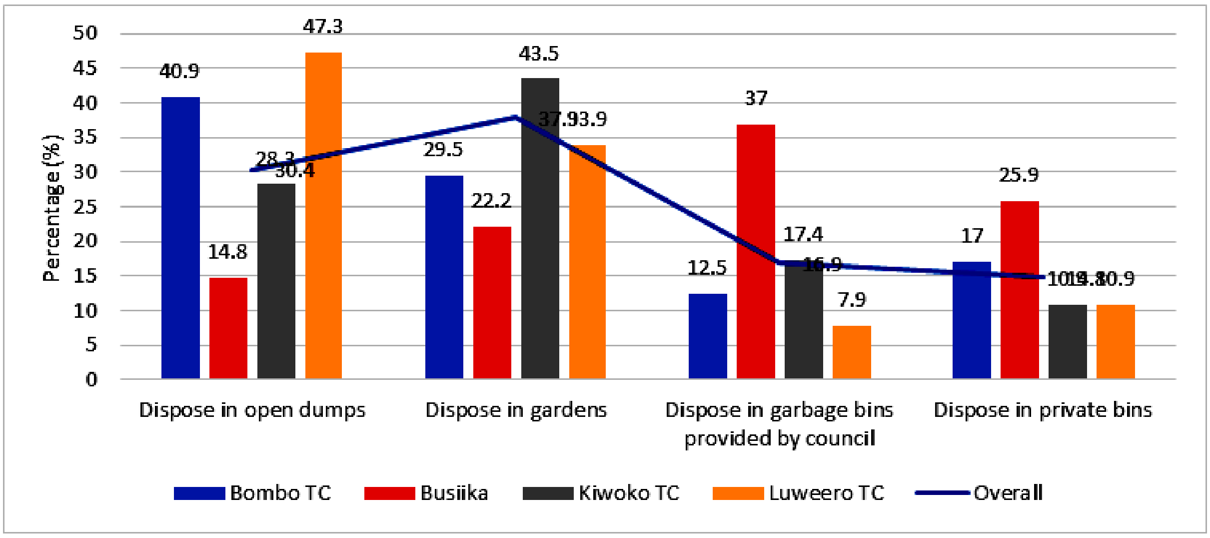


Figure 5-13: Disposal of Solid Waste
Source: *MWE 2019, Faecal Sludge Management Report – Kigumba Cluster Towns*

In the proposed towns, the local authorities do not charge residents for solid waste management, they instead use collections from local revenue to facilitate collection and dumping of solid waste.

Since local authorities were collecting solid waste from the collection centre free of charge, majority of respondents (99.5%) reported that they do not pay for solid waste management in Kiryandongo TC and Katulikire none of the respondent reported paying money for solid waste management (**Refer to Figure 5.14 below**).

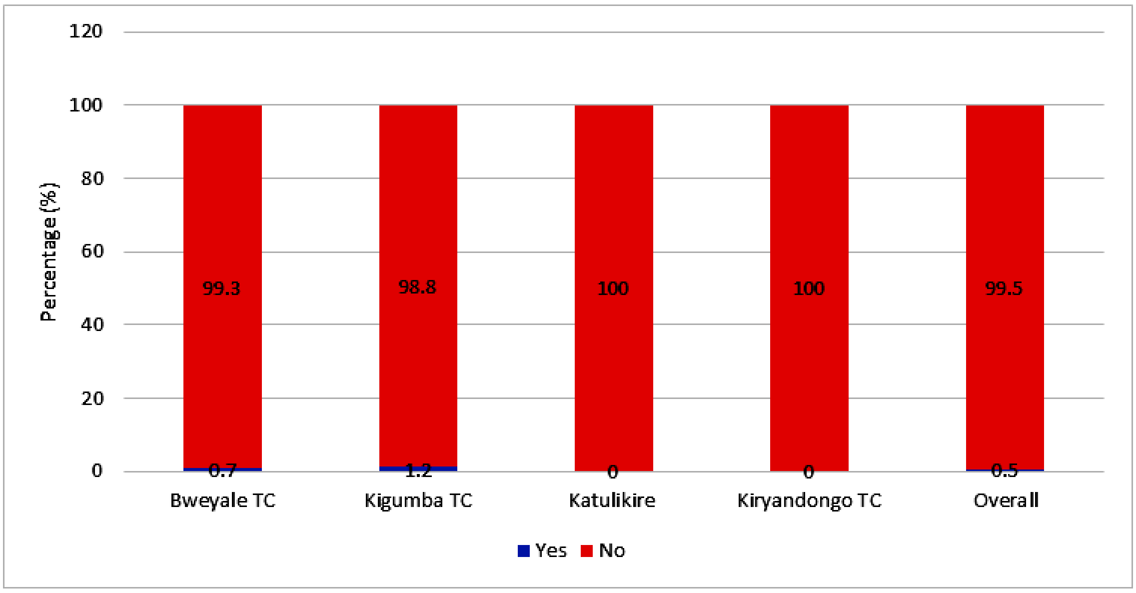
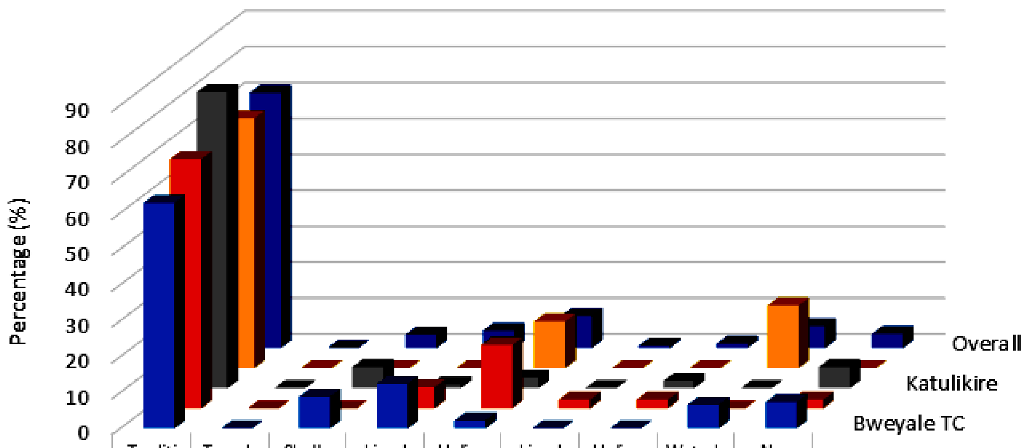


Figure 5-14: Payment for Solid Waste Management by Households
Source: *MWE 2019, Faecal Sludge Management Report – Kigumba Cluster Towns*

5.4.8.2 Toilet Coverage

According to MWE 2019, most of the respondents (96.1%) had sanitation facilities these households were mainly found in Bweyale TC (7.3%) and Katulikire (5.9%). The most dominant type of sanitation facilities were the traditional pits that were found in 71.1% of households. The majority of these were found in Katulikire (82.4%) followed by Kigumba and Kiryandongo TCs (69.6%) as shown in **Figure 5-15 below**.



	Traditional pit	Trenches	Shallow pits	Lined VIP	Unlined VIP	Lined double VIP	Unlined double VIP	Waterborne toilet	No toilet/latrine
Bweyale TC	62.8	0	8.8	12.4	2.2	0	0	6.6	7.3
Kigumba TC	69.4	0	0	5.9	17.6	2.4	2.4	0	2.4
Katulikire	82.4	0	5.9	1	2.9	0	2	0	5.9
Kiryandongo TC	69.6	0	0	0	13	0	0	17.4	0
Overall	71.1	0.0	3.7	4.8	8.9	0.6	1.1	6.0	3.9

Figure 5-15: Type of Sanitation Facilities within Kiryandongo District
Source: *MWE 2019, Faecal Sludge Management Report – Kigumba Cluster Towns*

5.4.8.3 Access to Toilet facilities

According to UBOS 2014, the access to Toilet facilities within Kiryandongo District with the various local governments with Bweyale Town Council 93.6% (without access 6.4%), Kiryandongo Town Council 96.9% (without access 3.1%), Kigumba Town Council 98.1% (without access 1.9%), Kigumba Sub county 82.1% (without 17.9%)Kiryandongo Sub County 84.9% (without access 15.1%), Mutunda sub county 79.8% (without access 20.2%) and Masindi Port Sub county 61.2% (without access 38.8%) as shown in **Figure 5-16 below**:

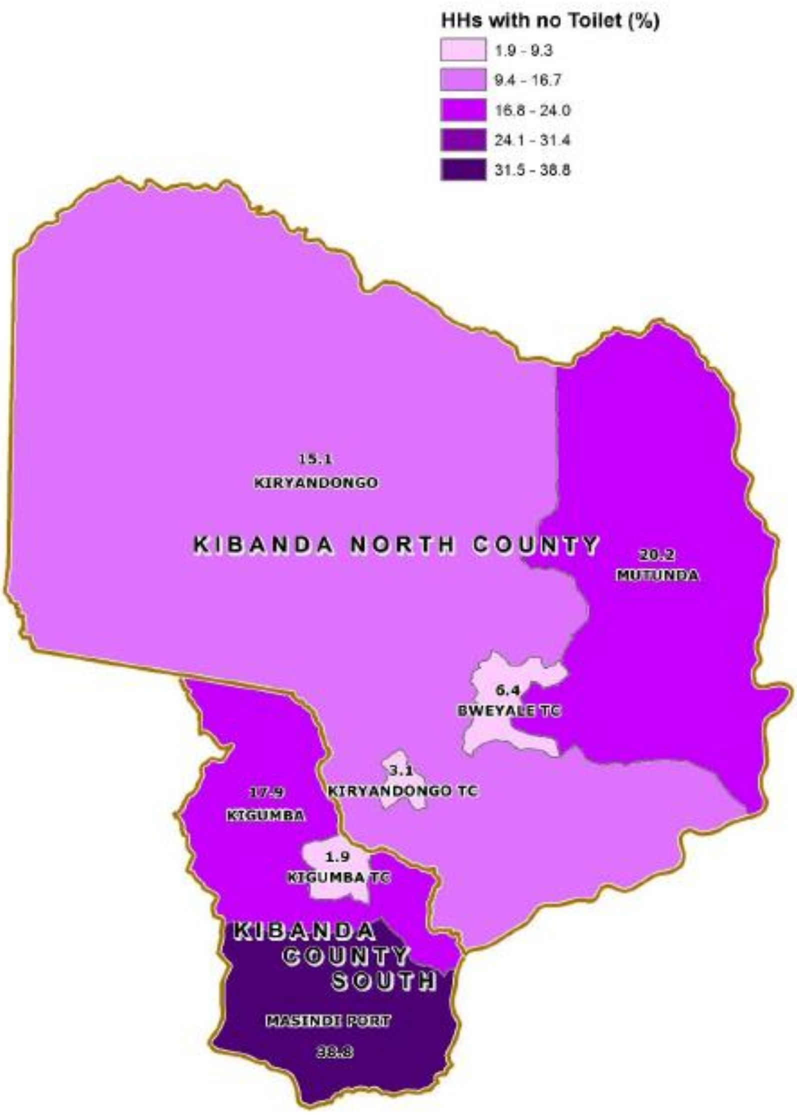


Figure 5-16: **Toilet coverage within Kiryandongo District**
***Source**: UBOS 2014*

5.4.8.4 Toilet coverage in Kigumba Town Council

Kigumba Town Council was identified as a potential location for the proposed faecal sludge treatment plant. The town council has an existing piped water supply system managed by NWSC.

The town council has a number of institutions such as primary schools, secondary schools, health center, hotels, offices, market, etc. There is a refugee settlement, Kiryandongo Refugee Settlement, located approximately 3km away.

The commercial institutions majorly rely on waterborne toilets connected to septic tanks. The education institutions majorly rely on pit latrines. The majority of pit latrines at the schools are unlined pit latrines. Unlined pit latrines are constructed at household level.

The town council has two public waterborne toilets, one is located at the daily market and the second is privately owned and located within the core of the town council.

The methods of emptying septic tanks and lined pit latrines are:

i. Use of a cesspool emptier. There are waste stabilization ponds (lagoons) in Kiryandongo hospital. Cesspool emptier trucks are hired from Kampala or Bweyale Town Council and dispose of the waste in the lagoon at the hospital. The lagoon was sized for only wastewater from the hospital; hence the hospital restricts the quantity of waste disposed of in the lagoon. There have been incidents of disposal of faecal sludge in swamps when the hospital doesn't grant access. This method of emptying is used by the education and commercial institutions.

ii. Manual emptying. Manual emptying is done by specialized personnel who access the vault and use buckets to collect the faecal matter. The faecal matter is disposed of in a pre-dug hole and buried. This method of emptying is cheaper than use of a cesspool emptier and is commonly used by households.

Figure 5-17: **Waterborne Toilet at a Petrol Station in Kigumba Town Council**

5.4.8.5 Toilet coverage in Kiryandongo Town Council

Kiryandongo Town Council is located approximately 10km North East from Kigumba Town Council. The town council has an existing piped water supply system managed by NWSC.

The town council has a number of institutions such as primary schools, secondary schools, hospital, hotels, offices, market, etc. The institutions majorly rely on pit latrines and a few rely on waterborne toilets connected to septic tanks. There are sections of the Town Council that have a high-water table; hence the residents build shallow pit latrines.

The pit latrines at institutions are lined and unlined pit latrines while at household level, lined and unlined pit latrines are constructed.

The methods of emptying septic tanks and lined pit latrines are:

i. Use of a cesspool emptier. There are waste stabilization ponds (lagoons) in Kiryandongo hospital, treating wastewater from a sewer network within the hospital. Cesspool emptier trucks are hired from Kampala or Bweyale Town Council and dispose of the waste in the lagoon at the hospital. The lagoon was sized for only wastewater from the hospital; hence the hospital restricts the quantity of waste disposed of in the lagoon. Additionally, some of the cesspool emptier trucks dispose of the faecal sludge in the maturation pond leading to poor treatment of waste. There have been incidents of disposal of faecal sludge in swamps when the hospital doesn't grant access. This method of emptying is used by the education and commercial institutions.

ii. Manual emptying. Manual emptying is done by specialized personnel who access the vault and use buckets to collect the faecal matter. The faecal matter is disposed of in a pre-dug hole and buried. This method of emptying is cheaper than use of a cesspool emptier and is commonly used at household level.

Figure 5-18: Waste Stabilization Ponds at Kiryandongo Hospital

5.4.8.6 Toilet Coverage in Bweyale Town Council

Bweyale Town Council is located approximately 22km North East from Kigumba Town Council. The town council has an existing piped water supply system managed by NWSC.

The town council has a number of institutions such as primary schools, secondary schools, health centers, hotels, offices, market, etc. The institutions majorly rely on pit latrines and a few rely on waterborne toilets connected to septic tanks.

The pit latrines at institutions are lined and unlined pit latrines while at household level, lined and unlined pit latrines are constructed.

The methods of emptying septic tanks and lined pit latrines are:

i. Use of a cesspool emptier. There are waste stabilization ponds (lagoons) in Kiryandongo hospital. A cesspool emptier truck is hired from within the Town Council (one privately owned cesspool emptier truck) and disposes of the waste in the lagoon at the hospital. The lagoon was sized for only wastewater from the hospital; hence the hospital restricts the quantity of waste disposed of in the lagoon. There have been incidents of disposal of faecal sludge in swamps when the hospital doesn't grant access. This method of emptying is used by the education and commercial institutions.

ii. Manual emptying. Manual emptying is done by specialized personnel who access the vault and use buckets to collect the faecal matter. The faecal matter is disposed of in a pre-dug hole and buried. This method of emptying is cheaper than use of a cesspool emptier and is commonly used at schools and household level.

Figure 5-19: Waterborne Toilet at a Market in Bweyale Town Council

5.4.9 Land Tenure and Land use

The predominant land tenure system within Kiryandongo District is both Customary land tenure, Freehold land Land tenure, mailo land tenure among others. The proposed site for the faecal sludge management facility is located on land that is on free hold and was acquired from the owner by the Ministry of Water and Environment (Refer to Land Agreement in **Appendix 1**)

According to OPM 2016, the major land use within Kiryandongo District comprise of woodland, Grassland, wetlands, shrubs, built up area/ bare land and open water as shown in **Figure 5-20 below**

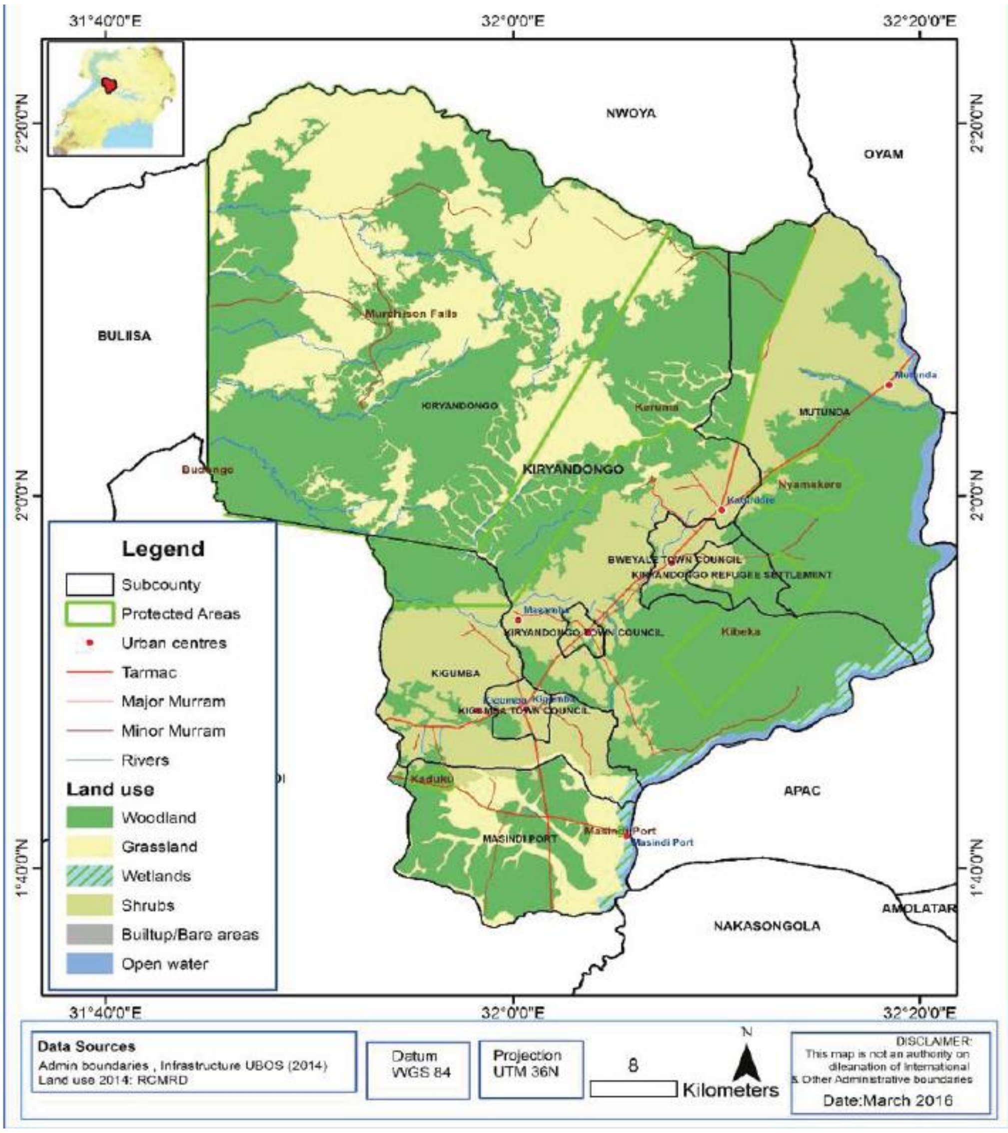


Figure 5-20: **Land use / Land cover around Kiryandongo District**

Source: *OPM 2016*

5.4.10 Administrative structure

According to Kiryandongo District Local Government 2015, Kiryandongo District is made up of one county called Kibanda county, four Sub counties namely Kiryandongo with four parishes of Kikuube, Kichwabugingo, Kitwara and Kyankende; Kigumba with three parishes of Mboira, Kiigya and Kigumba I; Masindi Port with two parishes of Kaduku and Waibango and Mutunda with three parishes of Diima, Kakwokwo and Nyamahasa. The district has one town board of Karuma and three town councils of Kiryandongo with two wards of Northern and Southern; Bweyale with three wards of Central, Northern and Southern as well as Kigumba with three wards of A, B and C. In total, the district has 211 gazetted villages.

6 STAKEHOLDER ENGAGEMENT AND PUBLIC DISCLOSURE

6.1 Introduction

Stakeholder consultation and Engagement Plan for the faecal sludge treatment facility in Kigumba town were prepared in accordance with the NEMA guidelines to seek opinions and views on the environmental and social aspects of the project and the related impacts. This included the local legal framework of consultation activities and project disclosure requirements, particularly in respect of public consultation activities that are directly required, were also consulted. In this regard, the key steps within the overall stakeholder consultation and engagement process include-

1) Identifying and notifying stakeholders of the EIA;
2) Holding meetings (formal and informal);
3) Making provision for stakeholders to review and comment on all reports; and
4) Making a record of responses to comments and concerns available to stakeholders.

A stakeholder analysis exercise was conducted to identify the potential interests of different stakeholders (excluding the project proponent) as well as the opportunities, threats and possible linkages they may have with regards to the proposed project.

The stakeholder analysis matrix is provided in Table 6.1.

As such, stakeholder consultation and engagement for the proposed faecal sludge treatment facility in Kigumba Town was undertaken in accordance with the NEMA guidelines so as to gather opinions and views on the environmental and social aspects of the proposed project.

Some of the key steps taken in the consultation and engagement process included:

a) Stakeholder consultation meetings; and

b) Site visits

Table 6-1: Stakeholder Analysis of faecal sludge treatment facilities in Kigumba Town Council, Kiryandongo District

Stakeholder	Interests	Opportunities	Threats	Linkages/Involvement with the proposed project
Central Government entities	• Sectoral guidance and policies • Input to environment management plans • Monitoring of environmental and social issues	Institutional support and coordination	Limited resources for monitoring A bureaucracy that may delay the progress of operations thus costing the project more time and money	Give guiding policies and government regulations Monitoring of works Technical support to District staff for restoration activities Issue approvals/permits/certificates to the project
Local Government entities	• Responsible for the planning and development of infrastructure (roads, water supply) • Representing project affected persons • Technical guidance during data collection • Accountability for development in their areas of jurisdiction	• Can provide information about population trends and their dynamics in the project area • Political support and mobilisation • Can be utilised as the contact persons in the project area • Can help in spreading information from sensitisation meetings	Political interference Lack of resources to participate fully	Share information on compensation modalities Witness the land acquisition and compensation process For purposes of facilitating the process of information among the stakeholders, district officials can participate in project progress and site meetings Can take up the role of liaising with the local communities since they are on the ground – through the Environmental Officer, the district can take on the role of environmental monitoring in collaboration with consultants
Local communities	• How will they be affected by the project? • Good source of information on the trends and dynamics within the project area • In some cases particularly the landowners, their livelihood might be affected by the proposed project • Can provide casual labour for the project	• Assistance in information transfer • Labour supply (Unskilled)	Misinterpret project intentions and therefore sabotage which eventually results in project delays If not sensitised, they might disrupt project activities	A good channel for information transfer and sharing Need for compensation Supply chain linkages

KEY:

Central government entities = Ministry of Water and Environment (MoWE), National Environment Management Authority (NEMA), ministry of gender labor and social development (under occupation health and safety department)

Local government entities = Kiryandongo District Environment Officer (DEOs)
Local communities = Residents of Kigumba Town Council

6.2 Meetings

Site visits to the proposed site for the faecal sludge treatment facilitys were conducted between the **2nd and 16th February 2021** to establish the likely situation on the ground and likely environmental and social concerns.

6.3 Comments Register

A record of all comments and observations made during the Environmental and Social Impact Study has been maintained and Table 6.2 below provides a summary of the key issues and concerns raised during the consultation and engagement by some of the key stakeholders (See **Appendix 5** for lists of people consulted)

Table 6-2: Stakeholder Consultations for the Proposed Faecal Sludge Facility Located in Kihura II Village, Ward C, Kigumba Town Council

DESIGNATION	WHEN AND WHERE	CONCERNS	REMARKS
Mr David Mugisa **Commissioner-Occupational Health and Safety** **MGLSD** **+256-772498767**	Online consultations held online on the 25th June 2021	**Wastewater and treatment** ✓ Many systems, receive infiltration, which can carry pesticides and herbicides from soil applications. For many years, work in the wastewater treatment field was regarded as the most hazardous to workers, particularly because of deaths involving confined space entry. The wastewater treatment area is seen as slightly less hazardous today, but treatment plant workers still experience health problems and death. Specifically, these experiences involve chemicals in the sewer system and in regular work exposures throughout the facility's operations. ✓ Mixing equipment, sludge rakes, pumps and mechanical devices used for a variety of operations in sewage treatment plants can maim, and even kill, if they are inadvertently activated when a worker is servicing them. Wet surfaces, often encountered in sewage treatment plants, contribute to slipping and falling hazards. ✓ Sewage and wastewater contain bacteria, funguses, parasites, and viruses that can cause intestinal, lung, and other infections. If equipment, work practices, and personal protective equipment (PPE) don't protect you from swallowing these agents, you can get sick. **Health effects** ✓ Some chemical-related health complaints are acute in nature and involve short-term exposures and	➢ Noted and incorporated in the impacts and mitigations

DESIGNATION	WHEN AND WHERE	CONCERNS	REMARKS
		complaints such as irritations of the eyes, nose or throat. Other problems are chronic and result from repeated exposures, sometimes over several years, that negatively affect internal organs or cause allergic reactions. ✓ Surveys indicate that wastewater treatment may generate aerosols containing microbiological and chemical factors. The primary path of exposure for aerosols is probably inhalation. The physical layouts of many sewage treatment plants involve open tanks and drainage areas; plants typically are not designed to prevent aerial dispersion of effluent during the treatment process. Volatile organics in wastewater may be vaporized or air-stripped during treatment. Many of the compounds are carcinogens and/or mutagens, so sewage workers may be at increased risk of cancer or adverse birth defects. **Exposure** ✓ Effluent treatment plant workers may be exposed to chemicals or organisms by direct contact with sewage, water and sludges, or by inhalation of gases, particles, aerosols, vapours or droplets. These hazards may come into the plant in soluble form or bound to suspended solids. Compounds reported from sludge analyses include chlorinated organic solvents, polychlorinated biphenyls (PCBs) and pesticides, petroleum hydrocarbons, flame retardants, heavy metals, asbestos, dioxins and radioactive materials.	

DESIGNATION	WHEN AND WHERE	CONCERNS	REMARKS
		✓ The concentration of organics and metals in sludge is indicative of the region's industries. In one case, high concentration of PCBs and sludge were caused by the fabrication of electrical equipment upstream from the treatment plant. ✓ Chemical derivatives formed by microbiological or other operations during the sewage treatment process may be more or less toxic than the original compound. Disease-causing organisms have been found in sewage sludge, so sewage workers may be at increased risk of infection or diseases. **Conclusion** ✓ To keep workers safe, operators	
Madam Patience Nssereko **NEMA** **+256-772656218**	25th /06/2021 Phone call	✓ The site should not be located in the wetland but can be adjacent to a wetland system ✓ The sites should not be located close to settlements. Any settlement within a radius of 200metres should be compensated.	➢ Noted and incorporated in the ESIA
Madam Resty Nyesigire **Ministry of Water and Environment** **+256-782860256**	9th July 2021 Phone call	✓ The Town Councils are in dire need for these faecal facilities and the ministry is responding to need ✓ The Ministry has ensured that the sites are not directly in the wetlands but near so that treated effluents from our planted wetlands can then be sent to the natural water bodies once treated ✓ As the ministry we are securing memorandums of understanding for the sites through the respective local governments who are mandated to provide the land spaces.	➢ Noted

DESIGNATION	WHEN AND WHERE	CONCERNS	REMARKS
Mr. Fred Kagara **Assistant Town Clerk Kigumba Town Council** **Tel: +256773447166**	5th February,2021 Community meeting at Kigumba Town Council	✓ We welcome the project in our area	➢ Noted
Mr. Augustine Muliko **Health Inspector. Bweyale Town Council** **Tel: +256774614425**	5th February,2021 Community meeting on site	✓ Sanitation will improve since people depose off their faecal matter anywhere, they find, many of them lack toilets	➢ Noted
Mr. Binepe Bwambale **Public Health Officer** **Tel: +256778454134**	5th February,2021 Community meeting held on site	✓ The project is particularly important to us, people lack pit latrines because when they can't empty them	➢ Noted
Ms. Stella Twikyirize **Health Assistant Kiryadongo Town Council** **Tel: +256781425462**	5th February,2021 Community meeting held on site	✓ We welcome the project ✓ We have been getting so many cases of Typhoid at the hospital in Kiryandongo Health centre II because of consumption of contaminated water	➢ Noted
Mr. Patrick Ogwok Adjacent Neighbour to the site Tel: +256772306839	5th February,2021 Community meeting held on site	✓ We welcome the project ✓ As a neighbour, am worried about the issue of smell being a nuisance to me and my children and I will be forced to leave yet I have been here for years	➢ Noted

7 ANALYSIS OF ALTERNATIVES

7.1 Introduction

One of the objectives of an EIA is to investigate alternatives to the proposed development. There are two types of alternatives - Fundamental Alternatives and Incremental Alternatives. Alternatives are "different means of meeting the general purpose and requirements of the activity" which includes alternatives to:

- The property on which or location where it is proposed to undertake the activity;
- The type of activity to be undertaken;
- The design or layout of the activity;
- The technology to be used in the activity; and
- The operational aspects of the activity.

There are two types of alternatives - Fundamental Alternatives and Incremental Alternatives.

7.2 Fundamental Alternatives

Fundamental alternatives are developments that are different from the proposed project and usually involve a different type of development on the proposed faecal sludge treatment facility in Kigumba town council.

7.2.1 A Different Type of Development

Since the main interest of the project proponent, the Ministry of Water and Environment-Central and Southwestern Uganda Water and Sanitation Development Facility intends to Promote and develop appropriate sanitation facilities in Kigumba town council.

The fundamental alternative of development other than to undertake a project that would allow the developers to construct the faecal sludge treatment facility and operate the facility is therefore not viable in this case and will not be considered further in the Environmental and Social Impact Statement.

7.2.2 A Different Location

The proposed project location was selected by the Ministry of Water and Environment-Central Uganda Water and Sanitation Development Facility after an in-depth needs assessment, as a result, 3 alternative locations/sites were found not technically feasible to meet the needs of Kigumba Town Council for the proposed development.

7.3 Incremental Alternatives

Incremental alternatives are modifications or variations to the design of the faecal sludge treatment project that provide different options to reduce or minimise environmental and social impacts. There are several incremental alternatives that can be considered. These include.

- ✓ The design or layout of the activity.
- ✓ The technology to be used in the activity, and;
- ✓ The operational aspects of the activity.

These alternatives will be considered as part of the design process for the proposed faecal sludge treatment facility in Kigumba Town Council.

7.3.1 Option 1: Operational Footprint

The proposed faecal sludge treatment facility is expected to cover approximately 5 acres of land, situated on relatively flat terrain. Options on how to further minimise the ecological footprint of the development have been explored in the EIStatement.

7.3.2 Option 2: Timing and Duration of the Construction Works

It should be noted that the proposed faecal sludge treatment facility for Kigumba Cluster Towns will not take a long time and the construction schedule will follow a logical building order. The timing and duration of the construction work are likely to have a number of implications especially on the relatively flat project areas which are prone to flooding during the rainy season. Options on how to minimize the construction duration have been examined in the ESIStatement.

7.3.3 Option 3: Method of Construction Works to Employed

The type of construction method that is to be used can have an impact on the stability of the faecal sludge treatment facility for Kigumba Cluster Towns. Therefore, a whole range of options have been considered especially those that will have little effect on the stability of the site, especially given the gentle terrain of the site.

7.3.4 Option 4: Source of construction Supplies and Raw Materials

The way supplies and materials (including labour) are sourced, can have implications especially for the local economy. Various options have been considered and assessed for the beneficiation effects on the local economy.

7.3.5 Option 5: Waste Management

The various phases of the project life cycle will generate wastes and the wastes will depend on the input materials that will be required for construction activities. The best waste prevention/minimisation and management practices will be considered as part of an effective waste management plan for the project.

All the incremental alternatives as well as the fundamental alternative of no development have been examined in detail in the Environmental and Social Impact Statement.

7.4 Technical site selection

During the feasibility study, a total of five sites in Kigumba cluster were considered for assessment. Two site (Site 1 and 2) were located in Kigumba TC while three sites (Site 3, 4 and 5) were located in Bweyale TC. The sites were assessed for the suitability of housing a faecal sludge treatment plant for the clustered towns.

In order to evaluate the sites, weight was attached to each of the parameters owing to its level of relevance to site selection. The score for each parameter was multiplied with the weighting factor, which are summed to give a final score for the site.

From the assessment, the most suitable site is Kigumba site 2, located in Kigumba Town Council, respectively as illustrated in Table 7-1 and Figure 7-1 below.

Table 7-1: Site scores for Kigumba Cluster Towns

Site	Score value (%)
Site 1 – Kigumba TC	61
Site 2 – Kigumba TC	64
Site 3 – Bweyale TC	**65**
Site 4 – Bweyale TC	47
Site 5 – Bweyale TC	63

Source: MWE Feasibility study for Kigumba Cluster Towns 2019

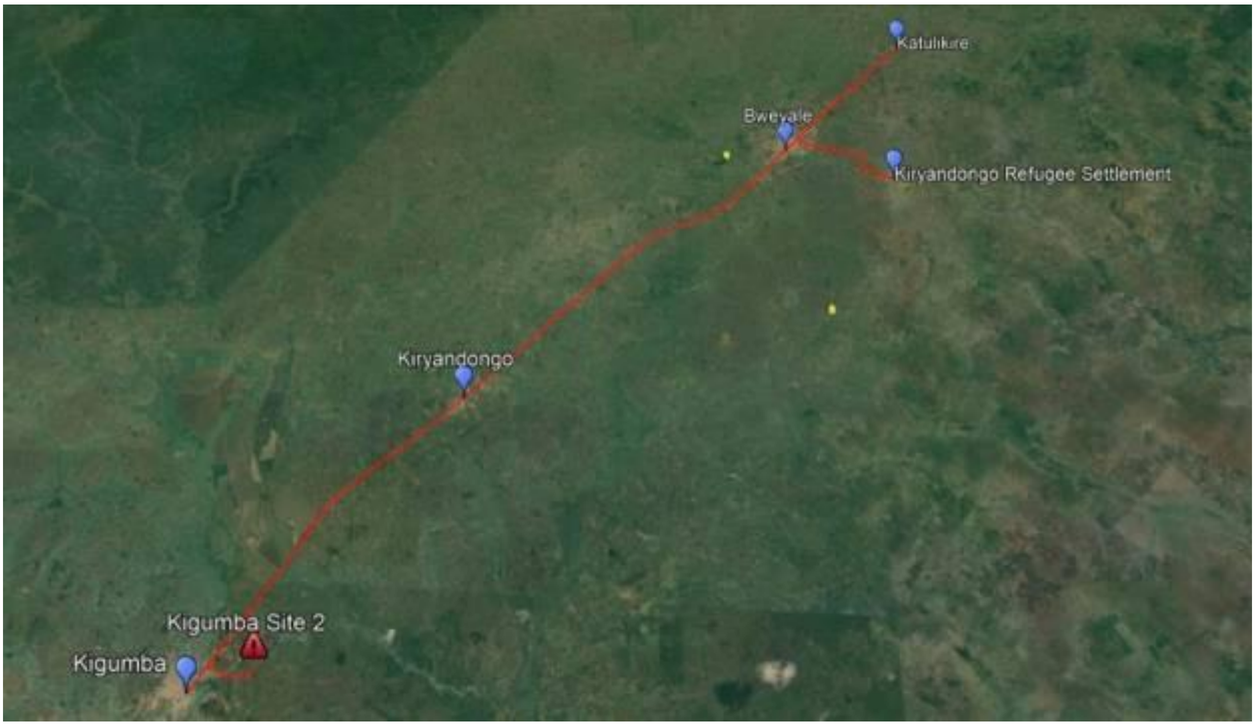


Figure 7-1: Location of Kigumba site 2 for the faecal sludge management facility

7.5 Alternative Treatment Technology

Screening of Treatment Technologies

a) Main emphasis in the selection of treatment technologies is to be put on:
b) Low operation costs, especially for energy and chemicals;
c) Low maintenance requirements for mechanical equipment and particularly low requirement for imported spare parts and components and specialised staff;
d) As low as possible requirements for labour-intensive handling of unstabilised solids;
e) The proposed technology for the Kigumba Faecal Sludge Treatment Plant shall allow for the adaptation to new and innovative treatment concepts and sludge resource recovery options.

