REPUBLIC OF UGANDA

INTEGRATED WATER MANAGEMENT AND DEVELOPMENT PROJECT (IWMDP)

CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER SUPPLY AND SANITATION PROJECT

CONTRACT NO: NWSC/HQ/SRVCS/2017-2018/164552

ENVIRONMENTAL AND SOCIAL IMPACT STATEMENT FOR MBALE & SMALL TOWNS WATER SUPPLY AND SANITATION PROJECT

(ESIA UPDATE)

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SUBMITTED BY:

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ABBREVIATIONS

AWE	: Air Water Earth (AWE) Limited
BoQs	: Bills of Quantities
CMP	: Catchment Management Plan
DEM	: Digital Elevation Model
DLP	: Defects Liability Period
DRR	: Design Review Register
DWD	: Directorate of Water Development
EHS	: Environmental, Health and Safety
ESIA	: Environmental and Social Impact Assessment
ESMF	: Environmental and Social Management Framework
FAO	: Food and Agricultural Organization
GPS	: Geographical Position System
GUI	: Graphical User Interfaces
HSE	: Health, Safety and Environment
IWMDP	: Integrated Uganda Water Management and Development Project
LU/LC	: Land Use/ Land Cover
m.a.s.l	: Meters Above Sea Level
MCM	: Million Cubic Meter
MIS	: Management Information System
mm	: Millimeter
MoM	: Minutes of Meeting
MWE	: Ministry of Water and Environment
NEMA	: National Environment Management Authority
NFA	: National Forestry Authority
NRW	: Non-Revenue Water
NWSC	: National Water and Sewerage Corporation
O&M	: Operation and Maintenance
PID	: Proportional-Integral-Derivative
PLC	: Programmable Logic Controllers
PPDA	:Public Procurement and Disposal Association

QA	: Quality Assurance
QC	: Quality Control
RAP	: Resettlement Action Plan
RFP	: Request for Proposals
RUSLE	: Revised Universal soil Loss Equation
SCADA	: Supervisory Control and Data Acquisition
ToR	: Terms of Reference
UBOS	: Ugandan Bureau of Statistics
UNBS	: Uganda National Bureau of Standards
WB	: World Bank
WBS	: Work Breakdown Structure
WTT	: West Tanzania Terrane
yr	: Year

0 EXECUTIVE SUMMARY

01 PROJECT BACKGROUND

Uganda Government obtained funds from the World Bank for implementing the Uganda Integrated Water Management and Development Project (IWMDP). The IWMDP was developed under the Ministry of Water and Environment (MWE) as an integrated water resource management and development project with objectives of improving integrated water resources planning, management and development; and access to water and sanitation services in priority urban areas. The project will contribute to higher level goals of sustaining natural resources, improving service delivery, and increasing economic productivity. Part of the IWMDP funds will finance the Water Supply and Sanitation Project in Mbale National Water and Sewerage Coprporation (NWSC) service area and small towns of Busolwe, Kadama, Tirinyi, Kibuku, Butaleja and Budaka.

The NWSC is the implementing agency in Mbale City while MWE through the Directorate of Water Development (DWD) is directly in charge of the small towns and enroute villages, which are to benefit from the project. Piped water will be extended from the NWSC Mbale Service Area to the neighbouring small towns and rural growth centres. The NWSC was established as a government parastatal organisation in 1972 to develop, operate, and maintain water supply and sewerage services in urban areas of Uganda.

The first piped water supply system in Mbale was constructed around 1939. The City relies on two treatment plants, namely Bungokho and Manafwa water treatment plants. Mbale has had its share of infrastructure development backlog experienced like all urban centres in Uganda that have undergone rapid growth. The backlog has placed immense pressure on the capacity of NWSC to effectively deliver water and sewerage services. Although a number of interventions have been undertaken in the production systems, little has been done in expansion of the distribution network and the sewerage services.

There are two isolated sewer networks in Mbale City. One system is discharging into the Namatala Treatment Ponds and the other one is discharging into the Doko Treatment Ponds. Doko treatment ponds and Namatala treatment ponds were constructed in 1968/69 and 1986, respectively. The sewer network in Mbale City was established as a separate sewer. However, there have been reports of illegal stormwater connections. From the feasibility study carried out by Consulting Engineers Salzgitter (CES) in 2015, there were several residential properties that connected their stormwater drains to the sewerage network in the Namatala catchment, which was a major cause of siltation in the sewers and treatment ponds. In addition, there was high infiltration as a result of broken sewers in the network. Many concrete pipes have been in use for 40 to 60 years. The Doko treatment ponds are in urgent need of repair. The Namatala treatment ponds appear to be in a good condition, except for the concrete works. The sewerage coverage is poor with only 14% of the households with water supply having a sewerage connection.

Approximately 47 km (17%) of the current water supply network (total length ~ 279 km) consists of asbestos cement pipes which are according to NWSC in poor state. As a result, frequent bursts and leakages are experienced. Furthermore, development within the town over the last few years has taken place at a much faster rate than infrastructure provision, overwhelming NWSC's capacity to provide reliable services. Mbale City has currently a population of 114,700 inhabitants (UBOS 2019) and the system was originally constructed for a population of around 45,000 people. With the city's boundaries having grown, it is now imperative that the water supply system be expanded in order to address the low per capita water production.

There is only piped water supply for the towns of Busolwe, Kibuku and Tirinyi. Budaka has a water supply system as well, but there is no operator in place and the pumps of the boreholes supplying the network are not functioning. The towns of Kadama and Butaleja do not have piped water. Despite having piped water in some of the towns, a sizeable part of the population is taking water from boreholes with hand pumps that have low yields and from shallow wells. The rivers as well, are used as water sources. The connections to the water supply network are yard connections with very few exceptions. In all the towns the majority of the population rely on on-site sanitation facilities, mainly simple pit latrines and a few VIP latrines. The same applies to the institutions, like schools and health centres. The condition of the sanitation facilities in these institutions appeared to be satisfactory. In Tirinyi and Kibuku two new public toilets have been constructed. Other than those two toilets there

is no appropriate public sanitation facility in any of the growth centres.

The scope of work under this project will include:

i) Catchment management measures to protect the current water sources at R. Nabijjo and R. Nabiyonga
ii) Catchment management measures to protect the Proposed water source at R. Namatala
iii) Rehabilitation and expansion of the water treatment plants at Bungokho and Manafwa;
iv) Investigations into possible new water sources;
v) Rehabilitation and expansion of the water supply and distribution system;
vi) Extension of water supply services to neighbouring small towns and rural growth centres;
vii) Rehabilitation and expansion of the sewer network and construction of new wastewater treatment facilities for new drainage areas; and
viii) Water and sanitation facilities in informal settlements.

02 OBJECTIVE OF THE ESIA

The main objective was to carry out an updated comprehensive environmental and social impact assessment for the proposed project works for the provision of improved water supply services in the business districts of Mbale, Kibuku, Budaka, and Butaleja. The specific objectives included updating the following:

i) The project's potential environmental and social impacts and proposing measures to mitigate them;
ii) The impacts of alternatives and advising the design consultant accordingly; and
iii) The actions required by NWSC, MWE and other stakeholders to satisfactorily address the impacts.

03 PROPONENTS' CONTACT AND PROJECT COST ESTIMATE

Name and address:

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The estimated project cost is **Eleven million five hundred thousand United States dollars** (USD 11,500,000).

04 LOCATION OF PROJECT SITE

Mbale lies approximately 245 km, by road, northeast of Kampala, on an all-weather bitumen highway. The coordinates of the town are: 1° 04' 50" N, 34°10' 30" E. Mount Elgon, one of the highest peaks in East Africa lies approximately 52 km east of Mbale. Mbale is home to the Islamic University in Uganda (IUIU), as well as the Moses Synagogue around which most of the Abayudaya ba Uganda live. The population includes members of the Gisu ethnic group, mainly the Bamasaaba and Bagisu. The Mbale water supply is being developed to also extend water to the neighbouring small towns of Busolwe, Butaleja, Kadama, Budaka, Kibuku and Tirinyi; Kadama, Budaka, Tirinyi and Kibuku being located along the Tirinyi-Mbale highway, while Busolwe and Butaleja are located off of the Mbale-Tororo Highway.

Budaka Town Council is located at grids 01° 01' 00" N, 33° 56' 42" E, approximately 36 km by road, west of Mbale. Kibuku Town Council is located between Grids 01°02'N and 33°50' E. It lies 53km by road west of Mbale town. Busolwe Town Council is located at grids 00° 50' 57"N, 33° 55' 37"E; at an elevation of 3,609 ft (1,100 m) above sea level. It lies 47 km by road southwest of Mbale town. Butaleja Town Council is located at grids 0°55'30.0"N, 33°56'42.0"E. It hosts the District headquarters. It lies at an elevation of 3,600 ft (1,100 m) above sea level. It lies at a distance 38 km by road southwest of Mbale town.

The different project components and their respective locations are presented in Table Es 0-2.

05 PROJECT COMPONENTS

a) Namatala Water Intake

The current intakes of Nabijo and Nabuyonga are not sufficient anymore for the new water supply system. Thus a new intake and a new transmission main between Namatala and Bungokho WTP are required. A small weir will be constructed for the water abstraction to maintain a water level that allows enough water to pass the screen of the intake structure and it needs to make sure that the minimum EF is passing the weir. The intake will also include flow monitoring devices to ensure river flows are measured and the minimum EF is maintained.

b) Upgrade of Water Treatment Plants

Rehabilitation of Bungokho WTP (Line 1): The main purpose of the WTP rehabilitation is to introduce the necessary modifications in actual structures in order to increase the treatment capacity of the Plant from the actual 6,400 m^3/d to 20,860 m^3/d in 2030 and 27,080 m^3/d in 2040 and at the same time to implement more appropriate coagulation and flocculation units for treating surface waters of relatively rapid changing characteristics. The measures proposed to upgrade the existing structures of Bungokho WTP include:

i) New inlet works, that could accommodate the water coming from Namatala River intake together with the water coming from rivers Nabijo and Nabuyonga;
ii) Automated coagulant dosing installation;
iii) Flow distribution to flocculation channels;
iv) Flocculation in two flocculation channels;
v) Refurbishing of the existing rectangular clarifiers;
vi) Refurbishing of the existing filters;
vii) New chlorination unit; and
viii) Supply of adequate maintenance tools and laboratory equipment.

Extension Bungokho WTP (Line 2): The proposed solution to extend the Bungokho WTP in order to reach a treatment capacity of 20,860 m^3/d in 2030 and 27,080 m^3/d, the following measures are required:

i) Flocculation in two flocculation channels;
ii) Construction of four lamellar clarifiers;
iii) Construction of a set of four filters and new filters building; and
iv) Sludge drying beds.

Upgrading of Manafwa WTP: The treatment capacity of Manafwa WTP will be upgraded from the existing capacity of 4200 m^3/d to 8,212 m^3/d in 2030 and 10,660 m^3/d in 2040 to provide an alternative source of water for the Bungokho supply area during the dry months of January to April when the water abstraction for the Bungokho system is insufficient to meet the maximum daily water demand.

The improvements in the units of the chemically-assisted sedimentation of the Manafwa WTP proposed for upgrading the capacity of the plant include:

i) Implementation of an automated coagulant dosing system, based in the regulation of the dosing rate in function of the measurements of a streaming current analyser actuating on the coagulant dosing pump;

ii) Construction of flocculation units (low mixing chambers) with mechanical stirrers to ensure the formation of flocks of adequate settling rate; and
iii) Refurbishing of the clarifiers in order to prevent hydraulic short circuiting.

c) Transmission Lines

The transmission line from the raw water intake will be DN 500 ductile iron pipeline of spanning 12.49 km of this 2 km aligned along the existing Mbale City roads.

Mbale City requires a new transmission main system and water supply to the west to Budaka, Kadama, Kibuku and Tirinyi. This will comprise of the existing DN 300 steel pipe, which runs from the reservoir at Bungokho WTP along the Republic Road and ends shortly after the Clock Tower. This will be used as the main feeder for the Pressure Zone 2, that is, Senior Quarters, parts of the Central Business Area and St. Paul Mbale College.

Table ES 0-1: Transmission lines within Mbale City

Pipe details	Remarks
DN 600	Runs from Bungokho reservoir to the pressure break tank at Mbale District Local Government (350m towards Central Business District (CBD) from Mbale Sports Club).
DN 400	Connected and run in parallel to the Republic Road up to the roundabout (Soroti / Kampala Road) for the supply to the north (Nakaloke) and west (Kamonkoli / Budaka / Tirinyi).
DN 600	Throttle section and 140m long will connect from the DN 600 to the pressure break tank.
DN 500	The outlet of the pressure break tank is a pipe which runs in parallel to the Republic Road up to the Clock Tower. This pipe is the main feeder pipe for the pressure Zone 3
DN 300 PN 16	From Manafwa to Busoba Reservoir T-off. From Busoba Reservoir T-off To Bongokho will be a OD 250 uPVC PN 10. The New pipeline will be placed alongside the existing DN 300 steel pipe.

d) Main reservoirs and pressure break tanks

These will include:

- Bungokho (Central Reservoir, Supply to Zone 1, 2 (via existing DN 300 steel) & 3 in Mbale and Growth Centres to Tirinyi)
- Pressure Break Tank in Mbale (Supply Zone 3)
- Busoba Reservoir (between Manafwa and Mbale, supply to Busolwe and Butaleja)
- Mooni (Supply Zone 1, Mbale)
- Four (6) new reservoirs with the size between 160 – 300 m^3 will be constructed in Budaka (existing reservoir will be used), Kadama (new - 300 m^3), Tirinyi (new - 250 m^3), Kibuku, Butaleja and Busolwe.

e) Distribution Networks

Mbale City: The distribution systems in and around Mbale were divided into the following sub-systems: Mbale, Manafwa, North and North-West systems. The total lengths of the new pipelines for Mbale City and surrounding areas is 146,177 m.

Rural Growth Centres: The water distribution systems in the growth centres will be rehabilitated, extended and upgraded in Budaka, Tirinyi, Kibuku and Busolwe while new distribution systems will be laid in Kadama and Butaleja. The total length of the distribution mains in Budaka, Kadama, Kibuku, Tirinyi, Butaleja and Busolwe is 30,043m; 8,529m; 7,700m; 18,414m; 8,868m; and 15,171m, respectively.

f) Public stand posts

There are currently 136 Public Stand Posts (PSPs) and 18 water kiosks that are run mainly by private operators in Mbale. They cover almost 100% the informal areas of Namatala, Nabuyonga, Nkoma, Namakwekwe, Busamaga and Mooni. All of the informal settlements will get a formal water distribution network installed.

Approximately 43 new PSP including prepaid meters will be installed in the existing informal settlements within a walking distance of 200 m. The new PSPs will guarantee 24 h water supply with the water tariff provided by NWSC for the low income population.

Table ES 0-2: Location of main project components for water supply and sanitation component

No	Project Component	Coordinates	Project Location
1.	Namatala Intake	36N 640452.43, 122872.10	Mbale District, Bungokho County, Bufumbo Subcounty, Jewa Parish.
2.	Raw water Mains	Start: 36N 640452, 122872 End: 36N 633964, 117608	Mbale District, Bungokho County, Bufumbo Subcounty, Jewa Parish. Mbale District, Mbale City, Wanale Division, Mooni Ward.
3.	Nabijo Intake	36N 635175 117308	Mbale District, Bungokho County, Bukonde Subcounty, Iwasso
4.	Nabuyonga Intake	36N 636531 118316	Mbale District, Bungokho County, Bungokho-Mutoto Subcounty, Mooni Ward
5.	Bungokho WTP	36N 633964, 117608	Mbale District, Mbale City, Wanale Division, Mooni Ward.
6.	Manafwa WTP	36N 628662, 103621	Mbale District, Bungokho County, Busiu Subcounty, Bufukhula Parish
7.	Busoba Reservoir	36N 630025, 107445	Mbale District, Bungokho County, Busoba Subcounty, Bumasikye Parish
8.	Break Pressure Tank	36N 631666, 118367	Mbale District, Mbale City, Northern Division, North Central Ward.
9.	Mbale – Tirinyi Transmission Main	Start: 36N 631666, 118367 End: 36N 586243 111952	Traverses through: Districts: Mbale, Budaka and Kibuku Sub counties: Bungokho-Mutoto, Kamonkoli, Naboa, Budaka, Kadama, Kibuku Kiriki and Tirinyi
10.	Budaka Reservoir		Budaka District, Budaka County, Budaka Subcounty, Macholi Parish
11.	Kadama Reservoir	36N 598818, 112329	Kibuku District, Kibuku County, Kadama Subcounty, Kadama Parish
12.	Tirinyi Reservoir	36N 586243, 111952	Kibuku District, Kibuku County, Kibuku Subcounty, KibukuParish
13.	Kibuku Reservoir	36N 588879, 115804	Kibuku District, Kibuku County, Tirinyi Subcounty, Tirinyi Parish
14.	Butaleja – Busolwe Transmission Mains	Start: 36N 607929, 100395 End: 36N 603086, 93095	Traverses through: Districts: Mbale, Butaleja Sub counties: Busoba, Nazimasa, Butaleja and Busolwe
15.	Butaleja Reservoir	36N 607929, 100395	Butaleja District, West Budama County, Paya Sub county, Nabwire Parish
16.	Busolwe Reservoir	36N 603086, 93095	Butaleja District, Bunyole County, Busolwe Sub county, Busolwe Parish

g) Mbale Sewerage System

From the findings of the feasibility study, the capacity of the wastewater treatment ponds was found to be satisfactory. It is recommended to install new inlet works with grit removal to avoid siltation of the ponds. Furthermore, at the Namatala treatment ponds the sluice gates shall be re-established to increase the treatment capacity by adjusting the flow regimes. It is also recommended to construct sludge drying beds at the treatment ponds that can receive and treat faecal sludge from the ponds.

Sewerage network Senior Quarters: The area around the Senior Quarters has been identified as a potential area for expansion due to the high water demand and its income structure. The Senior Quarters is the only high income neighbourhood in Mbale. Almost all of the houses have their water connections in the house and use septic tanks. Most of the bigger hotels in Mbale can be found in this area including the two main Hotels, the Mbale Resort and the Mount Elgon Hotel. Since most of the sanitation facilities in the area are already waterborne it must be expected that there is a high demand for sewerage services. The entire catchment shall drain towards an open area near the Nabijo River where a lifting station shall be built that connects the sewerage network with the existing sewer of the Namatala Catchment .

Rehabilitation of sewerage network – Indian Quarters: A new sewer shall be installed in the area of the Indian Quarter replacing a dilapidated existing sewer network. The new sewer shall be connected to an existing trunk sewer on the opposite side of the Kampala Road, which needs to be crossed. The total length of the new network is 2180 m and compromises 53 manholes. About 115 house connections are required to be relocated to the new sewer mains. At three locations an existing functional sewer will be connected to the new system.

Rehabilitation Namatala treatment ponds: The following measures are proposed at the Namatala treatment ponds:

i) Construction of new inlet structure and demolishing of old inlet structure;
ii) Reinstatement of embankments;
iii) Construction of five new channels connecting the ponds including sluice gates and demolishing of existing channels;
iv) Erection of boundary fence (live fence and diamond mesh fence);
v) Re-construction of approximately 200 m of DN 400 mm trunk sewer with two life connections; and
vi) Erection of a service building

Rehabilitation Doko treatment ponds: The following measures are proposed at the Doko treatment ponds:

i) Construction of new inlet structure and demolishing of old inlet structure;
ii) Construction of roofed sludge drying beds including separate inlet structure, feeder and drainage pipework;
iii) Construction of a solar powered drainage pump station;
iv) Establishment of operations building;
v) Erection of boundary fence (live fence and diamond mesh fence); and
vi) Re-construction of approximately 70 m of DN 400 mm trunk sewer with one life connection.

Sewerage connection Northern Cluster: The northern area of Mbale around the Islamic University in Uganda (IUIU) shall receive sewerage services. A gravity network and a treatment pond shall be constructed for that purpose. The network shall be a gravity network consisting of 10,950 m of OD 200, OD 250 and OD 315 mm uPVC sewer pipelines. Around 250 provisions for house connections shall be made by the Contractor at locations suitable for the terrain of the existing properties. Around 210 manholes shall be constructed.

The treatment ponds shall be constructed at a land close to the confluence of the Nabuyonga River into the Namatala River, which belongs to the IUIU. The treatment units shall include a mechanical treatment stage, an anaerobic pond and facultative ponds. The sludge from the anaerobic ponds shall be applied to sludge drying beds.

h) Sanitation facilities

Two types of sanitation facilities are proposed, that is:

a) 4No. Ablution blocks for the growth centres and the informal settlements that include a shower unit; and
b) 2No. Public toilets that are smaller in size for smaller settlements

Both types of facilities are divided into genders and have units for persons with disabilities. Sufficient hand wash basins will be installed to encourage hand washing and condom dispensers will be added to each unit. All toilets are waterborne and shall be equipped with a 1 m^3 water tank. The units shall be connected to a conservancy tank that shall be regularly emptied with a cesspool emptier. The faecal sludge shall then be driven to a suitable treatment facility.

06 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

According to the World Bank's environmental categorisation, the proposed project is classified as EA Category B undertaking which requires detailed ESIA studies. The proposed construction and operation of the water supply and sanitation facilities will be restricted within the user-communities. Similarly, according to the *Third Schedule of the National Environment Act, Cap. 153 (Section 4a: "storage dams, barrages and weirs", and Section 12c: "sewage disposal works")*, Ugandan environmental laws and regulations, require to undertake a full EIA for projects falling under this category. The ESIA was conducted following the World Bank Operation Policies and EHS Guidelines; the relevant national policies, regulations, standards and legal framework; international conventions and agreements.

07 PROJECT ALTERNATIVES

a) 'No Project' Scenario

The existing Mbale water supply system constructed in the 1950s and rehabilitated in 1990 has now reached its design capacity due to the fast-growing population rate and water demand. Without the proposed development, the government of Uganda would not have the ability to provide safe water and sanitary services to over 250,000 people living in Mbale and the growth centres of Kadama, Kibuku, Tirinyi and Budaka towns.

The "no project" scenario is neither a tenable nor beneficial alternative because safe water supply and sanitation are required to support rapid socio-economic development within the region.

b) Water supply

If the Namatala intake can be used the whole year, the raw water pumping main from Manafwa and the rehabilitation of the intakes at Nabijo and Nabuyonga is not required anymore.

Raw water sources: Four main rivers for raw water supply within this project area were identified. The Nabijo, Nabuyonga and Manafwa Rivers are currently used for water supply, while the River Namatala offers a further possibility for gravity raw water supply.

The dry season flow is the average of all flows in the dry months, which has been defined for December, January, February and March. For the Manafwa River the dry season average flow was relatively high (4.88 m^3/s) while for River Namatala and River Nabuyonga, flows of 1.6 m^3/s and 0.78 m^3/s, respectively, existed. The absolute minimum flows that were measured at the gauging stations were 1.3, 0.33 and 0.001 m^3/s for Manafwa, Namatala and Nabuyonga, respectively.

A water demand of 0.385 m^3/s is needed for year 2040 (design horizon) to serve the northern, western areas of Mbale and the growth centres of Budaka, Kadama, Kibuku, Tirinyi, Butaleja and Busolwe. The water supply for this Mbale core, Mbale West & Northern parts together with the growth centres of Budaka, Kadama, Kibuku, Tirinyi will come from the Bungokho WTP while Mbale south and growth centres of Butaleja and Busolwe will come from Manafwa WTP.. The Augmented water supply report and design review reaffirmed the different raw water sources to increase water production at Bungokho, including Nabijo, Nabuyonga, Namatala, and Manafwa Rivers as suggested by the detailed Design report (CES 2015).

River Nabuyonga: The statistical analysis of data for Nabuyonga suggests enough water availability based on the mean total and dry season flow. However, absolute minimum flows already indicate the drying up of the river during the dry season although the wet season flow seems generally to be above 0.436 m^3/s. Basing on the measurement and historical data analysed on Nabuyonga, the river exhibits both dry and wet seasons.

River Nabijo: This is similar to River Nabuyonga. Flows are generally slightly lower. Basing on the flow measurement and hydrological analysis done on Nabijo, the river exhibits both dry and wet seasons. The wet season varies between April and November With flows exceeding 0.305 m^3/s while the dry season varies from December to April with flows as low as 0.068 m^3/s.

River Namatala: For the Namatala River, data from the gauging station suggest that enough water is available, at least for most of the time during the year. The mean dry season flow is 1.56 m^3/s with a 95% exceedance probability of 0.47 m^3/s. The absolute minimum value was 0.303 m^3/s. The mean flow was estimated at 1.119 m^3/s. The analysis suggests enough water is available to meet water demand by year 2040 (0.313 m^3/s) for most of the year. However, Namatala's dry weather flows in some cases may not be sufficient to meet projected water demand and maintain an adequate Environmental Flow (EF).

The ESIA estimated a minimum EF of 0.19 m^3/s, which includes domestic, livestock, Small-scale irrigation water, and aquatic life water needs downstream of the proposed Namatala intake location.

River Manafwa: Based on data from the gauging station, Manafwa River seems to have enough water. The flow representing the 95% probability of exceedance (or the safe yield) is approximately 1.38 m^3/s. This is slightly lower than the value of 2 m^3/s obtained by CES (2015). The 9% exceedance probability has a flow of approximately 1.614 m^3/s. Absolute minimum value is 1.311 m^3/s with 90% exceedance probability of 1.7 m^3/s. Both values are significantly above the total water demand for the project.

Comparing all the four sources, River Manafwa is expected to have enough water. However, a guarantee cannot be given as extreme droughts can occur and human destruction of ecosystems continues. River Namatala has enough water for most times. Nevertheless, by the end of the dry season, flows could be close or even below the water demand. Nabijjo and Nabuyonga have enough water during the wet season but during the dry season flows are too low for sufficient water supply, even if both sources are used.

Therefore basing on the flows, River Namatala will be used as the major raw water source for the Bungokho WTP and River Manafwa will continue to supply the Manafwa WTP with modifications at the intake because of the high sediment load.

For raw water supply to Bungokho during the dry season only two options were further considered:

- Raw water supply from Manafwa (pumping)
- Raw water supply from Namatala (gravity)

Looking at the findings in the hydrological investigation no other options exists for the long-term water supply to Mbale. Further, four different scenarios were analysed. Three different pipeline diameters (DN 400, DN 500and DN 600) were investigated between Manafwa and Bungokho and one between Namatala intake and Bungokho (DN 500).

Based on the flow analysis and cost evaluation, Namatala River was selected as the major raw water source for the Bungokho WTP given advantages of running a gravity fed system. Manafwa River will continue to supply the Manafwa WTP with modifications at the intake because of the high sediment load. The Manafwa system will serve Manafwa, South of Mbale, Butaleja and Busolwe.

As indicated above, there is a risk of insufficient river flow during the dry months to meet the design water demand of 0.386 m^3/s when considering the minimum EF. Therefore, the NWSC will carry out an Alternative Water Supply Study prior to construction to evaluate options to augment water source during low flows for

Namatala and assess the reliability of the proposed water supply system. The options will include, among others but not limited to:

i) Construction of a water impoundment structure at the Namatala intake site to store water during high flows and sustain the water demand during the dry spell;
ii) Construction and rehabilitation of boreholes in the small towns;
iii) Expansion of Manafwa water supply system; and
iv) A reduction in water service delivery at acceptable levels.

The Project will also include a source water protection program to improve environmental conditions in the rivers feeding to the Mbale water supply project and community sensitization activities to promote water conservation and overall understanding of the proposed water supply system. The NWSC and MWE expect that these measures will reduce the minimum EF estimated for Namatala.

Busoba reservoir: The location of the new reservoir in the south is approximately 4000m north of Manafwa and 1700m south of the turn-off to Busolwe (630017 m E, 107451 m). Two supply options are possible:

- Option 1: Pumping all water from Manafwa to the southern reservoir from where the area north of the reservoir up to Mbale and the area around Manafwa WTP will be supplied. In this option the reservoir must have a size of 2000 m^3.
- Option 2: Pumping only the water from Manafwa to the southern reservoir which is required for the supply in the area north of the reservoir up to Mbale. The area around Manafwa WTP will be supplied by direct pumping. In this option the reservoir must have a size of 1750 m^3.

Option 1 was recommended as the cost implications are minor and it will reduce permanent pumping from Manafwa. In this case the existing DN 300 between Manafwa and the southern reservoir will serve as transmission and distribution main.

Water supply to small towns: To supply the small towns, two options, that is, gravity water supply from Mbale or a decentralised system with boreholes were investigated. Two main alternatives for the supply of the small towns were assessed, that is:

- Integrated approach: The entire project region could be combined into one supply area that would be fed from NWSC's Mbale Water Supply System.
- Decentralized approach: The growth centres would produce and supply their water on their own. The small towns were divided into three clusters: Budaka & Kadama, Tirinyi & Kibuku and Butaleja and Busolwe. The three clusters would have one combined system including own boreholes and a transmission main system up to the reservoirs in each small town.

The higher electricity consumption, continuous reinvestments and a low residual value in 2040 are making the decentralized water supply more expensive in the long-run.

Proposed transmission mains to the small towns: Two towns, Tirinyi and Kibuku, have sufficient water sources available as they fill their reservoirs only once or twice per week. Thus, the transmission mains between Kadama and Tirinyi as well as between Kadama and Kibuku could be postponed and constructed only as soon as more water is required in both towns. However, the demand for both towns was included in the overall dimensioning of the pipeline capacity between Mbale and Kadama as it will be required in future. As Kibuku is 20 m higher than Tirinyi it is proposed to have two separate lines from Kadama to Tirinyi and to Kibuku. Altogether three scenarios were investigated:

- Scenario 1: Pipeline design to Tirinyi/ Kibuku for the demand until 2040, gravity supply up to the north (Nakaloke) and north-west (Kamonkoli and Kabwangasi)
- Scenario 2: Pipeline design to Tirinyi/ Kibuku for the demand until 2030, installation of Booster Station in 2030 to supply up to Tirinyi/ Kibuku until 2040, gravity supply up to Kabwangasi until 2040

- Scenario 3: Pipeline Design to Tirinyi/ Kibuku for the demand until 2030, installation of Booster Station in 2030 to supply up to Tirinyi/ Kibuku until 2040, gravity supply up to Kabwangasi is not guaranteed from 2030 onwards. An additional booster station for the north-west might be required.

A dynamic prime cost analysis was done where all three above mentioned scenarios were compared with each other. Scenario1 was therefore considered on the basis of running costs.

c) Expansion of sewerage services

Two options for the expansion of sewerage services in Mbale were assessed. The biggest potential for sewerage services has been identified in the Senior Quarters and the Northern Division of Mbale.

Senior Quarters: For the northern part of the Senior Quarters there are two alternatives for the connection to the existing sewerage network, one gravity option and a pumping option. The trunk main in the Senior Quarters will follow the corridor of the main stormwater channel in the neighbourhood. Where this channel connects with the Nabijo River it could either be pumped towards the existing network behind the High Court (Option A) or a pipeline is built along the Nabijo River (Option B).

The environmental impact is major disadvantage of the gravity trunk main along the Nabijo River. Here, a large amount of trees would need to the removed as the line is running through a forest. In addition, the line is running very close to a river. Here sewerage can infiltrate to the river in case of any damage and flooding can undermine the structural integrity of the sewer. As the Nabijo is meandering significantly in this section, interventions will be required to protect the pipeline from erosion, which are expected to be very costly.

Considering the social and environmental issues, Option A was considered.

08 PUBLIC CONSULTATIONS AND DISCLOSURE

During conduct of the ESIA, consultative meetings were held with NEMA, Ministry of Water & Environment officials, Ministry of Gender Labour and Social Development, Mbale District Local Government and City officials, and the project-affected communities. The stakeholders consulted and key issues raised are presented in Table ES 0-3 and ES 0-4

Table ES 0-3: Stakeholders consulted for the project

Category/ stakeholder	Reasons for consultation	Location and date	Methods for consultation.
NWSC	Lead Agency (the client)	Head office boardroom- several meetings	Board meetings, telcommuication, mails .
NWSC Mbale Regional meeting	Local water supply situation	Regional managers office – Jane 13/01/2018	Boardroom Meeting
Ministry of water and Environment	Different permits, environmental concerns including environmental flow data		Board room Meetings
National Enviromental management Authority (NEMA)	Approval of ESIA and provision of permits for operation	June 2018	Meetings and review sessions
Project Districts – Mbale, Butalejja, Budaka and Kibuku	Local administration and management.	District headquators main boardrooms. 16 to 19/06/2018	Meetings
Mbale Municiplity	Project area of influence	Municiple headoffice boardroom. – 16/01/2018	Board meeting
Project Subcounties and town councils	Local knowledge of the	Subcounty head offices.	Meetings

Category/ stakeholder	Reasons for consultation	Location and date	Methods for consultation.
	project location	17 – 22/06/ 2018	
Project communities	Ownership and good will for the project	Project communities across the project District. 20 – 30/06/ 2018	Community meetings, focus group discussions and key informant discussions
Project affected persons.	Consent for land and their properties that could be affected by the project	Community meetings and individual consultation. 20th March to 18/07/2022	Meetings and household survey and census

Table ES 0-4: Key issues raised by stakeholders

Stakeholder	Key issues	Consultants concern
District Leadership from the three District	**Compensation.** There is need to enumerate project affected properties and have them compensated as ameasure to create sustainable livelihood among the communities.	As part of the project, all affected persons and their affected properties are going to be valuated and the client will find mechanism of compensation
	District involvement It is important that district leadership both political and technical are involved in the project design and implementation	It is good practice and obligation that the consultant will periodically meet leadership but also work on a day to day some district members such as water, environment CDO and the engineer.
	Employement of the locals As a give back to the community, the locals should be given an opportunity to work especially on the low skilled component of the project.	The project will aim at ensuring local content is observed through out the project area. Labour inflex management has also been intergrated in the project for that purpose.
	Child abuse through employment need to be controlled and discouraged throughout the project.	Child labour is againist both the local labour laws and world bank guidelines and ESIA under development will streamline measures against childlabour.
	Need to redesign some pipeline. It was noted by members from Mbale district and municipality that many of the pipes traverses highly buildup. Yet it can use the utility line along the roads in town .	Part of this project is undertaking a design review. Under this assignment all this concern will be rectified .
	Undertake proper site restoration and landscaping after construction, that is, stabilize all soils after construction and plant grass to control erosion.	Recommendation for site restoration especially for material borrow pits have been included in the ESMMP of this report .
	NWSC/MWE should undertake regular monitoring of the water quality in R. Namatala and R. Sironko stream	As part of the project, the consultant is undertaking an environmental flow study that will act as a baseline for

Stakeholder	Key issues	Consultants concern
	and keep the community/public informed.	future monitoring .
Project Subcounties	Alignment of the pipe along the road to minimize property damange. The subcounties noted that there was a need to realighn the pipelines along the roads	The design review component will undergo design review and rectify the problem noted here.
	For any employment ,there is need to give the locals including women. In orfder to ensure family wellbeing , women and men should be given equal treatment.	Local personal shall be recruited through the local council leadership at the time of construction.
	Create buffer zones of natural vegetation belts of at least 50m between the lagoons and the river	Buffer zones for catchment protection along the major rivers will be implemented in the project
	The developer should design and implement a program to sensitize the surrounding communities on the use of the river and how they should relate to the established infrastructure	Sensitization of communities is continuous and will go on through out the project.
	The contractor should plant tree shrubs and grass to improve area aesthetics	This is going to be recommended in the environmental management plan included under this ESIA. ESMP will provide mechanism of environmental restoration and sustainability.
NWSC – Mbale regional office	The faecal sludge drying beds at the WSPs should be constructed in such a way that leachate doesn't pollute the existing valley dam as it is the only source of water for the locals	That has been taken for consideration
	The contractors should create good relationship with the communities through consultations prior to construction activities so that the communities have a role in the management of the water infrastructure such as cleaning around the reservoirs.	Through consultation and engagement, the consultant is establishing liaison system with the communities to ensure there is a good relation with the affected communities.
	Ensure that the physical and biological properties for aerobic conditions are maintained	Studies regarding biodiversity are ongoing and will provide a basis for the development of management measures.
Project Communities	Need to ensure that atleast the project communities are supplied with free water.	The requested will be submitted to the client. However there is a well layed coporate social responsibility mechanism through which NWSC give support to the community.
	All affected properties along the project line should be compensated.	Project affected properties are to be enumerated and nature of compensation elaborated to the affected persons.

Stakeholder	Key issues	Consultants concern
	More often project of this nature come with domestic issues such as domestic violence, HIV and family distraction. Efforts should be put in place to ensure this is not the case in this project. Communities need to becompensated for their properties.	Mechanism for labour, child abuse , inflex of people, liaison system with the communities are going to be included in this report and will be emphasized throughout. The RAP is being developed to understand property impact and determine measures for compensation.
Mbale municipal council	The contractor should see to it that construction works are carried out during day time to limit noise interruption. All workers should be provided with proper PPE. The workers should be regularly checked to ensure good health conditions. Compensation should be provided to injured or affected workers due to lack of proper protection. Take records of all injuries and infections reported to track improvements Compensation to all affected properties should be undertaken.	The contractor is under obligation to ensure work place safety. We are undertaking a resettlement action plan alongside this ESIA to understand impact on property for compensation purposes.

09 POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

An improvement in potable water supplies and sanitation may generate interrelated improvements in health, economic and social welfare of the community. However, in addition to the many possible beneficial impacts, adverse impacts may arise from these improvements. The anticipated impacts and corresponding mitigation measures are presented within the ESMP (Table ES 0-5).

010 MONITORING PROGRAM

The environmental and social management plan (ESMP) for the proposed construction works and operation of the water supply and sanitation facilities of this project, identifies the potential environmental and social aspects that should be monitored. It identifies parties responsible for monitoring actions, associated costs, indicators and training or capacity building needs and reporting. Various aspects of the ESMP are detailed in sections below

Institutional Structure and Responsibilities: During the construction phase, there will be three parties involved with the ESMP, that is, the client (NWSC in Mbale City and DWD in the small towns) with ultimate responsibility for E&S performance on the project; the Supervising Engineer (with an Environment and Social Specialist on their team) responsible for monitoring and supervising the implementation of the ESMP and contract requirements by the contractor(s); and the the Contractor (with an Environment and Social Officer) who has responsibility for implementing the ESMP. NWSC and DWD in their respective areas of operation will ensure that both the Supervising Engineer and Contractor are doing their jobs effectively and that the ESMP is delivering the necessary environmental and social protection measures.

Therefore, the institutional responsibility of ensuring that this ESMP is implemented will rest with NWSC and DWD having a key role of reviewing consultants' reports for compliance with the ESMP, among others. The Project Managers from either institutions shall have the ultimate responsibility for implementation of ESMP and

will therefore ensure that resources are duly provided. Other roles will be:

- Monitoring implementation of mitigation actions by contractors
- Coordinating training and capacity building where planned

NWSC/DWD should ensure that all its personnel to be involved in implementation of this ESMP are adequately qualified and were appointed based on their qualification and suitability for respective roles. There is thus no training provided for them under this ESMP. Supervising Engineer is required to have an Environmental & Social management Specialist by contractual obligation. The Contractor's Environment and Social Officer will ensure that the provisions in this ESMP are implemented within the sites under their supervision and to collect and transmit relevant information to the Supervising Engineer.

Subcontractors will be required by a condition of their subcontract with the main contractor to actively manage environmental and social issues associated with their subcontract works and comply fully with all the applicable statutory regulations and the main contractor's environmental and social management plans. For significant aspects of work such as earthworks, the contractor may require subcontractors to provide their own Environmental and Social Management Plans and/or Method Statements for review by the Contractor's Environmental consultant/Officer. These ESMP's shall be approved by the Resident Engineer in consultation with NWSC for adequacy before being implemented.

The Mbale City Council & District Environmental Officers (DEOs) are responsible for overseeing environmental protection on behalf of NEMA. The DEOs within the respective project districts will have monitoring roles during execution of this ESMP in their respective project areas. Usually, these officials lack adequate facilitation so the project will need to provide auxiliary financial assistance for them to have effective participation in this project.

The contractor will be required to prepare ESMPs setting out the measures that they will take to implement the ESIA ESMP during the construction. This requirement also applies to NWSC and DWD during the operation phase of the project in their respective areas of operation.

Monitoring and Reporting Arrangements: Monitoring will verify if predicted impacts have actually occurred and check that mitigation actions recommended in the ESIA are implemented and their effectiveness. Monitoring will also identify any unforeseen impacts that might arise from project implementation.

Monitoring will be undertaken by NWSC/DWD (PCU) and Environmental Officers who represent NEMA at local administrative level. Monitoring by NEMA in this case can be considered "third party monitoring" but this is its regulatory mandate according to Section 9 of the National Environment Act (2019).

Another government agency that may undertake "third party monitoring" is the Occupational Health & Safety Department in Ministry of Gender, Labour & Social Development (MGLSD). This unit has authority to inspect any facility for compliance with national requirements on safety in workplaces. The project shall make no funding to MGLSD since this is provided for in its annual budget.

Monitoring will be done through site inspection, review of site records (Accident Log, issuance of PPE, waste records, trainings and inductions, permits and approvals, etc.), review of grievances logged by stakeholders and *ad hoc* discussions with potentially affected persons (construction workers, residents near the project facilities). At each monitoring, a discussion with chairpersons of environment committees of the areas' local councils (LC) could provide insight into views and grievances communities have about the project since they regularly interact with their community members.

Monitoring will be undertaken continuously on a daily basis over the construction period. Audits will be necessary both during construction and project operation. While construction audits will aim to verify compliance to impact mitigation requirements, post-construction audits are a regulatory requirement within 12 months and not more than 36 months after completion of construction, according to national EIA Regulations, 1998 Section 31(2).

Since construction duration is estimated to be 1½ years, this ESMP has included a budget for **1½ year's**

construction audit and a separate provision so that from year 2 to year 5 full environmental audits are done as per Uganda requirements.

Both construction and post-construction audits can be conducted internally (by NWSC/DWD) or by a consultant hired by NWSC/DWD. If undertaken by a hired consultant, a budget has been proposed for both in this ESMP.

Concise monthly monitoring reports should be compiled by the Contractor. The report will highlight the different activities undertaken to manage environmental and social aspects of the project in line with contract specifications, laws, standards, policies, and plans of Uganda and World Bank Safeguard policies. The report will be discussed during the monthly progress meetings. The Supervising Engineer guided by the Environmentalist and Social Specialist will approve the Contractor's monthly environmental and social monitoring report that will then be transmitted to NWSC or DWD for final approval. NWSC's or DWD's Environmental Management and Social Specialist will also independently monitor the implementation of the ESMP and/or verify the accuracy and content of the Contractor's monitoring report and then report to the client. The report will also be shared with The World Bank and other relevant stakeholders. Strictly it will be the contractors compliance with the contract requirements (whether BoQ items or items considered part of other BoQ items) that will enable the Resident Engineer or Supervising Engineer to approve payment.

Construction- and post-construction phase auditing should culminate in reports that NWSC and MWE shall share with IDA, NEMA or other interested stakeholders. Construction phase audits and annual post-construction audits must be submitted to NEMA as a regulatory requirement as per Section 46(6) and 54 of the National Environment (Environmental and Social Assessment) Regulations, 2020.

011 CHANCE FINDINGS:

Both the Contractor and NWSC/MWE should ensure that impacts on cultural heritage resources are minimized as far as possible. The Chance Findings Procedure (CFP) has been provided under Appendix E describing the approach and procedures to be undertaken by the Contractor with regard to protection of chance finds encountered during project implementation. The section below outline the required personnel and their responsibilities towards achieving the goals of the CFP.

Personnel and Responsibilities

i) The contractor will have a *Senior Environmental Officer* (SEO) on the site during project construction. The contractor's SEO will be required to closely work with the developer's socio-environmental staff to ensure compliance with national and financier's requirements as well as implementation of this chance finds procedure.
ii) During ground opening and excavations, the developer should facilitate an Archaeologist from the Department of Museums and Monuments in the Ministry of Tourism, Trade & Industry (MTTI) to be on site and ensure that any chance finds encountered are managed according to requirements of The Historical Monuments Act, 1967.
iii) All construction staff involved in earthworks should be trained in basis skills of recognising suspected chance finds and the procedure of notifying the SEO and Archeologist.

Specific roles of persons to be involved in implementation of this procedure are outlined below

Role of the contractor's Senior Environmental Officer

i) Communicate contents and requirements of this plan to contractor
ii) Sensitise workers to ensure that all are aware of their responsibilities in regard to protection chance finds
iii) Inform the Archaeologist of any chance finds encountered on site
iv) Coordinate inspection and monitoring by the MTTI Archaeologist. The SEO should keep in close contact with the archaeologist throughout the construction period
v) Implement measures recommended by the archaeologist for management of "chance finds" encountered
vi) Conduct cultural heritage tool box talks to construction personnel as advised by the Archaeologist
vii) Maintain records (daily logs) related to archaeological finds during construction

Role of the MTTI archaeologist: An archaeologist contracted (on a non-permanent basis) from the department responsible for museums and monuments in MTTI will have the following roles:

i) Archaeological monitoring of all earthworks;
ii) Advice/ guidance to the contractor with respect to halting construction activities if earthworks encounter chance finds;
iii) Conducting preliminary assessment of all previously unidentified archaeological features encountered and submission of these to the National Museum;
iv) Provision of advice on the significance and management of unidentified archaeological features encountered;
v) Processing/ excavation of any unidentified subsurface archaeological features encountered in accordance with standard procedures recommended by the Department of Museums and Monuments;
vi) Maintain watching briefs during opening up site or deep excavations at any location during construction, with clear procedures for protection and documentation of any "chance finds" encountered;
vii) Maintain monitoring records of all unidentified archaeological features encountered;
viii) Develop a set of points to be discussed in "Tool Box" sessions to create awareness among construction crews on "chance finds"/ archaeological features. Note that as part of their sensitization, workers will be required to cease work if they encounter archaeological features and report to Contractor's SEO, who will notify the Archaeologist; and
ix) Write a report for the developer upon completion of construction. This report will be submitted to the Supervising consultant, Contractor, Developer and Department of Museums and Monuments. The report will summarise findings of archaeological monitoring, describing any features encountered and their preservation significance.
x) The archeologist will also undertake "Watching briefs" as the primary element of management and protection of cultural heritage during project construction. Watching briefs will consist of passive visual investigation during ground breaking at excavation sites.

Role of the Contractor: The contractor will be required to heed advice from the Archaeologist in respect to halting earthworks when chance finds are encountered; and provide cultural heritage tool box talks to construction crews as advised by the Archaeologist.

General Rule When Chance Finds are Encountered : Upon identification of suspected archaeological remains, the location must not be disturbed until it is inspected by the archaeologist from MTTI.

012 CONCLUSION

The proposed project has potential to significantly improve quality of life in the Mbale City and the neighbouring towns both during construction and operation phases. Like in other areas, the long term socio-environmental benefits of a reliable supply of potable water and access to sanitary facilities include reduced morbidity and increased productivity of households; and increased enrolment of children in educational institutions. In addition, project development and operation in the City and small towns or rural growth centres will provide considerable economic opportunity and attraction of other services.

However, development of the project can also bring with it negative impacts. The key significant negative impacts will arise from operation of the sewage treatment plants, sludge drying beds and public toilets if not managed well. NWSC and DWD should use their vast experience in their respective areas of jurisdiction in operating and maintaining such systems to reduce and / or avoid occurrence of adverse effects during construction and operation of the facilities.

The positive impacts of this project are more sustainable and outweigh the negative impacts. Based on the level of detail and depth of the study, it is the view of the developer that all envisaged environmental and socioeconomic impacts have been adequately addressed within the limits of the current state of knowledge and reasonable practice. Therefore, this ESIA should be approved to pave way for development of the project.

Table ES 0-5: Environmental & social monitoring & management plan

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (UGX)
7.2 POSITIVE IMPACTS							
7.2.1 Income to material/ equipment suppliers and contractors	a) Project will promote local procurement where technically or commercially reasonable and feasible.	Local communities and businesses benefit from procurement process	Number of local businesses benefiting from construction related procurement	Before and during commencement of construction	Contractor	NWSC/ District Local Governments of Project Area.	
	b) For earth materials, procurement will be made from legitimate sources to avoid encouraging environmental degradation	Project's material demand does not encourage environmental degradation	All quarries from which materials (sand, stone) are obtained are licensed by the local authorities	Before and during construction	Contractor	NWSC/MWE/ District Local Governments of Project Area	
7.2.2 Employment	a) Information to create awareness about the proposed project activities will be provided to the project-affected communities.	The participation of local community members in all project activities.	Local community awareness of project progress status	Before and during construction	Contractor in association with NWSC	NWSC/MWE/ District Local Governments of Project Area	10,000,000
	b) Unskilled labour will be recruited exclusively from local community, and semi-skilled labour will be recruited preferentially from such communities, provided that they have the requisite qualification, competence and desired experience.	Maximisation of participation of local community members during site preparation and construction activities.	Number of local people (unskilled and semi-skilled) employed during construction phase	Before and during construction	Contractor	NWSC/ District Local Governments of Project Area	
	c) Contractors will be encouraged to pay a "living wage" to all workers.	Some level of improved livelihood of the local community	Record of contractors' employment activities on a monthly basis, including number of jobs created by employment type (skilled / semi-skilled / unskilled); number of jobs by gender, employment type and geographical area; total man hours and wages paid, by employment type, gender and geographical area; and rate of employee turnover by gender and area.	Before and during construction	Contractor	NWSC/ District Local Governments of Project Area	
	d) A training programme for artisans (builders, carpenters, plumbers) in the project area could be facilitated by the project to ensure skills transfer during the construction period.	Skills transfer to the community members hence empowering them to become job creators.	Number of local people trained during construction phase	Before and during construction	NWSC/MWE/ Contractor	NWSC/MWE/ District Local Governments of Project Area	20,000,000
	e) Contractor will develop and implement Labour Influx Management Plan, Workers Camp Management Plan and Code of Conduct. An example of the code of conduct for contractors and sub-contractors is provided in Appendix H.	Workers and community members live in harmony.	Number of cases reported	Throughout construction	Contractor	NWSC/MWE/ District Local Governments of Project Area	
7.2.3 Infrastructure improvement	The communities along the road will further be sensitized and encouraged to be cooperative when this kind of infrastructure, for example, electric poles are being put in place.	Support infrastructure put in place without any hindrance	No complaints	Prior to commencement of construction	NWSC/ District Local Governments of Project Area	NWSC/MWE/ District Local Governments of Project Area	
7.2.4 Improved health status of households and communities.	Educate users on the proper use, regular cleaning and effective maintenance of both the household and public facilities.	Improved health status of households	Clinical records of reported cases. Reduced incidences of illness at household level.		NWSC/ District Local Governments of Project Area	NWSC/MWE/ District Local Governments of Project Area	
	Water quality monitoring at supply points will be monitored to ensure that water supplied to communities meets portable water standards.	Safe water supplied to communities	Drinking water quality monitoring data	Monthly throughout the operation	NWSC/ DWD	District Local Governments of Project Area specifically the District Health Inspectors	
7.2.5 Educational Enrolment and Attendance	Encourage parents to take their children of enrolment age to school	Improved enrolment and attendance at all levels	Record of candidates at all institutional/ educational levels		NWSC/ District Local Governments of Project Area	NWSC/MWE/ District Local Governments of Project Area	
7.2.6 Acquisition of New Skills	Where the required skills are available locally, the local people should be given first priority commensurate to their level of training.	Improved capacity to handle assignment or repairs in the Project areas.	Number of local people employed for skilled jobs	Before commissioning of facilities	NWSC/ District Local Governments of Project Area	NWSC/MWE/ District Local Governments of Project Area	
7.2.7 Improvement in Household Economic Status	Water tariffs will be set taking into consideration the different levels of users. The users should also be educated to avoid wasteful use of the resources	Time saved for other income generating activities	Number of new connections; public majority comfortable water tariffs.	Regularly as need arises	NWSC/ District Local Governments of Project Area	NWSC/MWE/ District Local Governments of Project Area	
7.2.8 Saving in the Cost of Medical Treatment	Educate users on the proper use, regular cleaning and effective maintenance of both the household and public facilities	Savings made for investment or other household requirements	Household investments/ activities arising from improved water supply	Regularly as need arises – community outreach activities	NWSC/ District Local Governments of Project Area	NWSC/MWE/ District Local Governments of Project Area	18,000,000
7.3 NEGATIVE IMPACTS							
7.3.1 Degradation of Land and Soil Erosion	a) The topsoil removed from the site during site preparation will be stored properly (away from runoff and possible contaminants) for reuse else.	No topsoil is washed away into the environment and is readily	Presence of well banded storage areas for topsoil to be re-used	Throughout construction	Contractor	NWSC/MWE/ District Local Governments of Project Area	

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (UGX)
		available for backfilling					
	b) All waste generated during site preparation and construction will be transported to an authorized disposal area. The contractor will seek guidance from Mbale City and the Respective District Local Governments in project area on the final disposal point.	All waste collected and disposed of properly	No complaint from communities around the site and road of poor management of waste. No litter at project site and complaints from authorities	Throughout construction	Contractor	NWSC/MWE/ District Local Governments of Project Area	50,000,000
	c) Use of old equipment or even damaged equipment that is most likely to have oil leakages thus contaminate soils will be avoided.	No soils or land are contaminated, by for example, oil and fuel spills, as a result of project activities	Soil quality data	Maintenance of equipment throughout construction	Contractor	NWSC/MWE/ District Local Governments of Project Area	
	d) A waste management plan will be developed prior to start of construction activities.	Waste management plan developed	No complaint of poor management of waste from communities around the site and road. No litter at project site and complaints from authorities	Before construction	Contractor	NWSC/MWE/ District Local Governments of Project Area	
	e) Construction equipment will be properly maintained and fully functional to avoid leakages.	Equipment functioning properly	Records of maintenance/ soil quality data	Throughout construction	Contractor	NWSC/MWE/ District Local Governments of Project Area	
	f) Sewers will be made watertight during maintenance to avoid intrusion of storm water into the network and cut-off drains provided to WSPs. Storm water will be guided away from all sanitary facilities using cut-off drains around them.	No contamination of Land or soil erosion by wastewater from the sewers.	No complaints from the communities and authorities of sewage leakages	Throughout operation	NWSC	NEMA/District Local Governments of Project Area	
	g) The staff of the WSP will be trained for proper management of screenings, sludge, etc., to avoid soil contamination.	Skills enhancement of Staff at WSP	Number of staff trained /Training records	Annually throughout operation	NWSC/MWE/ District Local Governments of Project Area	NWSC/MWE/ District Local Governments of Project Area	10,000,000
	h) Monthly tests will be done to assure the quality of effluent and treated sludge, to avoid partially treated wastewater and sludge from reaching the soils	No soils or land are contaminated as a result of project activities	Effluent quality data and sludge cake quality records	Monitoring activities throughout operation	NWSC/ District Local Governments of Project Area	NEMA/NWSC/MWE/ District Local Governments of Project Area	30,000,000 annually
	i) During construction, soil erosion will be controlled by placing crushed stone, sandbags and other similar materials in areas prone to runoff or that are heavily used where vegetation is hard to establish and maintain.	No soil is washed away	No sediment transport to water courses and property	Throughout construction	Contractor	NEMA/NWSC/MWE/ District Local Governments of Project Area	20,000,000
7.3.2 Pollution of water resources	a) All construction equipment will be kept in good operating condition to avoid oil or fuel leakages that might contaminate water resources	No oil and/ or fuel leakage in water courses	Water quality data	Throughout construction	Contractor	NEMA/NWSC/MWE/ District Local Governments of Project Area	
	b) Fuel handling and oil spill measures will be implemented to prevent, control and address spill or leaks.	No oil and/ or fuel leakage in water courses	Water quality data	Monitoring throughout construction	Contractor	NEMA/NWSC/MWE/ District Local Governments of Project Area	12,000,000
	c) At Nabunyere (STP site), the concrete mixing will not be done on site to avoid polluting the nearby swamp with excess washwater.	No swamp pollution with cement/concrete wash water	Water quality data	Throughout construction	Contractor	NEMA/NWSC/MWE/ District Local Governments of Project Area	
	d) Laying of water pipelines and sewer lines will mainly be done during the dry season to avoid sediment transport to the nearby land, water courses and roads;	No sediment transported to the nearby river courses	Water quality data	Throughout construction	Contractor	NEMA/NWSC/ District Local Governments of Project Area	
	e) The leakages from sewers, sludge drying beds and WSPs will be minimized by regular monitoring and maintenance of the network; connections between sewers will be made water-tight to prevent leakages of wastewater to groundwater; and frequent effluent quality monitored to avoid release of poorly treated effluents into the River.	No leakages into water courses and Groundwater	Water quality data and No complaints from communities around project sites	Throughout Operation	NWSC	NEMA/NWSC/ District Local Governments of Project Area	
	f) Monthly quality tests for effluent and receiving water resources will be done to ensure that the quality of effluent meets the national discharge standards or requirements;	Compliant effluent standards being discharged into receiving water courses	Water quality data and No complaints from communities around project sites	Throughout Operation	NWSC	NEMA/NWSC/ District Local Governments of Project Area	Covered under 7.3.1 h
	g) A maintenance crew will be put in place to monitor and repair the network immediately a damage or leakage occurs to avoid accidental surface runoff intrusion to groundwater from the sewage network. Intrusion of storm water into the network and ponds can overburden facilities and cause discharge of partially treated wastewater into the water resources/ environment.	Timely repairs made on the network to avoid further leakages	Monitoring and repair records from maintenance crew.	Throughout Operation	NWSC	NWSC/ District Local Governments of Project Area	10,000,000 for monitoring activities
	h) Water abstraction permits shall be acquired by the Contractor and NWSC/DWD	Regulated water abstraction and protection of its quality	Availability of permit	Before construction for the Contractor and operation by NWSC/DWD	Contractor NWSC/DWD	MWE	
7.3.3 Generation of noise	a) Care will be exercised when selecting working equipment to avoid use of old equipment or damaged equipment with high level of noise	Construction activities generate permissible levels	No complaints from the communities and authorities/ record of noise levels	Before and during construction	Contractor	NWSC	

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (UGX)
	emissions that would have a negative impact in the environment.	of noise.					
	b) Construction equipment will be properly maintained and fully functional.	Construction activities generate permissible levels of noise.	Record of noise levels/ no complaints from the communities and authorities/	Before and during construction	Contractor	NWSC	
	c) All generators and heavy duty equipment will be insulated or placed in enclosures to minimize disrupting ambient noise levels.	No excessive noise reaching neighbouring communities	No complaints from the communities and authorities/ record of noise levels	Before construction begins	Contractor	NWSC	
	d) Construction workers will be made aware of the silent nature of workplaces they are operating in and advised to limit verbal noise or other forms of noise. For example, metallic objects or tools can be passed on to a colleague rather than dropping or throwing them with loud bangs.	No excessive noise from the site	Record of noise measurements	Throughout construction	Contractor	NWSC	
	e) Noise levels emanating from machinery, vehicles and noisy construction activities will kept at a minimum (within the national noise level limits) for the safety, health and protection of people in the nearby buildings.	Construction activities generate permissible levels of noise.	Record of noise measurements	Throughout construction	Contractor	NWSC/ District Local Governments of Project Area	
	f) During periods of inactivity, equipment will be switched off whenever possible. A limited number of construction activities may have to continue on a 24-hour basis. These include horizontal direction drilling, pipeline cleaning and hydrostatic pressure testing which are relatively low noise activities. Consultation will be undertaken with the relevant authorities in advance of any such operations. Where appropriate, residents living near to the pipeline construction activities will be kept informed of the contractors proposed working schedule (through implementation of the Community Liaison Management Plan) and will be advised of the times and duration of any abnormally noisy activity likely to cause concern	No vehicle engines running unnecessarily	Record of noise measurements	Throughout construction	Contractor	NWSC/ District Local Governments of Project Area	
	g) No construction activities will take place at night for sites where the closest residence is within less than 150 m from the project site.	No excessive noise from equipment during night time	No complaints from communities about night time construction activities	Throughout construction	Contractor	NWSC	
7.3.4 Improper Handling of AC Pipes and Accessories	a) NWSC should ensure that the hired contractor demonstrates having experience and capability to observe international good practice standards with asbestos, including training of workers and supervisors, possession of (or means of access to) adequate equipment and supplies for the scope of envisioned works, and a record of compliance with regulations on previous work. The Contractor will be required to prepare a Hazardous Waste Management Plan.	Experienced contractor or sub-contractor hired to ensure that AC pipe wastes are handled well. Hazardous collected and disposed as per waste management plan	Qualification and experience profile of the contractor or sub-contractor; Hazardous Waste Management Plan	Before commencement of construction activities	Contractor	NWSC	
	b) The contractor shall follow NWSC procedures (Appendix I) for handling waste AC materials	Hazardous wastes handled properly and o workers and the public are exposed to Asbestos dust	Procedure followed on site in handling the hazardous waste, records of inspection and waste disposal	During construction	Contractor	NWSC/ NEMA	
	c) Decommissioned AC pipes and accessories will be managed through a third party contractor certified by NEMA.	Hazardous wastes handled properly	Records of waste disposal; Proof of waste delivery and safe disposal	Throughout construction	Contractor	NWSC/ Mbale District Local Government (MDLG)/ Mbale City Council (MMC)	
	d) The selected contractor shall provide adequate protection to his personnel handling asbestos, including respirators and disposable clothing.	No workers and the public are exposed to Asbestos dust	Presence and use of PPE on site	Through out handling activities for AC pipes	Contractor	NWSC/ MDLG/ MMC	
	e) Disposal of AC pipes shall be carried out in a way that minimizes worker and community asbestos exposure. AC pipes and other related asbestos containing material shall be packaged, labelled, transported, stored and disposed of at approved sites for disposal of hazardous waste, for example, Luweero Industries Limited in Nakasongola District or EnviroServe waste handling facility in Hoima District. Proof of delivery and safe disposal of waste will be provided and records maintained at all times.	No asbestos dust exposure	Records of waste disposal; Proof of waste delivery and safe disposal	Through out handling activities for AC pipes	Contractor	NWSC/ MDLG/ MMC	
	f) Before transportation, the properly sealed, labeled and secured AC pipes are kept inside a locked fenced area to prevent access by unauthorized personnel, and covered to prevent water accumulation.	Safe storage before transportation	Presence and condition of the storage facility	Throughout construction	Contractor/NWSC	MDLG/ MMC/ NEMA	250,000,000*
7.3.5 Improper management of	a) The Contractor will be required to prepare a Waste Management Plan.	Waste Management Plan in place.	Record/ Evidence of Waste management Plan being used by	Throughout construction	Contractor	NWSC/ District Local Governments of	

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (UGX)
waste			Contractor			Project Area	
	b) Contractors will undertake waste segregation onsite to separate hazardous waste from non-hazardous waste	Hazardous waste separated from non-hazardous waste on site and each waste stream disposed of according to NEMA requirements in designated sites.	Separate containers for hazardous waste and non-hazardous waste on site	Throughout construction	Contractor	NEMA/NWSC/ District Local Governments of Project Area	10,000,000
	c) The contractor, MWE and NWSC Area Management will work hand in hand with Mbale City Council and respective Local governments to facilitate sound waste handling and disposal from the site. All wastes must be taken to the approved dumpsites. AC pipe waste will handled separately from other hazardous wastes	Amount of waste disposed/ minimized by reuse, wherever feasible	Record of waste types and estimated quantity disposed/ diverted for reuse	Throughout construction	Contractor	NEMA/NWSC/ District Local Governments of Project Area	45,000,000
	d) The contractor will hire and improve on existing sanitary facilities in the vicinity of the project area or provide his own facilities (e.g. mobile toilets) which should be adequate at construction sites.	No human waste disposed of at construction sites	Presence of mobile toilets at construction sites/ sanitary hire agreements	Throughout construction	Contractor	NEMA/NWSC/ District Local Governments of Project Area	
	e) NWSC/MWE together with the respective District Local Governments at the growth centres will ensure that the solid waste is collected by a firm licensed by NEMA and that the collected waste is disposed of at dumpsite or landfill approved by NEMA	Safe handling and disposal of solid waste by NEMA registered firm.	NEMA registration certificate of approved firm.	Throughout Operation	NWSC/ District Local Governments of Project Area	NEMA/NWSC/ District Local Governments of Project Area	
7.3.6 Air pollution	a) A maintenance programme for equipment and vehicles will be implemented, to ensure air emissions like particulates, SO2 and NO2 are minimised.	Emissions from vehicles complying with national standards.	No complaints of excessive fumes. No excessive emissions released to the atmosphere as a result of faulty equipment. Strict maintenance program	During construction	Contractor	NWSC/ District Local Governments of Project Area	
	b) Travel speeds of construction vehicles along the road especially at trading/ business centres will be controlled using humps and setting travel speeds not exceeding 40km/h	Humps and speed limit signage put in place in the appropriate areas	Number of accidents and/ or complaints reported/ Journey management records	During construction	Contractor	NWSC	
	c) Trucks will be covered during haulage of construction materials to reduce on spillage of materials	No spillage of materials along the transportation routes	Recognition of locales of contractor's efforts to minimise dust nuisance.	During construction	Contractor	NWSC/ District Local Governments of Project Area	
	d) Wherever dust suppression is necessary, water will be sprayed over dusty areas	No excessive dust	Air quality data/ Environmental monitoring report	Monthly throughout construction	Contractor	NWSC/ District Local Governments of Project Area	
	e) Construction work will be undertaken by an experienced and duly registered contractor with a verifiable sense of environmental awareness and responsibility	Employment of best Construction practices to minimise adverse impacts	Record of environmental responsiveness of the contractor/ Environmental Management Plan	During construction	Contractor	NWSC/ District Local Governments of Project Area	
	f) Workers will be provided with PPE and the use of PPE shall be enforced	Workers are not exposed to elevated air pollution levels	No complaints of excessive fumes	During construction	Contractor	NWSC/ District Local Governments of Project Area	
	g) NWSC will develop an Operations and Maintenance Manual for the Sewage Treatment Plan to guide staff on how to effectively run the WSPs;	Effective performance of WSPs run by knowledgeable operators	Record of operation procedures undertaken by staff	Throughout Operation	NWSC	NWSC/ District Local Governments of Project Area	
	h) Facultative ponds will be commissioned before anaerobic ponds to avoid odour nuisance when anaerobic pond effluent discharges into an empty facultative pond;	Controlled Odour from the Facultative pond	No complaints from communities near the WSPs	Throughout Operation	NWSC	NWSC/ District Local Governments of Project Area	
	i) NWSC/MWE will ensure adequate operation and management of both the existing and the new facilities to avoid bad odours that would arise from improper management of the facilities;	No odours from project facilities	No complaints from communities near the WSPs	Throughout Operation	NWSC	NWSC/ District Local Governments of Project Area	
7.3.7 Occupational health and safety (OHS) Risks	a) All construction workers will be oriented on safe work practices and guidelines and ensure that they adhere to them	Workers show a good understanding of and adhere to safe work practices	Records of workers' orientation	At the beginning of construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	b) Training will be conducted on how to prevent and manage incidences. This should involve proper handling of electricity, water etc. and sensitization on various modes of escape, conduct and responsibility during such incidences. All must fully be aware and mentally prepared for potential emergency	Up-to-date awareness of OHS requirements and preparedness by all workers to combat possible incidences	Records of training and details of staff trained	At the beginning of and during construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	c) Regular drills should constantly follow on various possible incidences. This will test the response of the involved stakeholders.	Workers are alert and responsive in case of incidences. Public and other staff safety	Record of drills	Throughout construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (UGX)
	d) Use signage to warn staff and/ or visitors that are not involved in construction activities of dangerous places.	Public and workers' safety	Presence of signage	During construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	e) Strict instructions should be given for operators and drivers of equipment and vehicles	No risk of accidents on construction workers	Documentation of instructions	Throughout construction	Contractor	Traffic Officers, NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	f) Supervision of works should be done regularly to ensure that safety conditions are met while any deviation from safety regulations is immediately reclaimed following the best practices regarding safety at work equipment.	Public and workers' safety	Supervision record	During construction	NWSC/MWE & Supervision Consultant	MGLSD/ NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	g) Communication line must be ensured between workers and operators/drivers of equipment and vehicles.	Public and workers' safety; No injuries arise from miscommunication	Presence of radio calls/Megaphones being utilised	During construction		Traffic Officers, NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	h) Develop evacuation procedures to handle emergency situations.	Reduced health and safety risks to construction workers	Presence of a documented evacuation procedure	During construction	Contractor	MGLSD/ NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	i) Provide adequate OHS personnel protective gear for the employees.	All personnel have adequate PPE	Record of PPE provided and staff; use of PPE on site	During construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	Covered in 7.3.5 (f)
7.3.8 Risk of accidents	a) Best transport safety practices (Journey Management Plans) will be adopted with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public.	No road accident caused by project traffic	Record of traffic related accidents in each month of construction duration	During construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	b) All workers, including sub-contractors and casual labourers, will undergo an environmental, health and safety induction before commencing work on site. This will include a full briefing on site safety and rules.	Workers aware of environmental, health and safety requirements	Record of induction; interviewing a sample of workers on environmental, health and safety issues	Before construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	c) The affected communities will be informed of the timing and duration of the construction activities across access roads and any uncertainties or potential for change.	Safety of the public and workers	Activity schedule and evidence of communication to the would-be affected communities	Before and during construction	Contractor/ NWSC	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	d) There will be restrictions on hours of driving (including night time restrictions where sensitive receptors may be affected) and timing of vehicle movements to avoid busy periods in urban areas, particularly the start and end of school and the working day	Safety of the public and workers	Activity schedule and journey management plans	During construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	e) No drivers or personnel under the influence of alcohol or any drug abuse will be allowed onsite	Public safety	Presence of a sound fence all around the site	During construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	f) The site, where possible, will be fenced and signalization put in place with security personnel to stop unauthorised people from accessing the site.	Public safety	Presence of a sound fence all around the site	During construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
7.3.9 Pressure on existing resources	a) Separate storage for water to use at the construction sites will be provided. Instead of connecting to the nearby/ communal water points, water bowsers will be adopted for water supply.	Uninterrupted water supplies to the communities	Presence of water bowsers/ storage tanks; water abstraction permit	Throughout construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	b) The NWSC/MWE, supervising consultant and contractor will phase the construction activities in such a way that water-consuming activities are not carried out concurrently but rather in combination with non-water-consuming activities in the same location, where possible.	Uninterrupted water supplies to the communities	Complaints of irregularities in water supply related to construction activities	Before construction	NWSC& Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	c) Through inductions and tool box meetings, NWSC/MWE will ensure that contractors are conversant with resource conservation practices in all project activities. Conservation awareness will focus on water use efficiency and general day-to-day measures such as turning off taps when water is not being used.	Uninterrupted water supplies to the communities	Record of water usage and conservation measures being implemented	During construction	Contractor NWSC DWD	District Local Governments of Project Area – SEO's, CDO's	
	d) Water abstraction will comply with rates allowed by the permit obtained from DWRM.	Contractor complies with Permit requirements/ conditions	Record of water abstracted	During construction	Contractor NWSC/MWE	DWRM	
	e) Earth materials will be sourced from a NEMA-approved source in a manner that reduces environmental and social impacts. Murram will be sourced in accordance with a NWSC approved murram/ subsoil extraction plan, which will be provided by the contractor prior to the start of works.	Project's material demand does not encourage environmental degradation	Approval from NEMA	ESIA for probable sources of materials before construction	Contractor	NEMA/ NWSC/DWD/ District Local Governments of Project Area – SEO's, CDO's	72,000,000

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (UGX)
	f) Catchment management plans are being developed with the aim of conserving and allowing recharge of water resources.	Recharge of existing water resources	Increased volumes of water in existing water resources	Throughout operation	NWSC	NWSC/ DWD/ District Local Governments of Project Area – SEO's, District Engineer's, Water Officers'	
	g) Water conservation measures will be encouraged: saving water is an efficient way of reducing the overuse of ground water resources. It is not only decreases the amount of the water withdrawn, but may also reduce the threat of pollution	Uninterrupted water supplies to the communities	Record of water usage and conservation measures being implemented	Throughout operation	NWSC	NWSC/ DWD/ District Local Governments of Project Area – SEO's, District Engineer's, Water Officers'	
7.3.10 Landscape and land use impacts	a) Reinstatement Plan will be developed	Reinstatement plan developed and implemented	Record of the developed reinstated plan	Throughout operation	Contractor	NEMA/ NWSC/ DWD/District Local Governments of Project Area – SEO's, CDO's	
	b) Reinstatement of the water pipeline and sewer routes will be done in such as return the visual integrity of the landscape as closely as possible to its previous condition. Replant of trees should be done as long as they do not hinder the integrity of the pipe or sewer line.	Wherever practical, the subsoil graded during reinstatement to reflect the original profile across the working width with a stable landform that mirrors the pre-disturbed condition	Presence of heaped soils and/or materials; slope stability, relief, topographic diversity, acceptable surface water drainage capabilities, and compaction; level of vegetation regrowth	Throughout operation	Contractor	NEMA/ NWSC/DWD/ District Local Governments of Project Area – SEO's, CDO's	
	c) Where pipelines and sewers are not buried in ground, if any, they will be painted to blend with the environment. They will be adequately supported by concrete pillars and of such materials that cannot easily be damaged by the communities.	No damage to exposed sections of pipelines and sewers by communities.		Throughout operation	NWSC	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
7.3.11 Social misdemeanour by construction workers	a) As a contractual obligation, contractors shall be required to have an HIV/AIDS policy and a framework (responsible staff, action plan, etc.) to implement during project execution.	No illicit sexual relationships among construction workers and local community	All construction workers living in a camp adhere to "No fraternization" and comply with latest entry time into camp set to avoid prostitution. Monitor complaints from the community	Development of policy before construction	Contractor	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
	b) All construction workers shall be oriented and sensitized about responsible sexual behaviour in project communities.	No aggravated spread of HIV/AIDS due to project implementation	All construction workers are aware of HIV/AIDS risk and responsible living.	Before construction	Contractor	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
7.3.13 Disruption of communication routes	a) Appropriate signage will be used and impacted owners will be informed ahead of disruption	No property owners are inconvenienced in accessing their properties	No complaints from property owners	Before and during construction	Contractor NWSC	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
	b) Disruptions to public access shall be identified in the Contractor's Traffic Management Plan, under which suitable notice of intending delays and closures are given to all concerned parties and approved prior to commencing work. All road closures shall be separately notified and agreed with the Local gov't administration.	Traffic Management Plan developed Stakeholders informed of impending closures in time and alternative routes communicated	Minimal or no interruption in pedestrian and traffic flow	Before and during construction	Contractor NWSC	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
	c) Where access to or from an individual property is closed for a period of 2 hours or more, the owner shall be informed at least 24 hours in advance.	Stakeholders informed of impending closures in time	No complaints from property owners	Before and during construction	Contractor NWSC	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
	d) Vehicular access to and from hospitals, police stations and fire stations shall be maintained through the use of steel road plates over open trenches. Pedestrian access to schools, health facilities, and other premises frequently accessed by the public will be maintained with the use of walking boards.	Appropriate infrastructure put in place to allow continued access to hospitals, clinics, schools, etc.	Minimal or no interruption in pedestrian and traffic flow to public facilities	Before and during construction	Contractor NWSC	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
	e) The laying of pipelines and sewers, backfilling and temporary reinstatement shall follow trench excavation as quickly as possible and trenches will not be left open for extended periods.	Reinstatement done as quickly as possible	No complaints from affected communities	Before and during construction	Contractor	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
7.3.12 Loss and degradation of natural habitats	a) Construction activities should be restricted only to the areas that must be disturbed to avoid unnecessary disturbance	Minimal degradation of the habitat beyond the project foot print.	Area of restored habitat that had been disturbed.	During Construction	Contractor	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
	b) All project workers should be sensitized to minimize damage to vegetation and flora	Minimal degradation of the habitat beyond the project foot print.	Record of worker sensitization about vegetation and flora.	During Construction	Contractor	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
	c) Close monitoring and supervision of the construction operations to ensure	Minimal degradation of the	Record monitoring and supervision of the construction	During Construction	NWSC/ DWD	District Local Governments of	

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (UGX)
	compliance and avoid causing further damage to un-designated project areas.	habitat beyond the project foot print.	operations about project footprint.			Project Area – SEO's, CDO's, District Engineers	
	d) Support and encouragement of communities to plant trees by providing planting material for fast-growing and multiple use species e.g. *Maesopsis eminii* and *Markhamia lutea* AND continuous engagement of communities.	All cut trees are offset.	Number of community planted trees in relation to the project.	During Construction and operation	Contractor/ NWSC/ DWD	District Local Governments of Project Area – SEO's, CDO's, District Engineers	200,000,000
	e) Support monitoring of performance of the planted trees.	All replanted trees successfully grow.	Number of replanted trees that successfully grow.	During Construction and operation	Contractor/ NWSC/ DWD	District Local Governments of Project Area – SEO's, CDO's,	
	f) Where tree cutting is inevitable, replacement planting should be done wherever feasible.	All cut trees are offset.	Number of cut trees replaced.	During Construction and operation.	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
	g) Effluent/ wastewater discharge permits will be acquired	No pollution of natural habitats	Water quality data and compliance with requirements of the discharge permits	During Construction and operation.	Contractor NWSC/ DWD	NWSC/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
7.3.14 Disruption to public utilities	a) Prior to undertaking any works, the Contractor will obtain from the utilities agencies definition and details of all utilities sites within 50 m of the works.	Details of all utilities within 50m of the works obtained	Details and mapping of all utilities obtained	Before construction	Contractor & NWSC	Affected Utility firms, Local Governments of Project Area	
	b) Damage to any utility at a defined site shall be made good to the satisfaction of the responsible agency at the Contractor's cost. Damage to utilities not defined prior to construction, despite the Contractor having undertaken all reasonable liaisons with the responsible agencies, shall not be the responsibility of the Contractor. It shall be the responsibility of NWSC to ensure the utilities agencies respond in good time to the Contractor's requests for information.	All damages incurred rectified to the satisfaction of the respective utility agency	No damages incurred and where they happen, remedial measures implemented to the satisfaction of the utility agency	During construction	Contractor	NWSC/ Affected Utility firms	
	c) Contractors shall liaise with each of the agencies responsible for the maintenance of utilities that are to be crossed or temporarily diverted or otherwise affected by the works as to the timing and nature of any disruption of service. Where required, the responsible agency shall be requested to carry out the necessary works at the time required and at NWSC's cost. The Tender Documents shall contain sufficient information on utilities crossings to permit the Contractor to include the cost of the works for which he is responsible in his bid.	Tender documents contain all relevant information about the utilities within the project areas; Timely liaison made with the utility agencies to avoid inconveniences	Details and mapping of all utilities obtained and remedial measures planned	Before and during construction	Contractor	NWSC/ Affected Utility firms	
	d) The Contractor shall incorporate in his programme the proposed arrangements for traffic diversions in the form of a Traffic Management Plan, with details of all necessary signage and any temporary works for approval by the NWSC and the District/City Engineers. The programme shall also contain details of the timing of the proposed closure, dates of closing and re-opening the route, and of any necessary remedial works.	Minimal or no inconvenience to traffic flow caused	Approved Traffic Management Plan in place	Before construction	Contractor	NWSC/ GMC	
7.3.15 Permanent Land take	Land will be acquired in accordance with Uganda's Land Access and Compensation Procedure taking into consideration the Development Partner's requirements. Amongst others, this requires: ▪ Sensitisation of community members whose property will be affected. ▪ Completion of a full inventory of privately registered and/or cultivated, grazed,s structures and graves along the access road. ▪ Compensation to be paid in line with mandated rates agreed in consultation with District officials. ▪ Ensuring that the Chief Government Valuer approves the valuation rates.	Equitable compensation in accordance to National and international laws.	Displayed list of fully compensated PAPs against Monies paid out to them. List of fully compensated PAPs against Monies paid out to them.	Prior to commencement of construction.	NWSC/MWE	NWSC/ CGV Independent Hired External Monitor	
7.3.16 Septage Disposal	a) Institute and maintain a ticketing system for cesspool emptiers, where upon successful disposal, the operator of the sludge treatment facility would issue a receipt to the cesspool emptier.	Proper septage disposal in designated areas	Record of ticket issued at STP	During Operation	NWSC/ Kibuku Local Government	NEMA/ NWSC/ NWSC/ Kibuku Local Government – SEO's, CDO's	15,000,000
	b) Kibuku DLG/Kadama sub-county and MWE, should put in place a system to monitor	Compliance of cesspool emptiers		During Operation	NWSC/ Kibuku Local	NWSC/ NWSC/ Kibuku Local Government –	

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (UGX)
	cesspool emptiers and in addition, have a public educational campaign to educate and inform the public about the system.	in proper septage disposal			Government	SEO's, CDO's	
	c) MWE and Kibuku District Local Government will work closely with operators of Cesspool Emptiers if any and train them in the proper handling and transport of sewage/ sludge.	Good septage handling and sewage disposal	No complaints from communities in and around Nabunyere village	During Operation	NWSC/ Kibuku Local Government	NWSC/ NWSC/ Kibuku Local Government – SEO's, CDO's	
ESTIMATED GRAND TOTAL							***772,000,000***

* The *cost is estimated for handling and storage of damaged parts of AC pipes in the process of excavation given that most ofthem will be plugged and left in the ground but during excavations some may be damaged. In the case when they are left interact in the ground, NWSC should ensure that call-first-before you excavate policy is put in place to ensure before any development takes place at particular site, these pipes are removed and handled in the proper manner.*.