Potential options with regard to the required capacity and above selection criteria include:

a) Solid liquid separation in a sedimentation tank;
b) Further sludge treatment (dewatering) in drying beds;
c) Further liquid phase treatment in ponds and / or constructed wetlands.

7.6 Comparison of Treatment Processes

In the following paragraphs the most appropriate technologies for small scale treatment plants were compared.

7.6.1 Planted Drying Beds

A planted drying bed (PDB) consists of a filter body (sand and gravel) with plants (e.g. cat tails). Operation of the PDB is described as follows:

a) Faecal sludge is repeatedly loaded onto the beds where it accumulates for several years (about 5 years);
b) Long-term bed permeability is maintained by the plants' root systems;
c) The sludge' liquid part (percolate) drains vertically through the filter body, is collected by perforated drainage pipes and needs further treatment;
d) Accumulated dried sludge (bio solids) needs to be stored in dry condition for a few months in order to hygienise it.

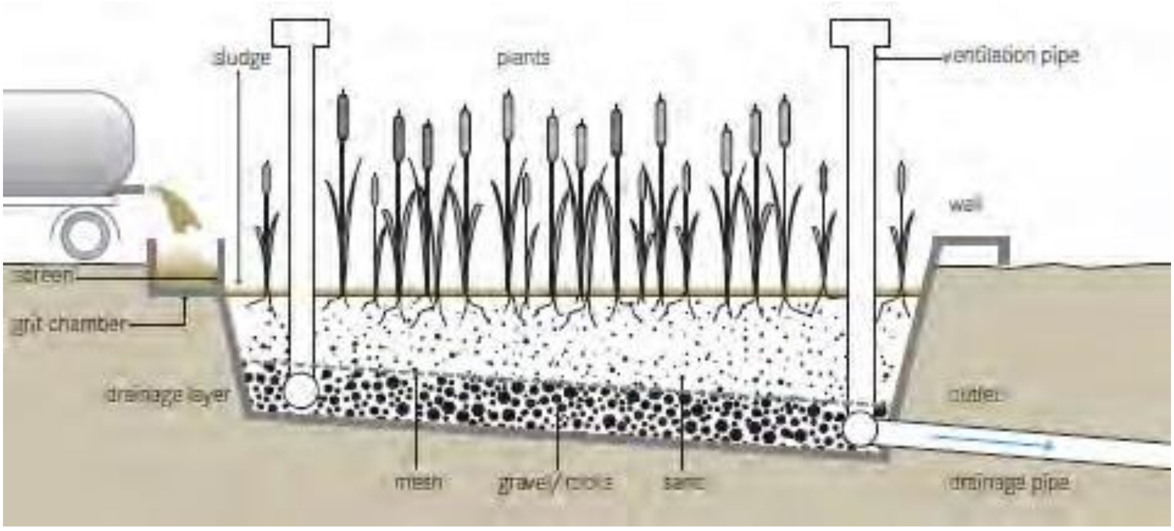


Figure 7-2: Schematic section view of planted drying beds

(Source: EAWAG, Compendium of sanitation systems and technologies, 2nd edition, 2014)

7.6.2 Unplanted Drying beds

Unplanted drying beds comprise a filter body and a drainage system at the bottom. As for the PDB, the percolate needs further treatment.

Before each new FS application, the dried sludge must be removed. If beds are covered, the drying period in Kampala is about 4 weeks, resulting in extensive land requirements.

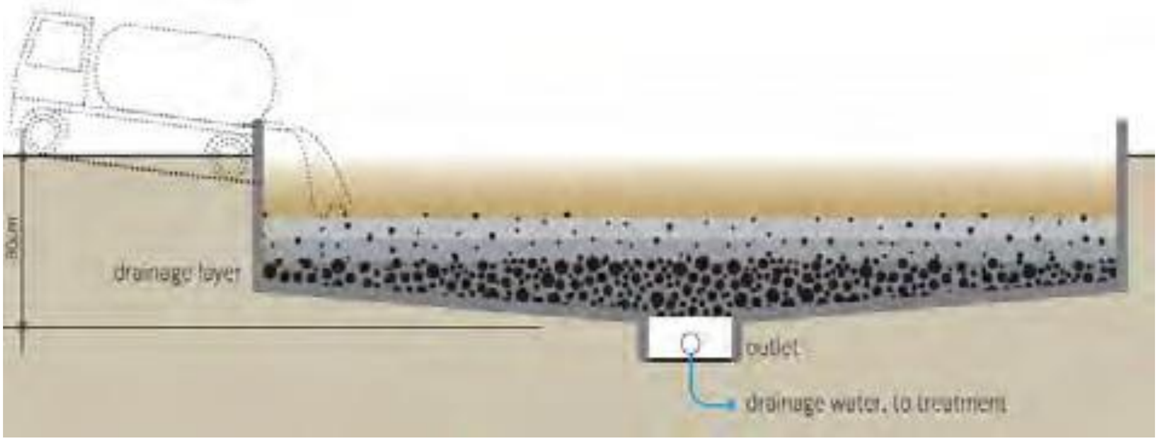


Figure 7-3: Illustration of possible treatment processes (Unplanted Drying Beds)

(Source: EAWAG, Compendium of sanitation systems and technologies, 2nd edition, 2014)

7.6.3 Thickening Tanks and Unplanted drying beds

To reduce the land requirements, unplanted drying beds can be combined with a preliminary thickening facility. It allows to reduce the volume of sludge to be dried and thus the land requirement for the unplanted drying beds.

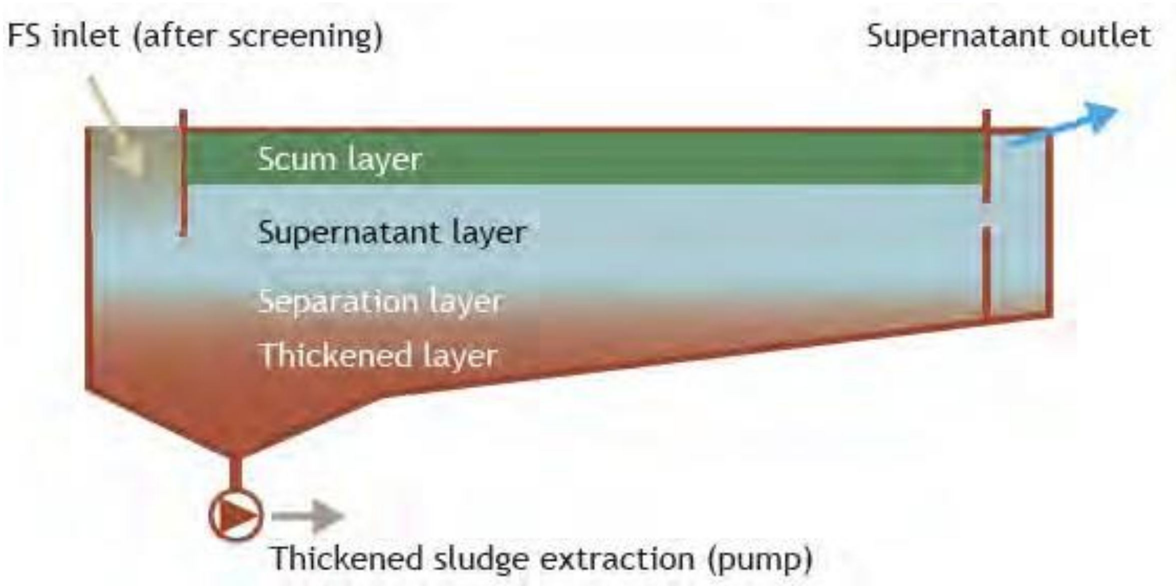


Figure 7-4: Illustration of possible treatment processes (Thickening + Unplanted Drying Beds)

(Source: EAWAG, Compendium of sanitation systems and technologies, 2nd edition, 2014)

7.6.4 Comparison and selection of most appropriate treatment processes

The following table 7.2 summarises the comparison and assessment of the three treatment processes:

Table 7-2:Comparison of Possible Treatment Processes

Criterion	Planted drying beds		Unplanted drying beds		Thickening tank + Unplanted drying	
	Assessment	Description	Assessment	Description	Assessment	Description
Sludge stabilization method	1	Dry storage period	1	Dry storage period	1	Dry storage period
Sludge stabilization duration	1	6-12 months	0	12-18 months	0	12-18 months
Sludge	1	5 years	0	Monthly	0	Weekly to monthly
Sludge removal	1	Manual or excavator	0	Manual	0	Manual
Liquid sludge	1	Not required	1	Not required	0	Required (ThT)
Operation	1	Low	1	Low	0	Medium
Day to day staff skill	2	Unskilled	1	Unskilled	1	Skilled
Liquid	1	Medium	1	Medium	0	High (ThT

Criterion	Planted drying beds		Unplanted drying beds		Thickening tank + Unplanted drying	
	Assessment	Description	Assessment	Description	Assessment	Description
Energy	1	≈ 0 kwh/m³	1	≈ 0 kwh/m³	0	≈ 5 kwh/m³
	-	-	-	-		1,500 €/a
Operation costs	1	Low	1	Low	0	Medium
Investment costs	2	Low (≈ 150,000 €)	0	High	1	Medium
Land requirement	1	Medium (1,500 to 3,000 m²)	0	High (4,000 to 12,000 m²)	1	Medium (1,500 to 3,000 m²)
Accumulated treatment process experience	1	Good	1	Good	1	Good
Overall	**15**		**8**		**5**	

The large land requirements and capital costs of unplanted drying beds exclude this technology from favourable options in this project as the treatment plants shall be constructed near to urban poor, informal settlements which are densely populated.

Combination with a thickening tank allows for the reduction of the drying bed's footprint, but in- creases the complexity of the plant and costs. This combination is suitable rather for large scale treatment plants.

In conclusion, **it is recommended to select the planted drying bed (PDB) technology**, which is in addition less expensive (capital as well as O&M costs).

7.7 The "No Go" Alternative

The option of doing nothing i.e. not proceeding with the proposed development (i.e. the No Go Option) has been assessed during the Environmental and Social Impact Assessment (ESIA). In addition to the No-Go Alternative, all the above-mentioned incremental alternatives (design/layout) have been examined in the Environmental and Social Impact Statement

8 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT AND MITIGATION / ENHANCEMENT MEASURES

8.1 Introduction

In line with the above legislative requirements, this chapter of the ESIStatement presents the identified impacts that may result from the proposed Faecal Sludge Management facility in Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District and provides mitigation measures to minimise the negative impacts as well as enhancing/optimising the positive impacts.

8.2 Assumption, Uncertainties and Gaps in Knowledge

The following assumptions, uncertainties and gaps in knowledge are implicit in the study which information formed the basis of part of the impact assessment:

<u>Social Impacts</u>

Assumptions

- No great social changes will take place in the proposed project area between data collection and the submission of this report; and
- Information about all important stakeholders has been included in the study.

Limitations

- Secondary data sources, including statistical data, are limited;

In addition to the assumptions and limitations listed above, it is important to note that identification of socio-economic impacts differs from identifying environmental impacts in the following ways:

- ✓ Social impacts are not always objectively measurable and often need to be inferred rather than measured. A combination of insight into social processes in general and a thorough knowledge of the communities under study are important to draw valid inferences.
- ✓ Social impacts are often clustered and interdependent rather than clearly separable.
- ✓ Communities are dynamic and in a continual process of change, which is not easily predictable. The proposed Faecal sludge management facility at in Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District is but one factor contributing to this change. It is often difficult to identify if an impact is attributable to the development, to factors beyond, or a combination of both.

- ✓ The positive or negative nature of an impact is often value-based – some might view a particular impact as positive and others as negative.
- ✓ Social impacts are often unavoidable and difficult to mitigate and as such, mitigation strategies should be regarded as strategies to manage change, rather than as means to avoid an impact. Successful management of a potentially negative impact may change the impact into a positive impact.

Designing of sanitation components for Kigumba Cluster Towns is one of the major issues in the pre-construction phase. Careful planning helps to avoid the occurrence of particular impacts and the design measures help to minimize ecological and socio-economic impacts as much as possible.

8.3 Pre-construction Phase (Physical Impacts)

8.3.1 Impact 1: Alteration of the Landscape and visual amenity

Cause of Impact

When surveying the proposed area for the project components for the faecal sludge plant, manual cutting of some trees and crops might be necessary in order to get a wide view when surveying. This impact may be more pronounced at the Faecal sludge treatment plant. This will cause minimal visual changes in the landscape.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographic Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	1	1	Low	Insignificant

<u>Mitigation Measures:</u>

- ✓ During site clearance vegetation clearance shall be minimised in as much as possible by considering the use of existing cleared areas or areas without crops and trees;
- ✓ The clearance of both tree branches, crops and shrubs at the proposed site for the faecal sludge management facility shall be done manually; and
- ✓ Prior to site clearance, an inventory of all the destroyed vegetation (crops and trees) shall be documented / recorded so that they can be included in the project valuation.

Significance Rating with Mitigation: Negative and Insignificant

8.3.2 Impact 2: Contamination of Soil and the Wetland

Cause of Impact

During surveying the proposed faecal sludge site at Kihura LCI, samples of the sub-soil will be taken for the soil profile survey. If the sample holes are left open, they may be contaminated by upper substrate waste. The soil cleared for purposes of soil surveys may get into the wetland causing contamination of the wetland which may lead to loss of ecosystems especially in the active wetland of the proposed Kigumba Cluster Town Faecal Sludge Treatment Plant (FSTP).

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographic Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	1	1	Low	Insignificant

<u>Mitigation Measures:</u>

- ✓ During site surveying particularly excavation of trial pits on the proposed site for the faecal sludge plant, consideration shall be made to prevent soil contamination;
- ✓ After each exploration hole for the site, the hole shall be capped after surveying; and
- ✓ During surveying, soils excavated from the exploration holes shall be left besides the holes to ensure that the soils don’t erode into the neighbouring water stream /wetland.

Significance Rating with Mitigation: Negative and Insignificant

8.4 Pre-construction Phase (Biological Impacts)

8.4.1 Impact 1: Loss of Vegetation cover and Crops

Cause of Impact

During the topographic and geological surveys of the project areas especially the faecal sludge plant, cutting of trees and clearance of vegetation and crops will be necessary. The proposed site for Kigumba Faecal sludge treatment plant because the proposed site has grasslands, a few trees and crops such as cabbages, sweet potatoes, beans, maize and eucalyptus trees which are planted by the locals. If this impact is not well managed, it may result into conflicts with the locals.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographic Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	2	1	Low	Insignificant

Mitigation Measures:

- ✓ During site clearance, vegetation removal shall only be restricted to only necessary areas for carrying out studies;
- ✓ Manual cutting of branches shall be encouraged especially when carrying out surveying;
- ✓ All the destroyed economic trees and crops shall be recorded and included in the valuation report for purposes of compensation; and
- ✓ Vegetation clearance shall be carried out in the presence of the property owners and the local leadership.

Significance Rating with Mitigation: Negative and Insignificant

8.4.2 Impact 2: Disturbance of Terrestrial Fauna

Cause of Impact

This impact will be caused by human presence and activity when carrying out the topographic and geological surveys on the proposed Kigumba faecal sludge plant. While surveying, the survey team will likely remove vegetation, cross the wetland and use of vehicles and/or machinery may affect the fauna resident at the proposed project site.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographic Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	1	1	Low	Insignificant

Mitigation Measures:

- ✓ During site clearance, vegetation removal shall be restricted to only necessary areas;
- ✓ Manual clearance of vegetation shall be encouraged to ensure that terrestrial fauna is largely protected; and
- ✓ The use of machinery in areas which harbour fauna like wetlands shall be encouraged.

Significance Rating with Mitigation: Negative and Insignificant

8.5 Pre-construction Phase (Socio-Economic Impacts)

8.5.1 Impact 1: High Expectations of the Local Communities in relation to Jobs

Cause of Impact

There is within the local population, expectations about jobs creation. Indeed, during the design and survey process, the project will create employment opportunities especially areas neighbouring the proposed Faecal sludge Treatment plant. The jobs will be limited due to the short-term nature of the survey and design period.

Significance Rating without Enhancement: Positive and Low

Impact classification:

Nature	Probability	Extension	Duration	Intensity	Significance without Enhancement	Significance with enhancement
Positive	Certain	1	1	1	Low	Insignificant

Enhancement Measures:

- ✓ The hiring requirements must be clear, properly publicized before the start of the recruitment process and respected by the design team. For a better impact on the communities this process shall be conducted with the involvement of local leaders;
- ✓ In the event there are local expectations for employment that cannot be met by the project, the limited availability of places shall be made known to the interested parties through local authorities; and
- ✓ The principles and procedures for hiring shall, as far as possible, give priority to the hiring of skilled local workers.

Significance Rating with enhancement: Positive and Insignificant

8.6 Construction Phase (Biological Impacts)

8.6.1 Impact 1: Temporary loss of habitat within the construction site

Cause of Impact

The construction phase of the faecal sludge plant will involve the use of heavy machines and vehicles and increase of circulation of people. Stock pile areas for storage of construction materials, storage of sewer pipes, parking of trucks and construction machines etc. and work camps have to be installed.

Vegetation will be cleared for opening or upgrading local access route to the proposed site. This will disturb the fauna and flora and cause temporary loss of habitat and component species within the construction site as highlighted under baseline sections 5.2.2 and 5.2.3. There is likely to be temporary fragmentation of the habitat and damage to adjacent habitat and species due to incursion of machinery/personnel into nearby site not directly required for construction purposes.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	1	1	Moderate	Insignificant

<u>Mitigation Measures:</u>

- ✓ The project access road especially in relation to Kihura site shall be selected limiting passage through the wetland section, avoiding sensitive areas and minimizing erosion;

- ✓ Unless of benefit to local communities, temporary access roads leading to the faecal sludge management site shall be removed when no longer needed and shall be reinstated;
- ✓ Selection of a temporary site for the workers camp and materials stockpiles shall ensure that avoidance of natural areas is observed to minimise the impact on fauna and flora. The selected sites (workers camp and materials stockpile sites) shall be approved by NEMA;
- ✓ All personnel shall be briefed on environmental sensitivities in the surrounding area especially the wetland;
- ✓ After construction and use of materials stock piles, reinstatement of the disturbed sites shall be enforced to maintain habitat continuity as far as is practicable;
- ✓ At the commencement of works, the working width shall be clearly delineated where it passes through environmental sensitive areas; and
- ✓ Fishing and the hunting of animals and birds by the construction personnel in areas around Kihura wetland shall be strictly prohibited.

Significance Rating with Mitigation: Negative and Insignificant

8.6.2 Impact 2: Disturbance of fauna by noise and vibration

Cause of Impact

The construction phase will involve the use of heavy machines and vehicles. Noise and vibration are generated by excavators, bulldozers, concrete mixers and transport vehicles. Increase in noise levels is and vibration is likely to mainly affect the fauna at the proposed Kigumba Faecal sludge treatment plant because of the presence of an active wetland. The site is reported to have some ecosystems, habitat and birds. Small animals, soil micro-organisms and birds are very sensitive to noise and vibration and often get killed or relocate to other areas.

Furthermore, impacts related to noise are more evident during the night disturbing animals which have a nocturnal living habit for feeding and roaming. However, construction activities will be restricted to day time what could affect e.g. birds that have their breeding habitats along the mains corridor.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	1	1	Low	Insignificant

Mitigation Measures:

- ✓ Restrict construction activities and operation of heavy machines to daylight, when most wildlife is active and can react to noise;
- ✓ Ensure that heavy machinery is limited to only necessary activities; and
- ✓ Construction machinery should be properly maintained to ensure that noise and vibration levels are limited.

Significance Rating with Mitigation: Negative and Insignificant

8.6.3 Impact 3: Disturbance of plant processes and fauna by dust generated

Cause of Impact

The construction activities will cause some dust emissions. These emissions will create short-term adverse impacts to the immediate environment. The dust can interfere with the plant photosynthesis, evapotranspiration and other processes and will disturb the fauna temporarily, causing respiratory and visual disruption as well. Dust emission will also decrease the quality of forage quality of herbivorous animal species in the area.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	2	1	1	Low	Insignificant

Mitigation Measures:

- ✓ Water the soil surface and any unpaved access roads during construction at least once a day during the dry season;

- ✓ If the soil removed from the sites is going to be left out for some days, cover the soil to prevent dust emission by wind.

Significance Rating with Mitigation: Negative and Insignificant

8.6.4 Impact 4: Loss of vegetation cover and plant diversity

Cause of Impact

Levelling activities, excavations and grading of the Kigumba faecal sludge site will require the removal of vegetation. This activity will lead to a loss of native vegetation and open access to the site with intact vegetation. Moreover, once established the access road and the faecal sludge site will be regularly cleared to control the growth of vegetation.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	2	3	High	Moderate

<u>Mitigation Measures:</u>

- ✓ All the access roads leading to the site shall be aligned during excavation, grading and levelling to follow existing access roads and already disturbed surfaces which are currently modified/ previously cleared;
- ✓ Vegetation removal shall be restricted to the minimum necessary width; and
- ✓ In the case of slow growing large trees, these shall be unburied and replanted to restore the vegetation cover / beautify the landscape.

Significance Rating with Mitigation: Negative and Moderate

8.6.5 Impact 5: Disturbance and mortality of terrestrial fauna

Cause of Impact

By clearance of vegetation breeding and feeding and hiding habitats for animals will be affected especially in the Kihura wetland. In addition, terrestrial fauna may also be killed. Sound and vibration during the construction phase is also likely to disturb the terrestrial fauna. Any use of light, if construction takes place during the night will attract fauna to the construction site and increase the chances of being hurt.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	1	2	Low	Insignificant

Mitigation Measures:

- ✓ Construction activities shall be restricted to day time hours (8:00 am – 5:00pm);
- ✓ Prior to site clearance and digging, inspections for any terrestrial fauna shall be carried out;
- ✓ Any trench left overnight shall be protected with a net fence to block fauna from being trapped inside;
- ✓ Capture and release fauna away from the direct influence zone (including species trapped in the trenches); and
- ✓ During site clearance and bush burning, this shall be carried out in the dry season to avoid interfering with nesting and breeding.

Significance Rating with Mitigation: Negative and Insignificant

8.6.6 Impact 6: Loss of habitat and disturbance of fauna using the wetland

Cause of Impact

The proposed Kigumba faecal sludge site is located in Kihura wetland which drains into River Nile. Therefore, the construction of the faecal sludge treatment plant will require the removal of wetland vegetation where most faunal species seek refuge during the daylight. The aquatic vegetation in the wetland will also be affected by vegetation clearance, siltation, noise and other related impacts.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	1	2	Moderate	Low

Mitigation Measures:

- ✓ Construction works shall be carried out during periods of lowest water flow in the wetland, so that aquatic wildlife will be less abundant on the papyrus vegetation to the cleared;
- ✓ Vegetation clearance shall be limited to only those areas required for construction of the faecal sludge plant;
- ✓ The workers' camp shall establish at a secure distance from the wetland to avoid unusual presence of workers near the water course; and
- ✓ Education programs shall be carried out for the workers on importance of the water bodies and wetland environments.

Significance Rating with Mitigation: Negative and Low

8.6.7 Impact 7: Pollution by solid wastes

Cause of Impact

Solid waste from construction activities and worker's domestic waste can also have negative impacts on the environment, especially if it gets into in the vital natural habitats for wildlife and aquatic life like wetland.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	1	1	Moderate	Insignificant

Mitigation Measures:

- ✓ Environmental awareness shall be provided to the contractor's employees on how to manage solid wastes;
- ✓ The contractor shall prepare and implement the Solid Waste Management Plan (SWMP);
- ✓ The contractor shall provide the proper containers for disposal of solid wastes; and
- ✓ The contractor shall contract a licenced waste handler to collect regularly and dispose properly the solid wastes.

Significance Rating with Mitigation: Negative and Insignificant

8.7 Construction Phase (Socio-Economic Impacts)

8.7.1 Impact 1: Loss of crops and livelihood

Cause of Impact

As part of site preparation activities, the vegetation within the footprint of the site which mainly comprises of sweet potatoes, cabbages, maize and beans belonging to a number of local residents. It was observed at the proposed site, eucalyptus is also common here and the most common system of agriculture here is visibly with some intercropping among others.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	3	2	Moderate	Low

<u>Mitigation Measures</u>

- ✓ Ensuring that the land take for the existing access road widening is kept to a minimum so as not to destroy a large section of the gardens and any crops planted therein;
- ✓ Most of the garden owners shall be allowed to harvest any standing crops before clearing for site preparation;
- ✓ In the event that some crops will have to be cleared, for purposes of compensation, an inventory of the crops in the gardens (annual crops and trees) shall be recorded and where possible agreed with the farmers;

- ✓ Linked to the above, the farmers shall be compensated according to the acceptable compensation rates commensurate with the evaluation rates at the District or the Chief Government valuer; and
- ✓ A strategy for engagement with the farmers during preparation and execution of the compensation plan, including a grievance mechanism shall be put in place.

Significance Rating with Mitigation: Negative and Low

8.7.2 Impact 2: Land take for the faecal sludge management facility and access road

Cause of Impact

The construction of both the faecal sludge management facility about 5 acres and the 300m long, site access road extension will lead to a certain degree of landtake manifesting itself in project affected persons.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	2	3	2	High	Low

<u>Mitigation Measures</u>

- ✓ The width of the access road extension should be kept to a miminum and shall not exceed that of the largest service vehicle that is to be used during the construction phase; and
- ✓ Adequate compensation shall be paid to project affected persons in line with approved District compensation rates prior to commencement of the project.

Significance Rating with Mitigation: Negative and Low

8.7.3 Impact 3: Employment opportunities

Cause of Impact

The construction activities at the proposed faecal sludge treatment facility and associated infrastructure project site will create temporary employment opportunities to some of the local residents of Kihura II

LCI, Ward C, Kigumba Town Council and the wider Kiryandongo District. These will be mainly casual labourers and a few technical personnel to participate in the construction activities.

Significance Rating without Enhancement: Positive and Low

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without Enhancement	Significance with Enhancement
Positive	Certain	3	3	2	Low	Low

Enhancement Measures

- ✓ Ministry of Water and Environment / their appointed contractor shall work hand in hand with the local leaders when recruiting labour from the local community. The policy for employment, working conditions and recruitment can then be communicated to prospective employees by the local leaders.

Significance Rating with Enhancement: The impact will remain Positive and Low because of the limited number of employees recruited and the short duration of the construction phase

8.7.4 Impact 4: Market for construction materials

Cause of Impact

Some of the construction materials will be procured locally within Kiryandongo District – the project area and this will provide revenue to the local economy and these will include: sand, bricks and aggregate stones. The proceeds from the sale of the raw materials to the construction activities at the proposed project will boost the local economy in form of increased earnings.

Significance Rating without Enhancement: Positive and Low

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without Enhancement	Significance with Enhancement
Positive	Certain	1	3	2	Low	Moderate

Enhancement Measures

- ✓ Ministry of Water and Environment and their appointed contractor shall work closely with the local leadership to ensure that local communities or businesses that are capable of supplying some of the construction materials benefit from the procurement process.

Significance Rating without Enhancement: Positive and Moderate

8.7.5 Impact 5: Theft of construction materials

Cause of Impact

With construction activities ongoing at the proposed faecal sludge management facility coupled with the location of the site, a huge volume of construction materials will be required for the construction activities which if not properly handled could attract wrong elements who might steal some of these items among which include cement, iron bars and timber among others. If this is not adequately addressed, it could sabotage the smooth implementation of the construction activities.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

Mitigation Measures

- ✓ A containerized storage facility for some of the construction materials (cement, iron bars and timber) shall be set up at the construction site with secure locking and manned with armed store keepers;

- ✓ The casual labourers hired at the construction site shall be screened with the help of the local leaders so as to screen out the wrong elements;
- ✓ Security guards shall be contracted to watch over the activities at the construction site; and
- ✓ Clarke Farm Limited and or their appointed contractor in collaboration with the local leadership of Kihura LCI and Kigumba Town Council shall hire people from the project area so as to benefit from a neighborhood watch scheme.

Significance Rating without Mitigation: Negative and Low

8.7.6 Impact 6: Pressure on Social Services

Cause of Impact

The construction workforce at the proposed faecal sludge management facility and associated infrastructure at Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District will in a way exert extra pressure on the existing health facilities in the area which are largely under equipped, located at distant locations from the site and under staffed. Tropical diseases like malaria which is rampant in the area and will likely be referred to health facilities in the area and not only the clinical facilities at the construction campsite. Sexually transmitted diseases such as HIV/AIDS are also likely to be a concern as well given the high prevalence of such diseases in remote areas; and.

Construction vehicles will equally exert extra pressure on the community roads in the area leading to the site in Kihura LCI, with most of roads being loose surface murram and are affected by both vagaries of weather which will also be damaged by the heavy trucks that will be plying along the community roads.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

<u>Mitigation Measures</u>

- ✓ In collaboration with both Kigumba Town Council and Kiryandongo District Local Government, the upgrading and maintenance of access roads will have to be a priority especially during the project activities. It has to be ascertained with District and Kigumba Town Council officials of their willingness to work with the Ministry of Water and Environment and the appointed contractor in order to improve the road infrastructure;

- ✓ The project's clinical support services will have to be adequately stocked to avoid relying on those within the local community/ project area;
- ✓ All members of the workforce will be provided with mosquito nets and encourage their use as means of preventing malaria which can have a negative impact on the project activities. None Ugandan / expatriate staff on the project will also be prescribed an anti-malarial dose;
- ✓ An HIV/AIDS in the work place policy will be put in place and a voluntary counselling and testing (VCT) programme rolled out and peer educators trained as way of guarding against this and other sexually transmitted diseases (STDs); and
- ✓ Liaisons between project employees and local people that might lead to uncalled for sexual liaisons will have to be discouraged.

Significance Rating without Mitigation: Negative and Low

8.7.7 Impact 7: Spread of Sexually Transmitted Infections (STIs)

Cause of Impact

With construction work ongoing at the proposed faecal sludge treatment facility and associated infrastructure, casual workers at the project site are likely to interact with the local community of both Kigumba Town Council and particularly Kihura LCI and beyond which could potentially lead into the spread of Sexually Transmitted Infections (STIs) including AIDS. With the booming petty trade, increased number of truck drivers stopping in Kigumba Town and construction business, sexual workers are likely to flock the area in search of casual sex to benefit from the construction workers earnings from the project. Additionally, with the young population and decaying moral fibre in rural areas, the young vulnerable girls are likely to be lured into sex with the construction workers leading to the spread of STIs and unwanted pregnancies among others.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

Mitigation Measures

- ✓ The contractor shall endeavour to hire local labour from the project area to minimise on the influx of immigrants in search of work who could also exacerbate the spread of STIs;
- ✓ HIV/AIDS awareness trainings shall be conducted among the work force and the local communities on a regular basis;
- ✓ The contractor shall develop and endeavour to implement an HIV/AIDS policy for the project;
- ✓ The contractor shall endeavour to sensitise workers on the use of appropriate preventive measures such as abstinence and the use of condoms by workers among others; and
- ✓ The contractor shall provide appropriate contraceptives (condoms) to the workers as a preventive measure for STIs.

Significance Rating with Mitigation: Negative and Low

8.8 Construction Phase (Physical Impacts)

8.8.1 Impact 1: Soil Compaction

Cause of Impact

Since the proposed site is situated in a swampy area, the dumping of marram and hardcore coupled with the stripping of the site of vegetation cover for the construction of the faecal sludge management facility and associated infrastructure, the frequent vehicular movements of construction trucks delivering construction materials, equipment and workers to the project site might result into soil compaction and trampling at the site if no designated access tracks and parking area are demarcated at the site.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	2	3	3	High	Low

Mitigation Measures

- ✓ Wide tyred construction vehicles shall be used in the construction activities at the site to minimise the impact of soil compaction and trampling at the site; and
- ✓ A designated parking area shall be established at the construction site to avoid construction vehicles indiscriminately parking around the site.

Significance Rating with Mitigation: Negative and Low

8.8.2 Impact 2: Siltation and Sedimentation of the wetland

Cause of Impact

The stripping of vegetation from the site coupled with compaction (for purposes of stability) of the site will result in accelerated runoff rates from the site. Given the gentle elevation of the site, the runoff is likely to carry soil and rocks along with it as it makes its way from the site into Kihura wetland.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

Mitigation measures

- ✓ Vegetation cover shall be maintained around and in some sections of the proposed project site to act as buffer against the effect of runoff; and
- ✓ The access road leading to the project site shall have proper drainage channels that will convey runoff to the main storm water drains.

Significance Rating with Mitigation: Negative and Low

8.8.3 Impact 3: Poor sanitation around the construction site

Cause of Impact

During the site visit, it was observed that there was no toilet facility at the proposed project site for faecal sludge management facility for which the construction workers could use during the short construction phase. There is a likelihood that the workers might indiscriminately dispose-off human waste in the wetland and in the neighbourhood which would potentially contaminate the water source used by some of the area residents or pollute the area and also result into disease outbreaks like cholera and dysentery among others.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

<u>Mitigation Measures</u>

- ✓ Since the construction phase will last for a short duration, the contractor shall liaise with Ministry of Water and Environment to construct a pit latrine at the site prior to construction – this can then be used by the necessary personnel e.g. guards at the site, construction work force during the construction and could also be used in the operational phase.

Significance Rating with Mitigation: Negative and Low

8.8.4 Impact 4: Poor air quality due to dust emissions

Cause of Impact

The clearance of vegetation around the proposed site for the faecal sludge management facility will expose the soils to wind erosion. Increased vehicular movement to and from the construction site could potentially generate fugitive dust in and around the vicinity of the site. Construction materials like cement might also be a source of dust that could cause nuisance.

Also, likely to have a negative impact on air quality, are the greenhouse gases generated by the construction vehicles, equipment and machinery.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	3	2	Moderate	Low

Mitigation measures

- ✓ To avoid the generation of unnecessary dust, material drop height shall be kept to a minimum;
- ✓ Dust at the site and along the access road shall be kept to a minimum through occasional wetting. The same shall be applied to any banked soil stockpiles. Wetting shall be increased during high wind days and during dry spells or seasons; and
- ✓ Greenhouse gas (GHG) generating equipment shall undergo routine preventive maintenance.

Significance Rating with Mitigation: Negative and Low

8.8.5 Impact 5: Construction debris and wastes

Cause of Impact

During the construction phase, some waste from the packaging and in form of packaging, construction debris – off cuts, and domestic waste from the food remains brought to the site by the construction workers. Once not well handled this waste could become a sanitation hazard and also be an eyesore at the construction site and in the neighbourhood.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

Mitigation Measures

- ✓ Ministry of Water and Environment / appointed contractor shall obtain a permit for the disposal of construction debris from the excavation, earth and civil works of some of the components at the proposed coffee processing mill and associated infrastructure;
- ✓ Pollution prevention and waste minimisation shall be made key aspects of a wider construction waste management plan. These shall be supplemented by having waste management facilities e.g. waste containers on site during construction that take waste segregation into account; and
- ✓ Appropriate waste management practices that include: Separation of wastes according to their hazardous and non-hazardous nature and their proper treatment and disposal shall be considered with special attention paid to any hazardous wastes.

Significance Rating with Mitigation: Negative and Low

8.8.6 Impact 8: Visual and Landscape Impacts

Cause of Impact

There is likely to be a high degree of visibility disruptions attributed to the construction activities for the proposed faecal sludge management facility and associated infrastructure at the project site.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	3	2	Moderate	Low

<u>Mitigation measures</u>

- ✓ The fence around the proposed faecal sludge management facility and associated infrastructure will be screened off with iron sheets painted in inconspicuous colours that blend with the surrounding so as to not affect the visual amenity of the community adjacent the project site; and
- ✓ The degree of lighting at the construction site at night will have to be kept to a minimum that is required for security vision.

Significance Rating with Mitigation: Negative and Low

8.9 Construction Phase (Health and Safety Impacts)

8.9.1 Impact 1: Construction related traffic

Cause of Impact

Given the location at the site for hosting the proposed faecal sludge management facility in the valley, there will be an increase in vehicular traffic due to the transportation of the required construction equipment and materials to the proposed project site. The increased volume of traffic to the site may increase the potential for accidents especially along the community access road leading to the proposed project site.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

<u>Mitigation Measures</u>

- ✓ Traffic calming measures, in particular speed bumps, shall be put in place along the community access road leading to the project site and inside the construction site;
- ✓ Traffic wardens shall be deployed to guide traffic along the access road leading to the project site;
- ✓ Traffic signage shall be put up along the access road and in the site premises to warn other road users on the access road of movements attributed to heavy construction vehicles;
- ✓ Environment Health and Safety toolbox talks shall be conducted for drivers of construction vehicles. The speed limit close to the construction site shall not exceed 5KPH; and
- ✓ Construction vehicles shall undergo regular preventive maintenance so as to guard against the effects of mechanical failure.

Significance Rating with Mitigation: Negative and Low

8.9.2 Impact 2: Construction Noise

Cause of Impact

Construction activities at the project site for the proposed faecal sludge management facility and associated infrastructure that involve operation of construction machinery, construction works and material delivery by trucks will generate noise at the project site and inconvenience the construction workers.

Significance Rating without Mitigation: *Negative and High*

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

Mitigation Measures

- ✓ If possible, a temporary storage for construction materials shall be constructed onsite to avoid multiple deliveries of materials;
- ✓ Noisy construction machinery shall be directed away from the direction of sensitive receptor(s) and its use restricted where possible;
- ✓ Construction workforce especially machine operators shall be provided with appropriate Personal Protective Equipment (PPE) in form of earplugs, / earmuffs; and
- ✓ Construction activities shall conform to National Environment (Noise standards and Control) Regulations, 2003. Key emphasis should conform to standards governing construction sites as indicated in Table 8.1 below.

Significance Rating without Mitigation: *Negative and Low*

Table 8-1: Maximum Permissible Noise Levels for construction sites

Time Frame:

Day	6:00 am.	10:00 pm
Night	10:00pm	6:00 am

**The time frame takes into consideration human activities*

Facility	Maximum Noise Level Permitted (Leq) in dB (A)	
Hospitals, Schools, Institutions of Higher learning, homes for the	60	50

Facility	Maximum Noise Level Permitted (Leq) in dB (A)	
disabled etc		
Buildings other than those prescribed in paragraph (i) above	75	65

Source: Environmental Legislation of Uganda Handbook (2003)

8.9.3 Impact 3: Construction accidents

Cause of Impact

Construction accidents at the proposed faecal sludge management facility and associated infrastructure may be caused by some of the following activities:

- Poor handling of machinery and equipment has the potential of causing accidents to the workers at the site. Incidents and near misses should also be taken into account; and
- Elevated and overhead work at the proposed faecal sludge management facility and associated infrastructure attributed to working at heights especially assembling metallic components, roofing, and building at elevated heights poses some level of risk to workers safety – fall from overhead.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

<u>Mitigation Measures</u>

- ✓ Basic Environment, Health and Safety induction training shall be carried out for all employees and contractors (where applicable) prior to commencement of work at the site;
- ✓ Regular Environment, Health and Safety (EHS) training toolbox talks shall be conducted for the construction workforce;
- ✓ Appropriate hazard warning signs shall be displayed around the construction site;
- ✓ Emergency preparedness and response measures such as first aid kits shall be in place;

- ✓ Adequate Personal Protective Equipment (PPE) shall be provided to all workers that are commensurate with construction site activities, e.g. helmets, overalls, safety shoes and harnesses for those working at height. It is important that PPE is used at all times whilst on duty and penalties for lack of its use/improper use should be clearly spelt out.; and
- ✓ Hoisting and lifting equipment shall be rated and maintained and operators trained in their use.

Significance Rating without Mitigation: Negative and Low

8.10 Operational Phase (Physical Impacts)

8.10.1 Impact 1: Decline in Air Quality

Cause of Impact

There is likely to be a potential of pollution at the proposed Kigumba Faecal sludge management facility during operation if there is poor management. Air pollution may result from improper treatment of the faecal matter or often taking long to collect faecal sludge thus accumulating and rooting before it is collected. Indeed, during transportation of faecal matter, pollution may be an issue to the areas along the access roads.

There is likely to be odour nuisance from Inlet works and anaerobic ponds if not well managed during operation. The concern is mainly on the neighbouring homesteads. If the nuisance is not well handled it may make the area inhabitable. Smell is one of the major issues why most people don't prefer staying close to a faecal sludge treatment plant.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	3	2	High	Low

<u>Mitigation Measures:</u>

- ✓ Proper process design and operation shall be essential in minimizing potential odour production;
- ✓ Trees shall be planted along the faecal sludge treatment plant boundary;
- ✓ Periodic maintenance and monitoring of the air quality shall be conducted along the proposed faecal sludge treatment plant/sewers;

- ✓ There shall be timely and adequate transportation of faecal sludge to the FSDP;
- ✓ Appropriate and adequate handling of the faecal sludge shall be ensured during transportation to avoid polluting the environment; and
- ✓ Proper waste treatment measures shall be used at the FSDP areas to avoid bad odours which may become a constant menace to the neighbouring areas.

Significance Rating with Mitigation: Negative and Low

8.10.2 Impact 2: Noise and Dust Emissions

Cause of Impact

The waste trucks bringing faecal matter to and from the treatment plants and project vehicles may be a source of noise along the access routes and project neighbours. Noise may also come as a result of dumping activities within the treatment plant.

On the other hand, dust may only accrue as a result of increased traffic along the un- paved access roads.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	1	2	Low	Insignificant

Mitigation Measures:

- ✓ Noise emissions shall be kept within the National Noise standards of Uganda;
- ✓ Local communities shall be informed on the activities schedule at the faecal treatment plant;
- ✓ Noise levels shall be monitored biannually to ensure that the surrounding communities and fauna are not being disturbed; and
- ✓ The client shall endeavour where possible to improve and tarmac the access roads to the treatment plants. Where this is not economically possible, NWSC Kigumba branch can continuously water the community access roads especially where the traffic is high in the dry spells.

Significance Rating with Mitigation: Negative and Insignificant

8.10.3 Impact 3: Solid wastes from the Screens

Cause of Impact

There is likely to be solid waste generated from the screening process. If these solid wastes get into the environment especially the neighbouring wetland, they may be a source of pollution.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	3	2	Moderate	Low

Mitigation Measure:

- ✓ Washing and disposal shall be done at controlled solid waste disposal site

Significance Rating with Mitigation: Negative and Low

8.11 Operational Phase (Biological Impacts)

8.11.1 Impact 1: Loss of vegetation cover during maintenance activities

Cause of Impact

There might be a need to conduct some repairs or maintenance. In principle, the impacts caused by such maintenance activities will likely cause loss of some vegetation along the access the roads. These maintenance activities during operation will take place very seldom.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	1	1	Low	Insignificant

Mitigation Measures:

- ✓ If needed, during the pipeline maintenance, vegetation shall be removed manually; and
- ✓ All temporary access roads (not in use) shall be rehabilitated to promote recovery of vegetation.

Significance Rating with Mitigation: Negative and Insignificant

8.11.2 Impact 2: Contamination of Ground water, wetland and Soils

Cause of Impact

Improper faecal sludge treatment or management may generate a substantial amount of leachate (residual liquids in solid waste containing among other components, organic matter, nutrients, salts, pathogens, and hazardous chemicals) that may end up in surface drainage structures or wetlands/natural waterways. The high biochemical oxygen demand of faecal sludge/leachate would severely pollute any nearby environmental receptor. Likewise, ground infiltration of leachate will present a considerable risk of soil and aquifer contamination, potentially resulting in the acidification of ground water. Storm water runoff from surface drainage structures at the site may also degrade the quality of receiving waters in nearby steam beds and banks. This may contain suspended sediments, coliform and other potential pathogens. Improper design of the sludge storage site could result in ground water contamination.

Significance Rating without Mitigation: Negative and Very High

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	2	3	3	Very High	Low

Mitigation Measures:

- ✓ Soil contamination prevention measures shall be considered while designing the sludge storage site;
- ✓ Use of a geomembrane (UV resistant) shall be employed to prevent soil from contamination;
- ✓ All the facilities, especially the storage, receiving, and disposal areas shall be paved with an impermeable floor structure (10-7 cm/sec) and covered. Furthermore, an effective drainage system shall be established for leachate and storm water collection and management. Storm water and runoff shall be diverted to avoid any contact with the faecal sludge waste;
- ✓ A drainage layer shall be installed underneath the Faecal Sludge plant to provide adequate drainage of leachate from faecal sludge. This may consist of a bed of coarse material such as wood chippings, or the processing area may permanently incorporate a drainage layer designed to withstand loading, working and removal of material; and
- ✓ Underground water investigations shall be undertaken by NWSC / Faecal sludge plant operator to determine subsurface water strikes and establish inclination of aquifers. This will be vital in determining the direction of faecal discharge in relation to the existing water sources and ground water flow.

Significance Rating with Mitigation: Negative and Low

8.11.3 Impact 3: Generation of Anaerobic Conditions

Cause of Impact

During operation of the sewerage/ faecal sludge treatment plants, there is likelihood of generation of anaerobic conditions in sewer pipes and storm water flooding of basements and leakage of sewer pipes.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	1	1	Low	Insignificant

Mitigation Measure:

- ✓ Proper maintenance of sewer system shall be ensured during operation

Significance Rating with Mitigation: Negative and Insignificant

8.11.4 Impact 4: Aquatic Weeds and Deterioration of Effluent Quality

Cause of Impact

During operation, there is likely to be proliferation of aquatic weeds in ponds and deterioration of effluent quality by decaying aquatic weeds.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	2	1	Moderate	Low

Mitigation Measure:

- ✓ Manual clearance of ponds for aquatic weeds shall be undertaken periodically, if necessary.

Significance Rating with Mitigation: Negative and Low

8.11.5 Impact 5: Foul Odour

Cause of Impact

There is likely to be foul odour coming from the dumping of faecal matter in the dumping points at the faeacal sludge management plant, when transporting faecal wastes and poor maintenance of disposal sites and public toilets. The concern is mainly on the neighbourhoods of the faecal disposal sites and public toilets. But there is also the issue of odour when transporting wastes along the access roads. If the nuisance is not well handled it may make the area inhabitable. Smell is one of the major issue why most people don’t prefer staying close to a faecal treatment plant.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	2	2	High	Low

Mitigation Measures:

- ✓ Proper in house management shall be employed especially when dumping the wastes. This shall be achieved with proper aeration in the dumping units;
- ✓ Trees shall be planted along the faecal sludge dumping points; and
- ✓ Periodic maintenance and monitoring of the air quality shall be carried out along the access roads to ensure that the sewer transportation vehicles are properly maintained.

Significance Rating with Mitigation: Negative and Low

8.12 Operational Phase (Health and Safety Impacts)

8.12.1 Impact 1: Occupational Health and Public Health concerns

Cause of Impact

Health and safety at the proposed Faecal sludge treatment plants sites are considered primarily in terms of potential exposure to pathogens and accident occurrence to workers and members of the local population during operation.

There is likely to be health and risk of pathogens for potential users of the wetland by liquid effluent discharge from the faecal sludge plant. This may lead to transmission of water borne diseases and vector transmitted diseases if the faecal sludge treatment/sewer is not well handled. FSTP are potentially dangerous work environments unless proper precautionary measures are implemented.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	3	2	High	Low

Mitigation Measures:

- ✓ Health and safety regulations shall be imposed on all the workers. Safety regulations include; first aid kits, protective clothing such as uniforms, gloves and helmets, in addition to regulations concerning the storage and use of hazardous material. Furthermore, the FSTP site shall be kept clean to prevent sanitation failures and workers should not be allowed to exceed working hours;
- ✓ To prevent accidents, members of the public shall not be allowed to access the faecal treatment plant at any time, especially after working hours. This is ensured by proper site closure, fencing, and securing the site using a night guard;
- ✓ No cattle grazing or irrigation shall be allowed to use water from the ponds/ wetlands created for purification;
- ✓ Fencing of 100m from the wetland from discharge point and provision of disinfecting facility shall be considered, if found necessary;
- ✓ Vector control program, i.e. fish & frogs feeding on insect larvae shall be instituted at the plant; and
- ✓ For use of insecticides, environmentally best practice shall be used, e.g. *bacillus thuringiensis* (bacterial toxin)

Significance Rating with Mitigation: Negative and Low

8.12.2 Impact 2: Effect on farm yield and soils by poorly treated faecal sludge cake

Cause of Impact

If the faecal sludge is not properly treated, it may harm the farm production of those farmers who apply the cake to their farm yields. It may also affect the soil fertility of the gardens. Additionally, the farmers handling the faecal sludge cake may get health effect because of handling sludge which is not well treated.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Unlikely	3	2	1	Moderate	Low

Mitigation Measures:

- ✓ Proper treatment of the faecal sludge shall be ensured before selling it as manure to the farmers; and
- ✓ Farmers shall be advised to use protective gears when applying manure to their farms / gardens.

Significance Rating with Mitigation: Negative and Low

8.13 Operational Phase (Social Impacts)

8.13.1 Impact 1: Improvement of farm yields and income source

Cause of Impact

The production of the faecal sludge cake will be important to the farmers who require fertilizers/manure for their farms. The sale of the cake will be a source of income to the client. But will also help improve the farm yields of the farmers and hence enhance food security of the country-Uganda.

Significance Rating without Enhancement: Positive and High

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without Enhancement	Significance with Enhancement
Positive	Certain	3	3	2	High	High

Enhancement Measures:

- ✓ Ensure proper treatment of the faecal sludge before selling it as manure to the farmers; and

- ✓ Train the farmers on the importance and best methods of using the fertilizer cake from the treated faecal matter.

Significance Rating with Enhancement: Positive and High

8.13.2 Impact 2: Effects on Accessibility

Cause of Impact

Cesspool vehicles bringing in faecal matter for dumping may cause traffic inconveniences to other road users especially along the Kampala – Karuma Highway and the Kihura community access roads leading to the Faecal sludge management plant. This may cause delays along these busy roads especially during peak hours.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	**Probability**	**Geographical Extent**	**Duration**	**Magnitude**	**Significance without mitigation**	**Significance with mitigation**
Negative	Probable	1	1	1	Moderate	Low

<u>Mitigation Measures:</u>

- ✓ Vehicles bringing faecal matter for dumping shall be restricted to particular times of the day and not certainly during peak hours; and
- ✓ The client (MWE or NWSC) shall ensure that the drivers realise the need of continuous flow of traffic and dumping shall be done as fast as possible.

Significance Rating with Mitigation: Negative and Low

8.13.3 Impact 3: Improved sanitation and standards of living

Cause of Impact

While overall improved sanitation facilities will lead to improved standards of living in since the cost of buying water and accessing good sanitation facilities like public toilets will be reduced.

Significance Rating without Enhancement: Positive and Low

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without Enhancement	Significance with Enhancement
Positive	Certain	3	3	2	Low	High

Enhancement Measures:

- ✓ The prices levied on sewer management and faecal sludge disposal should be rational and realistic based on the economy of Kigumba Cluster Towns. This will enable people access these services at a reasonable price which they can afford.

Significance Rating with Enhancement: Positive and High

8.13.4 Impact 4: Elimination of open dumping of faecal matter

Cause of Impact

Elimination of open dumping of faecal matter which often enters the open drains causing bad sanitary conditions and foul smell in the project areas especially during the rainy spells. Provision of the faecal sludge treatment facilities and ventilated improved and water borne toilet facilities will help solve this problem.

Significance Rating without Enhancement: Positive and Low

Impact classification:

Nature	Probability	Geographical Extent	Duration	Magnitude	Significance without Enhancement	Significance with Enhancement
Positive	Certain	3	3	2	Low	High

Enhancement Measures:

- ✓ The community shall be educated and sensitized on the dangers of open dumping of faecal matter and encouraged to use the provided toilets and pit latrines by the project.

Significance Rating with Enhancement: Positive and High

Table 8-2: Impact Matrix summary of the impacts for the proposed Kigumba Cluster Faecal sludge management facility and their influence on the environment

SN.	Impact/Issue of concern	Nature	Duration	Extent	Magnitude	Probability of occurrence	Overall Significance	
							Without Mitigation / Enhancement	With Mitigation / Enhancement
		PRE-CONSTRUCTION PHASE						
	Physical Impacts							
1.	**Alteration of landscape and visual amenity**	Negative	Short term	Local	Low	Probable	**LOW-**	**INSIGNIFICANT-**
2.	**Contamination of the soil and the wetland**	Negative	Short term	Local	Low	Probable	**LOW-**	**INSIGNIFICANT-**
	Biological Impacts							
1.	**Loss of vegetation and crops**	Negative	Short term	Local	Low	Probable	**LOW-**	**INSIGNIFICANT-**
2.	**Disturbance of Terrestrial fauna**	Negative	Short term	Local	Low	Probable	**LOW-**	**INSIGNIFICANT-**
	Socio-Economic Impacts							
1.	**High Expectations of local communities in relation to jobs**	Negative	Short term	Local	Low	Probable	**LOW+**	**INSIGNIFICANT +**
		CONSTRUCTION PHASE						
	Biological Impacts							
1.	**Temporary loss of habitat in construction site**	Negative	Medium Term	Local	Moderate	Very Probable	**MODERATE-**	**INSIGNIFICANT-**
2.	**Disturbance of fauna by noise and vibration**	Negative	Short term	Local	Moderate	Certain	**LOW-**	**INSIGNIFICANT-**
3.	**Disturbance of plant process and fauna by dust generated**	Negative	Medium Term	Local	Moderate	Probable	**LOW-**	**INSIGNIFICANT-**
4.	**Loss of vegetation cover and plant diversity**	Negative	Medium Term	Local	High	Certain	**HIGH-**	**MODERATE-**
5.	**Disturbance and mortality of terrestrial fauna**	Negative	Medium Term	Local	Moderate	Probable	**LOW-**	**INSIGNIFICANT-**
6.	**Loss of habitat and disturbance of fauna using the wetland**	Negative	Short term	Local	Moderate	Certain	**MODERATE-**	**LOW-**

SN.	Impact/Issue of concern	Nature	Duration	Extent	Magnitude	Probability of occurrence	Overall Significance	
							Without Mitigation / Enhancement	With Mitigation / Enhancement
7.	**Pollution by solid wastes**	Negative	Short term	Local	Moderate	Certain	**MODERATE-**	**LOW-**
	Socio-Economic Impacts							
1.	**Loss of crops and livelihood**	Negative	Long term	Local	Moderate	Certain	**MODERATE-**	**LOW-**
2.	**Land take for the faecal sludge management facility and access road**	Negative	Long term	Local	Moderate	Certain	**HIGH-**	**LOW-**
3.	**Employment opportunities**	Positive	Short term	Regional	Low	Certain	**LOW +**	**LOW+**
4.	**Market for construction materials**	Positive	Short term	Regional	Low	Certain	**LOW+**	**MODERATE +**
5.	**Theft of construction materials**	Negative	Short term	Local	High	Probable	**HIGH-**	**LOW-**
6.	**Pressure on social services**	Negative	Short term	Regional	High	Certain	**HIGH-**	**LOW-**
7.	**Spread of Sexually Transmitted Infections (STIs)**	Negative	Short term	Local	High	Certain	**HIGH-**	**LOW-**
	Physical Impacts							
1.	**Soil compaction**	Negative	Short term	Local	High	Certain	**HIGH-**	**LOW-**
2.	**Siltation and sedimentation of the wetland**	Negative	Short term	Local	High	Certain	**HIGH-**	**LOW-**
3.	**Poor sanitation around the construction site**	Negative	Short term	Local	Moderate	Certain	**MODERATE-**	**LOW-**
4.	**Construction debris and wastes**	Negative	Short term	Local	High	Certain	**HIGH-**	**LOW-**
5.	**Visual and landscape impact**	Negative	Short term	Local	Moderate	Certain	**MODERATE-**	**LOW-**
	Health and Safety Impacts							
1.	**Construction related traffic**	Negative	Short term	Local	High	Certain	**HIGH-**	**LOW-**
2.	**Construction noise**	Negative	Short term	Local	High	Certain	**HIGH-**	**LOW-**
3.	**Construction accidents**	Negative	Short term	Local	High	Certain	**HIGH-**	**LOW-**
		OPERATIONAL PHASE						
	Physical Impacts							
1.	**Decline in air quality**	Negative	Long term	Regional	High	Certain	**HIGH-**	**LOW-**
2.	**Noise and dust emissions**	Negative	Short term	Local	Moderate	Probable	**LOW-**	**INSIGNIFICANT-**

SN.	Impact/Issue of concern	Nature	Duration	Extent	Magnitude	Probability of occurrence	Overall Significance	
							Without Mitigation / Enhancement	With Mitigation / Enhancement
3.	**Solid wastes from the screens**	Negative	Long term	Local	Moderate	Certain	**MODERATE-**	**LOW-**
	Biological Impacts							
1.	**Loss of vegetation during maintenance activities**	Negative	Short term	Local	Low	Probable	**MODERATE-**	**LOW-**
2.	**Contamination of ground water, wetland and soils**	Negative	Long term	Regional	High	Probable	**VERY HIGH -**	**LOW-**
3.	**Generation of anaerobic conditions**	Negative	Short term	Local	Low	Probable	**LOW -**	**INSIGNIFICANT-**
4.	**Aquatic weeds, deterioration of effluent quality**	Negative	Medium term	Local	Low	Probable	**MODERATE-**	**LOW-**
5.	**Foul odor**	Negative	Long term	Regional	High	Probable	**HIGH -**	**LOW-**
	Health and Safety Impacts							
1.	**Occupational Health and Public Health concerns**	Negative	Long term	Local	Moderate	Probable	**HIGH-**	**LOW-**
2.	**Effect on farm yield and soils by poorly treated faecal sludge cake**	Negative	Long term	Regional	Moderate	Certain	**MODERATE-**	**LOW-**
	Socio-Economic Impacts							
1.	**Improved farm yields and income source**	Positive	Long term	Regional	High	Certain	**HIGH+**	**HIGH+**
2.	**Effects on accessibility**	Negative	Long term	Local	Moderate	Certain	**MODERATE-**	**LOW-**
3.	**Improved sanitation and standard of living**	Positive	Long term	Regional	Moderate	Certain	**LOW +**	**HIGH+**
4.	**Elimination of open dumping of faecal matter**	Positive	Long term	Regional	Moderate	Certain	**LOW +**	**HIGH+**

8.14 Decommissioning Phase Impacts

Decommissioning of the proposed project will become necessary when the project completes its life cycle or when there is change of use. In a situation where the Sanitation system facilities complete their lifecycle, decommissioning process will typically involve demolition of the buildings, clearing of the site and reclaiming or restoring the affected land into a natural condition. Table 8.2 below, outlines the basic measures that will be required to be undertaken once all operation activities have ceased.

8.14.1 Impact 1: Change of use situation

In a situation where there is a change of use, decommissioning process may entail structure alterations and/or relocation of Sanitation system facilities. Upon demolition of some of the sanitation structures, the affected land will need to be reclaimed or restored into a natural condition through landscaping and planting of vegetation.

8.14.2 Impact 2: End of life situation

In a situation where the faecal sludge structures have completed their useful life, the decommissioning process will entail removal of the Sanitation system facility buildings/structures. Site clearing of the site and reclaiming or restoring the affected land into a natural condition will then follow.

Restoration of the affected land may involve the filling in of the open pits and grading the land to its natural contours, then planting appropriate tree species and under cover vegetation to hold the soil in place and to prevent flooding. Planting of trees however, may not be necessary if the site is immediately taken over for another development.

During decommissioning, the debris resulting from the demolition will either be transported by a licensed waste transporter for dumping at an approved site or used as base material for new construction work. The demolition process will entail removal of permanent materials using crowbars and hammers, breaking of walling and reinforced slabs using sledge hammers and/or jack hammers, which utilize compressed air and lowering of materials from high to low levels. Some of the exercise may entail working at high level and all the necessary health and safety measures will need to be implemented including provision of personal protective equipment such as, safety harnesses, helmets, gloves, respirators, safety shoes, coveralls, goggles and ear protectors.

Generally, the developer will need to follow the necessary safety guidelines and precautions during the demolition process as shown in the decommissioning plan in Table 8.3 below.

Table 8-3: Decommissioning Plan for Kigumba Faecal Sludge Management facility

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Monitoring Means	Time Frame	Cost (UGX)
Demolition waste management					
Demolition waste	✓ Use of an integrated solid waste management system i.e., through a hierarchy of options: Source reduction; ✓ Recycling; Reuse; Sanitary land filling.	Project Manager and Contractor	Inspection and Observation	One-off	To be determined
	✓ All structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible.	Project Manager and Contractor	Inspection and Observation	One-off	-
	✓ All foundations must be removed and recycled, reused or disposed of at a licensed disposal site.	Project Manager and Contractor	Inspection and Observation	One-off	-
	✓ Where recycling/reuse is not possible, the materials should be taken to a licensed waste disposal site.	Project Manager and Contractor	Inspection and Observation	One-off	-
Rehabilitation of project site					
Vegetation disturbance	Implement an appropriate re-vegetation programme to restore the site to its original status.	Project Manager and Contractor	Observation	One-off	-
	✓ Consider use of indigenous plant species in re-vegetation.	Project Manager and Contractor	Observation	One-off	-
Minimization of occupational health and safety impacts					
Occupational	✓ Adherence to the Occupational Health and	Health and Safety	Inspection,	Throughout	To be

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Monitoring Means	Time Frame	Cost (UGX)
Health and Safety	Safety Rules and Regulations stipulated in the Occupational Health and Safety Act, 2006.	Manager	Meeting and Observation	decommissioning period	determined
	✓ Provision of appropriate personal protective equipment as well as ensuring a safe and healthy environment for demolition workers	Proponent	Inspection and Observation	Throughout decommissioning period	To be determined
	✓ Mitigate demolition workers' accidents by enforcing adherence to safety procedures and preparing contingency plan for accident response.	Health and Safety Manager	Meeting and Observation	Throughout decommissioning period	To be determined
Minimization of demolition noise and vibration					
Noise and vibration	✓ Sensitize demolition vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.	Project Manager and Contractor	Meeting	Throughout demolition period	No added cost

9 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

9.1 Scope of the Environmental and Social Management Plan for the Proposed Faecal sludge management facility at Kihura LCI

The purpose of this ESMMP is to ensure "good environmental practice" by taking a holistic approach to the management of environmental and social impacts during the construction and operational phases of the proposed faecal sludge management facility and associated infrastructure. This ESMMP therefore sets out the methods by which proper environmental controls are to be implemented by Ministry of Water and Environment (MWE) and any nominated contractor (if applicable) based largely on the mitigation measures recommended in the ESIStatment. However, where necessary, these methods have been expanded upon and additional issues addressed in order to ensure that all environmental and social aspects are appropriately considered and monitored. The duration over which contractors (if any) management controls shall be in place cover the construction and operation period of the faecal sludge management facility construction, operation as well as the project specifications and, as the defects notification period.

It is important to note that this ESMMP is focused primarily on the construction and operational phases of the proposed faecal sludge management facility and associated infrastructure. Design specifications from an environmental and social point of view were taken into consideration throughout the ESIA during which the Consultant provided input with regards to possible mitigation measures to reduce environmental and social impacts.

The provisions of this ESMMP are binding on Ministry of Water and Environment (MWE) and any nominated contractor and any contractors. They are to be read in conjunction with all the documents that comprise the suite of documents for this contract (as highlighted in Section 9.3 below). In the event that any conflict occurs between the terms of this ESMMP and the project specifications or Certificate of EIA Approval once / if issued by NEMA, the terms herein shall be subordinate.

EIA follow up and effective monitoring has become a matter of concern among EIA practitioners (IAIA, 2005) and in the EIA policies of many countries. Mitigation options and enhancement measures are meaningless without effective and consistent follow up i.e., monitoring.

Monitoring refers to the systematic collection of data through a series of repetitive measurements over a long period of time to provide information on characteristics and functioning of environmental and social variables in specific areas over time. There are four types of monitoring that are also relevant to this EIA.

Monitoring will be required in order to check on the effectiveness of the enhancement measures and mitigation options as well as generating information that would be used in future developments and planning processes. An Environmental Management and Social Monitoring Plan (ESMMP) is a detailed plan and schedule of measures necessary to minimize, mitigate, etc. any potential environmental and social impacts identified by the ESIA (World Bank 1999). In this EIA, the significant impacts have been identified, thus the preparation of this ESMMP.

This ESMMP consists of a set of mitigation, monitoring and institutional measures to be taken during the implementation and operation of the proposed pharmaceutical plant establishment so as to eliminate adverse environmental impacts, offset them or reduce them to acceptable levels. The ESMMP also includes the actions needed to implement these measures, including the following features:

- Mitigation based on the environmental and social impacts reported in the ESIA, the ESMMP describes the technical details of each mitigation measure; and
- The EMMP also includes monitoring objectives that specifies the type of monitoring activities linked to the mitigation measures.

Specifically, the monitoring section of the ESMMP provides:

1. A specific description, and technical details, of monitoring measures that includes the parameters to be measured, the methods to be used, sampling locations, frequency of measurements, detection limits (where appropriate), and definition of thresholds that will signal the need for corrective actions;
2. Monitoring and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures and to furnish information on the progress and results of mitigation;
3. The ESMMP also provides a specific description of institutional arrangements i.e. who is responsible for carrying out the mitigating and monitoring measures (for operation, supervision, enforcement, monitoring of implementation, remedial action, financing, reporting, and staff training);
4. Additionally, the ESMMP includes an estimate of the costs of the measures and activities recommended;
5. The ESMMP also considers compensatory measures if mitigation measures are not feasible or cost effective;

It is worth noting that this ESMMP is operative throughout the whole Project Cycle.

9.2 Assumptions and Limitations to the ESMMP

This ESMMP has been prepared based on the following assumptions and limitations:

- ✓ It is assumed that the consultant was provided with all relevant project description information by Ministry of Water and Environment;
- ✓ There will be no significant changes to the project description or surrounding environment between the completion of the report and implementation of the proposed project that could substantially influence findings, recommendations with respect to mitigation, etc.;

9.3 Applicable Documentation

All the environmental documentation/reports that form the suite of documents for the proposed project's ESIA are applicable to this project, and should therefore be read in conjunction with this ESMMP. In addition, cognisance of the Certificate of Approval must be taken once/if it is issued by NEMA. Where necessary, this ESMMP must be amended to comply with the Certificate of Approval, and submitted to NEMA for approval.

Other documentation which should be considered includes: -

- All contract documentation applicable.
- All applicable environmental legislation.

9.4 Administration and Regulation of the Environmental and Social Obligations

Ministry of Water and Environment – the operators / owner of the faecal sludge management facility and the associated infrastructure must in line with this ESMMP prepare a document clearly outlining and demonstrating the environmental and social responsibilities, accountability and liability of the Contractors' employees. Ministry of Water and Environment shall assign responsibilities for the following:

- Reporting structures.
- Actions to be taken to ensure compliance.
- Overall design, development and implementation of the ESMMP.
- Documenting the environmental policy and strategy.
- Implementing the ESMMP in all stages/phases of the project.
- All the aspects which require action under the other core elements and sub-elements of the ESMMP.

All official communication and reporting lines including instructions, directives and information shall be channeled according to the contractor's organization structure.

9.4.1 Roles and Responsibilities

9.4.1.1 Ministry of Water and Environment (MWE)

Ministry of Water and Environment (MWE) is the project proponent and shall therefore be the entity monitoring the implementation of the ESMMP and compliance with the Certificate of Approval. MWE's appointed contractor is not required to appoint a separate management staff for the implementation and monitoring of this management plan. MWE's appointed contractor to implement some of the measures during the construction phase of the project on behalf of the client (Ministry of Water and Environment) and hence implement the proposed mitigation measures documented in this ESMMP on behalf of MWE, then the successful contractors' responsibilities are outlined in Section 9.4.1.2 that follows.

9.4.1.2 The Appointed Contractor

The appointed Contractor shall:

- Be responsible for the finalization of the ESMMP in terms of methodologies which are required to be implemented to achieve the environmental specifications contained herein and the relevant requirements contained in the Certificate of Approval, once/if issued by NEMA;
- Be responsible for the overall implementation of the ESMMP in accordance with the requirements of Ministry of Water and Environment (MWE) and the Certificate of Approval, once/if issued by NEMA;
- Ensure that all third parties who carry out all or part of the Contractor's obligations under the Contract comply with the requirements of this ESMMP; and
- Ensure that the appointments of the Environmental Control Officer (ECO) and Environmental Site Officer (ESO) are subject to the approval of Ministry of Water and Environment (MWE).

9.4.1.3 Environmental Officer and Health and Safety Officer

Ministry of Water and Environment shall appoint an Environmental Officer (EO) as well as a Health and Safety Officer (HSO) who shall be based on site and shall be the responsible persons for implementing the environmental and social provisions as outlined in this document.

One of the tasks of the EO will be to ensure that the proposed impact mitigation actions as outlined in this report in respect of the faecal sludge management facility and associated infrastructure will be properly implemented as required during the construction phase, demobilization phase and during the operational phase. Where necessary, more than one EO may be required on the site as the scope of the work dictates.

9.4.1.4 Independent and External Environment and Social Auditor

An independent external environmental auditor shall be appointed by Ministry of Water and Environment to ensure compliance with the ESMMP. The audit shall at least be carried out halfway through the general operations phase of the faecal sludge management and associated infrastructure.

9.4.1.5 Liaison Committee

A liaison committee consisting of a representative from the Client – Ministry of Water and Environment, the contractor, National Environment Authority (NEMA), National Water and Sewage Corporation (NWSC), Kiryandongo District Local Government, Kigumba Town Council and any other role-player deemed necessary by the members of the committee (the "Liaison Committee") will meet regularly to review the progress of both the Contractor and Operator in implementing and complying with their obligations as set out in this ESMMP.