1 INTRODUCTION

1.1 BACKGROUND

Uganda Government obtained funds from the World Bank for implementing the Uganda Integrated Water Management and Development Project (IWMDP). The IWMDP was developed under the Ministry of Water and Environment (MWE) as an integrated water resource management and development project with objectives of improving integrated water resources planning, management and development; and access to water and sanitation services in priority urban areas. This project development objective is to improve access to water supply and sanitation services, integrated water resources management, and operational performance of water and sanitation service providers in project areas. It is believed that the project will contribute to higher level goals of sustaining natural resources, improving service delivery, and increasing economic productivity. Part of the IWMDP funds is intended to be applied towards Water Supply and Sanitation Project in Mbale NWSC service area and neighbouring small towns and rural growth centres of Busolwe, Kadama, Tirinyi, Kibuku, Butaleja and Budaka. National Water & Sewerage Corporation (NWSC) is the implementing agency in Mbale City while MWE through the Directorate of Water Development (DWD) is directly in charge with the small towns. Piped water will be extended from the NWSC Mbale Service Area to the neighbouring small towns and rural growth centres.

Mbale City is located in the East of Uganda in Mbale District (Figure 1-1). It is the main administrative and commercial centre of Mbale District and the surrounding sub-region. It is bordered by Sironko District to the north, Bududa District to the north-east, Manafwa District to the south-east, Tororo District to the south, Butaleja District to the south-west and Bududa District to the west. Pallisa and Kumi Districts lie to the north-west of Mbale.

Budaka Town is located in Budaka District in Eastern Uganda. It is 28 km from Mbale City along the Mbale - Iganga Highway. Budaka district borders the districts of Pallisa in the North, Mbale in the East, Butaleja in the South, and Kibuku in the West. The district is comprised of Budaka County which contains Budaka, Iki-Iki, Kaderuna, Kamonkoli, Lyama, Naboa, and Kameruka Sub-Counties and Budaka Town Council.

Butaleja and Busolwe Towns are located in Butaleja District (Figure 1-2). Butaleja town is 26 km from Kachonga Trading Centre which is along the Mbale - Tororo Highway. The town is the administrative centre of Butaleja District and consists of 6 parishes which are divided into 16 villages. The core of the town is in Nanyulu Village, Nanyulu Parish and it is where most of the commercial and administrative units are located. Busolwe Town is 7 km from Butaleja Town and 30 km northwest of Tororo City. The town consists of 4 parishes which are divided into 18 villages. The core of the town is in Busolwe and Busolwe Central Parishes.

Tirinyi, Kibuku and Kadama Towns are located in Kibuku District. Tirinyi town is located in Tirinyi Parish one of the five parishes in Tirinyi sub-county the others being Kataka, Kitantalo, Lwatama and Nanoko Tirinyi Town is located in Tirinyi Parish and is the access route to Pallisa District. Kibuku Town is located in Kibuku Sub-County. The town is about 5 km from Tirinyi Sub-County and is accessed by a gravel road linking Mbale-Tororo Highway to Kibuku Town via Kataka. Kibuku Sub-County comprises of 4 parishes namely Namawondo, Bumiza, Nalubembe and Kibuku.

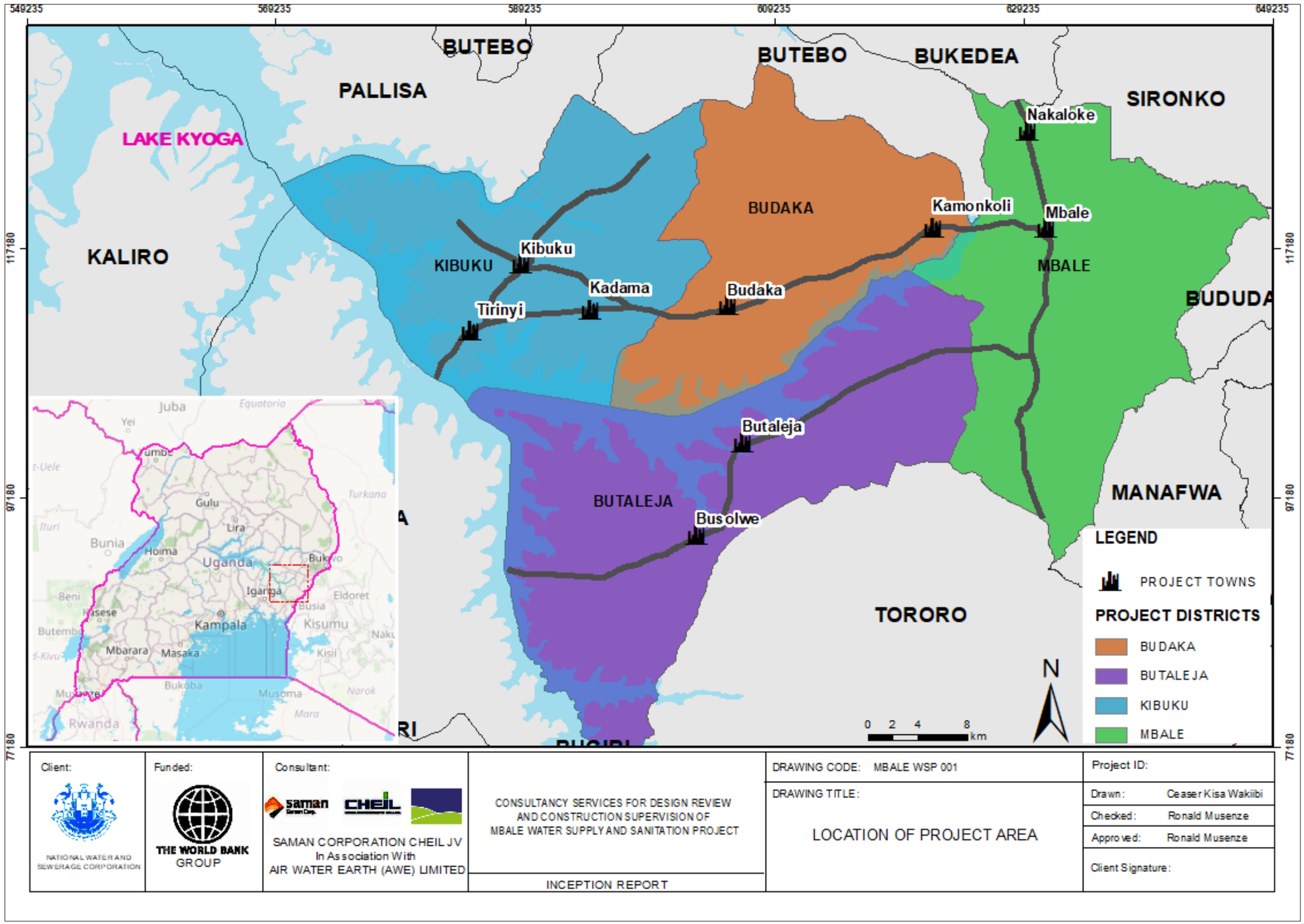


Figure 1-1 Location of the project districts relative to each other

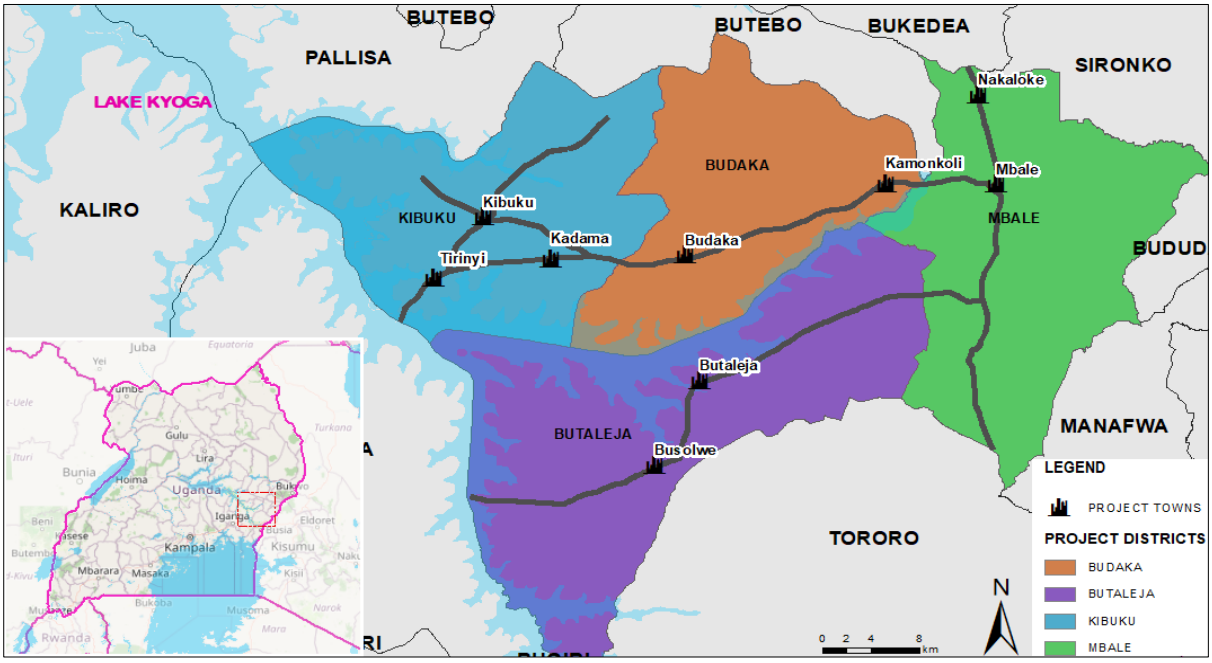


Figure 1-2 Location of the project towns within their respective districts

The first piped water supply system in Mbale was constructed around 1939. The City relies on two treatment plants, namely Bungokho and Manafwa water treatment plants. Mbale has had its share of infrastructure development backlog experienced as all urban centres in Uganda that have undergone rapid growth. The backlog has placed immense pressure on the capacity of NWSC to effectively deliver water and sewerage services. Although a number of interventions have been undertaken in the production systems, little has been done in the distribution network and the expansion of sanitary services.

Two sewage ponds, namely Doko treatment ponds and Namatala Wetland were constructed in 1968/69 and 1986. The condition of the ponds seems to be fair, the biggest problem being the high amount of infiltration during rains. The Doko treatment ponds appear to be in a good condition, except for the concrete works. The Namatala Wetlands are in urgent need of maintenance. The sewerage coverage is poor with only 14% of the households with water supply have a sewerage connection. Approximately 47 km (17%) of the current water supply network (total length ~ 279 km) consists of asbestos cement pipes which are according to NWSC in poor state. As a result, frequent bursts and leakages are experienced. Furthermore, development within the town over the last few years has taken place at a much faster rate than infrastructure provision, overwhelming NWSC's capacity to provide reliable services. Mbale City has currently a population of around 100,000 inhabitants and the system was originally constructed for a population of around 45,000 people. With the town's boundaries having grown, it is now imperative that the water supply system be expanded in order to address the low per capita water production.

There is only piped water supply for the towns of Busolwe, Kibuku and Tirinyi. Budaka has a water supply system as well, but there is no operator in place and the pumps of the boreholes supplying the network are not functioning. The towns of Kadama and Butaleja do not have piped water. Despite

having piped water in some of the towns a sizeable part of the population is taking water from boreholes with hand pumps that have low yields and from shallow wells. The rivers are used as well as a water source. The connections to the water supply network are yard connections with very few exceptions. In all the towns the majority of the population rely on on-site sanitation facilities, mainly simple pit latrines and a few VIP latrines. The same applies to the institutions, like schools and health centres. The condition of the sanitation facilities in these institutions appeared to be satisfactory. In Tirinyi and Kibuku two new public toilets have been constructed, but they are not yet commissioned. Other than those two toilets there is no appropriate public sanitation facility in any of the growth centres.

1.2 SCOPE OF PROJECT AND ESIA

The scope of work under this project will include:

i) Catchment management measures for protecting the current water sources at R. Nabijjo and R. Nabiyonga;
ii) Catchment management measures for protecting the proposed water source at R. Namatala;
iii) Rehabilitation and expansion of the water treatment plants at Bungokho and Manafwa;
iv) Investigations into possible new water sources;
v) Rehabilitation and expansion of the water supply and distribution system;
vi) Extension of water supply services to neighbouring small towns and rural growth centres;
vii) Rehabilitation and expansion of the sewer network and construction of new wastewater treatment facilities for new drainage areas
viii) Faecal Sludge treatment Facility
ix) Water and sanitation facilities in informal settlements.

For this ESIA, the project components covered under water supply were the new raw water intake, transmission line, distribution mains, reservoirs and pressure break tanks; while for sanitation, components considered were expansion of sewerage network to Senior Quarters and rehabilitation of that in the Indian Quarters; rehabilitation of the Doko and Namatala waste stabilization ponds and construction of new sewerage network and ponds for the Northern Cluster; and sanitation facilities.

1.3 OBJECTIVE OF THE ESIA

The main objective is to carry out an updated comprehensive environmental and social impact assessment for the proposed project works for provision of improved water supply services in the business districts of Mbale, Kibuku, Budaka, and Butaleja. The specific objectives included updating the following:

i) The project's potential environmental and social impacts and propose measures to mitigate them;
ii) The impacts of alternatives and advise the design consultant accordingly; and
iii) The actions required by NWSC, MWE and other stakeholders to satisfactorily address the impacts.

2 PROJECT DESCRIPTION

2.1 PROPONENTS' CONTACT AND PROJECT COST ESTIMATE

Mbale City

NATIONAL WATER AND SEWERAGE CORPORATION
The Senior Manager – Projects
39 Jinja Road,
P.O. Box 7053, Kampala, Uganda
T : +256-414-315100
E : info@nwsc.co.ug

Small Towns and Rural Growth Centres

DIRECTORATE OF WATER DEVELOPMENT
Ministry of Water and Environment
Plot 21/28 Port Bell Road
P. O. Box 20026, Kampala, Uganda

The estimated project cost is **Fifty Million United States dollars** (USD 50,000,000).

2.2 LOCATION OF PROJECT SITE

Mbale lies approximately 245 km, by road, northeast of Kampala, on an all-weather tarmac highway. The coordinates of the town are: 1° 04' 50" N, 34°10' 30" E. Mount Elgon, one of the highest peaks in East Africa lies approximately 52 km east of Mbale. Mbale is home to the Islamic University in Uganda (IUIU), as well as the Moses Synagogue around which most of the Abayudaya ba Uganda live. The population includes members of the Gisu ethnic group, mainly the Bamasaaba and Bagisu. The Mbale water supply is being developed to also extend water to the neighbouring small towns of Busolwe, Butaleja, Kadama, Budaka, Kibuku and Tirinyi; Kadama, Budaka, Tirinyi and Kibuku being located along the Tirinyi-Mbale highway, while Busolwe and Butaleja are located off of the Mbale-Tororo Highway. The location of the proposed facilities in Mbale and the small towns are presented in Table 2-1 and Figures 2-1 to 2-8.

Budaka Town Council is located at grids 01° 01' 00" N, 33° 56' 42" E, approximately 36 km by road, west of Mbale. It hosts the Budaka District headquarters and is at altitude 3,810 ft. (1,160 m) above sea level. Kadama Town Board is 8km from Budaka town towards Tirinyi town along the Mbale – Iganga Highway. Kibuku Town Council is located between Grids 01°02'N and 33°50' E. The altitude ranges from 1000m to 1100m above sea level. It lies 53km by road west of Mbale City.

Busolwe Town Council is located at grids 00° 50' 57"N, 33° 55' 37"E; at an elevation of 3,609 ft (1,100 m) above sea level. It lies 47 km by road southwest of Mbale City.

Butaleja Town Council is located at grids 0°55'30.0"N, 33°56'42.0"E. It hosts the District headquarters. It lies at an elevation of 3,600 ft (1,100 m) above sea level. It lies at a distance 38 km by road southwest of Mbale City.

Table 2-1: Location of main project components for water supply and sanitation component

No	Project Component	Coordinates	Project Location
17.	Namatala Intake	36N 640452.43, 122872.10	Mbale District, Bungokho County, Bufumbo Subcounty, Jewa Parish.
18.	Raw water Mains	Start: 36N 640452, 122872 End: 36N 633964, 117608	Mbale District, Bungokho County, Bufumbo Subcounty, Jewa Parish. Mbale District, Mbale City, Wanale Division, Mooni Ward.
19.	Nabijo Intake	36N 635175 117308	Mbale District, Bungokho County, Bukonde Subcounty, Iwasso
20.	Nabuyonga Intake	36N 636531 118316	Mbale District, Bungokho County, Bungokho-Mutoto Subcounty, Mooni Ward
21.	Bungokho WTP	36N 633964, 117608	Mbale District, Mbale City, Wanale Division, Mooni Ward.
22.	Manafwa WTP	36N 628662, 103621	Mbale District, Bungokho County, Busiu Subcounty, Bufukhula Parish
23.	Busoba Reservoir	36N 630025, 107445	Mbale District, Bungokho County, Busoba Subcounty, Bumasikye Parish
24.	Break Pressure Tank	36N 631666, 118367	Mbale District, Mbale City, Northern Division, North Central Ward.
25.	Mbale – Tirinyi Transmission Main	Start: 36N 631666, 118367 End: 36N 586243 111952	Traverses through: Districts: Mbale, Budaka and Kibuku
26.	Budaka Reservoir		Budaka District, Budaka County, Budaka Subcounty, Macholi Parish
27.	Kadama Reservoir	36N 598818, 112329	Kibuku District, Kibuku County, Kadama Subcounty, Kadama Parish
28.	Tirinyi Reservoir	36N 586243, 111952	Kibuku District, Kibuku County, Kibuku Subcounty, KibukuParish
29.	Kibuku Reservoir	36N 588879, 115804	Kibuku District, Kibuku County, Tirinyi Subcounty, Tirinyi Parish
30.	Butaleja – Busolwe Transmission Mains	Start: 36N 607929, 100395 End: 36N 603086, 93095	Traverses through: Districts: Mbale, Butaleja Sub counties: Busoba, Nazimasa, Butaleja and Busolwe
31.	Butaleja Reservoir	36N 607929, 100395	Butaleja District, West Budama County, Paya Sub county, Nabwire Parish
32.	Busolwe Reservoir	36N 603086, 93095	Butaleja District, Bunyole County, Busolwe Sub county, Busolwe Parish

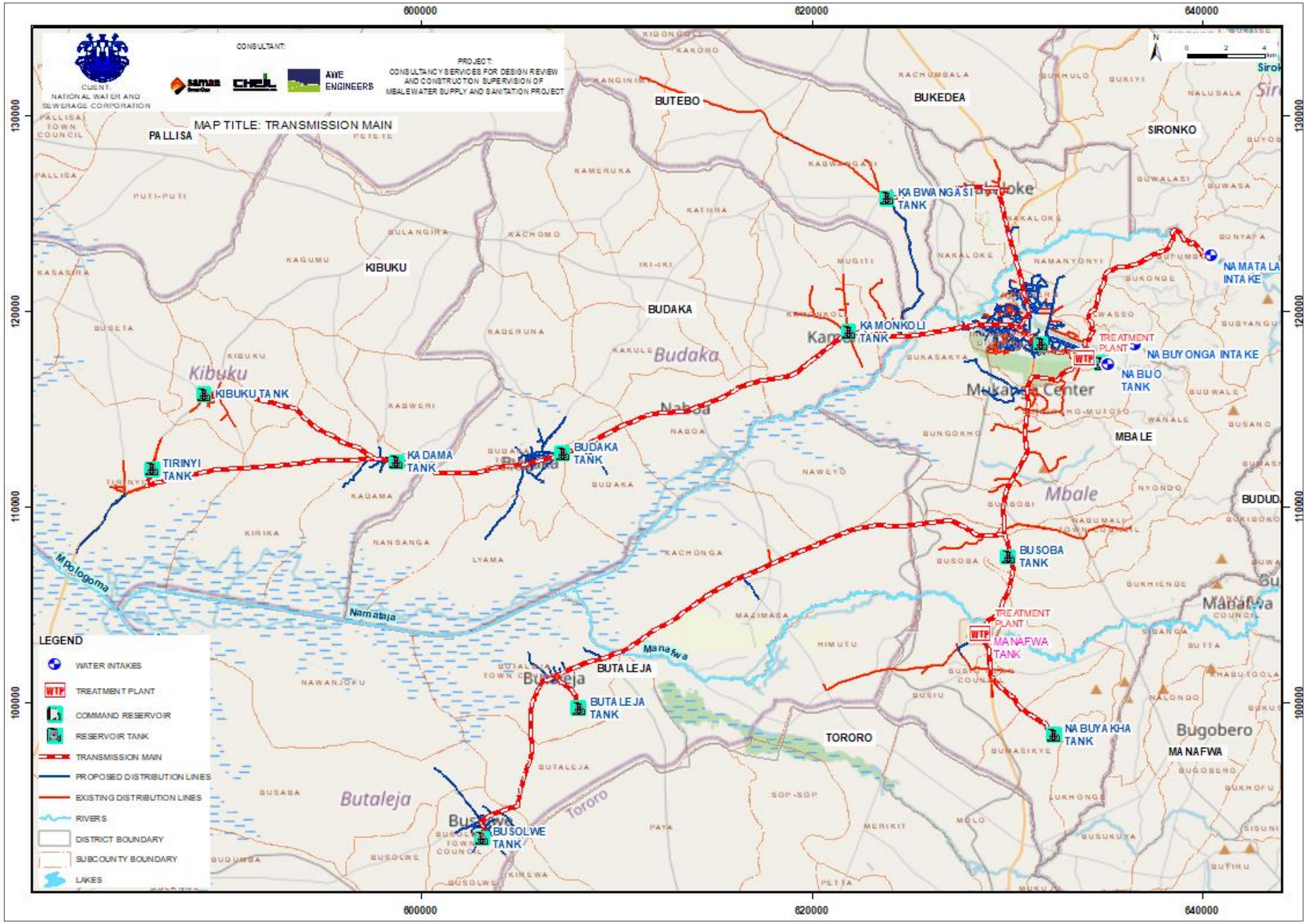


Figure 2-1 Location of the project towns within their respective districts

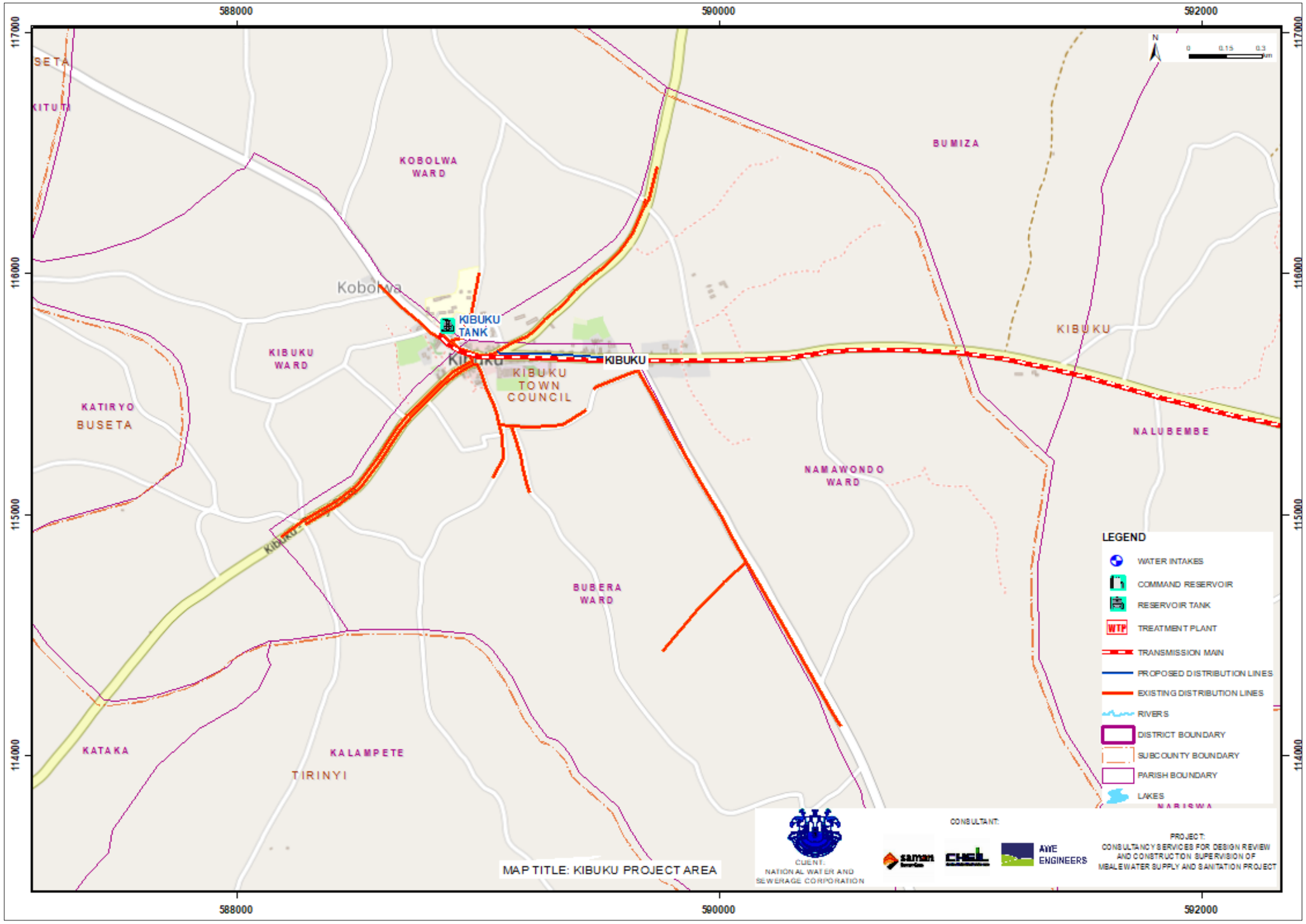


Figure 2-2 Location of the Kibuku project town

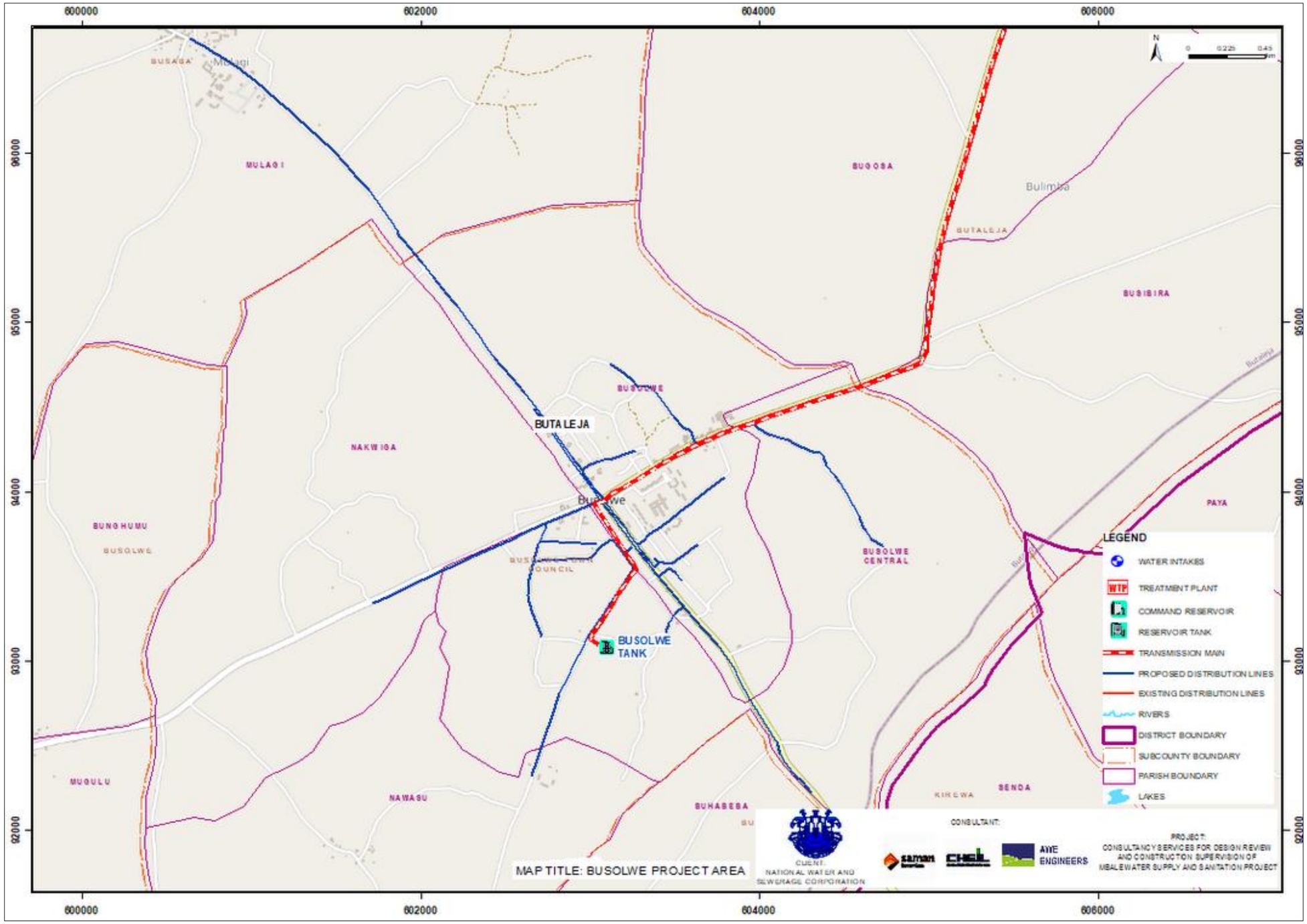


Figure 2-3 Location of the Busolwe project town

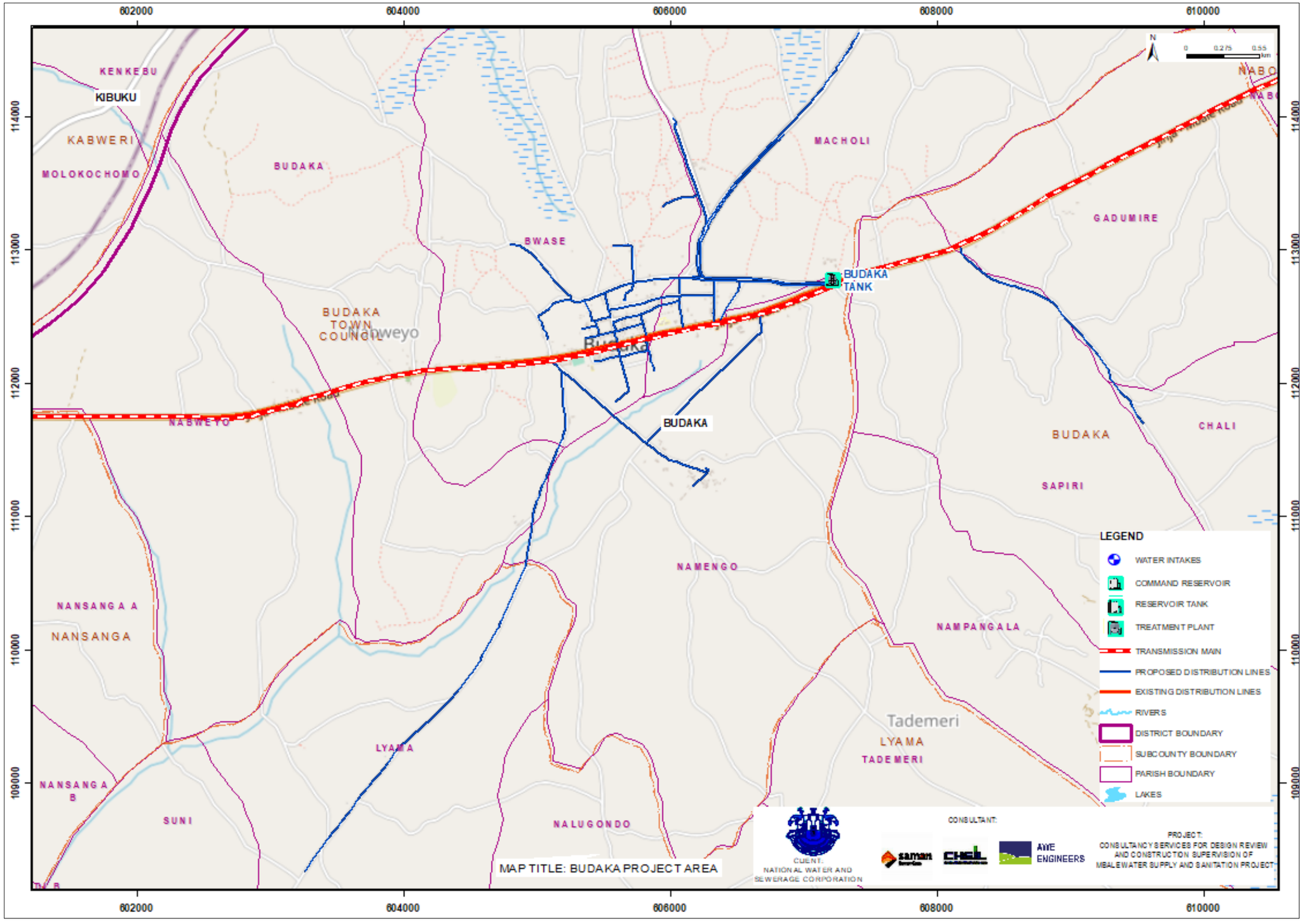


Figure 2-4 Location of the Budaka project town

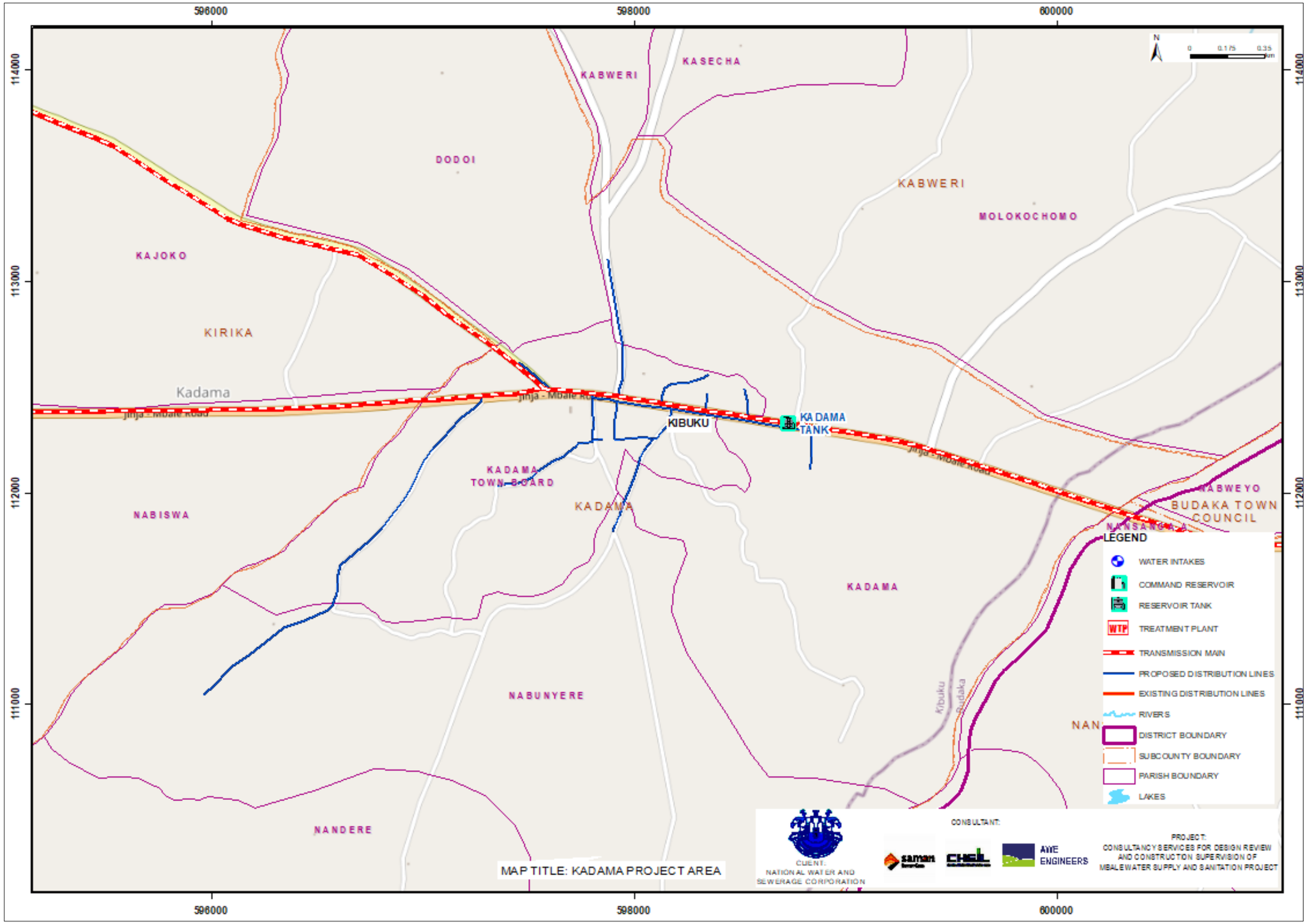


Figure 2-5 Location of the Kadama project town

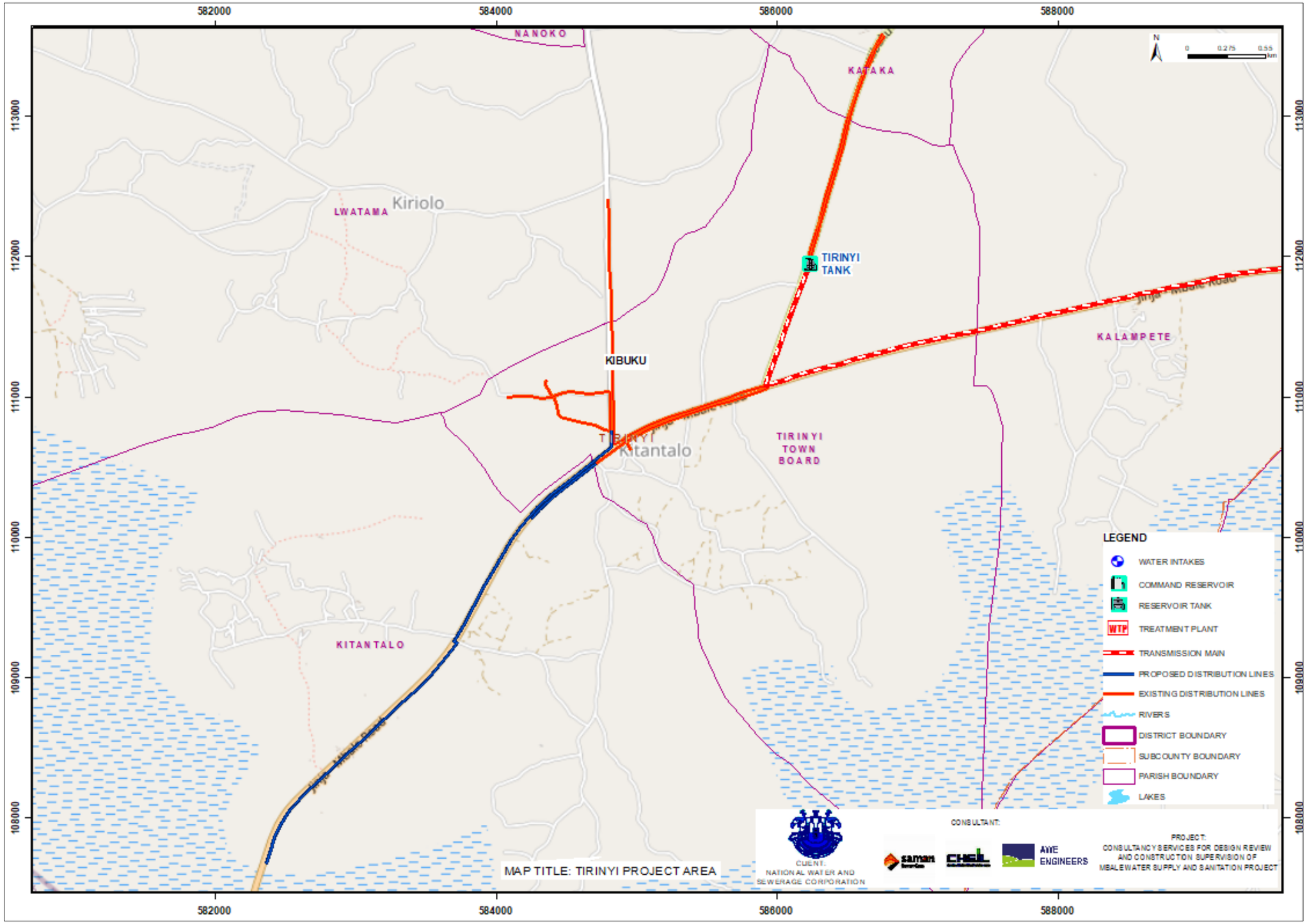


Figure 2-6 Location of the Tirinyi project town

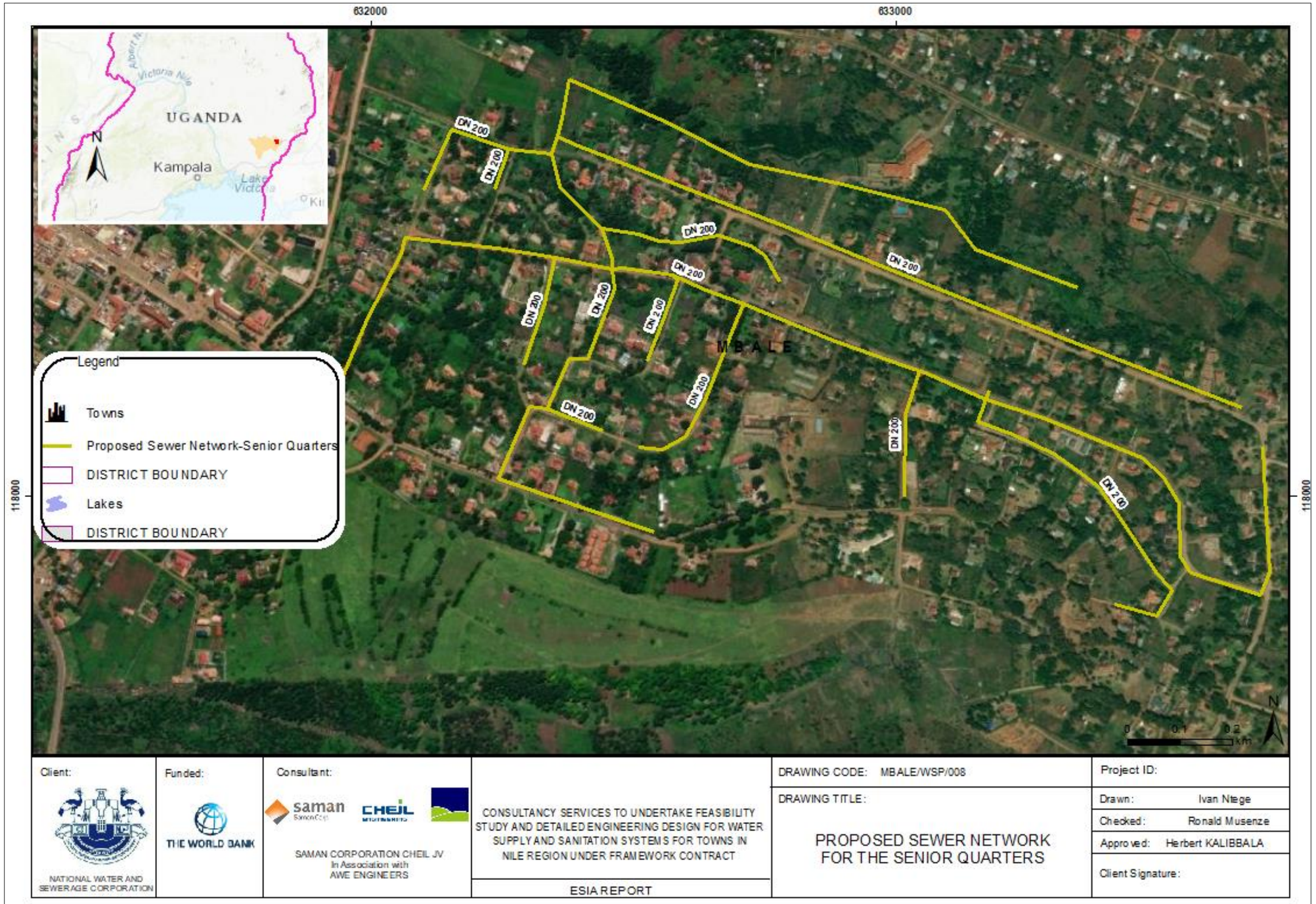


Figure 2-7 Layout and location of the proposed sewer network for the senior quarters in Mbale City

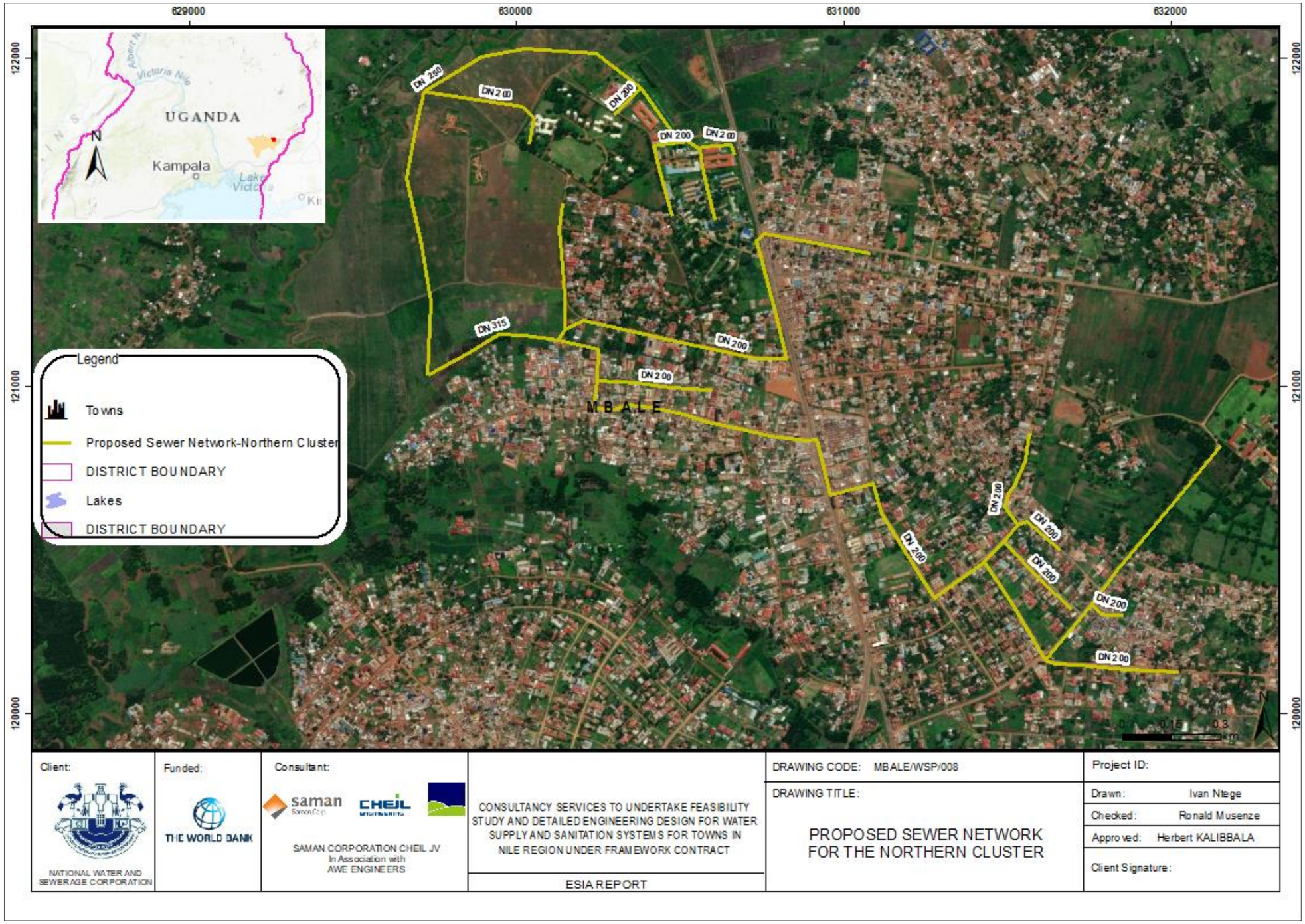


Figure 2-8 Layout and location of the proposed sewer network for the Northern Cluster in Mbale City

2.3 PROJECT COMPONENTS

2.3.1 Namatala Raw Water Intake

The current intakes of Nabijo and Nabuyonga are not sufficient anymore for the new water supply system. Thus a new intake (Photo 2-1) and a new transmission main between Namatala and Bungokho WTP are required. A small weir needs to be constructed for the water abstraction. The weir is an integral part of the intake as it needs to fulfil two purposes: it needs to maintain a water level that allows enough water to pass the screen of the intake structure and it needs to make sure that the minimum EF is passing the weir. The intake will also include flow monitoring devices to ensure river flows are measured and the minimum EF is maintained.

Photo 2-1: Proposed location of intake and weir (36N 640429 122846)

2.3.2 Upgrade of Water Treatment Plants

2.3.2.1 Upgrade Bungokho treatment plant

The deteriorating raw water quality has had an impact on the operational costs and reduced the capacity of the treatment facilities. It is proposed to upgrade, rehabilitate and expand the WTP at Bungokho, as the topography is suitable to serve the entire supply area (including the rural growth centres of Tirinyi, Kibuku, Kadama and Budaka) by gravity from here.

Rehabilitation of Bungokho WTP (Line 1): The main purpose of the WTP rehabilitation is to introduce the necessary modifications in actual structures in order to increase the treatment capacity of the Plant from the actual 6,400 m^3/d to 20,860 m^3/d in 2030 and 27,080 m^3/d in 2040 and at the same time to implement more appropriate coagulation and flocculation units for treating surface waters of relatively rapid changing characteristics. The measures proposed to upgrade the existing structures of Bungokho WTP include:

i) New inlet works, that could accommodate the water coming from Namatala River intake together with the water coming from rivers Nabijo and Nabuyonga;
ii) Automated coagulant dosing installation;
iii) Flow distribution to flocculation channels;
iv) Flocculation in two flocculation channels (Flocculation channels - Line 1);
v) Refurbishing of the existing rectangular clarifiers (Clarifiers – Line 1);
vi) Refurbishing of the existing filters (Filters – Line 1);
vii) New chlorination unit; and
viii) Supply of adequate maintenance tools and laboratory equipment.

Extension Bungokho WTP (Line 2): The proposed solution to extend the Bungokho WTP in order to reach a treatment capacity of 20,860 m^3/d in 2030 and 27,080 m^3/d, the following measures are required:

i) Flocculation in two flocculation channels (Flocculation channels - Line 2);
ii) Construction of four lamellar clarifiers (Clarifiers – Line 2);
iii) Construction of a set of four filters and new filters building (Filters – Line 2); and
iv) Sludge drying beds.

The process line of the upgraded and extended Bungokho WTP will comprise of the following treatments:

i) Inlet works, flow measurement, flow regulation, coagulant/ flocculant dosing and flash mixing;
ii) Flow distribution to four flocculation channels (two for each of the two lines);
iii) Flow regulation and flow measurement at the inlet of each flocculation channel;
iv) Flocculation in four flocculation channels (two flocculation channels in Line 1 and two flocculation channels in Line 2);
v) Sedimentation in two refurbished rectangular clarifiers (Line 1) and in four lamellar sedimentation tanks (Line 2);
vi) Rapid filtration in two sets of sand filters backwashed with air and water: existing set of six filters (Line 1) and new set of 4 filters(Line 2);
vii) Disinfection by calcium hypochlorite dosing; and
viii) Sludge treatment in ten drying beds.

2.3.2.2 Upgrading of Manafwa treatment plant

Due to human activities (for example, agricultural activities) in the catchment of River Manafwa, the sediment load in the River has continuously increased and the quality of water at the abstraction point to the WTP has deteriorated. This has resulted in the current treatment process chain failing to deliver the required quality and quantity of water at a reasonable cost. In addition, there are high costs associated with pumping water to the distribution reservoir at Bungokho. Consequently, there is need to upgrade the plant to allow for more appropriate coagulation and flocculation units for the treatment of surface waters of rapid changing characteristics like the raw water of River Manafwa at the intake point. The treatment capacity of Manafwa WTP should be upgraded from the existing capacity of 4200 m^3/d to 8,212 m^3/d in 2030 and 10,660 m^3/d in 2040 to provide an alternative source of water for the Bungokho

supply area during the dry months of January to April when the water abstraction for the Bungokho system is insufficient to meet the maximum daily water demand.

The improvements in the units of the chemically-assisted sedimentation of the Manafwa WTP proposed for upgrading the capacity of the plant include:

i) Implementation of an automated coagulant dosing system, based in the regulation of the dosing rate in function of the measurements of a streaming current analyser actuating on the coagulant dosing pump;
ii) Construction of flocculation units (low mixing chambers) with mechanical stirrers to ensure the formation of flocks of adequate settling rate; and
iii) Refurbishing of the clarifiers in order to prevent hydraulic short circuiting.

In addition, the raw water abstraction will be improved. A new intake structure shall be constructed next to the existing one. The new structure shall be fitted with a grit chamber to decrease the sediment load at the Clarifiers. A sump shall be provided from which raw water will be pumped and not anymore directly from the river, which causes frequent interruptions. The proposed modifications or upgrades are indicated in Figure 2-9.

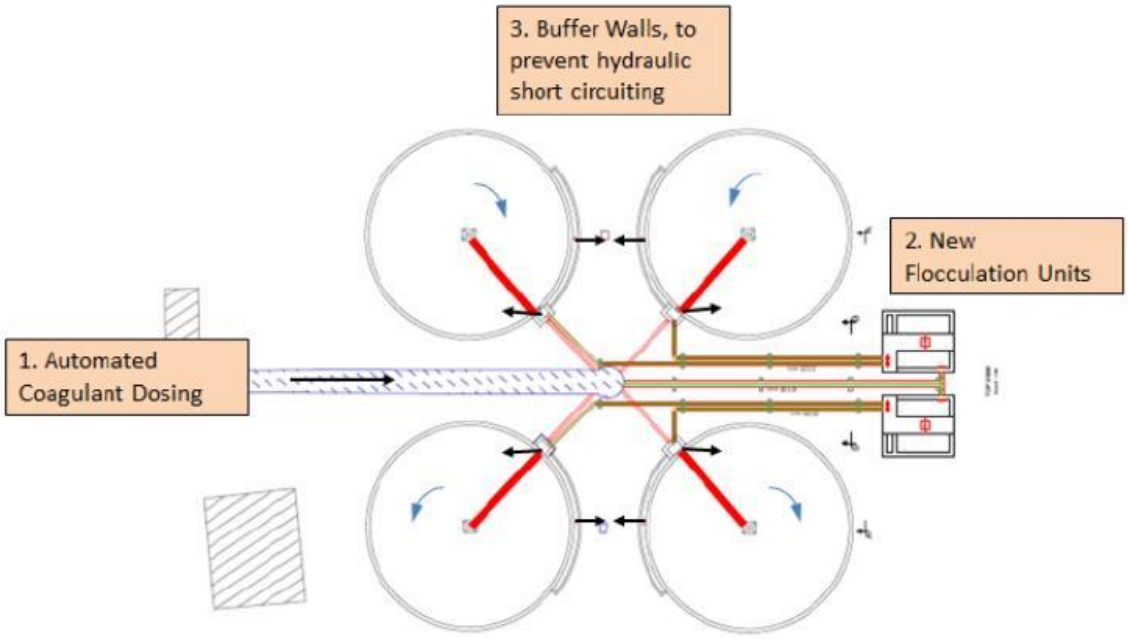


Figure 2-9 Proposed upgrade of Manafwa WTP

Figure 2-10 Manafwa WTP configuration

2.3.3 Transmission Lines

From the water intake, a 12.49-km DN 500 ductile iron pipeline shall follow in the beginning the contours and will be laid through agricultural land and forest. It is only the last 2 km before Mbale City that the pipeline alignment will follow existing roads.

From preliminary assessment of the minimum EF for Namatala River (refer to Section 5.3.1.3 and Annex K), there is a risk of insufficient river flow during the dry months (January to April) to meet the project water demand and the estimated minimum EF. The options will include, among others but not limited to:

i) Construction of a water impoundment structure at the Namatala intake site to store water during high flows and sustain the water demand during the dry spell
ii) Construction and rehabilitation of boreholes in the small towns
iii) Expansion of Manafwa water supply system
iv) Augmenting Water from Manafwa WTP during dry spell months
v) A reduction in water service delivery at acceptable levels.

These are not considered individual solutions, but complementary and inclusive; therefore, the final recommendation would likely be a combination of these options. The study will include specific recommendations and an implementation plan. The MWE and the NWSC will implement the recommendations under the IWMDP.

Mbale City requires a new transmission main system and water supply to the west to Budaka, Kadama, Kibuku and Tirinyi. The transmission main system in Mbale will comprise of the existing DN 300 Steel pipe, which runs from the reservoir at Bungokho WTP along the Republic Road and ends shortly after

the Clock Tower. This will be used as the main feeder for the Pressure Zone 2, that is, Senior Quarters, parts of the Central Business Area and St. Paul Mbale College (Figure 2-11).

A new DN 600 pipe will run down from Bungokho reservoir to the pressure break tank at Mbale District Local Government (350m towards Central Business District (CBD) from Mbale Sports Club). The DN 600 ends with a tee 140m before the pressure break tank. A DN 400 needs to be connected (with the full pressure from Bungokho) which runs in parallel to the Republic Road up to the roundabout (Soroti / Kampala Road) for the supply to the north (Nakaloke) and west (Kamonkoli / Budaka / Tirinyi). A DN 600 (throttle section, 140m long) will connect from the DN 600 to the pressure break tank. The outlet of the pressure break tank is a DN 500 pipe which runs in parallel to the republic road up to the clock tower. This pipe is the main feeder pipe for the pressure Zone 3. Two new transmission mains are required for the supply to the Growth Centres. The two mains need to be laid from: Mbale to Tirinyi / Kibuku and; Split point between Manafwa – Mbale to Butaleja and Busolwe.

During the dry months of January to April, the project area excluding Manafwa supply area experiences shortages in water. This is because the system largely depends on abstractions from the Manafwa, Nabijo and Nabuyonga intakes. Addition of R. Namatala will help boost water availability at Bungokho.

The transmission network from the Manafwa WTP will be a pumped main to Bungokho command reservoir with a T-off to Busoba reservoir. The new transmission will be a DN 300 PN 16 from Manafwa to Busoba Reservoir T-off. From Busoba Reservoir T-off To Bongokho will be a OD 250 uPVC PN 10. The New pipeline will be placed alongside the existing DN 300 steel pipe.

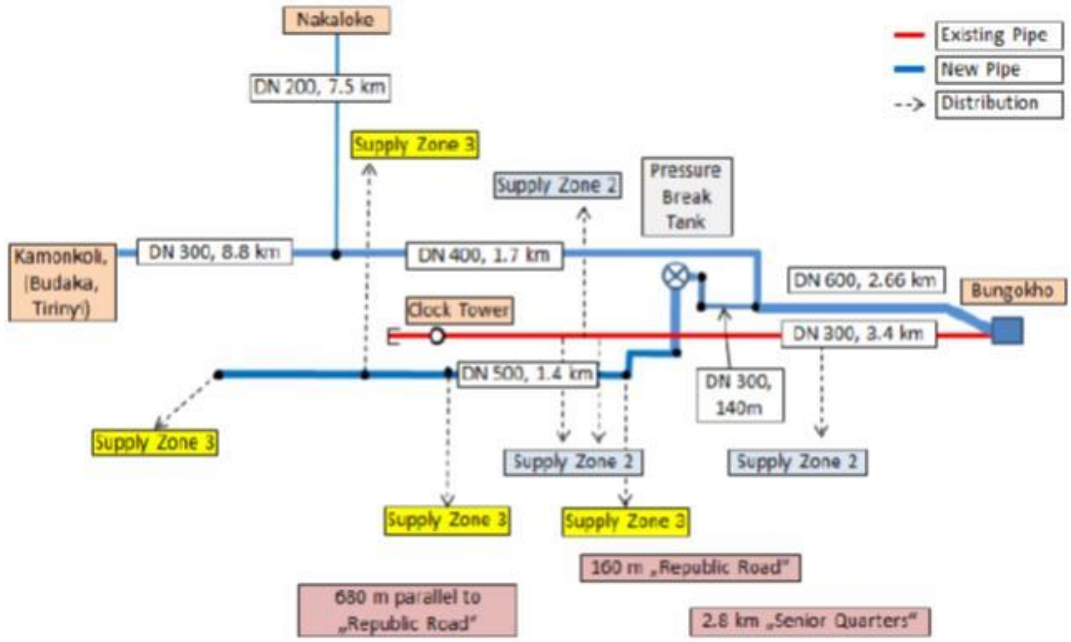


Figure 2-11 Schematic layout of the Mbale transmission main system

Figure 2-12 Lay out of Mbale transmission main

2.3.4 Main Reservoirs and Pressure Break Tanks

These will include:

- Bungokho (Central Reservoir, Supply to Zone 1, 2 (via existing DN 300 steel) & 3 in Mbale and Growth Centres to Tirinyi)
- Pressure Break Tank in Mbale (Supply Zone 3)
- Busoba Reservoir (between Manafwa and Mbale, supply to Busolwe and Butaleja)
- Mooni (Supply Zone 1, Mbale)

2.3.4.1 Bungokho reservoir

The Bungokho reservoir is an existing reservoir of Bungokho WTP which is located in the east of Mbale (Figure 2-13). The WTP was built around 1939. The following will be done to improve the state of the reservoir:

- Installation of new inlet and outlet pipes including valves and water meter
- Minor reservoir rehabilitation (hack out defective concrete, apply mortar, etc.)
- Installation of pumps that shall pump treated water to the Mooni Reservoir

2.3.4.2 Pressure break tank

There is no pressure break tank currently in Mbale. To prevent hydro-static pressure above 6 bar in the north and north west of Mbale, a new pressure break tank of about 100m^3 need will be constructed at “Mbale District Local Government” parking yard side (Figure 2-14).

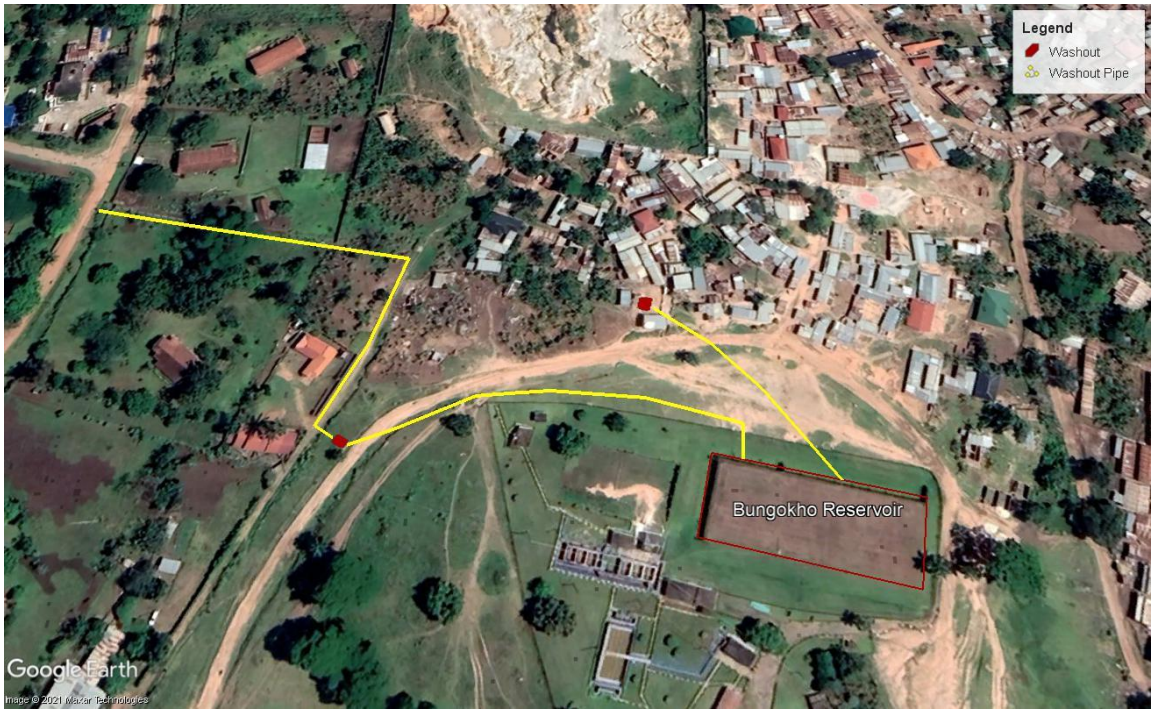


Figure 2-13 Location of Bungokho Reservoir

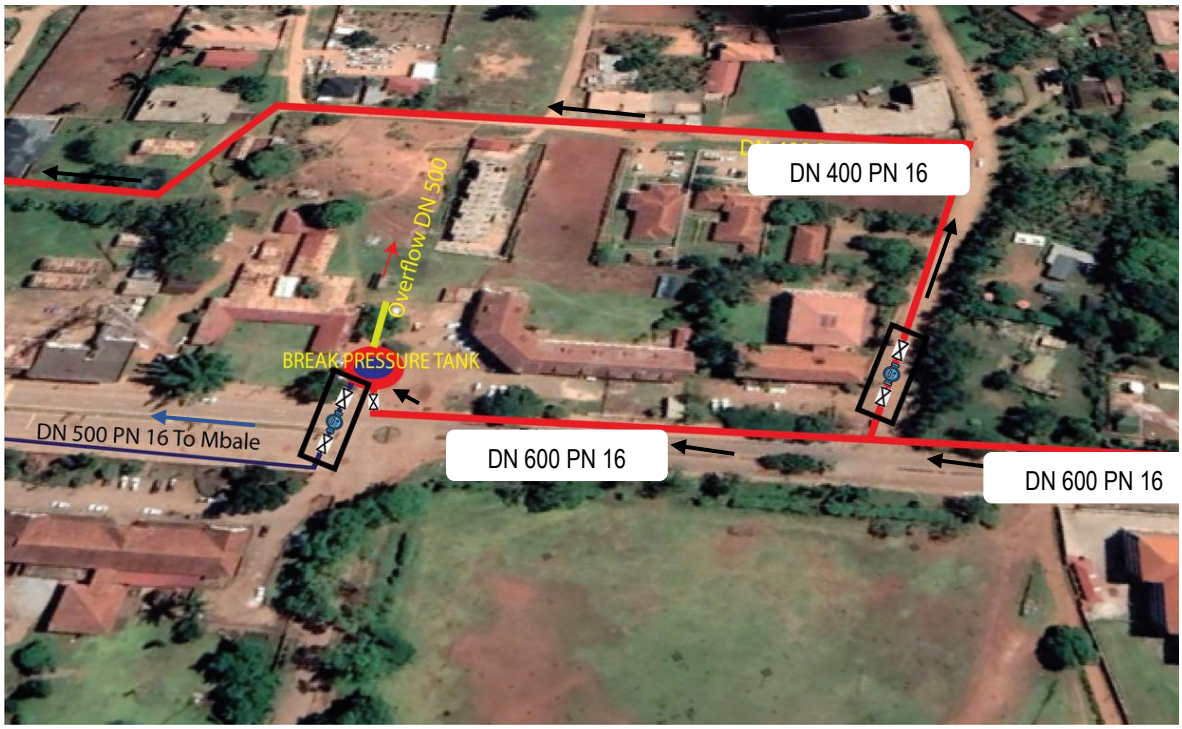


Figure 2-14 Sketch of the installations at the pressure break tank

2.3.4.3 Busoba reservoir

Currently, Busoba has no reservoir. A new reservoir will be constructed at Busoba that is fed from Manafwa to allow gravity supply to the north and south of the Busoba reservoir. The reservoir shall have a size of 2000 m^3. The pipeline between Manafwa and Bungokho exists and is a DN 300 steel pipe. The location of the new reservoir in the south at Busoba is approximately 4000 m north of

Manafwa and 1700 m south of the turn-off to Busolwe (Figure 2-15).