9.5 Environmental Monitoring

Environmental monitoring is the systematic measurement of key environmental indicators over time within a particular geographic area (World Bank, 1999). Monitoring should focus on the most significant impacts identified in the ESIA. Various types of monitoring activity are currently in practice. The main types are briefly described below:

1. **Baseline Monitoring:** A survey should be conducted on basic environmental parameters in the area surrounding the proposed project before implementation of project activities. Subsequent monitoring can assess the changes in those parameters over time against the baseline.
2. **Impact Monitoring**: The biophysical and socio-economical (including public health) parameters within the project area, shall be measured during the project construction, operational and decommissioning phases in order to detect environmental changes, which may have occurred as a result of project implementation e.g., air emission, dust, noise, water pollution etc. (European Commission, 1999).
3. **Compliance Monitoring:** This form of monitoring shall employ a periodic sampling method, or continuous recording of specific environmental quality indicators or pollution levels to ensure project compliance with recommended environmental protection standards.

Monitoring shall be regular and performed over a long period of time. Interruptions in monitoring might result in generating insufficient data to draw accurate conclusion concerning project impact.

The main aim of ESIA monitoring is to provide the information required to ensure that project implementation has the least possible negative environmental impacts on the people and environment.

9.6 Key Environmental and Social Monitoring Parameters

9.6.1 Geology and Soils

9.6.1.1 Construction phase

- ***Hazardous material***

Spills of fuel, oil and other liquids have the potential to cause contamination of soil and groundwater. The Contractor shall implement measures to contain such spills and avoid contamination as much as possible. However, it is possible that some contamination may occur and the Contractor will be required to implement remediation measures in accordance with project and national requirements.

- ***Soil Erosion***

The project area is susceptible to surface erosion, especially after heavy rain, therefore efforts will be made to reduce the potential for soil erosion during construction activities. Temporary berms will be constructed where necessary to control any run-off to prevents rills or gulley's forming or soil wash out to surface water features. Correct ground works and compaction should be specified in the contract documentation to prevent soil erosion.

- ***Air Quality***

It will be the responsibility of the construction management to schedule construction activities and to apply best practices for dust control, to minimize occurrences of excessive dust concentrations in sensitive neighbouring areas and at the worksite. It will be the responsibility of the construction management to apply best practices for reducing fuel consumption and exhaust emissions, wherever feasible. Aspects such as a reduction of idle driving, selection of new equipment where possible and maintenance of all machinery and engines should be encouraged.

- ***Noise***

The nature and extent of the works, particularly those involving the construction and operation of the sanitation services will result in noise and disturbance to local residents. NWSC will ensure that the contractor minimizes disruption and noise, by inter alia, liaising with residents. It must also be noted that the residents are supportive of the project, as it will result in provision of a reliable, constant water supply and will therefore generally be tolerant of disruption to some extent.

According to the National Environment (Noise standards and Control regulations) allowable noise level should be 60 dBA in daytime; and 50 dBA at night-time, which is close to the international.

- ***Flora and Fauna***

The main potential effects on the flora and fauna will be related to the construction of the faecal sludge treatment plants in areas which are largely wetlands with marsh vegetation. The most likely to be affected is the Kihura area which is presently cultivated and a few settlements in the vicinity. The widening of the access road(s) leading to the proposed faecal sludge site may affect the associated habitats. The work will need to be undertaken carefully, with good planning to conserve topsoil; reduce encroachment and damage to features such as tree roots; avoid pollution of the wetland; ensure continuous flow of water in the wetland; and ensure good reinstatement as well as storage and handling of fuels and oils to avoid contamination.

- ***Storage and Use of Chemicals***

All chemicals will be stored in designated, locked storage areas, taking care to ensure segregation of potentially reactive substance (e.g. flammables should not be stored with toxic substances). These areas will have an enclosed drainage system/bund to avoid contamination. Material Safety Data Sheets (MSDS) will be provided for all substances and used in project health and safety assessments. Efforts will be made to avoid and minimize the use of hazardous chemicals during construction where possible.

- ***Waste Management***

Inert, solid waste (metals, rocks, concrete, gravel, sand and etc.) will be generated during site excavation for the faecal sludge management facility. Construction of paved access roads and asphalt surfaces (where necessary) will also be carried out.

Solid wastes generated at the construction site and during the construction of the faecal sludge plant will be transported by the client (MWE) or his appointed construction contractor. Transportation and disposal of such waste will require in accordance with the National Environment (Waste Management) Regulations, 2020) a license from NEMA as waste handlers in Uganda or sub-contract the activity to a licensed company/person as necessary. The construction works will generate hazardous waste, such as used oils, solvents and other construction waste, which will be required to be disposed of and therefore it will be necessary to arrange an appropriate containment and/or disposal place in in accordance with the National Environment (Waste Management) Regulations, 2020). Measures compliant to good health and safety practice will need to be employed, including appropriate PPE for workers, dampening down of any material that may be generate potentially inhalable dust particles and appropriate containment prior to its storage at an approved/agreed secure facility.

A construction yard shall be created, for laydown of plant and material, maintenance of machinery and prefabrication of infrastructure components. The construction site will be managed as follows:

- Boundaries of the construction site will be marked beforehand and signs will be erected warning people not to enter or dump garbage;
- Metal wastes will be collected and taken to metal processing companies;
- Construction debris (sand, soil, rocks) will be re-used as an additional material for filling deep trenches when needed and where suitable. If not needed, they will be taken to a gazetted dumping site, as agreed with local environmental/planning authorities;
- Speed limits will be set for all trucks operating within the project area; this will be important for those transporting faecal matter for dumping and processing as well.

9.6.2 Waste Management Protocols

Waste and by-products are expected to be generated during the construction and operational phases of the project and therefore, measures to be put in place for the management of this waste have been discussed under the relevant headings in Mitigation Measures above. For ease of reference, waste management protocols for the construction and operational phases of the project are summarized in full in 9.1 below.

Table 9-1: Waste Management Protocols during Construction and Operational Phase

Ref. No.	Type of waste/By-product	Waste Management Measures
Construction Phase		
WM1.	Vegetative Material	• All woody species shall be harvested and cleared

Ref. No.	Type of waste/By-product	Waste Management Measures
		from the submergence area to be inundated prior to damming.
WM2.	Topsoil	• Topsoil generated by scarifying of work areas shall be stockpiled in designated areas and will be re-used on the site for re-vegetation of the quarry area and landscaping of other green areas.
WM3.	Overburden	• Overburden material from the construction works, depending on the quality, shall be used as gravel for construction purposes like access roads connecting the project site.
WM4.	Construction Rubble	• Material such as concrete spoil/broken blocks and excess sub-soil from trench excavations shall be stockpiled in a designated area on site and recycled as: • Aggregate for other construction and/or maintenance/erosion control.
WM5.	Other Solid Waste	• Skips shall be provided on site for the disposal of construction waste and refuse such as rejected off-cuts and packaging, worker's garbage, etc. • Waste from the skips shall be collected on a regular basis by for disposal in accordance with NEMA Waste Management Regulations. • Provision shall be made for the separation and composting of organic waste. • Materials such as scrap timber and cement bags shall be recycled as far as possible on the site.
WM6.	Hazardous Waste	• All hazardous wastes including material soiled with hazardous wastes and empty containers of hazardous materials shall be stored in a designated area on site for regular removal and disposal by a registered contractor in accordance with the Hazardous Waste Management Regulations. • Immediate soil remediation shall be carried out for any major oil or fuel spillages that may occur by mopping up with an appropriate material and disposal off site by a registered contractor in an approved manner. • Used oil and lubricants shall be stored in approved containers on a concrete hard standing surface with retention bund as per UNBS standards and disposed of in accordance with the Hazardous Waste Management Regulations. • Drip pans shall be available on hand for the capture of any substance leaking from machinery
WM7.	Sanitary Waste	• All workers (including casuals) shall use the toilets

Ref. No.	Type of waste/By-product	Waste Management Measures
		and ablutions provided on site
WM8.	Dust	• All exposed work surfaces on the site shall be watered down on a regular (daily) basis
WM9.	Exhaust Emissions /Oil & Fuel Leaks (Construction Machinery)	• Badly maintained construction equipment shall not be allowed to operate on the construction site to avoid smoke emissions and oil leaks.
Operational Phase		
WM10.	General	• Proper housekeeping shall ensure that all the parts of the faecal sludge management facility are at all times clean and tidy.
WM11.	Hazardous Waste	• As per WM6.
WM13.	Solid Waste	• Un-recyclable waste from refuse skips shall be collected on a regular basis for disposal in accordance with NEMA Waste Management Regulations.

9.6.2.1 Operational phase

- ***Air Quality***

Adverse air quality effects are not predicted during operation, due to the nature of the project. All machinery shall either be new and/or shall be maintained according to the manufacturer's service program. Furthermore, significant noxious odours are only typically generated from a WTP in the vicinity of pumping operations, where an aerosol effect is produced or when faecal waste has gone septic due to operational problems. All the main potential locations where noxious odour could be generated shall be housed and ventilated. In addition, there are no sensitive receptors nearby to the operating facility, which is located some distance away from residential areas.

- ***Noise***

Negligible operational noise is anticipated, as the faecal sludge plant shall be fenced off and trees planted around the site. Additionally, there is no major noise associated with faecal sludge plant with the exception of the cesspool trucks which bring in the faecal matter for treatment.

- ***Flora and Fauna***

The receiving watercourse /wetland and ground water may adversely be affected by waste/waste water from the faecal sludge plant if not properly treated, however with sound management it's expected to improve considerably and can be expected to see improvements as nutrient and bacteria levels will significantly reduce.

9.7 Environmental and Social Monitoring and Management Plan (ESMMP)

This ESMMP has been designed to suit the particular activities and needs of Ministry of Water and Environment, and incorporates the following:

- General environmental mitigation measures; and
- Project specific mitigation measures.

The EMMP therefore identifies the following:

1. Activities that will impact on the environment;
2. Specifications with which the contractor shall comply in order to protect the environment from the identified impacts and
3. Actions that shall be taken in the event of non-compliance.

It is important to note that the ESMMP is a dynamic document subject to similar influences and changes as are brought by variations to the provisions of the project specification. Any substantial changes shall be submitted to Ministry of Water and Environment - the proprietor / operator and the relevant environmental authorities in writing for approval. It must be emphasized that some changes may have budget and timeframe implications.

Table 9-2: Environmental and Social Management Plan for the Proposed Faecal Sludge Management Facility for Kigumba Cluster Towns

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
Pre-Construction Phase					
Physical Environment					
Changes in the Landscape – Visual Impact	Negative	✓ Vegetation clearance shall be restricted to existing cleared areas or areas without crops and trees whenever possible; ✓ The cutting of branches, crops and shrubs shall be done manually. ✓ All the destroyed trees and crops shall be recorded so that they can be included in the project valuation.	Not Applicable	Design team MWE	MWE Local leadership
Contamination of Soil and Wetland	Negative	✓ Soil contamination prevention measures shall be considered while carrying out trial pits survey on the proposed site for the faecal sludge plant. ✓ Each exploration hole shall be closed with a cap after surveying. ✓ The removal and clearance of all the soils shall be left on side of the excavated soil exploration holes to ensure that the soils don't erode into the neighbouring water streams/wetlands	Not applicable	Design Team MWE	MWE
Biological Environment					
Loss of Plant Cover/ Vegetation and Crops	Negative	✓ Vegetation removal shall be restricted to only necessary areas for carrying out studies; ✓ The cutting of branches shall be done manually especially when carrying out surveying; ✓ All the destroyed economic trees and crops shall be recorded and included in the valuation report for purposes of compensation; and ✓ Vegetation clearance shall be carried out in the presence of the property owners and the local leadership.	No cost because the identified measures are adequate, provided they are integrated into normal construction procedures.		

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
Disturbance of Terrestrial Fauna	Negative	✓ Vegetation removal shall be restricted to only necessary areas; ✓ Manual clearance of vegetation shall be encouraged to ensure that terrestrial fauna is largely protected; and ✓ Use of machinery in areas which harbour fauna like wetland shall be avoided.	No cost because the identified measures are adequate, provided they are integrated into normal construction procedures.	Contractor/MWE	MWE Kiryandongo Environmental officer and Kigumba Town Council Environmental Officer (if any) NEMA
Socioeconomic Environment					
High Expectations of the Local Communities in relation to Jobs	Positive	✓ The hiring requirements shall be clear and properly publicized before the start of the recruitment process and respected by the design team. For a better impact on the communities this process should be conducted with the involvement of local leaders; ✓ In the event there are local expectations for employment that cannot be met by the project, the limited availability of places shall be made known to the interested parties through local authorities; and ✓ The principles and procedures for hiring shall, as far as possible, give priority to the hiring of skilled local workers.	No cost because the identified measures are adequate, provided they are integrated into normal construction procedures.		
Construction Stage Impacts					
Physical Environment					
Changes of Landscape - Visual Impact	Negative	✓ The use of paint with colours that match the environment shall be considered to minimize visual impact of the faecal sludge plant structures; and ✓ The retention of a belt of trees/bush shall be encouraged around the faecal sludge facilities built to minimize visual impact.	No cost because the identified measures are adequate, provided they are integrated into normal construction procedures.	Contractor/MWE	MWE Kiryandongo District Environmental officer / Kigumba Town Council (if any) NEMA

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
Soils Contamination	Negative	✓ The contractor shall acquire, use and maintain mobile toilets during construction of the faecal sludge plant; ✓ Regular maintenance of construction vehicles and machinery shall be considered to ensure that they are spill free; ✓ Refueling activities shall be restricted to areas with concrete or impermeable and bunded surface. These areas shall be far from the wetland sections of the FSP site; ✓ Adequate supplies of absorbent material shall be available at all fuel storage and handling area; ✓ All members of the workforce shall be trained in their use and safe disposal; ✓ The contractor shall prepare and reinforce awareness on waste management and refueling procedure; ✓ Leaking or empty oil drums shall be removed from the construction site immediately with measures in place to prevent contamination; and ✓ The contractor shall prepare and implement a Waste Management Plan.	Management of Human wastes and machine maintenance UGX 15,000,000	Contractor/MWE	MWE Kiryandongo District Environmental officer / Kigumba Town Council (if any) NEMA
Soils Erosion and Compaction	Negative	✓ The contractor shall restrict the activities to the minimum possible site for the construction of the faecal sludge plant; ✓ The contractor shall use appropriate machinery and/or protective boarding during soil stripping; ✓ All parent material (top soil and subsoil) shall be removed and stockpiled separately; and ✓ The contractor shall use the stockpiled material in the origin area to reinstate after construction of the	Erosion control measures UGX 17,000,000	Contractor/MWE	MWE Kiryandongo District Environmental officer / Kigumba Town Council (if any) NEMA

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		faecal sludge plant;			
Noise and Vibration Emissions	Negative	✓ Noise and vibration awareness training shall be conducted for all site staff as part of general site induction; ✓ The construction and operation of heavy machinery and vehicles shall be restricted to daytime; ✓ Noise emissions shall be kept within the National Permissible Standards of 75db(A) during day and 65db(A) during night for Construction sites as highlighted under the National Environment (Noise Standards & Control) Regulations, 2003 ; ✓ Information shall be shared with the local communities on the activities schedule; ✓ Truck movements shall be restricted by careful planning of needs of construction material; ✓ Vehicles shall not be left turned on or idling at the site for longer than minimum amount of time required; ✓ All vehicles and construction machinery shall have an efficient muffler design in accordance with the manufacturer's specifications; ✓ Regular and effective equipment maintenance shall be conducted; and ✓ The use heavy vibration related machinery shall be restricted at night times.	No cost for identified measures provided they are integrated into normal construction procedures	Contractor/NWSC	NWSC Kiryandongo and Kigumba Environmental officers NEMA
Dust and Gaseous Emissions	Negative	✓ The soil surface and any non-asphalted roads shall be periodically watered, especially in the dry season; ✓ The storage and handling of spoil, subsoil, topsoil	Periodic watering of dusty areas estimated at UGX 11,000,000	Contractor/MWE	MWE Kiryandongo District Environmental officer / Kigumba Town Council (if

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		and materials shall be carefully managed to minimise the risk of wind-blown material and dust; ✓ The burning of any waste on site shall be prohibited; ✓ Vehicle engines shall not be left running unnecessarily; and ✓ Regular and proper maintenance of vehicles and machinery shall be emphasised.			any) NEMA
Alteration of hydrology of the wetland	Negative	✓ Ambient downstream flow rates shall be maintained and measures shall be taken to minimise raised sediment loadings in the wetland.	No cost because the identified measures are adequate provided, they are integrated into normal construction procedures.	Contractor/MWE	MWE Kiryandongo District Environmental officer / Kigumba Town Council (if any) NEMA
Contamination of the wetland and groundwater	Negative	✓ The Supervising Engineer shall ensure that strict and acceptable storage practices are upheld; ✓ The disposal of such oils shall be restricted to particular areas like the service bays and the used oil cans should be disposed at approved sites by the Kiryandongo environmental office and NEMA; ✓ The contractor shall have spill response equipment available on site; ✓ The contractor shall ensure there is regular maintenance of vehicles and machinery; ✓ The Refueling activities shall be restricted to areas with concrete or impermeable and bunded surface; ✓ Adequate supplies of absorbent material shall be available at all fuel storage and handling areas; ✓ The workforce shall be trained in their use and safe disposal; ✓ The contractor shall prepare and reinforce	Proper storage of toxic materials/effluents: UGX 13,000,000	Contractor/MWE	MWE Kiryandongo District Environmental officer / Kigumba Town Council (if any) NEMA

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		awareness on waste management and refueling procedure; ✓ Leaking or empty oil drums shall be removed from the site immediately with measures in place to prevent contamination; and ✓ Monitoring the status of the wetland shall be undertaken to ensure that any slight contamination is dealt with immediately.			
Biological Environment					
Temporary loss of habitat within the construction sites	Negative	✓ The project access road especially in relation to Kihura LCI shall be selected limiting passage through the wetland, avoiding sensitive areas and minimizing erosion; ✓ Unless of benefit to local communities, temporary access roads will be removed when no longer needed and shall be reinstated; ✓ Selection of the temporary site for the workers camp and material stockpiles shall ensure that avoidance of natural areas is observed to minimise the impact on fauna and flora. The selected sites shall be approved by NEMA; ✓ All personnel shall be briefed on environmental sensitivities in the surrounding areas especially the wetland; ✓ The contractor shall maintain habitat continuity as far as is practicable after construction during site restoration; and ✓ Fishing and the hunting of animals and birds by the construction personnel in the wetland shall be strictly prohibited.	No cost because the identified measures are adequate, provided they are integrated into normal construction procedures.	Contractor/MWE	MWE Kiryandongo District Environmental officer / Kigumba Town Council (if any) NEMA

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
Disturbance of fauna by noise and vibration	Negative	✓ Construction activities and operation of heavy machines shall be restricted to daylight, when most fauna is active and can react to noise; ✓ The use of heavy machinery shall be limited to only necessary activities; and ✓ Construction machinery shall be properly maintained to ensure that both noise and vibration levels are limited.	No cost because the identified measures are adequate, provided they are integrated into normal construction procedures.	Contractor/MWE	MWE Kiryandongo District Environmental officer / Kigumba Town Council (if any) NEMA
Loss of vegetation cover and plant diversity	Negative	✓ Water the soil surface and any unpaved access roads during construction roads at least once a day during the dry season; ✓ Soil excavated from the site shall be covered to prevent dust emission by wind.	Restoration/planting of greenery: UGX 28,000,000	Contractor/MWE	MWE Kiryandongo District Environmental officer / Kigumba Town Council (if any) NEMA
Disturbance and mortality of terrestrial fauna	Negative	✓ Construction activities shall be restricted to the day time; ✓ The area to be cleared shall be inspected for any terrestrial fauna before bush clearing and digging; and ✓ Large scale bush clearing activities shall be carried out during the dry season, to avoid interfering with nesting and breeding.	No cost because the identified measures are adequate, provided they are integrated into normal construction procedures.	Contractor/MWE	MWE Kiryandongo District Environmental officer / Kigumba Town Council (if any) NEMA
Loss of habitat and disturbance of fauna using the wetland	Negative	✓ Construction activities shall be carried out during periods of lowest water flow in the wetland, so that aquatic fauna will be less abundant in the papyrus vegetation to the cleared; ✓ Clearance of vegetation shall be limited to only those areas required for construction of the faecal sludge plant; ✓ The workers' camp shall be located at a secure distance from the wetland, to avoid unusual	No cost because the identified measures are adequate, provided they are integrated into normal construction procedures.	Contractor/MWE	MWE Kiryandongo District Environmental officer / Kigumba Town Council (if any) NEMA

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		presence of workers near the water course; and ✓ Education awareness programs shall be carried out for workers on importance of the wetland environment			
Pollution by solid wastes	Negative	✓ Environmental awareness shall be provided to the employees on solid wastes; ✓ A Solid Waste Management Plan shall be prepared and implemented; ✓ Proper containers shall be provided for the disposal of solid wastes; and ✓ Solid wastes shall be collected regularly and disposed off properly.	Waste management equipment's and collection UGX 15,000,000	Contractor/MWE	MWE Kiryandongo District Environmental officer / Kigumba Town Council (if any) NEMA
Socioeconomic					
Land take for the faecal sludge facility	Negative	✓ In case of compensation, adequate, prompt, timely compensation in line with the current market price shall be effected by the benefiting communities. The compensation shall be fair to ensure that the land owner does not feel cheated and is able to acquire land somewhere else. Most of this land will be acquired through voluntary good will surrender or full payment compensation.	Valuation Report will highlight the amount required for compensation	MWE Chief government Valuer	MWE Local leadership
Social Conflicts among workers and the local population in the project area	Negative	✓ In the dialogues of health and safety, MWE and the contractor shall explain to workers about the importance of keeping a good relationship with local communities; ✓ Amongst the local workers shall be a group of community liaison, responsible for establishing communication between project staff and community, which shall be particularly important in cases of complaint; and ✓ MWE and the contractor should establish and	Conflict resolution Budget required UGX 11,000,000	MWE Grievance management officer	Local leadership Contractor

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		implement a set of rules (or a Code of Conduct) for the workplace. The standards shall include, inter alia, the entry of persons outside the service and the prohibition of prostitution in the construction camp.			
Creation of Jobs and improvement of living conditions of the population	Positive	✓ Clear formal hiring requirements established shall be observed by the client MWE and the contractor; ✓ The hiring requirements shall be clear, properly publicized before the start of the recruitment process and respected by the designated contractor. For a better impact on the communities this process shall be conducted with the involvement of local leaders; ✓ The required skills for the positions shall be provided or, in cases where it is not applicable, shall be clearly indicated that no special qualifications are required; ✓ The client and contractor shall disclose for each position, the exact number of jobs available, the applicable period and the remuneration to be allocated for each type of work; ✓ The principles and procedures for hiring shall, as far as possible, give priority to the hiring of skilled local workers; ✓ In as much as possible, training shall be given to local people to perform semi-specialized tasks, so as to reduce the number of workers from outside for this purpose; ✓ Employment measures shall ensure that gender considerations are taken into consideration aimed at ensuring that at least 20% are women; and	No cost because the identified measures are adequate, provided they are integrated into normal construction procedures.	MWE/ Contractor Local leadership	Labour officers of Kiryandongo District Local leadership

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		✓ In the event where are local expectations for employment that cannot be met by the project, the limited availability of places shall be made known to the interested parties through local authorities.			
Health and Safety Impacts					
Injuries or fatalities	Negative	✓ A traffic management plan shall be developed for the construction site; ✓ All visiting drivers shall report to site management before entering the faecal sludge construction site; ✓ The H&S Management Plan shall include procedures to avoid repetitive motion and wrong manual handling; ✓ Manual work shall be carried out by workers having the physical conditions to undertake the tasks without any risks to their health (consider experience and familiarity with the job, age and historical of injuries); ✓ Sufficient breaks shall be implemented and organized to ensure the possibility for having a rest from repetitive tasks or heavy manual handling, especially under hot ambient conditions. The arrangements for breaks shall be communicated to all concerned workers; ✓ Suitable and proved PPE shall be provided to each worker without any cost; and ✓ Ensure that there are suitable pedestrian crossing points on vehicle routes bringing in construction materials and taking away waste soils.	Trainings of workers UGX 6,500,000 Provision of PPE's to the workers estimated at UGX 32,000,000 Provision of First Aid Kits on site 4,000,000	Contractor/MWE Workers Drivers of project vehicles Community members	Medical officers-Kiryandongo District Local leadership Occupational Health and Safety Department-MoGLSD
Exposure to Chemicals, Hazardous or	Negative	✓ Fuel stores shall be as low in volume as practicable; any leaks of the stores must be avoided and prevented. The outlet of the stores,	Storage facilities for chemicals and hazardous wastes UGX 8,500,000	Contractor/MWE Workers in contact with	Kiryandongo District Health Department Occupational Health and

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
Flammable Materials		drums, tanks etc. must be secured and locked. Bunds shall be empty at any time; any spills must be removed immediately. The storage areas must be secured against damage because of vehicle collision; ✓ The number of employees exposed shall be kept to a minimum; ✓ Adequate ventilation shall be provided in case of enclosed spaces; and ✓ Emergency numbers and MSDS shall be available and displayed.		chemicals	Safety Department-MoGLSD NEMA
Health related issues due to noise	Negative	✓ Warnings shall be posted to warn of the health effects and training and education of personnel on avoiding unnecessary noise generation; ✓ Noisy works shall be scheduled to times when the least workers are present; ✓ Surveillance and job rotation where exposure to noise is significant; ✓ If engineering and administrative controls do not reduce the noise levels sufficiently, approved hearing protection devices (HPD) shall be provided, worn and maintained; and. ✓ A reasonable mitigation measure, of more importance than wearing hearing protection devices, is the reduction of noise levels to an as low as possible level. Noise levels shall be kept below the recommended 75 dB (A) during day time wherever possible.	No cost for identified measures provided they are integrated into normal construction procedures	Contractor/MWE Drivers of project vehicles	Local leadership/community members NEMA
Increased incidence of diseases,	Negative	✓ Awareness campaigns shall be carried out for workers on ways of transmission of STIs and HIV/AIDS, including risk behaviours;	AIDs awareness campaigns in the project areas UGX 3,500,000	Contractor/MWE Project Workers Community members	Ministry of Health Kiryandongo District health department

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
including the spread of HIV/AIDS		✓ MWE shall recruit a specialist organization to implement activities to raise awareness about STIs and HIV/AIDS among the workers. Special attention should be given to sex workers, women and local girls; ✓ Free condoms shall be provided in the project area for the faecal sludge site; ✓ Awareness-raising shall be expected to encourage employees to undergo HIV testing (outside the scope of the employment contract); and ✓ The client (MWE) or the contractor shall forward workers to clinics for early treatment and monitoring of secondary infections/opportunistic such as coughs, flu and pneumonia.			MWE Local leadership
Operational Impacts					
Physical Environment					
Decline in Air Quality	Negative	✓ Proper process design and operation are essential in minimizing potential odour production; ✓ Trees shall be planted along the faecal sludge treatment plant boundary; ✓ Periodic maintenance and monitoring of the air quality shall be conducted along the proposed faecal sludge treatment plant; ✓ There shall be timely and adequate transportation of faecal sludge to the FSDP; ✓ During the transportation, appropriate and adequate handling of the faecal sludge shall be ensured to avoid polluting the environment; and ✓ Proper waste treatment measures shall be used at the FSDP area to avoid bad odours which may become a constant menace to the neighbourhood.	Monitoring of sludge quality: UGX 10,000,000/year Transportation of sludge UGX 10,000,000/year	MWE /NWSC	MWE /NWSC NEMA Neighbouring Communities Kiryandongo District Local Government

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
Noise and Dust Emissions	Negative	✓ Noise emissions shall be kept within the National Noise standards of Uganda; ✓ Local communities shall be informed on the activities schedule; ✓ Noise levels shall be monitored biannually to ensure that the surrounding communities and fauna are not being disturbed; and ✓ The client shall endeavour where possible to improve and tarmac the access roads to the treatment plant. Where this is not economically possible, MWE shall continuously water the community access roads especially where the traffic is high in the dry spells.	No cost because the identified measures are adequate, provided they are integrated into normal operating procedures.	MWE /NWSC	NEMA Local community/Leadership Kiryandongo District Local Government
Solid Wastes from Screens	Negative	✓ Washing and disposal shall be done at controlled solid waste disposal site	No cost because the identified measures are adequate, provided they are integrated into normal operating procedures.	MWE /NWSC	NEMA Kiryandongo District Local Government
Biological Impacts					
Contamination of Ground Water, Wetlands and Soil	Negative	✓ Soil contamination measures shall be considered while designing the sludge storage site; ✓ Geomembrane (UV resistant) shall be used to prevent soil from contamination; ✓ All the facilities, especially the storage, receiving, and disposal areas shall be paved with an impermeable floor structure (10-7 cm/sec) and covered. Furthermore, an effective drainage system shall be established for leachate and storm water collection and management. Storm water and runoff shall be diverted to avoid any contact with the faecal sludge waste; ✓ A drainage layer shall be installed underneath the	Cleaning up the contamination estimated at UGX 18,000,000	MWE /NWSC	NEMA Wetlands Management Department

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		FSTP to provide adequate drainage of leachate from faecal sludge. This may consist of a bed of coarse material such as wood chips, or the processing area may permanently incorporate a drainage layer designed to withstand loading, working and removal of material; and. ✓ Underground water investigations shall be undertaken by MWE to determine subsurface water strikes and establish inclination of aquifers. This will be vital in determining the direction of faecal discharge in relation to the existing water sources and ground water flow.			
Anaerobic Conditions	Negative	✓ Proper maintenance of sewer system in operation	No cost because the identified measures are adequate, provided they are integrated into normal operating procedures.	MWE /NWSC	NEMA
Aquatic Weeds and Deterioration of Effluent Quality	Negative	✓ Manual clearance of ponds for aquatic weeds to be undertaken periodically if necessary.	No cost because the identified measures are adequate, provided they are integrated into normal operating procedures.	MWE /NWSC	NEMA
Health and Safety					
Occupational Health and Public Health Concerns	Negative	✓ Health and safety regulations shall be imposed on all the workers. Safety regulations include; first aid kits, protective clothing such as uniforms, gloves and helmets, in addition to regulations concerning the storage and use of hazardous material. Furthermore, the FSTP site shall be kept clean to prevent sanitation failures and workers shall not be allowed to exceed working hours; ✓ To prevent accidents, members of the public shall not be allowed to access the faecal sludge site at	No cost because the identified measures are adequate, provided they are integrated into normal operating procedures.	MWE /NWSC	NEMA Occupational Health and Safety Department-MoGLSD

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		any time, especially after working hours. This is ensured by proper site closure, fencing, and securing the site using a night guard; ✓ No cattle grazing or irrigation shall be allowed to use water from the ponds/ wetland created for purification; ✓ Fencing of 100m from the wetland from discharge point, provision of disinfecting facility, if found necessary; ✓ Vector control program shall be implemented, i.e. fish & frogs feeding on insect larvae; and ✓ For use of insecticides, environmentally best practice shall be used, e.g. *bacillus thuringiensis* (bacterial toxin)			
Note: All mitigation measures identified in this Table should be specified in all bidding documents (Bill of Quantities) and contracts for construction and operation of the project, and should also be including in all manuals or operating procedures that are developed.					

In total around UGX 202,500,000 needs to be allocated to implement main mitigation measures.

The Contractor shall be contractually required to conform to the requirements specified in the ESIA and ESMMP and will be accountable to the Ministry of Water and Environment (MWE) as the client. It is recommended that Ministry of Water and Environment support the contractor in achieving project environmental and social safeguard objectives where necessary recruit an environmental consultant to be included in the staff of construction Supervisory Body, the consultant will advise and support MWE in implementation of the ESIA standards during construction and into operation.

There are several mechanisms of ensuring delivery during construction of both general and site specific mitigation developed in ESIAs. One mechanism favoured for the project involves requiring the Contractor to further develop the outline requirements in an ESMMP by designing individual Management Plans, such as oil and fuel storage, waste management, traffic management and pollution prevention.

This approach for each individual scheme will benefit from oversight by the Ministry of Water and Environment to form a set of environmental and social requirements applicable to the project as a whole, which will ensure compliance of the work to national and best international practices/standards. Such measures will be mandated in the bidding and contract documents, so that an overall good standard of work is achieved. This approach also has benefits of institutional capacity training, as the knowledge and capability of Ministry of Water and Environment will be extended to effective environmental management and as each scheme comes on stream the operator or National Water and Sewerage Corporation will benefit from knowledge gained on previous schemes. Main elements of the Specific Management Plans are given in Table 9.3 below.

Table 9-3: List of Specific Management Plans for the Proposed Faecal sludge management facility in Kigumba Town

Specific Management Plan	Outline of Content
Waste Management	Measures to reduce, handle, separate, store and dispose waste from operations and work sites. Requirements for monitoring, recording, inspection and reporting. Instructions for the storage and handling of various types of hazardous materials.
Waste Water Management	Measures to control, collect, treat or reuse Waste water/ effluents from various sources to avoid pollution.
Air Quality Control	Measures to reduce and control air emission from various sources. Requirements for monitoring, recording, inspection and reporting.
Dust Control	Measures to reduce and control dust emissions from roads, work sites and construction activities. Requirements for monitoring, recording, inspection and reporting.
Noise and Vibration Control	Measures to reduce and control noise and vibrations generated by plant at all work sites and from transport activities. Requirements for monitoring, recording, inspection and reporting.
Traffic Management	Procedures for minimizing disruption to traffic and access, especially for public buildings such as hospitals and schools.

Specific Management Plan	Outline of Content
Emergency Response	Procedures for response to a range of incidents and emergencies. Requirements for monitoring, recording, inspection and reporting.
Archaeology and Cultural Heritage	Measures to reduce adverse impacts on cultural heritage during construction. If any late finds are made measures must be taken to ensure 'conservation' in accordance with legislation.
Oil and fuel storage and refueling	Specification for storage of all oils and fuels (secondary containment etc.) and procedures for refueling vehicles, plant and equipment so as to ensure environmental protection.
Site Inspection	Procedures for site inspection and reporting including notification of non-compliance
Handling of Complaints and Grievances	Procedures for handling of complaints including response to complainer and reporting.
Environmental Training	• Project Induction • Toolbox talks Training requirements and procedures including target groups, contents of training sessions and verification.
Storage and use of hazardous products & substances	Registration, logging of material safety data sheets and risk assessment of materials and chemicals being used in the project. Documentation requirements.
Reinstatement Plan	Plan for topsoil management and removal of all equipment and materials from temporary work sites and reinstatement of areas to a standard at least as good as the pre-construction condition.

9.8 Performance Monitoring for Environmental parameters

Conducting monitoring is the major strategic tool in environmental management and the extent of project monitoring will be dependent on the nature, scale and potential impact of the project activities. 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.

Main elements of the environmental monitoring plan are the following:

a) **During the construction phase**:

- Dust monitoring;
- Noise monitoring;
- Solid wastes monitoring;
- Waste waters monitoring;
- Soil monitoring.

The Contractor/client will prepare Specific Management Plans (Refer to Table 9.3 above) addressing all aspects of the ESMMP, and will establish a team for the monitoring activities (as shown in Table 9.4 below).

b) During the Operation phase:

- Monitoring of water volume at water points distributed to informal settlements;
- Monitoring of microbiological and chemical composition of waste water discharged, comparison to water standards;
- Monitoring of waste waters after purification;
- Monitoring of odour and air quality especially around the faecal sludge treatment plant;
- Monitoring of on-site septic tanks, its desludging, sludge disposal;
- Monitoring of soil where depositions generated in water cleaning plant will be used as fertilizers.
- Monitoring of all activities during construction period will be under the responsibility of MWE.