Figure 2-15 Location of the proposed reservoir at Busoba (36N 630029 mE 107445 mN))

2.3.4.4 Mooni reservoir

Like in Busoba, no reservoir exists currently at Mooni. A new 150m^3 reservoir is proposed for Mooni and will be fed from Bungokho WTP to allow gravity supply to the area. A new feeder pipeline will be laid between Bungokho WTP and Mooni reservoir. The location of the new reservoir including the proposed feeder pipe is shown in Figure 2-16.

2.3.4.5 Reservoirs in the growth centres

Four (6) new reservoirs with the size between 160 – 300 m^3 will be constructed in Budaka, Kadama, Tirinyi, Kibuku, Butaleja and Busolwe. The reservoir in Kadama shall be used at same time as pressure break tank for the supply to Tirinyi and Kibuku. All reservoirs will be supplied by the transmission mains from Mbale to Tirinyi or the split point between Mbale and Manafwa to Busolwe.

Budaka: In Budaka the existing reservoir (Photo 2-2) shall be used together with the new reservoir, which has to be constructed. Since the water supply system is currently not in operation, the chlorination unit and the water meter will be replaced.

Figure 2-16 Location of Mooni reservoir (36N 634803 117386)

Photo 2-2: Existing reservoir structures at Budaka (36N 607206 112784)

Kadama: A new reservoir will be constructed at Kadama which serves as a reservoir for Kadama and a pressure break tank for Tirinyi and Kibuku. Because it will double both as a reservoir and break pressure tank, its capacity was slightly increased to 300 m^3.

Figure 2-17 Proposed reservoir at Kadama

Butaleja: Butaleja currently has no water supply system in place. A new reservoir will be constructed.

Photo 2-3: Proposed Reservoir at Butaleja

Busolwe: Busolwe has a water supply system in place. The current reservoir is located at a lower level necessitating construction of a new one at a higher level.

Photo 2-4: Proposed Reservoir at Busolwe

Tirinyi: Tirinyi has an operational water supply system in place. The existing reservoir is located in the north of the growth centre. A new 250 m^3 reservoir has been proposed to be constructed near the existing reservoir utilizing the associated facilities (the chlorination facility, valves and the water meter) which are all in operating condition.

Photo 2-5: Proposed and Existing Reservoir location at Tirinyi

Kibuku: Kibuku has an operational water supply system in place. The current reservoir is located in the centre of the growth centre and need to be connected with the new transmission main. The chlorination

facility, valves and the water meter are all in operating condition.

Figure 2-18 Proposed and existing reservoir location at Kibuku

2.3.5 Distribution Networks

2.3.5.1 Mbale distribution network

Developments within Mbale over the last few years have taken place at a faster rate than the pace at which the water supply and sanitation infrastructure was developed, overwhelming the utility's capacity to provide a continuous water supply. With the town's boundaries having grown, it is now imperative that the water distribution system be expanded in order to address the low per capita water availability which currently stands at about 15 litres per day.

The majority of the aged non-metallic pipelines will have to be replaced and the new connections done properly. Mbale City will be divided into 4 different pressure zones, namely: Mooni, Senior Quarters, St. Paul Mbale College and Mbale (Figure 2-19).

The distribution systems in and around Mbale were divided into the following sub-systems:

- Mbale
- Manafwa
- North
- North-West

Mbale means the centre of Mbale City; Manafwa the south of Mbale; North the north of Mbale up to Nakaloke and surrounding; and North-West the system to Kamonkoli and Kabwangasi. The total lengths of the new pipelines for Mbale City and surrounding areas is 146,177m.

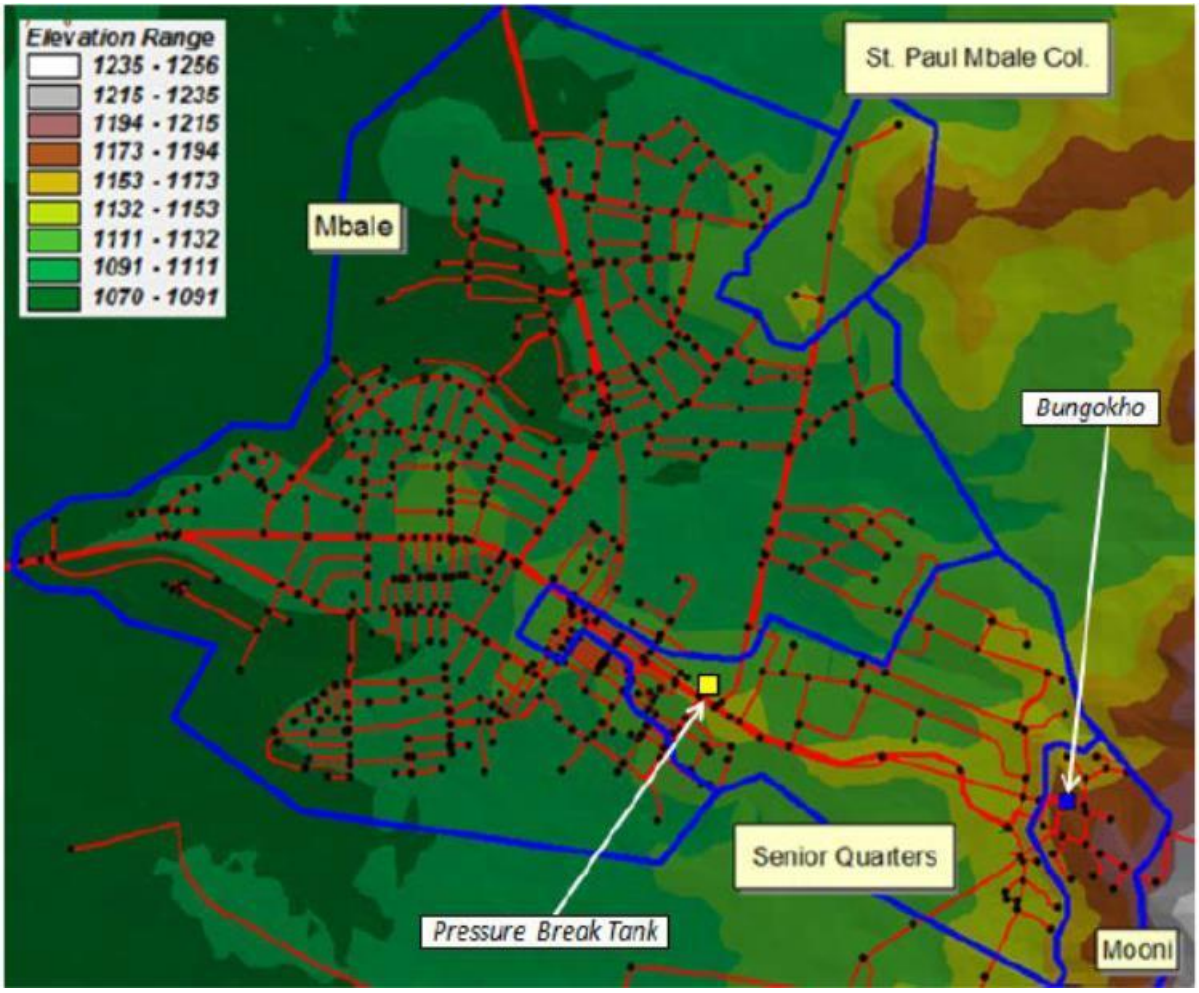


Figure 2-19 Proposed pressure zones in Mbale

All new and replaced pipes in Mbale are shown in Figure 2-20. The existing network will mainly be used in the south-western part of Mbale (new HDPE network in Malukhu), in Namatala and in Busamaga. Most of the AC pipes that will be replaced are in the City centre.

More fire hydrants will also be provided within the distribution system. Currently there are 17 fire hydrants installed in Mbale, mostly at the new market and in the south of Mbale. It was proposed to add 20 additional hydrants mainly on the main roads and some strategic points in the water distribution network to achieve a good coverage over entire Mbale. The proposed location of new fire hydrants and location of the existing ones.

Public stand posts: There are currently 136 Public Stand Posts (PSPs) and 18 water kiosks that are run mainly by private operators in Mbale. They cover almost 100% the informal areas of Namatala, Nabuyonga, Nkoma, Namakwekwe, Busamaga and Mooni. All of the informal settlements will get a formal water distribution network installed. The location of new and existing PSP and water kiosks is indicated in Figure 18 with a supply radius of 250 m.

Approximately 43 new PSP including prepaid meters will be installed in the existing informal settlements within a walking distance of 200 m. The new PSPs will guarantee 24 h water supply with

the water tariff provided by NWSC for the low income population.

Replacement of house connections: All house connections on the existing AC pipes will be disconnected and reconnected to the new replacement pipes. The same will apply in cases where the existing pipes are too small and need to be reinforced by larger pipes. The number of the required house connections is presented in Table 2-2.

Table 2-2: Proposed new PSPs

Informal settlement	Area (ha)	Minimum number of water points per chosen walking distance (m) to a water point			
		500	200	100	50
Busamaga	116.59	2	10	38	149
Mooni	72.67	1	6	24	93
Namatala	89.67	2	8	29	115
Nkoma	109.07	2	9	35	139
Nabuyonga	90.21	2	8	29	115
Namakwekwe	19.01	1	2	7	25
Total		**10**	**43**	**162**	**636**

2.3.5.2 Distribution systems in growth centres

The water distribution systems in the growth centres will be rehabilitated, extended and upgraded in: Budaka, Tirinyi, Kibuku and Busolwe while new distribution systems will be laid in Kadama and Butaleja. The total length of the distribution mains in Budaka, Kadama, Kibuku, Tirinyi, Butaleja and Busolwe is 30,043m; 8,529m; 7,700m; 18,414m; 8,868m; and 15,171m, respectively. The mains will be of two categories of pipes, that is, uPVC PN10 and HDPE PN10.

The start-up consumer connection for the six small towns of Tirinyi, Kibuku, Kadama, Budaka, Butaleja and Busolwe are detailed below:

- 1,800No. Yard taps and House connections in Budaka (500No.), Kadama (300No.), Tirinyi (300No.), Kibuku (200No.), Butaleja (200No.) and Busolwe (300No.).
- 28No. Public stand posts in Budaka (5No.), Kadama (4No.), Kibuku (4No.), Tirinyi (5No.), Butaleja (5No.) and Busolwe (5No.).

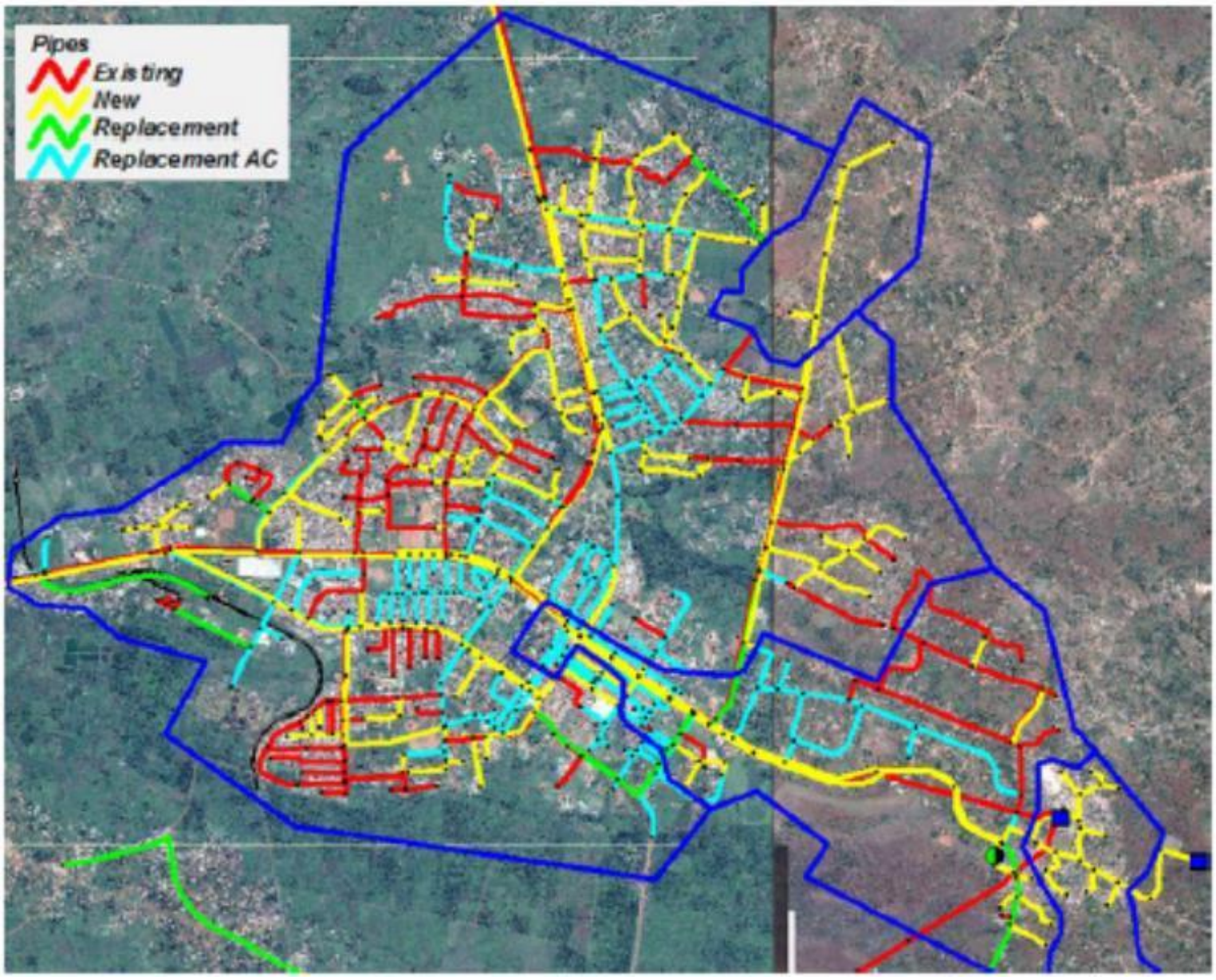


Figure 2-20 New or replaced pipes in Mbale

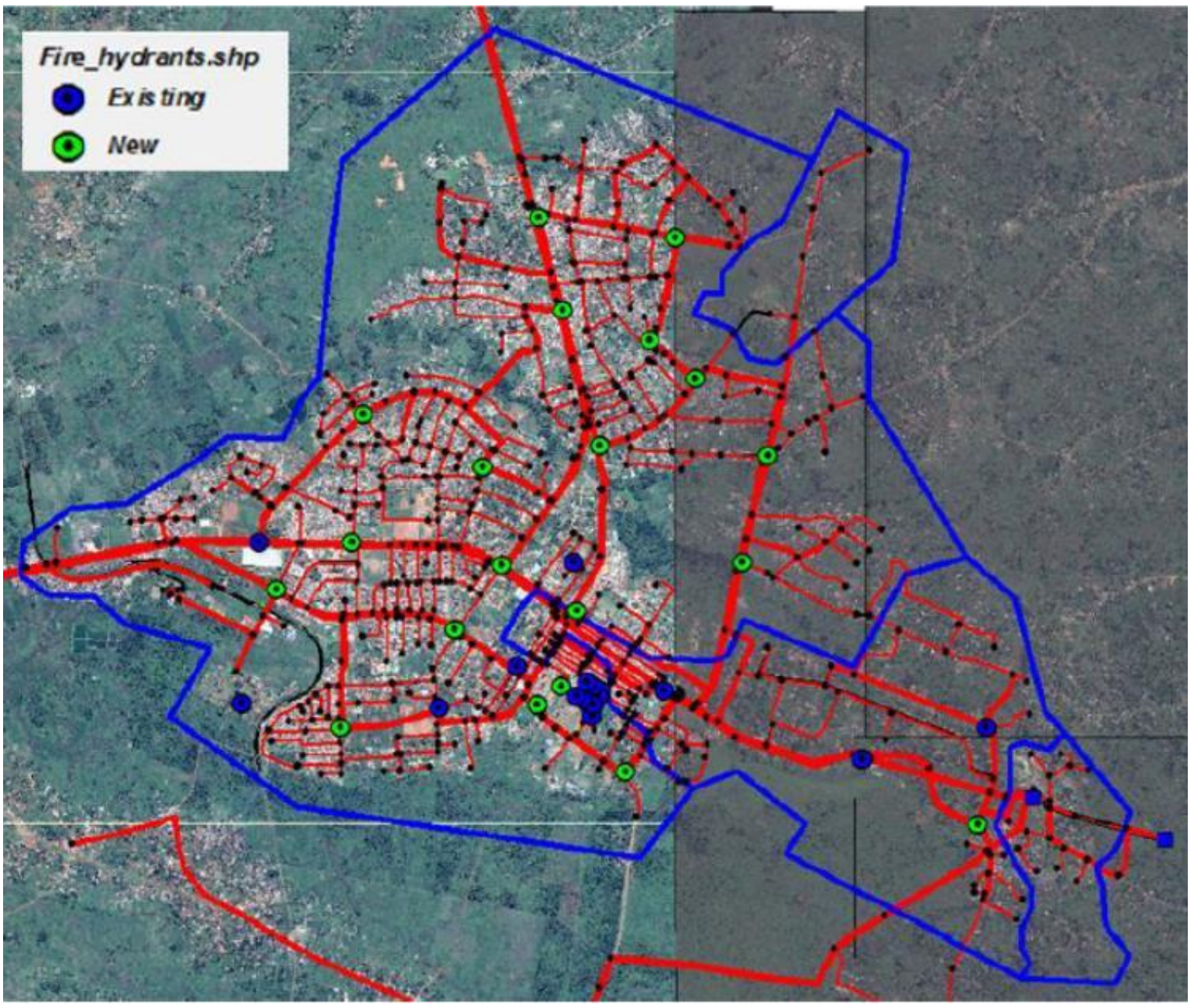


Figure 2-21 Location of fire hydrants in Mbale

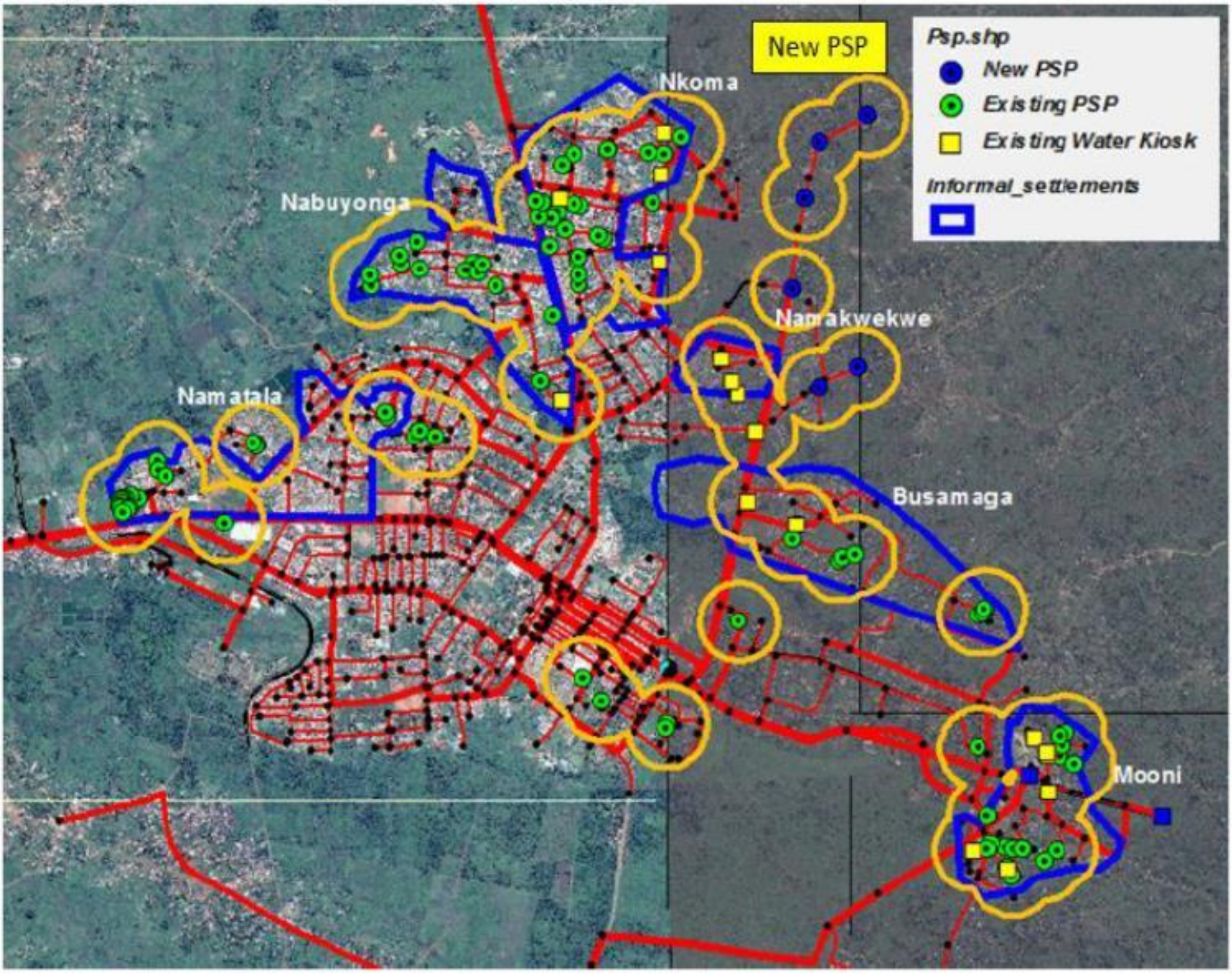


Figure 2-22 Location of new and existing PSPs and water kiosks in Mbale

2.3.6 Mbale Sewerage System

Interventions aimed at improving the adequacy and efficiency of the existing waste stabilization ponds will be made under the project. From the findings of the feasibility study, the capacity of the wastewater treatment ponds was found to be satisfactory. It is recommended to install new inlet works with grit removal to avoid siltation of the ponds. Furthermore, at the Namatala treatment ponds the sluice gates shall be re-established to increase the treatment capacity by adjusting the flow regimes. It is also recommended to construct sludge drying beds at the treatment ponds that can receive and treat faecal sludge from the ponds.

2.3.6.1 Sewerage network Senior Quarters

The area around the Senior Quarters has been identified as a potential area for expansion due to the high water demand and its income structure. The Senior Quarters is the only high income neighbourhood in Mbale. Almost all of the houses have their water connections in the house and use septic tanks. Most of the bigger hotels in Mbale can be found in this area including the two main Hotels, the Mbale Resort and the Mount Elgon Hotel. Since most of the sanitation facilities in the area are already waterborne it must be expected that there is a high demand for sewerage services. The entire catchment shall drain towards an open area near the Nabijo River where a lifting station shall be built that connects the sewerage network with the existing sewer of the Namatala Catchment (Figure 2-23).

2.3.6.2 Rehabilitation of sewerage network – Indian Quarters

A new sewer shall be installed in the area of the Indian Quarter replacing a dilapidated existing sewer network. The new sewer shall be connected to an existing trunk sewer on the opposite side of the Kampala Road, which needs to be crossed. The total length of the new network is 2180 m and compromises 53 manholes. About 115 house connections are required to be relocated to the new sewer mains. At three locations an existing functional sewer will be connected to the new system.

The proposed network in that area is shown in Figure 2-24. Similar works than in the Indian Quarters are expected to be carried out on the Namatala Trunk Sewer. A section of 150 m shall be replaced with a new sewer line to correct a piece of pipeline with a wrong gradient. The remaining existing networks shall be pressure cleaned and camera inspected.

2.3.6.3 Rehabilitation Namatala treatment ponds

The following measures are proposed at the Namatala treatment ponds:

i) Construction of new inlet structure and demolishing of old inlet structure;
ii) Reinstatement of embankments;
iii) Construction of five new channels connecting the ponds including sluice gates and demolishing of existing channels;
iv) Erection of boundary fence (live fence and diamond mesh fence);
v) Re-construction of approximately 200 m of DN 400 mm trunk sewer with two life connections; and
vi) Erection of a service building

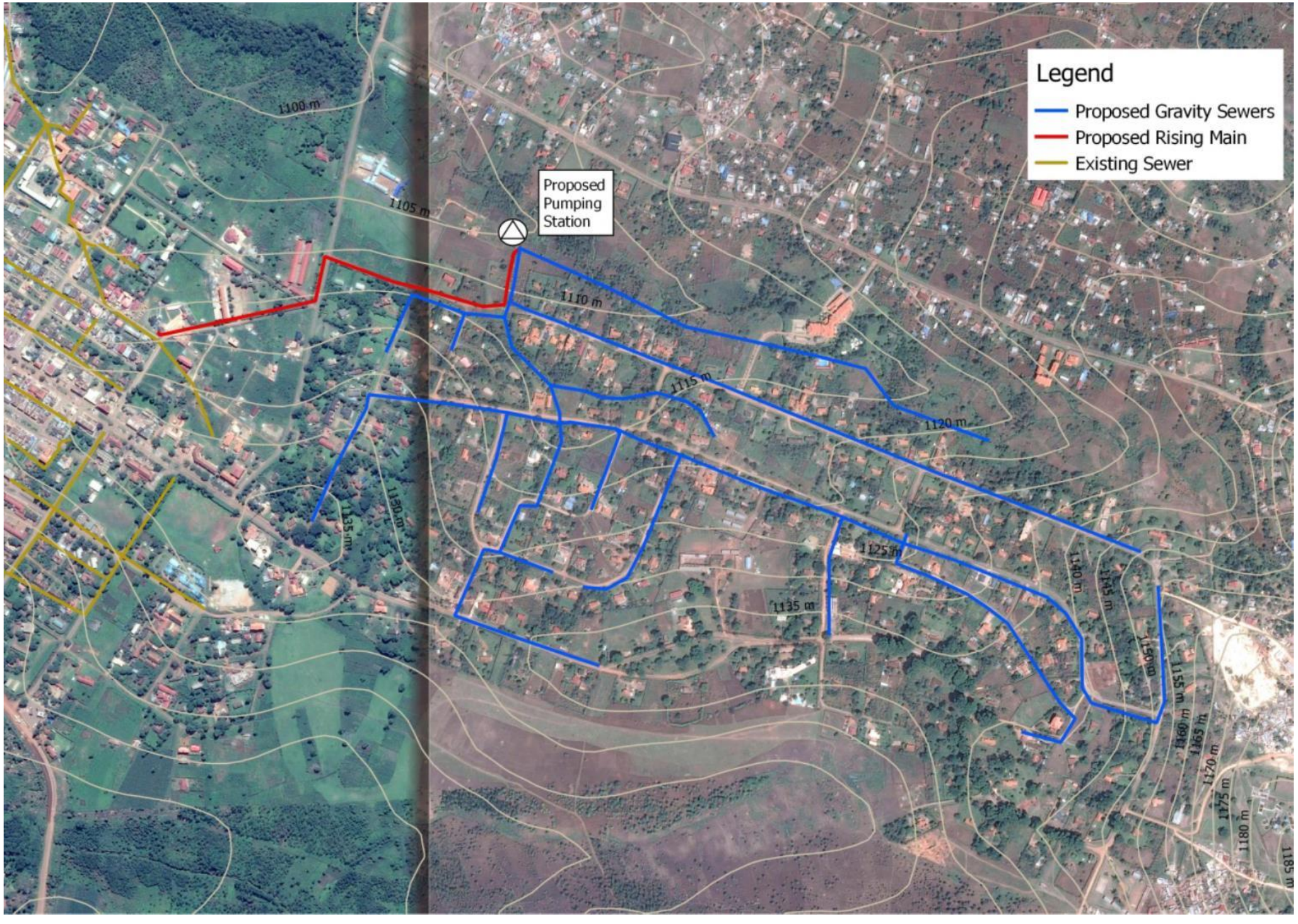


Figure 2-23 Proposed layout of the sewerage network for the Senior Quarters

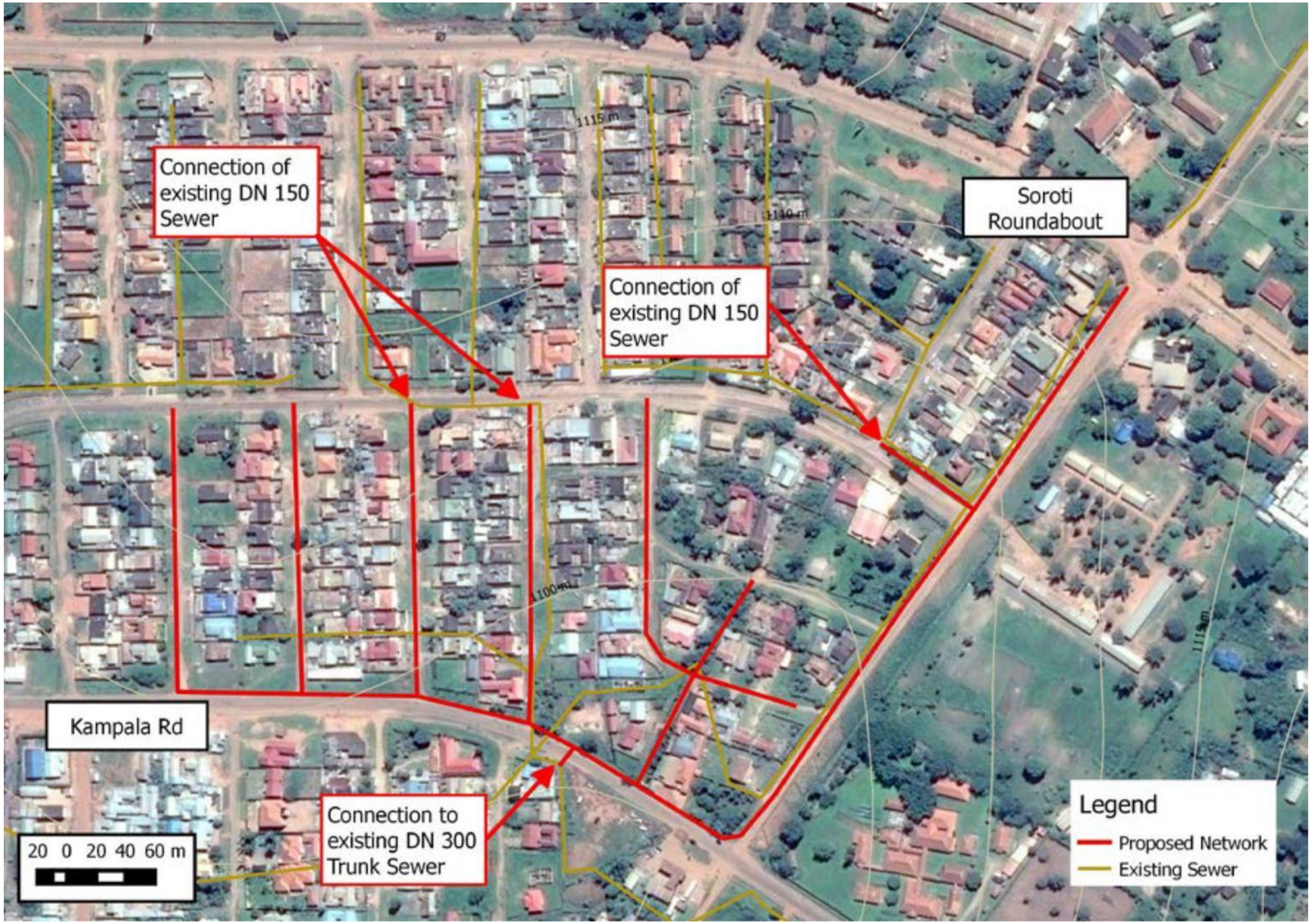


Figure 2-24 Proposed sewerage network in the Indian Quarters

The embankments around the ponds shall be reinstated by filling material which will also ease access to the ponds. Integral for the operation of the ponds is the reconstruction of the channels connecting the ponds. These shall be equipped with sluice gates in order the able to isolate ponds and to change the flow regime, which is becoming necessary in future to avoid an overloading of the facultative ponds.

2.3.6.4 Rehabilitation Doko treatment ponds

The following measures are proposed at the Doko treatment ponds:

i) Construction of new inlet structure and demolishing of old inlet structure;
ii) Construction of roofed sludge drying beds including separate inlet structure, feeder and drainage pipework;
iii) Construction of a solar powered drainage pump station;
iv) Establishment of operations building;
v) Erection of boundary fence (live fence and diamond mesh fence); and
vi) Re-construction of approximately 70 m of DN 400 mm trunk sewer with one life connection.

Similar to the Namatala treatment ponds, the most important aspect in the rehabilitation of the Doko treatment ponds is the replacement of the inlet chamber and inclusion of a mechanical treatment step to avoid the siltation.

The Doko treatment ponds shall play a vital part of the Faecal Sludge Management of the Mbale City. Sludge drying beds will be installed together with a small inlet structure that shall prevent the accumulation of solid waste in the faecal sludge. The structure shall be roofed to shorten the sludge drying time. A typical cross section of the structure is shown in Figure 2-25. The leachate of the sludge drying beds shall be collected under the drying beds with a drainage pipe and pumped to the inlet works using a solar-powered pump.

2.3.6.5 Sewerage connection Northern Cluster

The northern area of Mbale around the Islamic University in Uganda (IUIU) shall receive sewerage services. A gravity network and a treatment pond shall be constructed for that purpose. The network shall be a gravity network consisting of 10,950 m of OD 200, OD 250 and OD 315 mm uPVC sewer pipelines. Around 250 provisions for house connections shall be made by the Contractor at locations suitable for the terrain of the existing properties. Around 210 manholes shall be constructed.

The treatment ponds shall be constructed at a land close to the confluence of the Nabuyonga River into the Namatala River, which belongs to the IUIU. The treatment units shall include a mechanical treatment stage, an anaerobic pond and facultative ponds. The sludge from the anaerobic ponds shall be applied to sludge drying beds, as shown in Figure 2-26.

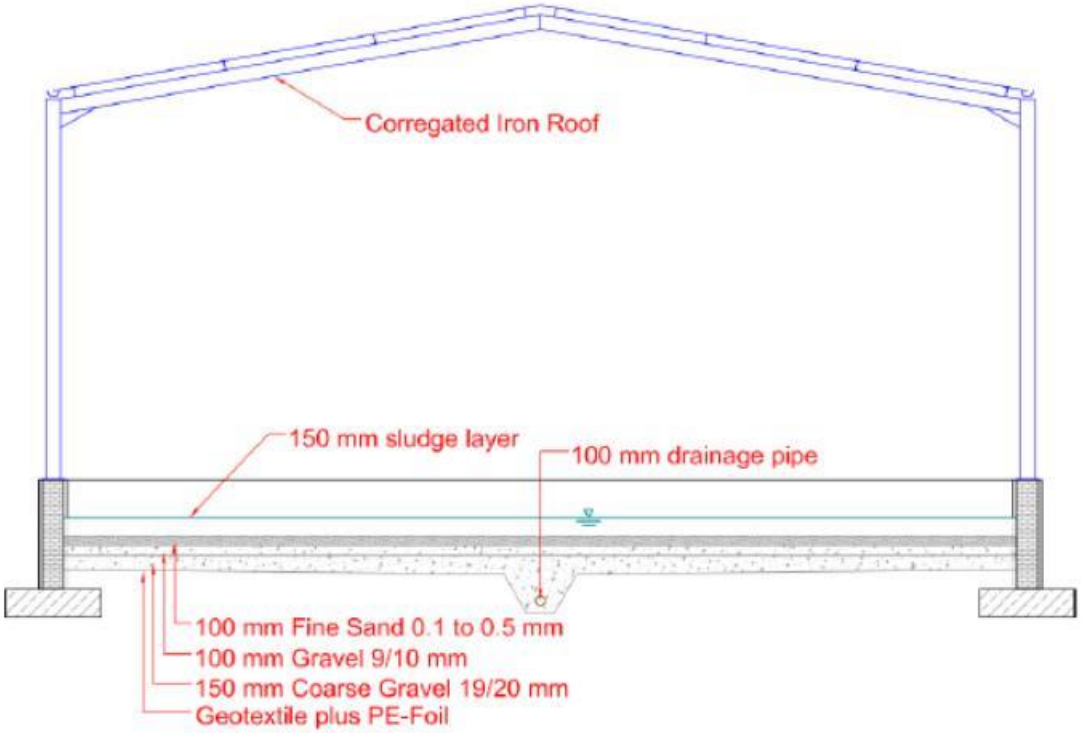


Figure 2-25 Cross section of the proposed sludge drying bed

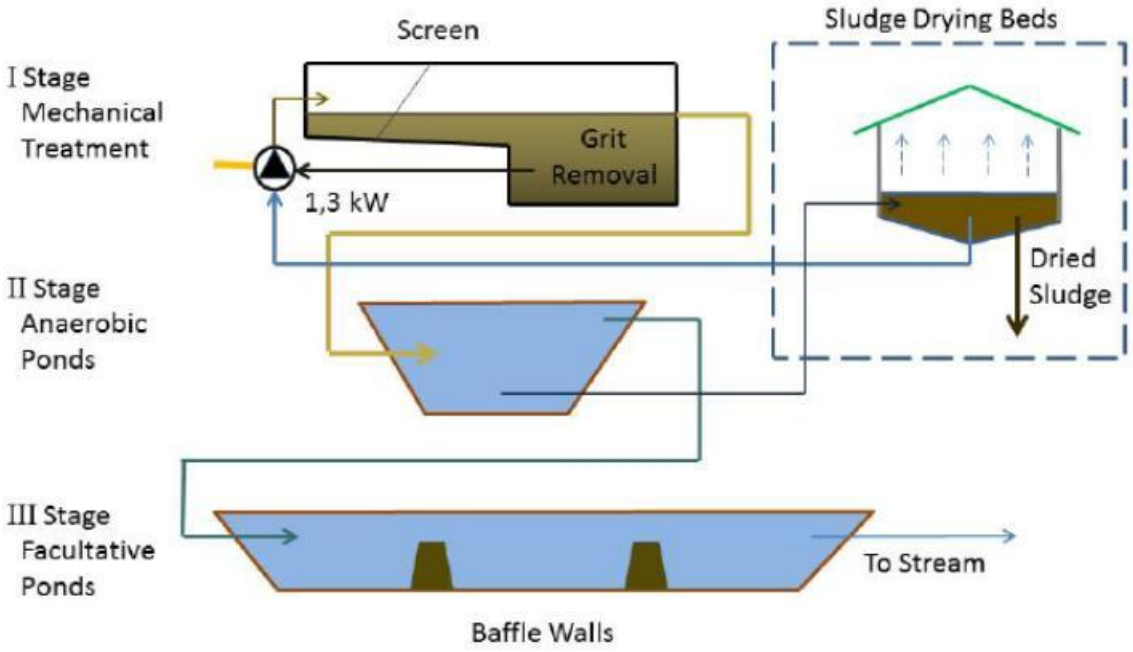


Figure 2-26 Schematic layout of the proposed pond treatment system for the Northern Cluster in Mbale

2.3.7 Sanitation Facilities

Two types of sanitation facilities are proposed, that is:

a) 4No. Ablution blocks for the growth centres and the informal settlements that include a shower unit; and

b) 2No. Public toilets that are smaller in size for smaller settlements

Both types of facilities are divided into genders and have units for persons with disabilities. Sufficient hand wash basins will be installed to encourage hand washing and condom dispensers will be added to each unit. The plan view of the Ablution Block is shown in Figure 2-27.

All toilets are waterborne and shall be equipped with a 1 m^3 water tank. The units shall be connected to a conservancy tank that shall be regularly emptied with a cesspool emptier. The faecal sludge shall then be driven to a suitable treatment facility.

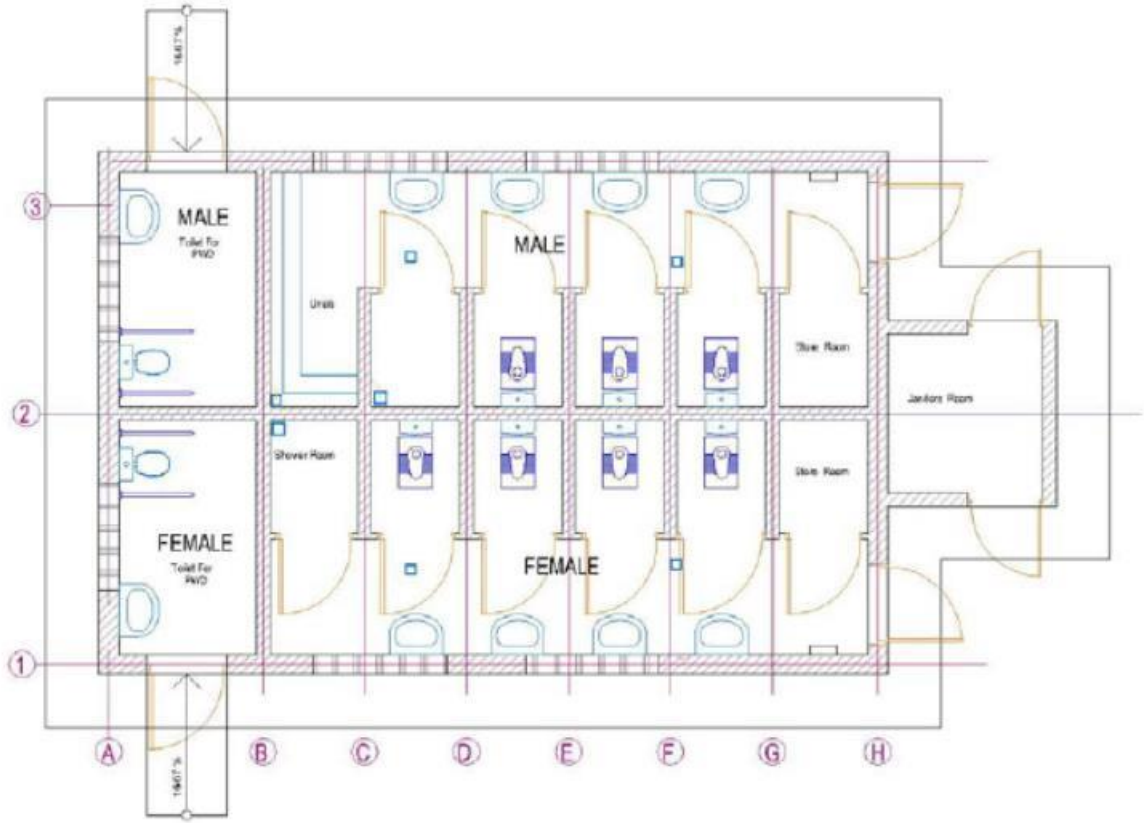


Figure 2-27 Plan of the proposed Ablution block

2.4 PROJECT PHASES

2.4.1 Mobilization Phase

This phase will involve mobilisation of the construction human resource, equipment, construction materials, erection of temporary worker's camp and storage yard. The estimated workforce for the contractor is 30 foreign workers and 100 local workers. Gender should be taken into consideration when recruiting workers, women should be given special consideration. The location of the project temporary camp will be agreed upon with the local leadership, landowners and contractor of the respective project areas. Once sites or locations of the auxillary support facilities are identified, the Contractor will be required to develop a Contractor's Environmental and Social Manangement Plan (CESMP) including acquisition permits and licences as well as Project Briefs and/ or Specific ESMPs for batching plants, camp sites, etc., where applicable.

2.4.2 Construction Phase

Upon completion of preliminary activities and onsite investigations, actual construction of the project components and facilities will start which will involve:

- Setting out to demarcate rights of way, work areas, clearing limits. Access paths, detours, bypasses and protective fences or barricades should all be in place before construction begins.
- Excavation of trenches for water pipe and sewer lines;
- Excavation for ponds for the sludge management facilities;
- Trench sheeting and bracing to protect collapsible trench side walls;
- Placing concrete to bases of foundations;
- Laying of main water pipes;
- Laying of sewer lines; and
- Backfilling, disposal of overburden and surface restoration to at least match the condition that existed prior to the water works construction.

All project activities under this phase are supposed to be carried along the tracks, route and access paths within the boundaries of the identified project sites without disturbing or obstructing the neighbours and businesses. To ensure this, the contractors will seal off the different site perimeters (where necessary) with corrugated iron sheets or other suitable material during project implementation. In case of trenches, proper barricade have to be applied to warn and protect the people of impending dangers of falling into open pits and trenches.

2.4.3 Demobilization Phase

Demobilisation phase will involve clearing of the project sites of all construction and unwanted material. The disposal of any unwanted material will be done by the contractor. The waste materials may include packaging, wood, steel crates, cardboard, wrapping materials, construction debris, boxes, sacks, drums, cans and chemical containers, etc. Damaged areas will need to be restored before commissioning the project. Upon completion of the contractor's obligations, the contractor will hand over the project to NWSC & MWE, the clients.

2.4.4 Operation Phase

This will involve employment of operators both skilled and unskilled, operation of the water supply system and sanitation facilities, maintenance of the facilities put in place, etc.

2.5 PROJECT ALTERNATIVES

2.5.1 'No Project' Scenario

The existing Mbale water supply system constructed in the 1950s and rehabilitated in 1990 has now reached its design capacity due to the fast-growing population rate and water demand. Without the proposed development, the government of Uganda would not have the ability to provide safe water and sanitary services to over 250,000 people living in Mbale and the growth centres of Kadama, Kibuku, Tirinyi and Budaka towns.

The "no project" scenario is neither a tenable nor beneficial alternative because safe water supply and sanitation are required to support rapid socio-economic development within the region.

2.5.2 Alternatives Considered

2.5.2.1 Water supply

If the Namatala intake can be used the whole year, the raw water pumping main from Manafwa and the rehabilitation of the intakes at Nabijo and Nabuyonga is not required anymore.

Raw water sources: Four main rivers for raw water supply within this project area have been identified. The Nabijo, Nabuyonga and Manafwa Rivers are currently used for water supply, while the River Namatala offers a further possibility for gravity raw water supply.

The dry season flow is the average of all flows in the dry months, which has been defined for December, January, February and March. For the Manafwa River the dry season average flow was relatively high (4.88 m^3/s) while for River Namatala and River Nabuyonga, flows of 1.6 m^3/s and 0.78 m^3/s, respectively, existed. The absolute minimum flows that were measured at the gauging stations were 1.3, 0.33 and 0.001 m^3/s for Manafwa, Namatala and Nabuyonga, respectively.

A water demand of 0.385 m^3/s is needed for year 2040 (design horizon) to serve the northern, western areas of Mbale and the growth centres of Budaka, Kadama, Kibuku, Tirinyi, Butaleja and Busolwe. The water supply for this Mbale core, Mbale West & Northern parts together with the growth centres of Budaka, Kadama, Kibuku, Tirinyi will come from the Bungokho WTP while Mbale south and growth centres of Butaleja and Busolwe will come from Manafwa WTP. The Augmented water supply report and design review reaffirmed the different raw water sources to increase water production at Bungokho, including Nabijo, Nabuyonga, Namatala, and Manafwa Rivers as suggested by the detailed Design report (CES 2015).

River Nabuyonga: The statistical analysis of data for Nabuyonga suggests enough water availability based on the mean total and dry season flow. However, absolute minimum flows already indicate the drying up of the river during the dry season although the wet season flow seems generally to be above 0.436 m^3/s. Basing on the measurement and historical data analysed on Nabuyonga, the river exhibits both dry and wet seasons. The wet season varies between April and November With flows exceeding 0.436 m^3/s while the dry season varies from December to April with flows as low as 0.098 m^3/s.

River Nabijo: This is similar to River Nabuyonga. Flows are generally slightly lower. Basing on the flow measurement and hydrological analysis done on Nabijo, the river exhibits both dry and wet seasons. The wet season varies between April and November With flows exceeding 0.305 m^3/s while the dry season varies from December to April with flows as low as 0.068 m^3/s.

River Namatala: For the Namatala River, data from the gauging station suggest that enough water is available, at least for most of the time during the year. The mean dry season flow is 1.56 m^3/s with a 95% exceedance probability of 0.47 m^3/s. The absolute minimum value was 0.303 m^3/s. The mean flow was estimated at 1.119 m^3/s. The analysis suggests enough water is available to meet water demand by year 2040 (0.313 m^3/s) for most of the year. However, Namatala's dry weather flows in some cases may not be sufficient to meet projected water demand and maintain an adequate Environmental Flow (EF).

The ESIA estimated a minimum EF of 0.19 m^3/s (refer to Annex K and Section 5.3.1.3), which includes domestic, livestock, Small-scale irrigation water, and aquatic life water needs downstream of the proposed Namatala intake location. According to the Augmented Water Supply Report, the aquatic flow requirement was further estimated and total water requirements was determined as shown in Table 2-3.

Table 2-3: Revised E-flow assessments using Tessman's Method for proposed R. Namatala

Monthly	MMF	MAF	Q95 (m^3/s)	E-flow proposed by Tessman using 20%	Other water requirements (Dw, Lw, lw, PA), m^3/s	Available water (m^3/s)
January	0.784	1.567	0.209	0.313	0.083	0.388
February	0.632	1.567	0.157	0.313	0.083	0.235
March	0.836	1.567	0.149	0.313	0.083	0.439
April	1.706	1.567	0.276	0.341	0.083	1.282
May	2.823	1.567	0.623	0.565	0.083	2.176
June	1.829	1.567	0.514	0.366	0.083	1.380
July	1.535	1.567	0.476	0.313	0.083	1.138
August	1.914	1.567	0.569	0.383	0.083	1.448
September	1.854	1.567	0.593	0.371	0.083	1.400
October	1.792	1.567	0.582	0.358	0.083	1.350
November	1.823	1.567	0.529	0.365	0.083	1.375
December	1.201	1.567	0.334	0.313	0.083	0.805

River Manafwa: Based on data from the gauging station, Manafwa River seems to have enough water. The flow representing the 95% probability of exceedance (or the safe yield) is approximately 1.38 m^3/s. This is slightly lower than the value of 2 m^3/s obtained by CES (2015). The 9% exceedance probability has a flow of approximately 1.614 m^3/s. Absolute minimum value is 1.311 m^3/s with 90% exceedance probability of 1.7 m^3/s. Both values are significantly above the total water demand for the project.

Comparing all the four sources, River Manafwa is expected to have enough water. However, a guarantee cannot be given as extreme droughts can occur and human destruction of ecosystems continues. River Namatala has enough water for most times. Nevertheless, by the end of the dry season, flows could be close or even below the water demand. Nabijo and Nabuyonga have enough water during the wet season but during the dry season flows are too low for sufficient water supply, even if both sources are used.

Therefore basing on the flows, River Namatala will be used as the major raw water source for the Bungokho WTP and River Manafwa will continue to supply the Manafwa WTP with modifications at the intake because of the high sediment load.

For raw water supply to Bungokho during the dry season only two options were further considered:

- Raw water supply from Manafwa (pumping)
- Raw water supply from Namatala (gravity)

Looking at the findings in the hydrological investigation no other options exists for the long-term water

supply to Mbale. Further, four different scenarios were analysed. Three different pipeline diameters (DN 400, DN 500and DN 600) were investigated between Manafwa and Bungokho and one between Namatala intake and Bungokho (DN 500).

The cost analysis clearly showed that the gravity pipe from Namatala River is the cheapest option for the raw water supply to Bungokho with running costs of 252 UGX/m^3 and total production costs of 954 UGX/m^3. Water from Manafwa would cost 1,253 UGX/m^3 (running costs) and 2,314 UGX/m^3 (production costs). However, in the case that Namatala does not has enough water in the dry season (needs to have more than 350 l/s), a DN 500 from Manafwa would be the cheapest option. In this scenario the pumps from Manafwa must have the following specifications: 3 pumps, 2 in operation, 1 as standby, Q = 564 m^3/h, H = 172m. The Feasibility Study concluded that, a new raw water pumping main from Manafwa is more expensive than the gravity main from Namatala.Therefore, a new raw water pumping main from Manafwa, only to bridge the dry period (December – March), is more expensive than the gravity main from Namatala.

Based on the flow analysis and cost evaluation, Namatala River was selected as the major raw water source for the Bungokho WTP given advantages of running a gravity fed system. Manafwa River will continue to supply the Manafwa WTP with modifications at the intake because of the high sediment load. The Manafwa system will serve Manafwa, South of Mbale, Butaleja and Busolwe.

As indicated above, there is a risk of insufficient river flow during the dry months to meet the design water demand of 0.386 m^3/s when considering the minimum EF. Therefore, the NWSC will carry out an Alternative Water Supply Study prior to construction to evaluate options to augment water source during low flows for Namatala and assess the reliability of the proposed water supply system. The options will include, among others but not limited to: (i) construction of a water impoundment structure at the Namatala intake site to store water during high flows and sustain the water demand during the dry spell, (ii) construction and rehabilitation of boreholes in the small towns, (iii) expansion of Manafwa water supply system, and (iv) a reduction in water service delivery at acceptable levels. The study will include specific recommendations and an implementation plan. Preliminary considerations of the feasibility of these options are described below.

Option 1. Modification of the intake structure to enable sufficient storage of water to sustain water demand during the dry spell to ensure abstraction rates are controlled so that minimum EF is maintained. Namatala's wet weather flows vary from 2.25 m^3/s to 15 m^3/s with a maximum close to 41 m3/s, which provides an indication of sufficient water for storage. Although land requirement information is not yet available, there is 100 meters available on either side of the river as part of the river bank management national regulation that could be used for a storage type structure. In addition, NWSC will embark on a full-scale source protection measures in the Mbale catchment area for which will engage a RAP consultant to look into land management and compensation measures, including this potential intervention. This option will be evaluated in close collaboration with the DWRM and NEMA.

Option 2. construction of boreholes systems as a mitigation plan during the dry spell. A hydrogeological report conducted in 2015 studied the potential for groundwater exploration in the proposed Mbale service area. The objective of this study was to analyse the potential in the area based on available data from boreholes, field visits and groundwater potential maps. Results indicate that there are areas which have good ground water potential. Yields in the range of 5 to 23 m^3/h were identified in the

existing boreholes. Maps showing the physical features of the area reveals that for the most part is well drained and therefore receives enough recharge for the deep-seated aquifers which can produce high yielding boreholes. Water quality for most of the boreholes indicated acceptable levels for domestic purposes. The Kadama small town was the only area with low groundwater potential according to the groundwater map; however, some boreholes are providing reasonable yields. Additional studies will need to be conducted to determine the number, location and output of the boreholes taking in consideration that they would operate as an augmentation measure during dry season.

Option 3. As indicated above, for the Manafwa River the dry season average flow was relatively high (4.88 m^3/s) and absolute minimum was recorded at 1.38 m^3/sec. Although, Manafwa river has sufficient water to meet 2040 water demand, the system was not selected as a primary source due to high operating cost. However, considering the potential vulnerability of the Namatala system, the Alternative Water Supply Study will consider the option of augmenting water supply from Manafwa.

Option 4. The consultant will also carry out a reliability assessment of the proposed Mbale water supply system to determine its vulnerability in supplying water to the Mbale service area. The study will assess levels of services during dry weather flow and drought conditions taking consideration water augmentation options and operational efficiency and planning. This will be conducted in close collaboration with the MWE/DWRM and local government officials in consultation with the community.

These four options will be explored and studied further. There are not considered individual solutions, but complementary and inclusive; therefore, the final recommendation would likely be a combination of these options. The MWE and the NWSC will implement the recommendations under the IWMDP.

The Project will also include a source water protection program to improve environmental conditions in the rivers feeding to the Mbale water supply project and community sensitization activities to promote water conservation and overall understanding of the proposed water supply system. The NWSC and MWE expect that these measures will reduce the minimum EF estimated for Namatala.

Busoba reservoir: The location of the new reservoir in the south is approximately 4000m north of Manafwa and 1700m south of the turn-off to Busolwe (630017 m E, 107451 m). Two supply options are possible:

- Option 1: Pumping all water from Manafwa to the southern reservoir from where the area north of the reservoir up to Mbale and the area around Manafwa WTP will be supplied. In this option the reservoir must have a size of 2000 m^3.
- Option 2: Pumping only the water from Manafwa to the southern reservoir which is required for the supply in the area north of the reservoir up to Mbale. The area around Manafwa WTP will be supplied by direct pumping. In this option the reservoir must have a size of 1750 m^3.

Option 1 was recommended as the cost implications are minor and it will reduce permanent pumping from Manafwa. In this case the existing DN 300 between Manafwa and the southern reservoir will serve as transmission and distribution main.

Water supply to small towns: To supply the small towns, two options, that is, gravity water supply from Mbale or a decentralised system with boreholes were investigated. Two main alternatives for the

supply of the small towns were assessed, that is:

- Integrated approach: The entire project region could be combined into one supply area that would be fed from NWSC's Mbale Water Supply System.
- Decentralized approach: The growth centres would produce and supply their water on their own. The small towns were divided into three clusters: Budaka & Kadama, Tirinyi & Kibuku and Butaleja and Busolwe. The three clusters would have one combined system including own boreholes and a transmission main system up to the reservoirs in each small town.

For the comparison, two different aspects were assessed. Besides the different investment costs, the dynamic prime costs (Figures 2-28 and 2-29) were calculated for each alternative and the different risks and challenges highlighted (Table 2-4). Based on these two evaluations a recommendation was made. From Figures 2-28 and 2-29, for both supply zones the total water production costs are higher for the decentralized supply despite the lower initial investment costs. The higher electricity consumption, continuous reinvestments and a low residual value in 2040 are making the decentralized water supply more expensive in the long-run.

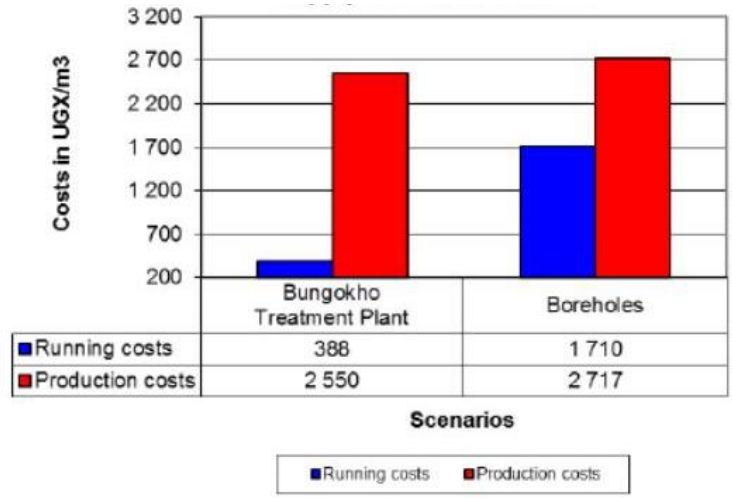


Figure 2-28 Dynamic prime costs for supply of Kadama cluster

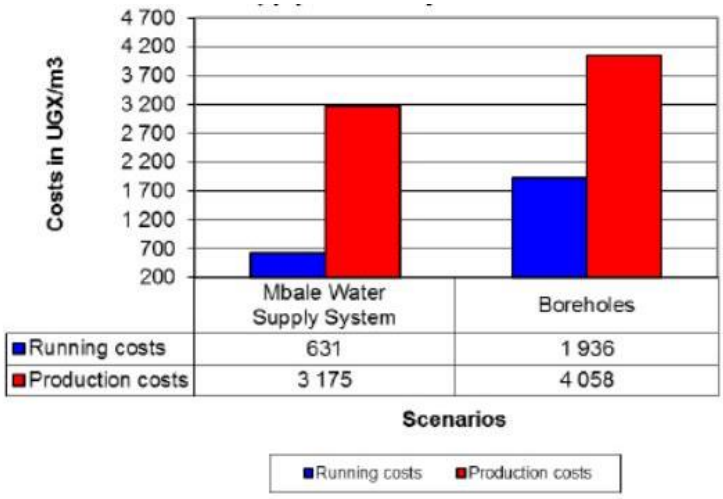


Figure 2-29 Dynamic prime costs for supply of Butaleja –Busolwe cluster

Table 2-4: Challenges, risks and benefits for the different supply options

Aspect	Integrated Approach	Decentralised Approach
Supply security	▪ Fair ▪ The Namatala and Manafwa River appear to be very solid water sources. ▪ Additional water sources could be easily integrated into the system. ▪ A breakdown of the transmission main could leave a sizeable population without water.	▪ Very Poor ▪ The present aquifer has never been exploited to that extend; recharge of aquifer could become a problem especially in the dry season. ▪ Experience has shown that the reserve funds in small water supply schemes are often insufficient to cover for repairs.
Water quality	▪ Good ▪ The water quality can be easily monitored and managed in the central treatment plants, but the travel time of the water can be long.	▪ Good ▪ Previous tests of groundwater indicate good quality in the project area
Management	▪ Good ▪ The Mbale Water Supply System has been managed very well in the past. It can be assumed that this will continue in a similar way; however an ever increasing supply area will become more difficult to manage especially in its fringes.	▪ Fair ▪ Smaller systems can be easily overseen, but experience has shown that they are often unattractive for experienced operators due to their small scale. Budaka for example could have an operating water supply system if the borehole pumps would have been replaced. Instead, Budaka has already since almost one year no operating water supply system.
Social and Environmental	▪ Fair ▪ The transmission mains are following exclusively roads, therefore little impact is expected. ▪ A bigger population is severed as smaller villages and trading centres between the six growth centres are connected. ▪ Considerable amounts of water are abstracted from the rivers in the Wanale Mountains that might be lacking in the future for other purposes like irrigation, water supply or other needs.	▪ Fair ▪ Well fields are likely to be in private property. ▪ Improved water supply and distribution system may increase stress on the groundwater resources

From Table 2-4, each supply strategy has its own benefits and challenges. Using scores and weights, a better option from the two was chosen/ recommended. Aspects in Table 2-5 and the dynamic prime cost were given a score between -2 and 2 and different criteria have been attributed with weights. The dynamic prime costs and the supply security were attributed with the highest weights as these are the main aspects for both the operator and the customer.

By comparing all the different aspects it can be said that the integrated approach is clearly the better option, especially due to the high risks associated with the stability of the aquifer and high operation costs of the decentralized water supply system. These aspects justify the high initial investment costs of the integrated water supply system.

Table 2-5: Comparison of the scores for the supply options

Criteria		Score	
Type	**Weight (%)**	**Integrated Approach**	**Decentralised Approach**
Investment costs	10	-2	2
Dynamic prime costs	30	2	-2
Supply security	25	0	-2
Water quality	10	1	1
Management aspects	10	1	0
Social & Environmental aspects	15	0	0
Total	**100**	**0.6**	**-0.8**

2.5.2.2 Proposed transmission mains to the small towns

The integrated approach transmission main options are presented. Two towns, Tirinyi and Kibuku, have sufficient water sources available as they fill their reservoirs only once or twice per week. Thus, the transmission mains between Kadama and Tirinyi as well as between Kadama and Kibuku could be postponed and constructed only as soon as more water is required in both towns. However, the demand for both towns was included in the overall dimensioning of the pipeline capacity between Mbale and Kadama as it will be required in future. As Kibuku is 20 m higher than Tirinyi it is proposed to have two separate lines from Kadama to Tirinyi and to Kibuku. Altogether three scenarios were investigated:

- Scenario 1: Pipeline design to Tirinyi/ Kibuku for the demand until 2040, gravity supply up to the north (Nakaloke) and north-west (Kamonkoli and Kabwangasi)
- Scenario 2: Pipeline design to Tirinyi/ Kibuku for the demand until 2030, installation of Booster Station in 2030 to supply up to Tirinyi/ Kibuku until 2040, gravity supply up to Kabwangasi until 2040
- Scenario 3: Pipeline Design to Tirinyi/ Kibuku for the demand until 2030, installation of Booster Station in 2030 to supply up to Tirinyi/ Kibuku until 2040, gravity supply up to Kabwangasi is not guaranteed from 2030 onwards. An additional booster station for the north-west might be required.

A dynamic prime cost analysis was done where all three above mentioned scenarios were compared with each other. Scenario 1 being gravity main has the lowest running costs until 2040 and beyond. Scenario 2 and 3 are almost the same although Scenario 2 has slightly lower running costs than Scenario 3. Scenario 3 has the lowest production costs. It has to be pointed out that a booster station to Kabwangasi was not considered in the cost comparison which will definitely increase the production and running costs in Scenario 3. Scenario1 was therefore considered on the basis of running costs.

2.5.2.3 Expansion of sewerage services

Two options for the expansion of sewerage services in Mbale were assessed. It was to be assessed if there are possibilities for extending the sewerage network and new areas outside the existing catchments needed to be identified. The biggest potential for sewerage services has been identified in the Senior Quarters and the Northern Division of Mbale.

Senior Quarters: For the northern part of the Senior Quarters there are two alternatives for the connection to the existing sewerage network, one gravity option and a pumping option (Figure 2-30). The trunk main in the Senior Quarters will follow the corridor of the main stormwater channel in the

neighbourhood. Where this channel connects with the Nabijo River it could either be pumped towards the existing network behind the High Court (Option A) or a pipeline is built along the Nabijo River (Option B).

The option of the lifting station results in higher operating costs due to the power consumption and the maintenance of the mechanical and electrical equipment. There is also an increased demand on the skills that are required in the operation of the facility, but here NWSC Mbale proofed that this can done with the successful operation of two similar lifting stations. The environmental impact is major disadvantage of the gravity trunk main along the Nabijo River. Here, a large amount of trees would need to the removed as the line is running through a forest. In addition, the line is running very close to a river. Here sewerage can infiltrate to the river in case of any damage and flooding can undermine the structural integrity of the sewer. As the Nabijo is meandering significantly in this section, interventions will be required to protect the pipeline from erosion, which are expected to be very costly. There is also a risk to public health in case of sewage leakage or overflow from manholes. This would pose a serious threat to public health and ecosystem via consumption of contaminated drinking water, food-chain transmission of contaminants through livestock watering and direct contact with faecally-polluted rivers by downstream users.

In terms of related costs, the network in the northern part of the Senior Quarters would cost a little less than USD 1 million. In case the network shall be connected to the Namatala catchment with a trunk sewer along the Nabijo River, an additional sum of USD 490,000 is expected. If it were to be connected with a lifting station, around USD 265,000 shall be added. In total, around USD 1.25 million for option A and USD 1.47 million for option B. to connect the Northern Part of the Senior Quarters to the existing sewerage network, depending on the chosen drainage option.

Considering the social and environmental issues, Option A was considered (Figure 2-31). The proposed sewerage network will drain close to a point along the Nabijo River, amount 500 m downstream of the Mbale Resort. This is also the point where the stormwater network of that area is discharging into the Nabijo River. From the last point of the network the area shall be connected through a lifting station to the existing sewerage network, which is discharging to the Namatala Treatment Ponds.

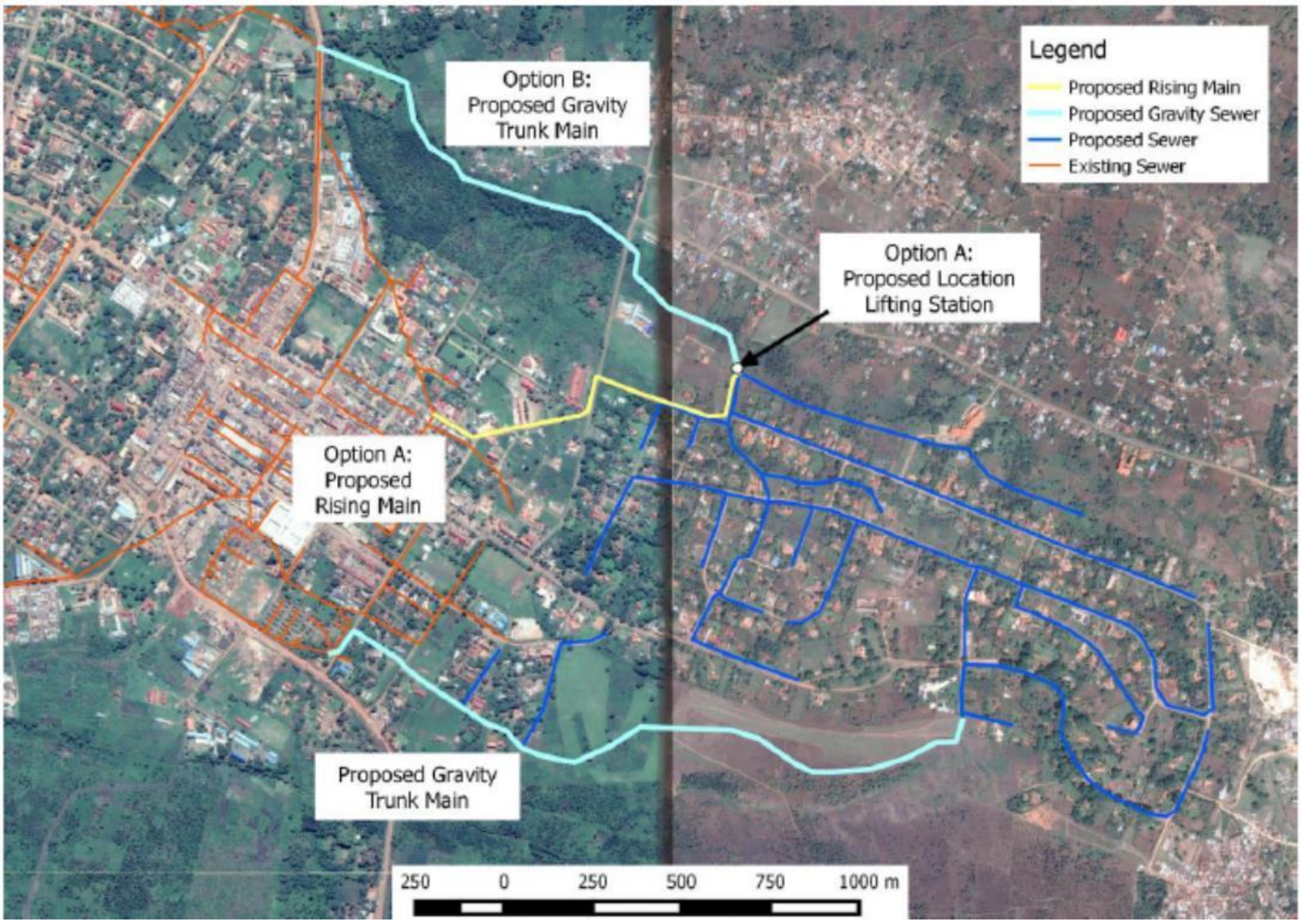


Figure 2-30 Options for connecting the Senior Quarters to the existing network

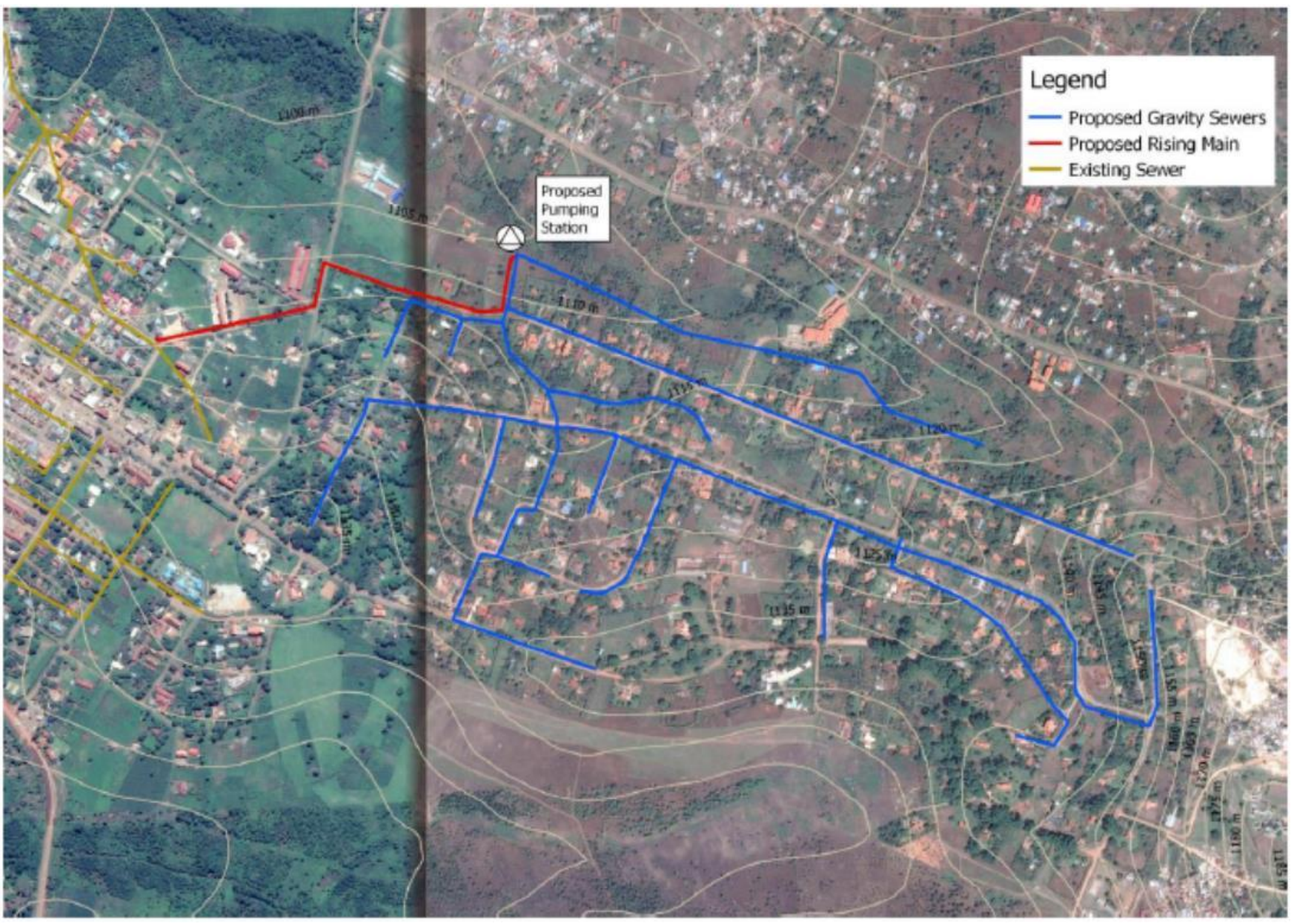


Figure 2-31 Proposed sewerage network in the Senior Quarters

3 POLICIES, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 INTRODUCTION

In Uganda, the key legislation governing an ESIA study includes the National Environmental Act (2019) of the laws of Uganda and the Environmental Impact Assessment Regulations (1998). National Environmental Act established NEMA and entrusts it with the responsibility to ensure compliance with ESIA process and procedures in planning and execution of development projects. The procedures require that a project proponent prepares an EIS with a clear assessment of relevant potential impacts, based on terms of reference (TORs) developed from a scoping exercise. This requires that the ESIA addresses potential direct and indirect socio-environmental impacts during the pre-construction, construction, operation and decommissioning phases together with attendant environmental and social management plan (ESMP).

Policies, legal and institutional framework considered relevant to this proposed project are discussed in this section. Various laws here reviewed relate to minimum acceptable construction operational requirements, environmental quality, land use, public health, occupational safety, labour standards and international legal obligations.

3.2 POLICY FRAMEWORK

3.2.1 The National Environment Management Policy, 1994

The overall goal of this policy is the promotion of sustainable economic and social development mindful of the needs of future generations and the EIA is one of the vital tools it considers necessary to ensure environmental quality and resource productivity on a long-term basis. It calls for integration of environmental concerns into development policies, plans and projects at national, district and local levels. Hence, the policy requires that projects or policies likely to have significant adverse ecological or social impacts undertake an EIA before their implementation. This is also reaffirmed in the National Environment Act, 2019 which makes EIA a requirement for eligible projects (Fifth Schedule).

Relevancy: At the national policy level, environment and development are interrelated and this policy requires that environmental aspects are considered in all development projects such as the proposed Mbale and small towns' water supply and sanitation project.

3.2.2 MWE Environment and Social Safeguards Policy, 2018

The Ministry of Water and Environment (MWE) prepared the Environmental and Social Safeguards (ESS) Policy Framework, to ensure that, in implementing development programs, positive social impacts are maximized while negative ones are minimized or avoided. There are 15 principles which apply to this Policy which determine the scope of risk and impact assessments.. The ESS principles are:

i) Compliance with the Law
ii) Access and Equity
iii) Marginalized and Vulnerable Groups
iv) Human Rights

v) Gender Equality and Women's Empowerment
vi) Core Labour Rights
vii) Indigenous Peoples
viii) Involuntary Resettlement-
ix) Protection of Natural Habitats
x) Conservation of Biological Diversity
xi) Climate Change-
xii) Pollution Prevention and Resource Efficiency-
xiii) Public Health
xiv) Physical and Cultural Heritage
xv) Lands and Soil Conservation

All the above principles apply to this project and should be taken into consideration during both construction and operation phases.

3.2.3 The National Water Policy, 1999

The goal of this policy is to provide guidance on development and management of the water resources of Uganda in an integrated and sustainable manner, so as to secure and provide water of adequate quantity and quality for all social and economic needs, with full participation of all stakeholders and mindful of the needs of future generations. The policy aims to:

- Promote rational use of water;
- Control pollution and promote safe storage, treatment and disposal of waste, which could pollute water and impact public health; and
- Promotion of awareness of water management and development issues and capacity building.

Relevancy: This policy is relevant to the project since it will promote rational use of source water and avoidance of contamination of water course. The policy advocates for integrated and sustainable development management and use of water resources with full participation of all the key stakeholders.

3.2.4 National Environmental Health Policy, 2005

The main objective of this policy is to create an enabling environment for the achievement and maintenance of healthy living conditions in rural and urban areas. It actively promotes and supports the adoption of a national sanitation, ensure that an environmental health community at national and local government level is suitably skilled and equipped to meet current environmental health challenges.

Relevancy: By ensuring availability of safe water supply and improved sanitation, the project will contribute to the reduction of water borne diseases thereby improving on the health of communities, especially the girl child and mothers who are mainly involved in collection of water. This project is in line with the strategies of this policy.

3.2.5 The National Policy for the Conservation and Management of Wetland Resources 1995

To curtail the rampant loss of wetland resources and ensure that benefits from wetlands are sustainable and equitably distributed. Wetlands acting as sources of water supply and wastewater treatment should be fully protected. Application of environmental impact mitigation measures on all activities of the

project to be carried out on affected wetlands. NWSC and DWD have to work hand in hand with WMD and NEMA to halt encroachment on wetland such as the swamp in Pece Lukung village where the lagoons are situated and water is abstracted.

3.2.6 Uganda Gender Policy, 2007

The overall goal of this policy is to achieve gender equality and women's empowerment as an integral p art of Uganda's socio-economic development. Its main purpose is to establish a clear framework for ide ntification, implementation and coordination of interventions designed to achieve gender equality and w omen's empowerment in Uganda. The policy is a guide to all stakeholders in planning, resource allocati on, implementation and monitoring and evaluation of programmes with a gender perspective. The main objectives of this policy include:

i) To reduce gender inequalities so that all women and men, girls and boys, are able to move out of poverty and to achieve improved and sustainable livelihoods;
ii) To increase knowledge and understanding of human rights among women and men so that they can identify violations, demand, access, seek redress and enjoy their rights;
iii) To strengthen women's presence and capacities in decision making for their meaningful participation in administrative and political processes;
iv) To address gender inequalities and ensure inclusion of gender analysis in macro-economic policy formulation, implementation, monitoring and evaluation

Relevancy: This policy would especially apply in the recruitment process of labour, both during construction and operation phase. Men and women should have equal opportunities for available jobs. This policy also requires provision of a work environment that is safe and conducive to women, as it is for men, considering gender-disaggregated differences and vulnerabilities. For example, women should have separate facilities from men's at workers' camps.

3.2.7 National AIDS Policy (2004) and National Strategic Framework for HIV/AIDS activities in Uganda

This provides overall policy framework for national HIV/AIDS response. The National Policy on HIV/AID S recognizes special groups, which include migrant workers. The Policy recommends the need to identi fy strategies to address migrant workers in view of the challenges posed by mobility and vulnerability to HIV. This is in line with the Constitution of the Republic of Uganda, 1995 Article 39. This Article creates t he right to a clean and healthy environment, implying that workplace safety and health (including preve ntion of HIV infection), is a basic right of every citizen. Under its General Objective XIV, the State is com mitted to fulfilling the fundamental rights of all Ugandans to, among others, social justice and economic development and shall, in particular, ensure that all developmental efforts are directed at ensuring the maximum social and cultural well-being of the people.

A number of workers will be expected to come to the project area during construction and these are likel y to be exposed to an environment that encourages the spread of HIV /AIDS and other STDs. The strat egies to fulfill the objective of this policy will need to be incorporated in project during the planning proce ss. The National AIDS Policy is aimed at managing the HIV/AIDS pandemic and provides guidance on how to approach the pandemic. Together with the National Strategic Framework for HIV/AIDS activities in Uganda, it provides overall guidance for activities geared towards preventing the spread of HIV/AIDS.

This will be achieved through:

i) Increased coverage and utilization of HIV prevention services. Attainment of this goal and outcomes is also contingent on
ii) Increased adoption of safer sexual behaviours and reduction in risk taking behaviours,
iii) A strengthened and sustainable enabling environment that mitigates underlying factors that drive the HIV epidemic,
iv) Strengthened leadership and coordination of HIV prevention programs, and
v) Strengthened information systems for HIV prevention.

Relevancy: The requirements of this policy are expected to be fulfilled by the construction contractors or their subcontractors, especially in regard to having an in-house HIV Policy, worker sensitisation and provision of free condoms. This policy is relevant to the project if implementation of proposed construction activities leads to in-migration into the project area by people seeking construction jobs and indulging in prostitution or irresponsible sexual fraternisation associated with HIV/AIDS risk.

3.2.8 Occupational Health and Safety (OHS) Policy, 2006

This policy seeks to:

- Provide and maintain a healthy working environment;
- Institutionalize OHS in the power-sector policies, programs and plans; and
- Contribute towards safeguarding the physical environment.

The OHS Policy Statement is guided by the Constitution of the Republic of Uganda and other global, national and sector regulations and policies. The OHS Policy also takes into consideration the Health Sector Strategic Plan, all of which aim to improve the quality of life for all Ugandans in their living and working environment.

Relevancy: This policy will be especially relevant for OHS of construction crews and subsequently, operation and maintenance personnel. The policy will also have relevance in mitigation measures that protect the public from health and safety impacts as a result of project construction and subsequent operation and maintenance activities.

3.2.9 Uganda Vision 2040

In 'Vision 2040', Uganda sets goals to achieve by the year 2040 ranging from political, economic, social, energy, water, and environment. With respect to environmental goals, Ugandans aspire to have sustainable social-economic development that ensures environmental quality and preservation of the ecosystem. Vision 2040 recognises water and sanitation infrastructure as a key driver of the economic development and notes that for Uganda to shift from a peasantry to an industrialized and urban society, it must develop its infrastructure.

The 2040 vision acknowledges that the slow accumulation of infrastructure i.e. water among others retards the economic development. It must be propelled by water as a factor of production in agricultural and industrial sectors. It estimates that Uganda's water consumption using 2010 as a baseline stands at 26 m^3 per capita and will require it to be raised to 600 m^3 per capita by year 2040

and this can only be achieved by raising percentage of population with access to safe piped water from 15 to 100 by 2040.

Relevancy: To provide the necessary stimulus to the economy, the government in partnership with other development partners have embarked on the improvement of water supply and sanitation infrastructure of which Mbale and the small towns' service area got a share. Vision 2040 notes that to improve access and availability of water to the rural and urban areas, especially to economic zones and other productive areas, new water supply lines should be established at an accelerated rate. Therefore, the proposed project is in line with aspirations of Vision 2040.

3.2.10 Uganda Resettlement/Land Acquisition Policy Framework, 2002

With regard to compensation and resettlement issues, the main pieces of legislation are the Constitution of the Republic of Uganda and the Land Act, both of which require that:

i) Compensation should be aimed at minimizing social disruption and assist those who have lost assets as a result of hydropower project to maintain their livelihoods. In accordance with Ugandan laws and standards, a disturbance allowance is to be provided to assist the project affected individual or family to cover costs of moving and locating to a new holding. This disturbance allowance, however, might not be sufficient to cover income losses; and
ii) Community infrastructure must be replaced and ideally be improved in situations where it was deficient. This includes installation of sanitary facilities, electricity generation systems, road links and provision of water.

Relevancy: The principles of potential resettlement caused by the project will be based on the requirements of this policy and legal framework and guide the development of the RAP.

3.2.11 National Guidelines for the Management of COVID-19, 2020

The Contractor and other players in the project will have to follow the Standard Operation Procedures (SOPs) for control of the spread of COVID-19 Pandemic as laid out by Ministry of Health. Among the SOPs is the use of masks, sanitising or washing hands using soap for not less than 20 seconds and social distancing of not less than two metres. Among the guidelines are those for conducting meetings at wrokplaces summarised as indicated below:

i) Meetings should not exceed 20 individuals at work places
ii) All individuals accessing the premises must undergo temperature screening
iii) Ensure provision of adequate hand washing facilities with soap and water or alcohol-based hand rub. Everyone MUST wash and sanitize before entry to these places and as frequently as possible. Handwashing facilities and alcohol based sanitizers should be placed at strategic points like security checks, entrances, bathrooms, toilets, conference/board rooms
iv) Ensure the work areas are clean and hygienic – regularly clean all surfaces with disinfectant (soap and water or JIK) (e.g. chairs, desks and tables, telephones and keyboards) at least three times a day.
v) Provide adequate waste management facilities (waste bins and bin-liners, cans) and ensure availability of properly protected/trained waste handlers with gloves, masks, aprons and protective overalls where necessary.

vi) Avoid overcrowding and body contact. Keep a distance of one meter between each other.
vii) Display posters with information and key messages on COVID-19 in different languages in places that are easily visible (notice boards, doors etc).
viii) Provide guidelines on Do's and Don'ts to every individual who attends meetings at your premises. These include the following:

- Cover your mouth and nose with tissue or a handkerchief when coughing and sneezing. The handkerchief must be washed and ironed by you daily. In case of use of disposable tissue, ensure it is disposed of in a waste bin or a designated area where it can be burnt on a daily basis. In this way, you protect others from any virus released through cough and sneezing
- Wash your hands with soap and water or use an alcohol-based hand rub immediately after using the tissue or handkerchief.
- Maintain a distance of 1 meter from anyone who is coughing or sneezing and remind them that they need to have a face mask to avoid infecting others.
- Avoid touching your eyes, nose and mouth at all times. Hands touch many surfaces including money which can be contaminated with the virus and you can transfer the virus from the surface to yourself.
- Avoid hand-shakes and hugging at all times.
- Do not spit in public. Identify secluded places like pit latrines or toilets for purposes of spitting and wash your hands immediately with soap and water.

3.2.12 Uganda National Land Policy, 2013

The overall goal of the Policy is to ensure an efficient, equitable and optimal utilization and management of Uganda's land resources for poverty reduction, wealth creation and overall socio-economic development. One of the guiding principles of the Land Policy is effective regulation of land use and land development. Objectives vii of this policy is to ensure planned, environmentally-friendly, affordable and orderly development of human settlements for both rural and urban areas, including infrastructure development.

Relevancy: Section 74 (i) states that where it is necessary to execute public works on any land (e.g. construction of water works), an authorized undertaker shall enter into mutual agreement with occupier or owner of the land in accordance with this act hence the need for consent forms from all directly affected people and a relocation procedure.

3.2.13 Uganda National Culture Policy, 2016

The Policy provides a framework for the promotion of culture for development and complies with international and regional instruments on culture. The core principles underlying the Policy are; Promoting Unity in Diversity, respecting one another's' culture, ensuring social inclusion (Children, youth, women, PWDs, elderly, People living with HIV/AIDS and indigenous minorities), promoting cultural change, promoting environmental protection and strengthening partnerships.

Relevancy: The project shall ensure harmony with efforts to promote and enhance the contribution of culture to community empowerment.

3.2.14 National Policy on Elimination of Gender Based violence, 2016

The policy seeks to promote, prevent and respond and end impunity of gender-based violation in the country. The highest prevalence of gender-based violence is among women aged between 15 and 45; and generally, involves sexual violence.

Relevancy: The proposed project shall have specific guidelines on eliminating of gender-based violence throughout project phases. In addition, the project will be required to work with community members, police, teachers, parents and all stakeholders to specifically address ***gender issues.***

3.2.15 National Policy on Disability, 2006

The vision of the policy is a society where people with disabilities (PWDs) fully participate in all spheres of development. The mission is to provide a framework to the empowerment of PWDs in the development process.

Relevancy: The project shall ensure participation of PWDs in the planning, implementation, monitoring and evaluation for all the project phases.

3.2.16 National Youth Policy, 2001

The goal is to provide an appropriate framework for enabling youth to develop social, economic, cultural and political skills so as to enhance their participation in the overall development process and improve their quality of life. The objectives of the policy are to:

i) Initiate, strengthen and streamline all programmes and services targeting the youth.
ii) Promote social and economic empowerment of the youth.
iii) Build capacity and provide relevant training and information to the stakeholders.
iv) Promote growth in the development of the youth through actions that protect empower and prepare them for adulthood.
v) Provide psycho-social support and other services to youth in conflict situations, difficult circumstances and to the disadvantaged groups.
vi) Increase youth involvement in decision--making, leadership, community based and other development programmes.
vii) Mobilise resources for youth programmes and projects at all levels.

Relevancy: The project should include all youth in all phases of the project execution, including planning, construction and operations. Priority for employment should be given to youth from the project area.

3.2.17 National Child Labour Policy, 2007

The overall objective of the policy is to guide and promote sustainable actions aimed at the progressive elimination of child labour starting with the worst forms. The vision of the policy is a society free of explo itative child labour in which all working children enjoy their right to childhood, education, dignity and the full development of their potential

Relevancy: The project shall actively participate in efforts to eliminate child labour during pre-constructi on, construction and post construction. The contractor shall ensure involvement of LC1 leaders in recrui

tment of local labour to ensure underage children are not employed in project works.

3.2.18 National Equal Opportunities Policy, 2006

The National Equal Opportunities Policy provides a framework for re-dressing imbalances, which exist against marginalized groups while promoting equality and fairness for all, with a goal of. Providing avenues where individuals and groups' potentials are put to maximum use by availing equal opportunities and affirmative action.

Relevancy: The Project comes along with a lot of opportunities including service delivery, trainings and employment. The project will avail equal opportunities and affirmative action.

3.3 LEGAL FRAMEWORK

3.3.1 Constitution of the Republic of Uganda, 1995

The 1995 Uganda Constitution provides that every person has a right to own property [Section 26.1] and that no person shall be deprived of property or any interest in or right over property without payment of fair and adequate compensation. The same constitution gives government powers to acquire land (compulsory acquisition) in public interest [Article 273(a)]. The Constitution [Chapter 3, Article 17J] entrusts Government with the duty of ensuring that Ugandans enjoy a healthy environment.

Relevancy: The Constitution is the cardinal law in Uganda upon which all environmental laws and regulations are founded. All environmental impact actions of the project are therefore meant to conform to the broader objectives of the Constitution which requires a healthy environment for all citizenry.

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 rehabilitation and expansion of the water treatment plants at Bungokho and Manafwa; the rehabilitation and expansion of the distribution system and sewer network; extension of water supply services to neighbouring small towns and rural growth centres; rehabilitation and expansion of the sewer network and construction of new wastewater treatment facilities for new drainage areas; and water and sanitation facilities in informal settlements are all aimed at sustainable development for the benefit of the locals and will be done following mitigation measures suggested in this report. All land acquisitions will adhere to provisions of the 1995 National Constitution.

3.3.2 National Environment Act, Act Nr. 5 of 2019

The National Environment Act (Act Nr. 5 of 2019 of Laws of Uganda) establishes and defines functions of NEMA as a body responsible for management, monitoring and supervision of all activities relating to environment (Section 9). This act provides for various strategies and tools for environment management, which also includes the Environmental and Social Assessment (Section X). The Act also mandates NEMA with a leading role to review environmental impact statements. NEMA sets environmental performance and standards (Section XII) to prevent contamination of air, water and soil resources. The Act also mandates NEMA with responsibility for the control of pollution and Environmental emergency preparedness (Part VIII). Sections 26-30 empowers NEMA, urban and district environment committees and local environment committees to be responsible for monitoring of

local land-use plans, which should be in conformity with national land-use plan. Part XV outlines provisions to enable compliance with obligations of international environmental conventions. Section 45 entrusts NEMA, lead agencies and local government environment committees with powers to protect the environment from human activities that could adversely affect it. Section 78 prohibits discharge of hazardous substances, chemicals, oil, etc. into the environment except in accordance with guidelines prescribed by NEMA. Section 22 on the Schedule requires that projects related to sewage disposal should undertake a full EIA.

This Act also formed the basis for enactment of the Environmental Impact Assessment Guidelines, 1997 and Environmental Impact Assessment Regulations, 1998 which together prescribe the EIA process in Uganda.

Relevancy: The Act governs and guides environmental management in Uganda. This ESIA is prepared to conform to the Act's requirement that projects likely to have significant environmental impact undertake an ESIA before they are implemented.

3.3.3 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 own political and administrative set-ups. According to Secti on 9 of the Act, a local government is the highest political and administrative authority in its area of juris diction and shall exercise both legislative and executive powers in accordance with the Constitution.

Relevancy: The project will be under jurisdiction of Mbale, Budaka and Butaleja District Local Governments, which are mandated under the Local Governments Act, Cap 243 to sanction and oversee development projects in their respective local governments. The Environmental Officers for the Districts, the Mbale City and project towns are mandated to inspect and monitor environmental considerations for development projects in their areas of jurisdiction.

3.3.4 Water Act, Cap 152

The Act provides for use, protection and management of water resources and supply; to provide for the constitution of water and sewerage authorities; and to facilitate the devolution of water supply and sewerage undertakings. The act provides for hydraulic works and use of water. Under this section 18(2), a person wishing to construct any works or to take and use water may apply to the Director of Water Development Directorate (DWD).

Relevancy: The Act provides guidance for requirements of implementation of water supply projects. As required by Section 18(2) of this Act, NWSC will apply to DWRM and DWD for permits for abstracting water from River Namatala and discharging effluents to the environment, respectively.

3.3.5 Land Act, Cap 227

The 1995 Constitution restored all private land tenure regimes (which had previously been abolished under the Land Reform Decree, 1975). It divested the state and the Uganda Land Commission of radical title to land that was expropriated in 1975, and vested it directly in the citizens of Uganda. The constitution provides for, inter alia:

- The right of every Ugandan to a clean and healthy environment (Article 39);
- The responsibility of government to enact laws that protect and preserve the environment from degradation and to hold in trust for the people of Uganda such natural assets as lakes, rivers, wetlands, game reserves and national parks [Article 237(2)];
- The right of every Ugandan to fair and adequate compensation in instances of land acquisition.

The Constitution provides that every person has a right to own property and that no person shall be compulsorily deprived of property or any interest in or right over property without prompt payment of fair and adequate compensation, prior to the taking of possession or acquisition of the property.

On land tenure regimes and transfer of land, the Constitution prescribes tenure regimes in accordance with rights and interests held in land. Article 237 of the Constitution, 1995, vests land in the citizens of Uganda and identifies four land tenure systems, namely: *customary*, *freehold*, *mailo* and *leasehold*. Understanding these systems (detailed in section 4 of the Land Act, 1998) is vital for compensation of households to be affected by the project. These tenure systems are outlined below:

Customary tenure: In this tenure, land is owned in perpetuity and tenure is governed by rules generally accepted as binding and authoritative by the class of persons to which it applies (that is, "customary regime is not governed by written law"). Customary occupants are occupant of former public land, and occupy the land by virtue of their customary rights; they have proprietary interest in the land and are entitled to certificates of customary ownership. Certificates for customary ownership are issued by the District Land Board, through application to the Parish Land Committee.

Freehold tenure: This tenure derives its legality from the Constitution. It involves the holding of land in perpetuity or for a period less than fixed by a condition and enables the holder to exercise, subject to the law, full powers of ownership.

Leasehold tenure: Lease tenure is created either by contract or by operation of the law. It is a form of tenure under which the landlord or lessor grants the tenant or lessee exclusive possession of the land, usually for a defined period and in return for a rental fee. The tenant has security of tenure and a proprietary interest in the land. The Constitution and the Land Act also protect "*rights of spouses and children"* with regard to land transactions. The head of household must acquire the consent of spouse and children prior to any sale of land on which the family ordinarily resides.

Mailo land tenure: The Mailo land tenure system is a feudal ownership introduced in Buganda by the British in 1900 under the Buganda Agreement. "Mailo" is a *Luganda* word for "mile" as the original grants under the agreement were measured in square miles. Prior to the 1975 Land Reform Decree, Mailo land was owned in perpetuity by individuals and by the Kabaka (Hereditary King). Since no section of the proposed line traverses Buganda region, this type of tenure does not apply to the project.

Relevancy: These tenure systems will be important during resettlement planning. Detail of land take and compensation are addressed in the line project resettlement action plan (RAP).

3.3.6 Land Acquisition Act, 1965

The Act requires that adequate, fair and prompt compensation is paid before taking possession of land

and property. Dispute arising from the compensation to be paid should be referred to the court for decision if the Land Tribunal cannot handle.

Relevancy; the key consideration regarding this Act in the project is to ensure land owners affected by the project are adequately and timely compensated. All land acquisitions, if any, regarding this project will be guided by this Act.

3.3.7 Public Health Act, Cap 281

The Public Health Act aims at avoiding pollution of environmental resources that support health and live lihoods of communities. It gives local authorities powers (Section 103) to prevent pollution of watercours es in interest of public good.

Relevancy: One of the components of this project is sanitation (sewage treatment plant and public sanit ation facilities). The disposal of waste from the proposed sewage treatment system will have to be appr opriately managed so as to prevent risk to public health, in line with the provisions of this Act.

3.3.8 Investment Code Act, Cap 92

Section 18(2) (d) of the Act requires an investor to take necessary steps to ensure that development and operation of an investment project do not cause adverse ecological and socio-economic impacts.

Relevancy: NWSC and DWD are the implementing agencies for the project that received funding from the World Bank. This ESIA is in partial fulfillment of the requirements of this Act, since adverse ecological and socio-economic impacts as a result of the project implementation have been identified and mitigation measures developed.

3.3.9 National Water and Sewerage Corporation Statute, 1995

Section 3 of this statute, states that the NWSC shall operate and provide water and sewerage services in areas entrusted to it under the Water Statute of 1995.

Relevancy: Some of the functions that are mentioned in the NWSC Statute include (a) management of water resources in ways which are beneficial to the people of Uganda (b) provision of water and sewerage services (c) development of water and sewerage systems in urban centres and big National Institutions throughout the country. NWSC is therefore fulfilling one of its mandates to supply water to the Mbale City and the neighbouring small towns.

3.3.10 Employment Act, 2006

Employment Act, 2006 repeals the Employment Act (Cap 219) enacted in 2000. This Act is the principal legislation that seeks to harmonize relationships between employees and employers, protect workers interests and welfare and safeguard their occupational health and safety through:

i) Prohibiting forced labour, discrimination and sexual harassment at workplaces (Part II; Part IV).
ii) Providing for labour inspection by the relevant ministry (Part III).
iii) Stipulating rights and duties in employment (weekly rest, working hours, annual leave, maternity and paternity leaves, sick pay, etc. (Part VI).
iv) Continuity of employment (continuous service, seasonal employment, etc. (Part VIII).

This Act is relevant to the project both during the construction and operational phase.

Relation to the project: The Act will govern labour type and conditions under which persons hired by the project work. It prohibits Child labour (a condition the contractor must comply with) as well as providing guidance on work rights during the post-construction phase.

3.3.11 Occupational Safety and Health Act, 2006

The Act replaces the Factories Act (1964). It departs from the original listing of "don'ts" and adopts a scientific approach in which technical measures required for protection of workers are prescribed, hence taking on a "preventive approach". The Act provides for prevention and protection of persons at all workplaces from injuries, diseases, death and damage to property. It covers not just the "factory" (as did the Factories Act) but also any workplace where persons are employed and its provisions extend not just to employees but to any other persons that may be legitimately present in a workplace and are at risk of injury or disease. Employers must protect workers from adverse weather and provide clean and healthy work environment, sanitary conveniences, sanitary and protective gear.

Relevancy: The Act is applicable in relation to the protection of the project workers, during both construction and operation phases, against injuries during execution of their duties or work.

3.3.12 Workers' Compensation Act, Cap 225

This Act shall apply to all employment within Uganda. and shall apply to workers employed by or under the Government of Uganda in the same way and to the same extent as if the employer were a private person, but the Act shall not apply to active members of the armed forces of Uganda. If personal injury by accident arises out of and in the course of a worker's employment, the injured worker's employer shall be liable to pay compensation in accordance with this Act. The employer shall not be liable in respect of an injury which does not either result in permanent incapacity or incapacitate the worker for at least three consecutive days from earning full wages at the work at which he or she was employed.

Relevancy: Considering that construction activities are associated with occurrence of various accidents, this law should be applied in case of any injuries arising to any of the workers in the due course of construction activities.

3.3.13 NSSF Act, Cap 222

The National Social Security Fund is a mandatory pure defined contribution provident fund which pays lump sums at retirement. The contribution rate to NSSF is 15% shared at 5% and 10% between the employee and employer respectively. The scheme was created by the National Social Security Fund Act (Cap 222) Laws of Uganda and its core objective is to protect formal employees against uncertainties of social and economic life.

Relevancy: The contractor shall ensure that all permanent and eligible employees should be subject to NSSF registration and their contributions promptly remitted.

3.3.14 Labour Disputes (Arbitration and Settlement Act), 2006

This Act provides for matters relating to the management of industrial relations and settlement of labour

related disputes. Under section 3 and 4, the act establishes the office of the Labour Officer and requires referral of labour disputes to the Labour Officer who should ensure timely reaction. Under section 7, the Act establishes an Industrial Court to arbitrate on labour disputes and adjudicate upon questions of law and fact arising for references to Industrial court by any other law.

Relevancy: The construction of the project shall employ several employees and may also employ subcontractors providing various services. Any dispute settlement between the contractor, subcontractors and employees will be managed in accordance with this Act.

3.3.15 Physical Planning Act, 2010

This Act replaced the Town and Country Planning Act, Cap 246 which was enacted in 1951 and revised in 1964 but is now inconsistent with contemporary government system in Uganda. The 1951 Act was enacted to regulate and operate in a centralised system of governance where physical planning was carried out at national level through the Town and Country Planning Board. Implementation of the Act was supervised by local governments, especially the urban local governments.

Uganda has since gone through many social, political and economic changes. For example, promulgation of the 1995 Constitution established a decentralised system of governance which divulged powers and functions including physical planning, finance and execution of projects from the central government to local governments. This therefore created a need to enact a physical planning legislation which is consistent with this Constitutional requirement. The Physical Planning Act, 2010 establishes district and urban physical planning committees, provides for making and approval of physical development plans and applications for development.

Section 37 of The Physical Planning Act, 2010 requires an EIA permit for developments before they are implemented. It states:

"Where a development application related to matters that require an environmental impact assessment, the approving authority may grant preliminary approval subject to the applicant obtaining an EIA certificate in accordance with the National Environment Act".

Relevancy: NWSC and DWD shall use established guidelines for planning schemes, to acquire land and compensate for acquired lands, as well as safeguarding the natural environment, in line with the provisions of this Act. This ESIA is being conducted in fulfillment of Section 37 of the Act.

3.3.16 The Domestic Violence Act , 2010

This Act provides for the protection and relief of victims of domestic violence; punishment of perpetrators of domestic violence and empowerment of the family and children court towards handling domestic violence cases and related matters.

Relevancy: Construction activities will involve interaction of workers recruited from different parts of the country with different behaviours. Construction workers earn disposable income and usually do not move to project areas with their partners. As such, they may engage in sexual relations with married men/women in the communities and give rose to domestic violence in such homes. Violent acts are also possible among workers themselves and these may manifest in terms of sexual abuse and

harassment and physical assault among others. The contactor shall implement all measures possible to minimize domestic violence in accordance to this Act.

3.3.17 The Penal Code Act, Cap 120 (as Amended, 2007)

The Penal Code Act, 1950 was amended in 2007 and only a few sections were replaced, amended and/or repealed. The following is relevant to this project: the principal Act was amended by substituting for section 129 a section for "Defilement of persons under eighteen years of age. Section 129 (1) spells out the punishment for defilement; Any person who performs a sexual act with another person who is below the age of eighteen years, commits a felony known as defilement and is on conviction liable to life imprisonment.

Relevancy: The project will fetch a lot of workers from different regions. There being a number of schools in the project area, this will pose a risk on the school going children. The penal code defines all crimes and their respective penalties. Therefore, any worker or sub-contractor shall have to abide by the existing laws and any one that breaks the law shall be dealt with according to the Act. The Local Councils and Uganda Police shall be involved in project operations and the contractor shall be required to cooperate with these entities to ensure crime control in regards to project operations.

3.3.18 Historical Monuments Act, 1967

This Act was assented to on 21st October 1967, and came into force on 15th May 1968. It provides for preservation and protection of historical monuments and objects of archaeological, paleontological, ethnographical and traditional interest. According to this Act, the responsible Minister may, by statutory instrument, declare any object of archaeological, paleontological, ethnographical, traditional or historical interest to be a protected object. Once thus declared, the Act adds, no person whether owner or not shall do any of the following:

- Excavate soil so as to affect to its detriment, any object declared to be preserved or protected.
- Make alteration, addition to, or repair, destroy, deface or injure any object declared to be preserved or protected.

Sub-section 12(1) requires that any portable object discovered in the course of an excavation shall be surrendered to the Minister who shall deposit it in the Museum. The Act adds that, notwithstanding provisions of the subsection, where any object is discovered in a protected site, place, or monument, the owner of the protected site, place, or monument shall be entitled to reasonable compensation.

Relevancy: This Act requires that any chance finds encountered during project construction shall be preserved by the Department of Monuments and Museum in the Ministry of Tourism, Wildlife and Heritage.

3.3.19 The Mining Act, Cap. 148

Stone quarry sites and gravel borrow pits will be necessary for materials needed to construct the concrete works of the project components. Therefore applicable licenses shall be obtained from the Commissioner of the Geological Survey and Mines. The Mining Act of 2003 regulates mining developments including set up of new quarries and/or sandpits. Relevant environmental studies required for this license application are described in Part XI. The extraction of stone/aggregate and

murram materials will be undertaken in line with the provisions of this Act. Issues of restoration of the sites after extraction of murram will be of key importance after construction of the proposed project.

Relevancy: This Act will apply to the project's contractors who will be required to obtain license for extraction of stone/ aggregate and murram materials required for construction.

3.3.20 Children Act, Cap 59

The Act provides for the reform and consolidation of the law relating to children; to provide for the care, protection and maintenance of children; to provide for local authority support for children; to establish a family and children court; to make provision for children charged with offences and for other connected purposes. Part I section 5 states that: (1) it shall be the duty of a parent, guardian or any person having custody of a child to maintain that child and, in particular, that duty gives a child the right to— education and guidance; immunisation; adequate diet; clothing; shelter; and medical attention; and (2) any person having custody of a child shall protect the child from discrimination, violence, abuse and neglect. Part I, Section 8 protects children against harmful employment. No child shall be employed or engaged in any activity that may be harmful to his or her health, education or mental, physical or moral development.

Relevancy: During the construction and operation phases child labour must not be used as required by this law.

3.4 REGULATIONS, STANDARDS AND GUIDELINES

3.4.1 National Environment (Environmental and Social Assessment) Regulations, 2020

The regulations require a detailed study to determine possible environmental impacts and mitigation measures. The guidelines require that the ESIA process should be participatory engaging the public and stakeholders in consultations or to inform them and obtain their views about the proposed development during the ESIA.

Relevancy: Conducting of this ESIA in compliance with requirements of these regulations.

3.4.2 The Water Resources Regulations, 1998

With regard to water abstraction, Part II: Section 3 Sub-section (1) of these regulations requires application for Water Permits by anyone who: (a) Occupies or intends to occupy any land; (b) Wishes to construct, own, occupy or control any works on or adjacent to the land referred to in regulation 10; may apply to the Director for a water permit.

Relevancy: NWSC intends to construct an intake and abstract water from River Namatala and should therefore fulfil the requirements of these regulations.

3.4.3 National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, 2020

Section 5 of the regulations requires that a person shall not discharge effluent into water or land except in accordance with the Act, the Water Act, the National Environment (Waste Management) Regulations, 2020, the Petroleum (Waste Management) Regulations, 2019, the Water (Waste Discharge) Regulations, these Regulations and environmental standards. Schedules 2 - 4 to these regulations

details maximum permissible limits for 70 regulated contaminants, which must not be exceeded before effluent is discharged into water or on land. A few commonly regulated parameters in sewage and wash / oily effluent from a construction site are indicated in Table 3-1.

Table 3-1: National discharge standards for selected pollutants

Parameter	National discharge standards
Temperature increase	≤ 5°C
Odour	Not detectable
Colour	50 TCU
pH	5.0 – 8.5
Electrical Conductivity	1000 µS/cm
Total Dissolved Solids	750 mg/L
Total Suspended solids (mg/l)	50 mg/L
Biological Oxygen Demand (Unfiltered)	50 mg/L
Chemical Oxygen Demand	70 mg/L
Cyanide (Free)	0.1 mg/L
Cyanide (AD)	0.5 mg/L
Cyanide (Total)	0.1 mg/L
Nitrogen (Total)	10 mg/L
Nitrogen (Ammonia)	10 mg/L
Nitrogen (Nitrates)	10 mg/L
Total Kjeldahl Nitrogen	10 mg/L
Phosphorus (Total)	5 mg/L
Sulphates	500 mg/L
Chlorides	250 mg/L
Chlorine (Residual)	0.2 mg/L
Total coliforms	400 counts/ 100ml
Phenols (µg/l)	0.5 mg/l
Oil and grease (mg/l)	10 mg/l

Source: The National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, 2020

Table 3-2: Indicative values for treated sanitary sewage discharges

Pollutant	Unit	Guideline Value
pH	mg/l	6 – 9
BOD	mg/l	30
COD	mg/l	125
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Oil and grease	mg/l	10
Total suspended solids	mg/l	50
Total coliform bacteria	Most Probable Number/100 ml	400[a]

Source: IFC/WB General EHS Guidelines

Relevancy: Effluent discharged from the wastewater treatment plant should conform to these regulations. Since the project is funded by World Bank, the one that is more stringent, that is, Uganda regulations or WBG EHS Guidelines (Table 3-2) will override.

3.4.4 National Environment (Noise Standards and Control) Regulations, 2003

Part III Section 8 (1) requires facility operators, to use the best practicable means to ensure that the

emission of noise does not exceed the permissible noise levels. The regulations require that persons to be exposed to occupational noise exceeding 85 dBA for eight hours in a day should be provided with requisite hearing protection.

Table 3-3: Regulatory noise limits

Facility	Noise limits dB (A) (Leq)	
	Day*	Night*
Construction sites	60	50
Mixed residential (with some commercial and entertainment)	55	45
*Time frame: Day 6.00 a.m -10.00 p.m; Night 10.00 p.m. - 6.00 a.m.		

Source: The National Environment (Noise Standards and Control) Regulations, 2003.

Relevancy: Both during construction and operation of the water supply and sanitation facilities, noise generated should not exceed limits prescribed by these regulations.

3.4.5 The National Environment (Wetlands, River Banks and Lakeshores Management) Regulations, 2000

Regulation 12(1) prohibits any person from carrying out an activity in a wetland without a permit issued by the Executive Director of NEMA. Under regulation 34(1), a developer desiring to conduct a project which may have significant impact on a wetland (for example dredging), river bank or lake shore, shall be required to carry out an environmental impact assessment in accordance with sections 20, 21, and 22 of the NES.

In Regulation 17 (1), every landowner, occupier or user who is adjacent or contiguous with a wetland shall have a duty to prevent the degradation or destruction of the wetland and shall maintain the ecological and other functions of the wetland. The tool used under these Regulations to ensure compliance is the permit. The Executive Director of NEMA can only permit activities in a wetland if he or she is satisfied that such activities shall not degrade the wetland in question.

Relevancy: Prior to any dredging works at River Namatala and discharge of effluent from the WSP into the environment, NWSC will seek permission from executive Director of NEMA, as provided for in these Regulations.

3.4.6 National Environment (Waste Management) Regulations, 2020

These regulations require waste disposal in a way that would not contaminate water, soil, and air or impact public health. According to the regulations, waste haulage and disposal should be done by licensed entities. These Regulations will apply to:

- All categories of hazardous and non-hazardous waste; and
- Storage and disposal of construction waste.

Relevancy: The regulations will relate to overall waste management of the project as wastes will be generated by both construction and operation & maintenance activities.

3.4.7 Draft National Air Quality Standards, 2006

The draft national air quality standards provide the following regulatory limits (Table 3-4).

Table 3-4: Uganda's regulatory air quality standards for selected pollutants

Pollutant	Averaging time for ambient air	Standard for ambient air
Carbon dioxide (CO_2)	8 hour	9.0 ppm
Carbon monoxide (CO)	8 hour	9.0 ppm
Hydrocarbons	24 hour	5 mg m^{-3}
Nitrogen oxides (NO_x)	24 hour 1 year arithmetic mean	0.10 ppm
Smoke	Not to exceed 5 minutes in any one hour	Ringlemann scale No.2 or 40% observed at 6m or more
Soot	24 hour	500 µg Nm^{-3}
Sulphur dioxide (SO_2)	24 hour	0.15 ppm
Sulphur trioxide (SO_3)	24 hour	200 µg Nm^{-3}

Note: ppm = parts per million; "N" in µg/Nm-3 connotes normal atmospheric conditions of pressure and temperature (25oC and 1 atmosphere).

Relevancy: These standards will apply particularly during construction of all project components. There should be a justification for applying a less stringent limit value, or in the absence of an acceptable justification, the EHS guidelines (Table 3-5) will apply.

Table 3-5: World Health Organisation (WHO) ambient air quality guidelines

Pollutant	Averaging Period	Guideline value in µg/m^3
Sulphur dioxide (SO2)	24-hour 10 minute	20 500
Nitrogen dioxide (NO2)	1-year 1-hour	40 200
Particulate Matter PM10	1-year 24-hour	20 50
Particulate Matter PM2.5	1-year 24-hour	10 25
Ozone	8-hour daily maximum	100

Source: IFC/WB General EHS Guidelines

3.4.8 The Water Supply Regulations, 1999

The Water Supply Regulations, 1999 manage the water supply works including:

a) Permits requirements and procedures for water supply works by authority or connection to land owner (Division 1, clauses 4 to 6);
b) Application, examination and approval of Water supply plan (Division 2, clauses 7 to 11);
c) Cost of works, security deposit, inspection of works and plenty for violation (Division 2, clauses 12 to 18);
d) Metering system and charging rates (Part III, clauses 19 to 21).

3.4.9 National Environment (Audit) Regulations, 2020

Part I (2) requires an environmental audit to be undertaken to ensure compliance by the developer with

the Act, regulations and standards made under the Act, conditions in permits and licences and any other applicable law, environment management systems and the environmental management and monitoring plan of the developer. Part III, Section 12, Sub-section (1) requires the developer of a project listed under Schedule 3 of these regulationsto carry out an Environmental Compliance Audit.

Relevancy: The project will involve construction and operation of water supply and sanitation facilities that have a potential to impact negatively of the environment. Therefore NWSC and MWE should conduct Environmental Audits to assess if there are impacts, to what extent and mitigate them.

3.4.10 National Environment (Minimum Standards for Management of Soil Quality) Regulations, 2001

Section 12 of this Act requires compliance with prescribed measures and guidelines for soil conservation for the particular topography, drainage and farming systems, contravention of which constitutes an offence.

Relevancy: The regulations will be relevant in regard to prevention of contamination of land covered by the project infrastructure. The regulations will apply to waste disposal practices during construction, operation, repair and maintenance. These regulations are also relevant to the project, since development will require construction activities in areas prone to soil erosion and landslides due to unstable slopes (slopes > 10%).

3.5 INSTITUTIONAL FRAMEWORK

3.5.1 National Environmental Management Authority (NEMA)

The National Environmental Act, Cap 153 establishes NEMA as the principal agency responsible for coordination, monitoring and supervision of environmental conservation activities. NEMA is under the Ministry of Water and Environment (MWE) but has a cross-sectoral mandate to oversee the conduct of EIAs through issuance of guidelines, regulations and registration of practitioners. It reviews and approves environmental impact statements in consultation with any relevant lead agencies.

NEMA works with District Environment Officers and local environment committees at local government levels who also undertake inspection, monitoring and enforce compliance on its behalf. In Government ministries, NEMA works with Environmental Liaison Units to ensure incorporation of environmental issues in their activities, policies and programs.

Role in the project: NEMA will:

- *Review and approve the ESIA report (ESIS)*
- *Through the Project Districts' Environment Officers, undertake environmental monitoring during project implementation.*

3.5.2 National Water and Sewerage Corporation (NWSC)

The National Water and Sewerage Corporation (NWSC) Statute establishes the NWSC as a Water and Sewerage Authority and gives it the mandate to operate and provide water and sewerage services in areas entrusted to it on a sound commercial and viable basis. NWSC is a parastatal that operates and

provides water and sewerage services for 111 urban centres across the country, of which Mbale City is part. Sector reforms in the period 1998-2003 included commercialization and modernization of the NWSC operating in cities and larger towns as well as decentralization and private sector participation in small towns. NWSC also operates small conventional sewage treatment plants in a series of towns.

3.5.3 Ministry of Water and Environment (MWE)

The Ministry of Water and Environment (MWE) has the responsibility for setting national policies and standards, managing and regulating water resources and determining priorities for water development and management.

It also monitors and evaluates sector development programmes to keep track of their performance, efficiency and effectiveness in service delivery. MWE has three directorates:

- Directorate of Water Resources Management (DWRM);
- Directorate of Water Development (DWD); and
- Directorate of Environmental Affairs (DEA).

The Directorate of Water Resource Management (DWRM) is responsible for water resources panning and regulation, monitoring and assessment and water quality management. DWRM has the following key functions:

- **Water Quality Management** in all Uganda's water bodies; and
- **Regulation and use of water resources in Uganda**

Any person abstracting water from a lake, river or from underground sources using a motorized pump; discharging wastewater into the environment; drilling for water; or constructing dams and other hydraulic structures on water bodies is required to apply for a water permit according to the Water Act. These permits are issued by DWRM.

The Directorate of Water Development (DWD) is responsible for urban water supply, water for production, rural water supply and urban water regulation.

The Directorate of Environmental Affairs (DEA) comprises:

- ***Climate Change Unit (CCU),*** whose main objective is to strengthen Uganda's implementation of the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol (KP);
- Environment Support Services (ESS);
- ***Forest Sector Support Department (FSSD***) that promotes efficient and effective governance of the forestry sector;
- ***Metrology Department*** that monitors weather and climate, exchange data/information and products and issue advisories to the nation; and
- ***Wetlands Management Department (WMD)*** which protects wetland resources in Uganda.

MWE also oversees autonomous agencies namely the NFA and NEMA.

Role in the project: Overall, this Ministry is responsible for environmental and water resources management in Uganda. MWE is also responsible for ensuring good catchment health. In absence of national guidelines, DWRM is expected to provide guidance on determination of environmental flow for the river.

3.5.4 Ministry of Lands, Housing and Urban Development (MoLHUD)

MoLHUD is responsible for providing policy direction, national standards and coordination of all matters concerning lands, housing and urban development. It is responsible for putting in place policies and initiating laws that ensure sustainable land management and promote sustainable housing for all and foster orderly urban development in the country. Through the MoLHUD, the government facilities the provision and improvement of urban infrastructure and utilities while ensuring management and maintenance of the provided facilities. The Ministry has put in place strategies to prepare Sewerage Master Plan as well as provision of a centralised sewage treatment system and a drainage system for urban areas.

The ministry also has strategies in place to promote a culture of maintenance for the urban infrastructures and facilities including sewerage systems.

3.5.5 Ministry of Gender, Labour & Social Development (MGLSD)

The Ministry sets policy direction and monitoring functions related to labour, gender and general social development. Its OHS Department in the ministry is responsible for inspection and mentoring of occupational safety in workplaces and this could be during project construction and operation of the laboratory facilities.

Role in the project: The OHS Department in this Ministry will be responsible for undertaking inspections of construction sites to ensure safe working conditions.

3.5.6 District Local Administration Structures

The proposed project is within the jurisdiction of Mbale, Budaka and Butaleja District Local Governments headed by a Local Council V (LC V) Chairman and Chief Administration Officer (CAO) who are the political head and technical head respectively. Various district offices whose functions would be relevant to the project include offices of Natural Resources/Environment, District Health Inspector, District Planner, Community Development Officer, District Director of Health Services, District Water Officer, Town Council and District Engineer. Equally important are village-level local council administration (LC I and LC III). Leaders at these levels of local administration are closer to residents and therefore important in effective community mobilization, sensitization and dispute resolution given that the laboratory is also going to serve cross-border communities.

Role in the project: Local government structures are important for mobilising support for the project as well as monitoring its social-environmental impacts both during construction and operation phases.

3.5.7 Uganda National Roads Authority (UNRA)

Uganda National Roads Authority (UNRA) was established by an Act of Parliament: The Uganda National Authority Act, No. 15 of 2006 and became operational on 1st July 2008. The mandate of UNRA

is to develop and maintain national roads network, advise Government on general roads policy and contribute to addressing transport constraints to development.

Role in the project: One of UNRA's responsibilities is the establishment and maintenance road reserves. Given that the water pipelines are in some places located in the road reserve especially on the Mbale-Tirinyi road, UNRA has to be informed so that any plans with respect to the project area takes into consideration the pipeline.

3.5.8 Ministry of Tourism, Wildlife and Heritage

In this ministry d found the Department of Monuments and Museums mandated to protect, promote and present the cultural and natural heritage of Uganda through collection, conservation, study and information dissemination for enjoyment and education.

The department's key functions are:

a) Research about natural and cultural heritage;
b) Conservation and maintenance of important Physical Cultural Resources or Heritage Collections;
c) Provision of professional knowledge and information on the archaeology and palaeontology of Uganda;
d) Publication of research findings in appropriate publications;
e) Exhibition and interpretation of specimens for public study and enjoyment;
f) Monitoring implementation policies and strategies of historical and cultural heritage conservation and development;
g) Development of strategies for community participation in cultural heritage;
h) Promote public awareness about cultural and natural heritage through formal and informal education; and
i) Provide technical guidelines to the private investors.

Role in the project: This Ministry will be responsible for preservation of any chance finds encountered during project implementation.

3.6 PROJECT CLASSIFICATION FOR ESIA PURPOSES

3.6.1 Classification according to Uganda's National Environment Act, 2019

The *Fifth Schedule* of the National Environment Act (2019) prescribes projects for which EIA is mandatory and according to Section 1 and Sections 4 (a) and 22 (b & c) in this Schedule, the project should undertake detailed EIA.

3.6.2 Project Classification according to World Bank

The Bank classifies a proposed project into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

Category A: A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. The project impacts may affect an area broader than the sites or facilities subject to physical works. Environmental assessment for a

Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives including the "without project" situation, and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

Category B: A proposed project is classified as Category B if it's potential adverse environmental impacts on human populations or environmentally important areas, including wetlands, forests, grasslands, and other natural habitats, are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than for Category A projects. Here the assessment also involves examination of the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

Category C: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further environmental assessment is required for a Category C project.

Category FI: A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.

The proposed project is classified as EA Category B. The proposed construction and operation of the water supply facilities will be restricted within the user-communities. The project will not significantly affect ecosystems such wetlands, forests, grasslands, etc as compared to a Category A project.

3.7 WORLD BANK ENVIRONMENTAL AND SOCIAL STANDARDS

The objective of the World Bank's environmental and social safeguard policies is to prevent and mitigate undue harm to people and their environment during the development process. These policies provide guidelines for bank and borrower staff in the identification, preparation, and implementation of programs and projects. Safeguard policies provide a platform for the participation of stakeholders in project design, and are an important instrument for building ownership among local populations (World Bank, 2006). The triggered safeguard policies are presented in the sub-sections below.

3.7.1 OP/BP 4.01 - Environmental Assessment

The World Bank's environmental assessment policy and recommended processing are described in Operational Policy (OP)/Bank Procedure (BP) 4.01: Environmental Assessment (Table 3-6). Its purpose is to improve decision making, to ensure that all options under consideration are sound and sustainable, and that potentially affected people have been properly consulted. Environmental Assessment (EA) is one of the 10 environmental, social, and legal Safeguard Policies of the World Bank. EA is used in the World Bank to identify, avoid, and mitigate the potential negative environmental impacts associated with Bank lending operations. This policy is considered to be the umbrella policy for the Bank's environmental 'safeguard policies'.

Table 3-6: WB OP/BP 4.01 Environmental Assessment (Jan 1999)

Objectives	Operational Principals
To help ensure the environmental and social soundness and sustainability of investment projects.	1. Use a screening process for each proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment (EA) so that appropriate studies are undertaken proportional to potential risks and to direct, and, as relevant, indirect, cumulative, and associated impacts. Use sectorial or regional environmental assessment when appropriate.
	2. Assess potential impacts of the proposed project on physical, biological, socio-economic and physical cultural resources, including trans-boundary and global concerns, and potential impacts on human health and safety.
	3. Assess the adequacy of the applicable legal and institutional framework, including applicable international environmental agreements, and confirm that they provide that the cooperating government does not finance project activities that would contravene such international obligations.
	4. Provide for assessment of feasible investment, technical, and siting alternatives, including the "no action" alternative, potential impacts, feasibility of mitigating these impacts, their capital and recurrent costs, their suitability under local conditions, and their institutional, training and monitoring requirements associated with them.
	5. Where applicable to the type of project being supported, normally apply the Pollution Prevention and Abatement Handbook (PPAH). Justify deviations when alternatives to measures set forth in the PPAH are selected.
	6. Prevent and, where not possible to prevent, at least minimize, or compensate for adverse project impacts and enhance positive impacts through environmental management and planning that includes the proposed mitigation measures, monitoring, institutional capacity development and training measures, an implementation schedule, and cost estimates.
	7. Involve stakeholders, including project-affected groups and local nongovernmental organizations, as early as possible, in the preparation process and ensure that their views and concerns are made known to decision makers and taken into account. Continue consultations throughout project implementation as necessary to address EA-related issues that affect them.
	8. Use independent expertise in the preparation of EA where appropriate. Use independent advisory panels during preparation and implementation of projects that are highly risky or contentious or that involve serious and multi-dimensional environmental and/or social concerns.
	9. Provide measures to link the environmental assessment process and findings with studies of economic, financial, institutional, social and technical analyses of a proposed project.
	10. Provide for application of the principles in this Table to subprojects under investment and financial intermediary

Objectives	Operational Principals
	activities.
	11. Disclose draft EA in a timely manner, before appraisal formally begins, in an accessible place and in a form and language understandable to key stakeholders.

Relevancy: The Project triggers this policy because although there is justification for the proposed water supply and sanitation infrastructure in the project districts, there are also environmental impacts associated with the construction and operation of these facilities. OP 4.01 requires an Environmental Assessment (EA) of projects proposed for WB financing to ensure that they are environmentally sound and sustainable, and thus to improve decision making. In this regard, a comprehensive Environmental and Social Impact Assessment has been undertaken by the Proponent to establish a detailed Environmental Management Plan that will provide guidelines for environmental stewardship of the construction and operational phases of the Project.

3.7.2 OP/BP 4.04 - Natural Habitats

This OP seeks to ensure that World Bank-supported infrastructure and other development projects take into account the conservation of biodiversity, as well as the numerous environmental services and products which natural habitats provide to human society. The policy strictly limits the circumstances under which any Bank-supported project can damage natural habitats (land and water areas where most of the native plant and animal species are still present). Specifically, the policy prohibits Bank support for projects which would lead to the significant loss or degradation of any Critical Natural Habitats, whose definition includes those natural habitats which are either:

- Legally protected,
- Officially proposed for protection, or
- Unprotected but of known high conservation value.

Table 3-7: WB OP/BP 4.04 Natural Habitats (June 2001)

Objectives	Operational Principals
To promote environmentally sustainable development by supporting the protection, conservation, maintenance, and rehabilitation of natural habitats and their functions.	1. Use a precautionary approach to natural resources management to ensure opportunities for environmentally sustainable development. Determine if project benefits substantially outweigh potential environmental costs.
	2. Avoid significant conversion or degradation of critical natural habitats, including those habitats that are (a) legally protected, (b) officially proposed for protection, (c) identified by authoritative sources for their high conservation value, or (d) recognized as protected by traditional local communities.
	3. Where projects adversely affect non-critical natural habitats, proceed only if viable alternatives are not available, and if appropriate conservation and mitigation measures, including those required to maintain ecological services they provide, are in place. Include also mitigation measures that minimize habitat loss and establish and maintain

Objectives	Operational Principals
	an ecologically similar protected area.
	4. Whenever feasible, give preference to siting projects on lands already converted.
	5. Consult key stakeholders, including local nongovernmental organizations and local communities, and involve such people in design, implementation, monitoring, and evaluation of projects, including mitigation planning.
	6. Provide for the use of appropriate expertise for the design and implementation of mitigation and monitoring plans.
	7. Disclose draft mitigation plan in a timely manner, before appraisal formally begins, in an accessible place and in a form and language understandable to key stakeholders.

Relevancy: The Project activities have limited potential to trigger this policy as most of the project areas are highly disturbed by agricultural and commercial activities..

3.7.3 OP 4.36 – Forests

The Bank's forests policy aims to reduce deforestation, enhance the environmental contribution of forested areas, promote reforestation, reduce poverty, and encourage economic development. Combating deforestation and promoting sustainable forest conservation and management have been high on the international agenda for two decades. However, little has been achieved so far and the world's forests and forest dependent people continue to experience unacceptably high rates of forest loss and degradation. Success in establishing sustainable forest conservation and management practices depends not only on changing the behaviour of all critical stakeholders, but also on a wide range of partnerships to accomplish what no country, government agency, donor, or interest group can do alone.

Table 3-8: WB OP/BP 4.36 Forests (November 2002)

Objectives	Operational Principals
To realize the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development, and protect the vital local and global environmental services and values of forests.	1. Screen as early as possible for potential impacts on forest health and quality and on the rights and welfare of the people who depend on them. As appropriate, evaluate the prospects for new markets and marketing arrangements.
	2. Do not finance projects that would involve significant conversion or degradation of critical forest areas or related critical natural habitats, or that would contravene applicable international environmental agreements.
	3. Do not finance natural forest harvesting or plantation development that would involve any conversion or degradation of critical forest areas or related critical natural habitats.
	4. Support projects that adversely impact non-critical natural forests or related natural habitats only if viable alternatives to the project are not available

Objectives	Operational Principals
	and only if appropriate conservation and mitigation measures are in place.
	5. Support commercial, industrial-scale forest harvesting only when the operation is certified, under an independent forest certification system, as meeting, or having a time-bound action plan to meet, internationally recognized standards of responsible forest management and use.
	6. Ensure that forest restoration projects maintain or enhance biodiversity and ecosystem functionality and that all plantation projects are environmentally appropriate, socially beneficial and economically viable
	7. Give preference to small-scale community-level management approaches where they best reduce poverty in a sustainable manner
	8. Support commercial harvesting by small-scale landholders, local communities or entities under joint forest management where monitoring with the meaningful participation of local communities demonstrates that these operations achieve a standard of forest management consistent with internationally recognized standards of responsible forest use or that they are adhering to an approved time-bound plan to meet these standards.
	9. Use forest certification systems that require: a) compliance with relevant laws; b) recognition of, and respect for, legal or customary land tenure and use rights as well as the rights of Indigenous Peoples and workers; c) measures to enhance sound community relations; d) conservation of biological diversity and ecological functions; e) measures to maintain or enhance environmentally sound multiple benefits from the forest; f) prevention or minimization of environmental impacts; g) effective forest management planning; h) active monitoring and assessment of relevant forest management areas; and i) independent, cost effective, third-party assessment of forest management performance against measurable performance standards defined at the national level and compatible with internationally accepted principles and criteria of sustainable forest management through decision making procedures that are fair, transparent,

Objectives	Operational Principals
	independent, designed to avoid conflict of interest and involve the meaningful participation of key stakeholders, including the private sector, Indigenous Peoples, and local communities.
	10. Disclose any time-bound action plans in a timely manner, before appraisal formally begins, in an accessible place and in a form and language that are understandable to key stakeholders.

Relevancy: The Project activities have limited potential to trigger this policy as only a few planted trees will be affected especially along the water pipelines. Most of the project areas are highly disturbed by agricultural and commercial activities.

3.7.4 OP 4.11 - Physical Cultural Resources

Cultural resources are important as sources of valuable historical and scientific information, as assets for economic and social development, and as integral parts of a people's cultural identity and practices. The loss of such resources is irreversible, but fortunately, it is often avoidable. The objective of OP/BP 4.11 on Physical Cultural Resources is to avoid, or mitigate, adverse impacts on cultural resources from development projects that the World Bank finances.

Table 3-9: WB OP/BP 4.11 Physical Cultural Resources (July 2006)

Objectives	Operational Principals
To assist in preserving physical cultural resources and avoiding their destruction or damage. PCR includes resources of archaeological, paleontological, historical, architectural, and religious (including graveyards and burial sites), aesthetic, or other cultural significance.	1. Use an environmental assessment (EA) or equivalent process to identify PCR and prevent or minimize or compensate for adverse impacts and enhance positive impacts on PCR through site selection and design.
	2. As part of the EA, as appropriate, conduct field based surveys, using qualified specialists
	3. Consult concerned government authorities, relevant non-governmental organizations, relevant experts and local people in documenting the presence and significance of PCR, assessing the nature and extent of potential impacts on these resources, and designing and implementing mitigation plans.
	4. For materials that may be discovered during project implementation, provide for the use of "chance find" procedures in the context of the PCR management plan or PCR component of the environmental management plan.
	5. Disclose draft mitigation plans as part of the EIA or equivalent process, in a timely manner, before appraisal formally begins, in an accessible place and in a form and language that are understandable to key stakeholders.

Relevancy: The activities of the Project have limited potential to trigger this policy as the only cultural resources identified, that is, Mutoto cultural ground, is 100 m away from the proposed transmission to Butaleja.

3.7.5 OP 4.10 - Indigenous Peoples

Indigenous People are identified as possessing the following characteristics in varying degrees: self-identification and recognition of this identity by others; collective attachment to geographically distinct habitats or ancestral territories and to the natural resources in these habitats and territories; presence of distinct customary cultural, economic, social or political institutions; and indigenous language. The World Bank policy on indigenous peoples underscores the need for Borrowers and Bank staff to identify indigenous peoples, consult with them, ensure that they participate in, and benefit from Bank- funded operations in a culturally appropriate way - and that adverse impacts on them are avoided, or where not feasible, minimized or mitigated.

Table 3-10: WB OP/BP 4.10 Indigenous Peoples (Sept 1991)

Objectives	Operational Principals
To design and implement projects in a way that fosters full respect for Indigenous Peoples' dignity, human rights, and cultural uniqueness and so that they: a) receive culturally compatible social and economic benefits; and b) do not suffer adverse effects during	1. Screen early to determine whether Indigenous Peoples are present in, or have collective attachment to, the project area.
	2. Undertake free, prior and informed consultation with affected Indigenous Peoples to ascertain their broad community support for projects affecting them and to solicit their participation: a) in designing, implementing, and monitoring measures to avoid adverse impacts, or, when avoidance is not feasible, to minimize, mitigate, or compensate for such effects; and b) In tailoring benefits in a culturally appropriate manner.
	3. Undertake social assessment or use similar methods to assess potential project impacts, both positive and adverse, on Indigenous Peoples. Give full consideration to options preferred by the affected Indigenous Peoples in the provision of benefits and design of mitigation measures. Identify social and economic benefits for Indigenous Peoples that are culturally appropriate, and gender and inter-generationally inclusive and develop measures to avoid, minimize and/or mitigate adverse impacts on Indigenous Peoples.
	4. Where restriction of access of Indigenous Peoples to parks and protected areas is not avoidable, ensure that the affected Indigenous Peoples' communities participate in the design, implementation, monitoring and evaluation of management plans for such parks and protected areas and share equitably in benefits from the parks and protected areas.
	5. Put in place an action plan for the legal recognition of customary rights to lands and territories, when the project involves: a) activities that are contingent on establishing legally recognized rights to lands and

Objectives	Operational Principals
	territories that Indigenous Peoples traditionally owned, or customarily used or occupied; or b) The acquisition of such lands.
	6. Do not undertake commercial development of cultural resources or knowledge of Indigenous Peoples without obtaining their prior agreement to such development.
	7. Prepare an Indigenous Peoples Plan that is based on the social assessment and draws on indigenous knowledge, in consultation with the affected Indigenous Peoples' communities and using qualified professionals. Normally, this plan would include a framework for continued consultation with the affected communities during project implementation; specify measures to ensure that Indigenous Peoples receive culturally appropriate benefits, and identify measures to avoid, minimize, mitigate or compensate for any adverse effects; and include grievance procedures, monitoring and evaluation arrangements, and the budget for implementing the planned measures.
	8. Disclose the draft Indigenous Peoples Plan; including documentation of the consultation process, in a timely manner before appraisal formally begins, in an accessible place and in a form and language that are understandable to key stakeholders.
	9. Monitor implementation of the Indigenous Peoples Plan, using experienced social scientists.

Relevancy: By definition, these are people or communities who claim a historical continuity and cultural affinity with societies endemic to their original territories that developed prior to exposure to Western culture civilization. These communities often consider themselves distinct from wider society or majority of cultures that contest their cultural sovereignty and self-determination. In Uganda, a distinct example is Batwa pygmies found in tropical rainforests in South-western Uganda. None of the project facilities traverses or is located in any indigenous people communities.

3.7.6 OP 4.12 - Involuntary Resettlement

This policy is triggered in situations involving involuntary taking of land and involuntary restrictions of access to legally designated parks and protected areas. The policy aims to avoid involuntary resettlement to the extent feasible, or to minimize and mitigate its adverse social and economic impacts. It promotes participation of displaced people in resettlement planning and implementation, and its key economic objective is to assist displaced persons in their efforts to improve or at least restore their incomes and standards of living after displacement. The policy prescribes compensation and other resettlement measures to achieve its objectives and requires that borrowers prepare adequate resettlement planning instruments prior to Bank appraisal of proposed projects.

Table 3-11: WB OP/BP 4.12 Involuntary Resettlement (Dec 2001)

Objectives	Operational Principals
To avoid or minimize involuntary resettlement and, where this is not feasible, to assist displaced persons in improving or at least restoring their livelihoods and standards of living in real terms relative to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.	1. Assess all viable alternative project designs to avoid, where feasible, or minimize involuntary resettlement
	2. Through census and socio-economic surveys of the affected population, identify, assess, and address the potential economic and social impacts of the project that are caused by involuntary taking of land (e.g., relocation or loss of shelter, loss of assets or access to assets, loss of income sources or means of livelihood, whether or not the affected person must move to another location) or involuntary restriction of access to legally designated parks and protected areas.
	3. Identify and address impacts also if they result from other activities that are: a) directly and significantly related to the proposed project, b) necessary to achieve its objectives, and c) Carried out or planned to be carried out contemporaneously with the project.
	4. Consult project-affected persons, host communities and local nongovernmental organizations, as appropriate. Provide them opportunities to participate in the planning, implementation, and monitoring of the resettlement program, especially in the process of developing and implementing the procedures for determining eligibility for compensation benefits and development assistance (as documented in a resettlement plan), and for establishing appropriate and accessible grievance mechanisms. Pay particular attention to the needs of vulnerable groups among those displaced, especially those below the poverty line, the landless, the elderly, women and children, Indigenous Peoples, ethnic minorities, or other displaced persons who may not be protected through national land compensation legislation.
	5. Inform displaced persons of their rights, consult them on options, and provide them with technically and economically feasible resettlement alternatives and needed assistance, including: a) prompt compensation at full replacement cost for loss of assets attributable to the project; b) if there is relocation, assistance during relocation, and residential housing, or housing sites, or agricultural sites of equivalent productive potential, as required; c) transitional support and development assistance, such as land preparation, credit facilities, training or job opportunities as required, in addition to compensation measures; d) cash compensation for land when the impact of land acquisition on livelihoods is minor; and e) Provision of civic infrastructure and community services as required.
	6. Give preference to land-based resettlement strategies for displaced persons whose livelihoods are land-based.
	7. For those without formal legal rights to lands or claims to such land that could be recognized under the laws of the country, provide resettlement assistance in lieu of compensation for land to help

Objectives	Operational Principals
	improve or at least restore their livelihoods.
	8. Disclose draft resettlement plans, including documentation of the consultation process, in a timely manner, before appraisal formally begins, in an accessible place and in a form and language that are understandable to key stakeholders
	9. Apply the principles described in the involuntary resettlement section of this Table, as applicable and relevant, to subprojects requiring land acquisition.
	10. Design, document, and disclose before appraisal of projects involving involuntary restriction of access to legally designated parks and protected areas, a participatory process for: a) preparing and implementing project components; b) establishing eligibility criteria; c) agreeing on mitigation measures that help improve or restore livelihoods in a manner that maintains the sustainability of the park or protected area; d) resolving conflicts; and e) Monitoring implementation.
	11. Implement all relevant resettlement plans before project completion and provide resettlement entitlements before displacement or restriction of access. For projects involving restrictions of access, impose the restrictions in accordance with the timetable in the plan of actions
	12. Assess whether the objectives of the resettlement instrument have been achieved, upon completion of the project, taking a count of the baseline conditions and the results of resettlement monitoring.

Relevancy: The activities of the Project will trigger this policy as the proposed water supply and sanitation facilities will be located in areas where people were conducting mostly agricultural activities. However, apart from involuntary resettlement with respect to socio-economic activities on land, there will not be resettlement of people from their settlements to other places.

3.7.7 OP 7.60 - Disputed Areas

Projects in Disputed Areas may affect the relations between the Bank and its borrowers, and between the claimants to the disputed area. Therefore, the Bank will only finance projects in disputed areas when either there is no objection from the other claimant to the disputed area, or when the special circumstances of the case support Bank financing, notwithstanding the objection. The policy details those special circumstances. In such cases, the project documents should include a statement emphasizing that by supporting the project, the Bank does not intend to make any judgment on the legal or other status of the territories concerned or to prejudice the final determination of the parties' claims.

Table 3-12: WB OP/BP 7.60 - Disputed Areas (June 2001)

Objectives	Operational Principals
The objective of this policy is to ensure that projects in disputed areas are dealt with at the earliest possible stage:	This policy is triggered if the proposed project will be in a “disputed area”.

Objectives	Operational Principals
a) so as not to affect relations between the WB and its member countries b) so as not to affect relations between the borrower and neighbouring countries c) So as not to prejudice the position of either the WB or the countries concerned.	

Relevancy: All areas proposed for the project facilities are under rightful legal jurisdiction of the Republic of Uganda and not disputed by any other nation. This issue is addressed in detail by the Impacts Assessment in section of the ESIA.

3.8 WORLD BANK GROUP - EHS GUIDELINES – WATER AND SANITATION (DECEMBER 10, 2007)

The WB Group Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. Industry sector EHS guidelines are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors.

The EHS Guidelines for Water and Sanitation include information relevant to the operation and maintenance of: potable water treatment and distribution systems; collection of sewage in centralized systems such as piped sewer collection networks or decentralized systems such as septic tanks subsequently serviced by pump trucks; and treatment of collected sewage at centralized facilities.

The Guidelines provide GIIP advice relating to the following elements of Water Projects:

Environment Safety

- Drinking water
- Water withdrawal
- Water treatment
- Water distribution

Occupational Health and Safety

- Accidents and injuries
- Chemical exposure
- Hazardous atmosphere
- Exposure to pathogens and vectors
- Noise

Community Health and Safety

- Drinking water

- Sanitation

Performance Indicators and Industry Benchmarks

- Environment
- Occupational health and safety

Relevancy: The WB Group Environmental, Health, and Safety (EHS) Guidelines (Water and Sanitation, 2007) are relevant to the Project as they provide the latest internationally accepted GIIP for relevant OHS issues. The recommendations contained within the Guidelines have been reviewed during the development of this ESIA and incorporated in to the prescribed management and mitigation measures as appropriate. Drinking water quality standards to be applied are those set out in the EHS Guidelines.

3.9 INTERNATIONAL CONVENTIONS AND AGREEMENTS

Uganda is a signatory to a number of International Agreements which are relevant to supporting the National efforts in environmental management and the welfare of communities. They are relevant to the road construction sector / efforts provided they support or are in consonance with the applicable Laws and Regulations in Uganda. The sections below describe some of these agreements/conventions.

3.9.1 The Convention on Biological Diversity (CBD)

The aim of the CBD is to effect international cooperation in the conservation of biological diversity and to promote the sustainable use of living natural resources worldwide. It also aims to bring about the sharing of the benefits arising from the utilization of natural resources. Parties to this convention are required to undertake EIA for projects likely to have significant adverse effects on biodiversity and develop national plans and programs for conservation and sustainable use of bio diversity. However, no sensitive natural resources are found at or along the proposed project sites.

3.9.2 UNESCO World Heritage Convention, 1972:

In the International arena, the legal regime regarding Cultural Heritage basically emanates from the UNESCO World Heritage Convention, 1972. The convention is concerned with the protection of the World Cultural and Natural Heritage. This convention gives the basis of recommendations developed by experts to conserve Cultural Heritage. Uganda, the country within which this road project is to be constructed, is a member of UNESCO and as such is bound by the recommendations made by the convention in the protection of Cultural Heritage. This regulation covers all chance findings on the project.

3.9.3 The Ramsar Convention on Wetlands, 1971

The Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention) is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Uganda is a Contracting Party to the Ramsar Convention. The Murchison Falls-Albert Delta Wetland System covering 17,293 ha was designated a Ramsar site (Ramsar site no. 1640). The Ramsar site stretches from the top of Murchison Falls, where the Victoria Nile flows through a rock cleft 6 m wide, to the delta at its confluence with Lake Albert. The convergence between Lake Albert and the delta forms a shallow area important for water birds, especially the shoebill, pelicans, darters and various heron species. As

part of the decision-making process, the ESIA outcomes giving impact ratings and mitigation measures relevant to the Ramsar site will need to be considered in the context of the Ugandan government's responsibilities to the Ramsar Convention as a contracting party. No gazetted wetlands are traversed by the project facilities.

3.9.4 The African Convention on the Conservation of Nature and Natural Resources, 1968

The contracting states to this Convention are required to undertake / to adopt measures to ensure conservation, utilization and development of soil, water, flora and fauna resources in accordance with scientific principles and with due regard to the best interest of the people. The States are also required to ensure that the conservation and management of natural resources are treated as an integral part of National and /or Regional Development Plans. In addition, during the formulation of all development plans, full consideration is required to be given to ecological, as well as to economic and social factors.

3.9.5 The Convention for the Safeguarding of the Intangible Cultural Heritage, 2003

The Convention calls on States that have ratified it to Safeguard Living Heritage on their own territories and in cooperation with others. It seeks to celebrate and safeguard the intangible heritage distinctive for particular communities. It affirms that the intangible heritage of all communities – whether they are large or small, dominant or non-dominant – deserve respect. The Convention defines "intangible Cultural heritage" as the practices, representations, expressions, knowledge, skills as well as the instruments, objects, artifacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their Cultural Heritage. This Intangible Cultural Heritage, transmitted from generation to generation, is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history, and provides them with a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity. The Road Project therefore will be required not to disrupt the Living Heritage but will be expected to safeguard it so as to ensure that the heritage where it exists continues to be practiced and transmitted within the community or group concerned. Communities should be actively involved in safeguarding and managing their Living Heritage, since it is only them who can consolidate its present and ensure its future.