The Client (MWE)/appointed contractor will be responsible for the compliance of the constructions with the national norms and standards. Monitoring of construction activities will have to ensure that mitigation measures of construction impacts are being implemented properly. Contractor's Environmental and Social Safeguards Team will be subject to the government inspections (National Environment Management Authority (NEMA), Wetland Management Department, Ministry of Gender, Labour and Social Development (MoGLSD), Kiryandongo District Local Government (KDLG) and Ministry of Health among others) from time to time. An individual auditing company may also inspect the Contractor on a long-term basis, such as every 3 months or 6 months. Regular reports on implementation of monitoring plan will be submitted to the Client (MWE) by the Contractor. The Environmental and Social Monitoring Plan (see Table 9.4) is as presented below.

Table 9-4: Environmental and Social Monitoring Plan for the proposed Faecal Sludge Management facility in Kigumba Town, Kiryandongo District

Item	Element	Location	Type of monitoring	Frequency of monitoring	Purpose of monitoring	Cost
Construction works of the faecal sludge plant	Dust	In the construction sites	Visual monitoring	During periodic site visits to be carried on daily basis by contractor and by environmentalist appointed in the contract	To ensure adherence to environmental protection requirements	UGX 2,000,000
			Project site and surrounding area	Each month	Relevance to standards and rules	UGX 2,000,000
	Waste water/ effluents flows generated in the construction site	In the construction sites	Visual monitoring	During monthly site visits	To ensure adherence to environmental protection requirements	UGX 2,000,000
	Collection of solid wastes	In the construction sites	Visual monitoring	During periodic site visits	To ensure adherence to environmental protection requirements	UGX 2,000,000
	Utilization of solid wastes	Abandoned areas	Visual monitoring	During periodic site visits	To ensure adherence to environmental protection requirements	UGX 2,000,000
	Use of dangerous materials h (paints with heavy metals, lead compositions, asbestos-cement slabs, pipes, inflammable and	In the construction sites with right documentation	Visual monitoring and study of documentation	Each month	To ensure adherence to environmental protection requirements	UGX 2,000,000

Item	Element	Location	Type of monitoring	Frequency of monitoring	Purpose of monitoring	Cost
	toxic substances etc.)					
	Protective measures in the construction site	In the construction sites with right documentation	Visual monitoring	Each month	To ensure adherence to environmental protection and safety requirements	UGX 2,000,000
Construction works of the faecal sludge plant	Protection of nature	In the construction sites	Visual monitoring	Each month	To ensure adherence to environmental protection requirements	UGX 2,000,000
	Earth restoration after excavation works	In the construction sites	Visual monitoring	At completion of construction works	To ensure adherence to environmental protection requirements	UGX 2,000,000
	Noise & vibrations resulting from equipment work	Project area/close to settlements	Portative noise metering device	During periodic site visits, on daily basis	To ensure adherence to environmental protection requirements	UGX 2,000,000
	Traffic operation /movement	In the construction sites	visual monitoring of machinery and b) trucks carrying construction materials	During periodic site visits	To ensure adherence to environmental protection requirements	UGX 2,000,000
Construction works of the faecal sludge plant	Obstructed access	In the construction sites	visual monitoring	During periodic site visits on daily basis	To ensure adherence to requirements	UGX 1,000,000
	Vehicle and pedestrian safety when there is no	In the construction sites	visual monitoring by supervisor	On daily basis during nonworking hours	To ensure adherence to requirements	UGX 2,000,000

Item	Element	Location	Type of monitoring	Frequency of monitoring	Purpose of monitoring	Cost
	construction activity					
Operation of the faecal sludge plant	Utilization of solid wastes	Abandoned areas	Visual	Periodic visits	To ensure adherence to environmental protection requirements	UGX 2,000,000
	Quality of treated potable water	Inlet to treatment structure	Measuring (pH, turbidity, suspended solids, bacteria)	In accordance with the schedule	Relevance to standards and norms	UGX 4,000,000 Each year
	Adequacy of treated potable water to standards	Outlet to treatment structure	Measuring (physical-chemical and bacteriological, including heavy metals and pesticides on permanent basis)	In accordance with the schedule	Relevance to potable water standards	UGX 4,000,000
	Quality of treated faecal effluents	Outlet to treatment structure	Measuring (physical-chemical and bacteriological analyses)	In accordance with the schedule	Relevance to standards and norms	UGX 4,000,000 each year
		Water quality (visual, water smell, bacteriological, chemical)	At up and downstream points of water discharge and water discharge areas (basins)	Each month	To ensure adherence to environmental protection requirements	UGX 4,000,000
	Quality of sludge (sediments)	Monitoring of nematodes, coliforms and heavy metals of sludge composition	Physical, chemical and bacteriological analyses	After sludge processing	Relevance to FAO requirements for neutralization or reuse for agricultural purposes	UGX 4,000,000
Total						**UGX 47,000,000**

10 CONCLUSIONS AND RECOMMENDATIONS

The overall aim of this ESIA was to evaluate impacts associated with the construction and operation of the proposed faecal sludge management facility for Kigumba Cluster Towns in Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District. Specifically, the assessment identified all likely positive and negative environmental and social impacts due to the proposed development and proposes appropriate mitigation measures for the attention of all stakeholders for incorporation into the construction and operational phases; compiles an Environmental and Social Impact Statement including an Environmental and Social Management Plan (ESMP) for all aspects of the proposed development for submission to the National Environment Management Authority (NEMA) for consideration for approval.

The predicted negative impacts of this project have been considered and mitigation measures to be implemented for the preparation, construction and operation stages suggested in this report.

10.1 Conclusion

Improving the sanitation in Kigumba Cluster Towns (Kigumba, Kiryandongo and Bweyale) through construction of the faecal sludge treatment plant. The establishment of the Faecal Sludge treatment plant will largely help in reducing diseases related to poor sanitation, lead to reduction in pollution of water bodies by faecal matter, reduce bad odour in the Towns and suburbs. The major likely negative impacts of the project will occur during construction and these will include land take, clearance of vegetation, noise, dust, vibration, production of wastes (i.e. domestic and hazardous), obstruction of access, accidents and health risks and soil contamination and pollution issues. The likely major impact during operation will arise from the transportation of the faecal matter to the treatment plant. This impact will likely lead to odour, obstruction of traffic and may lead to accident-related risks. The other key operation impact will be the discharge of waste water from the treatment of faecal sludge into the environment (land and wetland).

The charges for collecting faecal sludge should be set such that lower income group will pay less, and that they will to some extent be cross-subsidized by the other users.

It is important to realize that the key to success lies in effective management of the system. This will require intensive training and support by the relevant and responsible district authorities.

10.2 Recommendation

- ✓ All stakeholders involved in the implementation of the Sanitation System for the faecal sludge management facility for Kigumba cluster town project should ensure that all issues of land ownership issues are sorted out to avoid any delays during the construction;
- ✓ There is need to sensitize the communities and institutions on improved household and sanitation systems;

- ✓ The relevant stakeholders will ensure that the proposed Environmental Social Management and Monitoring Plan, which provides mitigation measures, a monitoring schedule and responsibility for monitoring, are implemented. The stakeholders in liaison with the contractors will also ensure that any other adverse impacts that may come up in the course of implementation of the project are addressed immediately.
- ✓ All other lead agencies should undertake monitoring of the project activities and ensure compliance with all relevant environment regulations and guidelines as stipulated in the ESMP.

In compliance with Environmental and Social Impact Assessment Regulations of 2020 and Environmental and Social Audit Regulations of 2020, regular environmental and social audits of the sanitation project should be carried out at least once every year preferably by a competent environmental and social auditor (s) and reports submitted to NEMA for review to ascertain compliance with NEMA EIA Approval Conditions contained in the Approval Certificate (once the project is granted approval), donor requirements and with the environmental regulations and suggested mitigation measures.

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Appendices

Appendix 1: Land Acquisition Documents for Kigumba Faecal Sludge Management facility

THE REPUBLIC OF UGAMDA

AGREEMENT FOR SALE OF LAND

Mr.Mubiru Fred (Hereunder referred to as seller) agrees to sell his/her land to Kigumba town council (Hereunder referred to as seller)

Land status

The land said is located in kihura I cell approximately one (1) km from the centre of the town with assize of four (4) Acres. It's a customary land without a land title.

The seller agrees to sell it at thirty eight million Uganda shillings (38,000,000/=).

Terms of payment

1. Paid cash.
2. Balance Nil.

Responsibility of the seller.

1. To clearly demarcate the land in question with locally commonly used plant (rukoni/muramura).
2. he/she will take the council representative around the land in the presence of the local leaders/LC I and the immediate neighbors.
3. He/she will in turn surrender the former agreement he/she could have signed with the original owner of the land.
4. Within two weeks after signing of this agreement and payment, he will be required to remove all he considers valuable for him from the sold land to enable town council start developing her land.

Responsibility of the buyer

To ensure that the bought land is promptly paid in cash.

Warranty:

The seller warrants that owns this piece of land the subject of this agreement and in the event of any loss, damage and or any defect arising out of ownership and being suffered by the buyer, the seller undertakes to refund the purchase price.

Consent of Spouse

I, KATUSIIME JOVIA of Kihura 1 cell, Kigumba Town Council in Kiryandongo District; being the wife of MUBIRU FRED (seller) hereby consent to the above transaction.

....

To be signed by and for the seller

Name MUBIRU FRED

Sign

Date 21st /09/2019

On behalf of the buyer (Town Council)

Name KAFUKO EDITH

Sign

Date 21st 09 2019

OFFICE OF THE TOWN CLERK KIGUMBA TOWN COUNCIL 21 SEP 2019 P.O. BOX 63 KIGUMBA

Witnessed by (LC1)

KIGUMBA TOWN COUNCIL WARD C 21 SEP 2019 OFFICE OF THE LC I CHAIRPERSON

Name

Title L.C.I CHAIRPERSN

Date 21/SEPTEBER.2019

Witnessed by

Name MONICA KYAGABA

Title SENIOR FINANCE OFFICER

Date 21/09/2019

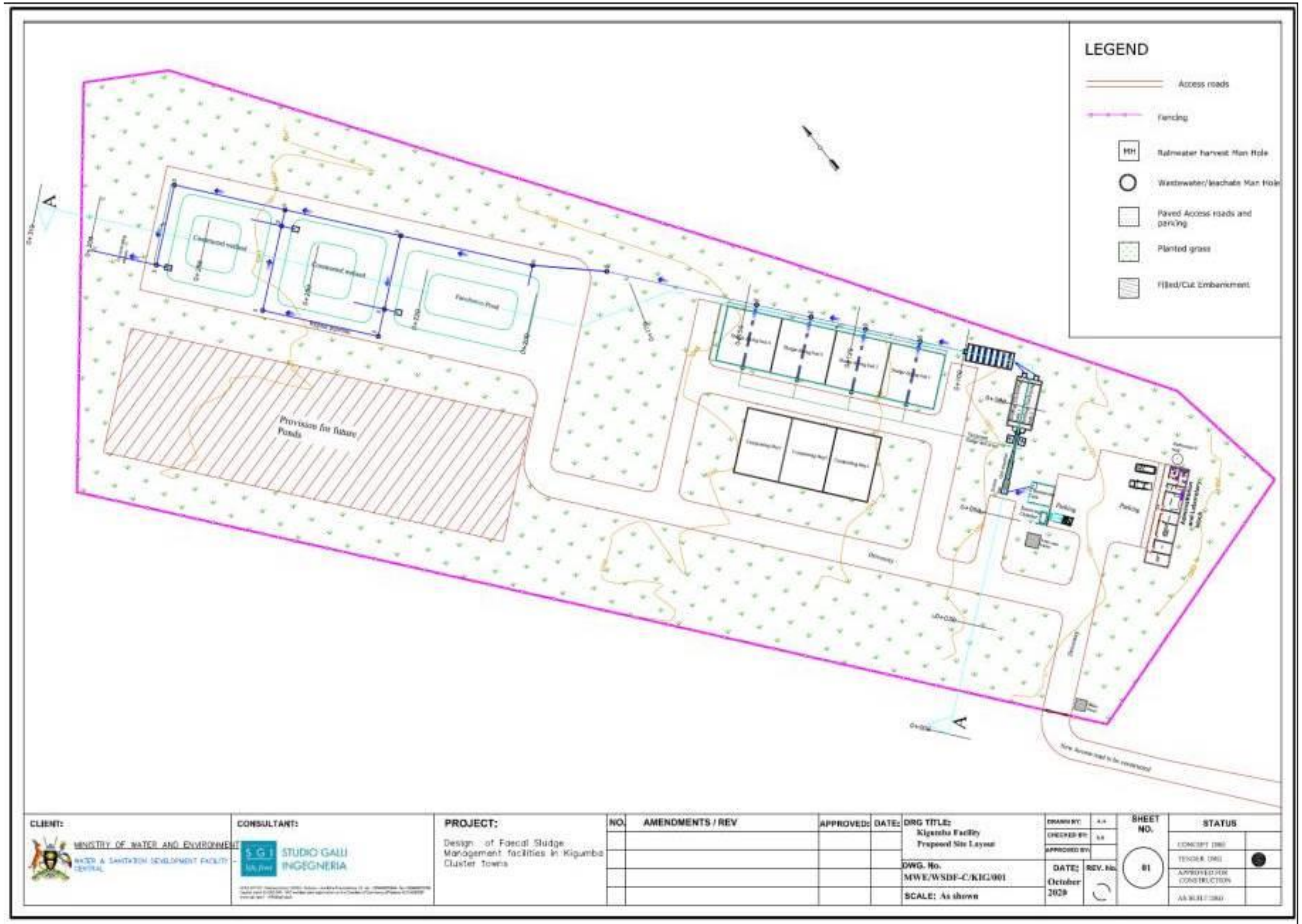
Other LC1 Executive Members

1. SSEKAWUNDE SWAIBU
2. Sebastian Benjamin
3. RUBOYOBA GIDEON
4.

Neighbors

1. MUGOYA
2. ZADU JOSEPH
3. KUSEMERERWA MOSES
4.

Appendix 2: Site layout for the proposed Kigumba Faecal Sludge Management facility



Appendix 3: NEMA Terms of Reference Approval for the proposed Kigumba Faecal Sludge Management facility

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
342758, 342759, 342717
Fax: 256-414-257521 / 232680
E-mail: info@nemaug.org
Website: www.nemaug.org

NEMA/4.5

6th July 2021

The Permanent Secretary,
Ministry of Water and Environment,
P. O. Box 200226,
KAMPALA.

Tel: +256 414 505942
Email: ps@mwe.go.ug

RE: APPROVAL OF THE SCOPING REPORT AND TERMS OF REFERENCE FOR UNDERTAKING THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE FEACAL SLUDGE MANAGEMENT FACILITIES IN SELECTED TOWNS IN CENTRAL AND SOUTH WESTERN UGANDA

This is in reference to the Terms of Reference (TOR) for carrying out an Environmental and Social Impact Assessment (ESIA) for the Feacal Sludge Management Facilities in selected Towns in Central and South Western Uganda which was submitted to this Authority for consideration for approval. Specifically, for the facilities to be developed in the following locations:

(i) Luteete Menvu Cell, Lugo Ward, Busukuma Division, Nansana Municipality, Wakiso District;

(ii) Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District;

(iii) Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District;

(iv) Luyembe Village, Kitoro Parish, Kyanzanga Town Council, Lwengo District; and,

(v) Kiiga Village, Bushura Parish, Kirima Sub County, Kanungu District.

This Authority has finalized the review and grants formal APPROVAL of the said TOR. However, separate ESIA reports shall be prepared for the respective Facilities and submitted to the Authority for further consideration.

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.

Page **1** of **3**

In addition to the scope of work detailed in the TOR, the ESIA team should consider the key aspects below during the conduct of the Environmental Impact Study and the preparation of the report.

(i) Make reference to the updated regulatory frameworks for environmental management. In particular, the National Environment (Waste Management) Regulations, 2020, the National Environment (Standards for Discharge of Effluent into Water or Land), Regulations, 2020, the National Environment (Environment and Social Assessment) Regulations, 2020 and the National Environment (Audit) Regulations, 2020. Uganda has not yet developed standards for air quality, however, reference can be made to the East African Standard: Air Quality Specification (EAS 751:2010). The project should be designed and planned to meet the standards and requirements set out in the respective pieces of legislation.

(ii) The sites are located within or close to wetland systems. Comprehensive hydrological studies of the respective catchment areas, should therefore be undertaken as part of the ESIA process. The report should provide details of the respective wetland systems and identify issues that may need to be addressed to minimize potential impacts on surface and ground water resources. Efforts should be made to avoid disturbing the critical areas or core of the wetland systems, and areas with a relatively high water table or undisturbed wetland.

(iii) Identify and map (including providing GPS coordinates) community water sources within the project sites or their surroundings. Assess potential impacts on such water sources and mitigation measures in this regard.

(iv) The scoping report makes mention of the potential use of treated feacal slugde as soil conditioner. The ESIS should clearly detail the quality assurance and quality control measures that will be implemented to ensure health and safety for the proposed disposal options.

(v) Provide site specific baseline information on the soils, water, air quality and existing activities at the respective sites and their surroundings, including maps and images where appropriate. In particular, provide baseline characteristics of water quality within the respective project sites and their surroundings.

(vi) Ensure that the project alternatives are clearly be documented and appropriate justification provided for the selected options. This shall include options for the safe disposal of treated sludge and effluent from the respective Plants.

Rosetto
6/7/21

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(vii) Consider any other critical environmental concerns that were not initially foreseen during the preparation of the Scoping Report and TOR, and include an evaluation of such concerns, in the ESIA report

(viii) Provide information on the project (investment) cost.

This is therefore, to recommend that you proceed with carrying out the ESIA for the **Feacal Sludge Management Facilities in selected Towns in Central and South Western Uganda**. We look forward to your cooperation and receipt of comprehensive copies of the respective ESIA reports, for our further action.

6/7/21

Patience Nsereko
FOR: EXECUTIVE DIRECTOR

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Appendix 4: Geo-Technical Investigation Report for Kigumba Faecal Sludge Management facility

RSV ENGINEERING GROUP

Geotechnical Investigation Report

Soil Investigations for the Proposed Faecal Sludge Treatment Plant at Kihura 1 Village, Ward C, Kigumba Town Council in Kiryandongo District

Date: February 12, 2021

To: Ministry of Water and Environment

DOCUMENT/REPORT CONTROL FORM

Client's Name:	Ministry of Water and Environment
Project Name:	Geotechnical Investigation for Proposed Faecal Sludge Treatment Plant at Kihura 1 Village, Ward C, Kigumba Town Council in Kiryandongo District
Project Number:	013-280121
Revision Number:	Rev #00

Revision History

Revision #	Date	Prepared	Reviewed	Approved for Issue
00	12-Feb-2021	Damaris Lubangakene	Kabuye Marvine	Eng. Robert Tumwesige

Issue Register

Distribution List	Date Issued	Number of Copies
Ministry of Water and Environment	12-Feb-2021	1 hard copy
RSV Engineering Group Ltd Project File	12-Feb-2021	1 electronic copy

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IMPORTANT NOTICE

This report is confidential and is provided solely for the purposes of determining the geotechnical properties for Proposed Faecal Sludge Treatment Plant at Kihura 1 Village, Ward C, Kigumba Town Council in Kiryandongo District. The report is provided pursuant to a Consultancy Agreement between RSV Engineering Group Ltd and Ministry of Water & Environment under which RSV Engineering Group Ltd undertook to perform a specific and limited task for [Ministry of Water and Environment]. The report is strictly limited to the matters stated in it and subject to the various assumptions, qualifications and limitations in it and does not apply by implication to other matters. RSV Engineering Group Ltd makes no representation that the scope, assumptions, qualifications and exclusions set out in this report will be suitable or sufficient for other purposes nor that the content of the report covers all matters which you may regard as material for your purposes.

This report must be read as a whole. Any subsequent reports must be read in conjunction with this report.

The report supersedes all previous draft or interim reports, whether written or presented orally, before the date of this report. This report has not and will not be updated for events or transactions occurring after the date of the report or any other matters which might have a material effect on its contents or which come to light after the date of the report. RSV Engineering Group Ltd is not obliged to inform you of any such event, transaction or matter nor to update the report for anything that occurs, or of which RSV Engineering Group Ltd becomes aware, after the date of this report.

Unless expressly agreed otherwise in writing, RSV Engineering Group Ltd does not accept a duty of care or any other legal responsibility whatsoever in relation to this report, or any related enquiries, advice or other work, nor does RSV Engineering Group Ltd make any representation in connection with this report, to any person other than [Ministry of Water and Environment]. Any other person who receives a draft or a copy of this report (or any part of it) or discusses it (or any part of it) or any related matter with RSV Engineering Group Ltd, does so on the basis that he or she acknowledges and accepts that he or she may not rely on this report nor on any related information or advice given by RSV Engineering Group Ltd for any purpose whatsoever.

TABLE OF CONTENTS

1. INTRODUCTION

On 5th January, 2021, Ministry of Water and Environment through its Engineers contracted RSV Engineering Group Ltd to conduct a ground investigation for the Proposed Faecal Sludge Treatment Plant at Kihura 1 Village, Ward C, Kigumba Town Council in Kiryandongo District. Field work involved intrusive site works and in-situ testing and sampling. The field work was followed by geotechnical laboratory testing of the sampled materials and reporting of the investigation results. This report provides the relevant geotechnical information required for the design of the project.

Investigation was carried out in accordance with BS 5930: 2015, the Client's instructions, and other relevant standards as cited in the remaining parts of the report. The report considers the Client's particular instructions and requirements and so it should not be used for purposes other than the design of the proposed development.

1.1. Key Objective of the Investigation

The primary purpose of this study was to determine the stratigraphic characteristics or geotechnical design parameters of the site based on field and laboratory tests.

1.2. General Scope of Works

The following activities which were agreed with the client were undertaken;

i. Excavation and logging of three (03) test pits to a maximum depth of 3.0m below ground surface level,

ii. Conducting the Dynamic Lightweight Penetrometer (DPL) tests to a maximum depth of 8.0m below ground level or till refusal at three points,

iii. Collection of representative disturbed and undisturbed samples for laboratory testing accordingly,

iv. Compilation of results and report writing.

1.3. Report Composition

This Geotechnical Report is submitted in accordance with the client's requirements dated 5th January 2021. The body of the report includes appendices which contain investigation findings with the following contents:

Appendix 1: Location of Exploration points

2. SITE DESCRIPTION

The site is located at Kihura 1 Village, Ward C. Kigumba Town Council in Kiryandongo District about 2Km off Kampala-Gulu highway between Kigumba and Kiryandongo towns. At the time of the investigation, the site had banana & maize plantations, gardens of sweet potato & moderately short grass lands with eucalyptus trees and a swamp at the periphery of the site in the western direction. **Figure 1** below shows the site view.

The site is situated on a low-lying area with various drainage Channels running from the east to the western draining into the swamp. A sketch drawing showing exploratory points is attached in **Appendix 1.**

Figure 1: View of the investigated site

2.1. Climate

Kiryandongo district, where the site is located has the tropical savannah climate prevailing. It is warm every month with both wet and dry season. The hot season lasts for 2 months and average annual temperatures of 22.9°C with humidity of 80% and an UV index of 6. The annual average rainfall is 1284mm. **Figure 2** below shows the climate graph of Kiryandongo.

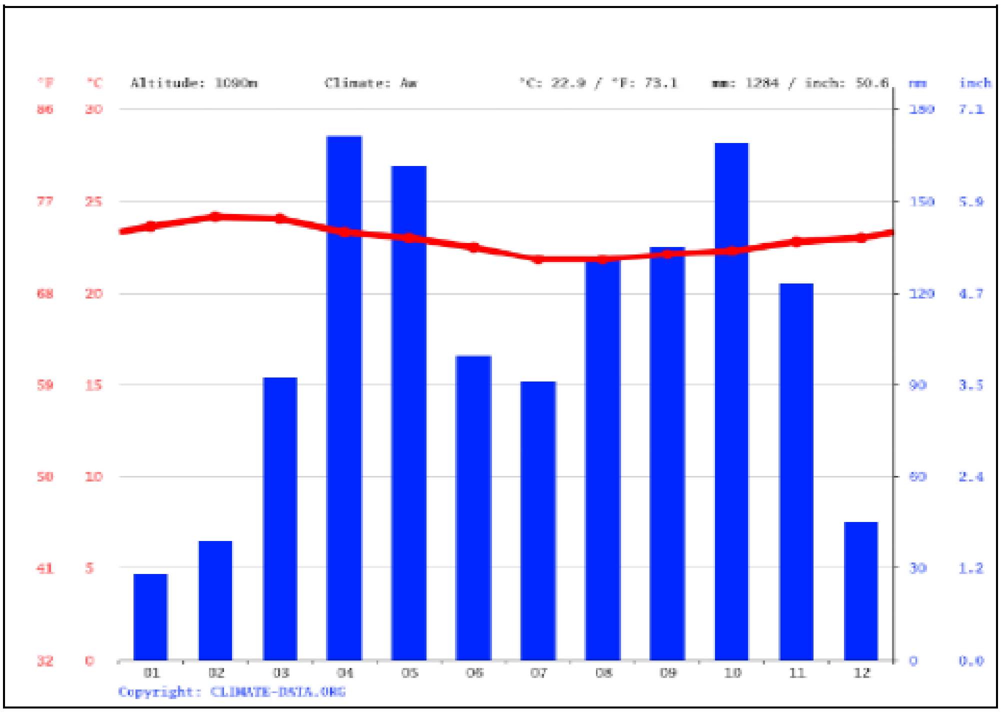

Figure 2: Climate graph of Kiryandongo District

2.2. Topography

Kiryandongo District is generally a high and relatively flat land with an altitude of 1295 metres above sea level combining undulating hills, with Kigumba town council as one pronounced high points located in the District.

2.3. Geology

Kiryandongo district has undulating hills with some pronounced high points located in some localities in the district such as Kaduku in Kigumba and comprises of Laterites (QHI) as shown in the **Figure** 3.

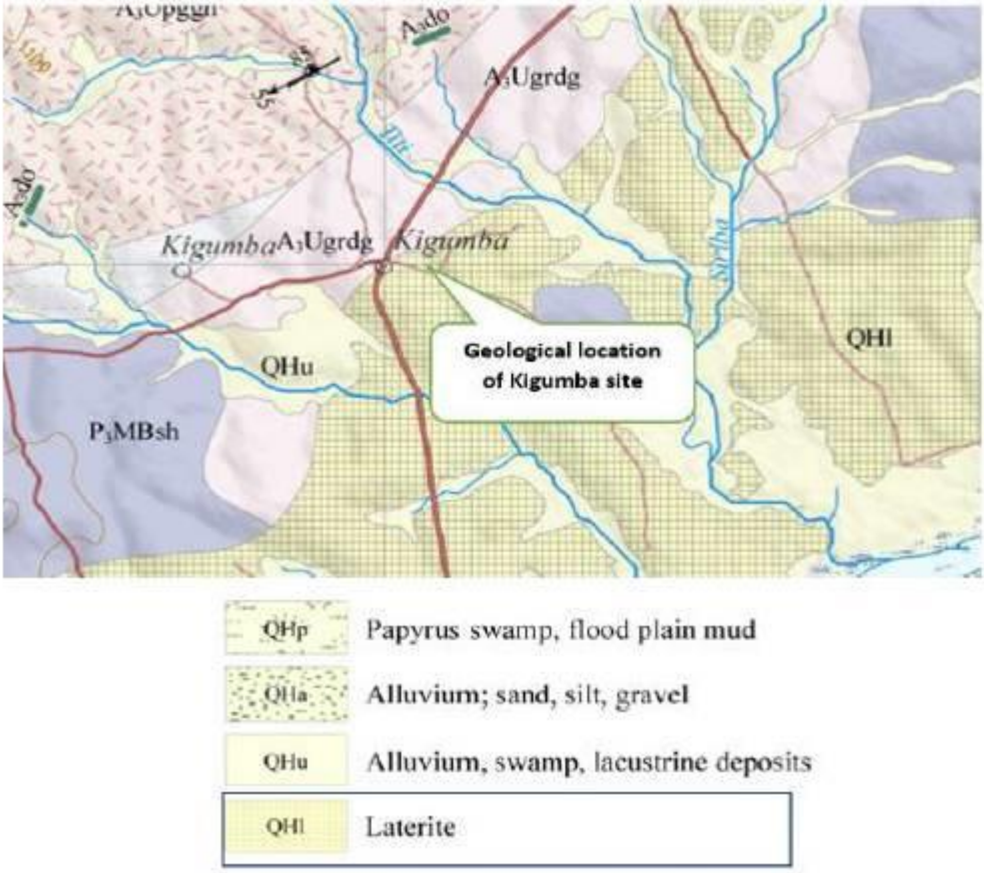

Figure 3: Excerpt from Geological Map of Uganda

2.4. Regional seismicity

According to the Seismic code of practice for structural designs, 2003 (US 319: 2003) from the Uganda National Bureau of Standards (UNBS), the site lies in zone 1 on the seismic zoning map. This is the most seismically active zone in Uganda with a zoning factor of Zmax=1.0. The project area is considered to be prone to earthquake risk as shown in **Figure 4.**

The seismic zoning map above indicates contours of ground acceleration, used for seismic action calculations. The seismic zoning factor, Z for the appropriate regions or locations and for the purposes of design may be applied as follows:

- Z_{max} = 1.0 for zone 1 (high risk area),
- Z = 0.8 for zone 2 (medium risk area) and:

- $Z = 0.7$ for zone 3 (low risk area).

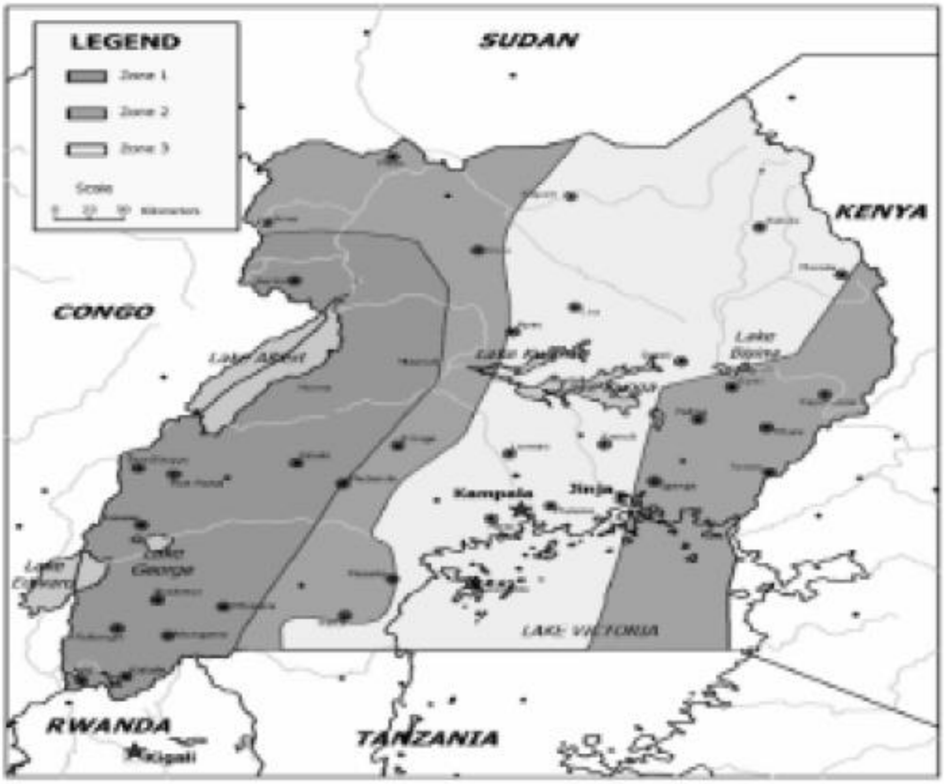

Figure 4: Seismic zoning map of Uganda (US319, 2003)

3. FIELD EXPLORATORY & LABORATORY TESTING

The field investigation covered logging of soil profile within the excavated trial pits, sampling and conducting of the DPL tests from the surface till refusal. Samples were transported to the laboratory and tests carried out accordingly.

3.1. Test Pit Excavation

Test pits excavation was generally carried out in accordance with the procedure described in BS5930:2015. The excavation was undertaken with the use of hand tools as shown in **Figure 5** up to a maximum depth of 3.0m based on the differences in soil consistency and density. Within the excavated test pits, logging was done to show the various subsoil strata as observed on site.

During the process of excavation, layers having different soil types were heaped separately. The trial pits were backfilled after obtaining disturbed & undisturbed samples. Backfilling of the excavated trial pits followed the same sequence with the last layer to be excavated being buried first. Test pit logs showing the site stratigraphy and sampling depth are attached as **Appendix 2.**

TP1 Excavation TP2 Excavation

Figure 5: Excavation of trial pits

A sketch drawing showing the location of the different trial pits is attached as **Appendix 1. Table 1** shows the coordinates and depth of the exploration points. All coordinates are given in UTM 36N, WGS 84 position datum.

3.2. Soil sampling

Two (02) disturbed and one (01) undisturbed sample were picked from each test pit, one disturbed sample was collected from 1.0m and the other at 3.0m together with the undisturbed soil sample being picked from the extreme bottom of each test pit. This kind of sampling applied to all the test pits. In addition, two bulk disturbed samples were picked from the areas of the proposed access roads at 0.5-1.0m from TP1 and TP3 in order to determine the subgrade properties. Samples were properly packed and safely transported to the laboratory for carrying out classification, CBR, compaction & soil chemical tests on disturbed samples; and direct shear box, permeability and consolidation tests on Undisturbed samples.

Table 1: Showing location of exploration points and sampling criteria

Test pit/exploration point	Sample type/Depth (m)	Depth (m)	Coordinates
TP 01	Disturbed	1.0	36N 0391279 UTM 0200728
	Disturbed & Undisturbed	3.0	
TP 02	Disturbed	1.0	36N 0391352 UTM 0200749
	Disturbed & Undisturbed	3.0	
TP 03	Disturbed	1.0	36N 0391405 UTM 0200765
	Disturbed & Undisturbed	3.0	

3.3. Dynamic Light Penetrometer (DPL) Test

The Dynamic Light Penetrometer (DPL) test was carried out starting from the ground surface. The test involved dropping a hammer of 10kg from a height of 50 cm causing the rod with probe to penetrate into the ground. The number of strokes or blows was calculated after every 10.0 cm of penetration depth. The penetration per blow "penetration rate" was recorded as the cone was being driven into the soil and then used to calculate the strength of the soil through which it was passing. A change in penetration rate indicated a change in strength between the soil layers, thus allowing strength of the soil to be determined. **Figure 6** shows technicians conducting the DPL test at some of the exploratory points. DPL bearing capacity test results are attached in **Appendix 3.**

Figure 6: Conducting of the DPL test at site

3.4. Laboratory Testing

Laboratory tests to determine classification, subgrade strength, shear strength and chemical composition of soil samples obtained were carried out. Classification tests carried out included wet sieving (grain size distribution) and Atterberg limits. On the other hand, chemical tests included PH. Chloride and Sulphate. CBR and compaction tests were conducted on the bulk subgrade samples to determine the properties of the subgrade required for the design of access roads. Direct shear box, permeability and consolidation tests were carried out on the undisturbed samples. **Table 2** shows a summary of the geotechnical tests which were carried out on the samples with the procedures used.

Table 2: Standards used in testing the samples

Test Description	International Standard
Disturbed samples	
Liquid Limit	BS 1377: Part 2, Clause 4:1990
Plastic Limit & Plasticity Index	BS 1377: Part 2, Clause 5:1990
Linear Shrinkage	BS 1377: Part 2, Clause 6:1990
Particle Size Distribution	BS 1377: Part 2, Sub cl. 9.2: 1990
Soil Chemical tests	BS 1377: Part 7: 1990
5 Point Modified Proctor Compaction	AASHTO T99
Soaked CBR Test - One Point Method	BS1377: Part 4:1990
Undisturbed samples	
Direct Shear box test	BS 1377: Part 7: 1990
Consolidation test	ASTM D: 2435
Permeability test	BS 1377: Part 8: 1990

3.4.1 Particle Size Distribution

Gradation curves in **Figure 7** show that the soils from the test pits sampled at 1.0m are fine grained i.e., % passing the #200 sieve is more than 50%. On the other hand, soil samples obtained at 3.0m are medium size to coarse grained i.e., % passing the #200 sieve is less than 50%. Detailed results are attached in **Appendix 4.**

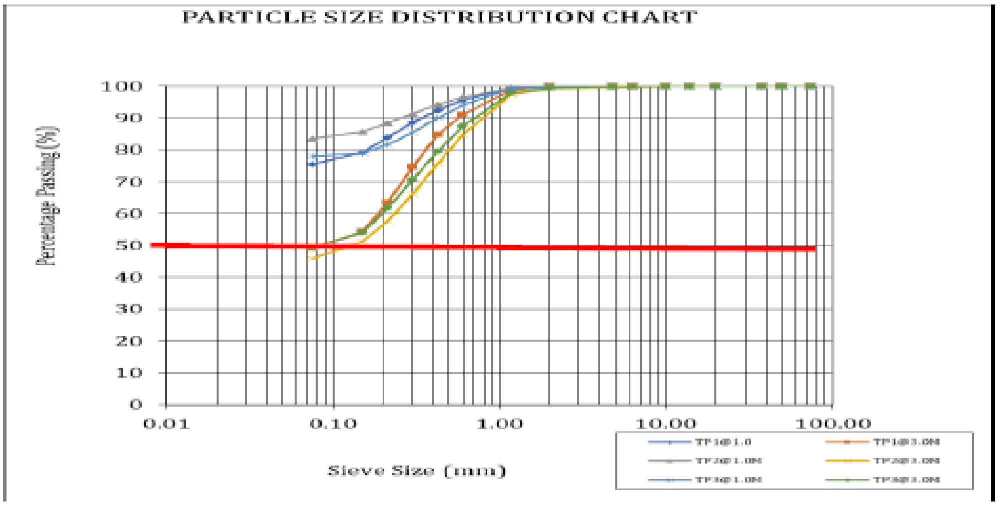

Figure 7: Particle size distribution curves

3.4.2 Atterberg Test Results

Plasticity index (PI) values were plotted against Liquid (LL) values for the samples on the A-Line chart. All samples picked at 1.0m plotted above the A-line within regions of clays of high plasticity while samples at 3.0m plotted above the A-line within regions of clays of low plasticity as shown in **Figure 8.** Detailed results are attached in **Appendix 4.**

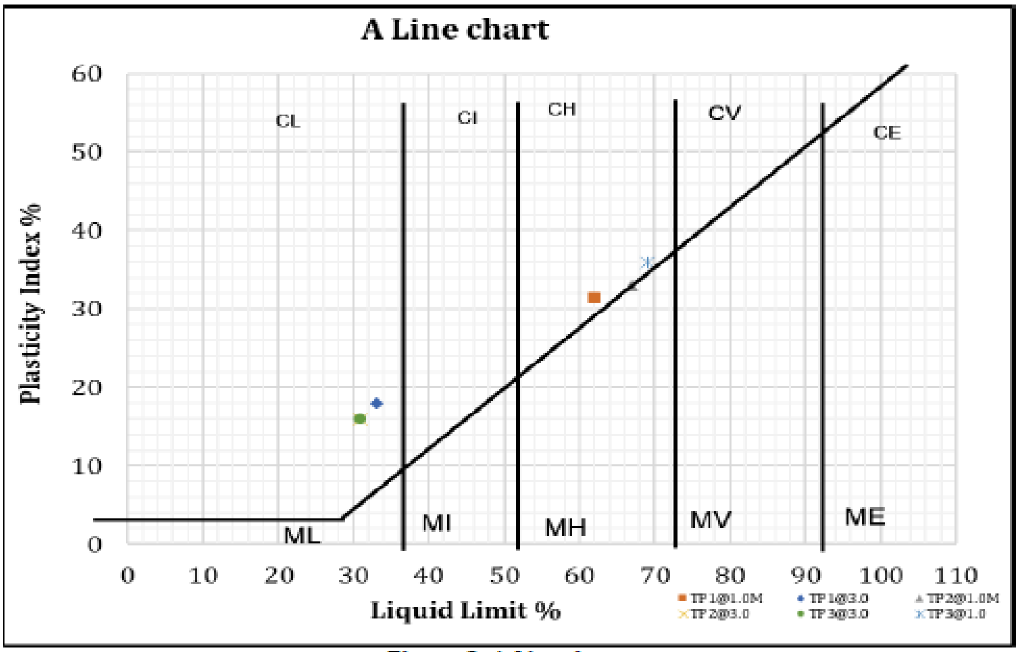

Figure 8: A-Line chart

3.4.3. Subgrade Test Results

Tests conducted on the subgrade materials from TP1 and TP3 included; moisture content, sieve analysis, Atterberg Limits, Compaction and CBR. Test Results are presented in **Table 3** and more details are presented in **Appendix 5.**

Table 3: Subgrade Test Results

Test Pit	Depth (m)	Natural Moisture Content	% pass 75µm	Plasticity Index	MDD (Mg/m³)	OMC (%)	CBR (%)
TP1	0.5-1.0	32.0	86	33	1.610	18.0	2
TP3	0.5-1.0	24.0	74	33	1.670	16.2	4

The average subgrade CBR is 3% and according to the Ministry of Works and Transport Flexible Pavement Design Manual 2010, the subgrade can be classified as an S2.

3.4.4. Chemical Aggressiveness to Concrete

The chemical test results for tests conducted on the samples are presented in **Table 4** below. The following assessment of the chemical environment to concrete is in accordance with BRE Special Digest 1 'Concrete in Aggressive Ground' SD1, published 2005 and Bureau of Reclamation (1981). The following criteria will be used to determine need for corrosion protection:

- A pH less than 5.5 is considered to be strongly acidic, while values of 8.5 or greater are considered to be strongly alkaline. If the pH >6.5, enhanced concrete protection will not be required unless an electric resistivity test is carried out and the resulting resistivities are found to be below 1500 ohm-cm.
- For grounds with sulphate or chloride concentrations <0.1% or 1000 parts per million, ordinary concrete will be considered sufficient to withstand these chemical concentrations in the ground. For higher concentrations of sulphates, higher strength concrete, concrete with lower amounts of calcium aluminate (under 5%) or special coatings may be necessary.

Results from chemical test for the samples tested show that the pH was ranging from 5.2 to 5.9 (implying that the soil is acidic) and sulphate and chloride contents are less 0.1%. This implies that protection against chemical attack may be required. A resistivity test is recommended before construction to confirm the corrosive nature of the soil.

Table 4: Summary of chemical test results

Trial Pit No.	pH	Chlorides (%)	Sulphates (%)
TP 01 (1.0m)	5.8	0.0165	0.0062
TP 02 (3.0m)	5.9	0.0087	0.0016
TP 03 (3.0m)	5.2	0.0269	0.0044

3.4.5. Direct Shear Box Test Results

Direct shear box test was carried out on the undisturbed samples. Results are presented in **Table 5** below and detailed results are attached as **Appendix 6** and these are typical of a clayey SAND material with a higher percentage of clay.

Table 5: Direct shear box test results

TP No; & Depth	Bulk density (Mg/m^3)	Cohesion (kPa)	Angle of Internal Friction (Degrees)
TP 01 (3.0m)	2.117	38.2	11.5
TP 02 (3.0m)	1.951	21.5	7.4
TP 03 (3.0m)	2.014	28.2	7.8

3.4.6. Permeability Test Results

A falling head permeability test was carried out on the undisturbed sample from TP2. Results are presented in **Table 6** below and detailed results are attached as **Appendix 7** and these are typical of a clayey sand material (BS 8004:1986).

Table 6: Permeability test results

TP No	Depth (m)	Coefficient of permeability (k: m/s)	Hydraulic Gradient (i)
TP 02	3.0	2.639×10^{-6}	1.7

3.4.7. Consolidation Test Results

Consolidation test was conducted on the undisturbed samples and results are presented in **Table 7** below and detailed results are attached as **Appendix 8.**

Table 7: Consolidation test results

Test pits		TP1 (3.0m)
Average C_V	(mm^2/sec)	3.67×10^{-1}
Average M_V	(m^2/MN)	1.4452
Over Burden Pressure	(Kpa)	67
Pre-Consolidation pressure	(Kpa)	N/A

From the results, the coefficients of consolidation C_V for the site soils are less than $10m^2$/yr which indicate that rate of consolidation is high after Lambe & William (1979).

3.5. Soil Profile

The soil stratigraphy at the site is presented in **Table 8** for Test Pit Logs. As it can be observed on the logs in **Appendix 2,** the stratigraphy consists of three (03) major layers. There is a layer of top soil of organic clay which is underlain by silty clay, clayey silt or sandy clay. The lower layer comprises of mainly clayey sand which is the predominant layer.

Table 8: Stratigraphy at the site

Profile at TP 1	Profile at TP 2	Profile at TP 3
0.0 ~1.0m: Organic fat CLAY	0.0 ~1.0m: Organic fat CLAY	0.0 ~0.4m: Organic fat CLAY
1.0~2.3m: Silty CLAY	1.0~2.0m: Clayey SILT	0.4~1.0m: Sandy CLAY
2.3~3.0m: Clayey SAND	2.0~3.0m: Clayey SAND	1.0~3.0m: Clayey SAND

4. GEOTECHNICAL MODEL

The geotechnical design parameters for this soil are presented in **Table 5** above and DPL results in **Appendix 3**. The site is predominantly underlain by clayey sand.

4.1. Geotechnical Model Parameters

With the objective of obtaining a representative geotechnical model of the site under study, laboratory and field tests were executed with the aim of studying the behavior of the site subsoil. The laboratory test results obtained were compared with the Dynamic Light Penetrometer (DPL) Test results obtained during the field campaign as shown in **Appendix 3.** The geotechnical design parameters which were considered are presented in **Table 9.**

Table 9: Geotechnical design parameters

Fi = 7.4 degrees C=21.5 kN/m² Unit Weight = 19.51 kN/m²	E = 10000 kN/m² Poisson's ratio = 0.3

4.2. Load Bearing Capacity for Square & Raft Footing

For the calculation of the ultimate load bearing capacity of a square footing, Terzaghi's theory was used by employing the following expression:

$$q_u = 1.3\, c\, N_c + \gamma\, D_f\, N_q + 0.4\, \gamma\, B\, N_\gamma \quad \ldots\ldots \quad \text{Square footing}$$

Where:

q_c	Ultimate load capacity, t/m²
N_c, N_q & N_γ	Non-dimensional load capacity factors
γ	Unit weight, t/m³
D_f	Foundation depth, m
B	Foundation width, m
C	Soil cohesion, t/m²

A Safety Factor of 3 was used to obtain the admissible load capacity. The load capacity factors Nc, Nq and Ng, are a function of the soil friction angle and are obtained through the graph shown in **Figure 9.**

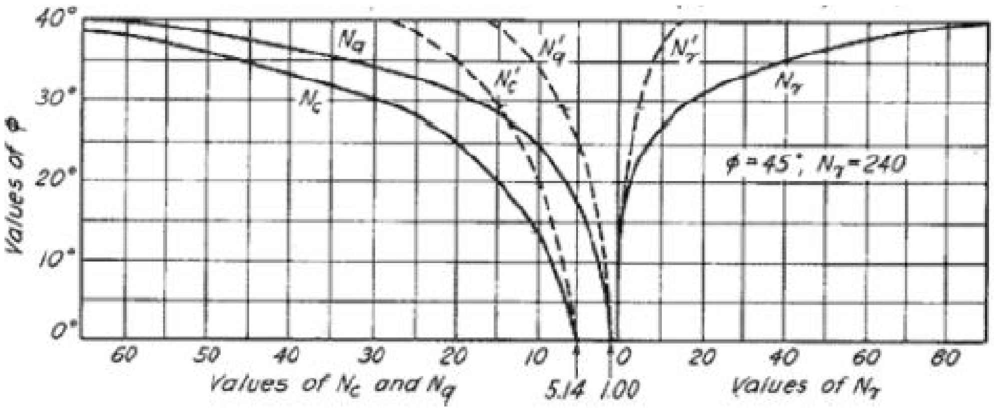

Figure 9: Terzaghi load bearing capacity factors.

4.3. Analysis of Settlements

Based on the physical characteristics of the soil (i.e., medium Grained soil) found during the exploration stage, it is a fact that the settlements generated by the loads from the structure to the foundation system will be both immediate and long-term in nature, that is to say, the deformations will take place during and or shortly after the construction stage and many years after construction.

The elastic/short term settlements were therefore analyzed using the theory of elasticity by employing following equation.

$$S_e = \frac{Bq_o}{E_s}(1 - \mu_s^2)\,[(1 - \mu_s^2)\,F_1 + (1 - \mu_s - 2\mu_s^2)F_2]$$

Where:

Se Elastic Settlement, cm

q Contact pressure, kg/cm²

B Foundation width, cm

Es Modulus of elasticity of the soil, kg/cm²

μ Poisson's ratio of the soil, dimensionless

H Depth of the incompressible stratum, m

B Footing width

L Footing length, m (L=B)

F1 & F2 Shape and depth factors (Steinbrenner, 1934)

Figures 10 and **11**show the graphs used to obtain the values of F1 and F2 with respect to the relation to shape (L / B) and depth (H / B) factors.

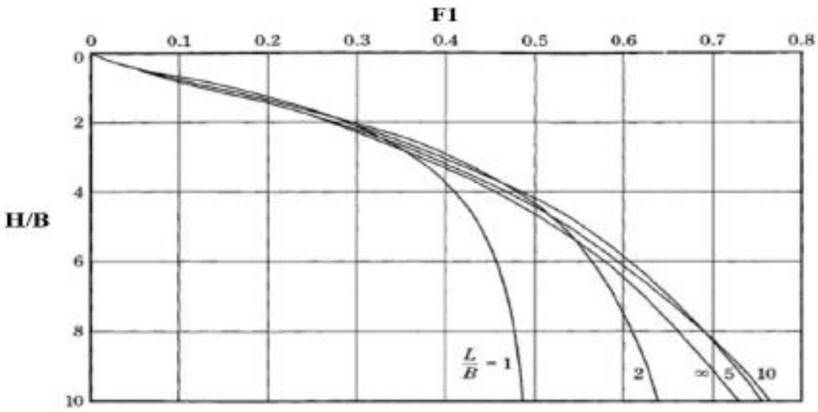

Figure 10: Variation of F1 with respect to H / B (Steinbrenner, 1934)

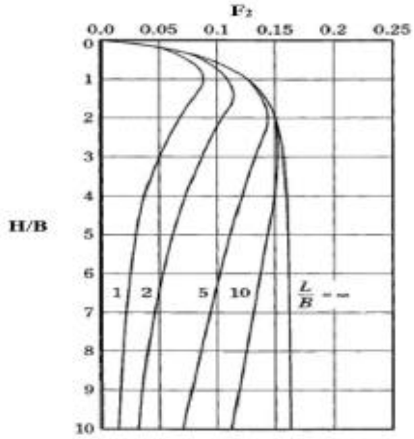

Figure 11: Variation of F2 with respect to H / B (Steinbrenner, 1934)

The long-term settlement was analyzed using oedometer test results attached as **Appendix 8.**

4.4. Modulus of Subgrade Reaction

This parameter is associated with the load transmitted to the ground and is measured by the relationship between the applied load and the settlement it generates; it is usually identified as follows:

$$K_{sv} = \frac{q}{\delta}$$

Where:

K_{sv} Modulus of subgrade reaction.

q Applied load, t/m^2.

δ Measured deformation, m.

4.5. Results of the Geotechnical Analysis

It is worth mentioning that as of the date of preparation of this report, there was not any detailed information to evaluate the settlements as well as the design of foundations for each structure in a particular way, however, the range of loads provided was taken to provide various foundation solutions. The specialist in charge of detailed engineering will be responsible for defining the specific foundation sizes that will be adapted to the needs and specific requirements of the project based on the load bearing capacity information presented in the following tables and graphs.

As an outcome of the geotechnical analysis of the classified zones, the values of admissible load capacity, elastic settlements and modulus of subgrade reaction of the soil were obtained and the results are presented as follows:

RESULTS FOR SQUARE FOOTING

Table 10: Load bearing capacity results

ALLOWABLE SOIL BEARING CAPACITY FOR SQUARE FOOTINGS (kN/m^2 or kPa)				
FOOTING WIDTH (m)	FOUNDING DEPTH (m)			
	Df = 1.50 m	Df = 2.00 m	Df = 2.50 m	Df = 3.00 m
1.00	96.72	103.36	110.00	116.64
1.50	97.07	103.71	110.35	116.99
2.00	97.41	104.05	110.69	117.33
2.50	97.76	104.40	111.04	117.68
3.00	98.10	104.74	111.38	118.02

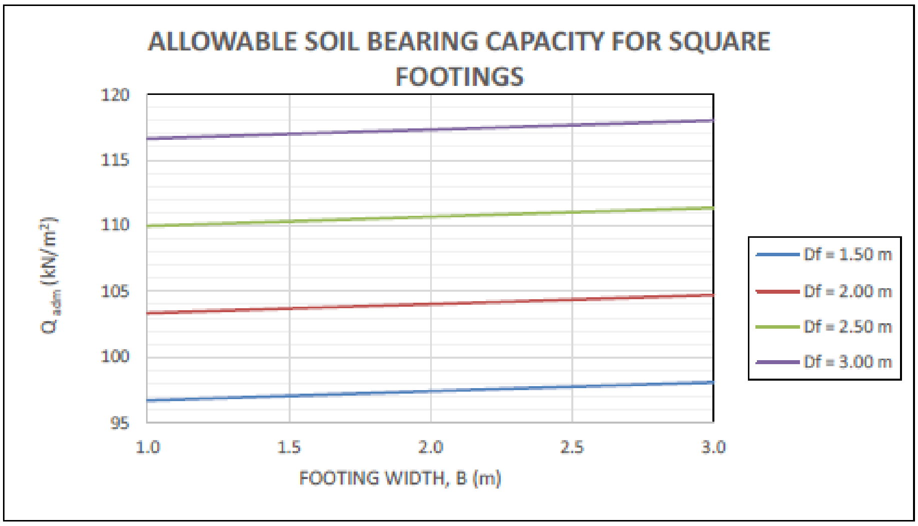

Figure 12: Results of load bearing capacity vs. foundation width

Table 11: Results of short-term settlement analysis.

SETTLEMENTS FOR SQUARE FOOTINGS - SHORT TERM (cm)				
FOOTING WIDTH (m)	FOUNDING DEPTH (m)			
	Df = 1.5	Df = 2.0	Df = 2.5	Df = 3.0
1.00	0.54	0.55	0.56	0.58
1.50	0.85	0.85	0.86	0.88
2.00	1.16	1.15	1.16	1.18
2.50	1.45	1.44	1.45	1.47
3.00	1.73	1.72	1.73	1.75

Table 12: Results of short-term & Long-term settlement analysis

SETTLEMENTS FOR SQUARE FOOTINGS - ELASTIC + LONGTERM SETTLEMENTS (cm)				
FOOTING WIDTH (m)	FOUNDING DEPTH (m)			
	1.5	2	2.5	3
0.50	11.88	11.89	11.90	11.92
1.00	12.19	12.19	12.20	12.22
1.50	12.50	12.49	12.50	12.52
2.00	12.79	12.78	12.79	12.81
2.50	13.07	13.06	13.07	13.09

Table 13: Modulus of Subgrade Reaction

MODULUS OF SUBGRADE REACTION (k=q/δ) SQUARE FOOTINGS (t/m^3)				
FOOTING WIDTH (m)	FOUNDING DEPTH (m)			
	Df = 1.5	Df = 2.0	Df = 2.5	Df = 3.0
1.00	1823.53	1926.66	1997.33	2048.50
1.50	1167.52	1248.75	1308.19	1353.09
2.00	859.22	923.74	973.84	1013.26
2.50	685.99	737.97	780.44	815.12
3.00	577.89	620.45	656.74	687.37

Raft Foundations, also called Mat Foundations, are recommended as a second option. In this type of foundation, the entire floor slab acts as the foundation; the weight of the building or structure is spread evenly over the entire footprint of the building.

Mat Foundations are used where the soil is weak, and therefore building or structural loads have to be spread over a large area, or where columns are closely spaced, which means that if individual footings were used, they would touch each other, however, in this current project the above-mentioned problem does not arise.

RESULTS FOR RAFT FOOTING

Table 14: Load bearing capacity results.

ALLOWABLE SOIL BEARING CAPACITY FOR MAT/COMBINED FOOTING (kN/m^2 or kPa)				
FOOTING WIDTH (m)	FOUNDING DEPTH (m)			
	Df = 0.20 m	Df = 0.30 m	Df = 0.40 m	Df = 0.50 m
4.00	64.65	65.98	67.31	68.63
6.00	66.37	67.70	69.03	70.36
8.00	68.10	69.42	70.75	72.08
10.00	69.82	71.15	72.47	73.80
12.00	71.54	72.87	74.20	75.52

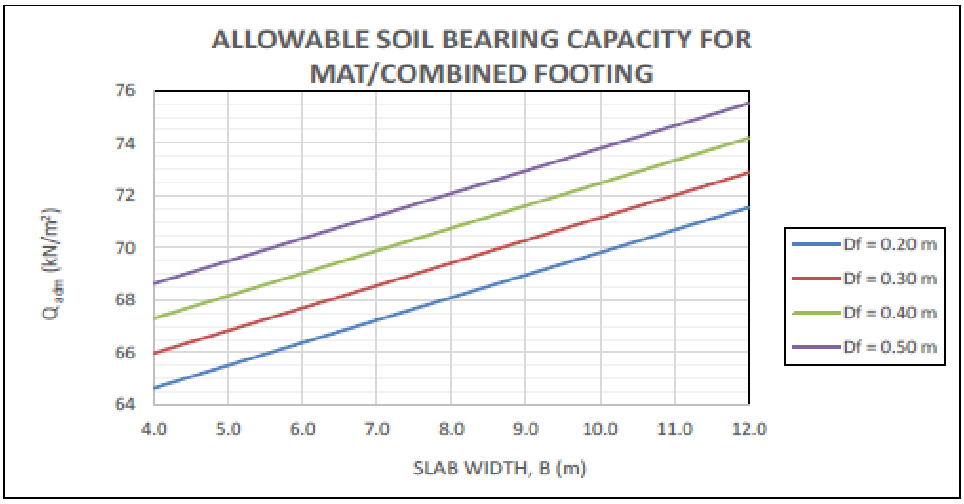

Figure 13: Results of load bearing capacity vs. foundation width

Table 15: Results of short-term settlement analysis.

SETTLEMENTS FOR MAT/COMBINED FOUNDATIONS - SHORT TERM (cm)				
FOOTING WIDTH (m)	FOUNDING DEPTH (m)			
	Df = 0.2	Df = 0.3	Df = 0.4	Df = 0.5
4.00	1.70	1.71	1.72	1.73
6.00	1.95	1.97	1.99	2.00
8.00	2.15	2.17	2.20	2.22
10.00	2.30	2.33	2.36	2.39
12.00	2.43	2.46	2.49	2.52

Table 16: Results of short-term & Long-term settlement analysis

SETTLEMENTS FOR SQUARE FOOTINGS - ELASTIC + LONGTERM SETTLEMENTS (cm)				
SLAB WIDTH (m)	FOUNDING DEPTH (m)			
	Df = 0.2	Df = 0.3	Df = 0.4	Df = 0.5
4.00	13.04	13.05	13.06	13.07
6.00	13.29	13.31	13.33	13.34
8.00	13.49	13.51	13.54	13.56
10.00	13.65	13.67	13.70	13.73
12.00	13.77	13.80	13.83	13.86

Table 17: Modulus of Subgrade Reaction

MODULUS OF SUBGRADE REACTION (k=q/δ)				
MAT/COMBINED FOUNDATIONS (t/m^3)				
FOOTING WIDTH (m)	FOUNDING DEPTH (m)			
	Df = 0.2	Df = 0.3	Df = 0.4	Df = 0.5
4.00	388.50	393.38	398.59	404.06
6.00	347.30	350.67	354.26	358.02
8.00	323.32	325.86	328.55	331.38
10.00	308.86	310.89	313.04	315.29
12.00	300.11	301.80	303.59	305.46

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

This investigation was carried out to determine the soil type underlying the proposed site, determine its bearing capacity and determine the founding depth. From the investigation results, the following conclusions are drawn:

i. The stratigraphy at the site comprises of layer of top soil of organic clay which is underlain by silty clay, clayey silt or sandy clay. The lower layer comprises of mainly clayey sand which is the predominant material.

ii. The allowable Bearing capacities based on DPL ranged from 100Kpa to 300Kpa at an average depth of 2.0-3.0m an indication of firm Ground,

iii. The subgrade has an average CBR of 3% and this is classified as an S2 subgrade,

iv. Groundwater table was encountered at a depth of 3.0m,

v. The soils at the site have an average coefficient of permeability of $2.639x10^{-6}$m/s,

vi. The allowable bearing capacities for square footings from the geotechnical model vary from 96.72 to 119.02kpa at depths varying from 1.5m to 3.0m for foundation widths between 1.0 and 3.0m respectively,

vii. The allowable bearing capacities for mat footings from the geotechnical model vary from 64.65 to 75.52kpa at depths varying from 0.2m to 0.5m for foundation widths between 4.0and 12.0m respectively.

5.2 Recommendations

Based on the results of the investigation, the following recommendations have been made;

i. Two foundation types have been proposed i.e., square footings slab and mat foundation,

ii. Once excavations to accommodate the foundations have been completed, the bottom of the excavation shall be protected in all cases with a thin layer of lean concrete (f'c=100 kg/cm^2), with a thickness of at least 50mm before proceeding to place concrete for foundation construction.

iii. The foundation should be cured for 14 days (minimum) and thereafter left undisturbed for a period not less than 30 days,

iv. This soil mechanics report provides geotechnical recommendations for the **explored area** and the information provided should never be employed to provide geotechnical solutions to a different location.

Appendix 5: Stakeholder Consultations

Appendix 5 (a): Consultation List for the Proposed Faecal Sludge Treatment Facility Located in Kihura II Village, Kigumba Town Council

Feasibility Studies and Detailed Designs for Faecal Sludge Service Chain Management in Un-Sewered Urban Centers in Uganda

INCEPTION VISIT

PROJECT AREA: KIRYANDONGO **DATE:** 27/11/19

No.	NAME	COMPANY/ ORGANIZATION	DESIGNATION	TEL No.	SIGNATURE
	Dorothy Ajwang [illegible]	Kiryandongo	CAO	0772480057	
	Mulleo Augustine	BTC	Health Inspector	0774614428	
	Tibewenyi George	BTC	Town Clerk	0772-[illegible]	
	Moili Martin	BTC (Officer	Engineer	07733621[illegible]	
	Kwizera Zephaniah	Ass/t – BTC	Sen. Ass. Admin	[illegible]	
	Hon. Byarugaba Edward	C/P. LC III B.TC	C/P LC III	0772914901	
	Musinguzi Simon	KTC Town Council	Health Inspector	0773842440	
	Kagonyera Joel	KTC Town Council	Physical Planner	0781222015	
	Tumusiime Morris	Kigumba Town Council	Asst. Town Clerk	0782700449	
	Ocira James M	Kigumba	Health Inspector	0772831895	

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Date: 5th/FEB/2021

Environmental Stakeholder Consultation List For the proposed Faecal Sludge Treatment Facility Located in KIGUMBA TOWN COUNCIL, KIHURA II VILLAGE, WARD C

NO	Name	Village Name (OCCUPATION)	Contact	Signature
1)	MULIKO [illegible]	Health Inspector	0772 614025	
2)	Bimuyu David	C/P Mirima	0782 894421	
3)	BINAFE L. BWAMBALE	PUBLIC HEALTH OFFICER	0778454134	
4)	TWIKIRIZE STELLA	HEALTH ASSISTANT	0781425462	
5)	KATEMBA [illegible]	A.T.C	0773447166	
6)	OGWOK J. PATRICK	HEADTEACHER	0772306839	
7)	OTIM JASPER O	Social Worker	0781284724	
8)	Okidi Jacob	Social worker	0777809001	
9)	KATUSIIME JOVIA	Landowner	0780736116	KOS
10)				
11)				
12)				
13)				
14)				
15)				

Appendix 6: Bills of Quantities

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-5					
DESCRIPTION: SLUDGE DRYING BEDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	SLUDGE DRYING BEDS				
	PREAMBLE				
Note 1	The works measured in this bill are covered under the Particular Specifications. The relevant drawings are the DRAWINGS **MWE/WSDF_C/KN/006** (including references made there-in to other drawings)	item			
	CLIMATIC CONDITIONS				
Note 2	Refer to Specification Clause 1.1.02 - Climatic Conditions - detailing wet/dry seasons; The Tenderer is to provide in his price for all temporary works required to complete this work under these conditions.	Item			
	CLASS E: EARTHWORKS				
	EXCAVATION FOR FOUNDATIONS				
	Material other than topsoil, rock or artificial hard material, commencing surface is the underside of artificial hard material removal				
E323	Maximum Depth: not exceeding 0.25 m	m3	168.2	10,000	1,682,000
E322	Maximum Depth: 0.25 - 0.5m	m3	168.2	10,000	1,682,000
E323	Maximum Depth: 0.5 - 1m	m3	336.3	12,000	4,036,080
E324	Maximum Depth: 1 - 2m	m3	336.3	14,500	4,876,350
	In rock, commencing surface is the exposed surface of the rock				
E333	Maximum Depth: 1 - 2m	m³	20.0	50,000	1,000,000
	EXCAVATION ANCILLARIES				
	Preparation of excavated surfaces for whole structure in the following materials				
E522	Material other than topsoil, rock or artificial hard material	m²	622.7	5,000	3,113,400
E523	Rock surfaces	m²	50.0	20,000	1,000,000
	Disposal of excavated material				
E532	Material other than topsoil, rock or artificial hard material	m3	971.0	20,000	19,420,320
E533	Rock	m3	20.0	20,000	400,000
	Double handling of excavated material				
E542	Material other than topsoil, rock or artificial hard material - Column footings	m3	38.0	20,000	760,480
Carried to Collection					**37,970,630**
	FILTER MEDIUM TO SLUDGE DRYING BEDS				
	Imported natural material other than topsoil or rock				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-5					
DESCRIPTION: SLUDGE DRYING BEDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
E645.1	Initial Filter Layer of corase gravel (20 - 40mm) as specified; to Sludge Drying Beds: Average 150mm thick	m3	269.1	160,000	43,056,000
E645.2	Second Filter Layer of fine to medium gravel as specified to sludge Drying Beds: 150 mm thick	m3	100.0	160,000	16,000,000
E645.3	Top Filter Layer fine to coarse sand as Specified to Sludge Drying Bed: 300 mm thick	m3	201.0	180,000	36,180,000
	Preparation of filled surface				
E722.1	Imported natural material; Filter layers	m2	294.0	10,000	2,940,000
	CLASS F: IN-SITU CONCRETE				
	PROVISION OF CONCRETE				
	Ordinary Designed Mix Concrete				
	Grade 15/20				
	Designed mix, grade 15/20 concrete, to BS 5328, with ordinary portland cement to BS 12, aggregate to BS882, for the following aggregate sizes				
F233	20mm aggregate	m3	35.9	450,000	16,159,500
	PROVISION OF CONCRETE (Cont'd)				
	Grade 30/20				
	Designed mix, grade 30/20 concrete, to BS 5328, with ordinary portland cement to BS 12, aggregate to BS882, for the following aggregate sizes				
F253	20mm aggregate	m3	143.6	550,000	79,002,000
	Grade 30/20 in Column footings and bases				
	Designed mix, grade 30/20 concrete, to BS 5328, with ordinary portland cement to BS 12, aggregate to BS882, for the following aggregate sizes				
F253	20mm aggregate	m3	45.9	550,000	25,239,500
Carried to Collection					**218,577,000**
	CLASS F: IN-SITU CONCRETE (Cont'd)				
	PLACING MASS CONCRETE				
	Blinding				
	Placing blinding concrete, for ground slab, grade 15/20				
F511	Thickness not exceeding 150mm	m3	35.9	180,000	6,463,800
	PLACING REINFORCED CONCRETE				
	Bases, Footings, Pile Caps & Ground Slabs				
	Placing reinforced concrete,				
F622	Thickness 150 - 300mm	m³	159.6	180,000	28,728,000
	Walls				
F642	Thickness 150 - 300mm	m³	56.3	180,000	10,134,000
	Columns				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-5					
DESCRIPTION: SLUDGE DRYING BEDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
F653	Cross sectional area 0.1 -0.55m2	m³	4.3	180,000	772,200
	CLASS G: CONCRETE ANCILLARIES				
	FORMWORK: ROUGH FINISH				
	Plane Vertical				
G142.1	Width: 0.20-0.40m - to edges of slab and leachate channel	m2	46.0	35,000	1,610,000
G142.2	Width: 0.20-0.40m - to edges of column bases	m2	83.2	35,000	2,912,000
Carried to Collection					**50,620,000**
	CLASS G: CONCRETE ANCILLARIES (Cont'd)				
	FORMWORK: FAIR FINISH				
	Plane Vertical				
G243.1	Width: 0.20-0.40m - to edges of external walls	m2	25.3	35,000	885,500
G243.2	Width: 0.20-0.40m - to edges of internal walls	m2	35.6	35,000	1,246,000
G244	Width: 0.40 - 1.22m to edges of external walls	m2	163.8	35,000	5,733,000
G243.2	Width: 0.40 - 1.22m to edges of internal walls	m2	231.4	35,000	8,099,000
	For concrete components of constant cross section				
G282	Columns: 350mm x 250mm	m	75.1	12,000	901,680
G283	Walls:	m	0.0	-	-
	REINFORCEMENT				
	Deformed High Yield Steel				
	Hot rolled high yield ribbed bars of yield strength of 460N/mm2 to BS 4449 and of the following sizes				
G524	Nominal size, 6-16mm	t	32.0	5,000,000	160,000,000
	JOINTS				
	Plastic or Rubber water stops				
G652.1	Horizontal - Average width 150 - 200mm, Specification Reference 2.2.20	m	165.4	95,000	15,713,000
G652.2	Vertical - Average width 150 - 200mm, Specification Reference 2.2.20	m	50.0	95,000	4,750,000
	FINISHING OF TOP SURFACES				
G812.1	Steel Trowel. Horizontal	m2	718.2	15,000	10,773,600
G812.2	Wood Trowel. Slope 1 in 20	m2	718.2	15,000	10,773,600
	CLASS I: PIPEWORK - PIPES				
	uPVC PIPES				
	Perforated uPVC Pipes: Nominal Bore 150mm				
I511	Not in Trenches	m	43.0	65,000	2,795,000
	uPVC Pipes: Nominal Bore 150mm				
I511	In trenches, depth: not exceeding 1.5m	m	5.0	85,000	425,000
Carried to Collection					**222,095,380**