3.9.6 The United Nations Framework Convention on Climate change (UNFCCC), 1992

The United Nations Framework Convention on Climate Change (UNFCCC) is an international environmental treaty negotiated at the Earth Summit in Rio de Janeiro from 3 to 14 June 1992, then entered into force on 21 March 1994. UNFCCC has 197 parties as of December 2015 of which Uganda is a member. Its sister Rio Conventions are the UN Convention on Biological Diversity and the Convention to Combat Desertification. Preventing "dangerous" human interference with the climate system is the ultimate aim of the UNFCCC. Therefore, all road works should maintain the ecological integrity of the habitat by avoiding activities that could enhance climate change especially massive tree cutting.

3.9.7 The Stockholm Convention

The Convention seeks to protect human health and the environment from persistent organic pollutants (POPs). Uganda acceded to the Convention on 20th July 2004. Among the pollutants, controlled under the Convention are unintentionally released persistent organic pollutants. The National Implementation Plan (NIP) developed under the Convention in December 2008, to eliminate and minimize the impacts

of (twelve) 12 of the most harmful hazardous chemicals in the world, identifies over 70% of the unintentionally released POPs to be a result of uncontrolled open burning of waste. The Plan, therefore, recommends reduction of unintentionally released POPs through emission at source by promoting cleaner production methods and Best Available Techniques and Best Environmental Practices. Management of waste under the project will have to be undertaken in line with this requirement by avoiding burning of waste, among others.

3.9.8 The Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal

The Basel Convention is a global treaty aimed at protecting human health and the environment from risks posed by hazardous wastes and their transboundary movement. The treaty was adopted in 1989, came into force in 1992 and Uganda acceded to it on 11th March 1999. The overall goal of the Basel Convention is to protect, by strictly controlling, human health and the environment against the adverse effects which may result from the generation, transboundary movement and management of hazardous and other wastes. When hazardous wastes are dumped indiscriminately, spilled accidentally or managed improperly, they can cause severe health problems, or even death, and poison water and land for decades. All chemicals used in Road constructions will be managed in accordance to this convention.

3.9.9 The UN Conventions on the Rights of Persons with Disabilities, 2008

The Convention on the Rights of Persons with Disabilities is an international human rights treaty of the United Nations intended to protect the rights and dignity of persons with disabilities. Parties to the Convention are required to promote, protect, and ensure the full enjoyment of human rights by persons with disabilities and ensure that they enjoy full equality under the law. The Convention has served as the major catalyst in the global movement from viewing persons with disabilities as objects of charity, medical treatment and social protection towards viewing them as full and equal members of society, with human rights. It is also the only UN human rights instrument with an explicit sustainable development dimension. The Convention was the first human rights treaty of the third millennium.

3.9.10 International Convention on Economical Social and Cultural Rights

The International Covenant on Economic, Social and Cultural Rights is a multilateral treaty (of which Uganda is a member) adopted by the United Nations General Assembly on 16 December 1966, and in force from 3 January 1976. It commits its parties to work toward the granting of economic, social, and cultural rights (ESCR) to the Non-Self-Governing and Trust Territories and individuals, including labour rights and the right to health, the right to education, and the right to an adequate standard of living. As of 2015, the Covenant has 164 parties.

3.9.11 Convention on Elimination of All Forms of Discrimination against Women

The Convention on the Elimination of all Forms of Discrimination against Women is an international treaty adopted in 1979 by the United Nations General Assembly. Described as an international bill of rights for women, it was instituted on 3 September 1981 and has been ratified by 189 states including Uganda. Article 1 defines discrimination against women as; any distinction, exclusion or restriction made on the basis of sex which has the effect or purpose of impairing or nullifying the recognition, enjoyment or exercise by women, irrespective of their marital status, on a basis of equality of men and women, of human rights and fundamental freedoms in the political, economic, social, cultural, civil or

any other field. Therefore, all forms of discrimination against women during implementation of all road project activities shall be condemned.

3.9.12 Convention on Protection of Migrant Workers

The International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families is a United Nations multilateral treaty governing the protection of migrant workers and families. Signed on 18 December 1990, it entered into force on 1 July 2003 after the threshold of 20 ratifying States was reached in March 2003. The Committee on Migrant Workers monitors implementation of the convention, and is one of the seven UN-linked human rights treaty bodies. Implementing Contractors of this road project may have foreign workers whose rights need to be protected.

3.9.13 United Nations Conventions on the Rights of the Child and its Optional Protocols and Declarations on Children

The United Nations Convention on the Rights of the Child (commonly abbreviated as the CRC or UNCRC) is a human rights treaty which sets out the civil, political, economic, social, health and cultural rights of children. The Convention defines a child as any human being under the age of eighteen, unless the age of majority is attained earlier under national legislation. Two optional protocols were adopted on 25 May 2000. The First Optional Protocol restricts the involvement of children in military conflicts, and the Second Optional Protocol prohibits the sale of children, child prostitution and child pornography. Both protocols have been ratified by more than 160 states including Uganda.

The foregoing notwithstanding, the contractor and NWSC/ MWE will have a contractual obligation to avoid impacts that may violate above conventions, wherever encountered.

3.10 PERMITS AND LICENSES

Permits and licenses that may be required by the project are presented in Table 3-13.

Table 3-13: Permits and licenses potentially required by the project

Permit Required	Issuing Authority	Party responsible for acquiring permit/license	Legal Framework
Water Abstraction Permit	DWRM	NWSC & Contractor	Water Act, cap 152
River Dredging Permit	DWRM	Contractor	Rivers Act, cap 357
Waste Discharge permit	DWRM	NWSC & Contractor	Water Act, cap 152
Waste Disposal Permit	NEMA	NWSC & Contractor	National Environment Act Cap 153; National Environment (Waste Management) Regulation
Waste Transportation License	NEMA	Contractor	National Environment Act Cap 153; National Environment (Waste Management) Regulation
Storage of Hazardous/ Non Hazardous Waste	NEMA	Contractor	National Environment Act Cap 153; National Environment (Waste Management) Regulation
Workplace Registration Permit	MGLSD	Contractor	Occupational Health and Safety Act, 2006

4 ESIA METHODOLOGY

4.1 INTRODUCTION

This section describes the broad principles of methodology of the ESIA indicating approaches, practices and techniques used for impact identification, quantification, analysis and abatement. Impacts of the project were predicted in relation to environmental and social receptors and natural resources. This was accomplished by comparing prevailing conditions ("pre-project") and "post-project" situations.

The requirement for environmental assessment in Uganda is set out by the National Environment Act (2019) and the National Environment (Environmental and Social Assessment) Regulations, 2020. The process was also guided by the EIA Guidelines (NEMA, 1997) and the Environmental Impact Assessment Guidelines for Water Resources Related Projects in Uganda (MWE, 2011).

The methodology used consisted of a review of Uganda's institutional arrangements, regulations and policies and those of the World Bank and World Health Organisation. Also done were baseline measurements, identification of impact receptors and their relation to project's site; and consultations with various stakeholders. Other activities included data collection & analysis and review of engineering designs.

Impacts of the project were predicted in relation to environmental and social receptors and natural resources. This was accomplished by comparing prevailing conditions ("pre-project") and "post-project" situations.

4.2 ESTABLISHMENT OF ENVIRONMENTAL & SOCIO-ECONOMIC BASELINE

4.2.1 Physical Environment

Baseline water quality, air quality and noise levels were measured, not only to inform construction contractors about pre-construction conditions existing at proposed sites, but also the first annual environmental audit: subsequent baseline conditions would be those values measured in the first annual full environmental audit. These were determined through the following actions:

Air quality: Baseline air quality was measured using a pair of digital MX6 iBrid™ portable gas meters (Industrial Scientific-Oldham) and a Microdust 880nm digital aerosol monitor (Casella®) (Photo 6). Measurement points or locations were selected basing on presence of potential receptors.

Ambient noise: Baseline noise measurements were undertaken at locations around the proposed storage facility site with potential receptors. Measurement of ambient noise levels was carried out using a precision integrating sound level meter (Photo 7), with an active range of 0-140 decibels (dB) and complying with IEC 651 and ANSI S4 standards. A Casella CEL-621C digital noise logger was set to record for a sample period of ten minutes at each of the selected locations. The assessment procedure involved recording the LA_{MAX} and LA_{MIN} decibel levels. Measurement points were recorded using a GPS receiver and the noise sources together with the ambient environment at each location noted.

CASELLA Microdust meter

Digital 6-gas MX6 Ibrid meter

Photo 4-1: Digital CASELLA microdust and 6-gas MX6 iBrid™ meters to be used to measure air quality

Noise measurement will be done with a CASELLA CEL-621C2/K1 Integrating 1/3 Octave Band Sound Level Meter (Class2)

Photo 4-2: Noise measurement meter

Drinking water samples and surface water quality sampling was conducted along the river as well as upstream and downstream of the proposed facilities. Samples were stored at 4°C and the following day transported to NWSC laboratory at Bugolobi for biological and physicochemical analysis. In situ measurements were undertaken with a multi-probe water quality meter (HANNA HI 9828).

Sample Table: Expected water analysis results of the project

Sample No.	Parameters	Locations and nature of Water resource (e.g. river, swamp or springs)		Permissible limits as per DWD
1	pH			
2	Colour			
3	Turbidity			
4	Total dissolved solids (TDS) (mg/L)			
5	Total Hardness as $CaCO_3$ (mg/L)			
6	Calcium as Ca (mg/L)			
7	Magnesium as Mg (mg/L			
8	Chloride as Cl (mg/L)			
9	Sulphate as SO_4 (mg/L)			
10	Nitrates as NO_3 (mg/L)			

Sample No.	Parameters	Locations and nature of Water resource (e.g. river, swamp or springs)		Permissible limits as per DWD
11	Iron as Fe (mg/L)			
12	Total Alkalinity (as $CaCO_3$)			

Soil environment: Specific sites for soil sampling were earmarked in Mbale district in the project area along the proposed sewer line. For correct classification and understanding of the soils of the project area, soil profile description method was employed and the soil properties of all the horizons up to the parent material were described. This method involved exposing a profile by digging a 1.5m^2 area soil test pit with a depth of 1.5m or up to the parent material. The test pits were strategically sited to represent the areas within the project area. The sites were selected within the villages where the proposed sewer line is transecting and where other construction works have been planned. Four sites were selected in that respect as follows: at the proposed intake site (Makku Village, Bukiti parish, Bunyanya sub-county, Sironko District) at the reservoir site (Mukhubu village, Mooni Mukhubu Ward parish, Mutoto Sub-County, Mbale District) at the treatment plant (Zesui Village, Mukhubu Ward Parish, Wanale Division Sub-county, Mbale District) and along the sewer line (Bugembe village, Nabweya parish, Namanyonyi Sub-County, Mbale District). For each of the horizons in the profile, soil properties described included: depth of the horizon, boundary regularity and sharpness, moisture status, colour, texture, structure (degree of structural development and the shapes of the different soil peds), consistence, porosity, compactness, presence of fauna, drainage, roots distribution and size with their quantifying adjectives such as shape, nature, health and age. In addition, details of the vegetation, slope gradient and susceptibility to erosion around the samples area were recorded.


Photo 4-3: Characterization of soil test pits

Hydrological assessment: A rainfall runoff model SWAT was setup for project area. The main inputs to the model were land use/cover, soil, meteorological variables and slope ranges extracted from digital elevation model. A combination of the Land use/cover, soil type and slope ranges resulted into hydrological response unit for the estimation of the surface runoff yield for the catchment. The HRU were then reclassified based on the dominant combination of the soils, land use/cover and slopes. The delineation of existing conditions drainage catchments and graphical information relating to other parameters like slopes, length of longest path, sub-basin area were provided. Rainfall runoff simulations were based on the soil conservation service (SCS). A hydrologic model provided quantitative estimates

of the mean annual, mean monthly and daily flows.

Environmental flow (EF): There is no single best way to do an environmental flow assessment. The choice of methodology depends on the availability of resources, that is, data, time, funds, etc. The major criteria for determining environmental flows should include the conservation of the variability of the natural flow. Besides lack of national guidelines the concept of environmental flows is complicated by the poor understanding of the relationship between river flows and river ecology. A database of various methodologies for environmental flow assessment, established in 2003, contains useful information on 134 methodologies with key references. This database is a valuable source of different environmental methodologies. The methodologies can be sorted by type, region or country where they have been applied.

There are four categories of environmental flow methodologies, which are recognized by most scientists in the environmental flow field (Tharme, 2008). These four levels are listed in Table 4-1.

Table 4-1: The four significant different types of environmental flow methodologies

Environmental Flows Methodology	Description
Hydrological (Desktop Estimates, Look Up Table)	This is a simple and rapid method that uses hydrological data to derive the environmental flow requirement. A "minimum flow" often represents the flow intended to maintain the recommended river condition. Hydrological methodologies are generally used for the planning level and have been applied widely, both in developed and developing countries. These methods rely on examination of stream flow statistics and typically based on mean annual flow (MAF) or monthly median flows. The Tennant Method is the most widely used hydrological method.
Hydraulic Rating (Rapid Determinations)	These type of methodologies measure changes in various single river hydraulic variables (e.g. depth and velocity) to develop a simple relationship between biota habitat availability and river flow. A common methodology is the Wetted Perimeter Method, developed in Australia.
Habitat Simulation (Habitat Rating, Expert Panels, Intermediate)	The Habitat Simulation methodology provides links between discharge and available habitat conditions. It uses key target biota to predict habitat discharge curves or habitat time and exceedence services. PHABSIM, developed in U.S.A. is the most commonly applied methodology.
Holistic (Holistic Approaches, Frameworks, Comprehensive)	In a holistic approach all important flow characteristics (high floods, base flows, etc.) are identified. These methodologies incorporate hydrological, hydraulic and habitat simulation models. The Building Block Methodology (BBM) is a holistic methodology and was developed in South Africa.

The Tennant Method (or Montana Method) and the Range of Variability Approach (RVA), both developed in USA are the most frequent used hydrological methods on a global perspective (Tharme, 2008). The Tennant Method (Tennant, 1976) differs from most other hydrological methodologies because it included expert opinions and detailed field studies when it was developed. Tennant findings

are summarised as follows:

a) 10% of the average flow is a minimum flow recommended to sustain short-term survival habitat for most aquatic life forms;
b) 30% is recommended as a base flow to sustain good survival conditions for most aquatic forms and general recreation; and
c) 60% provides excellent to outstanding habitat for most aquatic life forms and for the majority of recreational uses.

The recommended percentage of natural flow regime may also be varied during the seasons to satisfy the need during more sensitive times such as while fish is spawning.

The Tennant's approach either uses mean annual discharge (MAD) or Median Monthly Flows for Determining Instream Flow Needs. The use of monthly median flows for recommending minimum instream flows is based on the principle that fish in a particular stream have adapted to the historic streamflow regime, which, at least for base flows, is best defined by median rather than mean flows.

Given the unavailability of data, the environmental flow in this ESIA report was determined using the hydrological statistical method and recommendation from the Lake Kyoga Water Management Zone Plan. as indicated in the hydrological assessment report (Appendix B). According to the Lake Kyoga Water Management Zone an environmental flow of 30% of the flow must always be retained in the river if there are no major downstream consumers.

4.2.2 Biological Environment

a) Terrestrial flora

Specific points along each pipeline were identified for vegetation and flora studies. All these sample sites were geo-referenced producing a baseline of information on the basis of which future impacts could be evaluated. Characterization of the project area was based on the floristic, and landscape features observed at the different sites. The sample points were effectually random points along the proposed pipeline and existing community roads.

The area traversed by water pipeline is relatively large and traverses largely through built up environment, extensive subsistence farmland including coffee and banana plantation, and seasonal and permanent wetlands including Lwabi and Nakwasi wetland system. The pipeline area negotiates steep slopes, valley bottoms and flat lands but it largely follows the river course in many places. Ninety five percent (95%) of the natural vegetation stands have therefore been modified for settlement and agricultural purposes and as such vegetation cover is already of a modified state. This was done to provide information necessary for ascertaining species richness and diversity; identifying species of conservation concern (in terms of range restriction, rarity and threat), identify ecologically sensitive sites, altered habitats as well as providing a quick review of vegetation and flora assemblages at the proposed site.

During the course of vegetation and flora baseline studies, data were sourced from possible areas through desk-based studies. These reinforced findings of the field surveys conducted from the proposed site for pipeline development. The field survey was conducted in July 2015 to collect further

site-specific information on habitats and species presence. Global Positioning System (GPS) units were used to record the geographical coordinates of the survey locations. The vegetation specialist traversed the proposed site making points of interest depending on the set objectives. Photographs were taken and notes made at each different point of interest to record the habitat and species of flora as well as landscape features of importance.

Species richness, abundance, invasive, and sensitive habitat were investigated. Sensitivity of habitats was assessed from presence of i) threatened taxa in accordance to IUCN conservation assessment, ii) rarity, iii) endemism; presence of: iv) fragile watersheds, v) steep slopes, and vi) riparian areas.

Transect: During the actual field surveys, records of the features of the landscape and environment including the dominant habitats and common species within the survey area, were made along transects. A transect method was used to sample the vegetation and flora in the proposed pipeline areas from the three pipelines. Vegetation types traversed by each transect was identified. Along each transect estimation of species abundance on DAFOR scale, presence of disturbances, signs of usability and presences of invasive species were made at determined points in a space of 20 m radius. Opportunistic recording of species not recorded at the regular survey locations was done in between survey locations. The three transects were designed to follow the 3 pipelines as designed.

The vegetative communities in the study area were classified using the Langdale-Brown et al. (1964) system. This system recognizes 22 ecosystem types, identified by letters between A to Z. Although the Langdale-Brown (L-B) system is now 50 years old, it was used in preference to the more recent National Biomass Study (1996) for several reasons as indicated by Van Breugel*et al,*. 2011). The L-B system is based on plant community composition rather than just plant biomass, which was more relevant to the goal of characterizing vegetation and identifying sensitive habitats. Secondly, although much of Uganda's vegetation has been extensively altered over the past few decades the L-B system can still be considered to represent the potential of an area to support an ecosystem type, which is relevant for a study of environmental impacts (Kalema J, et al,. 2010, Pomeroy D, et al,. 2002). Finally the L-B system provides 22 vegetative categories compared to the 13 adopted by the National Biomass System (USAID 2014), this greater level of resolution allows us to assess the potential impacts of water development project on ecosystems at a finer scale. A summary of the sampling points and vegetation at these points is presented in Table 4-2.

b) Terrestrial fauna

Herpetiles: Field data was obtained by conducting a survey of amphibians and reptiles in and around Mbale and Butalejja water pipeline project area. Various methods i.e. Visual Encounter Surveys, opportunistic surveys and local consultations were used. The species were identified, counted and recorded. The conservation status of the hepertofauna is reported using the IUCN Red Listing (IUCN 2014).

Visual Encounter Surveys (VES) - This method involved walking through the study areas or habitats for a prescribed time period systematically searching for amphibians turning logs or stones, inspecting retreats, watching out for surface-active species and listening out for frog calls. Visual encounter survey method is commonly used to determine the species richness of an area, to compile a species list and to estimate relative abundances of species within an assemblage.

Table 4-2: Summary of terrestrial flora sampling points

				
Zea mays and ground nuts garden with scattered *Albizia-Erythrina* trees at geographical coordinates N1.11437, E34.22278	Post cultivated mixed light bushland in between gardens and a small river at geographical coordinate N1.09439, E34.20867	*Zea mays* garden at geographical N1.10399, E34.21481 along Ndega road	*Eucalyptus* woodlot along Mbale- Busolwe route.	*Cyperus dives* wetland along Mbale –Busolwe pipeline route. This is continuous with Nakwiga *Cyperus* papyrus swamp
				
Eucalyptus woodlots, *Musa* sp gardens and *Zea mays* gardens at Bumadibira intake Point	*Eucalyptus-Grevilia* woodlot, Banana plantation with scattered tress of *Milicia excelsa, Ficus natalensis; Zea mays* and Ground nuts gardens besides Mooni mini water reservoir. Geographical coordinate N1.06215, E34.21148	Open grassland with scattered trees of *Mangifera indica* at Mukhubu water treatment plant.	*Cyperus papyrus* swamp along Mbale- Busolwe pipeline. This is located a few kilometers from Doho irrigation scheme. It's the only natural intact vegetation remnant within the project site. Its edges are affected by *Oryza sativa* growing.	Busolwe mini water reservoir in a seasonally flooded grassland located along Busolwe – Tororo road
				
Oryza sativa, *zea mays* gardens and *Eucalyptus* woodlot in a reclaimed wetland on the Mbale-Tororo high way within Bugema village.	Banana plantation along Bugema –Manafwa pipeline route.	Mixed *Casuarina- pinus* woodlot along the Bugema- Manafwa pipeline route	*Oryza sativa* at Doho irrigation scheme	

Opportunistic Encounters - This method involves recording any amphibian or reptilian species encountered anywhere and at any time within the study area, or brought in / reported by local people. Opportunistic searches were used to maximize the number of species encountered in the study area.

Local Consultations - Local people are a valuable source of information since they are constantly in touch with their environment; they encounter amphibians and reptiles of different kinds as they carry out their daily activities. We talked to some local people who informed us about the availability of some species of reptiles and amphibians. Some of the records were later confirmed by encountering some of them in the field. The reptiles and amphibians were identified using standard reference books available namely; Schiotz (1972) and Drewes (2006).

Mammals: These are some of the principal biodiversity components of great importance in environmental assessment and conservation planning. They are often used as indicators of environmental health and continue to be of great value in conservation decision making. This is largely due to their ecological importance (as regulators of food chain, seed dispersers, regulators of communities of plants and other animals etc.) and economic importance as food sources, tourist attractions, and disease vectors among others. They are included in the environmental impact assessment studies of the impending water development works as part of the Mbale water and sanitation project. This report among other things outlines the results of a mammal survey conducted as part of the latter project.

Village transects and Consultations - A reconnaissance tour around the project area was conducted to identify areas of conservation importance and those suitable for sampling. In this effect a drive through was conducted and no site was identified as being a critical mammal habitat. Transects were moved through the villages on foot to identify any prospects of mammal presence (especially through foot prints and dung deposition) and to consult the local people. The consultations basically involved asking local people of the animals they encounter in their day to day activities. Respondents were picked randomly and responses from all were collated to generate one species list for the area.

Opportunistic encounters - This involves opportunistic sightings while moving through the project area. These records are ideally not from designated sampling areas but within the larger project area. They are essential in enriching the species list of the project area. While moving through the villages, different animals were opportunistically encountered.

Birds: Site species composition was managed by Timed Species Count (TSC) method (Pomeroy 1992), where all species positively identified were listed in order seen or heard. For each site each TSC lasted for 40 minutes. To make the count, we moved slowly around the study sites listing any species which were anywhere within the site, regardless of how far away from the transect, species flying over the transect were also recorded. Along each count, predominant vegetation type of the habitat was recorded

Twelve sites were randomly and or purposively selected basing on habit type and expected species abundance and richness. Four were predominantly wetland sites (Doho rice scheme, Bugema, Manafwa and Busolwe). Whereas eight sites where predominantly agricultural and these include;

Namatale, Kama-lower, Makhosi, Bungukho, Buwaki, Makudui, Mooni and Kifuluriro.

c) Aquatic flora and fauna

Phytoplankton: Phytoplankton was determined in terms of cell density and bio volume using an Inverted Microscope and Modified Utermohl. Sedimentation Technique using (Hasle 1978) in terms of Cells /ml and converted to cell/l.

An integrated water column sampler was used to collect phytoplankton. A large plastic container (20 L) was filled using the integrated water sampler. The composite sampler was mixed and a pre-labelled 125-m lamber bottle was manually immersed into the container. The bottle was labelled with the date, station ID, sample type, replicate number, and preservative type. The sample was immediately preserved with 2-ml Lugol's solution per 100-ml of sample (Vollenweider 1974) and stored in the dark.

Phytoplankton was counted using the inverted microscope procedure of Utermohl as described by Lund et al. (1958). Sub-samples were settled for at least 24 hours in a sedimentation chamber prior to counting. Replicate areas were enumerated at a magnification of no less than 500X (Lund et al. 1958). For enumeration of rare, large taxa, the entire chamber was subsequently scanned and counted at low magnification. Results were expressed as cells/ml and then converted to Cells/L using appropriate geometric formulae (Downing and Rigler 1984) for all algal taxa.

Zoo plankton: The total zooplankton volume was determined by the displacement volume method. In this method the zooplankton sample was filtered through a piece of clean, dried netting material. The mesh size of netting material was 20 micron metre mesh size of the net used for collecting the samples. The interstitial water between the organisms was removed with the blotting paper. The filtered zooplankton was then transferred with a spatula to a measuring cylinder with a known volume of 75% ethanol. The displacement volume is obtained by recording the volume of fixative in the measuring jar displaced by the zooplankton. The settled volume was obtained by making the sample to a known volume in the measuring jar. The plankton was allowed to settle for at least 24 hours before recording the settled volume.

Fish: Information on the fish species was mainly obtained from the District Fisheries Officer and no fish was trapped during the field surveys.

4.2.3 Social Environment

A detailed social impact assessment and evaluation of the positive and negative, direct and indirect, immediate and long term, and permanent and temporary impacts due to the construction and operation of water and sanitation facilities and associated works was carried out. Assessment of the impacts identified in either qualitative or quantitative terms, according to their inherent nature and the availability of adequate data to enable predictive analysis has been undertaken and incorporated into this report under Impacts Section Chapter 6.

4.3 CULTURAL HERITAGE

The study involved a desktop study of the history of the area. A study of the main ethnic groups in the project area namely the Bagisu, Bagwere and the Banyole was undertaken. Lastly fieldwork on the

supply pipeline from Namatala river intake to Bungokho water treatment plant plus the survey of the water supply route Mbale - Budakaa – Tirinyi and the survey of the proposed water supply route Mbale- Busolwe –Butaleja. The survey investigated the presence of physical cultural resources which could be affected by the project. The study was conducted by David Kalanzi a Cultural Heritage Consultant.

4.4 CONSULTATION AND PROJECT DISCLOSURE

Relevant and adequate project information was provided to stakeholders to enable them to understand project risks, impacts and opportunities. Stakeholder consultation aimed at:

- Generating understanding of the project
- Understanding local expectations of the project
- Characterising potential environmental, socio-economic impacts
- Garnering consensus on mitigation options

The following techniques were used:

- Face-to-face or telephone interviews
- Data and literature review
- Email consultation correspondences

Consultative meetings were held with Mbale, Budaka, Kibuku and Butaleja District Local Government Officials and Mbale City Officials, and the project-affected communities.

4.5 REVIEW OF POLICY, REGULATIONS, INSTITUTIONAL FRAMEWORK & INTERNATIONAL GUIDELINES

This was done to determine if the proposed project was in line with national policies and met environmental laws and regulations, to achieve this, the following actions were undertaken:

i) Review of national environmental laws, policies and institutional framework.
ii) Review of World Bank Group (IDA is one of the 5 World Bank Group member organizations) guidelines on environment.

4.6 IMPACT IDENTIFICATION AND ANALYSIS

4.6.1 Impact Description

Describing a potential impact involved an appraisal of its characteristics, together with the attributes of the receiving environment. Relevant impact characteristics included whether the impact is:

- Adverse or beneficial;
- Direct or indirect;
- Short, medium, or long-term in duration; and permanent or temporary;
- Affecting a local, regional or global scale; including trans-boundary; and

- Cumulative (such an impact results from the aggregated effect of more than one project occurring at the same time, or the aggregated effect of sequential projects. A cumulative impact is "the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions").

Each of these characteristics is addressed for each impact. Consideration of the above gives a sense of the relative **intensity** of the impact. The **sensitivity** of the receiving environment was determined by specialists based on the baseline data collected during the study.

4.6.2 Impact Evaluation

Each impact is evaluated using the criteria listed in Table 4-2. To provide a relative illustration of impact severity, it is useful to assign numerical or relative descriptors to the impact intensity and receptor sensitivity for each potential impact. Each is assigned a numerical descriptor of 1, 2, 3, or 4, equivalent to very low, low, medium or high.

Table 4-3: Classification of impact evaluation

	Classification	Description
1	Extent:	Evaluation of the area of occurrence/influence by the impact on the subject environment; whether the impact will occur on site, in a limited area (within 2 km radius of the site); locally (within 5 km radius of the site); regionally (district wide, nationally or internationally).
2	Persistence/Duration:	Evaluation of the duration of impact on the subject environment, whether the impact was temporary (<1 year); short term (1 – 5 years); medium term (5 – 10 years); long term (>10); or permanent.
3	Social Context / Sensitivity or Potential for Stakeholder Conflict:	Assessment of the impacts for sensitive receptors in terms of ecological, social sensitivity and such things as rare and endangered species, unusual and vulnerable environments, architecture, social or cultural setting, major potential for stakeholder conflicts. The sensitivity classification is shown below: ***High sensitivity:*** Entire community displacement, destruction of world heritage and important cultural sites, large scale stakeholder conflict, etc. ***Medium sensitivity:*** Displacement of some households, moderate level of stakeholder concern ***Low sensitivity:*** No displacements, no potential for stakeholder conflict.
4	Regulatory and Legal Compliance:	Evaluation of the impact against Local and International legislative requirements. ***High:*** Prohibition terms for specific activities/emissions. Major breach of regulatory requirements resulting in potential prosecution or significant project approval delays. ***Medium:*** Potential breach of specific regulatory consent limits resulting in non-compliance. ***Low:*** No breach of specific regulatory consent limits anticipated.
5	Overall Impact rating (Severity):	Using a combination of the above criteria, the overall severity of the impact was assigned a rating Severe, Substantial, Moderate, Minor and negligible. Refer to Table 21 for broad categories of impact for each rating. **Note:** These are just guidelines that will constitute professional judgement required in each individual case.

4.6.3 Intensity of Impact

The scale of intensity is defined on the basis of ecological-toxicological studies and expert judgment and is presented in Table 4-3.

Table 4-4: Intensity scale gradation for environmental impacts

Scale of Impact Intensity	Criterion	Score
Very low	Environmental changes are within the existing limits of natural variations	1
Low	Environmental changes exceed the existing limits of natural variations. Natural environment is completely self-recoverable.	2
Medium	Environmental changes exceed the existing limits of natural variations and results in damage to the separate environmental components.. Natural environment is remains self-recoverable.	3
High	Environmental changes result in significant disturbance to particular environmental components and ecosystems. Certain environmental components lose self-recovering ability.	4

4.6.4 Impact Significance

Impact significance is determined from an impact significance matrix (Table 4-4) which compares severity of the impact with probability of its occurrence. Impact significance criteria are as follows:

Table 4-5: Determination of impact significance

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

- ***Major:*** These denote that the impact is unacceptable and further mitigation measures must be implemented to reduce the significance. Shaded red in the Table 4-5.
- ***Moderate:*** Impacts in this region are considered tolerable but efforts must be made to reduce the impact to levels that are as low as reasonably practical. Shaded orange in the impact significance matrix.
- ***Minor:*** Impacts in this region are considered acceptable. Shaded blue.
- ***Negligible:*** Impacts in this region are almost not felt. Shaded green.

4.7 CUMULATIVE IMPACTS

Cumulative effects manifest when socio-environmental conditions are already or will be affected by past or reasonably probable future development or activities. The ESIA identified current, past and probable

future similar activities that may compound socio-environmental conditions in the project area.

The assessment of the cumulative impacts considered the the geographical and temporal setting and identification of other activities and drivers that would contribute to similar impacts as anticipated for this project taking into consideration the baseline conditions as well.

4.8 MITIGATION OF ENVIRONMENTAL IMPACTS

Mitigation measures are designed in order to avoid, reduce, mitigate, or compensate for adverse environmental and social impacts and inform the Environmental and Social Management Plan (ESMP).

Table 4-6: Illustration of significance values that would apply to various impacts

	Major impact	Moderate impact	Minor
Legislative compliance	Expected non-compliance with national regulatory standards or good industry practice (e.g. World Bank Environmental and Social Standards)	Potential for non-compliance with national regulatory standards or good industry practice.	Expected compliance with national regulatory standards or good industry practice, or no regulations apply
Biophysical environment	▪ Impairment of ecosystem with no expectation of recovery within 20 years. ▪ Effect contrary to the objectives of management plans for internationally or nationally protected populations, habitats or sites with no expectation of recovery within 5 years. ▪ Environmental changes giving rise to issues of public or international concern. Impacts that harm human health, or damage a site of historic, cultural or archaeological value. ▪ Long-term (>10 years) and widespread changes to habitat or ecosystems features or functions that reduce its integrity, affect the ability to sustain valued components and may require extensive intervention. The habitat/ecosystem may not recover to its baseline state. ▪ Disturbance of a sufficient portion of the biogeographic population of a species to cause a decline in abundance, distribution or size of the genetic pool such that the population of the species, and other species dependent on it, will not recover naturally to former levels. ▪ Major loss or major alteration to an internationally designated site whereby key elements will be fundamentally changed. ▪ Incident that requires mobilization of	▪ Impairment of ecosystem with expectation of recovery within 10 years. ▪ Effect contrary to the objectives of management plans for internationally or nationally protected populations, habitats or sites with expectation of recovery within 1-5 years. ▪ Disturbance of a sufficient portion of the biogeographic population of a species to cause a decline in abundance, distribution or size of the genetic pool such that the population of the species, and other species dependent on it, will not recover within several generations. ▪ Major loss or major alteration to a locally designated site whereby key elements will be fundamentally changed. ▪ Injury or death of an IUCN listed “Vulnerable” species. ▪ Incident that requires mobilization of national/company response equipment. ▪ Major change to the visual quality, setting and feeling associated with a rare or unique locally recognized landscape. ▪ Fundamental change to hydrology and hydrogeology resulting in temporal changes to the watershed.	▪ Impairment of Forest ecosystem with expectation of recovery within 5 years. ▪ Ecosystem change is within the range of natural variation, but may be detectable; or ecosystem change that is unlikely to be noticed; or change resulting in positive, desirable of beneficial effects on an ecosystem. ▪ Reduction in ecosystem or habitat integrity, but recovery to baseline state is expected within 2-5 years with minimal intervention. ▪ Disturbance of a bio-geographic population or individuals of a species resulting in a decline in abundance or distribution over one or two generations, but that does not change the integrity of the population of the species or populations of other dependent species. ▪ Incident that requires mobilization of onsite response equipment and crews. ▪ A noticeable but not fundamental change to hydrology or hydrogeology. ▪ The development will not affect the key characteristics that contribute to the distinctiveness and/or value of the landscape.

	Major impact	Moderate impact	Minor
	international response equipment and crews. ▪ Injury or death of an IUCN listed "Endangered" species. ▪ Major change to the visual quality, setting and feeling associated with a rare or unique (inter)nationally recognized landscape. ▪ Widespread and permanent change to hydrology and hydrogeology in an internationally or nationally designated site.		
Social environment	▪ Damage to social, cultural or economic activity considerably beyond programme lifetime. ▪ Long term or life threatening health effects that may increase mortality rates. ▪ Physical resettlement (as defined in World Bank ESS 5) of a community. ▪ Changes that differentially negatively affects the life chances (access to health care/medicines) of vulnerable groups (disabled, elderly, female-headed households and those living below officially poverty or subsistence levels). ▪ Damage to a site of international cultural importance or national site where damage is likely to provoke protest/unrest. ▪ Damage to a site of national cultural importance or local site where damage is likely to provoke protest/unrest. ▪ Unplanned in-migration flows sufficient to cause exceedance of the capacity of numerous components of physical or social infrastructure. ▪ Increases of cultural conflict likely not to be contained within existing social control norms.	▪ May adversely affect the economic and social wellbeing of residents for the duration of the programme. ▪ Raises issues of limited public concern. ▪ Physical resettlement (as defined in IFC PS 5) one or more household/businesses. ▪ Reduction in assets, or access to assets, such that economic displacement (as defined in IFC PS 5) affects five or more individuals, households or businesses. ▪ Job losses in small communities very limited alternative opportunities in the near – medium term (within one year of job losses). ▪ Changes likely to prejudice success of an existing policy or plan. ▪ Changes that differentially affects the livelihoods of vulnerable groups (disabled, elderly, female-headed households and those living below poverty or subsistence levels). ▪ Damage to a site of local or regional cultural importance. ▪ Medium to long-term (>1 year) financial loss to businesses where recovery may be difficult. ▪ Unplanned in-migration flows sufficient to	▪ Negative effect within existing fluctuation of the society or economy. ▪ Reduction in assets, or access to assets, such that economic displacement (as defined in IFC PS 5) affects 1-4 individuals, households or businesses. ▪ Job losses in a community able to adapt and provide alternative job opportunities in the near – medium term (within one year). ▪ Short-term (<1 year) financial loss to owners of businesses where recovery is likely. ▪ Unplanned in-migration not expected to cause infrastructure capacity exceedance. ▪ Decline in access to health care facilities and acquisition of treatment.

	Major impact	Moderate impact	Minor
		cause exceedance of the capacity of at least one component of infrastructure. ▪ Increases in incidences of cultural conflict, but expected to be contained within existing social control norms. ▪ Movement of development traffic through very sensitive areas (e.g. near schools, hospitals) or that may exceed carrying capacity of roads. ▪ Movement of development traffic through community areas or having the potential to add unsuitable loadings to the infrastructure. ▪ Increased public exposure to health threats that may increase morbidity rates.	

5 ENVIRONMENTAL AND SOCIO-ECONOMIC BASELINE

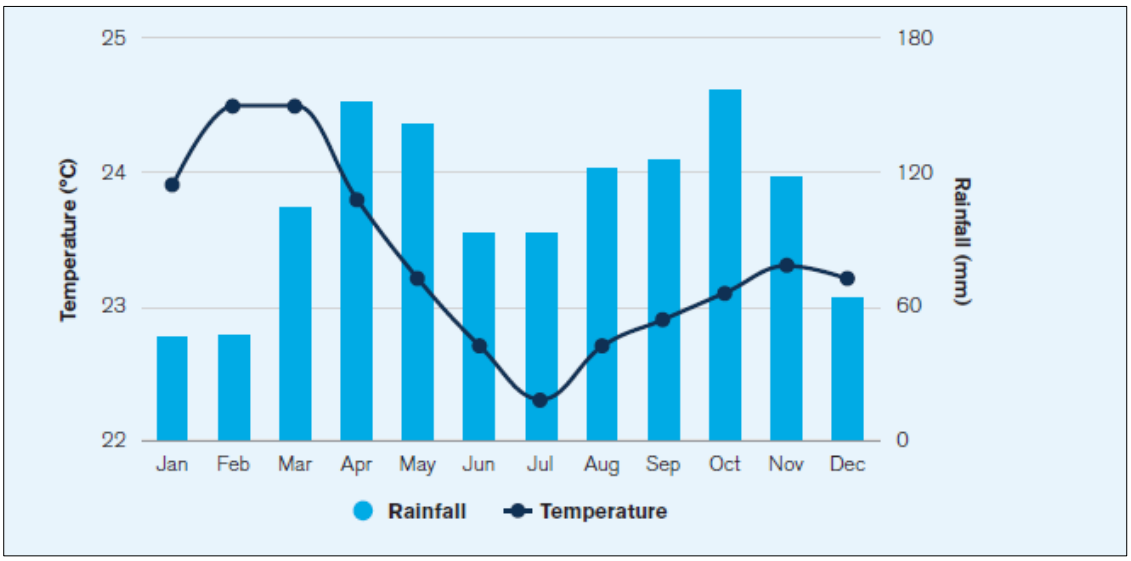
This Chapter describes the environmental and socio-economic baseline conditions in the proposed project area in which the proposed water supply and sanitation project is to be located and in which impacts may be experienced, that is, Mbale, Budaka, Tirinyi, Kibuku, Kadama and Busolwe. A detailed socio-environmental baseline assessment will be done during the ESIA but sections below provide preliminary site investigations and observations made during the scoping exercise. A baseline overview of conditions in project districts is provided first to give context to observations made during the scoping study. The proposed project will be located in the districts of Mbale, Budaka, Kibuku, and Butaleja.

5.1 MBALE DISTRICT

5.1.1 Environmental Profile

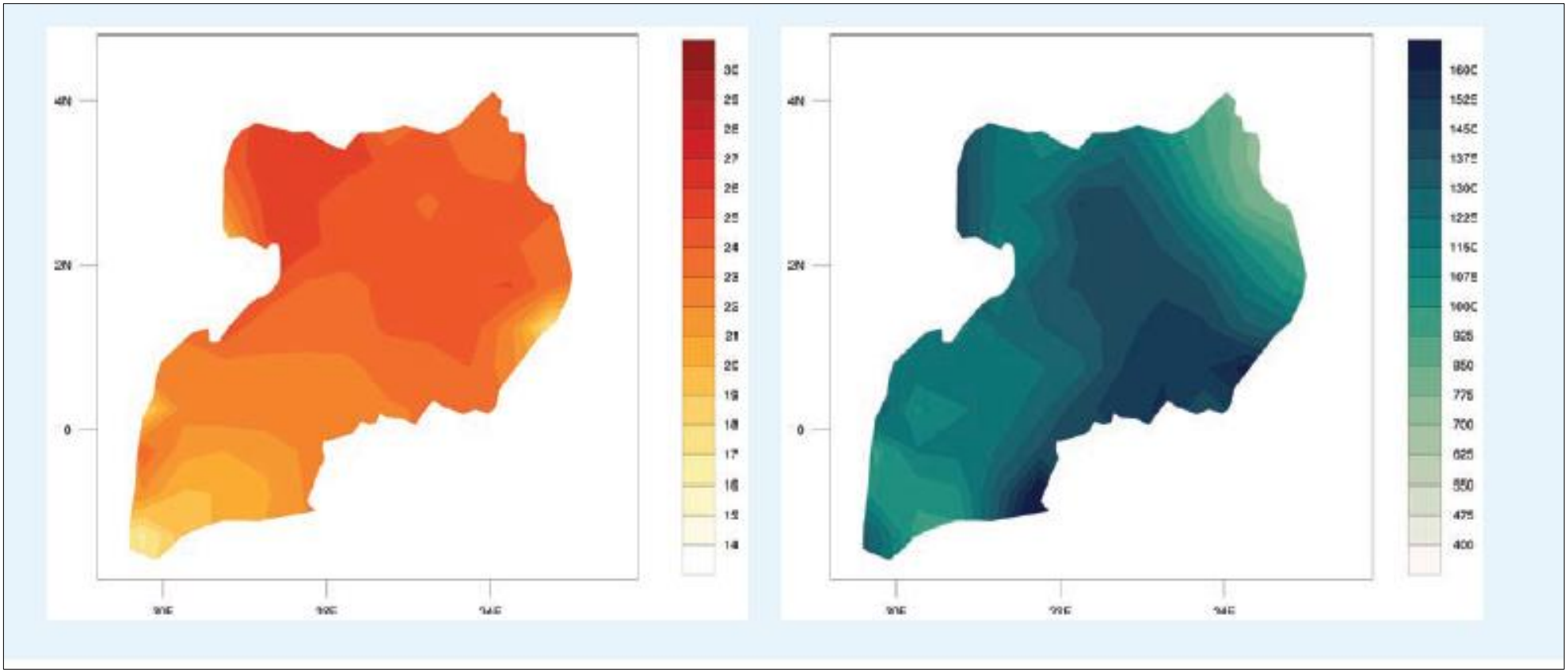
5.1.1.1 Climate

Precipitation for the country is highly variable, but overall, Uganda has experienced a statistically significant reduction in annual as well as seasonal rainfall. The average monthly and average annual temperature and rainfall of Uganda for 1991 – 2020 are presented in Figures 36 and 37, respectively. While trends in extreme rainfall conditions are more difficult to define due to the lack of data and seasonal variability, droughts have increased in Uganda over the past 60 years. Specifically, over the past 20 years, western, northern and north-eastern regions have experienced more frequent and longer-lasting drought conditions. The percentage of rainfall occurring from heavy precipitation events is anticipated to increase, which would also escalate the risk of disasters such as floods and landslides, for which are very common in Mbale and neighbouring districts. The climate of Mbale is influenced by its proximity to the equator and its position at the foot of Wanale Ridge. The climate is warm and humid without extremes; with temperatures ranging from 23 – 25°C. Rainfall is fairly distributed ranging between 1250 mm and 1750 mm per year.



Source: World Bank, 2021

Figure 5-1 Average monthly temperature and rainfall of Uganda for 1991 - 2020



Source: World Bank, 2021

Figure 5-2 Map of average annual temperature (left) and annual precipitation (right) of Uganda for 1991 - 2020

5.1.1.2 Geology, geomorphology and soils

Mbale has gentle hills and valleys covering a geographical area of 24.35 sq. km. Its relief varies from 1212 m above sea level in the South Eastern Border region to 1080 m above sea level, in the west. The soils of Mbale City are largely of the formalistic gneiss that is in the last stages of tropical weathering. Their volcanic nature renders them fertile for support of plant life. The larger part of the City is developed given the firm and stable nature of complex basement rendering it ideal for the development of housing to the high density settlement. The types of soils in Mbale District and the City are presented in Figure 38.

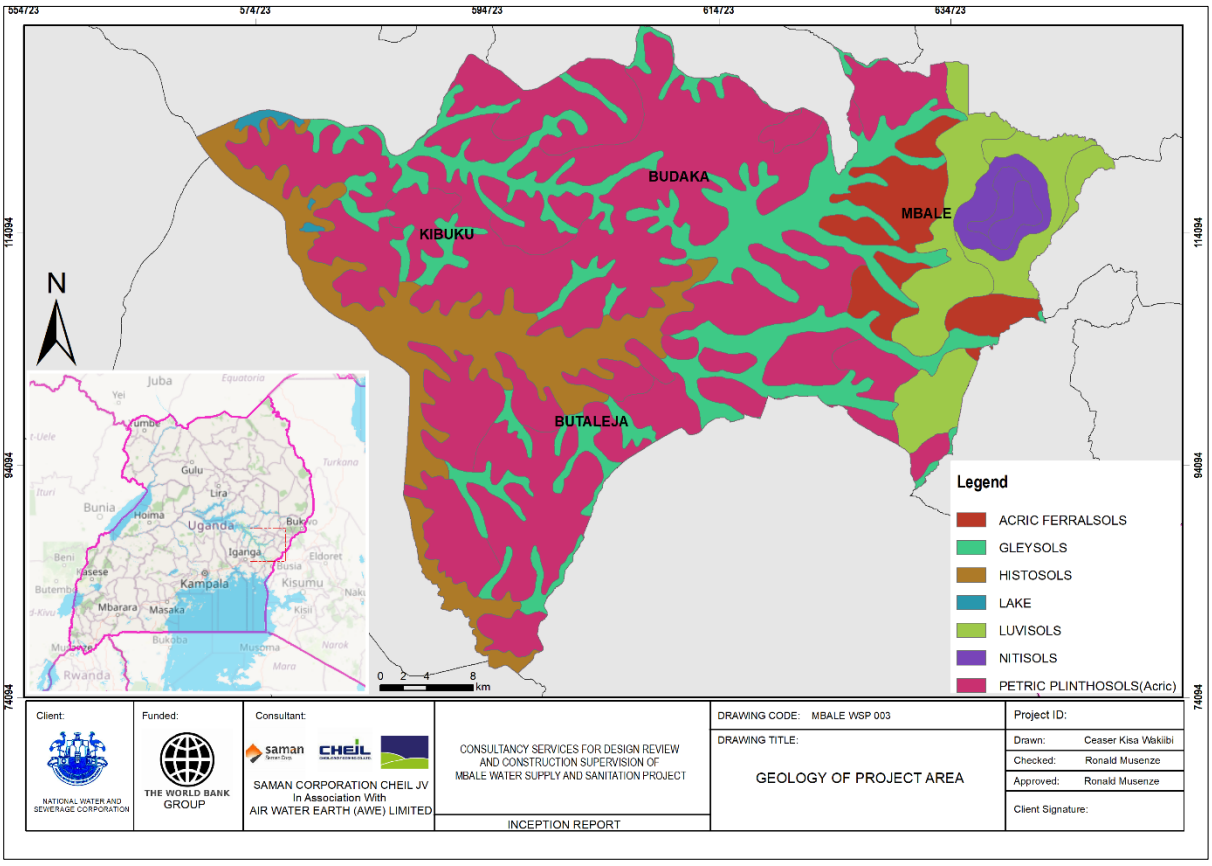


Figure 5-3 Types of soils in Mbale District and City

5.1.1.3 Water resources and drainage

The City is drained from east to west by three major rivers that have their sources on Wanale Ridge. River Nashibiso and its tributary Napwoli drain into the southern part of the town. These are bound by an extensive plain under forest reserve management. River Nabiyonga and its major tributary Namatala drain across the northern area of the town. Several primary and secondary drains have been developed to originate from within the town area and drain into these rivers. All the mentioned rivers drain into River Namatala which forms the north-west boundary of Mbale City. Rivers in the project are presented in Figure 39. Four main rivers for raw water supply within this project area have been identified. The rivers Nabijo, Nabuyonga and Manafwa are currently used for water supply, while the River Namatala offers a further possibility for gravity raw water supply. The output of this assessment can support the decision for the best strategy of water supply within this project. For River Namatala the consultant

received data of hydrological flows from 1990 to 2014 (Gauging Station 82212 and 82213), while data for Nabuyonga (Gauging Station 82248) is available from 1972-1996. No data exists for the Nabijo River, because no gauging station has been constructed for this stream.

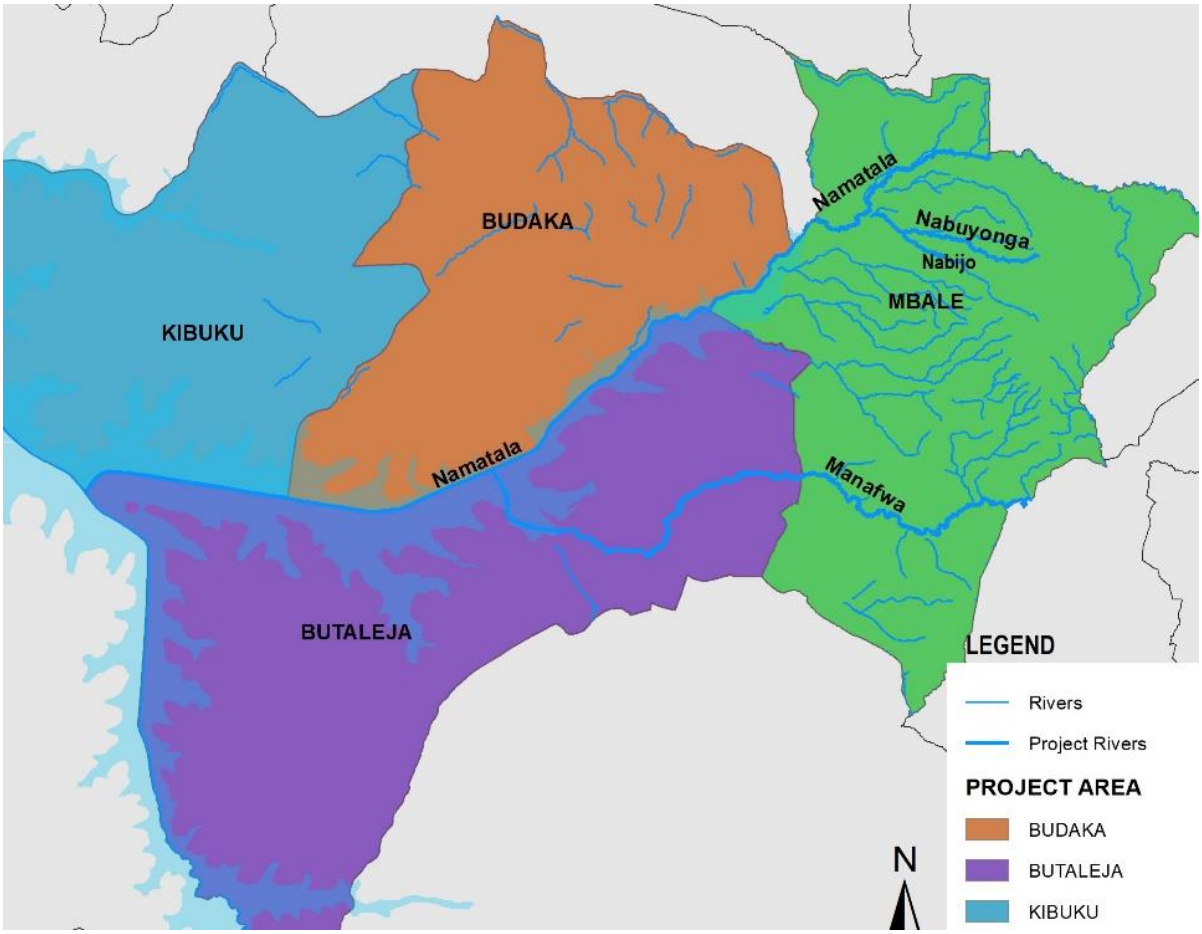


Figure 5-4 Water resources in the Mbale project area

5.1.2 Socio-economic and Land Use Activities

5.1.2.1 Administrative units

Mbale District has 1 City with 3 divisions, 4 counties with 31 sub-counties, 148 parishes and 1448 villages (Table 5-1). Mbale City is comprised of three Divisions namely: Northern, Industrial and Wanale (Figure 40). The divisions of the City are further subdivided into Wards and Cells as indicated in Table 5-2. The proposed project will be located in both counties of the district with the largest component in Mbale City.

Table 5-1: Number of Mbale District Administrative Units

County Name	Sub-County/ Divisions	Town Councils	Parishes/Wards	Number of Villages/Cells
Bungokho	20	4	128	896
Mbale City	3		14	93
Total	**23**	**4**	**142**	**989**

Source: https://www.mbale.go.ug (accessed on 06/12/2021 at 11.12 hours)

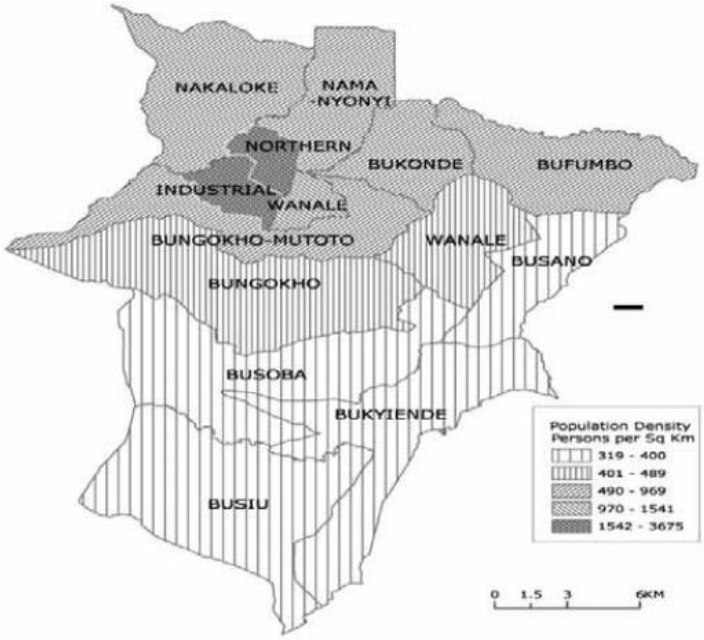


Figure 5-5 Administrative boundaries of Mbale district and the location of the City

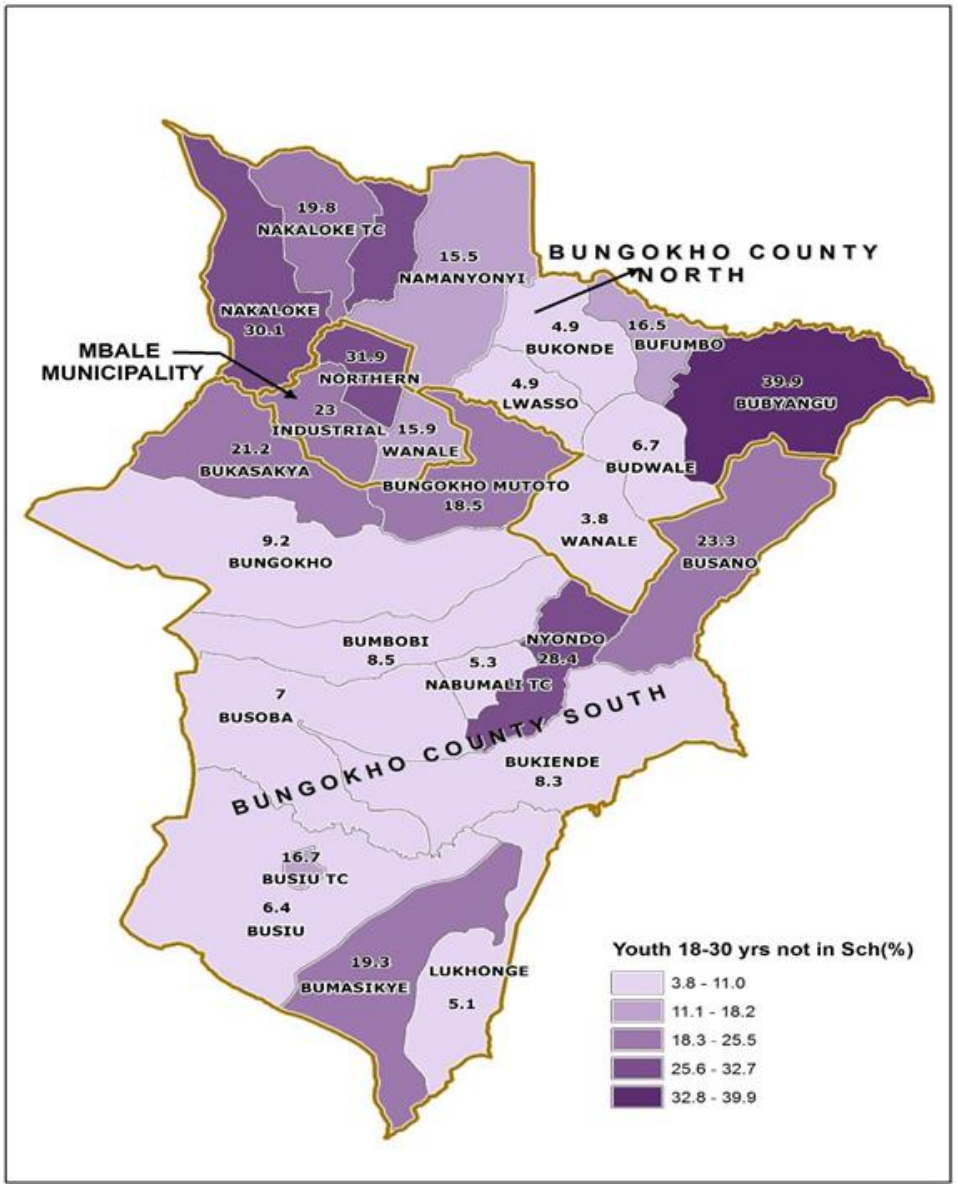
Table 5-2: Wards and cells in Mbale City

Divisions	Wards	Cells
Wanale	Boma	Masaba, Union, Elgon, Nakhupa, Bungokho, Fairway, Bukwa, Nabigyo and Wanale
	Busamaga West	Nabweya, Health Centre, Mosque and Bumboi
	Busamaga East	Nampanga, Butandiga, Namalogo and Namatsyo
	Mukhubu	Isebele, Sawa, Shiende and Zesui
	Mooni	Namubiru,Mutoto, Nashibiso and Nagudi
Northern	Nabuyonga	Sebei, Buwalasi, Kichafu, Kisenyi,Mulembe and Magezi
	Nkoma	Busajja, Hygiene, Buyonjo, Bujoloto, Gangama, Senkulu, Wanambwa and Nambozo
	North Central	Hospital, Clock Tower, Duka, North Road, Byasala, Uhuru, Pesa and Nkokonjeru
	Namakwekwe	Nabigyo, Link Road, Bufumbo, Mission, Kachumbala, Gudoi, Mugisu, Kiteso, Bulago, College and Mpumude
	University	Staff, Sheraton, Northern and Village
Industrial	South Central	St. Andrew's, Wasike, Naboa, Republic Street, Foods, Lwakhakha, Park, Police, Kale and Cathedral
	Masaba	Butaleja, Bumasifa, Pallisa, Malawa, Bugwere and Temuteo Mukasa
	Malukhu	Sironko, Busano, Majanga, Wanyera, Muti, Primary and Muyembe
	Namatala	Somero, Mvule, Sisye, Nyanza, Wandawa, Doko, Bubirabi and Kiduda

5.1.2.2 Employment

Mbale is strategically located in Uganda which makes it attractive and competitive. It is surrounded by a rich agricultural region which provides the City with agricultural produce. Its close location to Kenya provides the town with opportunities for various economic activities and trans-border trade. However, the informal sector is the major source of employment for the residents of Mbale. The sector consists of small entrepreneurs and people with flexible but non-permanent employment, although a large number

of entrepreneurs are not registered with any authority. The main economic activities carried out in Mbale include trade, transport services such as transport on motor cycles (boda-bodas), telecommunication services, restaurants, lodges and hotel services, and food processing industries. In slum areas however, there are high levels of unemployment, especially among the youth. The proportion of youth population aged between 18 and 30 years, not in school and not working in the district is presented in Figure 5-6.



Source: UBOS, 2017

Figure 5-6 Percentage distribution of youth population aged 18-30 years, not in school and not working; Mbale District, 2014

5.1.2.3 Population and demographic characteristics

The estimated population of Mbale District is 492,804 as per 2014 census (Table 5-3) of which 237,610 are males and 255,194 females. The rural population was estimated at 369,083 persons while the urban population stood at 123,721 persons implying that the largest proportion of the population is rural. Currently the average population growth rate is 2.5 while that of the country is 3.03 (UBOS, 2014). The

population of Mbale City is distributed in the three divisions with the largest, most populous and economically most prosperous being Industrial Division. The large population in Industrial Division is attributed to the large population of immigrants as compared to Wanale Division, which is predominately a residential area comprising mainly Senior Quarters. Industrial Division is also the location of most industrial setups in the City and covers the busiest parts of the central business district. This explains it's relatively high population.

Table 5-3: Current Population in Mbale District

County	Sub-County	Number of households	Average size of household	Male	Female	Total Population
Bungokho	Bubyangu	4,274	4.9	10,114	10,783	20,897
	Budwale	1,575	4.9	3,838	3,919	7,757
	Bufumbo	3117	5.5	8,107	8,945	17,052
	Bukasakya	7,802	4.2	15,888	17,096	32,984
	Bukhiende	4,708	4.7	10,765	11,407	22,172
	Bukonde	3,958	4.9	9,288	9,983	19,271
	Bumasikye	2,497	4.8	5,856	6,258	12,114
	Bumbobi	3,454	4.6	7,620	8,176	12,796
	Bungokho	6,277	4.5	13,475	14,628	28,103
	Bungokho Mutoto	8,255	4.2	16,904	17,843	34,747
	Busano	3,132	4.7	7,305	7,432	14,737
	Busiu	5,058	4.7	11,675	12,177	23,852
	Busoba	4,596	4.7	10,511	11,329	21,840
	Lukhonge	2,065	4.7	4,755	5,027	9,782
	Lwasso	1,712	5.3	4,475	4,550	9,025
	Nakaloke	4,553	4.9	10,747	11,947	22,694
	Nakaloke TC	5,661	4.8	12,994	14,538	27,532
	Namanyonyi	6,736	4.5	14,971	15,741	30,712
	Nyondo	2,529	4.7	5,881	6,406	12,287
	Wanale	2,699	4.9	6,510	6,751	13,261
Mbale City	Industrial Division	10,722	3.8	20,638	21,672	42,310
	Northern Division	10,546	3.4	18,440	20,636	39,076
	Wanale Division	3,606	4.0	6,853	7,950	14,803

Source: UBOS, 2014

5.1.2.4 Healthcare services

There are a number of health institutions in Mbale City, with the Mbale Regional Hospital being the largest and serving as a referral hospital for the eastern region of Uganda. Other health institutions include the CURE Hospital for specialized orthopaedic services, the Ahamadiya Hospital, the City Health Centre, Namakwekwe Maternity Centre and Namatala Health Centre IV. Private clinics, First Aid posts and drug shops are fairly distributed in the City.

5.1.2.5 Level of education and literacy

Educational institutions are many, ranging from nursery, primary, and secondary schools to higher institutions of learning, which vary from privately owned to Government institutions. Most of these institutions are found in the Northern Division, while the rest are in Wanale Division. The major higher institutions of learning include: the Islamic University in Uganda, the School of Clinical Officers, and the

Mbale School of Hygiene. Others include Mbale Secondary School believed to be one of the oldest schools in Eastern Uganda. The literacy level is at 67.4 percent.

5.1.2.6 Land use activities and tenure

The land use in the catchment Areas is mainly subject to highly cultivated land. Only patches of the former dense forests in the catchment areas at the slopes of Mount Elgon remained, due to population pressure and subsequent impacts of economic activities and agriculture. Main land use activities are based on subsistence agriculture for crops such as bananas, potatoes, beans, cabbage, cassavas, maize, beans or nuts. Other agricultural activities include livestock farming, apiculture or forestry. Apart from coffee production, forestry of Eucalyptus is commonly practiced for timber, firewood and charcoal production. Other economic activities include mining, such as for sand and stones, as well as brick making.

Photo 5-1: Some of the activities along the banks of River Namatala

Land tenure is under customary and freehold system and the City has no control over land use because of the customary nature of land tenure. The privatization/ liberalization of the economy has led to the growth of buildings and structures, many of which are built without following the environmental and zoning guidelines. Slums have mushroomed uncontrolled, further contributing to the degradation of land. The lack of basic social amenities in some areas has led to increased development in areas that have access to the basic social amenities such as water, sewer lines and electricity; this has led to overcrowding in certain parts of the town. Over-population and land shortage is forcing people to encroach on flood plains, road reserves, drainage channels, and public land.

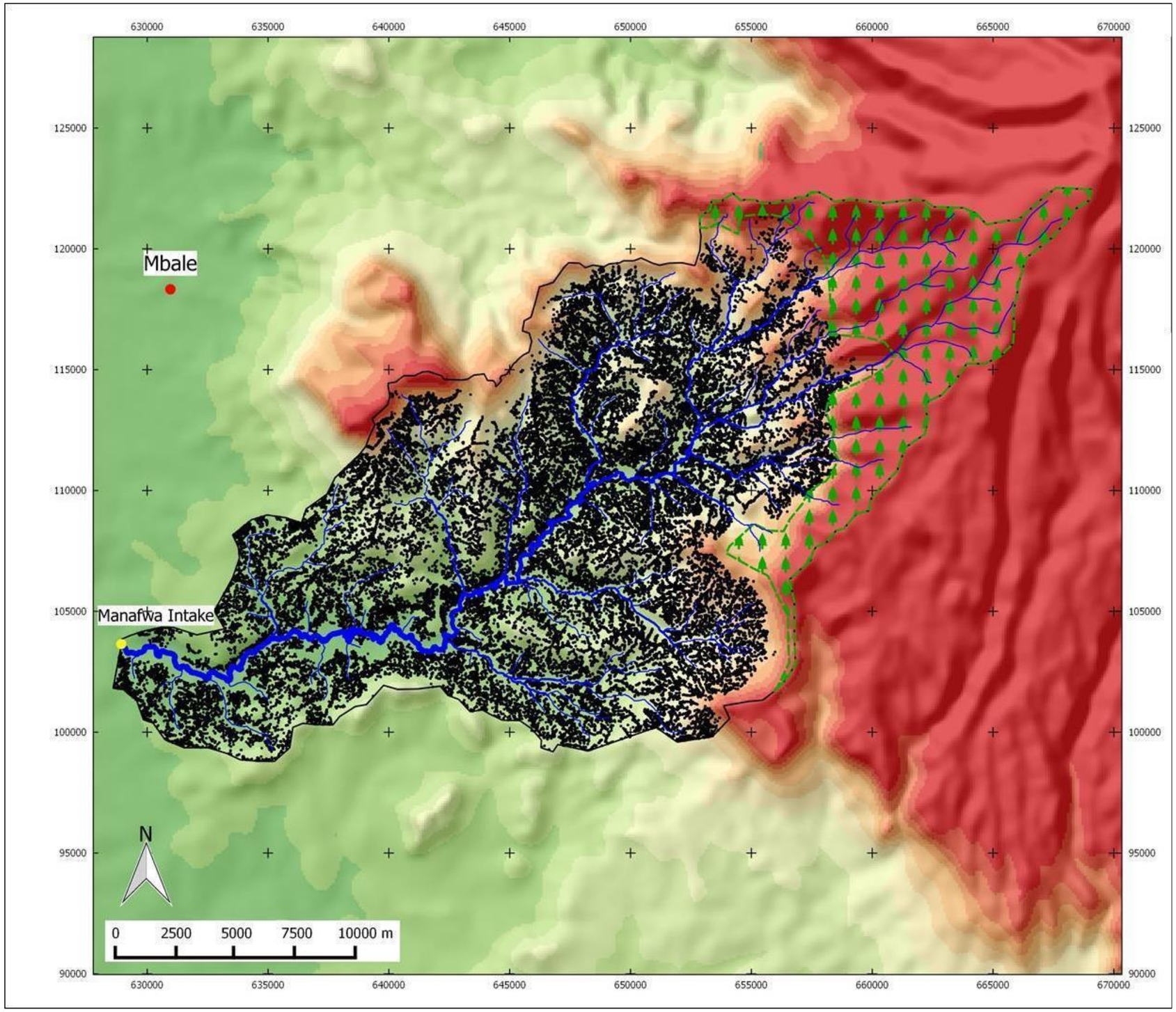


Figure 5-7 Built up structures in Manafwa catchment area as of 2015

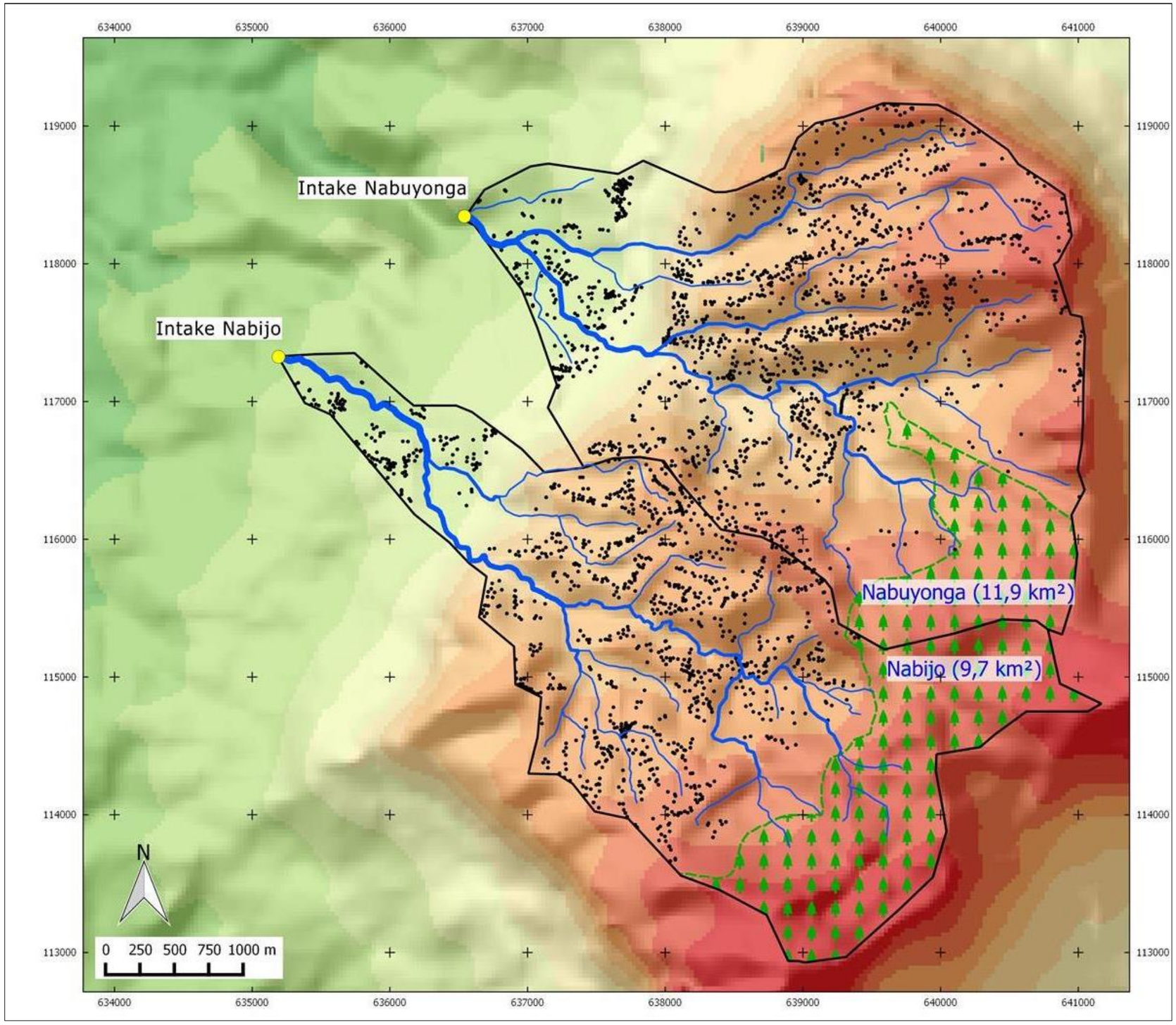


Figure 5-8 Built-up structures in Nabuyonga and Nabijo catchment areas as of 2015

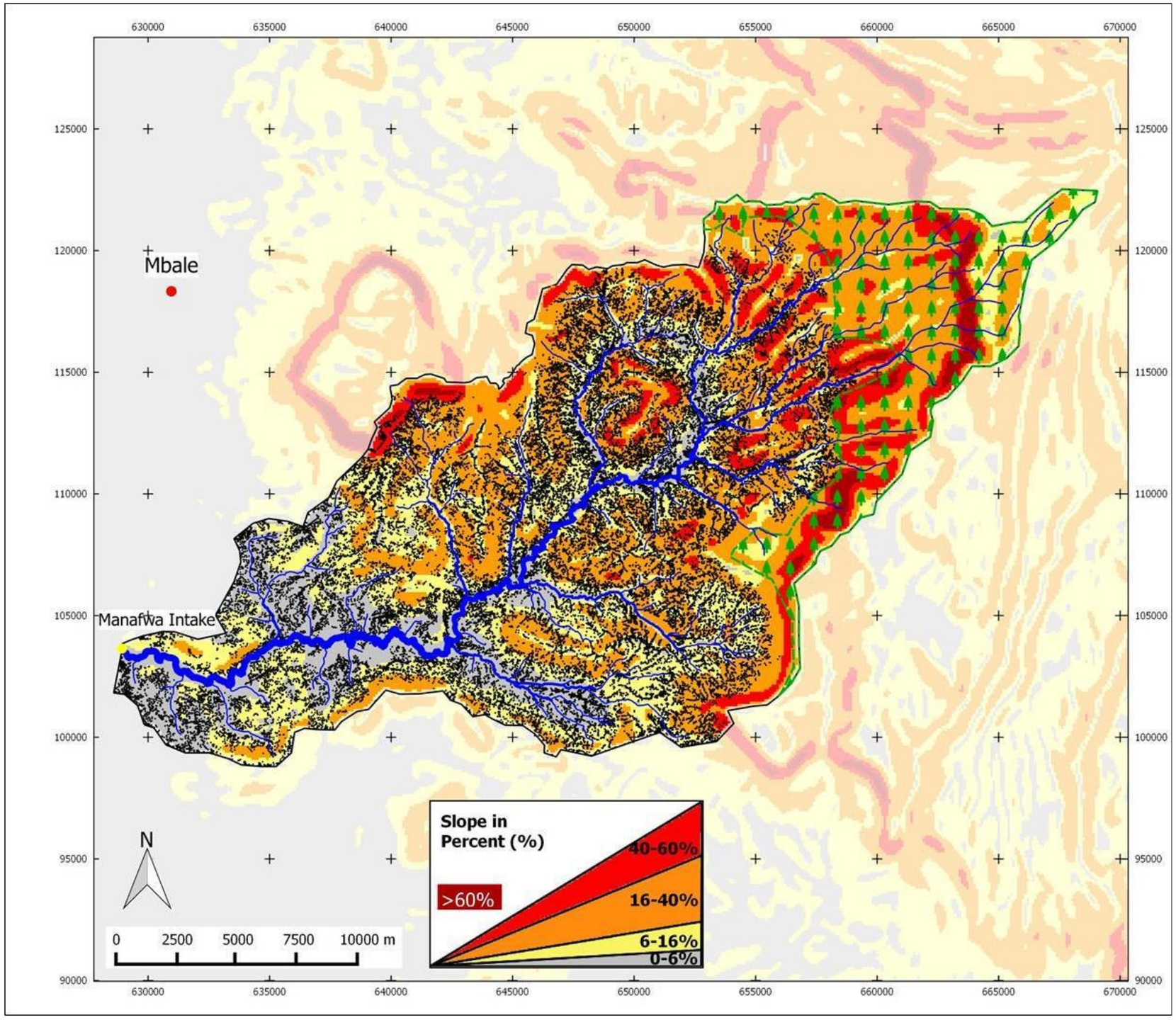


Figure 5-9 Built up structures (black dots) in Namatala catchment area as of 2015

5.1.2.7 Water supply and sanitation

According to NWSC approximately 78% of the population in Mbale is currently connected to the water supply system. Water is treated at the Manafwa and Bungokho water treatment plants. From there it is supplied via a central reservoir to Mbale and surrounding towns. A normal house connection (1/2", less than 50 m) costs UGX 105,000 in Mbale. The price includes the pipe, a water meter and the labour for the installation. A deposit of 30,000 UGX has to be paid which remains on the customer's account. Once connected consumers pay their consumption, as listed in Table 5-4.