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-5					
DESCRIPTION: SLUDGE DRYING BEDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	CLASS I: PIPEWORK - PIPES (Cont'd)				
	DUCTILE SPUN IRON PIPES TO BS EN 598				
	SPECIFICATION, FLANGED JOINTS				
	INLET PIPE				
	Nominal bore: 150 mm				
I312	In trenches: depth not exceeding 1.5m	m	10.0	150,000	1,500,000
	OUTLET PIPE				
	Nominal bore: 150 mm				
I312	In trenches: depth not exceeding 1.5m	m	20.0	170,000	3,400,000
	CLASS J: PIPEWORK - FITTINGS AND VALVES				
	DUCTILE SPUN IRON PIPE FITTINGS TO BS EN 598				
	SPECIFICATION; FLANGED JOINTS				
	90 DEGREE FLANGED BENDS TO PN 16				
J311	Nominal bore: 150 mm	nr	5.0	380,000	1,900,000
	JUNCTIONS AND BRANCHES TO PN 16				
J321	Nominal bore 150mm - Flanged Tee	nr	2.0	380,000	760,000
	ADAPTORS TO PN 16				
J351.2	DN 150 flange adaptor.	Nr.	13.0	380,000	4,940,000
	FLANGED STRAIGHT SPECIALS TO PN16				
J312.1	Nominal bore: 150 mm: 750mm long with puddle flange	nr	3.0	380,000	1,140,000
J312.2	Nominal bore: 150 mm: 600mm long flanged one side with puddle flange	nr	3.0	380,000	1,140,000
J312.3	Nominal bore: 150 mm: 300 - 600mm long	nr	3.0	380,000	1,140,000
	OUTLET				
J312.4	Nominal bore: 150 mm: 400mm long with puddle flange	nr	3.0	380,000	1,140,000
	CLASS K: PIPEWORK - MANHOLES AND PIPEWORK				
	ANCILLARIES				
	MANHOLES				
	PRECAST CONCRETE WITH HEAVY DUTY CONCRETE COVER AND FRAME WITH LIFTING LUG: INCLUDING BUILDING IN PIPEWORK				
	OUTLET PIPE				
K151.1	Depth not exceeding 1.5m;	nr	4.0	1,800,000	7,200,000
K151.2	Depth 1.5 - 2 m	nr		2,000,000	-
Carried to Collection					**24,260,000**
	CLASS L: PIPEWORK - SUPPORTS AND PROTECTION, ANCILLARIES TO LAYING AND EXCAVATION (Cont'd)				
	VALVES AND PENSTOCKS				
	Gate Valve: Manual Operated				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-5					
DESCRIPTION: SLUDGE DRYING BEDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	All flanged CI gate valves to BS 5163, flanges to BS 4505, complete with Spindle & Pillar				
J812	150 mm Nominal Bore	nr	3.0	1,750,000	5,250,000
	SUNDRIES				
	GRAVEL TO DRAIN PIPE CHANNEL				
J999	Gravel: Max 15mm grain size: surround to perforated uPVC pipe	m	43.0	25,000	1,075,000
	CLASS N: MISCELLANEOUS METAL WORK				
	GALVANISED STEEL PLATFORM				
	Provide and Install Galvanised raised metal open grid access platform between Sludge Tanks. Raised to provide assess to Gate Valves: fixed to reinforces concrete with supports: provide openings for Spindals				
N190.3	Fixed to reinforced concrete structure; 22.8m long x 1600mm wide	nr		60,000,000	-
	HAND RAILS				
	Mild steel handrails to BS 4211, galvanised to BS 729, complete, and fixed to the following structures				
N140	Fixed to a metal platform: 22.8m long	nr		280,000	-
Carried to Collection					**6,325,000**
	CLASS M: STRUCTURAL METALWORK				
	SHELTER TO SLUDGE DRYING BEDS				
	FABRICATION FOR MEMBERS OF FRAMES				
	Portal Frames; Grade 48 Hot Rolled Sections; Galvanised: IPE 200; including cleats, plates, flanges and haunches.				
M333	Straight on plan	t	5.0	5,000,000	25,000,000
	Bracing, purlins & cladding rails; Grade 48 Hot rolled sections: Galvanised; including cleates, plates flanges and haunches				
M363	Straight on plan	t	2.0	5,000,000	10,000,000
	ERECTION OF MEMBERS OF FRAMES				
	Permanent Erection				
M520.1	Shelter to Sludge Drying Beds	t	7.0	5,000,000	35,000,000
	Anti sag rods				
M520.2	Galvanised Steel; 12 dia rods: fixed to eaves beams; include for drilling, fixing, tensioning and making good.	m	260.0	10,000	2,600,000
	Site Bolts, galvanised; including washers and nuts.				
M631	Diameter; 10mm - 20mm	nr	250.0	18,000	4,500,000
	Anchor Bolts				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-5					
DESCRIPTION: SLUDGE DRYING BEDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
M682.1	16mm dia ASTM F1554, High Tensile: Grade 55 Galvanised Anchor Bolts;fixed to reinforced concrete stub column. As detailed	nr	104.0	20,000	2,080,000
	GROUTING				
	Grouting to underside of of base plates with 30MPa non-Shrinking grout.				
M682.2	350mm x 250mm base plate	nr	26.0	25,000	650,000
Carried to Collection					**79,830,000**
	CLASS Z: BUILDING WORKS				
	SURFACE FINISHES				
	Roofing Sheets				
	Roofing Sheets: Anti-Cossosive Composite Corrugated uPVC; IT5 profile; 200mm laps; screw fixed to Z-Purlins with proprietary screws complete with waterproof cap;				
W321	Roofs; sloping	m2	832.7	95,000	79,104,600
W327	Ridge Capping; fixed to roof apex	m	51.4	30,000	1,542,000
W327	Ridge cap fixing to gable ends	m	0.0	30,000	-
W326	360mm Fascia board	m	135.2	35,000	4,732,000
	RAINWATER DISPOSAL				
Z5.04	160mm uPVC rainwater gutters; fixed to eaves beam with and including brackets, outlets and ends.	m	46.0	50,000	2,300,000
Z505	110mm diameter uPVC Downpipes; fixed to steel columns, including hopper heads, bends and outlet shoes; overall length 3.5m	nr	6.0	40,000	240,000
Z506	110mm diameter uPVC pipes; including hopper heads, bends and outlet shoes; to convey rainwater to the wastewater pipeline	m	60.0	25,000	1,500,000
Carried to Collection					**89,418,600**
	Bill Summary				
	Collection, Page 1/8				37,970,630
	Collection, Page 2/8				218,577,000
	Collection, Page 3/8				50,620,000
	Collection, Page 4/8				222,095,380
	Collection, Page 5/8				24,260,000
	Collection, Page 6/8				6,325,000
	Collection, Page 7/8				79,830,000
	Collection, Page 8/8				89,418,600

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-6					
DESCRIPTION: DRIED FAECAL SLUDGE COMPOSTING BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE Ushs**	**AMOUNT Ushs**
	SLUDGE DRYING BEDS				
	PREAMBLE				
Note 1	The works measured in this bill are covered under the Particular Specifications. The relevant drawings are the DRAWINGS **MWE/WSDF-C/KN/008** (including references made there-in to other drawings)	item			
	CLIMATIC CONDITIONS				
Note 2	Refer to Specification Clause 1.1.02 - Climatic Conditions - detailing wet/dry seasons; The Tenderer is to provide in his price for all temporary works required to complete this work under these conditions.	Item			
	CLASS E: EARTHWORKS				
	EXCAVATION FOR FOUNDATIONS				
	Material other than topsoil, rock or artificial hard material, commencing surface is the underside of artificial hard material removal				
E323	Maximum Depth: not exceeding 0.25 m	m3	119.4	10,000	1,193,500
E322	Maximum Depth: 0.25 - 0.5m	m3	119.4	10,000	1,194,000
E323	Maximum Depth: 0.5 - 1m	m3	238.7	12,000	2,864,400
E324	Maximum Depth: 1 - 2m	m3	238.7	14,500	3,461,150
	In rock, commencing surface is the exposed surface of the rock				
E333	Maximum Depth: 1 - 2m	m^3	20.0	50,000	1,000,000
	EXCAVATION ANCILLARIES				
	Preparation of excavated surfaces for whole structure in the following materials				
E522	Material other than topsoil, rock or artificial hard material	m^2	477.4	5,000	2,387,000
	Disposal of excavated material				
E532	Material other than topsoil, rock or artificial hard material	m3	695.0	20,000	13,900,000
E533	Rock	m3	20.0	20,000	400,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-6					
DESCRIPTION: DRIED FAECAL SLUDGE COMPOSTING BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE Ushs**	**AMOUNT Ushs**
	Double handling of excavated material				
E542	Material other than topsoil, rock or artificial hard material - Return fill and compact selected excavated material in foundations to 95% MDD	m3	97.0	10,000	970,000
Carried to Collection					**27,370,050**
	CLASS E: EARTHWORKS (Cont'd)				
	DISPOSAL				
	To Embankments				
E624	Disposal of excavated material other than topsoil, rock or artificial hard material to embankments on site	m3	598.0	5,000	2,990,000
E626	Excavated Rock to embankments on site	m3	5.0	20,000	100,000
	EXCAVATION ANCILLARIES				
	Trimming of Surfaces in Disposal Embankment				
E722.1	Material other than topsoil, rock or artificial hard material.	m2	457.4	5,000	2,287,000
E722.2	Material other than topsoil, rock or artificial hard material, inclined at an angle of 10 deg to 45 deg to the horizontal.	m2	20.0	20,000	400,000
	FILLING				
	Imported rock				
	To Structures				
E617	Imported rock - 200mm thick compacted hardcore filling	m3	95.5	160,000	15,276,800
	FILLING ANCILLARIES				
	Preparation of filled surface				
E722.1	Imported natural material - sand blinding; 50mm thick	m3	23.9	150,000	3,580,500
	CLASS F: IN-SITU CONCRETE				
	PROVISION OF CONCRETE				
	Ordinary Designed Mix Concrete				
	Grade 15/20				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-6					
DESCRIPTION: DRIED FAECAL SLUDGE COMPOSTING BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE Ushs**	**AMOUNT Ushs**
	Designed mix, grade 15/20 concrete, to BS 5328, with ordinary portland cement to BS 12, aggregate to BS882 , for the following aggregate sizes				
F233	20mm aggregate	m3	20.8	450,000	9,351,000
	PROVISION OF CONCRETE (Cont'd)				
	Grade 30/20				
	Designed mix, grade 30/20 concrete, to BS 5328, with ordinary portland cement to BS 12, aggregate to BS882 , for the following aggregate sizes				
F253	20mm aggregate	m3	70.0	550,000	38,500,000
Carried to Collection					**72,485,300**
	CLASS F: IN-SITU CONCRETE (Cont'd)				
	PLACING MASS CONCRETE				
	Blinding				
	Placing blinding concrete, grade 15/20				
F511	Thickness not exceeding 150mm	m3	2.9	180,000	514,800
	Strip foundation				
	Placing strip foundation concrete, grade 30/20				
F521	Thickness not exceeding 150mm	m3	17.9	180,000	3,225,600
	PLACING REINFORCED CONCRETE				
	Bases, Footings, Pile Caps & Ground Slabs				
	Placing reinforced concrete,				
F621	Thickness: not exceeding 150mm - floor slab	m^3	47.7	180,000	8,593,200
F622	Thickness 150 - 300mm - Column bases	m^3	17.1	180,000	3,085,200
	Columns				
F653	Cross sectional area 0.1 -0.25m2	m3	5.0	180,000	907,200
	CLASS G: CONCRETE ANCILLARIES				
	FORMWORK: ROUGH FINISH				
	Plane Vertical				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-6					
DESCRIPTION: DRIED FAECAL SLUDGE COMPOSTING BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE Ushs**	**AMOUNT Ushs**
G142	Width: 0.10-0.20m - to edges of slab	m	92.6	35,000	3,241,000
G143	Width: 0.20-0.40m - to edges of bases	m2	36.5	35,000	1,276,800
G144	Width: 0.40-1.22m - to edges of column	m2	62.7	35,000	2,195,200
	CLASS G: CONCRETE ANCILLARIES (Cont'd)				
	REINFORCEMENT				
	Deformed High Yield Steel				
	Hot rolled high yield ribbed bars of yield strength of 460N/mm2 to BS 4449 and of the following sizes				
G524	Nominal size, 6-16mm	t	7.0	5,000,000	35,000,000
	Steel Fabric				-
	Steel fabric to BS4483				-
G522	Nominal mass: 2 - 3 kg/m^2 - A142	m2	477.4	15,000	7,161,000
Carried to Collection					**65,200,000**
	CLASS M: STRUCTURAL METALWORK				
	FABRICATION FOR MEMBERS OF FRAMES				
	Portal Frames; Grade 48 Hot Rolled Sections; Galvanised: IPE 200; including cleats, plates, flanges and haunches.				
M333	Straight on plan	t	6.0	5,000,000	30,000,000
	Bracing, purlins & cladding rails; Grade 48 Hot rolled sections: Galvanised; including cleates, plates flanges and haunches				
M363	Straight on plan	t	3.0	5,000,000	15,000,000
	ERECTION OF MEMBERS OF FRAMES				
	Permanent Erection				
M620	Erection of members for frame	t	9.0	5,000,000	45,000,000
	Anti sag rods				
M520.2	Galvanised Steel; 12 dia rods: fixed to eaves beams; include for drilling, fixing, tensioning and making good.	m	227.0	15,000	3,405,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-6					
DESCRIPTION: DRIED FAECAL SLUDGE COMPOSTING BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE Ushs**	**AMOUNT Ushs**
	Site Bolts, galvanised; including washers and nuts.				
M631	Diameter; 10mm - 20mm	nr	250.0	18,000	4,500,000
	Anchor Bolts				
M682.1	10mm dia ASTM F1554, High Tensile: Grade 55 Galvanised Anchor Bolts;fixed to reinforced concrete stub column. As detailed	nr	64.0	20,000	1,280,000
	GROUTING				
	Grouting to underside of of base plates with 30MPa non-Shrinking grout.				
M682.2	350mm x 200mm base plate	nr	64.0	25,000	1,600,000
Carried to Collection					**100,785,000**
	CLASS U; BRICKWORK, BLOCKWORK AND MASONRY				-
	Dense Concrete Blockwork				-
	Dense concrete blockwork to BS 7263, jointed with ordinary 1:3 cement mortar, hoop irons every three courses				-
U521.1	200mm thick solid block wall	m²	179.3	80,000	14,340,000
	Dense concrete blockwork to BS 7263, jointed with ordinary 1:4 cement mortar, hoop irons every three courses				-
U521.2	200mm thick solid block wall	m²	115.7	70,000	8,099,000
	Damp proof course of bitumen impregnated fabric to BS 6398 for the following wall thickness				-
U582	Width 150-200mm wide	m	89.0	5,000	445,000
	CLASS W: WATER PROOFING				-
	Protective Layers				-
	Flexible polyethylene sheeting, gauge 1000, or similar approved, laid to the surface of blinding concrete or sand blinded hardcore fill				-
W131	Surfaces inclined at an angle not exceeding 30 degrees to the horizontal	m²	477.4	9,000	4,296,600
	CLASS Z: BUILDING WORKS				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-6					
DESCRIPTION: DRIED FAECAL SLUDGE COMPOSTING BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE Ushs**	**AMOUNT Ushs**
	SURFACE FINISHES				
	SURFACE FINISHINGS, LININGS AND PARTITIONS				-
	In situ finishes, beds and backings				
	Floors				
	Sand and Cement Screed				
	Sand and cement screed of 1:3 cement sand mortar, applied to concrete floors, 40 mm thick, prepared and applied as specified, and finished with a steel float				
W441	Surfaces of floors inclined at an angle not exceeding 30 degrees to the horizontal	m²	477.4	19,500	9,309,300
	Wall Finishes				
Z413.1	External: 25 mm thick plaster (1:4) in two coats to walls, trowelled hard and smooth	m²	85.1	19,500	1,659,840
Z413.2	Internal: 20 mm plaster in two coats, steel trowelled to hard and smooth finish to walls internally	m²	165.2	19,500	3,221,400
Carried to Collection					**41,371,140**
	Roofing Sheets				
	Roofing Sheets: Anti-Cossosive Composite Corrugated uPVC; IT5 profile; 200mm laps; screw fixed to Z-Purlins with proprietary screws complete with waterproof cap;				
W321	Upper surfaces inclined at an angle not exceeding 30º to the horzontal	m2	513.3	95,000	48,761,600
W323	Upper surfaces inclined at an angle exceeding 60º to the horzontal	m2	0.0	95,000	-
W327	Ridge Capping; fixed to roof apex	m	32.0	30,000	960,000
W327	Ridge cap fixing to gable ends	m	32.0	30,000	960,000
W326	460mm Fascia board	m	96.0	35,000	3,360,000
	RAINWATER DISPOSAL				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-6					
DESCRIPTION: DRIED FAECAL SLUDGE COMPOSTING BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE Ushs**	**AMOUNT Ushs**
Z5.04	160mm uPVC rainwater gutters; fixed to eaves beam with and including brackets, outlets and ends.	m	64.0	50,000	3,200,000
Z505	110mm diameter uPVC Downpipes; fixed to steel columns, including hopperheads, bends and outlet shoes; overall length 3.5m	nr	6.0	45,000	270,000
Z506	110mm diameter uPVC pipes; including hopperheads, bends and outlet shoes; to convey rainwater to the wastewater pipeline	m	50.0	25,000	1,250,000
Carried to Collection					**58,761,600**
	<u>Bill Summary</u>				
	Collection, Page 1/7				27,370,050
	Collection, Page 2/7				72,485,300
	Collection, Page 3/7				65,200,000
	Collection, Page 4/7				100,785,000
	Collection, Page 5/7				41,371,140
	Collection, Page 6/7				58,761,600

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-7					
DESCRIPTION: FACULTATIVE AND MATURATION PONDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	<u>FACULTATIVE AND MATURATION PONDS</u>				
	PREAMBLE				
Note 1	The works measured in this bill are covered under the Particular Specifications. The relevant drawings are	item			

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-7					
DESCRIPTION: FACULTATIVE AND MATURATION PONDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	the DRAWING **MWE/WSDF-C/KN/010** (including references made there-in to other drawings)				
	CLIMATIC CONDITIONS				
Note 3	Refer to Specification Clause 1.1.02 - Climatic Conditions - detailing wet/dry seasons; The Tenderer is to provide in his price for all temporary works required to complete this work under these conditions.	Item			
	CLASS E: EARTHWORKS				
	EXCAVATION FOR CUTTINGS				
	Material other than topsoil, rock or artificial hard material, commencing surface is the underside of topsoil strip				
E211	Maximum Depth: not exceeding 0.25m	m3	2050	12,000	24,600,000
E222	Maximum Depth: 0.25 - 0.5m	m3	293	12,000	3,516,000
E223	Maximum Depth: 0.5 - 1m	m3	238	14,500	3,451,000
	Maximum Depth: 1 - 2m	m3	98	18,500	1,813,000
	In rock, commencing surface is the exposed surface of the rock				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-7					
DESCRIPTION: FACULTATIVE AND MATURATION PONDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
E333	Maximum Depth 0.5 - 1.0m	m³	75	50,000	3,750,000
	EXCAVATION ANCILLARIES				
	Preparation of excavated surfaces for whole structure in the following materials				
E522.1	Material other than topsoil, rock or artificial hard material	m²	810	10,000	8,100,000
E522.2	Material other than topsoil, rock or artificial hard material; inclined at an angle of 10-45deg to the horizontal	m²	379	15,000	5,685,000
E523	Rock surfaces	m²	100	15,000	1,500,000
	Disposal of excavated material				
E532	Material other than topsoil, rock or artificial hard material	m³	2125	7,000	14,875,000
Carried to Collection					**67,290,000**
	FILLING TO FORM SLOPES OF FACULTATIVE AND MATURATION PONDS				
	Filling Embankments by methods specified and to depths as shown in the drawing				
E614	Selected excavated material	m3	3,010	16,000	48,160,000
	Imported Fill				
E615	Imported natural material other than topsoil or rock	m3	1,000	40,000	40,000,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-7					
DESCRIPTION: FACULTATIVE AND MATURATION PONDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
E645	Imported material: Impermeable clay layer (Puddle Clay) - to form base and sides of the Ponds - 300mm deep. Including finishing to a profiled smooth finish	m2	1500	40,000	60,000,000
	Filling Ancillaries				
E722.1	Preparation of filled surface to form profile - horizontal - Pond bases and accesses	m2	1,914	7,000	13,398,000
E722.2	Preparation of filled surface to form profile - inclined at an angle 10 - 45deg to the horizontal - Pond side slopes	m2	2,550	7,000	17,850,910
	DISPOSAL				
	To Embankments on site				
E624	Selected excavated material other than topsoil or rock	m3	1000	5,000	5,000,000
E626	Excavated Rock	m3	500	20,000	10,000,000
	FILLING ANCILLARIES				
	Trimming of Filled Surfaces				
E722	Material other than topsoil, rock or artificial hard material.	m2	500	5,000	2,500,000
E722	Material other than topsoil, rock or artificial hard material, inclined at an angle of 10 deg to 45 deg to the horizontal.	m2	500	10,000	5,000,000
E722	Excavated Rock:	m2	200	15,000	3,000,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-7					
DESCRIPTION: FACULTATIVE AND MATURATION PONDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
E722	Excavated Rock: inclined at an angle of 10 deg to 45 deg to the horizontal.	m2	100	15,000	1,500,000
	SLOPE PROTECTION SLABS				
	Supply and install concrete slabs to form protection strip to embankment at water level. Slabs (600mm x 600mm) to be laid on prepared base to Engineer's instruction.				
E911	1200mm wide	m2	270	100,000	27,000,000
	Construct reinforced concrete beam; include for all excavation, preparation, disposal, concrete Grade C25, formwork, reinforcement and finishes.				
E912	400mm deep x 150mm wide complete.	m	230	120,000	27,600,000
Carried to Collection					**261,008,910**
	CLASS I - PIPEWORK - PIPES				
	DUCTILE SPUN IRON PIPES TO BS EN 598;				
	FLANGED JOINTS				
	FACULTATIVE POND INLET PIPE				
	Nominal bore: 150 mm				-

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-7					
DESCRIPTION: FACULTATIVE AND MATURATION PONDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
I312.1	Partly in trenches, include for excavation, backfilling and making good: depth not exceeding 1.5 m; passing through side slopes and supported at one end on concrete support: other end with puddle flange: Pipe 7m long	nr	1	2,500,000	2,500,000
	FACULTATIVE POND OUTLET PIPE				
	Nominal bore: 150 mm				-
I312.2	Partly in trenches, include for excavation, backfilling and making good: depth not exceeding 1.5 m; passing through side slopes one end built into Outlet Structure other end with puddle flange: Pipe 3m long	nr	1	1,200,000	1,200,000
	MATURATION POND 1 INLET PIPE				
	Nominal bore: 150 mm				-
I312.3	Partly in trenches, include for excavation, backfilling and making good: depth not exceeding 1.5 m; passing through side slopes and supported at one end on concrete support: other end with puddle flange: Pipe 7m	nr	1	2,500,000	2,500,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-7					
DESCRIPTION: FACULTATIVE AND MATURATION PONDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	long				
	<u>MATURATION POND 2 INLET PIPE</u>				
	<u>Nominal bore: 150 mm</u>				-
I312.4	Partly in trenches, include for excavation, backfilling and making good: depth not exceeding 1.5 m; passing through side slopes and supported at one end on concrete support: other end with puddle flange: Pipe 7m long	nr	1	2,500,000	2,500,000
	<u>MATURATION POND 1 OUTLET PIPE</u>				
	<u>Nominal bore: 150 mm</u>				-
I312.5	Partly in trenches, include for excavation, backfilling and making good: depth not exceeding 1.5 m; passing through side slopes one end built into Outlet Structure other end with puddle flange: Pipe 3m long	nr	1	1,200,000	1,200,000
	<u>MATURATION POND 2 OUTLET PIPE</u>				
	<u>Nominal bore: 150 mm</u>				-
I312.6	Partly in trenches, include for excavation, backfilling and making good: depth: 1.5 - 2.0m; passing through side slopes one end built into	nr	1	2,000,000	2,000,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-7					
DESCRIPTION: FACULTATIVE AND MATURATION PONDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Outlet Structure other end with puddle flange: Pipe 10m long				
Carried to Collection					**11,900,000**
	OTHER STATED CHAMBERS				
	In-situ concrete: Reinforced				
K231	Internal - 1000mm x 1375mm x 1350mm high: 250mm thick walls and base: including Scum board	nr	2	1,500,000	3,000,000
K232	Internal - 1000mm x 1375mm x 1800mm high: 250mm thick walls and base: including Scum board	nr	1	2,000,000	2,000,000
	CLASS L: PIPEWORK - SUPPORTS AND PROTECTION, ANCILLARIES TO LAYING AND EXCAVATION				
	Other Isolated Pipe Supports				
L870.3	Concrete column/foundation 1.2 - 1.5m high, include for excavation and making good to existing surfaces in Facultative Pond	nr	4	1,500,000	6,000,000
Carried to Collection					**31,100,000**
	Bill Summary				
	Collection, Page 1/5				67,290,000
	Collection, Page 2/5				261,008,910
	Collection, Page 3/5				11,900,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-7					
DESCRIPTION: FACULTATIVE AND MATURATION PONDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Collection, Page 4/5				31,100,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-8					
DESCRIPTION: CONSTRUCTED WETLAND					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE UShs**	**AMOUNT UShs**
	Preamble:				
	The works under this bill are covered under Part 3 of the Particular Specifications.				
	EARTHWORKS				
	Excavation for Cuttings				
	Ordinary Soil				
	Excavation for cuttings, for dry bed in material other than topsoil, rock or artificial hard material, commencing surface is the stripped ground level				
E221	Depth 0.25 to 1.5 m	m³	2,137.50	9,500	20,306,250
	Rock				
	Excavation for Cuttings for dry bed in rock, commencing surface is the exposed surface of the rock				
E332	Depth 0.25-1.5m	m³	112.50	140,000	15,750,000
	Excavation Ancillaries				
	Trimming				
	Trimming of excavated surfaces for whole structure in the following materials				
E512	Material other than topsoil,rock,or artificial hard material inclined at an angle not exceeding 45 degrees to the horizontal	m²	675.00	4,500	3,037,500
E513	Rock surfaces inclined at an angle not exceeding 45 degrees to the horizontal	m²	75.00	6,000	450,000
	Preparation				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-8					
DESCRIPTION: CONSTRUCTED WETLAND					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE UShs**	**AMOUNT UShs**
	Preparation of excavated surfaces for whole structure in the following materials				
E522	Material other than topsoil,rock,or artificial hard material inclined at an angle not exceeding 45 degrees to the horizontal	m²	360.00	4,500	1,620,000
E523	Rock surfaces inclined at an angle not exceeding 45 degrees to the horizontal	m²	40.00	6,000	240,000
	Disposal of Excavated Material				
	Disposal of excess excavated material to sites as specified and as directed by the Engineer				
E532	Material other than topsoil, rock,or artificial hard material	m³	855.00	11,000	9,405,000
E533	Rock	m³	45.00	11,000	495,000
				Carried to Collection	**51,303,750**
	Filling				
	Embankments				
	Filling to embankments of dry bed by methods specified and to depths as in drawings with the following materials				
E624	Selected excavated material other than topsoil,rock or artificial hard material	m³	225.00	13,000	2,925,000
E625	Imported specified gravel material other than topsoil or rock	m³	75.00	16,000	1,200,000
	IN-SITU CONCRETE				
	Provision of Concrete				
	Ordinary Designed Mix Concrete				
	Grade C15				
	Designed mix, grade C15 concrete, to BS 5328, with ordinary Portland cement to BS12, aggregate to BS882 , for the following aggregate sizes				
F233	20mm aggregate	m³	37.50	450,000	16,875,000
	Grade C25				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-8					
DESCRIPTION: CONSTRUCTED WETLAND					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE UShs**	**AMOUNT UShs**
	Designed mix,grade C25 concrete, to BS 5328, with ordinary portland cement to BS 12 , aggregate to BS882 , for the following aggregate sizes				
F253	20mm aggregate	m³	75.00	550,000	41,250,000
	Placing Mass Concrete				
	Blinding				
	Placing blinding concrete, grade C15, of the following thickness				
F511	Thickness not exceeding 150mm	m³	37.50	180,000	6,750,000
	Bases, Footings and Ground Slabs				
	Placing mass concrete, grade C25, of the following thickness				
F521	Thickness not exceeding 150mm	m³	75.00	180,000	13,500,000
				Carried to Collection	**82,500,000**
	CONCRETE ANCILLARIES				
	Formwork-Fair Finish				
	Fair Finish Plane Verticle				
	Plane fair finish vertical formwork of the following width				
G245	All widths	m²	17.56	25,000	439,000
	Reinforcement				
	High Yield Steel				
	High yield squire twisted bars to BS4449 and of the following sizes				
G523	Nominal size, 6-16mm	t	7.50	5,000,000	37,500,000
	Finishing of Top Surfaces				
	Finishing of top surfaces by the following methods				
G812	With steel float finish	m²	750.00	3,000	2,250,000
	PIPEWORK-PIPES				
	Plastic Drain Pipes				
	uPVC drain pipes, to BS 5481, with flexible joints to BS 4346 or BS 6209, 200 mm ND, laid NOT in trench to the following depths				
I511	On ground and supported with steel section	m	5.00	49,504	247,520

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-8					
DESCRIPTION: CONSTRUCTED WETLAND					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE UShs**	**AMOUNT UShs**
	uPVC drain pipes, to BS5481 with flexible joints to BS4346 or BS6209, 200 ND, laid in trench to the following depths				
I514	Depth not exceeding 1.5m	m	9.00	56,576	509,184
	PIPEWORK - FITTINGS AND VALVES				
	Plastic Pipe Fittings				
	Bends				
	uPVC bends with push-fit joint for use with uPVC pipes, to ISO 2531, all to PN4, and of the following sizes				
J412.1	200 mm DN all socketed 90^0 bend	nr	1	68,000	68,000
J412.2	200 mm DN all socketed 45^0 bend	nr	4	68,000	272,000
	Junctions and Branches				
	All Socketed uPVC Cross tee to BS 4346, and of the following size				
J422	200/200/200/200 mm ND	nr	2	120,000	240,000
				Carried to Collection	**41,525,704**
	Straight Specials				
	Perforated uPVC drain pipes, to BS 5481, with flexible joints to BS 4346 or BS 6209, 200 mm DN				
J482.1	Length not exceeding 1.0m	nr	1	39,780	39,780
J482.2	Length not exceeding 1.8m	nr	1	71,604	71,604
J482.3	Length not exceeding 2.0m	nr	1	79,560	79,560
J482.4	Length not exceeding 3.0m	nr	4	119,340	477,360
	uPVC drain pipes, to BS 5481, with flexible joints to BS 4346 or BS 6209, 200 mm DN				
J482.5	Length not exceeding 0.4m	nr	1	15,912	15,912
J482.6	Length not exceeding 1.8m	nr	1	71,604	71,604
	End caps				
	uPVC end caps to fit uPVC spigots, to ISO 161 and of the following pipe sizes				
J492	ND 200 mm	nr	1	58,500	58,500
	PIPEWORK-MANHOLES AND PIPEWORK ANCILLARIES				
	Manholes				
	In Situ Concrete Manholes				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-8					
DESCRIPTION: CONSTRUCTED WETLAND					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE UShs**	**AMOUNT UShs**
	In situ concrete manhole with reinforced concrete base or footing, include cast in pipe pieces for inlet and outlet as specified, include step irons as specified, include hinged cast iron heavy duty grating manhole cover, size 1.0m by 1.0m clear opening complete, and of the following depths				
K131	Depth not exceeding 1.5m	nr	4	800,000	3,200,000
	PIPEWORK-SUPPORTS AND PROTECTION, ANCILLARIES TO LAYING AND EXCAVATION				
	Extras to Excavation and Backfilling				
	In Pipe Trenches				
	Extras to excavation in pipe trenches in the following materials				
L111	In rock	m³	0.72	140,000	100,100
	Beds				
	Pipe bedding, of imported granular material, for the following pipe sizes				
L331	Diameter not exceeding 200 mm ND	m	13.00	5,500	71,500
	Surrounds				
	Pipe surrounds, of imported granular material, for the following pipe sizes				
L531	Diameter not exceeding 200 mm ND	m	13.00	5,500	71,500
				Carried to Collection	**4,257,420**
	WATER PROOFING				
	Protective Layers				
	Flexible Sheeting				
	Flexible sealing foil 25mm thick, or similar approved, laid to the surface of compacted marrum				
W422	Surfaces of compacted marrum inclined at an angle not exceeding 60 degrees to the horizontal	m²	1000.00	7,500	7,500,000
	MISCELLANEOUS WORK				
	Filter Media				
RHI S-5.1	Supply and place approved filter	m³	75.00		15,000,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-8					
DESCRIPTION: CONSTRUCTED WETLAND					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE UShs**	**AMOUNT UShs**
	media (Sand 0.3-1.5mm)			200,000	
RHI S-5.2	Supply and place approved filter support media (Medium Gravel 3-20mm)	m³	112.50	235,000	26,437,500
RHI S-5.3	Supply and place approved filter support media (Coarse Gravel 20-60mm)	m³	600.00	240,000	144,000,000
RHI S-5.4	Supply and place / plant approved Phragmytes Australis Shoots (8-10 shoots/m^2)	nr	7,500.00	1,000	7,500,000
	Vent Pipes				
	200 mm uPVC Vent pipe, complete with plactic mesh attached at end of pipe and including a pipe fastening system to fasten the pipe onto the bed surface				
RHI S-5.5	Length not exceeding 2.5m	nr	4	106,080	424,320
	Other Works				
RHI S-5.6	Perforated Drainage Pipe Protection mesh placed around the DN200 perforated pipe for its protection	sum	1	444,216	444,216
RHI S-5.7	Supply and place pipe support system including 500x500 mm erosion protection stone plate as in the drawing	sum	1	250,000	250,000
RHI S-5.8	Supply, place and set to work steel plate as in the drawing	sum	1	65,000	65,000
RHI S-5.9	Filling bed with water	m³	2,250.00	1,500	3,375,000
				Carried to Collection	**204,996,036**
	Bill Summary				
	Collection, Page 1/6				51,303,750
	Collection, Page 2/6				82,500,000
	Collection, Page 3/6				41,525,704
	Collection, Page 4/6				4,257,420
	Collection, Page 5/6				204,996,036
	Cost for 1 Constructed Wetland				**384,582,910**
	Other Constructed Wetlands	**nr**	**2**	**384,582,910**	**769,165,820**
MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-9					

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-8					
DESCRIPTION: CONSTRUCTED WETLAND					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE UShs**	**AMOUNT UShs**
DESCRIPTION: CONSTRUCTED WETLAND					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE**	**AMOUNT**
				UShs	**UShs**
	Preamble:				
	The works under this bill are covered under Part 3 of the Particular Specifications.				
	EARTHWORKS				
	Excavation for Cuttings				
	Ordinary Soil				
	Excavation for cuttings, for dry bed in material other than topsoil, rock or artificial hard material, commencing surface is the stripped ground level				
E221	Depth 0.25 to 1.5 m	m³	2,137.50	(1,243)	(2,656,133)
				(3,034)	
	Rock			(4,826)	
				(6,617)	
	Excavation for Cuttings for dry bed in rock, commencing surface is the exposed surface of the rock			(8,409)	
				(10,200)	
E332	Depth 0.25-1.5m	m³	112.50	(11,992)	(1,349,068)
				(13,783)	
	Excavation Ancillaries			(15,575)	
				(17,366)	
	Trimming			(19,158)	
				(20,949)	
	Trimming of excavated surfaces for whole structure in the following materials			(22,741)	
				(24,532)	
E512	Material other than topsoil, rock, or artificial hard material inclined at an angle not exceeding 45 degrees to the horizontal	m²	675.00	(26,324)	(17,768,586)
				(28,115)	
E513	Rock surfaces inclined at an angle not exceeding 45 degrees to the horizontal	m²	75.00	(29,907)	(2,243,014)
				(31,698)	
	Preparation				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-8					
DESCRIPTION: CONSTRUCTED WETLAND					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE UShs**	**AMOUNT UShs**
				(33,490)	
				(35,281)	
	<u>Preparation of excavated surfaces for whole structure in the following materials</u>			(37,073)	
				(38,864)	
E522	Material other than topsoil, rock,or artificial hard material inclined at an angle not exceeding 45 degrees to the horizontal	m²	360.00	(40,656)	(14,636,140)
				(42,447)	
E523	Rock surfaces inclined at an angle not exceeding 45 degrees to the horizontal	m²	40.00	(44,239)	(1,769,559)
				(46,030)	
	Disposal of Excavated Material			(47,822)	
				(49,614)	
	<u>Disposal of excess excavated material to sites as specified and as directed by the Engineer</u>			(51,405)	
				(53,197)	
E532	Material other than topsoil, rock, or artificial hard material	m³	855.00	(54,988)	(47,014,787)
E533	Rock	m³	45.00	(56,780)	(2,555,081)
				Carried to Collection	**(89,992,368)**
	<u>**Filling**</u>				
	Embankments				
	<u>Filling to embankments of dry bed by methods specified and to depths as in drawings with the following materials</u>				
E624	Selected excavated material other than topsoil, rock or artificial hard material	m³	225.00	345,551	77,749,008
E625	Imported specified gravel material other than topsoil or rock	m³	75.00	352,007	26,400,515
				358,463	
	<u>**IN-SITU CONCRETE**</u>			364,918	
				371,374	
	<u>**Provision of Concrete**</u>			377,830	
				384,285	

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-8					
DESCRIPTION: CONSTRUCTED WETLAND					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE UShs**	**AMOUNT UShs**
	Ordinary Designed Mix Concrete			390,741	
				397,197	
	Grade C16			403,653	
				410,108	
	Designed mix,grade C15 concrete, to BS 5328, with ordinary port land cement to BS12, aggregate to BS882 , for the following aggregate sizes			416,564	
				423,020	
F233	20mm aggregate	m³	37.50	429,476	16,105,334
				435,931	
	Grade C26			442,387	
				448,843	
	Designed mix,grade C25 concrete, to BS 5328, with ordinary portland cement to BS 12 , aggregate to BS882 , for the following aggregate sizes			455,298	
				461,754	
F253	20mm aggregate	m³	75.00	468,210	35,115,744
				474,666	
	Placing Mass Concrete			481,121	
				487,577	
	Blinding			494,033	
				500,489	
	Placing blinding concrete, grade C15, of the following thickness			506,944	
				513,400	
F511	Thickness not exceeding 150mm	m³	37.50	519,856	19,494,590
				526,311	
	Bases, Footings and Ground Slabs			532,767	
				539,223	
	Placing mass concrete, grade C25, of the following thickness			545,679	
F521	Thickness not exceeding 150mm	m³	75.00	552,134	41,410,076
				Carried to Collection	**216,275,267**
	CONCRETE ANCILLARIES				
	Formwork-Fair Finish				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-8					
DESCRIPTION: CONSTRUCTED WETLAND					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE UShs**	**AMOUNT UShs**
	Fair Finish Plane Verticle				
	Plane fair finish vertical formwork of the following width				
G245	All widths	m²	18.56	1,922,318	35,678,214
				1,954,446	
	Reinforcement			1,986,574	
	-			2,018,703	
	High Yield Steel			2,050,831	
				2,082,959	
	High yield squire twisted bars to BS4449 and of the following sizes			2,115,088	
				2,147,216	
G523	Nominal size, 6-16mm	t	7.50	2,179,345	16,345,084
				2,211,473	
	Finishing of Top Surfaces			2,243,601	
				2,275,730	
	Finishing of top surfaces by the following methods			2,307,858	
				2,339,986	
G812	With steel float finish	m131	750.00	2,372,115	1,779,086,149
	PIPEWORK-PIPES				
	Plastic Drain Pipes				
	uPVC drain pipes, to BS 5481, with flexible joints to BS 4346 or BS 6209, 200 mm ND, laid NOT in trench to the following depths				
I517	On ground and Supported with steel section	m	6.44	49,504	318,872
	uPVC drain pipes, to BS5481 with flexible joints to BS4346 or BS6209, 200 ND, laid in trench to the following depths		7		
I520	Depth not exceeding 1.5m	m	6.69	56,576	378,560
			6.75		
	PIPEWORK - FITTINGS AND VALVES		6.82		
			6.88		
	Plastic Pipe Fittings		7		
			7		
	Bends		7		
			7		

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-8					
DESCRIPTION: CONSTRUCTED WETLAND					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE UShs**	**AMOUNT UShs**
	uPVC bends with push-fit joint for use with uPVC pipes, to ISO 2531, all to PN4, and of the following sizes		7		
			7		
J412.3	201 mm DN all socketed 90^0 bend	nr	7	68,000	497,471
J412.4	201 mm DN all socketed 45^0 bend	nr	7	68,000	501,718
			7.44		
	Junctions and Branches		7.5		
			7.6		
	All Socketed uPVC Cross tee to BS 4346, and of the following size		8		
			8		
J423	200/200/200/200 mm ND	nr	8	120,001	930,361
			8		
			7.88		
			7.94		
			8	**Carried to Collection**	**1,833,736,430**
			8.07		
	Straight Specials		8.13		
	-		8.19		
	Perforated uPVC drain pipes, to BS 5481, with flexible joints to BS 4346 or BS 6209, 200 mm DN		8.25		
			8.32		
J482.1	Length not exceeding 1.0m	nr	8	39,780	333,258
J482.2	Length not exceeding 1.8m	nr	8	71,604	604,336
J482.3	Length not exceeding 2.0m	nr	9	79,560	676,453
J482.4	Length not exceeding 3.0m	nr	9	119,340	1,022,134
			8.63		
	uPVC drain pipes, to BS 5481, with flexible joints to BS 4346 or BS 6209, 200 mm DN		8.69		
			8.75		
J482.5	Length not exceeding 0.4m	nr	9	15,912	140,260
J482.6	Length not exceeding 1.8m	nr	9	71,604	635,641
			8.94		
	End caps		9		
			9		
	uPVC end caps to fit uPVC spigots, to ISO 161 and of the following pipe		9		

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-8					
DESCRIPTION: CONSTRUCTED WETLAND					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE UShs**	**AMOUNT UShs**
	sizes				
	-		9		
J493	ND 200 mm	nr	9.251915255	58,500	541,237
			9		
	PIPEWORK-MANHOLES AND PIPEWORK ANCILLARIES		9		
	Manholes		9		
			10		
	In Situ Concrete Manholes		10		
			10		
	In situ concrete manhole with reinforced concrete base or footing, include cast in pipe pieces for inlet and outlet as specified, include step irons as specified, include hinged cast iron heavy duty grating manhole cover, size 1.0m by 1.0m clear opening complete, and of the following depths		10		
			10		
K132	Depth not exceeding 1.5m	nr	10	(170,708)	(1,675,336)
			10	(207,841)	
	PIPEWORK-SUPPORTS AND PROTECTION, ANCILLARIES TO LAYING AND EXCAVATION		10	(244,973)	
	-		10	(282,106)	
	Extras to Excavation and Backfilling		10	(319,239)	
			10	(356,371)	
	In Pipe Trenches		10	(393,504)	
			10	(430,636)	
	Extras to excavation in pipe trenches in the following materials		10	(467,769)	
			10	(504,902)	
L111	In rock	m132	10.44	(542,034)	(5,658,077)
			10.50	(579,167)	
	Beds		11	(616,299)	
	-		11	(653,432)	
	Pipe bedding, of imported granular material, for the following pipe sizes		11	(690,564)	

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-8					
DESCRIPTION: CONSTRUCTED WETLAND					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE UShs**	**AMOUNT UShs**
			11	(727,697)	
L331	Diameter not exceeding 200 mm ND	m	10.81	(764,830)	(8,270,363)
			10.88	(801,962)	
	Surrounds		10.94	(839,095)	
			11.00	(876,227)	
	Pipe surrounds, of imported granular material, for the following pipe sizes		11.06	(913,360)	
			11.13	(950,492)	
L531	Diameter not exceeding 200 mm ND	m	11.19	(987,625)	(11,049,631)
				Carried to Collection	**(22,700,089)**
	WATER PROOFING				
	Protective Layers				
	Flexible Sheeting				
	Flexible sealing foil 25mm thick, or similar approved, laid to the surface of compacted marrum				
W423	Surfaces of compacted marrum inclined at an angle not exceeding 60 degrees to the horizontal	m²	1000.00	175,741	175,740,566
				182,472	
	MISCELLANEOUS WORK			189,203	
				195,934	
	Filter Media			202,665	
	-			209,396	
RHI S-5.1	Supply and place approved filter media (Sand 0.3-1.5mm)	m³	75.00	216,127	16,209,552
				222,858	
RHI S-5.2	Supply and place approved filter support media (Medium Gravel 3-20mm)	m³	112.50	229,590	25,828,833
				236,321	
RHI S-5.3	Supply and place approved filter support media (Coarse Gravel 20-60mm)	m³	600.00	243,052	145,831,132
				249,783	
RHI S-5.4	Supply and place / plant approved Phragmytes Australis Shoots (8-10 shoots/m²)	nr	7,500.00	256,514	1,923,856,132
	Vent Pipes				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-8					
DESCRIPTION: CONSTRUCTED WETLAND					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE UShs**	**AMOUNT UShs**
	201 mm uPVC Vent pipe, complete with plactic mesh attached at end of pipe and including a pipe fastening system to fasten the pipe onto the bed surface				
RHI S-5.5	Length not exceeding 2.5m	nr	0	106,080	1,515
			-0.37		
	Other Works		-0.76		
			-1.14		
RHI S-5.6	Perforated Drainage Pipe Protection mesh placed around the DN200 perforated pipe for its protection	sum	-2	444,216	(679,016)
			-2		
RHI S-5.7	Supply and place pipe support system including 500x500 mm erosion protection stone plate as in the drawing	sum	-2	(80,875)	186,012
			-3	(143,000)	
RHI S-5.8	Supply,place and set to work steel plate as in the drawing	sum	-3	(205,125)	630,027
				(267,250)	
RHI S-5.9	Filling bed with water	m132	2,250.00	(329,375)	(741,093,750)
				Carried to Collection	**1,546,511,003**
	Bill Summary				
	Collection, Page 1/7				(89,992,368)
	Collection, Page 2/7				216,275,267
	Collection, Page 3/7				1,833,736,430
	Collection, Page 4/7				(22,700,089)
	Collection, Page 5/7				1,546,511,003
	Cost for 1 Constructed Wetland				**3,483,830,243**
	Other Constructed Wetlands	**nr**	**3**	**3,483,830,243**	**10,451,490,730**

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT RATE Ushs	AMOUNT Ushs
	ADMINISTRATION BUILDING				
	PREAMBLE				
Note 1	The works measured in this bill are covered under the Particular Specifications. The relevant drawings are the DRAWING **MWE/WSDF-C/KN/0** (including references made there-in to other drawings)	item			
	CLASS E: EARTHWORKS				
	Excavation for foundations				
E323	Depth 0.5 - 1m	m³	70.0	12,000	840,000
E324	Depth 1 - 2m	m³	70.0	14,500	1,015,000
	Disposal of Excavated Material				
	Disposal of excavated material off site				
E532	Material other than topsoil, rock, or artificial hard material.	m³	54.0	10,000	540,000
	Double handling of excavated material				
E542	Material other than topsoil, rock or artificial hard material - Return fill and compact selected excavated material in foundations to 95% MDD	m3	16.0	10,000	160,000
	Filling				
	Filling to Structures by methods specified and to depths as shown in the drawings				
E615	Imported granular material - 50mm sand blinding	m3	6	20,000	120,000
E647	Hardcore filling; 200mm deep	m2	115	65,000	7,475,000
Carried to Collection					10,150,000
	FILLING ANCILLARIES				
	Preparation of Filled Surfaces				
E712.1	hardcore materials	m2	115	5,000	575,000
	CLASS F: IN-SITU CONCRETE				
	Provision of Concrete				
	Ordinary Designed Mix Concrete				
	Grade 15/20				
	Designed mix, grade 15/20 concrete, to BS 5328, with ordinary portland cement to BS 12, aggregate to BS882 , for the				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	following aggregate sizes				
F231	20mm aggregate	m³	5.0	400,000	2,000,000
	Grade 30/20				
	Designed mix, grade 30/20 concrete, to BS 5328, with ordinary Portland cement to BS 12, aggregate to BS882 , for the following aggregate sizes				
F253	20mm aggregate	m³	36	500,000	18,000,000
	Placing Mass Concrete				
	Blinding				
	Placing blinding concrete, for ground slab, grade 15/20, of the following thickness				
F511	Thickness not exceeding 150mm	m³	5	108,000	540,000
	Strip foundation				
	Placing strip foundation concrete, grade 30/20				
F522	Nominal thickness 230mm	m3	19	108,000	2,052,000
	Placing Reinforced Concrete				
	Bases, Footings and Ground Slabs				
	Placing reinforced concrete, grade 30/20, for ground slab of the following thickness				
F623	Thickness not exceeding 150mm	m³	13	108,000	1,404,000
Carried to Collection					24,571,000
	CLASS F: IN-SITU CONCRETE (Cont'd)				
	Placing Reinforced Concrete (Cont'd)				
	Ring Beams				
	Placing reinforced concrete, grade 30/20, for ring beam				
F632	Thickness 200 x 200mm	m³	4.0	108,000	432,000
	CONCRETE ANCILLARIES				
	Formwork; Rough Finish				
	Plane vertical				
	Width 0.20 to 0.40m	m2		35,000	

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Formwork-Fair Finish				
	Plane Vertical				
G242	Width 0.1m - 0.2m to edges of slab	m	56	12,000	674,400
	Plane Vertical				
G243	To ring beam 200mm x 200mm; Width 0.2m - 0.4m	m2	40.0	35,000	1,400,000
	Reinforcement				
	Deformed High Yield Steel				
	Hot rolled high yield ribbed bars of yield strength of 460N/mm2 to BS 4449 or BS EN 10080 and BS EN 1993 and of the following sizes				
G524	All sizes	kg	440	5,000	2,200,000
	Steel Fabric				
	Steel fabric to BS4483				
G522	Nominal mass: 2 - 3 kg/m^2 - A142	m2	126	15,000	1,890,000
	CLASS N: MISCELLANEOUS METAL WORK				
	Steel veranda supports: tubular section				
N164	100mm diameter x 4mm thick Round hollow section: size 2700mm long including 500mm length bedded in concrete grade 20: top welded with 4mm thick mild steel plate to receive timber beam (m/s): bottom welded with fixing lugs: bottom 4mm base plate welded to the steel pipe: including Bolts and nuts, painted in accordance with engineers specification. complete.	nr	8	1,500,000	12,000,000
Carried to Collection					18,596,400
	CLASS U; BRICKWORK, BLOCKWORK AND MASONRY				
	Dense Concrete Blockwork				
	Dense concrete blockwork to BS 7263, jointed with ordinary 1:3 cement mortar, hoop irons every				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	three courses				
U521.1	200mm thick solid block wall in plinth wall	m²	200	80,000	16,020,800
	Dense concrete blockwork to BS 7263, jointed with ordinary 1:4 cement mortar, hoop irons every three courses				
U521.2	200mm thick solid block wall	m²	306	80,000	24,484,320
U511	100mm thick solid block wall	m²	13	40,000	520,000
	Damp proof course of bitumen impregnated fabric to BS 6398 for the following wall thickness				
U582	Width 150-200mm wide	m	116	5,000	580,000
	CLASS V: PAINTING				
	High Gloss				
	Timber Surfaces				
	External quality high gloss oil paint, two coats, to the following timber surfaces; include surface preparation and undercoat				
V321	Upper surfaces of facia board inclined at an angle not exceeding 30 degrees to the horizontal	m²	15	15,000	225,000
	Emulsion Paint				
	Masonry				
	External quality emulsion paint (weather guard), two coats, to the following smooth masonry surfaces, include surface preparation and undercoat as specified				
V553	Surfaces of walls inclined at an angle exceeding 60 degrees to the horizontal	m²	179	10,000	1,790,000
Carried to Collection					43,620,120
	CLASS V: PAINTING (Cont'd)				
	Emulsion Paint (Cont'd)				
	Masonry				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Internal quality emulsion paint, two coats, to plastered blockwork; include surface preparation and undercoat as specified				
V553	Surfaces of walls; inclined at an angle exceeding 60 degrees to the horizontal	m²	350	12,000	4,200,000
	Approved Floor Paint				
	Horizontal Surfaces of steel trowelled concrete floor; applied strictly in accordance with suppliers' recommendations.				
V639	Surfaces of floors; horizontal - Office, store, Labourer's rest area and veranda	m2	63	12,000	756,000
	CLASS W: WATER PROOFING				
	Protective Layers				
	Flexible polyethylene sheeting, gauge 1000, or similar approved, laid to the surface of blinding concrete or sand blinded hardcore fill				
W421	Surfaces inclined at an angle not exceeding 30 degrees to the horizontal	m²	115	6,500	747,500
	CLASS Z: SIMPLE BUILDING WORKS				
	WINDOWS DOORS & GLAZING				
	Timber Doors				
	Supply and install 45mm thick wrot hardwood timber doors as described to: 45 mm thick framed, ledged and battened size as shown below overall comprising 45 x 125 mm stile and top rail, 25 x 125 mm ledges, 20 x 100 mm battens with V joints, all glued and assembled, including painting general surfaces woodwork and all necessary iron mongery.				
Z313.1	Size 900mm x 2100mm high	nr	9	750,000	6,750,000
Z313.2	Size 800mm x 2100mm high	nr	3		

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
				600,000	1,800,000
Carried to Collection					14,253,500
	CLASS Z: SIMPLE BUILDING WORKS (Cont'd)				
	WINDOWS DOORS & GLAZING (Cont'd)				
	Metal Doors				
	Supply and install steel door fabricated from standard steel sections not less than 3mm thick and comprising 300mm high vent filled in with 4no 2mm thick x 75mm wide steel louvre blades, 2no 6mm thick clear glass and glazing panels complete with all iron mongery, steel burglar proof grilles, heavy-duty stainless-steel door lock to as union or equal approved and including painting to Engineer's satisfaction.				
Z323.1	Door size 1200mm x 2100mm high	nr	3	1,400,000	4,200,000
Z323.2	Door size 900mm x 2100mm high	nr	2	1,200,000	2,400,000
	Metal Windows				
	Supply and install steel casement window with frames and sashes in standard sections as described: timber including timber sub-frames; including glazing, complete with all ironmongery, burglar proof and including painting to Engineer's specification.				
Z321.1	Window Size 1500mm x 1200mm high, with 1500mm x 250mm vent on top; casement	nr	6	900,000	5,400,000
Z321.2	Window Size 1000mm x 1200mm high, with 1000mm x 250mm vent on top; casement	nr	5	700,000	3,500,000
Z321.3	Window Size 600mm x 600mm high, with 600mm x 250mm vent on top; top hung	nr	5	450,000	2,250,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Precast concrete				
	Window Cills				
	Supply and install 265 x 68mm weathered and throated window sill finished fair on exposed surfaces and bedded in cement mortar (1:4) including gloss oil painting applied in three coats				
Z350	Cross-sectional area not exceeding 0.1 m2	m	17	50,000	850,000
Carried to Collection					18,600,000
	CLASS Z: SIMPLE BUILDING WORKS (Cont'd)				
	SURFACE FINISHINGS, LININGS AND PARTITIONS				
	In situ finishes, beds and backings				
	Floors				
	Sand and Cement Screed				
	Sand and cement screed of 1:4 cement sand mortar, applied to concrete floors, 50 mm thick, prepared and applied as specified, and finished with a steel float				
W441	Surfaces of floors inclined at an angle not exceeding 30 degrees to the horizontal	m²	63	25,000	1,575,000
	Wall Finishes				
Z413.1	External: 20 mm thick plaster (1:5) in two coats to walls, trowelled hard and smooth	m²	179	15,000	2,685,000
Z413.2	Internal: 15 mm plaster in two coats, steel trowelled to hard and smooth finish to walls internally	m²	350	15,000	5,250,000
	Tiles				
Z421.1	300x 300 x 8mm thick approved non-slip ceramic floor tiles on 42mm thick screed - toilets, pantry and laboratory.	m²	39	90,000	3,510,000
Z421.2	8x100mm high skirting	m	52	15,000	780,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
Z423	300x 150 x 8mm thick approved ceramic wall tiles on 25mm thick cement and sand mortar backing - 1.8m high.	m²	94	90,000	8,460,000
	Ceiling Finishes				
	Soffits				
Z414	In situ finishes, beds and backings: plasterboard ceiling with applied finish to provide a smooth surface: complete with timber backing & expanded metal as required.	m²	90	70,000	6,300,000
Carried to Collection					28,560,000
	CLASS Z: SIMPLE BUILDING WORKS (Cont'd)				
	FIXTURES & FITTINGS				
	Laboratory fittings				
	Factory manufactured laboratory fittings				
Z371.1	Cupboard units and bench tops as specified; to make up units 7000mm x 550mm wide	nr	1	5,000,000	5,000,000
	Pantry fittings				
	Factory manufactured pantry fittings				
Z371.2	Cupboard units and bench tops as specified; to make up units 2050mm & 950mm long - width 550mm	nr	1	1,900,000	1,900,000
	Office Furniture				
Z371.3	Provisional sum for furniture in the Manager's, Laboratory and Secretary's offices including cupboards, and shelves in accordance to details to be provided by the project manager	sum	1	20,000,000	20,000,000
	Roof				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
Z800	Construct roofing, complete as shown on drawing DET - WWTPN-006 and as specified; include tie beams, purlins, rafters, struts, wall plate, facia board and all roofing timber, gauge 24 pre-painted GCI resin sheeting and ridges; the GCI sheet should be resin bonded or with other protection against corrosion by Alum or Soda Ash or Chlorine	m^2	173	125,000	21,625,000
	Piped building services				
	Pipework				
	Supply and install complete cold water distribution system for the building from the main water supply line to laboratories, ladies & gents washrooms as shown in Drawing MWE/WSDF-C/Nak/17/012 in PE or PPR plastic pipes, including all bends, elbows, tees, tapers, ball valves and accessories				
Z511-1	Administration Building cold water distribution system	item	1	3,500,000	3,500,000
	Supply and install complete internal sewage collection system to laboratories, pantry, ladies & gents washrooms and as shown in MWE/WSDF-C/Nak/17/012 in PVC DN 40 mm to DN 110 mm pipes with flexible rubber joints, including all bends, elbows, tees, tapers and accessories				
Z511-3	Administration building internal sewage drainage system	item	1	3,000,000	3,000,000
Carried to Collection					55,025,000
	CLASS Z: SIMPLE BUILDING WORKS (Cont'd)				
	Piped building services (Cont'd)				
	Sanitary appliances and fittings				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
Z701	Supply and Install Vitreous China WC as Twyford Classic bowl with P outlet 9 litre cistern with valve fittings and seat and cover, complete with valve cistern fittings, including outlet and inlet valves, internal overflow, connecting fitments from cistern to bowl and all accessories.	nr	3	750,000	2,250,000
Z702	Wash hand basin in Vitreous China approximately 560 x 405mm with one tap hole and chain-stay hole, complete with Amazon mixer pillar tap, Chrome plated chain waste, plastic bottle trap, pedestal and all accessories as TWYFORDS CLASSIC 560 or equal approve	nr	2	550,000	1,100,000
Z703	Stainless steel sink: Single bowl single as "ASL" or equal approved (2000 x 500mm): 615/041 40mm chain waste: Bricon 365/50 tap: 40mm S.P. bottle trap: 75mm seal: including fixing with necessary screws and brackets.	nr	2	1,800,000	3,600,000
	Concrete Splash Apron				
Z703	Concrete Grade 25/20 100mm thick laid on 150mm thick blinded hardcore sub-base; include for wood float surface finish to falls; formwork to external edge and movement/ construction joints as required.	m2	36	90,000	3,240,000
	RAINWATER DISPOSAL				
Z5.04	160mm uPVC rainwater gutters; fixed to eaves beam with and including brackets, outlets and ends.	m	60	65,000	3,900,000
Z505	110mm diameter uPVC pipes; including hopperheads, bends and outlet shoes; to convey rainwater to the water tank	m	10	10,000	100,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
Z505	5000 litre plastic water tanks with all the necesssary valves and outflow pipes including masonry base	nr	1	4,500,000	4,500,000
Carried to Collection					18,690,000
	Bill Summary				
	Collection, Page 1/10				10,150,000
	Collection, Page 2/10				24,571,000
	Collection, Page 3/10				18,596,400
	Collection, Page 4/10				43,620,120
	Collection, Page 5/10				14,253,500
	Collection, Page 6/10				18,600,000
	Collection, Page 7/10				28,560,000
	Collection, Page 8/10				55,025,000
	Collection, Page 9/10				18,690,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-10					
DESCRIPTION: ANCILLARY SITE WORKS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	<u>ANCILLARY SITE WORKS</u>				
	PREAMBLE				
Note 1	The works measured in this bill are covered under the Specifications. The relevant drawings are the DRAWING …………………………... (including references made there-in to other drawings)	item			
Note 3	**CLIMATIC CONDITIONS**				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-10					
DESCRIPTION: ANCILLARY SITE WORKS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Refer to Specification Clause 1.1.02 - Climatic Conditions - detailing wet/dry seasons; The Tenderer is to provide in his price for all temporary works required to complete this work under these conditions.	Item			
	CLASS D: DEMOLITION AND SITE CLEARANCE				
	GENERAL CLEARANCE				
D100	Faecal Sludge Management Facility Site	ha	1.2	4,000,000	4,800,000
	TREES				
	Cut and dispose of trees of the following girth; include removal of stump and backfilling the hole left with top soil				
D210	Girth 500 mm - 1m	nr	15	150,000	2,250,000
D220	Girth 1-2 m	nr	10	300,000	3,000,000
	STUMPS				
	Remove and dispose of stumps of the following diameter; include for grabbing up the roots and backfilling the hole left with top soil				
D310	Diameter 150- 500 mm	nr	5	150,000	750,000
D320	Diameter 500mm - 1m	nr	3	300,000	900,000
	CLASS E: EARTHWORKS				
	GENERAL EXCAVATION				
	Top soil				
E411	Maximum depth: not exceeding 0.25m	m^3	1390.0	10,000	13,900,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-10					
DESCRIPTION: ANCILLARY SITE WORKS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	EXCAVATION FOR CUTTINGS				
	Material other than topsoil, rock or artificial hard material, commencing surface is the underside of topsoil strip				
E222	Maximum Depth: 0.25 - 0.5m	m3	56	10,000	560,000
E223	Maximum Depth: 0.5 - 1m	m3	260	12,000	3,120,000
E224	Maximum Depth: 1 - 2m	m3	1100	14,500	15,950,000
E225	Maximum Depth: 2 - 5m	m3	2688	18,500	49,728,000
Carried to Collection					**94,958,000**
	In rock, commencing surface is the exposed surface of the rock				
E333	Maximum Depth 0.5 - 1.0m	m³	50	50,000	2,500,000
E334	Maximum Depth: 1 - 2m	m3	50	100,000	5,000,000
E335	Maximum Depth: 2 - 5m	m3	50	150,000	7,500,000
	EXCAVATION ANCILLARIES				
	Preparation of excavated surfaces				
E522	Material other than topsoil, rock or artificial hard material	m²	1200	5,000	6,000,000
	Disposal of excavated material				
E531	Top soil	m³	18387	5,000	91,935,000
E532	Material other than topsoil, rock or artificial hard material	m³	2000	5,000	10,000,000
E533	Rock	m³	1500	20,000	30,000,000
	FILLING				
	General				
E634	Selected excavated material other than topsoil or rock	m³	21500	16,000	344,000,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-10					
DESCRIPTION: ANCILLARY SITE WORKS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	LANDSCAPING				
E820	Hydraulic mulch grass seeding to horizantal and inclined surfaces including importation of top soil and preparation of surface	m2	12790.0	5,000	63,950,000
	CLASS I: PIPEWORK-PIPES				
	PN 10 'UNPLASTICISED POLYVINAL CHLORIDE (uPVC) SEWER PIPES WITH FLEXIBLE RUBER RING JOINTS TO BS EN 1401-1: 2009				
	SECTION - ANAEROBIC BAFFLE REACTOR TO INLET MANHOLE OF FACULTATIVE POND				
	OD: 160mm Sewer pipe				
I243.1	In trenches, depth not exceeding 1.5 m	m	25	85,000	2,125,000
Carried to Collection					**563,010,000**
	CLASS I: PIPEWORK-PIPES (Cont'd)				
	UNPLASTICISED POLYVINAL CHLORIDE (uPVC) PIPES TO BS EN 1401-1: 2009				
	SECTION - SLUDGE DRYING BEDS TO MAIN SEWER LINE				
	OD : 160mm Sewer pipe				
I243.1	In trenches, depth not exceeding 1.5 m	m	49	85,000	4,165,000
	SECTION - WITHIN WWTP - BY-PASS LINE				
	OD : 160mm Sewer pipe				
I243.1	In trenches, depth not exceeding 1.5 m	m	190	85,000	16,150,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-10					
DESCRIPTION: ANCILLARY SITE WORKS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	SECTION - OUTFALL WITHIN THE FSTP SITE				
	OD: 160mm Sewer pipe				
I512	In trenches, depth not exceeding 1.5 m	m	25	85,000	2,125,000
I512	In trenches, depth: 1.5 - 2 m	m		95,000	
	SECTION - OUTFALL OUTSIDE FSTP				
	OD: 160mm Sewer pipe				
I512	In trenches, depth not exceeding 1.5 m	m	20	85,000	1,700,000
	CLASS J: PIPEWORK - FITTINGS AND VALVES				
	UNPLASTICISED POLYVINAL CHLORIDE (uPVC) PIPES TO BS EN 1401-1: 2009				
	STRAIGHT SPECIALS				
J383.1	Nominal Bore: 150mm: 900mm long to manholes with puddle flange	nr	32	380,000	12,160,000
	CLASS L: PIPEWORK - SUPPORTS AND PROTECTION, ANCILLARIES TO LAYING AND EXCAVATION				
	EXTRAS TO EXCAVATION AND BACKFILLING				
	IN PIPE TRENCHES				
L111	Excavation of rock	m3	5	120,000	600,000
L118.1	Excavation of natural material below the Final Surface and backfilling with imported granular material	m3			
	IN MANHOLES AND				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-10					
DESCRIPTION: ANCILLARY SITE WORKS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	OTHER CHAMBERS				
L118.2	Excavation of natural material below the Final Surface and backfilling with imported granular material	m3			
Carried to Collection					**36,900,000**
	SURROUNDS				
	Pipe surrounds, of imported granular material; Standard Detail for the following pipe sizes				
L532.1	Nominal bore 150 mm - Outfall pipe in swamp	m	20	20,000	400,000
	CLASS K: PIPEWORK - MANHOLES AND PIPEWORK				
	ANCILLARIES				
	PRECAST CONCRETE MANHOLES WITH HEAVY				
	DUTY PE COVER AND FRAME				
	Refer to Drawing No.				
K151.1	Depth not exceeding 1.5m	nr	14	1,500,000	21,000,000
K151.2	Depth 1.5 - 2 m	nr	2	1,500,000	3,000,000
	OTHER PIPEWORK ANCILLARIES				
	STONE PITCHING DRAINAGE CHANNEL				
K871	200mm thick grouted stone pitching (1:3 cement mortar) as detailed for open drains	m2	405	70,000	28,350,000
	ROAD CROSSINGS - Precast Concrete Pipe Culverts				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-10					
DESCRIPTION: ANCILLARY SITE WORKS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
H7	Diameter 600mm with bedding class B, including excavation not exceeding 1.5m depth, compacted backfilling to 93%BS heavy	m	25	200,000	5,000,000
	CONCRETE BLOCKWORK FOR HEADWALLS				
U521	230 mm thick jointed with 1:3 motar	m2	24	90,000	2,160,000
	CLASS R: ROADS AND PAVINGS				
	SUB BASE; FLEXIBLE ROAD BASE AND SURFACING				
	Granular Material				
R715	150mm natural gravel fill material for base well-watered and compacted to 98% BS Heavy laid to Engineer's approval - All access roads and parking	m3	512	85,000	43,520,000
	Kerbs				
	Construct Kerbs of pre-cast concrete to BS 7263 of cross section area 0.05-0.1 m² to the following alignment				
R611	Straight or curved to a radius exceeding 12 m - to parking area only	m	100	50,000	5,000,000
R612	To a radius not exceeding 12 m	m			
Carried to Collection					**108,430,000**
	CLASS R: ROADS AND PAVINGS (Cont'd)				
	Double surface dressing				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-10					
DESCRIPTION: ANCILLARY SITE WORKS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
R341	Bituminous surface dressing to part of access road and parking (450m2), include preparation of base course surface, heat & spray MC30 cutback bitumen as prime coat, at a rate of 0.7 L/m2 , provision of blinding material on primed surface at 200m2 /m3, first seal of 80/100 pen at a rate of 1.2 L/m2, and 14/20 mm chippings at rate of 80m2 /m3, 2nd seal of 80/100 bitumen at a rate of 1.0 L/m2 , 6/10 mm chippings at rate of 135m2 /m3 to the satisfaction of the Engineer	m2	1,700	70,000	119,000,000
	CLASS U; BRICKWORK, BLOCKWORK AND MASONRY				
	STONE PITCHING				
U823	200mm thick stone pitching (1:3 cement mortar) to sides of filled material	m2	70	80,000	5,600,000
	CLASS X: MISCELLANEOUS WORKS				
	FENCES				
	100x100mm Concrete post of grade 35/20 concrete and wire galvanised wire chain link fence of gauge 10 to BS 1722, with triple row of barbed wire on top, anchored into and including Concrete/blockwork dwarf				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-10					
DESCRIPTION: ANCILLARY SITE WORKS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	wall complete with foundations as per drawing, height 2-2.5 m				
X135	Height 2.0 - 2.5m	m	450	160,000	72,000,000
	GATES AND STILES				
	Supply and complete installation of metal field gate to BS 3470 in grade 25/20 concrete pad foundations; complete. height 2-2.5 m				
X235	Width 4 - 5m, double leaf	nr	1	5,000,000	5,000,000
Carried to Collection					**201,600,000**
	MISCELLANEOUS STRUCTURES				
	Solid waste skip				
X901	Area 9 sq. m	nr	1	3,500,000	3,500,000
	Guard House				
X902	Area 10 sq. m	nr	1	15,000,000	15,000,000
	VIP Latrine (2stances with Shower)				
X903	Area 10 sq. m	nr	1	25,500,000	25,500,000
	Squatting Flush Toilets (2stances with Shower)				
X904	Area 10 sq. m	nr	1	28,500,000	28,500,000
	Sitting Flush Toilets (2stances with Shower)				
X905	Area 10 sq. m	nr	1	38,000,000	38,000,000
	Cistern/Pour Flash Toilet Connected to septic Tank				
X906	Area 4 sq. m	nr	1	30,000,000	30,000,000
	Urine Diversion Dry Toilet				
X907	Area 13 sq. m	nr	1	32,500,000	32,500,000
	Public/Institutional water borne Facility				
X908	Area 82 sq. m	nr	1	85,000,000	85,000,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF KIGUMBA FAECAL SLUDGE TREATMENT PLANT					
BILL No. KIG FS-10					
DESCRIPTION: ANCILLARY SITE WORKS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Bio Latrine Sanitation Facility				
X909	Area 82 sq. m	nr	1	105,000,000	105,000,000
Carried to Collection					**363,000,000**
	<u>Bill Summary</u>				
	Collection, Page 1/7				94,958,000
	Collection, Page 2/7				563,010,000
	Collection, Page 3/7				36,900,000
	Collection, Page 4/7				108,430,000
	Collection, Page 5/7				201,600,000
	Collection, Page 6/7				363,000,000