Table 5-4: Water tariff structure as per 1st July 2014

Type of consumer	Charges (UGX/ m^3)
Public standpipes	1323
Residential	2046
Institutional/ Government	2518
Industrial/ Commercial: ▪ Below 1500 m^3 per month ▪ Over 1500 m^3 per month	 3089 2468

From the socio-economic survey conducted by CES during the feasibility study, in all of the six growth centres between 60 – 85% of the population is using borehole water, water from springs and shallow wells and the river. In Busolwe and Tirinyi/Kibuku about 17% - 20% of households were connected to piped water from a private operator and the water consumption amounted to one (1) jerry can per person per day which is equal to 20 l/p/d. The average income in the Growth Centres was estimated at UGX 87,000 in Tirinyi and Kibuku and UGX 181,000 in Butaleja and Busolwe far lower than the average income in rural areas of Uganda (UGX 303,700). The average monthly income is only in Budaka (UGX 486,000) higher. A house connection will cost more than the average monthly salary in Tirinyi and Kibuku and approximately 60% of the average monthly salary in Butaleja and Busolwe (assuming the NWSC house connection costs of UGX 105,000 in Mbale). The survey indicated that the majority of the population in the Growth Centres had willingness to pay for improved services (83% - 97%) with the main reasons that would hinder them from private house connections being the connection fees (26% - 48%) and the user charges (13% - 39%). Most of the inhabitants in Busolwe and Butaleja are willing to pay UGX 50 (25 - 35%) or even UGX 100 (20 – 32%) per jerry can (20l). The willingness to pay per month is between UGX 7,500 (40%) – 15,000 (50%) with only 5% that cannot afford to pay more than UGX 7,500 /month.

As part of Augmented Water Supply Study and Design review of water quality, historical data was obtained from NWSC - Mbale Area. Data was sampled on the raw water mains from the respective intakes over a period of March 2020 to January 2021. Baseline water quality was carried out for 9 parameters including pH, electrical conductivity, turbidity, total alkanity, total hardness, total dissolved solids (TDS), total suspended solids (TSS) and iron of the water sample.

Table 5-5: Typical physical requirements for potable water

Characteristic	Treated potable water*	Natural potable water**	Testing method
Colour (TCU) max	15	50	ISO 7887
Turbidity (NTU) max	5	25	ISO 7027
pH	6.5-8.8	5.5-9.5	ISO 10523

Characteristic	Treated potable water*	Natural potable water**	Testing method
Taste	Not objectionable	Not objectionable	-
Odor	Odorless	Odorless	-
Conductivity (µS/cm) max	1,500	2,500	ISO 7888
Suspended matter	Not detected	Not detected	ISO 11923
* Water that has undergone processes such as flocculation, coagulation, sedimentation, filtration and disinfection. ** Water that is from natural sources that is fit for human consumption without undergoing any form of treatment which will alter its original chemical			

Table 5-6: Typical chemical quality requirements for potable water

Substance or characteristic	Treated potable water (mg/L max)	Natural potable water (mg/L max)	Testing method
Total dissolved solids	700	1500	ASTM D 5907
Total hardness as $CaCO_3$	300	600	ISO 6059
Chloride as Cl-	250	250	ISO 9297
Total iron as Fe	0.3	0.3	ISO 6362
Magnesium as Mg2+	100	100	ISO 7980

5.1.3 River Nabijo

The plots below shows a The temporal variation of the raw water quality at Manafwa intake over a period of 11 months (May 2020 – January 2021) is presented in Figures 5-10 to 5-18.

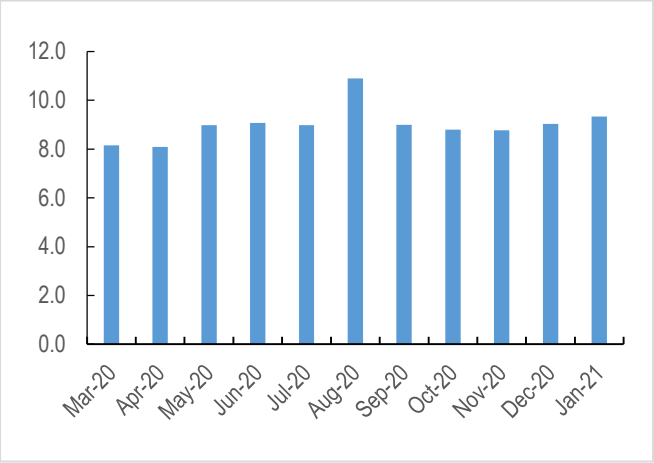


Figure 5-10 Nabijo average monthly pH

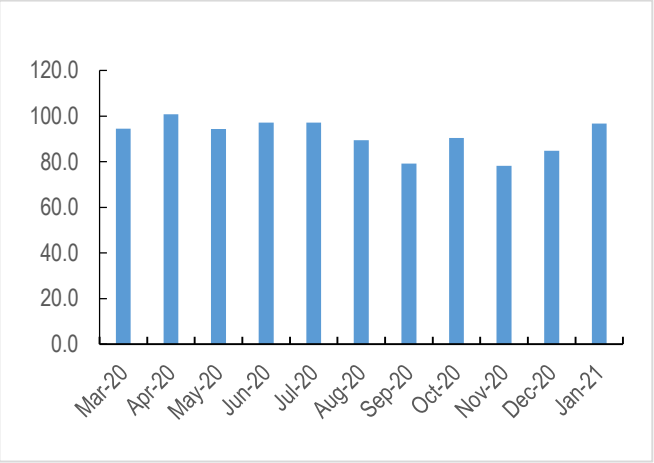


Figure 5-11 Nabijo average monthly EC

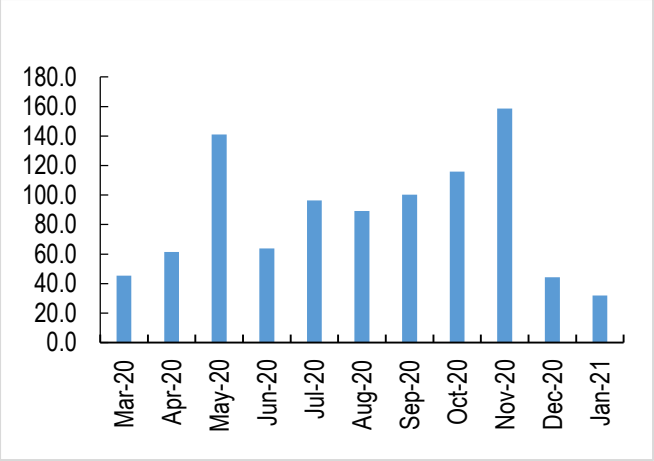


Figure 5-12 Nabijo average monthly turbidity

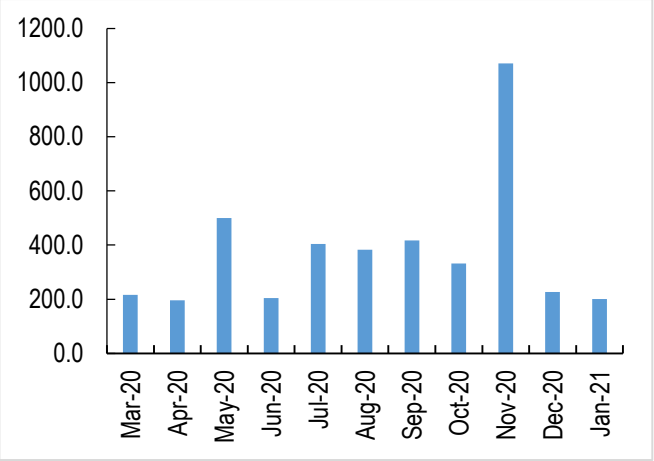


Figure 5-13 Nabijo average monthly colour

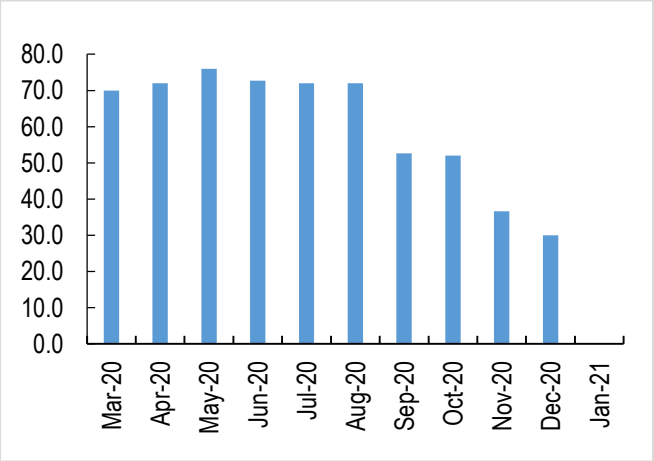


Figure 5-14 Nabijo average monthly total alkalinity

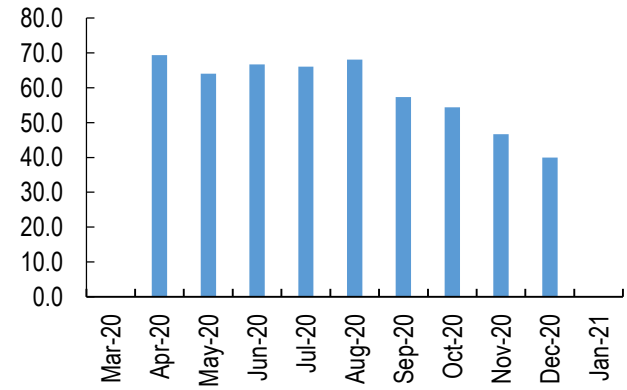


Figure 5-15 Nabijo average monthly total hardness

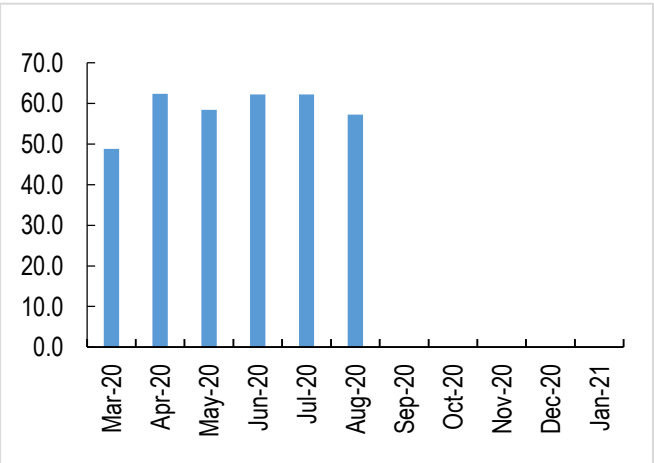


Figure 5-16 Nabijo average monthly TDS

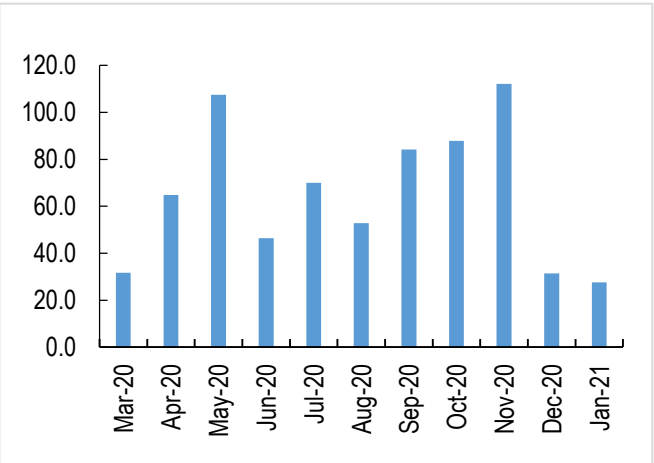


Figure 5-17 Nabijo average monthly TSS

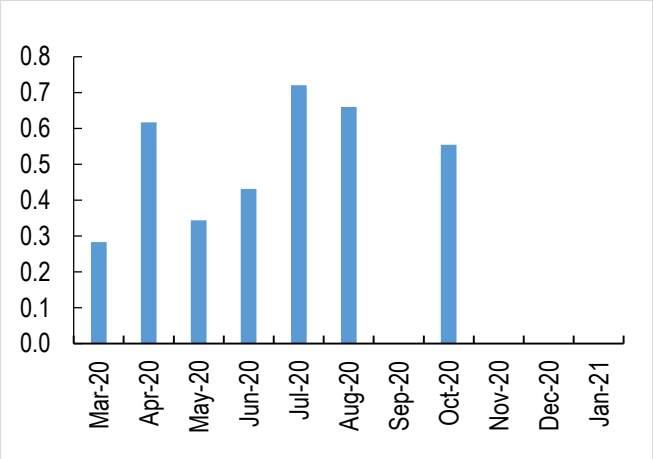


Figure 5-18 Nabijo average monthly total iron

From the data analysed, most of water quality parameters were not complying with the potable standards except pH. TDS, Colour and TSS levels gradually increased as the rainy season progressed (May to November) and gradually decreases as the rains reduce. Given that R. Nabijo has a relatively large catchment with relatively exists poor catchment management practices, most of the soils within the catchment are prone to erosion. This is evident by silt build up at the intake weir hence increasing the cost of treatment.

5.1.4 R. Nabuyonga Intake

The variation of the raw water quality at River Nabuyonga intake over a period of 11 months (May 2020 – January 2021) is presented in Figures 5-19 to 5-27.

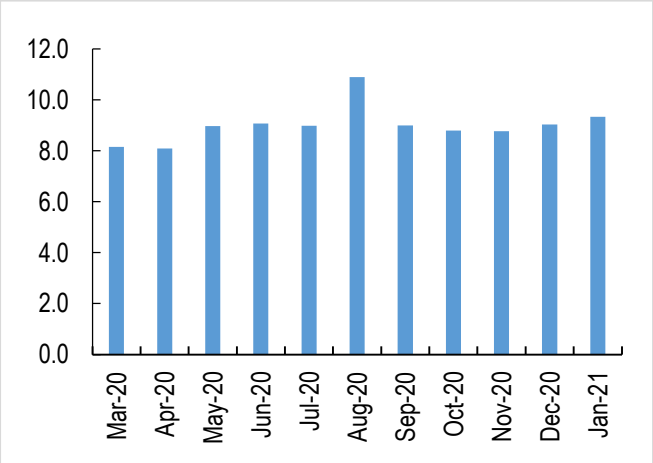


Figure 5-19 Nabuyonga Average monthly pH

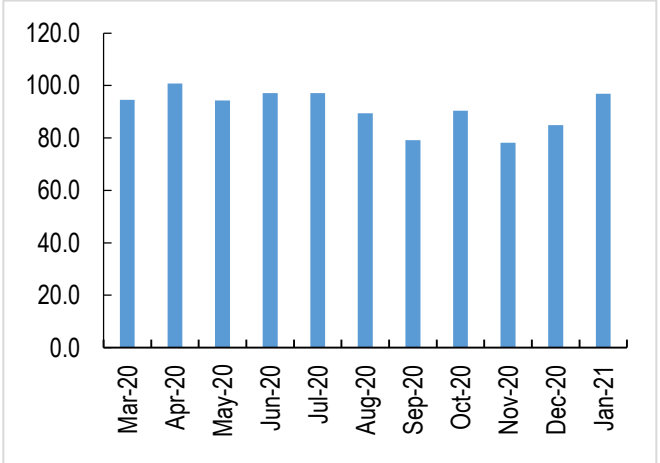


Figure 5-20 Nabuyonga Average monthly EC

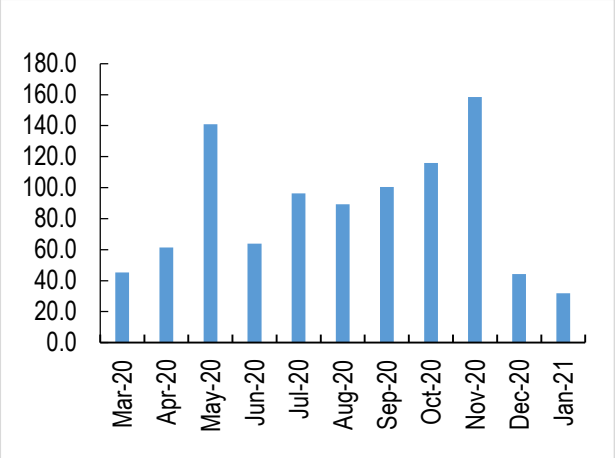


Figure 5-21 Nabuyonga average monthly turbidity

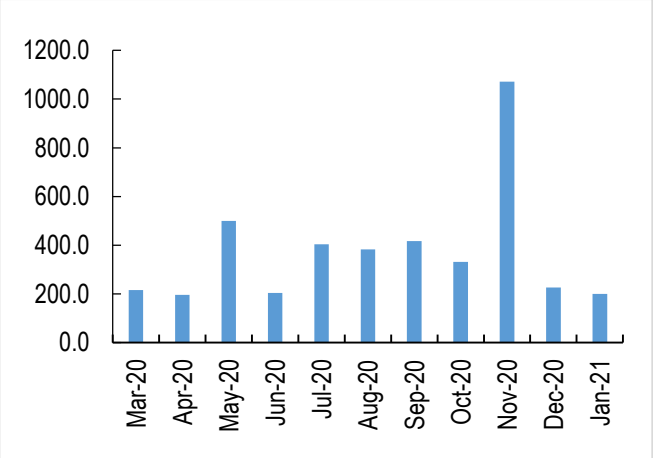


Figure 5-22 Nabuyonga average monthly colour

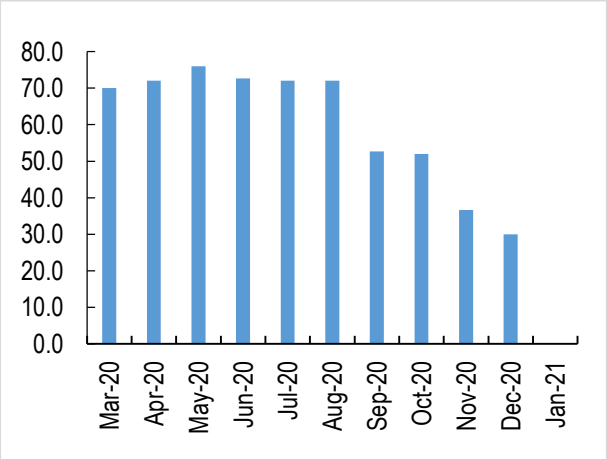


Figure 5-23 Nabuyonga average monthly total alkalinity

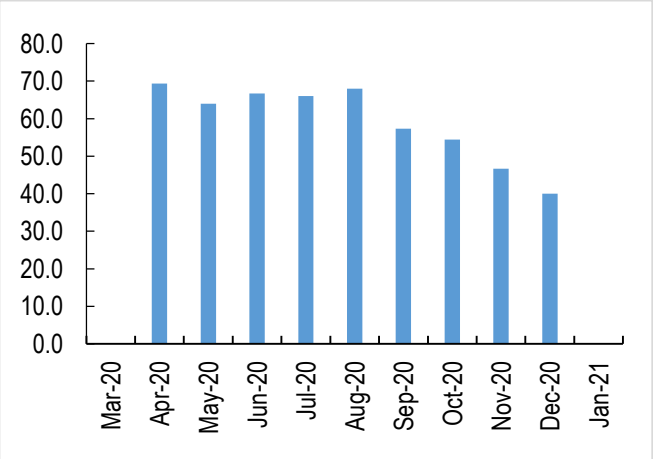


Figure 5-24 Nabuyonga average monthly total hardness

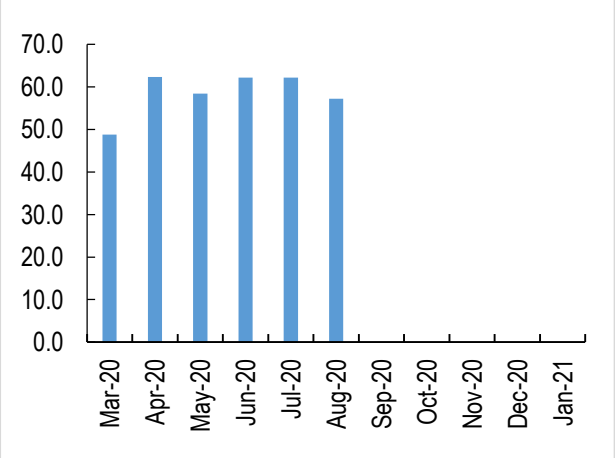


Figure 5-25 Nabuyonga average monthly TDS

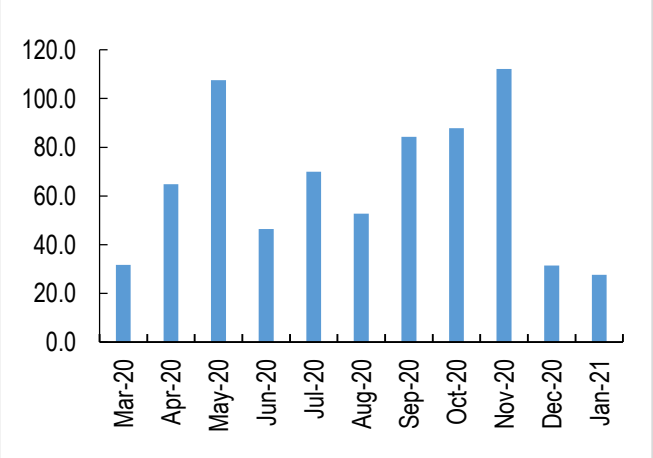


Figure 5-26 Nabuyonga average monthly TSS

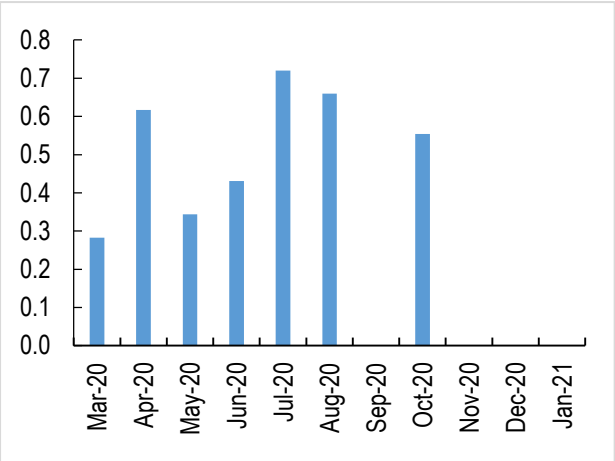


Figure 5-27 Nabuyonga average monthly total iron

From the data analysed, most of water quality parameters were not complying with the potable standards except pH. TDS, Colour and TSS levels gradually increased as the rainy season progressed (May to November) and gradually decreases as the rains reduce. Given that R. Nabuyonga has a relatively large catchment and their existing poor catchment management practices hence soils are prone to erosion. This is evident by silt build up at the intake weir hence increasing the cost of treatment.

5.1.5 R. Manafwa Intake

The variation of the raw water quality at River Manafwa intake over a period of 11 months (May 2020 – January 2021) is presented in Figures 5-28 to 5-36.

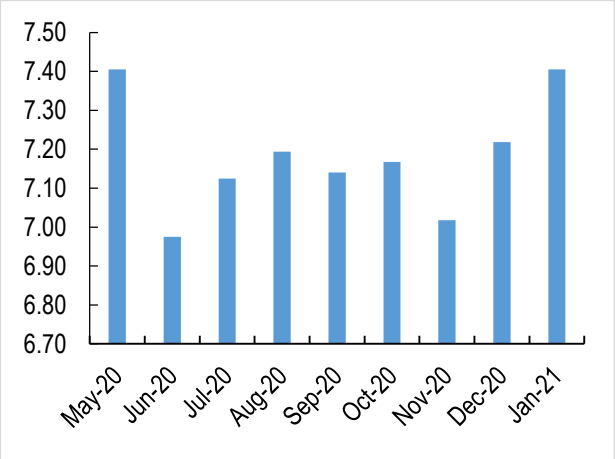


Figure 5-28 Manafwa average monthly pH

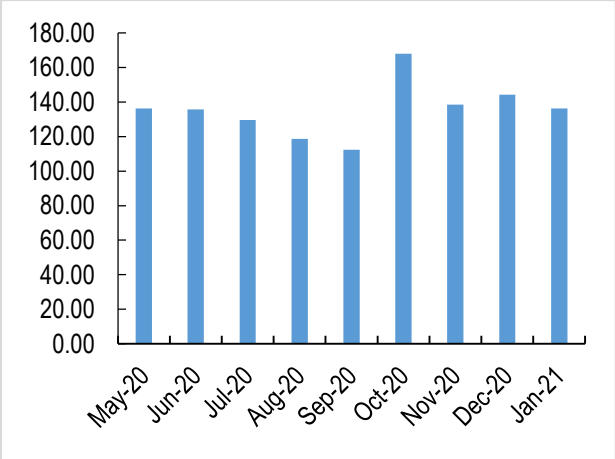


Figure 5-29 Manafwa average monthly EC

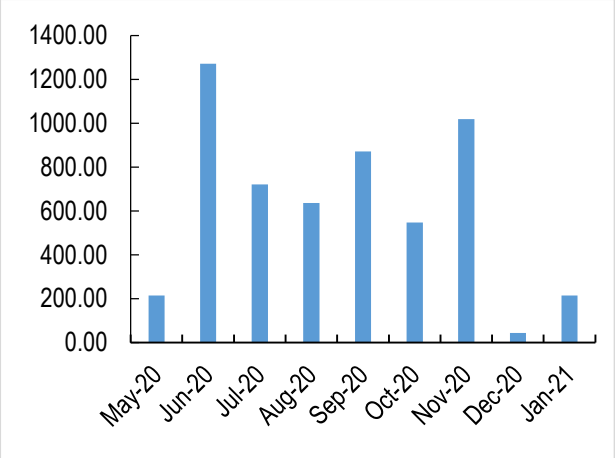


Figure 5-30 Manafwa average monthly turbidity

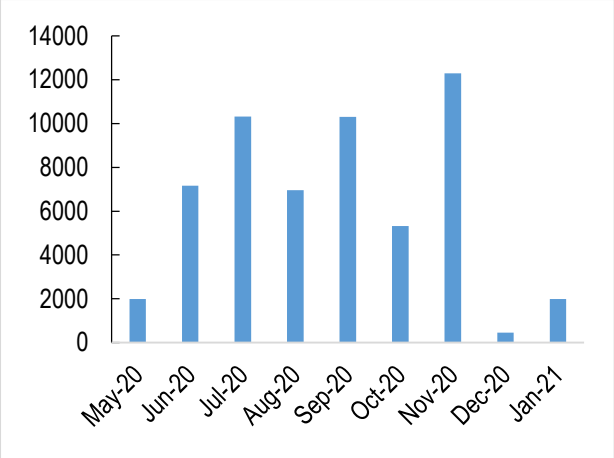


Figure 5-31 Manafwa average monthly colour

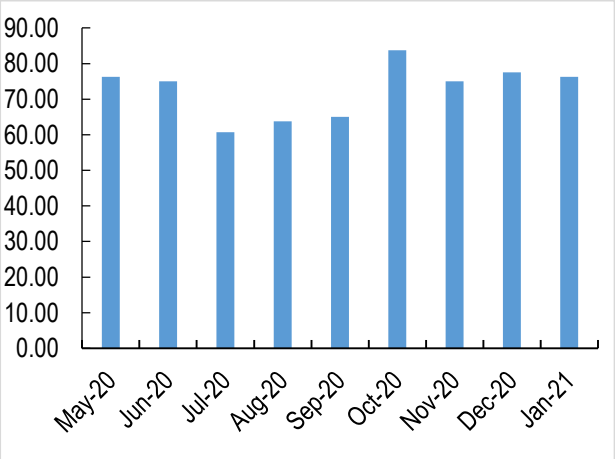


Figure 5-32 Manafwa average monthly total alkalinity

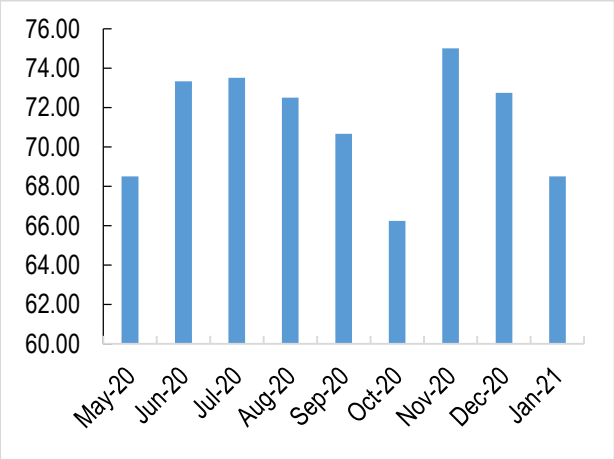


Figure 5-33 Manafwa average monthly total hardness

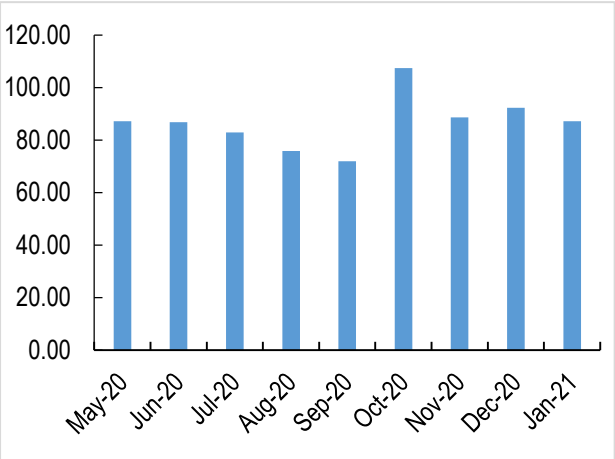


Figure 5-34 Manafwa average monthly TDS

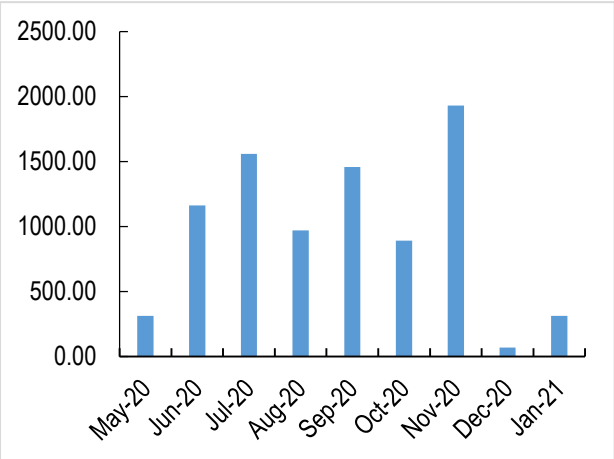


Figure 5-35 Manafwa average monthly TSS

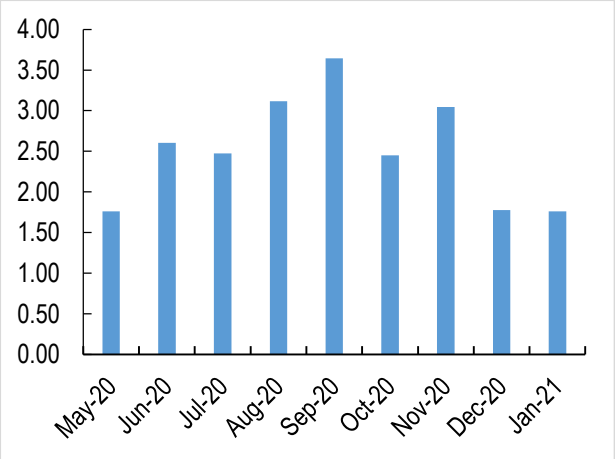


Figure 5-36 Manafwa average monthly total iron

From the data analysed, most of water quality parameters were not complying with the potable standards except pH. TDS, Colour and TSS levels gradually increased as the rainy season progressed (June to November) and gradually decreases as the rains reduce. Given that R. Manafwa has a big catchment and their existing poor catchment management practices hence soils are prone to erosion. This is evident by activities like sand mining that utilise silt for other economic activities.

There are two isolated sewer networks in Mbale City. One system is discharging into the Namatala Treatment Ponds and the other one is discharging into the Doko Treatment Ponds. The two sewerage treatment ponds operated by NWSC are located in the west of Mbale. The Doko Treatment Pond is located south of the Kampala Road and the Namatala Treatment Pond is located north of this road. The Namatala Treatment Ponds were constructed in 1985. The ponds have a total volume of approximately 40,000 m^3 and a surface area of 2.75 ha. The ponds are located at approximately 1110 masl. Several flow measurements were conducted that averaged to a flow of 1,030 m^3 per day. The biggest peak that has been measured was 1,300 m^3 per day. The Doko Treatment Ponds were constructed in the 1985. The total volume of the ponds is 44,010 m^3. The ponds are located approximately 1106 masl. Several flow measurements have been conducted resulting in an average daily flow 1120 m^3 per day.

Although the sewer network in Mbale was established as a separate sewer, there have been reports of illegal stormwater connections. Especially in the Namatala catchment there are several residential properties that did connect their stormwater drains to the sewerage network, which causes siltation in the pipelines and treatment ponds. The quality of effluent from Namatala and Doko waste stabilisation pond systems is presented in Table 5-7. Most of the parameters exceed that the national effluent standards hence the need to rehabilitate and improve on the performance of these pond systems.

Table 5-7: Quality of effluent from Namatala and Doko waste stabilisation pond systems

Waste stabilisation pond	Month/ Year	pH	BOD (mg/l)	COD (mg/l)	TN (mg/l)	TP (mg/l)	TSS (mg/l)	Total Coliform (CFU/100ml)
Doko	Oct-17	7.19	220	106	7.2	2.16	86	41000
	Nov-17	7.50	119	226	9.6	2.42	50	28000
	Dec-17	11.18	252	338	6.4	2.18	28	3000
	Jan-18	9.05	117	139	3.11	1.97	51	3000

Waste stabilisation pond	Month/ Year	pH	BOD (mg/l)	COD (mg/l)	TN (mg/l)	TP (mg/l)	TSS (mg/l)	Total Coliform (CFU/100ml)
	Feb-18	7.93	110	778	8.2	2.58	29	2200
	Mean	**8.57**	**163.6**	**317.4**	**6.902**	**2.262**	**48.8**	**15440**
Namatala	Oct-17	7.65	158	148	12.2	5.67	13	5400
	Nov-17	7.51	87	118	7.7	3.63	3	4500
	Dec-17	7.68	159	221	13.2	5.22	46	3800
	Jan-18	8.90	123	148	5.35	2.65	19	4100
	Feb-18	8.97	252	574	4.6	1.858	12	2600
	Mean	**8.142**	**155.8**	**241.8**	**8.61**	**3.8056**	**18.6**	**4080**
Effluent Discharge Standard		**6.0 – 8.0**	**50**	**100**	**10**	**10**	**100**	**5000**

The majority of the population has access to sanitation facilities, mainly to simple pit latrines. Especially in the growth centres, the use of waterborne toilets is not very widespread. Between 78% (Tirinyi, Kibuku, Kadama) and 95% (Budaka, Butaleja and Busolwe) are using private pit latrines. Between 4% - 8% are using public pit latrines in Butaleja and Busolwe

5.2 SMALL TOWNS

5.2.1 Environmental Profile

5.2.1.1 Climate

The districts have two rainfall seasons, the main one from March to June and the second one from August to November. The variations in the temperatures are not significant and have a sub humid climate with relative humid ranging from 52% to 89%.

5.2.1.2 Topography, vegetation and soils

The topography of the project districts is generally low and flat characterized by shallow seasonal wetlands (Figure 5-37). Its altitude ranges from 900-1200m above sea level (average of 1145m above sea level). The vegetation cover has been largely modified by cutting down trees, grazing, annual or biennial grass fire (burning) compounded by an overload of traditional farming systems. The dominant grass cover is savannah grassland. The swampy vegetation is very common along the major wetlands of the districts. Isolated cases of forest cover exist in some districts like Kibuku with local forest reserves of Sala Wetland in Kirika and Goli goli Nangaiza in Kagumu sub-county. The soils are plinthosols (Ferruginous) tropical soils with low nutrient status that renders them unsuitable for arable farming (Figure 5-38).

5.2.1.3 Geology

According to the Geological Map of Uganda in Figure 5-39 (Compiled by and drawn by Department of Geological Surveys and Mines; scale: 1:1,250,000), this area is generally underlain by precambrian basement rocks of wholly granitized or high to medium metamorphic formation of the Basement Complex. These rocks comprise of Kisoko granite which occupies the bigger central part of the area, Southern and Northern parts are covered by Medium grained granite with pegmatites and Mbale porphyritic granite respectively. The rest of the project area is covered by unconsolidated sediments

comprising of Alluvium, swamp and lacustrine deposits mainly in swampy valleys.

5.2.1.4 Hydrology

The drainage system is dominated by rivers flowing from Namatala and Lwere swamp complexes and Mpologoma swamp (Figure 5-40). These wetland ecosystems have their water sheds mainly on the slopes of Mountain Elgon. These wetland ecosystems feed into Lake Kyoga drainage system. Mpologoma is the major river which forms a natural boundary between Kibuku and Butaleja districts. Many streams and rivers have disappeared over the years due to deforestation on the slopes of Mountain Elgon and encroachment on the major catchment areas of Namatala, Lwere complexes and Mpologoma.

5.2.2 Socio-economic Profile

5.2.2.1 Land use and land tenure system

The most common types of land tenure systems are leasehold and customary. Due to the very nature of small land holdings, most of the land is used for subsistence agriculture (Figure 5-41). However, it should be noted that Kibuku district has some parts of the land gazetted as local forest reserves. This forest reserve is in Saala in Kirika sub-county. Therefore land which was formerly for subsistence agricultural is being converted into urban settlements. Some parts of the wetlands are being converted into industrial activities and commercial agriculture (paddy rice cultivation).

There is great dependency on wetlands for sustenance of livelihoods due to their high level of productivity. The population is engaged in rice cultivation as a cash crop in Doho and Lwoba Schemes. The other crops grown include millet, vegetables, sweet potatoes maize, sugar cane, and sorghum. Grazing is common in the wetlands throughout the year though mostly in the dry season. Subsistence fishing is also carried out in the permanent wetlands and seasonally in the seasonal wetlands and floodplains. Some wetlands are used as hunting ground for wild game. They are also sources of tree products for construction local medicines, charcoal burning and making of floats for instance on the Hisiro island in Butaleja district.

5.2.2.2 Employment

Agriculture is the backbone of the economy in all project towns. The small town's major activity is crop farming accounting for an average of 98% with minimal animal rearing. However, crop farming in Mbale is estimated at 73.3% whereas trade in agriculture and non-agricultural products as well as investment properties are on the raise this area. The major crops grown are coffee, beans, matooke and maize in Mbale, and cassava, millet, sorghum, maize, groundnuts and rice in the whole area. The region in general is endowed with good climate and fertile soils in most parts, which favours a wide range of crops that can be grown throughout the year. Like many other regions in the country, communities in the project towns majorly dependent on subsistence agriculture.

5.2.2.3 Water supply and sanitation

The major sources of water in the towns include boreholes, protected springs, ponds and traditional wells. In Busolwe, 65% of the population relies on boreholes followed by piped water at 20.4%. In Butaleja 84% of the population uses boreholes as the major source of water. The other sources included ponds, traditional wells and protected springs. In Budaka town during the rainy season, most

households (69.7%) obtain water from hand pumps fitted on deep drilled wells, the second largest category are those that use tradition wells. Tirinyi –Kibuku –Kadama towns, the major sources of water are boreholes fitted with hand pumps, shallow wells, hand dug wells, rain water harvesting, rivers and water vendors.

The population in the growth centres is mainly served by pit latrines. The most common method of waste water disposal was by dumping into the yard, 24%, followed by dumping into the soak-away pit (22%). 71% of the respondents had a problem with stagnant water. The majority of the respondents reported that disposal of refuse is mainly done by burning (67%). The results also indicate that 73% of the people do not boil drinking water in Tirinyi and Kibuku towns.

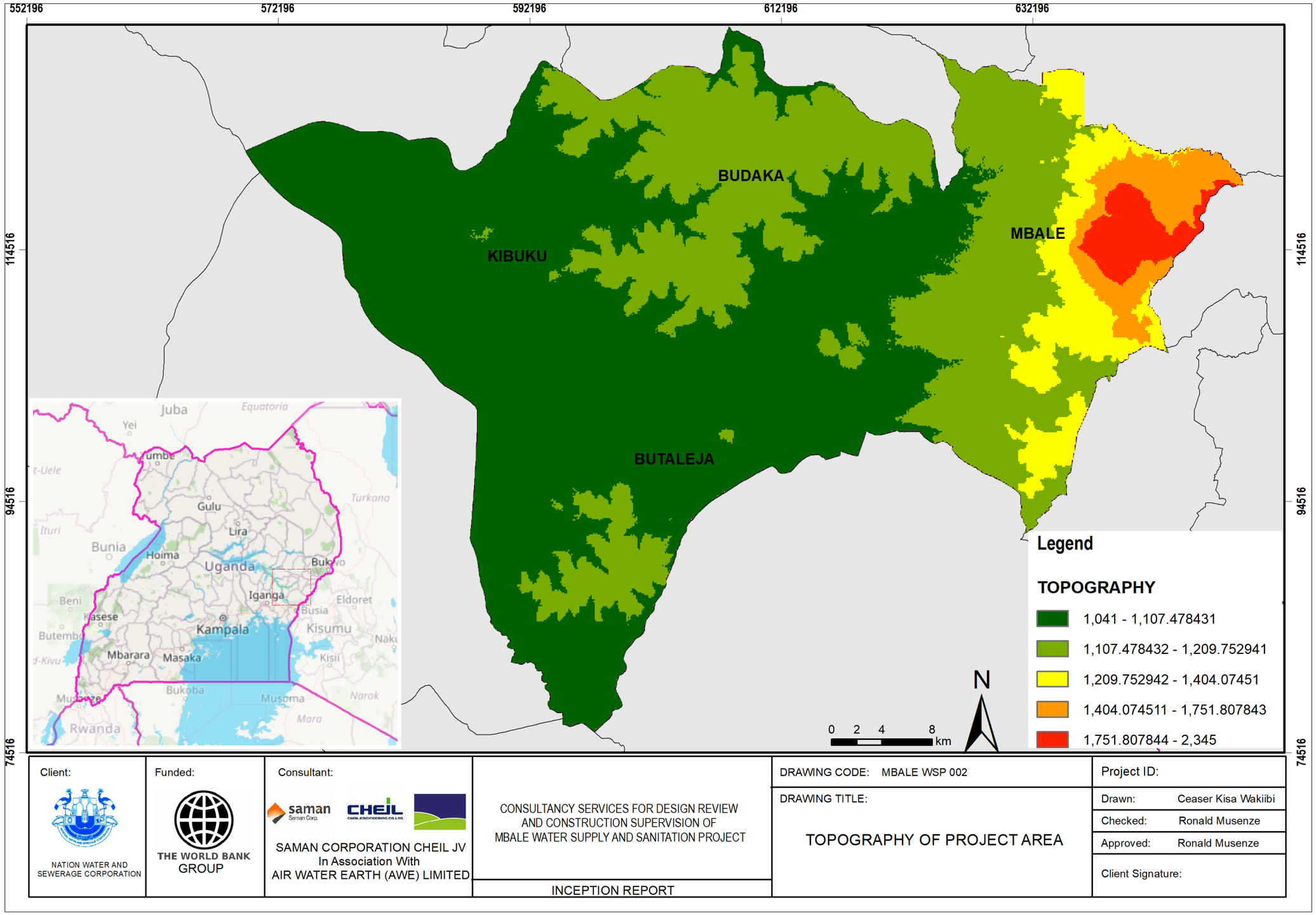


Figure 5-37 Topography of the project towns

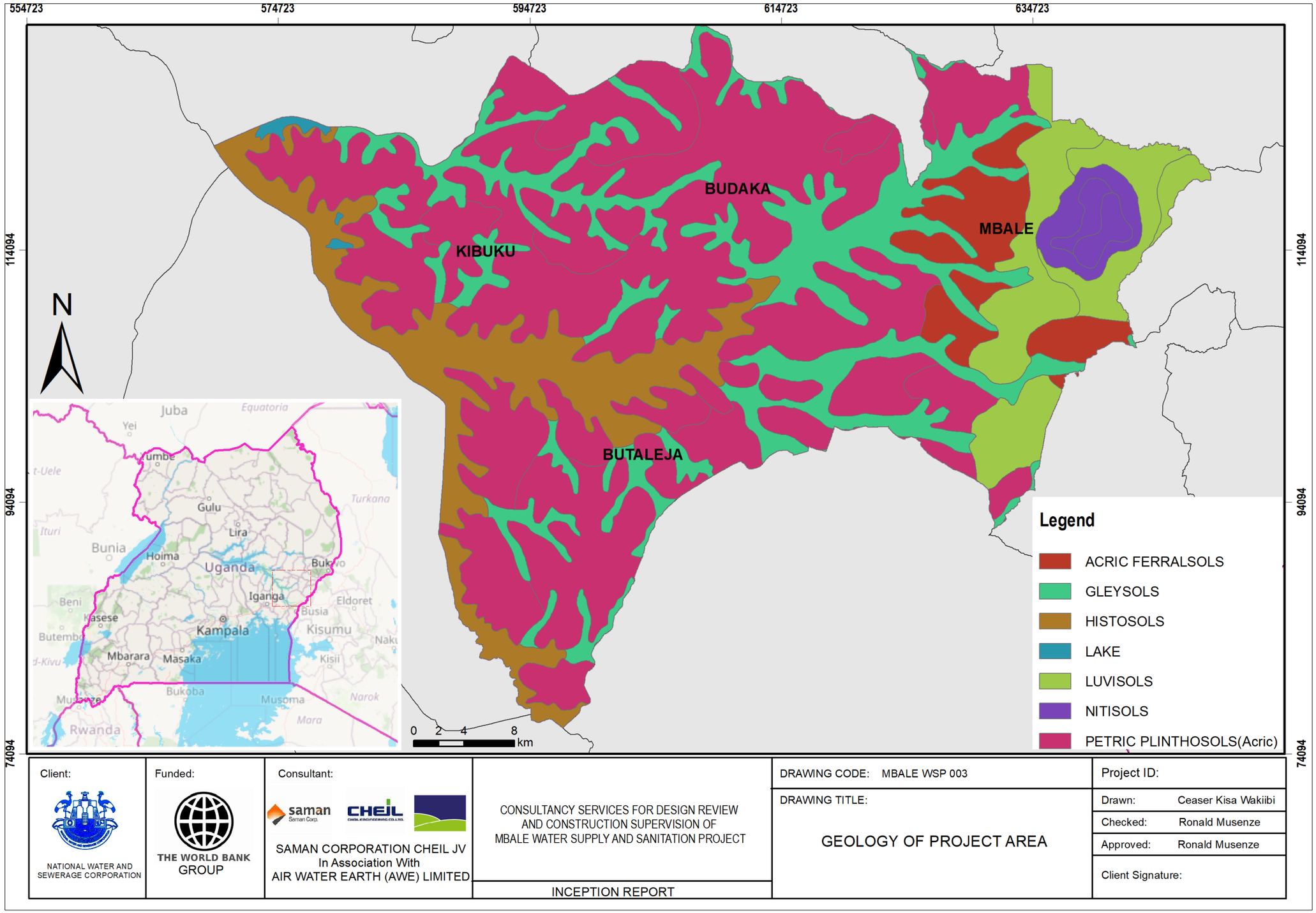


Figure 5-38 Soil types at the proposed project towns

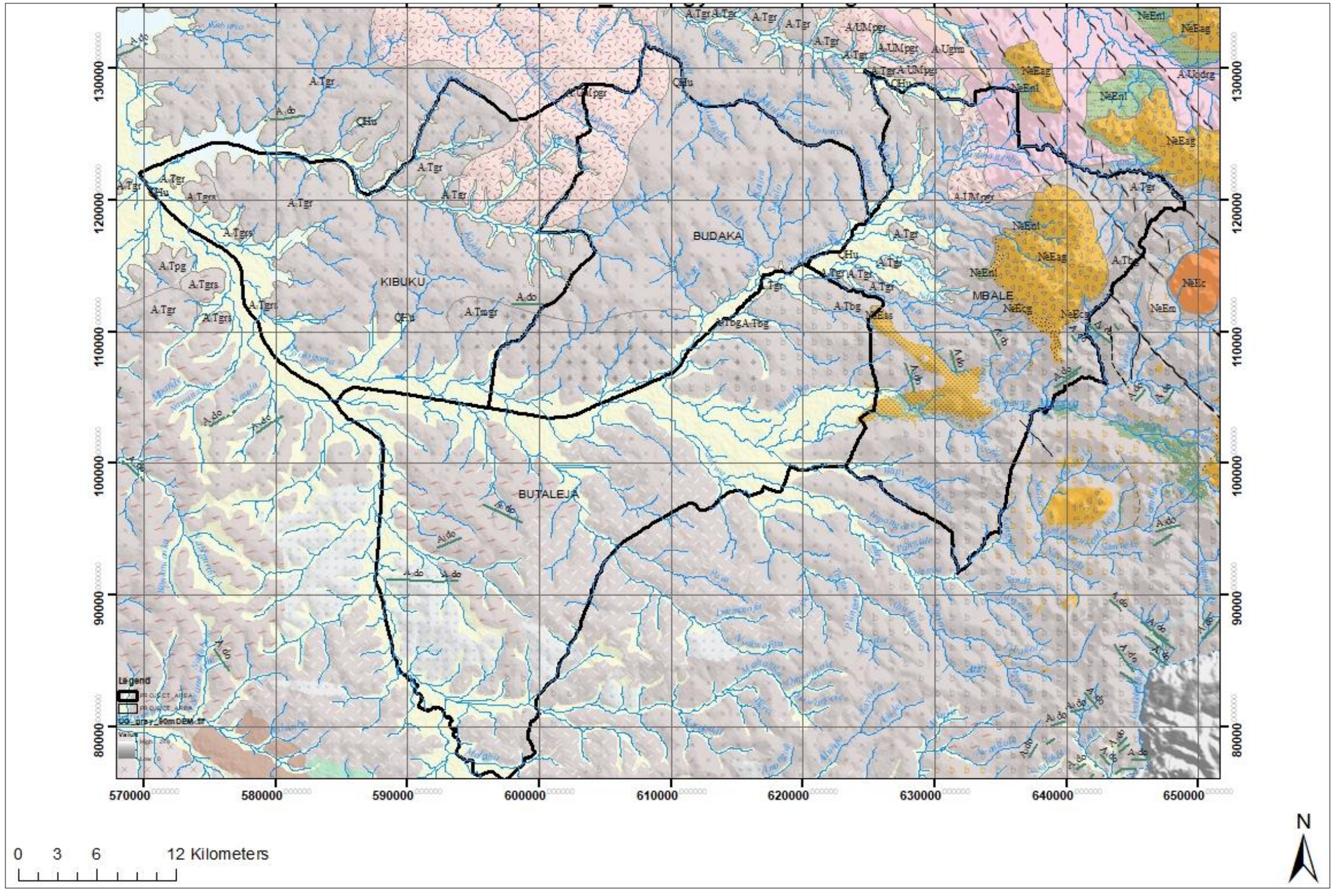


Figure 5-39 Geology of the project area

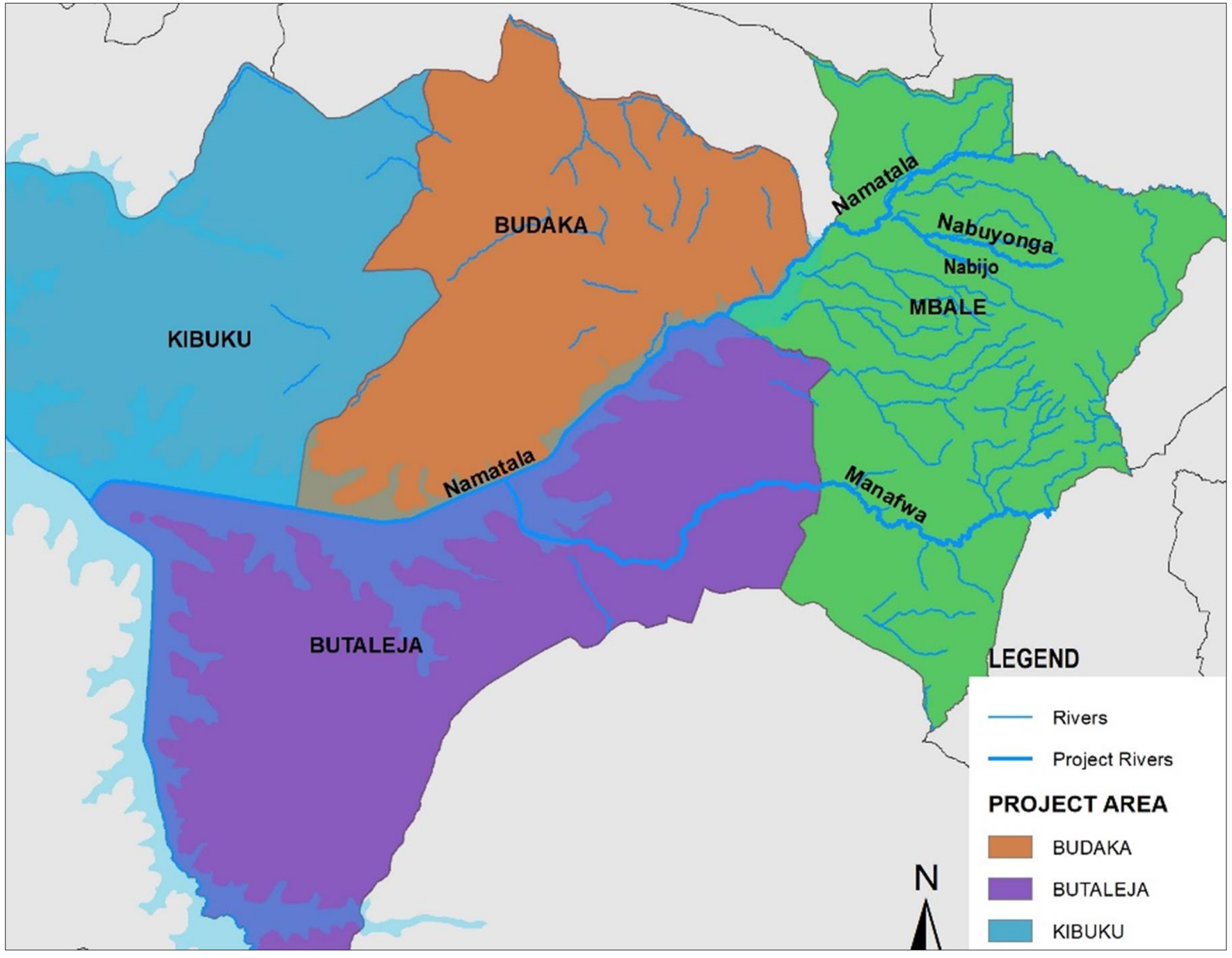


Figure 5-40 Hydrology at the project districts

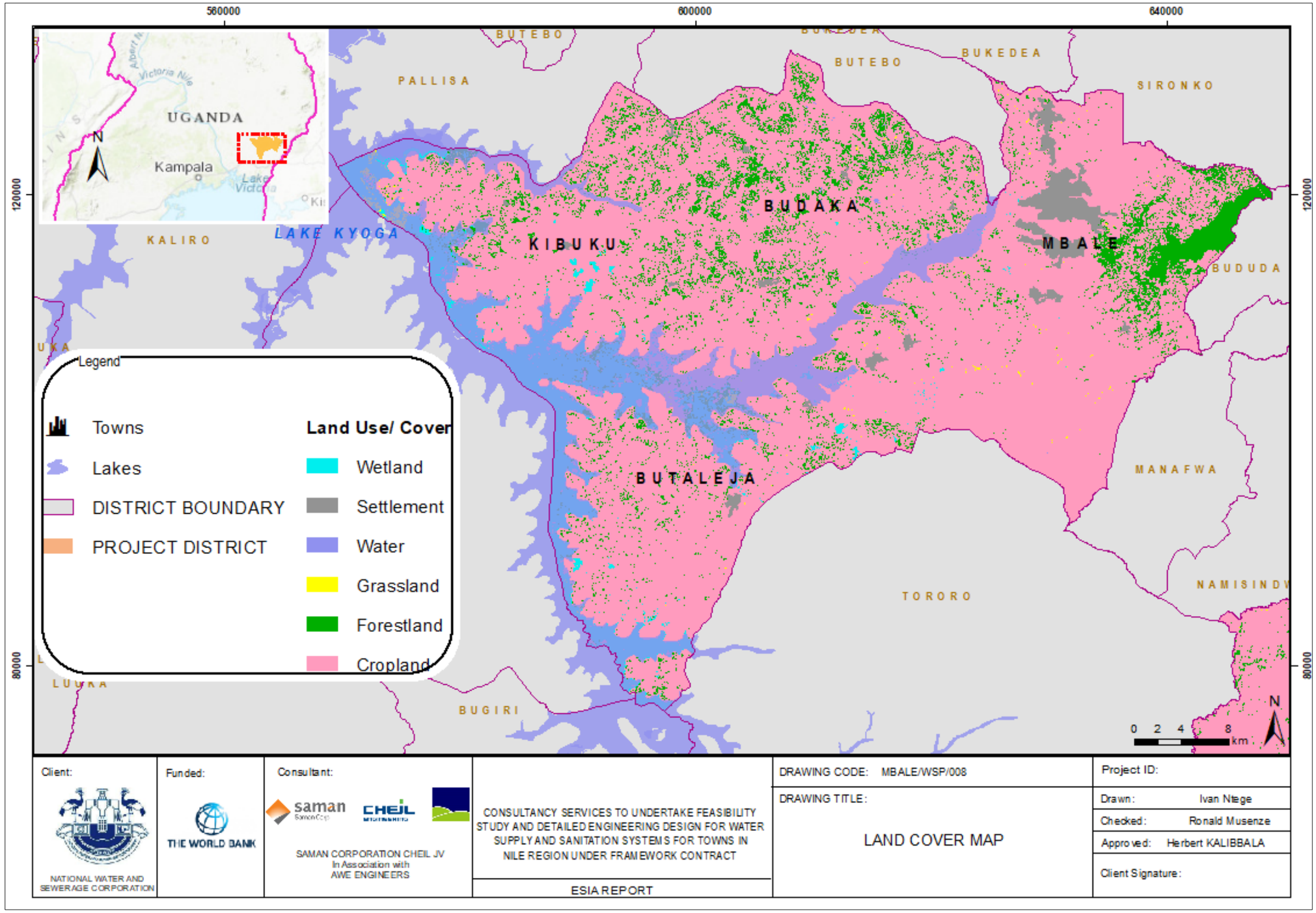


Figure 5-41 Land use in the project districts

5.2.2.4 Demographics

The total population of the district project towns is estimated at 656,942 people (UBOS, 2014) with an average growth rate of 3.68% which is higher than the national average of 3.03%. The districts in general have more females estimated at 340,670 than male estimated at 316,272 in 2014. In Table 5-8, it is also indicated that Kibuku district has the highest estimated average growth rate at 3.8% compared to the other districts. The high growth rates in this region imply that several people will migrate to small towns with the aim of looking for better opportunities thus increasing the demand for social services.

Table 5-8: Population in project town districts

District	Male	Female	Urban	Rural	Households	Non house holds	Total	Growth rate
Budaka	100,196	108,243	23,834	184,605	207,538	901	208,439	3.53
Butaleja	119,068	126,805	36,249	209,629	245,223	650	245,873	3.71
Kibuku	97,008	105,622	8,478	194,152	201,919	711	202,630	3.81
Total	**316,272**	**340,670**	**68,561**	**588,386**	**654,680**	**2,262**	**656,942**	

5.3 SITE SPECIFIC BASELINE

5.3.1 Physical Environment Baseline

5.3.1.1 Air quality

Uganda currently has no comprehensive database about national air quality. However, motor vehicles are major emission sources for several air pollutants, including nitrogen oxides (NO_X), carbon monoxide (CO), particulate matter (PM), and hydrocarbons (HCs) (WHO, 2005). Measurements carried out at selected locations at the proposed project site indicated an environment free from key air pollutants such as carbon monoxide, ammonia, nitrogen and nitrogen oxide emissions as indicated in Table 5-9.

Table 5-9: Air quality at the proposed project sites

Location (UTM 36M coordinates)	Particulates ($\mu g/m^3$)	CO_2 (%)	O_2 (%)	H_2 (ppm)	PID (ppm)	Notes
640418E, 122836N (Bumadibira Bridge)	1	0.03	20.9	0	0	Wet morning
638446E, 123149N (Kamma Lower)	1	0.03	20.9	1	0	Sunny humid weather
636727E, 122577N (Makhosi)	1	0.03	20.9	0	0.4	Sunny humid weather
634150E, 122365N (Nankobe)	1	0.03	20.9	1	0	Sunny humid weather
634850E, 120368N (Namulama)	1	0.03	20.9	1	0	
634174E, 119885N (Kibagala)	1	0.03	20.9	2	0	
634400E, 119014N (Mukhuwa)	9	0.03	20.9	0	0	Motorcycle traffic

Location (UTM 36M coordinates)	Particulates (µg/m³)	CO_2 (%)	O_2 (%)	H_2 (ppm)	PID (ppm)	Notes
632875E, 116426N (Mutoto)	17	0.03	20.9	0	0	Motorcycle traffic
634544E, 118225 (Mango)	2	0.03	20.9	0	0	Light vehicular traffic
631064E, 114941N (Bugema)	11	0.03	20.9	3	0	Highway traffic
631042E, 112895N (Mailo 4)	5	0.03	20.9	2	0	Highway traffic
630298E, 111461N (Bungokho)	4	0.03	20.9	0	0	Highway traffic
628832E, 103613N (Manafwa waterworks)	1	0.03	20.9	1	0	Highway traffic
630274E, 107175N (Busoba)	1	0.03	20.9	0	0	Highway traffic
626953E, 109314N (Bukhumwa)	8	0.03	20.9	0	0	
624197E, 109034N (Kachonga)	34	0.03	20.9	5	1.2	Light vehicular traffic
621366E, 108571N (Naweyo)	4	0.03	20.8	0	0.8	
619667E, 107860N (Namaji)	1	0.03	20.9	5	1.9	Motorcycle traffic
618044E, 107162N (Nabiganda)	6	0.03	20.9	3	3.1	Light vehicular traffic
614837E, 105607N (Nampologoma)	14	0.03	20.9	0	0	
609375E, 102293N (Leresi)	1	0.03	20.9	1	0	Light vehicular traffic
606798E, 101343N (Butaleja)	19	0.03	20.9	0	0	Light vehicular traffic
603235E, 94051N (Busolwe) Town Council)	3	0.03	20.9	0	0.8	Vehicular traffic
634646E, 117456N (Mooni Primary School)	1	0.03	20.9	0	0	
634032N, 117648N (Mukubu)	1	0.03	20.9	0	0	NWSC water works

Inference from measurements: At all measurement locations, no detectable levels of NO, NO_2, CO, H_2S, Cl_2, ClO_2, SO_2, VOCs and combustible gases (CH_4 inclusive) were encountered. These measurements indicate a generally pristine environment with respect to air quality.

5.3.1.2 Noise

The major sources of noise in urban centres of Uganda include humans and transportation activities. The most common source of noise at the project site is from transportation activities, principally motor vehicles and motor cycles (commonly known as boda boda). Noise levels recorded at the proposed project sites are presented in Table 5-10.

Table 5-10: Noise levels measured at the proposed project sites

Location (UTM 36N coordinates)	Sound pressure level dB(A)	Notes
640418E, 122836N (Bumadibira Bridge)	61.8	River roar
638446E, 123149N (Kamma Lower)	42.7	Human conversations. Rustling leaves.

Location (UTM 36N coordinates)	Sound pressure level dB(A)	Notes
636727E, 122577N (Makhosi)	41.4	Human conversations. Chirping birds.
634150E, 122365N (Nankobe)	42.3	Human conversations. Chirping birds.
634850E, 120368N (Namulama)	47.1	Human conversation.
634174E, 119885N (Kibagala)	46.5	Human conversations. Chirping birds.
634400E, 119014N (Mukhuwa)	39.4	Human conversations. Chirping birds.
632875E, 116426N (Mutoto)	58.2	Human conversations. Playing children. Motorcycle traffic. Chirping crickets.
634544E, 118225 (Mango)	47.7	Human conversation. Light traffic.
631064E, 114941N (Bugema)	71.2	Highway traffic.
631042E, 112895N (Mailo 4)	68.6	Highway traffic. Chirping birds
630298E, 111461N (Bungokho)	64.4	Highway traffic. Human conversation.
628832E, 103613N (Manafwa Water Works)	54.2	Chirping birds. Rustling leaves. Highway traffic.
630274E, 107175N (Busoba)	58.8	Highway traffic. Multiple loud stereos. Human conversation.
626953E, 109314N (Bukhumwa)	54.2	Vehicular traffic. Human conversations.
624197E, 109034N (Kachonga)	55.1	Light vehicular traffic
621366E, 108571N (Naweyo)	47.1	Human conversations.
619667E, 107860N (Namaji)	51.9	Light vehicular traffic. Stereos playing. Human conversations.
618044E, 107162N (Nabiganda)	55.6	Light vehicular traffic. Chirping birds.
614837E, 105607N (Nampologoma)	55.1	Vehicular traffic. Human conversations.
609375E, 102293N (Leresi)	53.6	Vehicular traffic. Human conversations. Chirping birds.
606798E, 101343N (Butaleja)	62.5	Vehicular traffic. Multiple loud stereos. Human conversations. Chirping birds.
603235E, 94051N (Busolwe) Town Council)	60.4	Vehicual traffic. Multiple public address systems. Human activity.
634646E, 117456N (Mooni Primary School)	44.6	Playing school children.
634032N, 117648N (Mukubu)	49.1	Distant mosque public address system. Chirping birds. Human conversation. Light vehicular traffic approaching or exiting NWSC water works.
	Non-compliant with NEMA LAeq standards (Day-time limit of 50 dBA) for residential areas	

** Based on landuse Category D (Residential + Industry or small scale production + commerce) for which daytime and night limits are 60 and 50 dBA, respectively according to The National Environment (Noise Standards and Control) Regulations 2003.*

Inference from measurements: These measurements indicate a generally pristine environment with respect to ambient noise levels. These measurements indicate a generally pristine environment with respect to ambient noise levels. However, as would be expected due to the increased human activities in more urban/roadside environments, towns along the road from Mbale to Busolwe had day time noise levels that are higher than is stipulated in the NEMA regulations.

5.3.1.3 Hydrology and catchment characteristics of River Namatala

The proposed Mbale and Small Towns' Water Supply and Sanitation Project is located in Mbale, Budaka, Kibuku and Butelaja Districts of Eastern Uganda subregion. Among the areas to be served include Mbale Muncipality, Trinyi, Kadama, Kibuku, Butaleja, Busolwe and Budaka town councils. The

applicant (MWE) wishes to abstract an amount of 0.313 m^3/s from Namatala and Manafwa for domestic purposes to benefit an ultimate population of about 333,792 by 2040. The total water demand to be supplied by Bungokho WTP is approximately between 27,000 m^3/d while the water demand to be met by Manafwa WTP is approximated to 6,700 m^3/d by 2040.

Namatala watershed is located in Mbale district. The Upper Namatala catchment covers the part of the game reserve with the lower part transversing through seasonal and permanent wetlands before joining the river Mpologoma. The Namatala system specifically originates from Wanale Mountains and crosses the sub counties of Bungokho, Jami village of Bunyole County and Nakaloke County in Pallisa. Most of the area covered by this system is in the lowlands of Mbale District. The soils can be explained in terms of geology and geomorphological processes which have significant impact on soil formation processes. Namatala catchment at Mbale-Soroti road is approximately 123.6 km^2.

The mean dry season flow is relatively high 1.6 m^3/s for Namatala compared to anticipated water demand of 0.385 m3/s. Though lower flows can be experienced at the proposed abstraction point nevertheless the absolute minimum flows (0.326 m^3/s) are less than the water supply demand required by 2040. The mean flow was estimated at 2.67 m^3/s while the flow representing the 95% probability of exceedance (or the safe yield) is approximately 0.52 m3/s similar to the value of 0.5 m^3/s obtained by CES (2015). A 90% exceedance probability has a flow of approximately 0.73 m^3/s. flows exceeded 95% and 99% of time was estimated to be 0.47 m^3/s and 0.37 m^3/s respectively. The analysis suggests enough water is available to meet water demand by design horizon of 2040 will having flow left for environmental issues for downstream users. The environmental flow computed for Namatala River using the Tenannt method was 0.19 m^3/s (Appendix K) leaving an abstractable flow of 0.342 m^3/s in dry season, that is, basing on the mean monthly flow. The EF was calculated basing on estimated data which is most likely higher than the actual situation, for example, Kamonkoli will partly be served by the project. Therefore, this amount of water should allow the river to sustain river health as well as meet the needs of riparian communities.

Photo 5-2: Proposed site for the intake works on River Namatala

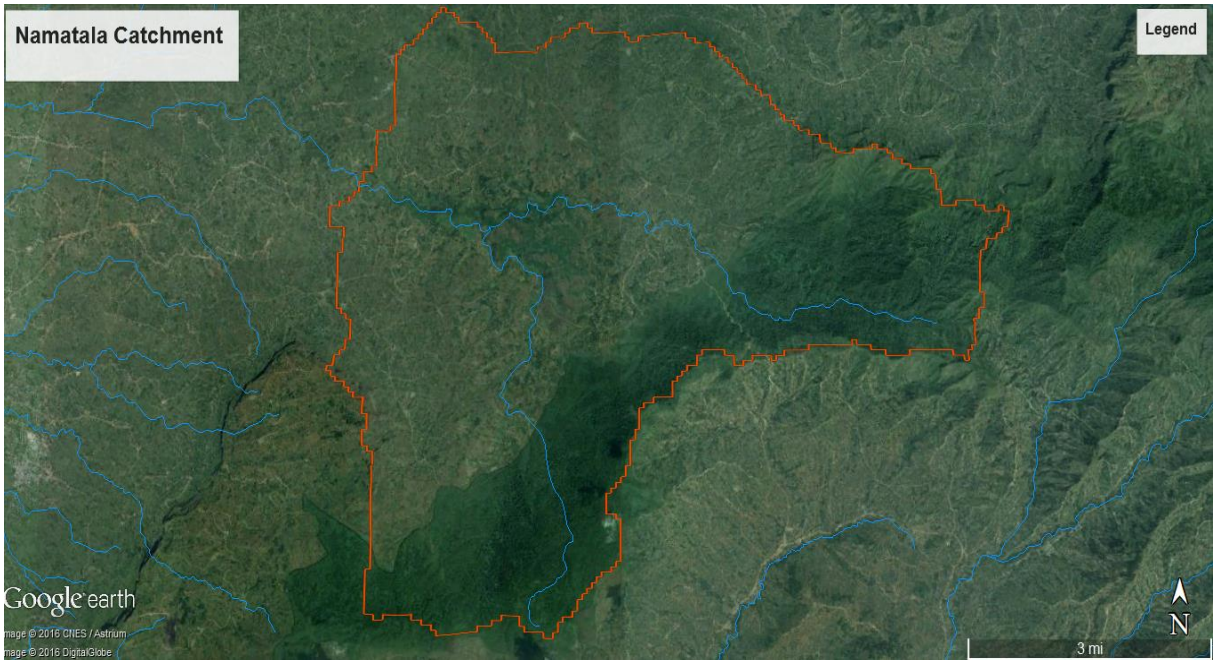


Figure 5-42 Namatala catchment draining through gauge station on Mbale-Soroti road

5.3.2 Biological Environment Profile

Vegetation and flora: The area traversed by the pipeline from Bumadirila intake to Mukhubu treatment plant cuts across built up area, subsistence farmland (including maize, banana, coffee, Ground nuts, and sugarcane gardens), woodlots (including Eucalyptus spp, Pinus spp, and *Grevilia robusta*), and mixed woodlots of *Eucalyptus, Pinus, Tectonia, Maesopsis eminii, Albizia* spp*, Milicia excelsa & Azadirachta indica)* and patches of post-cultivated light bushland and grassland with scattered trees. The Bugema-Manafwa pipeline crosses built up area including small towns and linear settlement along the Mbale-Tororo road, subsistence gardens mainly maize, taro (wetland yams), rice, cassava and Banana. It also cuts across a small patch of fallow land dominated mainly by herbaceous plants of *Bidens pilosa, Panicum maximum* and *Sorghum arundinaceum*. The Mbale-Busolwe line traverse through built up area, subsistence gardens of maize, banana, Potatoes, Beans, cassava, and rice; it also cuts across extensive rice farmland of Doho irrigation scheme, and the only remnant *Cyperus papyrus-Cyperus dives* swamp in areas of Lwabi and Nakwasi. A description of the vegetation type and major/dominant flora from all the three pipelines is given in Table 5-11.

Table 5-11: Vegetation types and dominant species at the project site

Pipeline route	Vegetation description	Dominant species
Bumadibira –Mukhubu Pipeline	✓ Subsistence farmland ✓ Post cultivated grassland with scattered trees ✓ Post cultivated light bushland ✓ Woodlots	- *Zea mays* - *Coffea spp* - *Musa sp* - *Albizia coriaria* - *Mangifera indica* - *Thevetia peruviana* - *Synedrella nodiflora* - *Saccharum officinarum* - *Psidium guajava* - *Persea amaricana* - *Maesopsis eminii*

Pipeline route	Vegetation description	Dominant species
		- *Manihot escelenta* - *Markhamia lutea* - *Cymbopogon nardus* - *Cynodon dactylon* - *Artocarpus heterophyllusEucalyptus grandis* - *Grevilia robusta*
Bugema- Manafwa pipeline	✓ Subsistence farmland ✓ Post cultivated grassland with scattered trees ✓ Post cultivated light bushland ✓ Woodlots	- *Zea mays* - *Oryza sativa* - *Acacia polyacantha* - *Cynodon dactylon* - *Markhamia lutea* - *Eucalyptus grandis* - *Tithonia diversifolia* - *Grevilia robusta* - *Persea americana* - *Psidium guajava* - *Milicia excelsa* - *Manihot esculenta*
Mbale- Busolwe pipeline	✓ Subsistence farmland ✓ Post cultivated grassland with scattered trees ✓ Post cultivated light bushland ✓ Woodlots ✓ Cyperus swamp	- *Oryza sativa* - *Zea mays* - *Artocarpus heterophyllus* - *Albizia coriaria* - *Grevilia robusta* - *Pinus caribaea* - *Panicum trichocladum* - *Senna siamea* - *Senna spectabilis* - *Sesbania sesban* - *Mangifera indica* - *Manihot escelenta* - *Markhamia lutea* - *Ficus natalensis* - *Ficus ovata* - *Eucalyptus grandis* - *Cyperus dives* - *Cyperus rotundus* - *Cyperus papyrus*

The images in Photo 5-3 highlight the fact that except in a few sections covered by species of *Cyperus*, the natural vegetation cover in general landscape is already very much simplified in some cases into mono-cultures such as rice growing.

Species Richness: The surveyed sites yielded a total of 149 plant species in 120 genera and 40 families in the sampled areas altogether of which 44 species were trees and 31 shrubs. A plot of the species richness by growth form is presented in Figure 5-43 and the full list of all plants encountered is presented in Appendix C. While shrubs and trees encountered formed the woody biomass in the study area, they are found scattered in extensive crop land.

Zea mays and ground nuts garden with scattered *Albizia-Mangifera-Erythrina* trees at geographical coordinates N1.11437, E34.22278

Post cultivated mixed light bushland in between gardens and a small river at geographical coordinate N1.09439, E34.20867

Zea mays garden at geographical N1.10399, E34.21481 along Ndega road

Eucalyptus woodlot along Mbale- Busolwe route.

Cyperus dives wetland along Mbale –Busolwe pipeline route. This is continuous with Nakwiga *Cyperus* papyrus swamp

Eucalyptus woodlots, *Musa* sp gardens and *Zea mays* gardens at Bumadibira intake Point

Eucalyptus-Grevilia woodlot, Banana plantation with scattered tress of *Milicia excelsa, Ficus natalensis; Zea mays* and Ground nuts gardens besides Mooni mini water reservoir. Geographical coordinate N1.06215, E34.21148

Open grassland with scattered trees of *Mangifera indica* at Mukhubu water treatment plant.

Cyperus papyrus swamp along Mbale- Busolwe pipeline. This is located a few kilometers from Doho irrigation scheme. It's the only natural intact vegetation remnant within the project site. Its edges are affected by *Oryza sativa* growing.

Busolwe mini water reservoir in a seasonally flooded grassland located along Busolwe – Tororo road

Oryza sativa, *zea mays* gardens and *Eucalyptus* woodlot in a reclaimed wetland on the Mbale-Tororo high way within Bugema village.

Banana plantation along Bugema –Manafwa pipeline route.

Mixed *Casuarina- pinus* woodlot along the Bugema- Manafwa pipeline route

Oryza sativa at Doho irrigation scheme

Photo 5-3: Vegetation types along the three proposed pipeline routes

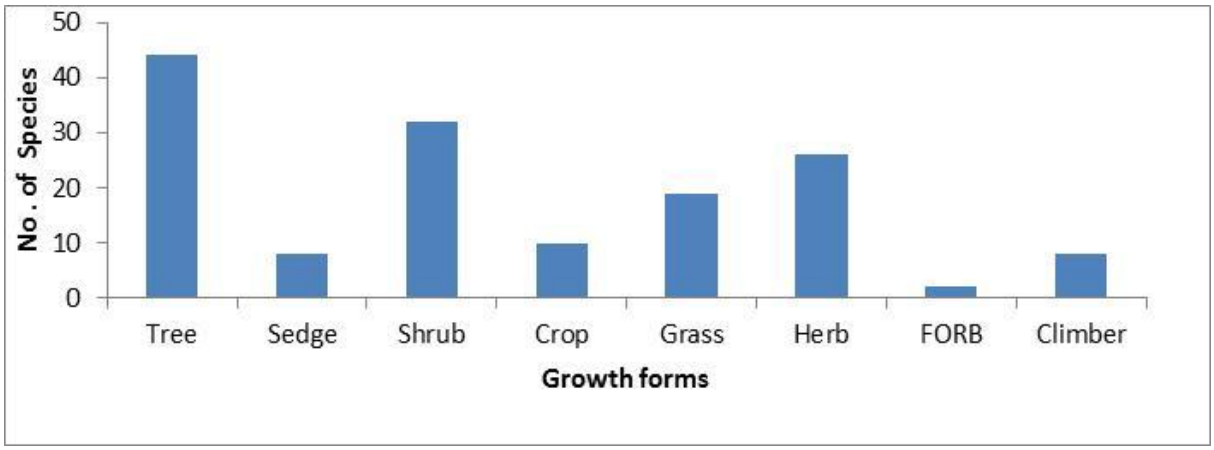


Figure 5-43 Distribution of the recorded plant species in the different growth forms

Species of conservation concern: Some plant species of conservation concern (in terms of range restriction, rarity, and threat) were observed in the project area. These include the following:

a) Species recorded that are listed by IUCN

Milicia excelsa is one of the species listed under IUCN Red List of Threatened Species, version 2015.3l as a nearly threatened species (IUCN red list (2015)). This species is sparsely distributed within the project site.

b) Species recorded that are listed by NFA

Milicia excelsa, Tarmarindus indica, Markhamia lutea andMaesopsis eminii are all on Uganda's National Forestry Authority Reserved Species list, and are therefore protected from exploitation and threat to their habitats. *Milicia excelsa* is on the list because of commercial logging and its use for timber, specifically for quality indoor and outdoor furniture, firewood and charcoal. The fruits of *Tarmarindus indica* are commonly used as food but are threatened with felling for fuel wood. *Maesopsis eminii*and *Markhamialutea* are used for poles, timber and fire wood.

c) Invasive species

The following species are all a result of introduction in Uganda, with a large potential to suppress the indigenous species of plants (Global Invasive Species Programme 2003):

i) ***Eichhornia crassipes*** is one of the most notorious invasive species that has been recorded in the fresh waters of Uganda and beyond (Howard & Matindi 2003). It was recorded from permanent Cyperus papyrus swamp along Mbale-Busolwe pipeline.
ii) ***Mimosa pigra*** is a moist ground invasive shrub capable of covering large parts of wetlands once disturbances are chronic. This is scattered within the reclaimed wetlands especially along the Bugema-Manafwa pipeline.

iii) ***Lantana camara*** invades areas that are drier than *Mimosa pigra*. Both species thrive with disturbance (Cronk & Fuller 2001). Their presence makes the indigenous flora in any given area susceptible to suppression effects (Global Invasive Species Programme 2003).
iv) ***Other invasive species*** encountered include*Senna siamea, Senna spectabilis* and *Ricinus communis.*

However, since the project impact zone is very narrow and small, little destruction of valuable species is expected.

Hepertiles: Most of the water pipeline is going to pass through settlements and a few areas with pertinent biodiversity concerns. A total of 13 species of Hepertiles were recorded in the entire project area.

Intake - This is located along river Namatale in Bumadibira, it's mostly dominated by cultivated areas with patches of fallow lands. Six species were recorded here; they are *Ptychadena mascareniensis, Mabuya striata, Amietophrynus maculirabris, Hyperolius viridiflavus, Hyperolius kivuensis* and *Amientia angolensis*

Reservoir - There are two mini water reservoirs in Mooni and Busolwe. Both of the reservoirs are located in settlement and cultivated areas. Busolwe is located in Butalejja while mooni is located in Mbale. Specimens recorded in the two areas area; *Hemidactylus brookii Mabuya striatus* and *Acanthocercus atricolis.*

Treatment plant - This is located in Bungokho a settlement area, two hepertiles were recorded here ie *Mabuya striatta* and *Acanthocercus atricolis.*

Water pipeline route - Most of the areas through which the pipeline will pass are located in settlement and gardens. However a few areas especially along small streams, rice puddles, fallow lands and swamps represented some of the areas from which hepertiles were recorded.

River Namatala - This is located at 0640501N, 0122858E with most of its banks heavily cultivated. Are total of 10 species were recorded from this survey point, they included; *Phrynobatrachus natalensis, Hyperolius viridiflavus, Amietophrynus maculatus, Amietophrynus regularis, Amietia angolensis, Xenopus victorianus, Haplobatrachus occipitalis, Mabuya striata, Mabuya maculilabris* and *Acanthocercus atricolis.*

Three species of amphibians were recorded at a small stream right after Bugema town along Tororo road (630936N, 113848E). The species include *Phrynobatrachus natalensis, Ptychadena mascareniensis* and *Psammophis mossambicus*

Rice puddles in the Doho irrigation system had a reasonable number of amphibian species abundance. *Ptychadena mascareniensis* was the most abundant. Other species recorded are, *Amietophrynus maculatus* and *Phrynobatrachus natalensis.*

Nakwasi wetland is a papyrus swamp located at 610162 N, 102613 E, its part of the Kyoga wetland system with permanent standing water. Species recorded hear are *Hyperolius nasutus, Hyperolius*

viridiflavus, Xenopus victorianus, Haplobatrachus occipitalis, Naja melanoleuca, and *Ptychadena mascareniensis.*

The conservation status of amphibians in Uganda is generally unknown because of data deficiency. However, according to the IUCN Red List Category, all amphibians recorded during the study are of least conservation concern (Table 5-12).

Table 5-12: Amphibians fauna of Mbale water pipeline project

Species	Common Name	IUCN Status
Amientia angolensis	Angola River Frog	Least Concern (LC)
Ptychadena mascareniensis	Mascarean frog	Least Concern (LC)
Phrynobatrachus natalensis	Natal puddle frog	Least Concern (LC)
Xenopus victorianus	Victoria clawed frog	Least Concern (LC)
Hyperolius kivuensis	Kivu reed frog	Least Concern (LC)
Hyperolius viridiflavus	Common reed frog	Least Concern (LC)
Hyperolius nasutus	Sharp nosed reed frog	Least Concern (LC)
Amietophrynus maculatus	Flat backed toad	Least Concern (LC)
Haplobatrachus occipitalis	Common bull-frog	Least Concern (LC)
Amietophrynus regularis	Common toad	Least Concern (LC)

Table 5-13: Reptilian fauna of Mbale water pipeline project

Species	Common Name	IUCN Status
Mabuya striata	Striped Skink	Not Evaluated
Naja melanoleuca	Forest water cobra	Least Concern (LC)
Psammophis mossambicus	Olive sand snake	Least Concern (LC)
Acanthocercus atricolis	Blue headed Agama	Least Concern (LC)
Mabuya maculilabris	Speckled skink	Least Concern (LC)
Hemidactylus brooki	Brook's gecko	Least Concern (LC)

Mammals: A total of 7 mammal species were recorded in the project area (Table 5-14). Six of the encountered species are listed as Least Concern (LC) on the IUCN Red List of Threatened Species (Version 2015.2). The Leopard (*Panthera pardus*) is listed as Near Threatened (NT). This, however, does not raise any conservation issues as the animals seen or noticed to appear around the villages are vagrants from the forests of the Wanale Mountain only wandering through the villages at night. The critical habitats where these animals come from are beyond the project scope therefore will not be affected.

The habitats along the pipeline are majorly human settlements, small towns and cultivated areas with a range of crops including cassava, maize, bananas, rice etc. There are majorly fruit trees interspersed with in, the most notable ones including Mango (*Mangifera indica*), Ovacado (*Persea Americana*) and Jack fruit.

Table 5-14: Mammal species recorded in the project area and their conservation status

Common Name	Scientific Name	Conservation Status
Side Striped Squirrel	*Euxerus erythropus*	LC
Leopard	*Panthera pardus*	NT
African Grass Rat	*Arvicanthis niloticus*	LC
Striped Grass Mouse	*Lemniscomys striatus*	LC
Savanna-hare	*Lepus victoriae*	LC
Common Jackal	*Canis aureus*	LC
Banded Mangoose	*Mungos mungo*	LC

The key sites of the project, that is, the water treatment plant (in Mukhubu village); the reservoir (in Mooni village) and the intake (in Bumadibira village) all form a continuum of human settlements, small towns and cultivated areas with no considerable conservation importance as far as mammals are concerned. The villages in the project area in Mbale surround the Wanale Mountain range. This is largely forested and is the most likely source of the reported wild animals in the villages. River Namatala is also an important habitat feature to point out in the project area.

The nature of the vegetation cover at selected points in the pipeline routes is demonstrated in Photo 10. There is a clear absence of natural vegetation cover which has been cleared for either settlement or farmland. These kinds of areas do not hold significant populations (if any) of medium to large sized mammals. Small mammals will still continue to exist in the search areas although species with particular habitat requirements such as forest interior and/or intact wetland specialists will also be displaced and lost out.

Birds: A summary of the bird species richness and habitat preference of the birds recorded from the different survey points is presented in Table 5-15. Over all species that are dependent on availability of some tree stand (f – forest visitors) were the most numerous in most survey areas. There was a near absence of forest specialist species (FF) except for one species in the Makhosi area. Wetland species were also widely occurring although the numbers of species encountered were generally lower than those of the forest visitors.

Table 5-15: Number of bird species for each transect site in the categories shown

Sites		Doho	Manafwa	Mooni	Bungukho	Makudui	Bugembe	Busolwe	Kifuluriro	Makhosi	Buwaki	Kama-Lower	Namatale
Habitat Specialist	FF Forest specialist									1			
	F Forest generalist		3	3	1	3	4	1	2	1	1	1	2
	f Forest Visitor	7	13	11	12	17	16	7	14	12	7	13	15
	W Wetland specialist	18	3	1	1	1	13	10		2	2	1	3
	w Wetland associate	9	5	3	6	5	13	13	8	2	4	6	8
	G Glassland specalist	4	4	2	4	2	3	3	2	1	2	1	3
	Ae Aerial feeder	1	2	1	2	1	4	3	1	1	2	3	3

Sites		Doho	Manafwa	Mooni	Bungukho	Makudui	Bugembe	Busolwe	Kifuluriro	Makhosi	Buwaki	Kama-Lower	Namatale
Migrant	P Palearctic	2		1	1	2	2	1	1	1			
	A Afrotropical	3	3	1	1	1	5	4	2	1		1	1
Conservation status	G-EN Globally endangered	1			1								
	R-Vu Regionally Vulnerable	2	1			1	1	4					2
	R-NT Regionally Near threatened	4	2		1	2	1	1	1	1			2
	R-RR Regional Responsibility	1	2	2	2		4	2	1	1	2	3	

A section of R. Namatala in Bumadibira

One of the cultivated areas in Makudui village

A section of the Wanale Mountain in Mooni village

A cultivated rice field in Nakwasi village

Photo 5-4: Different habitat sections in the project area.

The two globally endangered species identified were the Grey Crowned Crane *Balearica regulorum* and the Hooded Vulture *Necrosyrtes monachus*, Doho rice scheme is very important for breeding of the Grey Crowned crane (Gumonye-Mafabi 1991). However no information is known about breeding of the Hooded Vulture in the country. Forest species were well represented including one forest generalist; such numbers could be attributed to high numbers of local trees in the cultivated areas and especially areas close to Mt Elgon. The number of wetland species was high especially in areas around Bugembe,

Busolwe, Doho and Manafwa.

Aerial feeders such as, Palm swifts, little swifts and Angola swallows where numerous throughout the study sites. Generally, number of Afro tropical species was higher than that of Palearctic species since the later are expected to return around September. Forest visitors and Grassland specialist where well represented, this could be due to too much rain in the area which impacted on the nature of vegetation and birds too.

a) Wetland dominated sites

Doho: Thirty seven (37) species were recorded, 1 of which is endangered (Grey Crowned Crane), 18 were wetland specialist. The Doho rice scheme (IBA) is known for its, in particular the large number of papyrus and terrestrial endemics. The area is important for the breeding of Grey Crowned crane (Gumonye-Mafabi 1991) which is classified endangered (Birdlife International 2015), and other species such as Black-headed Heron, Sacred Ibis and African Spoonbill (Byaruhanga per.comm).

The rice scheme is an important site for some migratory species and big congregations are occasionally recorded (Byaruhanga, Kasoma & Pomeroy 2001). Species such as the Black winged stilt, black-tailed Godwit and Spotted Redshank are sometimes numerous.

Manafwa: There were 38 species, majority were forest specialist (13), nine were wetland birds, thre raptor species were observed saring into the sky above and they were; Brown Snake Eagle Circaetus cinereus which is a *Regionally Near Threatened* (R-NT) species, Dark Chanting Goshawk Melierax metabates and Lizard Buzzard Kaupifalco monogrammicus. There were several tree with Black headed weaver nests.

Busolwe: Opportunistic observations through this site resulted into 40 species; the most conspicuous species is the African Spoonbill *Platalea alba* (Photo 5-5).

Photo 5-5: Part of Doho which formed part of the transect

Photo 5-6: Spoonbill

It is one the few areas in the country where spoonbills nest. Other species which nested together with spoonbills included Long-Tailed Cormorant *Phalacrocorax africanus*, Black-Headed Heron *Ardea melanocephala and Cattle* Egret *Bubulcus ibis*.

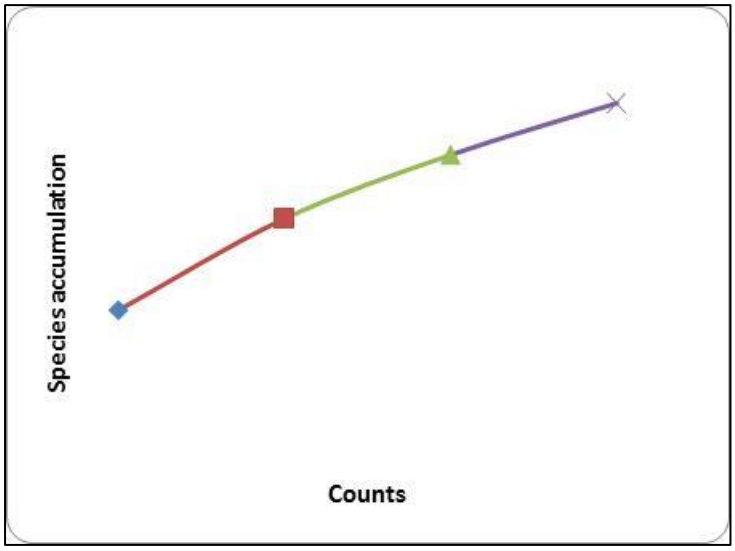


Figure 5-44 Species accumulation curve for birds in wetland dominated sites

The number of new species for any preceding count increased at afast rate, the curve suggests that there could be other wetland predominant species which were not identified, and thus there is need for more counts to come up with a complete habitat list.

Bugema: This was the most species richest site; we recorded 51 species, of which 16 were forest visitor, 13 were wetland specialist and 13 were wetland generalist. No Forest specialist and endangered species were recorded.

b) Predominantly cultivated site

There were eight sites which were predominantly cultivated namely; Namatali, Kama-lower, Buwaki, Makhosi, Kifuruliro, Makudui, Mooni and Bungukho.

Namatale: River Namatale (the proposed water source) is part of this site; there were 37 species, of the which majority were forest specialist (15), no forest specialist, 8 wetland associate, 3 were grassland and wetland specialists, the three aerial feeders were palm swifts, Angola swallows and the Rock martin, it was found nesting on the walls of the bridge on the river. Vieillot's Black Weaver *Ploceus nigerrimus* were also nesting besides the river together with Black headed weavers.

Photo 5-7: Section of River Namatale that is within the proposed project impact area

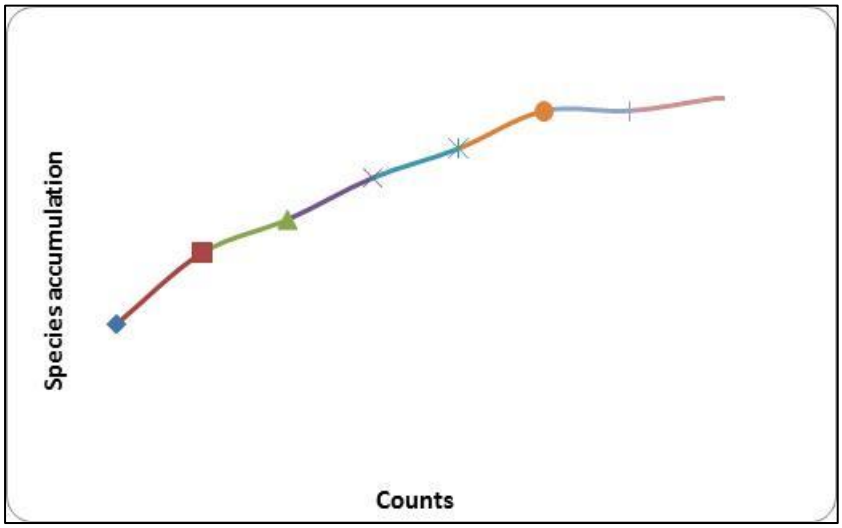


Figure 5-45 Species accumulation curve in the agricultural sites

After count six (Figure 5-45), the rate at which the number of new species added to the overall list was much lower suggesting that to a greater extent, the species list for the area was close to complete for the survey period.

Phytoplankton: The phytoplankton community of river Namatala consists mainly of blue greens, greens and flagellates (Table 5-16).

Table 5-16: Phytoplankton species found in River Namatala from the two sampling sites

Site Name	Taxon	Number of Organisms Per Litre
SITE 1	**BLUE GREENS**	
Upstream	*Oscillatoria (sp)*	22
	zygnema (sp)	186
	Anabeana (sp)	14
	calothrix (sp)	22
	GREENS	
	Chlorella (sp)	06
	Nitella (sp)	32
	Peridinum (sp)	62
	Clodophora(sp)	44
	Volvox (sp)	90
	FLAGELLATES	
	Phacus (sp)	10
	Euglena (sp)	03
SITE 2	**BLUE GREENS**	
Down stream	*Microcystis (sp)*	102
	Zygnema (sp)	32
	Oscillatoria(sp)	49
	Anabeana(sp)	16
	Calothrix (sp)	84
	GREENS	
	Chlorella (sp)	34
	Cladophora (sp)	58
	Peridinium (sp)	19
	Nitella (sp)	64
	Westella (sp)	10
	DIATOMS	06
	Sydedra (sp)	

Zoo plankton: The zooplankton community of River Namatala consists mainly of rotifers and crustaceans as indicated in Table 5-17.

Table 5-17: Zooplankton species found in River Namatala from the two sampling sites

Site Name	Taxon	Number of Organisms Per Litre
SITE 1	**ROTIFERS**	
Upstream	*Brachionus (sp)*	24
	Proales(sp)	18
	Lecane (sp)	39
	Porlyathral (sp)	66
	Trichocerca (sp)	10
	Euclanis (sp)	22
	CRUSTACEANS	
	Cyclops (sp)	20
	Bosmina (sp)	08
	Diaphanosoma (sp)	05

Site Name	Taxon	Number of Organisms Per Litre
SITE 2	**ROTIFERS**	
Down stream	*Hydracarina (sp)*	06
	Lecane (sp)	46
	Trichocerca (sp)	40
	Proales (sp)	47
	Porlyathra (sp)	72
	Brachionus (sp	64
	Euclanis (sp)	44
	CRUSTACEANS	
	Bosmina (sp)	10
	Cyclops (sp)	23
	Diaphanosoma (sp)	18

Fish: Fish species occurring in River Namatala documented in survey were *Mormyrus* spp.and *Clarias* spp. The fish is especially abundant in the rainy seasons when the river banks flood. None of the fish species identified in the area were identified as rare or endangered. It is however very important to note that the fish diversity of River Namatala in the project area is very low. From the local knowledge survey and interaction with the local authorities (District Fisheries Officer of Sironko and community leaders, they confirmed that fisheries activities are almost non-existent in the downstream project area part of the river. It is therefore anticipated that the project will have minimal or no impact on the fisheries of the river in the project footprint.

5.3.3 Cultural Heritage

The project area was like the rest of Uganda first inhabited by the hunter gatherer people. These people had been in the area since the Stone Age period. From 1000B.C the Bantu people entered the great lakes region of East Africa.

The hunter gatherers were either submerged in the Bantu communities or they were pushed up in the Elgon Mountain and the remnants of these hunter gatherers are known as the Ndorobo. Of the Bantu groups, the Bagisu were the first to arrive .They adopted the circumcision custom from the Kalenjin Nilotic people who were their neighbors to the east. Later on the Bagwere people of Budaka district entered the area from the west after the breakup of the Bunyoro kitara kingdom around 1400 A.D which they specify as their place of origin. They were also closely followed in the area by the Banyole of Butaleja District who came into eastern Uganda with the Basamia people with whom they are closely related in customs.

With the coming of colonialism, the area was first ruled by Semei Kakungulu a Muganda warlord / General who was employed by the British to put in place the administrative structure for the British and who then established Mbale town as his administrative headquarters for the whole region.

Later on after the retirement of Kakungulu, the area was first divided into Bugisu and Bukedi districts. After independence Uganda has continuously been subdivided and as of the time of this report, the project area is located in the districts of Mbale, Butaleja and Budaka.

There is one important site in the project area. This is the Mutoto Cultural site where circumcision is undertaken by the Bagisu Tribe. The circumcision season is flagged off from this site every two years

by Inzu ya Masaba the cultural institution of the Bagisu Tribe.

Photo 5-8: Mutoto cultural ground with huts for circumcision candidates in the background

The coordinates of this ground are 36N 0632707, UTM 0116635. The Mutoto sub county headquarters are located at this site and it maintains this cultural ground. The water supply pipe line route from Manafwa to Busolwe and Butaleja towns is located 100meters from the circumcision grounds,

The project will not have an impact on the physical cultural resources of the area .Observations during the survey of the proposed water supply routes as well as inquiries during the focus group consultative meetings indicated that no cultural or historical site would be affected by the project.

As regards archaeological resources, there were no known resources in the area found during the survey which can be impacted by the project although their existence cannot be ruled out. A procedure for handling chance finds will have to come into effect in the case of significant archaeological discoveries during the construction phase of the pipeline routes. The pipelines will be underground and trenches will have to be dug to lay the pipes. A chance finds procedure to this effect was developed in consultation with the staff of the project staff in Mbale during the survey and is appended as an annex to this report.

6 KEY STAKEHOLDER VIEWS AND SUGGESTIONS

The broad objective of the stakeholder engagement process was to provide the local authorities, interested parties and the communities likely to be affected by the project an opportunity to air out their views, concerns, and opportunities as regards the proposed project and to consequently address their concerns

- Obtain their view and find whys of incorporating them into the project implementation
- Inquire about preminary baseline information that will guide the project development and implementation
- Gain ownership and good will for the project proponent by the stakeholders
- Inform them about the project. More often stakeholders resent project because of either no information or limited information regarding the project .
- To manage expectations and misconceptions regarding the project

Different stakeholders were consulted under Mbale water supply project. Each of the category had differing connotation to the project and therefore analyised and consulted depending on the level of interest, influence , impact and power.

Table 6-1: Stakeholders consulted for the project

Category/ stakeholder	Reasons for consultation	Location and date	Methods for consultation.
NWSC	Lead Agency (the client)	Head office boardroom- several meetings	Board meetings, telcommuication, mails .
NWSC Mbale Regional meeting	Local water supply situation	Regional managers office – Jane 13/01/2018	Boardroom Meeting
Ministry of water and Environment	Different permits, environmental concerns including environmental flow data		Board room Meetings
National Enviromental management Authority (NEMA)	Approval of ESIA and provision of permits for operation	June 2018	Meetings and review sessions
Project Districts – Mbale, Butalejja, Budaka and Kibuku	Local administration and management.	District headquators main boardrooms. 16 to 19/06/2018	Meetings
Mbale Municiplity	Project area of influence	Municiple headoffice boardroom. – 16/01/2018	Board meeting
Project Subcounties and town councils	Local knowledge of the project location	Subcounty head offices. 17 – 22/06/ 2018	Meetings
Project communities	Ownership and good will for the project	Project communities across the project District. 20 – 30/06/ 2018	Community meetings, focus group discussions and key informant discussions

Category/ stakeholder	Reasons for consultation	Location and date	Methods for consultation.
Project affected persons.	Consent for land and their properties that could be affected by the project	Community meetings and individual consultation. 20th March to 18/07/2022	Meetings and household survey and census

As a result of engagement and consultations done with the different stakeholders a number of issues were identified and these have been taken into account in the preparation of the report. Some of the most pertinent issues raised are presented in Table 6-2.

Table 6-2: Key issues raised by stakeholders

Stakeholder	Key issues	Consultants concern
District Leadership from the three District	**Compensation.** There is need to enumerate project affected properties and have them compensated as ameasure to create sustainable livelihood among the communities.	As part of the project, all affected persons and their affected properties are going to be valuated and the client will find mechanism of compensation
	District involvement It is important that district leadership both political and technical are involved in the project design and implementation	It is good practice and obligation that the consultant will periodically meet leadership but also work on a day to day some district members such as water, environment CDO and the engineer.
	Employement of the locals As a give back to the community, the locals should be given an opportunity to work especially on the low skilled component of the project.	The project will aim at ensuring local content is observed through out the project area. Labour inflex management has also been intergrated in the project for that purpose.
	Child abuse through employment need to be controlled and discouraged throughout the project.	Child labour is againist both the local labour laws and world bank guidelines and ESIA under development will streamline measures against childlabour.
	Need to redesign some pipeline. It was noted by members from Mbale district and municipality that many of the pipes traverses highly buildup. Yet it can use the utility line along the roads in town .	Part of this project is undertaking a design review. Under this assignment all this concern will be rectified .
	Undertake proper site restoration and landscaping after construction, that is, stabilize all	Recommendation for site restoration especially for material borrow pits have been included in

Stakeholder	Key issues	Consultants concern
	soils after construction and plant grass to control erosion. NWSC/MWE should undertake regular monitoring of the water quality in R. Namatala and R. Sironko stream and keep the community/public informed.	the ESMMP of this report . As part of the project, the consultant is undertaking an environmental flow study that will act as a baseline for future monitoring .
Project Subcounties	Alignment of the pipe along the road to minimize property damange. The subcounties noted that there was a need to realighn the pipelines along the roads For any employment ,there is need to give the locals including women. In orfder to ensure family wellbeing , women and men should be given equal treatment. Create buffer zones of natural vegetation belts of at least 50m between the lagoons and the river The developer should design and implement a program to sensitize the surrounding communities on the use of the river and how they should relate to the established infrastructure The contractor should plant tree shrubs and grass to improve area aesthetics	The design review component will undergo design review and rectify the problem noted here. Local personal shall be recruited through the local council leadership at the time of construction. Buffer zones for catchment protection along the major rivers will be implemented in the project Sensitization of communities is continuous and will go on through out the project. This is going to be recommended in the environmental management plan included under this ESIA. ESMP will provide mechanism of environmental restoration and sustainability.
NWSC – Mbale regional office	The faecal sludge drying beds at the WSPs should be constructed in such a way that leachate doesn't pollute the existing valley dam as it is the only source of water for the locals The contractors should create good relationship with the communities through consultations prior to construction activities so that the communities have a role in the management of the water infrastructure such as cleaning around the reservoirs.	That has been taken for consideration Through consultation and engagement, the consultant is establishing liaison system with the communities to ensure there is a good relation with the affected communities.

Stakeholder	Key issues	Consultants concern
	Ensure that the physical and biological properties for aerobic conditions are maintained	Studies regarding biodiversity are ongoing and will provide a basis for the development of management measures.
Project Communities	Need to ensure that atleast the project communities are supplied with free water. All affected properties along the project line should be compensated. More often project of this nature come with domestic issues such as domestic violence, HIV and family distraction. Efforts should be put in place to ensure this is not the case in this project. Communities need to becompensated for their properties.	The requested will be submitted to the client. However there is a well layed coporate social responsibility mechanism through which NWSC give support to the community. Project affected properties are to be enumerated and nature of compensation elaborated to the affected persons. Mechanism for labour, child abuse , inflex of people, liaison system with the communities are going to be included in this report and will be emphasized throughout. The RAP is being developed to understand property impact and determine measures for compensation.
Mbale municipal council	The contractor should see to it that construction works are carried out during day time to limit noise interruption. All workers should be provided with proper PPE. The workers should be regularly checked to ensure good health conditions. Compensation should be provided to injured or affected workers due to lack of proper protection. Take records of all injuries and infections reported to track improvements Compensation to all affected properties should be undertaken.	The contractor is under obligation to ensure work place safety. We are undertaking a resettlement action plan alongside this ESIA to understand impact on property for compensation purposes.

Kachonga A & B, Nebo, Kato, Muvule, Mirembe, Bukedi College Kachonga (BCK), Bugadunya Villages-MaziMasa SubCounty-Butaleja District.

Makhai A, Makhai B and Namwaro Villages in Busoba Sub-county.

Busoba, Lusaafu, Namwaro and Butunde in Mbale district

Lubanga, Matibo and Kamuli Villages in Butaleja Town Council

Busolwe South, Busolwe North, and Nakuyiga Villges in Busolwe Town Council.

Sapiri, Gadumire and Nakawolo Villages-Budaka District

Bambone, Lukangole and Nanyulu in Busolwe sub-county

Bumbwire, Bukholi and Kiralaka Villages- Kamomkoli Sub-county

Budaka township, Nakibulu, Nankone, Nabweyo, Nalado and Nasawo Villages in Budaka Town Council

Photo 6-1: Some of the photographs of consultative meetings held in Mbale and neighbouring towns

7 POTENTIAL SOCIO-ENVIRONMENTAL IMPACTS

7.1 INTRODUCTION

An improvement in potable water supplies and sanitation may generate interrelated improvements in health, economic and social welfare of the community. However, in addition to the many possible beneficial impacts, adverse impacts may arise from these improvements. The impact of potable water supply and sanitation on health depends on the quality and quantity of the piped water supply and sanitation infrastructure; the proportion of population covered; and the utilization of the water and sanitation facilities by the population. In this chapter, prediction and analysis of possible positive and negative impacts of construction and operation of the water supply and sanitation project is presented, with main focus on the proposed new raw water intake from River Namatala to Bungokho Water treatment works in Isebere village, Mooni Parish, Bungokho-Mutoto sub-county. Upgrading of the water distribution and sewer networks within Mbale City will also be embarked on as well as conveyance of treated water to Tirinyi from Bungokho WTP. A second leg of the project will entail pipeline running from Manafwa Water treatment works to Busoba sub-county in Mbale before branching off to Butaleja town council and Busolwe town Council in Butaleja District.

7.2 POSITIVE IMPACTS

The development and operation of the proposed project will have substantial positive environmental and social impacts. Specifically, the following positive impacts are anticipated during construction phase of the different project components:

7.2.1 Income to Material/ Equipment Suppliers and Contractors

The scale of construction works is large and widespread, including the areas of Bungokho-Mutoto and Busoba sub-counties and Mbale City all in Mbale District; Kamonkoli, Budaka Rural and Budaka Township all in Budaka district; Kadama and Tirinyi sub-counties in Kibuku District; Mazimasa sub-county, Butaleja and Busolwe Town councils in Butaleja District. Although some of the equipment and materials required for the project will be sourced nationally and internationally to ensure quality is achieved, a number of equipment and materials (such as gravel, bricks, lumber, steel reinforcement and cement for civil works) can be sourced locally. Local suppliers of materials and equipment who get involved in the project will benefit financially. This is a *positive* but would occur during both the construction and operation phase although largely occur during the construction.

	Construction	Operation
Project phase when impact will occur	√	√

***Enhancement measure**:* Earth materials needed for construction, for example, murram, aggregate (stones and sand) are obtained from quarry operations. Conscious or unwitting purchase of these materials from unlicensed operations indirectly promotes environmental degradation at illegal quarry sites and can cause medium- to long-term negative impacts. It should therefore be a contractual obligation for contractors to procure construction materials from quarries legitimately licensed by Mbale, Budaka, Kibuku and Butaleja District Local Governments and duly approved by NEMA.

7.2.2 Employment

Construction will avail skilled and unskilled job opportunities for residents, especially youths, in the project area which includes Bungokho-Mutoto, Busoba sub-counties and Mbale City all in Mbale District; Kamonkoli, Budaka Rural and Budaka Township all in Budaka district; Kadama and Tirinyi sub-counties in Kibuku District; Mazimasa sub-county, Butaleja and Busolwe Town councils in Butaleja District. Skilled labour will include artisans such as plumbers, carpenters, masons while unskilled labour will include trench excavation.

During the operation of the expanded water supply system and sewer network, additional long-term technical and non-technical job opportunities for professionals, casual labourers, etc. will be available. Staffing will be required in the above Local Government structures to operate the expanded water supply system 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; and
- Writing status reports for the operations of the system.

The level of staffing and the staffing costs are uniform and currently, the Mbale area has a staff complement of about 62 staff in total. It is envisaged that there will be a significant change in the number, which will increase to over 150 staff with approximately 12 Key staff manning each of the growth centres upon project completion.

	Construction	Operation
Project phase when impact will occur	√	√

***Enhancement measure**:* Wherever feasible, local people should be considered for job opportunities commensurate with their level of skills. Adequate occupational health and safety standards should be provided to ensure the work environment is conducive.

i) Information to create awareness about the proposed project activities will be provided to the project-affected communities including targeting women.
ii) Unskilled labour will be recruited exclusively from local community, and semi-skilled labour will be recruited preferentially from such communities, provided that they have the requisite qualification, competence and desired experience.
iii) Contractors will be encouraged to pay a “living wage” to all workers and to ensure that workers have contracts.
iv) A training programme for artisans (builders, carpenters, plumbers) in the project area could be facilitated by the project to ensure skills transfer during the construction period.

v) Contractor will develop and implement Labour Influx Management Plan, Workers Camp Management Plan and Code of Conduct. An example of the code of conduct for contractors and sub-contractors is provided in Appendix H.

7.2.3 Infrastructure Improvement

With the installation of improved water and sewer network within Mbale City; infrastructure improvement and/or development will be sparked off in those areas as well as the growth centres. Modern infrastructure induces development, stimulates investment and employment and helps improve marginal investment opportunities. The access road will have to be improved thus the community will benefit from an improved road network and those who can afford to connect to the power grid will have the opportunity to do so since the connection point will have been brought closer to their homes.

	Construction	Operation
Project phase when impact will occur		√

***Enhancement measure**:* The extent to which development becomes a positive or negative impact will be determined by the effectiveness of the planning framework. Such induced developments should be of a type that is desirable and sustainable and for this to happen, all future developments must be undertaken within the framework of proactive government policy and strict planning and environmental enforcement by the responsible Local Government.

It is also vitally important that the new infrastructure, particularly the sewerage system within Mbale City, be made fully operational as soon as possible, if necessary with incentives, perhaps in the form of relief on connection charges, to ensure all existing property owners are quickly connected to fully realise the benefits of the project.

7.2.4 Improved Health Status of Households and Communities

The provision of an adequate, safe water supply and sanitation has positive impacts on the health of users by greatly reducing the incidence of communicable enteric and infectious related diseases, which, in many instances occur in communities due to lack of adequate sanitation and potable water supply. Both potable water supplies as well as safe disposal of human excreta are needed to break the chain of transmission of diseases.

In addition to improvement in provision of sewerage system within Mbale City, sanitation situation at the growth centres will also be improved by provision of ablution blocks with water borne public toilets with the exception of Busolwe where only a four Stance public toilet will be constructed. This will directly contribute to improved public health and Sanitation situation within Mbale City and the growth centres. Currently, Mbale City has got Doko Treatment Ponds that were constructed in 1985 as the only sewage treatment plant whilst the growth centres have neither formal sewage collection nor treatment facilities. The Eco-san public toilets constructed in the growth centres were rejected by the community members thus the construction of the ablution blocks and public toilets as part of the project will promote improved public health status. Rehabilitation of the treatment ponds in Mbale City and establishment of STP in Nabunyere as well as the public toilets will reduce and or eliminate the indiscriminate disposal of human excreta and wastewater/ sullage. This, however, can only be achieved if the water borne systems/ toilets are used properly and maintained well.

	Construction	Operation
Project phase when impact will occur		√

Enhancement measures:

i) Users will be educated on the proper use, regular cleaning and effective maintenance of both the household and public facilities.
ii) Water quality monitoring at supply points will be monitored to ensure that water supplied to communities meets portable water standards.

7.2.5 Educational Enrolment and Attendance

Operation of the different components of the project will lead to considerably near and consistent access to safe water. In relation to provision of potable water supply, time savings are the most immediate and easily measured benefits although its magnitude will depend on the conditions prevailing before installing the piped water supply.

Consequently, time spent on searching and waiting for water by women and children will be saved. This will enable children, especially the girl child to regularly and promptly attend school, while mothers will get more time to prepare their children for school. Assuming other factors are available (such as scholastic materials, teachers) school attendance and performance will improve.

	Construction	Operation
Project phase when impact will occur		√

Enhancement measures: Parents and/ or guardians will be encouraged to take their children or dependants of enrolment age to school.

7.2.6 Acquisition of New Skills

Most water supply and sanitation projects are built through the labour of local residents who are directed by a small cadre of sub-professional or supervisory personnel from outside the community. Community participation can also have a great impact on the effectiveness and sustainability of water supply and sanitation programs. It can also help to minimize many of the potential negative environmental impacts associated with them.

	Construction	Operation
Project phase when impact will occur	√	√

Enhancement measures: Where the required skills are available locally, the local people will be given first priority commensurate to their level of training.

7.2.7 Improvement in Household Economic Status

The provision of potable water supply and sanitation has positive beneficial impact on health and ultimately directly and indirectly on productive and economic benefits.

Livestock and poultry keeping: Improved water supply would lead to an increase in poultry and livestock keeping in homesteads. A permanent water source near or on the farm will permit an increase in cattle

and improve the production of milk and beef. Those farmers who previously felt water to be a crucial constraint preventing them from keeping such livestock as grade cows and pigs, poultry like chicken or expanding their activities in this regard, may find it feasible to do so.

Small scale gardens: The provision of piped potable water supply may have positive beneficial impact on the irrigation of small scale gardens if there is excess water available and it can be used for irrigation of small scale garden plots near each household or tap. This will have positive beneficial *impacts* on increasing agricultural productivity and perhaps also improving nutrition status of households.

Small scale industries: The ample availability of piped potable water supply may lead to improvements in the small scale industrial development and increased production.

Improved crop yield: The sludge cake commonly referred to as bio-solids from the sludge drying beds can be used as a fertilizers on farmlands to improve the crop yields thus generating more income for the farmers. These will be sold to farmers at a subsidised price since the raw sewage comes from the community members themselves. These Bio-solids increase agricultural yields and improve soil condition by providing nitrogen, phosphorous and potassium in a less soluble form than farmyard manure and artificial fertilisers, thus remaining in the soil for longer and are less prone to leaching into groundwater or run-off, which pollutes waterways.

	Construction	Operation
Project phase when impact will occur		√

Enhancement measures: Water tariffs should be set taking into consideration the different levels of users. Modalities as indicated in Sub-section 5.1.2.7 would be sought. The users should also be educated to avoid wasteful use of the resources.

7.2.8 Saving in the Cost of Medical Treatment

The provision of potable water supply and sanitation may lead to improved health of the population. This can be realised if there is a reduction in cases of water related diseases hence reduction of some of the expenses currently made for health and medical services.

	Construction	Operation
Project phase when impact will occur		√

Enhancement measures: Users will be educated on the proper use, regular cleaning and effective maintenance of both the household and public facilities.

7.3 NEGATIVE IMPACTS

7.3.1 Degradation of Land and Soil Erosion

Site preparation will involve clearing of strips of vegetation to allow for excavations to begin. Soils excavated may be heaped besides the trenches hence exposed to agents of erosion such as wind and storm water. Topsoil stripping during levelling and grading of the right of way (ROW), the STP at Nabunyere, maintenance works at Doko WSP and the excavation of subsoil during trenching will break up the soil structure. Poor disposal or management of the wastewater generated will lead to land and/

or water pollution and related drainage problems. If sewers and Doko WSPs are not watertight, then storm water and/or groundwater infiltration would lead to overflows that could impact negatively on the soil environment. In cases where households are connected to piped water and not to sewerage system, they may use septic tanks whose cesspools may lead to contamination of soil.

The reuse of treated wastewater for irrigation will improve the fertility of agricultural lands of the area. Nevertheless, when unsatisfactorily treated effluents are released, these might contaminate the soils. If the grease and sludge are not properly handled and managed, they can contaminate the nearby soils and create unsightly conditions. The dried sludge will be removed periodically from the sludge drying beds and shall be taken to tip, burnt or be given to interested farmers.

Also equipment engaged in activities might cause contaminations of soil due to leakage of fuels and lubricants from equipment. The fuel and lubricating oils required by the construction equipment have the potential to contaminate soil and water resources if they leak or are spilled during handling or use.

These impacts are negative and the stakeholders likely to be affected are nearby community, land and aquatic fauna and flora. Its extent will be mainly local limited within site boundary and communities in its immediate vicinity. The project components that may contribute to these impacts are presented below.

Project component	**Project phase when impact will occur**	
	Construction	**Operation**
Water and sewer pipelines	√	√
Modification of Doko & Namatala Waste Stabilization Ponds and construction of ablution blocks with water borne public toilets	√	√

Impact significance: Even though there are earthworks (for example grading, levelling and compaction), the terrain around the proposed sites is flat and given that similar activities have already taken place and considering the project footprint, the likelihood of the impact occurring is low. The likelihood of the impact arising from improper management of sanitation facilities occurring is high if water users are not educated on techniques for safely disposing of wastewater or sullage from their households, especially in informal settlements. The ***intensity*** of the impacts is ***medium*** and ***sensitivity*** of the receptor is rated ***medium*** given that in some parts of growth centres, these systems are appearing for the first time resulting in a ***moderate*** impact significance.

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

Mitigation strategies – construction phase

i) A waste management plan will be developed prior to start of construction activities.

ii) Topsoil and subsoil removed from the site during site preparation will be stored properly (away from runoff and possible contaminants) for reuse elsewhere or for backfilling and reinstatement. Topsoil will be protected through separation from subsoil and storage in a manner that, as far as possible, retains the soil structure and minimises the risk of topsoil loss. The trench will be subsequently backfilled with subsoil, followed by topsoil. In order to prevent loss of fertility and degradation of the seed bank within stored topsoil (where present), the topsoil will be stored for as short a time as possible, allowing for engineering constraints.
iii) Contractor will avoid use of old equipment and damaged equipment that is most likely to have oil leakages thus contaminate the soils and the Contractor will ensure that equipment is properly maintained and fully functional to avoid leakages that may contaminate soils.
iv) During reinstatement, the trench back-fill material will be compacted to a level similar to the original surrounding soils to avoid subsidence as a consequence of rain water channelling.
v) Recreation of a stable landform that mirrors the pre-disturbed condition (e.g. contours, shape, level of compaction, etc.) as this will minimise the risk of preferential erosion and therefore facilitate natural revegetation.
vi) Upon completion of subsoil and topsoil reinstatement, disturbed areas will be inspected jointly by the construction contractor and MWE/NWSC personnel for slope stability, relief, topographic diversity, acceptable surface water drainage capabilities, and compaction.
vii) All waste generated during site preparation and construction will be transported to an authorized disposal area. The contractor will seek guidance from Mbale City and the respective District Local Government of the growth centres on the final disposal point.
viii) Waste shall not be taken out of the Site without a Waste Manifest.
ix) A Spill Kit will be maintained onsite to clean-up any accidental spills.
x) During construction, soil erosion will be controlled by placing crushed stone, sandbags and other similar materials in areas prone to runoff or that are heavily used where vegetation is hard to establish and maintain.

Mitigation strategies – operation phase

xi) Sewers will be made watertight during maintenance to avoid intrusion of storm water into the network and cut-off drains provided to WSPs. Storm water will be guided away from all sanitary facilities using cut-off drains around them.
xii) The staff of the WSP and STP will be trained for proper management of screenings, sludge, etc., to avoid soil contamination.
xiii) Periodic tests will be done to assure the quality of effluent and treated sludge, to avoid partially treated wastewater and sludge from reaching the soils.
xiv) Proper measures (for example, ensuring that manholes are in place and in good condition) will be taken to avoid accidental surface runoff intrusion from the manholes of the sewage network, which can overburden the plant and cause discharge of partially treated wastewater from the plant onto land.

Adoption of the above mitigation measures will reduce impact intensity to “very low” resulting in a residual impact of minor significance.

7.3.2 Pollution of Water Resources

During construction activities, the principal potential contaminants associated with the construction

activities include: sediments, fuels and lubricating oils; domestic wastes; welding wastes; paints and solvents; and hydro-testing chemicals if used (for example, biocides, oxygen scavengers and corrosion inhibitors), etc. Oils and greases contain hydrocarbons and/or heavy metals such as lead, chromium and cadmium, which are known drinking water pollutants. Increased water runoff and erosion from various work sites could potentially result in siltation of water courses like River Namatala and its network, etc. Significant erosion can occur at unstable River Namatala banks and spoil dumps also resulting in the sediment transport and siltation. During construction, there may also be need to stockpile assorted materials on site. There is a potential pollution risk if construction materials are not stored or handled responsibly such as to lead to stockpiles wash away.

The sewage/excreta produced by the construction personnel have a high potential of contaminating water resources if not properly handled. Transportation of pollutants with runoff would affect the water quality hence the communities/ livestock depending on it. General wastes may have the same effect if not handled properly.

During the operation phase, the treated effluent of the WSPs will be discharged in existing streams or rivers. Treated effluent from Doko WSP system will discharge into Nashibiso River while that from Namatala WSP will empty into R. Namatala. The treated effluents will not generate significant impacts, if the facilities are operated and maintained according to the designed standards. However, discharge of improperly and inadequately treated effluents will cause surface and groundwater contamination. There is also the possibility for pollution of the groundwater and surface water due to leakages from and intrusion of storm water to the facilities (sewers, manholes, ponds, soak pits of septic tanks of public toilets).

In the operation of Namatala and Doko Waste Stabilization Ponds, there might or will be increased amount of sand in the sewage due to the fact that several properties connect their storm water to the sewerage. This will most likely increase the amount of BOD being released in the final effluent as well as sludge that settles at the bottom of the anaerobic and facultative ponds requiring de-sludging more often than usual. High BOD results in potential for increased nutrients (Phosphates and Nitrates into water resulting in eutrophication downstream). High concentrations of nutrients combined with high temperatures, can result in “blooms” of aquatic vegetation, particularly microscopic algae. In highly eutrophic waters, algal blooms can cause de-oxygenation of water resulting in fish mortality, bad odour or colour and difficulties in treating the water for drinking purposes. However, this can be negated by the frequent cleaning of screens and regular de-sludging of the anaerobic and facultative ponds for effective reduction in BOD. The clarification of water and further nutrient and pathogen removal would also lead to sedimentation in the maturation ponds, which primarily increases the effective treatment of sewage by use of WSPs. These would all consequently lead to changes in downstream water quality.

Project component	**Project phase when impact will occur**	
	Construction	**Operation**
Water and sewer pipelines	√	√
Modification of Doko & Namatala Waste Stabilization Ponds	√	√

Impact significance: The likelihood of the impact occurring is high. The duration of the impact will generally be short-term during construction but long-term during operation. The extent of the impact will be local for the water and sewer pipelines but regional for the WSPs facilities given that R. Namatala is

a trans-district River running through Sironko, Bududa, Mbale, Budaka, Kibuku and Butaleja districts. The ***intensity*** of the impact is assessed as ***Low*** given the short term duration of construction activities and the dilution impact made by the greater R. Namatala Network as the river progresses further downstream to the other districts of Budaka, Butaleja and Kibuku where aeration due to turbulence would have far reaching effects in improving the quality. In addition, NWSC will procure an experienced contractor for the construction activities and will be in charge of operation and maintenance of the facilities. The ***sensitivity*** of the receptor is ***high*** given the scarcity of the water resource and the number of users who depend on the River as a source of livelihood (that is, fishing, Rice growing and brick making). This results in a ***moderate*** impact significance.

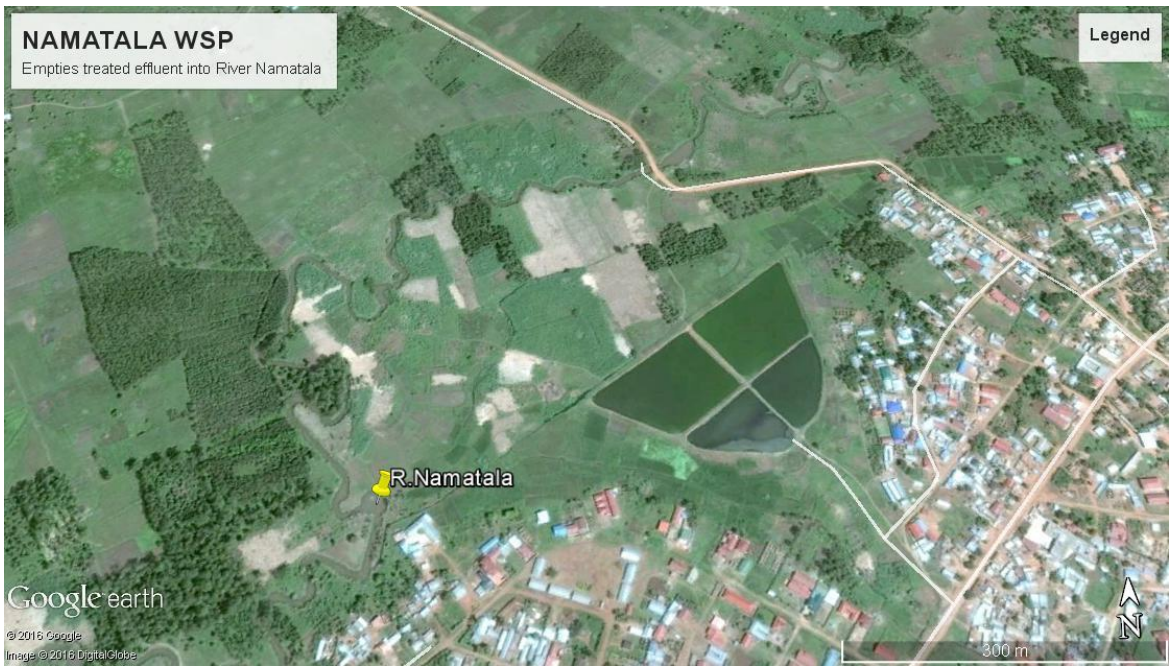


Figure 7-1 Namatala Waste Stabilization Pond which empties into R. Namatala

Figure 7-2 Doko Waste Stabilization Pond which empties into R. Nashibiso

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

Mitigation strategies - construction phase

i) All construction equipment will be kept in good operating condition to avoid oil or fuel leakages that might contaminate water resources. Poorly maintained machinery will not be allowed to operate on site. All routine maintenance of construction machinery and vehicles shall be carried out in a designated workshop / maintenance area with concrete hard standing surface and drainage to an oil interceptor.

ii) Stockpile areas for materials such as sand, gravel, stone, laterite, and topsoil, as well as overburden dumps will be located away from water courses and will be surrounded by perimeter or cut-off drains with sediment and other pollutant traps located at drain exits. Cut-off drains will be maintained throughout the subsequent operation phase;

iii) Water quality downstream of the affected resources (R. Namatala and its network) will be monitored on a monthly basis, with samples taken and analysed for all forms of contaminants.

iv) 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 National Environment (Waste Management) Regulations, 1999. All other wastes generated during site preparation and construction will be transported by the contractor or a company that has been specifically contracted to an authorized disposal area. The contractor will seek guidance from Mbale City and the respective District Local Government for the growth centres on the final disposal point.

v) Fuel handling and oil spill measures will be implemented to prevent, control and address spill or leaks. Fuel storage and dispensing on site shall not be allowed. Fuel and oil handling will be assigned to trained personnel and procedures for fuel storage, operation of mobile fuel tankers and refuelling areas will be well defined. Impermeable sheets, spill mats, and drip trays will also be provided in the appropriate areas to curb fuel and oil leakage to the ground. This will be done at designated places at the contractor's camp and in accordance with relevant standards set by the Energy Regulation Board and Uganda Bureau of Standards.

vi) Laying of water pipelines and sewer lines will mainly be done during the dry season to avoid sediment transport to the nearby land, water courses and roads;

vii) Any cleaning and hydrotest water which could cause contamination of surface (or ground) waters will be tested and treated as necessary prior to discharge, including debris and sediment removal.

viii) NWSC will ensure the contractor complies with its environmental management policies, EIA recommendations and national regulations.

Mitigation strategies – operation phase

ix) NWSC will ensure adequate operation and management of both the existing WSPs and the new facilities to avoid leakages and discharge of inadequately treated effluent;
x) The leakages from sewers, sludge drying beds and WSPs will be minimized by regular monitoring and maintenance of the network; connections between sewers will be made water-tight to prevent leakages of wastewater to groundwater; and frequent effluent quality monitored to avoid release of poorly treated effluents into the River.
xi) All requirements for construction of the sludge drying beds, especially for providing water impermeable basins, efficient drainage system for leachate and flood protection structures like cut-off drains and embankments will be put in place and respected;
xii) Awareness campaign will be launched for the residents about proper operation and maintenance of both water supply and sanitation facilities put in place in order to reduce the introduction of grease, solid waste and other non-biodegradable particulates into the sewerage network;
xiii) Monthly quality tests for effluent and receiving water resources will be done to ensure that the quality of effluent meets the national discharge standards or requirements;
xiv) Sanitary facilities, for example, toilets and human settlements will not be allowed to be built or developed within 30-50 m of boreholes to avoid potential contamination of the groundwater;
xv) A maintenance crew will be put in place to monitor and repair the network immediately a damage or leakage occurs to avoid accidental surface runoff intrusion to groundwater from the sewage network. Intrusion of storm water into the network and ponds can overburden facilities and cause discharge of partially treated wastewater into the water resources/ environment.
xvi) Maintain, repair and refuel vehicles and machinery at an offsite garage/workshop;
xvii) Emergency Lines (hotline) will be established to enable the public to immediately notify NWSC of any damages to the sewer lines to ensure timely response and repair of such damages; and
xviii) Location/ layout drawings of water pipelines and sewers will be availed to other agencies (e.g. UNRA) and regularly updated to ensure they are not damaged during road maintenance activities.

Adoption of the above mitigation measures will reduce impact intensity to “Very low” level resulting in a residual impact of minor significance.

7.3.3 Generation of Noise

Generation of noise will mainly occur during the construction phase. The use of heavy equipment including bulldozers, graders and dump trucks during site preparation and transportation of materials will generate noise and vibrations. Traffic associated with the pipeline and sewer line construction will be routed via main roads and along the right of way (ROW) as far as is possible (for example Naboa, Bishop Wasike, Hospital and Republic roads, etc. within Mbale City). Some minor roads will have to be used for access to the construction sites and some new access roads will be created. The levels of noise generated will depend on the type and condition of equipment employed by the contractor; and the number of employees at a particular site, in addition to the time of the day during which construction activities are taking place. The increase in traffic movements on minor roads may cause a noticeable increase in daytime noise levels through small villages; this effect will be localised and temporary, and will, for the most part, be restricted to the construction phase of the project. A number of roads will require repair prior to use for construction vehicle access (e.g. Mbale-Butaleja road around Nabigganda trading Centre that will have to be widened to enable the trucks maneuver the turn with ease). These repairs will help to reduce noise levels generated by such access, and other vehicular movements. With

noise being perceived as one of the most undesirable consequences of construction activity, it might become a nuisance to the settlements within its environs. The proposed sites are currently devoid of sources of high noise pollution as stipulated in Table 28. Since the noise levels in the area are low, the activities will therefore temporarily increase such levels.

Project component	Project phase when impact will occur	
	Construction	Operation
Water and sewer pipelines	√	
Modification of Doko & Namatala Waste Stabilization Ponds and construction of ablution blocks with water borne public toilets	√	

Impact significance: Given that most of the proposed routes for the sewers and water pipelines are located in relatively noisy areas of Mbale City and its neighbourhood, the receptor ***sensitivity*** is considered to be '***low***' due to the continuous construction activities during the day that might irritate the nearby locals although the noise attenuates with increasing distance from the source. The ***intensity*** of impact is assessed as ***low*** resulting into a ***minor*** impact significance.

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

Mitigation strategies:

i) Contractor will be careful when selecting the working equipment to avoid use of old equipment or damaged equipment with high level of noise emissions that would have a negative impact on the environment. Contractor will ensure that equipment is properly maintained and fully functional.

ii) Construction workers will be made aware of the permissible noise levels at the workplace and surrounding environment, and be advised to limit verbal noise or other forms of noise. For example, metallic objects or tools can be passed on to a colleague rather than dropping or throwing them with loud bangs. Construction truck drivers will be required to switch off vehicle engines while offloading materials. According to National Environment (Noise Standards and Control) Regulations, 2003; noise levels at construction sites should not exceed 60 dBA and 50 dBA during the day and night, respectively.

iii) All generators and heavy duty equipment will be insulated or placed in enclosures to minimize disrupting ambient noise levels. Pumps, generators and other mobile equipment will be sited as far as practicable from housing and other noise sensitive locations. Regular maintenance, monitoring and, where necessary, the use of silencing equipment will be employed with the aim of reducing noise emissions.

iv) The contractor will submit detailed information on the noise levels which will be generated by the specific methods and equipment proposed and the actions that will be implemented to minimise

the noise impact. Equipment shall be operated within their specifications and capacity (for example, avoid overloading machines).

v) During periods of inactivity, equipment will be switched off whenever possible. A limited number of construction activities may have to continue on a 24-hour basis. These include horizontal direction drilling, pipeline cleaning and hydrostatic pressure testing which are relatively low noise activities. Consultation will be undertaken with the relevant authorities in advance of any such operations. Where appropriate, residents living near to the pipeline construction activities will be kept informed of the contractor's proposed working schedule (through implementation of the Community Liaison Management Plan) and will be advised on the times and duration of any abnormally noisy activity likely to cause concern.

vi) Project vehicles will have a restricted speed limit of 40 km/h through settlements and trading centres to minimise noise.

vii) No construction activities will take place at night for sites where the closest residence is within less than 150 m from the project site.

7.3.4 Improper Handling of Asbestos Cement (AC) Pipes

During construction, asbestos cement (AC) pipes and accessories will be replaced by uPVC pipes. If improperly done, removal of AC pipes can release asbestos fibres into the air, posing risks to public health. Health hazards from breathing asbestos dust include asbestosis, a lung scarring disease, and various forms of cancer (including lung cancer and mesothelioma of the pleura and peritoneum). These diseases usually arise decades after the onset of asbestos exposure. Mesothelioma, a signal tumuor for asbestos exposure, occurs among workers' family members from dust on the workers' clothes and among neighbors of asbestos air pollution point sources. To reduce the risks and cost of handling the waste AC pipes and accessories, they will not be removed from the ground instead the new pipeline will be laid along them according to NWSC. But during construction depending on the distance of the AC pipe and the excavations, they would be damaged and particulates exposed to the surface.

Project component	**Project phase when impact will occur**	
	Construction	**Operation**
Water pipelines and sewers	√	

Impact significance: The ***sensitivity*** of receptors is assessed as ***'high'*** given that the effects of asbestos are carcinogenic. The impact intensity is assigned ***'medium'*** rating resulting in a ***major*** impact significance.

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

Mitigation strategies:

i) NWSC will ensure that the hired contractor demonstrates having experience and capability to observe international good practice standards with asbestos, including training of workers and supervisors, possession of (or means of access to) adequate equipment and supplies for the scope of envisioned works, and a record of compliance with regulations on previous work. The Contractor will be required to prepare a Hazardous Waste Management Plan.
ii) The contractor shall follow NWSC & NEMA procedures (Appendix I & J) for handling waste AC materials
iii) Decommissioned AC pipes and accessories will be managed through a third party contractor certified by NEMA.
iv) The selected contractor shall provide adequate protection to his personnel handling asbestos, including respirators and disposable clothing.
v) Disposal of AC pipes shall be carried out in a way that minimizes worker and community asbestos exposure. This way, all AC pipes and other related asbestos containing material shall be packaged, labelled, transported, stored and disposed of at approved sites for disposal of hazardous waste, for example, Luweero Industries Limited in Nakasongola District or EnviroServe waste handling facility in Hoima District.
vi) Before transportation, the properly sealed, labeled and secured AC pipes are kept inside a locked fenced area to prevent access by unauthorized personnel, and covered to prevent water accumulation.
vii) The contractor and NWSC Area Management will work hand in hand with the Mbale City Council to facilitate sound waste handling and disposal from the site to the approved Mbale City dumping site. All wastes must be taken to the approved dumpsites. AC pipe waste will handled following NEMA Asbestos Handling and Disposal Procedure (Appendix J).
viii) Proof of delivery and safe disposal of waste will be provided and records maintained at all times.

Adoption of the above mitigation measures will reduce impact intensity to “low” resulting in a residual impact of minor significance.

7.3.5 Improper Management of Waste

During construction, waste will be generated, including vegetation stripped from site, soil excavated from foundation sites, packaging waste (cement bags, paper, polythene sheets, and wood pallets), metal scrap, wire cuttings, wooden planks, polyethene sheets, PET water bottles, empty paint and solvent containers and waste oil from construction equipment or vehicles. Some of the waste materials such as paints, cement, adhesives and cleaning solvents contain hazardous substances, while some including metal cuttings and plastic containers are not biodegradable and can have long-term and cumulative effects on the environment.

Other wastes which will be generated by non-construction activities because of the presence of the workers, for example, during operation of facilities include food debris, contaminated water from washing, cleaning equipment, tools and vehicles. Inappropriate disposal of waste or spoil could have medium or long-term environmental and public health impact. Improper managing of these wastes could result in:

- Littering, health and safety risks associated with uncontrolled public access to disposal sites;

- Impairment of local air quality and increased health risks due to open burning of wastes; and
- Contamination of soil, air, surface water (in this case Swamp located adjacent to the STP site) and impact on public health when hazardous waste is improperly disposed of.

Operation of the WSPs generates relatively large quantities of sludge and solid waste that provoke negative impact on all media (soil, groundwater, air, etc.). There will be a need to remove the screenings and grit from all sites (Doko and Namatala WSPs) on an operational basis. Sludge will mainly come from the anaerobic and facultative ponds of the WSPs. Improper treatment of sludge could lead to putrefaction and other related problems such as bad odour, health effects etc. The removed suspended materials and screenings if not properly stored and managed on regular basis, can also cause odours.

Project component	**Project phase when impact will occur**	
	Construction	**Operation**
Water and sewer pipelines	√	
Modification of Doko & Namatala Waste Stabilization Ponds and construction of ablution blocks with water borne public toilets	√	√

Impact significance: The ***sensitivity*** of receptors is assessed as ***'high'*** given that some sites are located close to wetlands and streams, for example, the WSPs located near River Namatala and the lack of a well streamlined waste management system in Mbale and the growth centres. The impact intensity is assigned ***'Low'*** rating resulting in a ***moderate*** impact significance.

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

Mitigation strategies-Construction phase

i) The Contractor will be required to prepare a Waste Management Plan that will ensure that:
- The wastes are properly segregated and separated to encourage recycling of some useful waste materials, that is, some excavated material can be used as backfills.
- Solid waste storage bins and/or skips are provided at contractor's camp site and at the construction sites and ensure they are collected or emptied in time. Depending on the rate of accumulation, waste collection is made at least once in 24 hours and done in such a way to minimize nuisance of smell and dust during collection.
- Hazardous wastes such as paints, cement, adhesives are managed through a third party contractor certified by NEMA.
- Washing is not done at working areas but should be restricted to workers' camps and on paved areas to control runoff.

ii) The contractor, MWE and NWSC Area Management will work hand in hand with Mbale City and respective Local governments to facilitate sound waste handling and disposal from the site. All wastes must be taken to the approved dumpsites. AC pipe waste will be handled separately from other hazardous wastes.
iii) Proof of delivery and safe disposal of waste will be provided and records maintained at all times.
iv) The contractor will hire and improve on existing sanitary facilities in the vicinity of the project area or provide his own facilities (e.g. mobile toilets) which should be adequate at construction sites.

Mitigation strategies - operation phase

v) NWSC will ensure adequate operation and management of both the existing and the new facilities to avoid improper management of waste;
vi) NWSC/MWE together with the respective District Local Governments at the growth centres will ensure that the solid waste is collected by a firm licensed by NEMA and that the collected waste is disposed of at dumpsite or landfill approved by NEMA;
vii) Solid waste will be collected and disposed of in an approved dumpsite. Proof of delivery and safe disposal of waste should be provided and records maintained at all times;
viii) Adequate bins will be provided to prevent access by vermin at the sewage treatment plant and public toilets; and
ix) Strengthen the existing Water and Sanitation Committees especially the public water supply points.

Adoption of the above mitigation measures will reduce impact intensity to “very low” resulting in a residual impact of minor significance.

7.3.6 Air Pollution

The most significant issues that could potentially impact on air quality and climate during construction are combustion gas emissions and nuisance dust. During the construction phase there will be an increase in road traffic associated with material and equipment haulage. The principal sources of combustion gases are the exhausts of vehicles and construction equipment, power generation at the work camps and pipe storage yards. The potential impacts are nuisance to people in the area, coverage of crops (possibly leading to reduced yields) and deposition on natural vegetation and small animals, including bees.

During the operation, air pollution would mainly come from the public toilets and WSPs. If they are not operated and managed well, malodours are generated and can impact on communities in the downwind direction. Discharge of partially treated effluents due to overloading of the systems or negligence of the operator, in this case NWSC, in ensuring proper operation and maintenance could render the systems a nuisance and unfriendly to the environment and surrounding communities. The dried sludge shall be removed periodically from the sludge drying area and shall be taken to tip or be given to interested farmers. Burning can contribute to air pollution. The removed greasy material from the grease and sand trap if not properly stored and managed on regular basis, can also result in bad odours.

Due to the temporary nature of construction, dust emissions are not anticipated to have a long-term impact on local air quality. Dust nuisance will decline as stripped areas of land re-vegetate. Ambient air quality measurements (Table 27) indicate that the environment around the proposed project sites is

currently devoid of sources of high noise and air pollution.

Project component	Project phase when impact will occur	
	Construction	Operation
Water and sewer pipelines	√	
Modification of Doko & Namatala Waste Stabilization Ponds and construction of ablution blocks with water borne public toilets	√	√

Impact significance: The above impacts will affect roadside communities, communities neighbouring the proposed sites and road users. The manageability of the impact is high since typical impacts are well understood in conventional infrastructure construction industry and the ability to adapt to the impact is high because construction activities have been going on in the project area. Due to the intermittent and short-term nature of the activities, the ***intensity*** of impact is assessed as ***low*** and ***sensitivity*** of the receptors as ***high***. The impact significance is therefore ***moderate***.

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

Mitigation strategies – construction phase

i) Construction work will be undertaken by an experienced and duly registered contractor with a verifiable sense of environmental awareness and responsibility;
ii) Travel speeds of construction vehicles along the road especially at trading/ business centres will be controlled using humps and setting travel speeds not exceeding 40km/h;
iii) Trucks will be covered during haulage of construction materials to reduce on spillage of materials and wherever dust suppression is necessary, water will be sprayed over dusty areas;
iv) Workers will be provided with PPE and the use of PPE shall be enforced;
v) All surfaced roads shall be subject to road cleaning and un-surfaced roads to dust suppression, the methodology and frequency of which shall be included in the Contractor's Traffic Management Plan;
vi) Stockpiles of friable material will be grassed in order to prevent wind erosion;
vii) A maintenance programme for equipment and vehicles will be implemented, to ensure air emissions like particulates, SO_2 and NO_2 are minimised.

Mitigation strategies – operation phase

viii) NWSC/MWE will ensure adequate operation and management of both the existing and the new facilities to avoid bad odours that would arise from improper management of the facilities;
ix) The perimeter of the proposed sites will be vegetated with trees and plants of varying heights thereby forming wind breakers in addition to chain link fences;

x) Proper measures will be taken to avoid accidental surface runoff intrusion from the manholes of the sewage network, which can overburden the facilities and cause foul odours;
xi) NWSC will develop an Operations and Maintenance Manual for the Sewage Treatment Plan to guide staff on how to effectively run the WSPs;
xii) Facultative ponds will be commissioned before anaerobic ponds to avoid odour nuisance when anaerobic pond effluent discharges into an empty facultative pond;
xiii) Anaerobic ponds must be commissioned by filling them with raw sewage and seeded with sludge from a conventional sewage treatment plant or septic tanks. After filling and seeding, the pond should gradually be loaded up to the design-loading rate.

Adoption of the above mitigation measures will reduce impact intensity to "very low" resulting in a residual impact of minor significance.

7.3.7 Occupational Health and Safety (OHS) Risks

Construction traffic, excavation machinery and trenches may pose accident risk to workers either when equipment is operated by inexperienced workers or when in a poor mechanical condition or falls into the trenches. Inadequate OHS risks or problems could also result from insufficient medical capability at the construction site; or neglect of safety equipment, precautions and procedures.

During operation and maintenance of the water supply and sanitation facilities, occupational health and safety problems will arise. Workers at the facilities might experience negative health impacts, particularly during the removal and collection of screenings, grit, greases, sludge and sands etc. at the sewage; fatal falls, suffocation and injury while working in confined places like deep trenches. Storage and handling of tools, for example, sewer rodding snakes, spades, wheel barrows, spanners etc. if not well cleaned and disinfected may contaminate the stores and pose hazards to the workers. Other causes of OHS problem include but not limited to:

- Lifting of heavy and sharp objects;
- Poor transportation of materials for maintenance;
- Improper storage as well as handling and use of dangerous substances/ chemicals;
- Inadequate lighting and ventilation in workplaces;
- Lack of adequate training (or neglect of safety precautions/ guidelines) in use of equipment and tools;
- Misuse of equipment and materials for functions they are not designed;
- Lack of safety signage in specific areas;
- Electrical hazard;
- Eye hazards such as splashes;
- Lack of adequate PPE; and
- Biological hazards (vermin, mosquitos, pathogens, etc.).

Project component	Project phase when impact will occur	
	Construction	Operation
Water and sewer pipelines	√	√
Modification of Doko & Namatala Waste Stabilization Ponds and construction of ablution blocks with water borne public toilets	√	√

Impact significance: Accidents could cause considerable ecological damage, financial loss and harm to human life. While largely reversible, some impacts such as loss of human life and body injury are irreversible. The receptor ***sensitivity*** is considered ***medium*** given that although such impacts may be irreversible once they occur; the workers have done similar work and have knowledge on how to avoid such incidences. The impact ***intensity*** is considered to be ***medium*** since NWSC will procure a qualified contractor who is aware of OHS measures and NWSC will be incharge of operating the facilities for which it has vast experience. Nevertheless, this gives rise to an impact of ***moderate*** significance.

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

Mitigation strategies

i) A qualified Health and Safety Officer will be recruited by the Contractor to oversee OHS matters on a daily basis.
ii) All construction workers will be oriented on safe work practices and guidelines and ensure that they adhere to them.
iii) Appropriate signage will be used to warn staff and/ or visitors that are not involved in construction and operation activities in dangerous places.
iv) Regular drills will be constantly followed on various possible incidences. This will test the response of the involved stakeholders. Such drills will keep them alert and they will become more responsive in case of incidences.
v) Training will be conducted on how to prevent and manage incidences. This should involve proper handling of electricity, water etc. and sensitization on various modes of escape, conduct and responsibility during such incidences. All must fully be aware and mentally prepared for potential emergency.
vi) Personnel will only undertake tasks for which they are trained/ qualified. A formal 'permit to work' system will be in place and strict instructions will be given for operators of equipment.
vii) Strict instructions should be given for operators and drivers of equipment and vehicles. Ensure electrical safety at fabrication workshops by putting in place secure electrical connections and providing adequate insulation. All temporary electrical installations in use on site such as generators and welding sets should be adequately and effectively earthed at all times during operation.
viii) Supervision of works will be done regularly (daily during construction and weekly during operation) to ensure that safety conditions are met while any deviation from safety regulations is immediately reclaimed following the best practices regarding safety at work.
ix) Communication line must be ensured between workers and operators/drivers of equipment and vehicles.

x) Evacuation procedures to handle emergency situations will be developed. A van will be dedicated to this purpose during and throughout construction activities.

xi) Adequate OHS personnel protective gear will be provided to the employees. The guide below should be useful:

Hearing (Over 80 Decibels for 8 hours a day requires hearing protection)

- Ear Muffs: One size fits all, comfortable, less ear infection risk
- Ear Plugs: Small, lightweight, can get dirty and cause infection

Face/Eye (Working with any chemical or using any mechanical equipment)

- Face Shield: Protect face from splashing and particles
- Safety Glasses: Protection from solids (cutting, sanding, grinding)
- Safety Goggles: Protects eyes from splashing

Hand (Use correct gloves for the job)

- Chemical Gloves: (Nitrile, Latex, PVC)
- Gloves for other use: special gloves for cutting, burning, abrasions/ blisters

Body

- Overalls: Can protect against dust, vapours, splashes.

Foot Protection

- If electrical hazard present ensure boots offer protection
- Safety Toe/Steel Toe Boots: Always worn when potential for falling hazards exists
- Water/Chemical Resistant Boots: Use in a spill situation
- Non-slip boots for working on wet/slippery floors.

Working in water

- Water rescue apparel
- Water proof cardboard element.

xii) Strict adherence to safety measures and procedures are required to minimise (or eliminate) risks of accidents or hazardous developments occurring and ensure healthy and safe conditions for all persons working on the site. To ensure occupational health and safety on construction sites, the Contractor shall be obliged to comply with all applicable Ugandan construction Health and Safety Standards as required by the Occupational Safety and Health Act of 2006. These include provisions of the Factories Act, Labour Unions Act and Workman's Compensation Act.

xiii) First aid box will be available at all active construction sites.

xiv) An Accident Log will be maintained onsite to register all injuries and to investigate their causes during both the construction and operation phases of the project.

xv) Emergency resources (e.g., fire extinguishers, stocked First Aid kits, Emergency Contacts, Doctor on Call, etc.) will be maintained at all active construction sites and at water and wastewater facilities during operation.

xvi) The Contractor shall ensure that all areas requiring access including platforms, under platforms, underpasses, excavations, etc. have enough illumination.

xvii) Ensure that excavations (soak pits, septic tanks, etc.) especially for public toilets are undertaken under strict guidance to avoid chances of collapse.

xviii) All construction workers will be oriented on safe work practices and guidelines especially regarding work in confined spaces and it will be ensured that they adhere to them.
xix) The contractor will first determine the nature of soil to be excavated before any excavation is done; the type of soils at the site – construction of toilets will be investigated to devise the extra care and expertise.
xx) Before starting any pipeline excavation works, the contractor will undertake planning so that the significant hazards (e.g. collapse of the sides, materials falling on workers in the excavation; dangers associated with excavation machinery; and falls of people and/or livestock into the excavation) can be addressed.
xxi) The Contractor shall provide a signal man, barricades and safety sign boards around the excavations.
xxii) Routine maintenance (removal of garbage, removal of screenings and grit, slashing around the embankments, repair of damages to the fence, etc.).
xxiii) The manufacturer's instructions and Material Safety Data Sheets (MSDS) must be followed for the storage of all chemicals used in water and sewage treatment. Storage must conform to compatibility restrictions.
xxiv) Regular fumigation of the Plant will be undertaken to kill disease vectors such as mosquitoes.

Adoption of the above mitigation measures will reduce impact intensity to “very low” resulting in a residual impact of minor significance.

7.3.8 Risk of Accidents

The water pipeline and sewers will have to be laid across existing roads (e.g. Naboa, Bishop Wasike, Hospital, Duka, Mbale -Tirinyi highway, Busoba - Butaleja roads) that are used by motorists and cyclists in addition to pedestrians. The trenches created for the pipe or sewer crossing can lead to accidents if proper signage is not put in place. Vehicles and trucks transporting construction materials to the site may result in community risk of traffic-related accidents, especially when the safe speed limits are not adhered to. Most of the water pipelines and sewer lines will be laid within the road reserves that traverse several communities with a significant number of school going children and traders, for example, Nabiswa Church of Uganda Primary School and Jami Primary School located along the Mbale-Tirinyi highway, and other commercial activities like shops mostly situated within Mbale City and Nabigganda area in Butaleja.

Construction traffic accidents would be a significant social impact and likely to affect children, women, disabled, elderly people and livestock. The duration of the risk will be short-term occurring only during the construction phase. Although some effects of the accidents (e.g. minor injuries) may be reversible, some, for example, loss of human life is irreversible.

Project component	Project phase when impact will occur	
	Construction	Operation
Water and sewer pipelines	√	√
Modification of Doko & Namatala Waste Stabilization Ponds and construction of ablution blocks with water borne public toilets	√	

Impact significance: The receptor sensitivity is ***high*** given that there are a number of pedestrians and commercial activities along the roads while the intensity is ***medium*** given the temporary nature of the

construction activities, however, some of the impacts like loss of life or damage to body may be irreversible. The impact significance is thus assessed to be ***major***.

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

Mitigation strategies

i) Contractor will adopt best transport safety practices (Journey Management Plans (JMPs)) with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public by: employing safe traffic control measures, including road signs and flagmen/traffic guides to warn of dangerous conditions and children crossings; and setting speed limits on all access roads in the project area will be 40km/h for light vehicles and 30km/h for heavy vehicles. Through the JMPs, optimum routes from material storage areas to the construction sites will be identified to avoid sensitive receptors such as schools and hospitals.

ii) The Contractor shall provide dedicated site entrances and exits for personnel, which shall be manned 24 hours per day, 7 days per week including holidays.

iii) Some roads in Mbale City e.g. Republic street are being surfaced. NWSC should contact UNRA and request for service ducts to be installed at points where sewers and water mains will cross roads to avoid cutting through roads that have just been upgraded.

iv) The Contractor will have a community liaison Officer (CLO) to get feedback/complaints from communities regarding the operations of the project and issues the communities think are not being done in a proper manner. The CLO would also be responsible for informing project-affected communities of the timing and duration of the construction activities across access roads and any uncertainties or potential for change.

v) All workers, including sub-contractors and casual labour, will undergo an environmental, health and safety induction before commencing work on site. This will include a full briefing on site safety and rules.

vi) Restrictions on hours of driving (including night time restrictions where sensitive receptors may be affected) and timing of vehicle movements will be emphasized to avoid busy periods in urban areas, particularly the start and end of school and the working day.

vii) No drivers or personnel under the influence of alcohol or any drug abuse will be allowed onsite.

viii) The site, where possible, will be fenced and signalization put in place with security personnel to stop unauthorised people from accessing the site.

ix) Strict adherence to safety measures and procedures are required to minimise (or eliminate) risks of accidents or hazardous developments occurring and ensure healthy and safe conditions for all persons working on the site and the project-affected communities. To ensure occupational health and safety on construction sites, the Contractor shall be obliged to comply with all applicable Ugandan construction Health and Safety Standards as required by the Occupational Safety and Health Act of 2006. These include provisions of the Factories Act, Labour Unions Act and Workman's Compensation Act.

Adoption of the above mitigation measures will reduce impact intensity to "very low" resulting in a residual impact of minor significance.

7.3.9 Pressure on Existing Resources

During the construction stage, demand for basic amenities such as water, fuel and gravel may put pressure on the existing resources such as water stress to the local communities and landscape blight due to unrestored borrow sites. Water scarcity is especially prevalent during the dry seasons where the water levels in the Rivers drop to a minimum and yet there are several aspects of the project that will require the resource during the construction phase, e.g. concrete mixing, compaction and dust suppression at the site and access roads etc.

Construction employment opportunities may attract an external workforce to the project areas who would in turn pose pressure on resources such as water, wood fuel, building materials, food, social infrastructure including medical facilities and land. This may mean increased encroachment on, and degradation of land as well as increased pressure on available community water resources. An increase in population also means increased pressure on the social infrastructure and risk of environmental pollution from human excreta and solid waste.

During the operational phase, the continuous abstraction of water from R. Namatala and R. Manafwa might reduce the flow levels downstream due to ineffective compensation. From water resources assessment (see Sub-section 2.5.2.1), River Manafwa is expected to have enough water. However, a guarantee cannot be given as extreme droughts can occur and human destruction of ecosystems continues. River Namatala has enough water for most times. However, flows can drop to less than 0.4 m^3/s and by the end of the dry season, flows could be close or even below the water demand.

Project component	Project phase when impact will occur	
	Construction	Operation
Laying of Water and sewer pipelines	√	
Water treatment plant supply	√	√
Modification of Doko & Namatala waste stabilization ponds	√	
Ablution blocks with water borne public toilets	√	√

Impact significance: Duration of the impact will be short-term or long-term depending on the recharge from the catchment and socio-economic activities prevailing given that Mbale City is vying for City status. The extent of the impact will be local to respective districts for resources like gravel, wood fuel etc. but regional for the water resource as both R. Namatala and R. Manafwa are Trans-district Rivers. The ***intensity*** of the impact is ***medium*** if not alternative measures are instituted in the dry season to ensure that the water demand is covered but there are plans to put in place catchment basin management measures that would contribute in recharging the affected drainage basins. ***Sensitivity*** of the receptor is rated ***medium*** given that there are other sources that can still be relied on by the community e.g. Boreholes, spring wells etc. and abstraction permits are required for regulatory purposes. Therefore significance of the impact is ***moderate***.

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

Mitigation strategies – Construction Phase

i) The contractor will provide separate storage for water to use at the construction sites. Instead of connecting to the nearby/ communal water points, the contractor should opt to use water bowsers for water supply from the nearest surface water point.
ii) The NWSC/MWE, supervising consultant and contractor will phase the construction activities in such a way that water-consuming activities (for example, concrete works, pressure testing) are not carried out concurrently but rather in combination with non-water-consuming activities (for example, trench excavation, pipe laying) in the same location, where possible.
iii) Through inductions and toolbox meetings, NWSC/MWE will ensure that contractors are conversant with resource conservation practices in all project activities. Conservation awareness will focus on water use efficiency and general day-to-day measures such as turning off taps when water is not being used.
iv) The Contractor and NWSC will acquire water abstraction permits with conditions to guide the amount of water to be abstracted as stipulated in the Water Supply Regulations (1999).
v) Earth materials will be sourced from NEMA-approved sources in a manner that reduces environmental and social impacts. Approved sources are known and easy to monitor and regulate by both the district local administration and NEMA.

Mitigation strategies - operation phase

vi) Catchment management plans are being developed with the aim of conserving and allowing recharge of water resources.
vii) Water conservation measures will be encouraged: saving water is an efficient way of reducing the overuse of ground water resources. It does not only decrease the amount of the water withdrawn, but may also reduce the threat of pollution.
viii) NWSC should adhere to the safest maximum abstractable water quantities throughout the project life. Environmmental Flow will be maintained.
ix) NWSC should adhere to the stipulated limits in the water abstraction permit obtained from DWRM.

Adoption of the above mitigation measures will reduce impact intensity to “very low” resulting in a residual impact of minor significance.

7.3.10 Landscape and Land Use Impacts

Construction of the ablution blocks with water borne toilets will alter the land usage of the proposed sites where the toilets will be located respectively. This land use alteration will be long-term lasting the

entire project lifetime. Other project aspects that will temporarily impact on the land use of the project areas will be the use of land for construction maintenance yards, construction camps and pipe yards.

Project aspects that will impact on the landscape of the area are the temporary and the permanent adoption of land for the water supply facilities (Reservoir tanks in the growth centres, block valves and access roads) and sewage management facilities, etc. Sourcing earth materials such as murram and gravel which are used for construction works can have visual and socio-environmental impacts if borrow pit areas are not properly restored after use. Water impounded in derelict borrow pits forms a breeding ground for mosquitoes or other disease vectors, posing health risks to local communities, which is a negative but reversible impact. In addition, there will be change in the land use at the proposed sites for wastewater management facilities hence a change in the visual quality.

Project component	**Project phase when impact will occur**	
	Construction	**Operation**
Laying of Water and sewer pipelines	√	
Water treatment plant supply	√	√
Modification of Doko & Namatala Waste Stabilization Ponds	√	
Ablution blocks with water borne public toilets	√	√

Impact significance: Duration of the impact will be long-term and the extent of the impact will be local. The ***intensity*** of the impact is ***low*** given that some of the facilities are already existent and only modifications will be made to them and, sludge drying beds blend well with the environment. ***Sensitivity*** of the receptor is rated ***high.*** Therefore significance of the impact is ***moderate***.

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

Mitigation strategies

i) The contractor will be required to develop and implement a Reinstatement Plan.
ii) Murram and subsoil will be obtained preferentially from a licensed source and in accordance with any terms of the license. "Licensed" means approved by NEMA or the respective District Local Governments. The contractor will provide a copy of the license to NWSC before the beginning of works at the murram/subsoil extraction location;
iii) If no suitable licensed source of murram/subsoil is available in the area and the contractor plans to obtain the material from a private landowner, then the contractor will:

- Provide NWSC/MWE with a copy of the written agreement between the contractor and the owner of the murram/subsoil source in advance of the beginning of works at the location. The

identity of the landowner will be certified by a certificate of ownership or a paper signed by the LC1 chairperson and/ or Head of Clan;

- Engage and consult any households and/or communities in close proximity to the identified murram/topsoil source and provide evidence of these consultations to the NWSC;
- Ensure adequate compensation on mutually agreed terms is made to people who are either physically or economically displaced by the activities of the contractor. The contractor will provide documentation of the compensation terms (minutes of consultation meetings, signed agreements with affected persons, compensation receipts etc.) to NWSC;
- Assess health and safety risks linked to murram/subsoil extraction and transport, and implement appropriate mitigation measures. The risk assessment will be provided to NWSC ahead of the beginning of works;
- Provide a restoration plan for review, and ensure that the actions of the restoration plan are implemented to the satisfaction of concerned authorities. Sign-off from the relevant authorities will be required and copies of the sign-off will be provided to NWSC.
- NWSC will submit to NEMA the documentation related to management of the identified borrow pits, especially the restoration plan of the borrow pits.

iv) Restoration of borrow pits to as close to pre-project conditions as possible will be done immediately after use in cases where they are specifically opened up for this project. Native vegetation must be used for re-seeding the excavated site.
v) Where grading impacts on the local topography, reinstatement will be undertaken in a manner which is generally sympathetic to the existing contours.
vi) Reinstatement of the water pipeline and sewer routes will be done in such as return the visual integrity of the landscape as closely as possible to its previous condition.
vii) Wherever possible the removal of existing mature trees will be avoided, for example, for the sewerage network provided that the integrity of the pipeline/ sewer line is not jeopardised.
viii) In areas where grading of the working width impacts on the local topography, reinstatement will be undertaken in a manner which is generally sympathetic to the existing contours.
ix) Where sections of the road are cut, these will be reinstated immediately after construction or maintenance activities.
x) Where pipelines and sewers are not buried in ground, if any, they will be painted to blend with the environment. They will be adequately supported by concrete pillars and of such materials that cannot easily be damaged by the communities.

Adoption of the above mitigation measures will reduce impact intensity to “very low” resulting in a residual impact of minor significance.

7.3.11 Social Misdemeanour by Workers

While most workers may originate from the local community where they have families, there might be others from distant places and working away from their families. With some disposable income to spend, this might induce illicit sexual relationships, with attendant risk for spread of HIV/AIDS. Irresponsible sexual relationships in project communities can break families and heighten risk of contracting HIV/AIDS. Illicit sexual relationships can be short-term but have long-term and irreversible effects if HIV were contracted. If this impact occurred, extent of disease spread would be local or national depending on origin and next destination of infected persons.

Project component	Project phase when impact will occur	
	Construction	Operation
Laying of Water and sewer pipelines	√	
Water treatment plant supply	√	
Modification of Doko & Namatala Waste Stabilization Ponds	√	
Ablution blocks with water borne public toilets	√	

Impact significance: Duration of the impact will be short-term or long-term depending on whether HIV/AIDS is contracted and the extent of the impact will be local or national depending on origin of construction workers. The likelihood of the impact occurring is low if contractor adequately sensitise workers about responsible and safe behaviour. The ***intensity*** of the impact is ***very low*** given that similar construction activities like for roads are already taking place in the area. ***Sensitivity*** of the receptor is rated ***high*** given that HIV/AIDS, if contracted, is a long-term effect. Therefore significance of the impact is ***minor***.

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

Mitigation strategies

i) As a contractual obligation, contractors shall be required to have an HIV/AIDS policy and a framework (responsible staff, action plan, etc.) to implement during project execution.
ii) All construction workers shall be orientated and sensitized about responsible sexual behaviour in project communities.
iii) The contractors will develop and follow a code of conduct. An example is provided in Appendix H

7.3.12 Loss and Degradation of Natural Habitats

The area traversed by project facilities is relatively large and traverses largely through built up environment, extensive subsistence farmland, seasonal and permanent wetlands including Lwabi and Nakwasi wetland system. The proposed Mbale-Busolwe water pipeline route traverses through built up area, subsistence gardens of maize, banana, Potatoes, Beans, cassava, and rice; it also cuts across extensive rice farmland of Doho irrigation scheme, and the only remnant *Cyperus papyrus-Cyperus dives* swamp in areas of Lwabi and Nakwasi. Given the pipeline and sewer corrodors, there will be minimal vegetation clearance during construction activities especially during excavation of land. This is expected to cause minimal disturbance since almost all natural vegetation were converted into farm land.

Loss of tree cover may occur along all the routes during pipeline construction but this will notably be in

areas where the proposed pipeline route passes through mixed patches of post cultivated areas, woodlots, and agricultural gardens. Consequently, no significant impacts or loss of habits will result from construction and operation of the proposed pipeline.

Project phase when impact will occur	Construction	Operation
	√	

Impact significance: Impact ***intensity*** is considered ***low*** since there are no natural forested stretches along the pipeline route. Moreover where natural vegetation exists along the proposed pipeline route, it exists in a post cultivated form except at Lwabi and Nakwasi Cyprus swamp. The ***sensitivity*** of the receptor is rated ***low*** given that most of the areas traversed by the project were already disturbed with human activities resulting in a ***minor*** impact significance.

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

Mitigation strategies

i) Construction activities should be restricted only to the areas that must be disturbed to avoid unnecessary disturbance
ii) All project workers should be sensitized to minimize damage to vegetation and flora
iii) Close monitoring and supervision of the construction operations to ensure compliance and avoid causing further damage to undesignated project areas
iv) Support and encouragement of communities to plant trees by providing planting material for fast-growing and multiple use species e.g. *Maesopsis eminii* and *Markhamia lutea* AND continuous engagement of communities
v) Support monitoring of performance of the planted trees
vi) Where tree cutting is inevitable, replacement planting should be done wherever feasible.

7.3.13 Disruption to Communication Routes

The excavation of trenches and pipe/sewer installation along main roads within Mbale City will result in considerable and unavoidable delays to traffic flows. At the present time, and until the contractor has developed a detailed programme of work, the exact timing and duration of delays, the overall impact upon the community is difficult to assess. The impact upon vehicular movement will generally be confined to increased journey time and the costs associated with delays, which in the majority of cases will only be of minor inconvenience. Effective traffic management will be key in determining the severity of impacts. Delays will be most noticeable during morning and evening peak 'rush-hours' even though these are relatively modest in Mbale City. In addition to the general disruption of communications, laying of sewers and water pipes will result in the temporary loss of access as work progresses past

individual property entrances. This will be most serious when crossing roads and in front of public building and emergency service centres.

Project component	Project phase when impact will occur	
	Construction	Operation
Water pipelines and sewers	√	√

Impact significance: Duration of the impact will generally be short-term and the extent of the impact will be local. The ***intensity*** of the impact is ***low*** given that the road network in the City is well planned and has interconnections in most parts of the project area. ***Sensitivity*** of the receptor is rated ***low***. Therefore significance of the impact is ***minor***.

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

Mitigation strategies

i) Appropriate signage will be used and impacted owners will be informed ahead of disruption.
ii) Disruptions to public access shall be identified in the Contractor's Traffic Management Plan, under which suitable notice of intending delays and closures are given to all concerned parties and approved prior to commencing work. All road closures shall be separately notified and agreed with the City administration. However, partial closures and traffic delays managed with flagmen need not be separately notified.
iii) Where access to or from an individual property is closed for a period of 2 hours or more, the owner shall be informed at least 24 hours in advance.
iv) Vehicular access to and from hospitals, police stations and fire stations shall be maintained through the use of steel road plates over open trenches. Pedestrian access to schools, health facilities, and other premises frequently accessed by the public will be maintained with the use of walking boards.
v) The laying of pipelines and sewers, backfilling and temporary reinstatement shall follow trench excavation as quickly as possible and trenches will not be left open for extended periods.

7.3.14 Disruption to Public Utilities

During the installation of new subsurface infrastructure it is very easy to damage existing service cables and pipelines or temporarily interrupt supplies to consumers. For example, some of the telecom and power lines have been installed underground although most are above ground. Also underground are existing water supply pipelines and sewers that are assets of the project proponent.

Project component	Project phase when impact will occur	
	Construction	Operation
Water pipelines and sewers	√	√

Impact significance: Duration of the impact will generally be short-term and the extent of the impact will be local. The ***intensity*** of the impact is ***low*** given that such utilities are well demarcated and the ***Sensitivity*** of the receptor is rated ***low***. Therefore significance of the impact is ***minor***.

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

Mitigation strategies

i) Prior to undertaking any works, the Contractor will obtain from the utilities agencies definition and details of all utilities sites within 50m of the works. These agencies shall include, but not necessarily be limited to, the following:

- Umeme;
- Telecom companies;
- National Water & Sewerage Corporation, etc.

ii) Damage to any utility at a defined site shall be made good to the satisfaction of the responsible agency at the Contractor's cost. Damage to utilities not defined prior to construction, despite the Contractor having undertaken all reasonable liaisons with the responsible agencies, shall not be the responsibility of the Contractor. It shall be the responsibility of NWSC to ensure the utilities' agencies respond in good time to the Contractor's requests for information.

iii) NWSC will ensure that water supply to the project affected communities is not interrupted for more than 24 hours. Announcements will also be made to ensure consumers store enough water to take them through the period of interrupted service provion.

iv) Contractors shall liaise with each of the agencies responsible for the maintenance of utilities that are to be crossed, temporarily diverted or otherwise affected by the works as to the timing and nature of any disruption of service. Where required, the responsible agency shall be requested by NWSC to carry out the necessary works at the time required and at NWSC's cost. The Tender Documents shall contain sufficient information on utilities' crossings to permit the Contractor to include the cost of the works for which he is responsible in his or her bid.

v) The Contractor shall incorporate his or her programme his or her proposed arrangements for traffic diversions in the form of a Traffic Management Plan, with details of all necessary signage and any temporary works for approval by the NWSC and the City Engineer. The programme shall also contain details of the timing of the proposed closure, dates of closing and re-opening the route, and of any necessary remedial works.

7.3.15 Permanent Land-take

Construction of the STP, ablution blocks with water borne toilets, water treatment plant, reservoir tanks in the growth centres, booster stations and laying of the water and sewer pipelines will to certain extents involve taking of land permanently from the original owners. The contentious areas that will likely affect communities include: Namatala transmission main that traverses arable land. The villages (20 villages) to be traversed by the transmission line and corresponding number of PAPs (376) are presented in Table 7-1. The proposed Mbale pressure break tank (100m^3 capacity) at and Busoba reservoir (2000m^3 capacity and size (24.6m $\times$ 24m $\times$ 4.5m)) and the other reservoir tanks in the growth centres will be placed on government land hence avoiding displacement and compensation of the would-be land owners. Modification works at the WSPs will not require any new land-take as the system will only be improved within the existing boundaries.

Table 7-1: Villages traversed by the transmission line and corresponding number of PAPs

#	Village	Indicative Number of PAPs	#	Village	Indicative Number of PAPs
1	Zesui	55	11	Makhosi	9
2	Butandiga	19	12	Masengese	11
3	Munhgo	3	13	Mitumba	19
4	Mukhuwa	18	14	Kikondo	10
5	Kibagala	23	15	Tugutu	6
6	Namulama	29	16	Muluka	11
7	Kilongo	5	17	Lower	52
8	Kifululiro	12	18	Kikongelo	14
9	Nanyila	27	19	Bukoba	30
10	Namwali	7	20	Maku	16

Source: Resettlement Action Plan for Mbale and Small Towns Water Supply and Sanitation Project (Project Reference Number: NWSC-HQRS/SRVCS/13-14/158804)

Laying of the water and sewer pipelines will be done within the boundaries of the existing road reserves that is owned by the Government. However, in the event that there are people's properties within the road reserves, due compensation will be effected prior to construction works.

The following categories are eligible for compensation:

i) Persons with houses / structures located in the project area;
ii) Persons with perennial and annual crops;
iii) Customary landowners whose plots are in the project area; and
iv) Registered landowners.

Note that people operating or renting business structures can enter into or move out of these premises before the compensation date. For this reason they were not documented. It is advised that these people are documented at a time close to the date RAP implementation and compensation or relocation assistance given to tenants occupying the premises at that time.

Persons who encroach on the proposed project area after the resettlement survey (census and valuation) are not eligible for compensation. Cut-off date was communicated as the date of completion

of the census and assets inventory of persons affected by the project. Persons occupying the project area after the cut-off date are not eligible for compensation and/or resettlement assistance. Similarly, fixed assets (such as built structures, crops, fruit trees, and woodlots) established after the date of completion of the assets inventory, or an alternative mutually agreed on date, will not be compensated.More details are provided in the RAP Report (2018).

Project component	Project phase when impact will occur	
	Pre-Construction	Operation
Water and sewer pipelines	√	
Modification of Doko & Namatala Waste Stabilization Ponds	√	
Ablution blocks with water borne public toilets	√	

Impact significance: The likelihood of this impact occurring is high because land will be lost to the reservoirs. Impact intensity is ***low*** since most of the said land is not under intensive agricultural activities and Government owns most of the affected land. Sensitivity of receptors is ***high*** because properties will be affected for the water pipeline especially around Budaka area where most persons encroached into the road reserves. Therefore significance is ***moderate***.

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

Mitigation strategies:

i) NWSC/MWE will ensure that the project-affected persons identified through the Resettlement Action Plan study of the project are compensated for the land and property on it in time and fairly.

ii) Land will be acquired in accordance with the Resettlement Action Plan developed for the project based on Uganda's Land Access and Compensation Procedure and World Bank's Safeguard requirements (OP/BP 4.12), which requires amongst others:

- Sensitization of community members whose property will be affected.
- Completion of a full inventory of privately registered and/cultivated, grazed or other uses of the property that will be taken for the project as well as structures and graves within the road reserves.
- Compensation to be paid in line with mandated rates agreed in consultation with the respective Project District Officials' before commencement of construction activities.
- Ensuring that the Chief Government Valuer approves the valuation rates.

Adoption of the above mitigation strategies will lower the impact intensity to "very low" rate resulting in a *minor* significance.

7.3.16 Sludge Disposal

Sludge will be generated during rehabilitation of the Doko and Namatala Waste Stabilisation Ponds. This activity has the potential to have two negative impacts. The first being unscrupulous cesspool emptiers collecting funds to carry septage from the source to approved disposal facilities and depositing it at unapproved locations and the second being the smell.

Project component	Project phase when impact will occur	
	Construction	Operation
Waste management facilities		√

Impact significance: The ***intensity*** of the impact is ***high*** once septage is disposed of in the wrong place while ***sensitivity*** of the receptor is rated ***high*** due to the discomfort experienced as a result of the stench from wrong disposal of septage, hence resulting in a ***major*** impact significance.

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

Mitigation strategies:

i) Institute and maintain a ticketing system for cesspool emptiers, where upon successful disposal, the operator of the waste treatment facility would issue a receipt to the cesspool emptier.
ii) Kibuku District Local Government/ Kadama sub-county and MWE, should put in place a system to monitor cesspool emptiers and in addition, have a public educational campaign to educate and inform the public about the system.
iii) NWSC and Mbale District Local Government will work closely to ensure that transporters of sludge take it to designated areas for disposal.
iv) The MWE, NWSC and the District Local Government will work together to identify the most suitable way of disposing off the treated sludge. If the sludge is to be reused as a soil conditioner, it will be tested to ensure its safety before being given to farmers.

Adoption of the above mitigation measures will reduce impact intensity to "low" resulting in a residual impact of moderate significance.

7.4 CUMULATIVE IMPACTS

7.4.1 Positive Cumulative Impacts

There will be improved safe water supply within Mbale City and the growth centres of Kadama, Tirinyi, and Kibuku as well as improved access to sanitary facilities as a result of the project's intervention to improve public health by way of pit latrines and faecal sludge drying beds. This will be in addition to

improvements contributed by other projects in area, for example, improvement of the road network in the City and neighbouring areas.

7.4.2 Negative Cumulative Impacts

Induced development can cause in-migration as a result of increased economic activity and development. This is likely to happen in towns and trading centres and may result in social tensions or increase in prostitution, crime and excessive demand for resources (food, water, rented accommodation). As towns develop, prices of land, food and other commodities may increase, making them increasingly unaffordable for local residents.

Impact significance: The likelihood of this impact occurring is high because of the availability of water supply and improvement in other infrastructure like roads. The extent of the impact will be variable. Given the existing pressures on infrastructure, any increase in local population will add to an existing problem. Impact intensity is ***low*** since most of the said activities are already taking place and control measures are in place. Manageability of the impact is low because the Project has little control over expectations of potential immigrants and rising commodity prices. Sensitivity of receptors is ***medium*** resulting in ***moderate*** impact significance.

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

Mitigation strategies:

i) The Government of Uganda and NGOs are actively involved in issues of induced development and in-migration and will continue to take a lead role on this area. However, it is vital that the local government actively enforce local planning policy to restrict over development and also monitor commodity prices.

ii) NWSC will advertise locally at the districts and lower local government offices project labour requirements to give a first priority to local people and reduce on inmigration.

8 ENVIRONMENTAL-SOCIOMANAGEMENT PLAN (ESMP)

This environmental-socio management plan, ESMP (Table 44) for proposed construction works and operation of the water supply and sanitation facilities under this project, identifies the potential environmental and social aspects that should be monitored. It identifies parties responsible for monitoring actions, associated costs, indicators and training or capacity building needs and reporting. Various aspects of the ESMP are detailed in sections below

8.1 INSTITUTIONAL ARRANGEMENTS

8.1.1 Institutional Structure and Responsibilities

During the construction phase, there will be three parties involved with the ESMP, that is, the client (NWSC in Mbale City and DWD in the small towns) with ultimate responsibility for E&S performance on the project; the Supervising Engineer (with an Environment and Social Specialist on their team) responsible for monitoring and supervising the implementation of the ESMP and contract requirements by the contractor(s); and the the Contractor (with an Environmental Specialist, Social Development Specialist and Health & Safety Specialist) who has responsibility for implementing the ESMP. NWSC and DWD in their respective areas of operation will ensure that both the Supervising Engineer and Contractor are doing their jobs effectively and that the ESMP is delivering the necessary environmental and social protection measures.

Therefore, the institutional responsibility of ensuring that this ESMP is implemented will rest with NWSC and DWD having a key role of reviewing consultants' reports for compliance with the ESMP, among others. The Project Managers from either instititutions shall have the ultimate responsibility for implementation of ESMP and will therefore ensure that resources are duly provided. Other roles will be:

- Monitoring implementation of mitigation actions by contractors
- Coordinating training and capacity building where planned

NWSC/DWD should ensure that all its personnel to be involved in implementation of this ESMP are adequately qualified and were appointed based on their qualification and suitability for respective roles. There is thus no training provided for them under this ESMP. Supervising Engineer is required to have an Environmental & Social management Specialist by contractual obligation. The Contractor's Environment and Social Officer will ensure that the provisions in this ESMP are implemented within the sites under their supervision and to collect and transmit relevant information to the Supervising Engineer.

Subcontractors will be required by a condition of their subcontract with the main contractor to actively manage environmental and social issues associated with their subcontract works and comply fully with all the applicable statutory regulations and the main contractor's environmental and social management plans. For significant aspects of work such as earthworks, the contractor may require subcontractors to provide their own Environmental and Social Management Plans and/or Method Statements for review by the Contractor's Environmental consultant/Officer. These ESMP's shall be approved by the Resident Engineer in consultation with NWSC for adequacy before being implemented.

The Mbale City Council & District Environmental Officers (DEOs) are responsible for overseeing environmental protection on behalf of NEMA. The DEOs within the respective project districts will have monitoring roles during execution of this ESMP in their respective project areas. Usually, these officials lack adequate facilitation so the project will need to provide auxiliary financial assistance for them to have effective participation in this project.

The contractor will be required to prepare ESMPs setting out the measures that they will take to implement the ESIA ESMP during the construction. This requirement also applies to NWSC and DWD during the operation phase of the project in their respective areas of operation.

8.1.2 Monitoring and Reporting Arrangements

Monitoring will verify if predicted impacts have actually occurred and check that mitigation actions recommended in the ESIA are implemented and their effectiveness. Monitoring will also identify any unforeseen impacts that might arise from project implementation.

Who monitors and how: Monitoring will be undertaken by NWSC/DWD (PCU) and Environmental Officers who represent NEMA at local administrative level. Monitoring by NEMA in this case can be considered "third party monitoring" but this is its regulatory mandate according to Section 9 of the National Environment Act (2019).

Another government agency that may undertake "third party monitoring" is the Occupational Health & Safety Department in Ministry of Gender, Labour & Social Development (MGLSD). This unit has authority to inspect any facility for compliance with national requirements on safety in workplaces. The project shall make no funding to MGLSD since this is provided for in its annual budget.

Monitoring will be done through site inspection, review of site records (Accident Log, issuance of PPE, waste records, trainings and inductions, permits and approvals, etc.), review of grievances logged by stakeholders and *ad hoc* discussions with potentially affected persons (construction workers, residents near the project facilities). At each monitoring, a discussion with chairpersons of environment committees of the areas' local councils (LC) could provide insight into views and grievances communities have about the project since they regularly interact with their community members.

Frequency: Monitoring will be undertaken continuously on a daily basis over the construction period.

Audits: Audits will be necessary both during construction and project operation. While construction audits will aim to verify compliance to impact mitigation requirements, both construction and post-construction audits are a regulatory requirement as per Sections 46(6) and 54 of the National Environment (Environmental and Social Assessment) Regulations, 2020.

Since construction duration is estimated to be 1½ years, this ESMP has included a budget for **1½ year's** construction audit and a separate provision so that from year 2 to year 5 full environmental audits are done as per Uganda requirements.

Both construction and post-construction audits can be conducted internally (by NWSC/MWE) or by a consultant hired by NWSC/MWE. If undertaken by a hired consultant, a budget has been proposed for both in this ESMP.

Reporting: Concise monthly monitoring reports should be compiled by the Contractor. The report will highlight the different activities undertaken to manage environmental and social aspects of the project in line with contract specifications, laws, standards, policies, and plans of Uganda and World Bank Safeguard policies. The report will be discussed during the monthly progress meetings. The Supervising Engineer guided by the Environmentalist and Social Specialist will approve the Contractor's monthly environmental and social monitoring report that will then be transmitted to NWSC or MWE for final approval. NWSC's or MWE's Environmental Management and Social Specialist will also independently monitor the implementation of the ESMP and/or verify the accuracy and content of the Contractor's monitoring report and then report to the client. The report will also be shared with The World Bank and other relevant stakeholders. Strictly it will be the contractors compliance with the contract requirements (whether BoQ items or items considered part of other BoQ items) that will enable the Resident Engineer or Supervising Engineer to approve payment.

Construction- and post-construction phase auditing should culminate in reports that NWSC shall share with IDA, NEMA or other interested stakeholders. Construction phase audits and annual post-construction audits must be submitted to NEMA as a regulatory requirement as per Section 46(6) and 54 of the National Environment (Environmental and Social Assessment) Regulations, 2020.

8.2 CHANCE FINDINGS

Both the Contractor and NWSC/MWE should ensure that impacts on cultural heritage resources are minimized as far as possible. The Chance Findings Procedure (CFP) has been provided under Appendix E describing the approach and procedures to be undertaken by the Contractor with regard to protection of chance finds encountered during project implementation. The section below outline the required personnel and their responsibilities towards achieving the goals of the CFP.

8.2.1 Personnel and Responsibilities

iv) The contractor will have a *Senior Environmental Officer* (SEO) on the site during project construction. The contractor's SEO will be required to closely work with the developer's socio-environmental staff to ensure compliance with national and financier's requirements as well as implementation of this chance finds procedure.
v) During ground opening and excavations, the developer should facilitate an Archaeologist from the Department of Museums and Monuments in the Ministry of Tourism, Trade & Industry (MTTI) to be on site and ensure that any chance finds encountered are managed according to requirements of The Historical Monuments Act, 1967.
vi) All construction staff involved in earthworks should be trained in basis skills of recognising suspected chance finds and the procedure of notifying the SEO and Archeologist.

Specific roles of persons to be involved in implementation of this procedure are outlined below

a) Role of the contractor's Senior Environmental Officer

viii) Communicate contents and requirements of this plan to contractor
ix) Sensitise workers to ensure that all are aware of their responsibilities in regard to protection chance finds
x) Inform the Archaeologist of any chance finds encountered on site
xi) Coordinate inspection and monitoring by the MTTI Archaeologist. The SEO should keep in close contact with the archaeologist throughout the construction period
xii) Implement measures recommended by the archaeologist for management of "chance finds" encountered
xiii) Conduct cultural heritage tool box talks to construction personnel as advised by the Archaeologist
xiv) Maintain records (daily logs) related to archaeological finds during construction

b) Role of the MTTI archaeologist

An archaeologist contracted (on a non-permanent basis) from the department responsible for museums and monuments in MTTI will have the following roles:

xi) Archaeological monitoring of all earthworks;
xii) Advice/ guidance to the contractor with respect to halting construction activities if earthworks encounter chance finds;
xiii) Conducting preliminary assessment of all previously unidentified archaeological features encountered and submission of these to the National Museum;
xiv) Provision of advice on the significance and management of unidentified archaeological features encountered;
xv) Processing/ excavation of any unidentified subsurface archaeological features encountered in accordance with standard procedures recommended by the Department of Museums and Monuments;
xvi) Maintain watching briefs during opening up site or deep excavations at any location during construction, with clear procedures for protection and documentation of any "chance finds" encountered;
xvii) Maintain monitoring records of all unidentified archaeological features encountered;
xviii) Develop a set of points to be discussed in "Tool Box" sessions to create awareness among construction crews on "chance finds"/ archaeological features. Note that as part of their sensitization, workers will be required to cease work if they encounter archaeological features and report to Contractor's SEO, who will notify the Archaeologist; and
xix) Write a report for the developer upon completion of construction. This report will be submitted to the Supervising consultant, Contractor, Developer and Department of Museums and Monuments. The report will summarise findings of archaeological monitoring, describing any features encountered and their preservation significance.
xx) The archeologist will also undertake "Watching briefs" as the primary element of management and protection of cultural heritage during project construction. Watching briefs will consist of passive visual investigation during ground breaking at excavation sites. Details are provided in Appendix E.

c) Role of the Contractor

The contractor will be required to:

i) Heed advice from the Archaeologist in respect to halting earthworks when chance finds are encountered; and
ii) Provide cultural heritage tool box talks to construction crews as advised by the Archaeologist.

8.2.2 General Rule When Chance Finds are Encountered

Upon identification of suspected archaeological remains, the location must not be disturbed until it is inspected by the archaeologist from MTTI.

8.3 GRIEVANCE REDRESS MECHANISMS (GRMs)

This section describes avenues for affected persons to lodge a complaint or express a grievance against the project staff or contractors during project implementation. It also describes the procedures, roles and responsibilities for addressing grievances and resolving disputes. Every aggrieved person shall be able to trigger this mechanism to quickly resolve their complaints. The objectives of the grievance process are:

- Ensure that appropriate and mutually acceptable corrective actions are identified and implemented to address complaints;
- Verify that complainants are satisfied with outcomes of corrective actions;
- Avoid the need to resort to judicial proceedings.

The project will operate two major grievance redress mechanisms, namely:

- Worker's grievance redress mechanism, and
- Community grievance redress mechanism.

NB: I*n all cases, criminal matters shall be explicitly handled in accordance with the Criminal Code Act and other laws governing criminal issues in Uganda.*

8.3.1 Worker's Grievance Redress Mechanism

Employee grievances may include:

a) Undesirable working conditions in physical terms.
b) Changes without prior notice.
c) Poor employee relations.
d) Improper wage adjustments.
e) Dissatisfactory office policies in case of: Promotion, Demotion, Leaves, Overtime
f) Violation of laws.
g) Inadequate safety, health, and welfare amenities.
h) Labour-management hostility.
i) Incidences of workplace favouritism and nepotism, among others.

8.3.1.1 Workers' council:

The project construction works shall employ over 100 workers. For better organisation and management of workers' grievances, this substantial number shall necessitate the establishment of a Workers' Council. The workers' council shall consist of each category of workers organizing themselves and selecting male and female representatives. These categories will include:

a) Casual workers
b) Drivers, Operators and Turn men
c) Flag Personnel
d) Site Cooks & Cleaners
e) Technical
f) Consultant Site Sociologist

For effective confidence building and confidentiality, the Consultant Site Sociologist shall be the secretary to document and manage the grievance log, minutes, and writing workers' council reports. The other members will select a Chairperson and Vice Chairperson. The council shall meet at least once every week to ensure timely management of workers' issues.

Roles of Workers' Council: With management support from the contractor, Supervising consultant and NWSC/MWE, the workers' council shall play a significant role in proactive management of employer –employee relations, workers' welfare and grievances within the workplace. This council shall not interfere with either Management's authority or its obligation to manage their contracts but rather provides a formally recognized opportunity and avenue for their grievances to be lodged and managed and their rights to be heard and respected. Workers' Council shall:

i) Provide a forum for consultation, frank exchange of information, discussion and joint problem solving between management and employee representatives on issues pertaining to staff welfare, rights, discipline; any proposed changes dealing with policies, procedures and working conditions.
ii) Receive and report workers' complaints/grievances to management and negotiate for timely redress/ participate in arbitration of cases between workers and management through disciplinary hearings and / or between fellow workers through conflict resolution meetings
iii) Represent the interests of workers pertaining to their terms and conditions of employment, staff welfare, staff development and other matters of concern to the workers, and to negotiate with the contractor's management on their behalf accordingly.
iv) Educate Workers on their rights, discipline, code of conduct, spirit of staff unity across the project as well as on respect for cultural diversity pertaining to workers of different races, tribes, religion and other cultural differences
v) Regularly solicit for employees' suggestions/opinions to management through appropriate and organized channels such as their representatives, suggestion box, or joint meetings from time to time.
vi) Act as a point of contact between the employees and management; establish and maintain good relations, foster effective two-way communication and mutual understanding between workers on one hand, and with management on another.
vii) Identify and represent concerns of special interest groups on the project such as women, expectant and lactating mothers, workers with disability etc.

viii) Organize and conduct monthly Workers' GMC meetings to review and discuss staff welfare, discipline and related matters; compile and share in timely manner meeting minutes with the contractor, supervising consultant and NWSC/MWE pointing to key action areas requiring attention.
ix) Report any incident(s) of violation of workers' rights, staff indiscipline and related issues to management for redress
x) Keep adequate log of all matters that come before the Workers' GMC for better reference and effective management

NB: *Any appeals from the Workers' Council shall be referred to the Site Disciplinary committee*

8.3.1.2 Site disciplinary committee:

A *Site Disciplinary Committee* comprising of the following members will be established to manage appeals from workers' council:

- Consultant's Lead Sociologist (Chairperson)
- Contractor's Human Resource Officer (Secretary)
- Chairperson of Workers' Council

NB: *The committee may adopt any other member deemed important depending on the issue being resolved.*

The committee shall meet at least twice every month, during working hours based on a meeting schedule prior agreed with project Management (contractor and supervising consultant). A special meeting, if required, may be held at the call of the Chairperson at short notice in consultation with the project management. The site disciplinary committee shall ensure fairness and make recommendations to the Contract Manager on the appropriate course of action.

NB: *Any resulting appeal against recommendations from the Site Disciplinary committee shall be escalated to NWSC/MWE through the Resident engineer for overall guidance and more appropriate actions. NWSC/MWE may involve mandated offices including Labour Officers, Labour Unions, among others to conclude the emerging labour issues.*

8.3.1.3 Stages of handling workers' grievances;

Option 1: Informal discussion: If workers have a grievance or complaint regarding their work, they shall, wherever possible, raise their concern with a supervisor or manager as it may be possible to find a solution informally. This shall make it more likely that disputes can be resolved quickly, closer to the source of the problem, making it less likely that the issue escalates into an intractable problem. Nonetheless, the issue and response shall still be logged and tracked from the perspectives of checking outcomes and monitoring.

Option 2: Formal complaint: If the grievance is not resolved informally, the aggrieved shall proceed to resort to the formal grievance redress mechanisms, following the following steps;

Step 1: Lodging the compliant to workers' council

If the matter is serious and/or the worker wishes to raise the matter formally, the worker shall set out the

facts of the grievance in writing to the committee, with support and guidance from the section representative who then forwards the complaint to the secretary. The secretary then records the complaint in the log book and notifies the chairperson. Alternatively, the worker may raise complaint through suggestion boxes, phone calls, text messages or email to the secretary (Consultant's Site Sociologist).

Step 2: Assessment of compliant and investigation by workers' council within 5 days

On receipt of the complaint, the secretary shall make further investigations and in consultation with Chairperson shall schedule for a meeting (depending on the urgency of the complaint) to assess the complaint and determine the corrective action. The assessment shall also identify the key issues that have been raised, together with any root causes, and shall determine the outcome that the worker is looking for from the process. Any additional information shall be gathered to allow a full assessment. The appropriate form of investigation will depend on the type of complaint and the seriousness of the allegation. In general terms, the committee shall try to understand the key issues and interview the individuals involved in a complaint, e.g. those managing the workers, or those responsible for the activity or service that is raised in the grievance. The workers council shall conclude the issues or escalate the issues to the Disciplinary committee.

Concluded issues which require attention of management shall be communicated formally by the Secretary to Contract Manager for action with a copy to the Resident Engineer. The issues which require escalation shall be referred to the Secretary of the Site Disciplinary committee (Contractor's Human Resource Officer).

Step 3: Determination of corrective action by disciplinary committee within 7 days

A disciplinary committee shall then hold hearings, and invite both the offender and the offended. The disciplinary committee shall give fair hearing to anyone suspected as offender in order to make fair judgment guided by the Workers' Code of Conduct. On assessment of the complaint and judgement derived from hearings convened for complaints of disciplinary nature, the GMC will advise / recommend to the contractor's management in writing on the appropriate course of action to be taken against the suspected offender. The submission shall be made by the Chairperson to Contract Manager with a copy to the Resident Engineer.

Step 3: Feedback from the affected parties

The contractor or worker shall give feedback to the GRC on the implementation of the Committee recommendation and this shall be recorded in the log book.

Step 5: Appealing to NWSC/MWE against the verdict of the disciplinary committee

Any issues that require escalation beyond disciplinary committee shall be referred to NWSC/MWE. The issues shall be referred by the Resident Engineer and addressed to Permanent secretary of MWE or the Managing Director of NWSC with attention to the Social Development Specialist. Upon case receipt, the project management team shall review and handle the matter within 10 days. The team shall comprise at the minimum the following:

- Project Engineer (Chairperson)

- Social Development Specialist (Secretary)
- Environment Specialist
- Communication Specialist

In the event that the team finds a valid case, it would then revisit the process of investigation in consultation with the District Labour Office and/or any other relevant office/ agency. The steps of the worker's grievance management process are illustrated in Figure 8-1.

8.3.2 Community Grievance Redress Mechanism

During construction works, anticipated complaints are mainly of two categories; criminal and civil. Criminal grievances e.g. theft, Gender Based Violence and Violence against children shall be immediately referred to Uganda Police for statutory investigations and management in accordance with Uganda's legal system. Civil related grievances include complaints that require civil understanding and settlement. These shall be handled with guidance from the following:

8.3.2.1 Grievance management structure

The grievance management structure will be anchored to institutionalize the decentralized setting of the Local Government system. Hence committees shall be established at Sub County and District level to manage grievances. The key components of the grievance management structure will include the following:

- Complaints and grievances desk
- Grievances management committee at project site level, sub-counties/ town councils and district levels
- Appeals procedure
- Communication protocols and feedback

8.3.2.2 Common civil related grievances in construction projects

Considering the nature and extent of works, grievances may arise especially during the construction phase of the project and these include;

a) Land requirements especially where a realignment is sought, alternative access where a road has been closed due to ongoing works like on a swamp or river crossing, workers camp and material storage areas
b) Clearance of right of way which may affect crops and trees
c) Temporary displacement of road side activities in urban centres, including vendors
d) Complaints related to noise, dust, and traffic incidents
e) Complaints on workers behaviour or conduct specially towards women, girl and boy children
f) Illicit behaviours like alcoholism, smoking, drug abuse etc. of the contractor's workers
g) Disruption of social set up and security
h) Disputes on compensation values
i) Increased pressure on social services and infrastructure, including water supply
j) Contractor failure to pay workers and suppliers
k) Accidents arising out of contractor's negligence to provide necessary information, protective gears and supervision

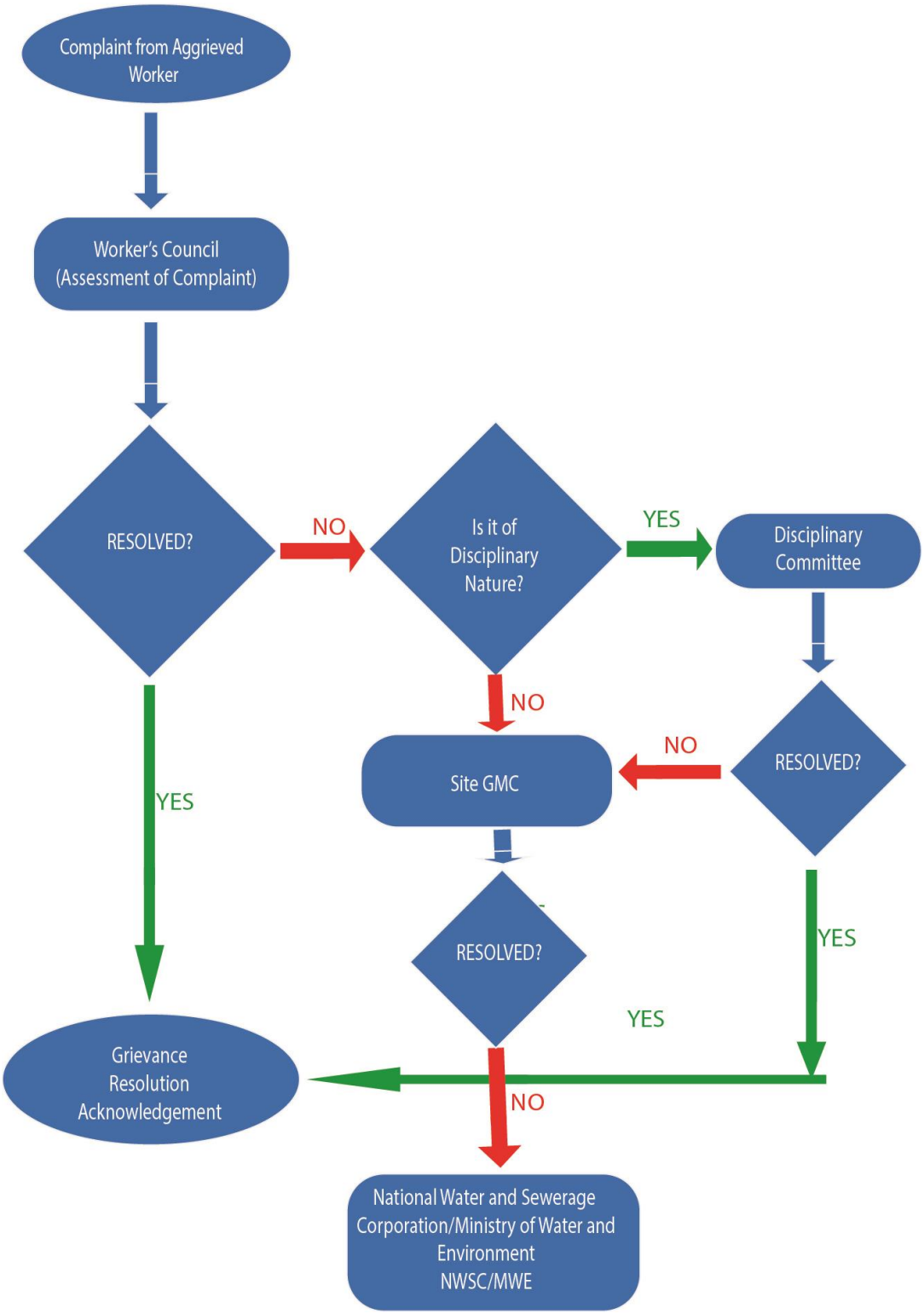


Figure 8-1 Workers' grievance management process flow chart

8.3.2.3 Complaints and grievances desk

This will be the secretariat for grievances management hosted within the GRC at project site level, Contractor's Sociologist for Site GRC, CDO for Subcounties/ Town Councils GRC, District CDO for District GRC and Social Development Specialist for NWSC/MWE GRC. This will be dedicated office assigned the responsibility of receiving, registering, and screening, assessing and following up complaints and grievances to their conclusion. Specific capacity building will be delivered by the NWSC/MWE to these secretariats to ensure that they perform their roles effectively.

8.3.2.4 The Grievance Management Committees for community grievances (GMC)

Dedicated Grievance Committees will be established to manage grievances during project implementation. The committees will be set up in a manner that brings political leadership and technical teams so that any resultant agreements are politically acceptable and technically compliant. The grievances management committees shall be formed at water user committee level, project site level, Subcounties/ Town Councils, District and NWSC/MWE level.

Committee 1: Water user committee - to handle within 3 days upon receipt of Grievance

The water user committees shall be the first step for community grievance management. The committees shall include at least 11 members including Chairperson, Vice Chairperson, Secretary, other Members (7) including a youth, Elderly Person, PWD and at least 3 members should be female. Quorum sitting shall be of at least five (5 members). The LC I Chairpersons and Vice Chairpersons will be ex-officials to these committees. Any grievances that are not resolved at this level shall be escalated to the project site level.

Committee 2: Site GMC for Community Grievances with 5 days upon receipt of Grievance

The GMC at site level shall include the following:

- Resident Engineer- Chair Person
- Site Engineer
- Contractor's Sociologist
- Contractor's Health and Safety Officer
- Consultant's Site Sociologist- Secretary
- Consultant's Site Environmentalist

For timely management of community level complaints, the Contractors shall have a grievance desk at the site. Under the supervision of the consultant Site Sociologist, the contractor shall make immediate responses to matters related to the road construction, contractor's workers, agents, sub-contractors or suppliers. Unresolved matters by the contractors shall be escalated or referred to the Subcounty/ Town Council level.

Committee 3: GMC at Subcounties/ Town Councils Level - to handle with 5 days upon receipt of Grievance

The Subcounties/ Town Councils grievance management committee shall include the following members:

- LC III Chairperson/ Mayor (Chairperson)
- SAS/ Town clerk
- Subcounty Water Officer
- Subcounty Health Assistant
- Community Development Officer (Secretary)
- Parish Chief where the grievances originated
- Representative of the PAPs

Committee 4: GMC at District Level- to handle with 5 days upon receipt of Grievance

At the District Level, the Grievances Management Committee shall consist of:

- LC V Chairperson (Chairman)
- Chief Administrative Officer
- District Water Officer
- District Health Inspector
- District Community Development Officer (Secretary)
- Representative from the PAPs
- District Lands officer
- Any other Officer that the CAO deems fit to fast track the grievance redress process.

Committee 5: GMC at Ministry/ NWSC Level to handle with 3 days upon receipt of Grievance

At Ministry of Water and Environment/ National Water and Sewerage Corporation the Permanent Secretary/ Managing Director shall take administrative charge of all referred complaints/grievances. The Social Development Specialist shall be the focal person for grievance handling at the Ministry.

8.3.2.5 Capacity Building for the Grievances Management Committees

The NWSC/MWE shall orient and train the committees in their responsibilities. In the execution of their responsibilities, the respective committees will seek support and advice from any other relevant official (s) from time to time depending on the matter being handled.

8.3.2.6 Appeals Procedure

At each committee level where the complainant is dissatisfied with the outcome of the negotiation or implementation of agreed upon actions, he/she shall be advised to lodge an appeal to be handled at a higher level within 14 days. This procedure shall be followed until all resolution levels.

8.3.2.7 Process of handling community grievances

Step 1: Receipt of complaint

The grievance management committees at all levels will have one person to act as the grievance officer. A verbal or written complaint from a complainant will be received by the grievance officer and recorded in a grievance log that is kept in the community at each Grievance management level. Complaints can be submitted at any time, either directly or through a grievance handling committee member. Some can also be submitted by word of mouth or through telephone, SMS or emails.

At water user committee level, which is the first level of community grievance management, the

secretary shall register the complaint, screen it and handle it if possible or;

i) Refer to the grievance management committee for further investigations, or
ii) Refer to police if the grievance is of criminal nature for example assaults, rapes, defilements, theft etc. If the aggrieved party is satisfied, the matter shall be closed and signed off with them in the complaints log book.

This committee shall sit at least every two weeks to investigate and conduct hearings, outcomes of which will be given to the complainant within 24hrs. If the complainant agrees and is satisfied with the decision taken, the matter shall be closed and signed off in the complaints log book. If the party is not satisfied, the matter shall be referred to the site committee in Step 2.

Step 2: Escalation of Grievances to Construction Site Grievance management committee

The site GMC shall receive and register the grievances by the Contractor's Sociologist. The Consultant Site Sociologist will then review the register and recommend to the Chairperson the schedule for GMC meeting. The affected person (s) shall be involved in GMC hearings so that conclusive solutions are arrived at. Once completed, the affected person shall sign in the grievance register if satisfied and if not satisfied with outcome, he/ she or the Site committee will escalate to Subcounties/ Town Councils within 7 days.

NB: At the Site level, the Resident Engineer shall update NWSC/MWE on grievances management and emerging issues which might require immediate or explicit action or support from NWSC/MWE to expedite project implementation.

Step 3: Escalation of Grievances to Subcounties/ Town Councils Grievance management committee

The Subcounties/ Town Councils shall have a grievance management desk. The Community Development Officer shall be the Grievance officer responsible for recording all grievances at this level. Member of the committee shall include; the L.C III Chairperson, SAS, CDO and any other person deemed relevant by the L.C III Chairperson. Where the Subcounty receives grievances directly from the community, the issues will be referred to Construction site for action. If necessary, the complainant and LC1 chairperson of their village shall be invited to attend the hearing.

If the complainant is satisfied with the decision at this level, he/she shall be informed of the outcome within 24hrs and the matter shall be closed off and signed in the grievance log book. If the complainant is not satisfied, the matter shall be referred to the District Grievance management committee.

NB: At the Subcounty *level, the SAS shall update NWSC/MWE on grievances management and emerging issues which might require immediate or explicit action or support from NWSC/MWE to expedite project implementation.*

Step 4: Escalation of Grievances to District Grievance management committee

In the event that a complainant is not satisfied with the decision made by the Subcounties/ Town Councils committee or the committee fails to resolve it, it shall be referred to the District Grievance

management committee. This committee shall be chaired by the LCV Chairperson and members will include the CAO, RDC, District Land officer, District Community Development Officer, District Water Officer/ Project focal person and any other persons deemed relevant by the chairperson. At district level, the District Community Development Officer shall be responsible for receiving and recording the grievance in the log book. On receipt, he will screen the grievance and handle it if possible. If not, he will notify the committee chairperson who shall convene a meeting/ hearing within one week, the outcome of which shall be communicated to the aggrieved person within 24hrs.
If the complainant is satisfied with the outcome, the matter shall be signed off in the log book. If the aggrieved is not satisfied, the matter shall be referred to the Ministry of Water and Environment/ National Water and Sewerage Corporation as step 4.

NB: At the District level, the CAO shall update NWSC/MWE on grievances management and emerging issues which might require immediate or explicit action or support from NWSC/MWE to expedite project implementation

Step 5: Escalation of Grievances to NWSC/MWE Grievances Management Committee

At the Ministry of Water and Environment/ NWSC, referrals shall be registered in a complaint log book by the Social Development Specialist. Within 2 weeks, the NWSC/MWE committee shall investigate and if necessary, conduct site visits and conclude the issue.

If the complainant is satisfied with the decision, the matter shall be signed off in the complaints log book with consent of the complainant. The Ministry shall, in form of reports, also report to the World Bank on the complaints handled and the outcomes of the same.

In the event that the matter has not been solved at this level, NWSC/MWE may advise the complainant to seek further justice from alternative offices like courts of law or any other Government agencies.

The steps of the grievance management process are illustrated in Figure 8-2.

8.3.3 The World Bank's Grievance Redress Service (GRS)

The WB GRS provides an avenue for individuals and communities to submit complains directly to the W orld Bank if on their opinion a World Bank financed project has or is likely to cause harm to communitie s and the environment which in turn may have adverse effects to them or the community. The GRS see ks to ensure that grievances are promptly reviewed and responded to, and problems and solutions iden tified by working together.

The GRS acknowledges the project-level grievance mechanisms as the primary tools for raising and ad dressing project-related grievances. The GRS helps to resolve issues that cannot be resolved at the pro ject level or where there is no project-level grievance mechanism.

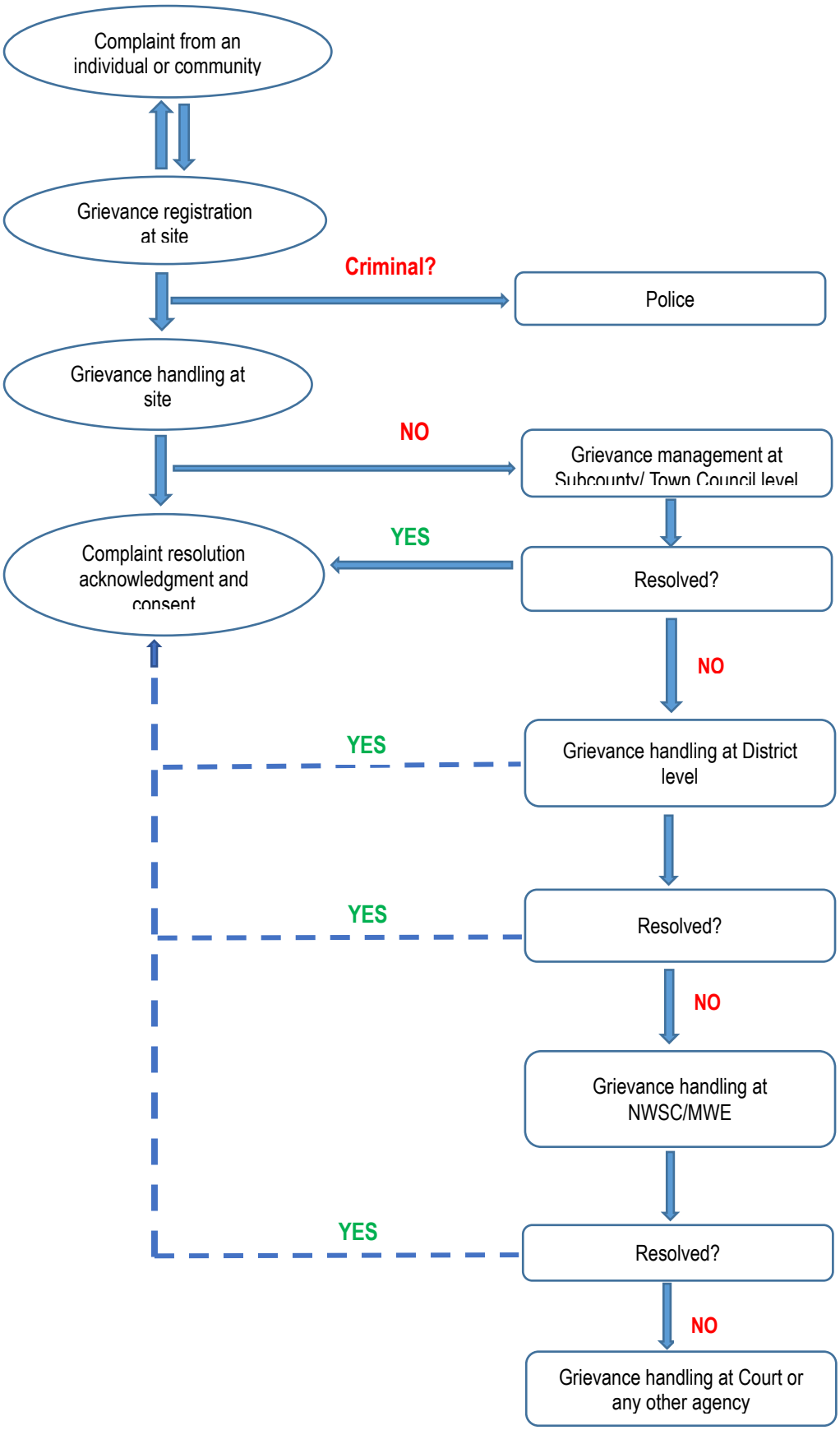


Figure 8-2 Community grievance management process flow chart

How to submit a complaint: The GRS accepts complaints in English or in the language of the complainants. The channels for submission include the following:

i) The World Bank – Uganda Country Office
Rwenzori House, 1 Lumumba Avenue,
P.O. Box 4463, Kampala, Uganda
+256 414 230 094
Email: ugandaalert@worldbank.org
ii) Complainants may use the form on the GRS website available at www.worldbank.org/grs
iii) Submissions to the GRS may also be sent by: Email: grievances@worldbank.org
Instructions to submit procurement related complaints can be found on the GRS website.
iv) Letter can be sent to:
The World Bank Grievance Redress Service (GRS)
MSN MC 10-1018 1818 H St. NW
Washington, DC 20433, USA

Complaints should:

- Include the names of complainant(s) (or their representatives) and state if confidentiality is requested;
- Identify the project that is the subject of the complaint
- Describe the harm complainants believe is caused or may be caused by the project

A copy of the grievance register is provided below.

Copy of a grievance register

(A2 Book Hardcover Bound 20 pages/ Committee)

MINISTRY OF WATER AND ENVIRONMENT/ NWSC

IWMDP Project

Complaints and Grievances Register

Subcounty/ Town Council ……..……District……..……

S/N	Date received	Name of complainant	Zone and Parish	Contacts	Complaint Description	Compliant Category[1]	Solution Sought	Action Taken	Closure Date	Referral Date	Comments on status of complaints	Complainant satisfied	Sign of complainant

Note: The complaints and grievances register should be able to provide the stakeholders with a record of the type of grievances and any trends, effectiveness of resolution strategies, and risk mitigation measure implemented in the Complaints and Grievances framework.

[1] L= Land, H= Health and Safety, E= Employment, C= Cultural, LL= Loss of Livelihood, EV= Environment, GBV=Gender Based Violence, VAC= Violence Against Children, SH= Sexual Harassment/ Defilement, T= Theft

Table 8-1: Environmental & social monitoring & management plan

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (Uganda Shillings)
7.2 POSITIVE IMPACTS							
7.2.1 Income to material/ equipment suppliers and contractors	a) Project will promote local procurement where technically or commercially reasonable and feasible.	Local communities and businesses benefit from procurement process	Number of local businesses benefiting from construction related procurement	Before and during commencement of construction	Contractor	NWSC/ District Local Governments of Project Area.	
	b) For earth materials, procurement will be made from legitimate sources to avoid encouraging environmental degradation	Project's material demand does not encourage environmental degradation	All quarries from which materials (sand, stone) are obtained are licensed by the local authorities	Before and during construction	Contractor	NWSC/MWE/ District Local Governments of Project Area	
7.2.2 Employment	a) Information to create awareness about the proposed project activities will be provided to the project-affected communities.	The participation of local community members in all project activities.	Local community awareness of project progress status	Before and during construction	Contractor in association with NWSC	NWSC/MWE/ District Local Governments of Project Area	10,000,000
	b) Unskilled labour will be recruited exclusively from local community, and semi-skilled labour will be recruited preferentially from such communities, provided that they have the requisite qualification, competence and desired	Maximisation of participation of local community members during site preparation and construction	Number of local people (unskilled and semi-skilled) employed during construction phase	Before and during construction	Contractor	NWSC/ District Local Governments of Project Area	

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (Uganda Shillings)
	experience.	activities.					
	c) Contractors will be encouraged to pay a "living wage" to all workers.	Some level of improved livelihood of the local community	Record of contractors' employment activities on a monthly basis, including number of jobs created by employment type (skilled / semi-skilled / unskilled); number of jobs by gender, employment type and geographical area; total man hours and wages paid, by employment type, gender and geographical area; and rate of employee turnover by gender and area.	Before and during construction	Contractor	NWSC/ District Local Governments of Project Area	
	d) A training programme for artisans (builders, carpenters, plumbers) in the project area could be facilitated by the project to ensure skills transfer during the construction period.	Skills transfer to the community members hence empowering them to become job creators.	Number of local people trained during construction phase	Before and during construction	NWSC/MWE/ Contractor	NWSC/MWE/ District Local Governments of Project Area	20,000,000
	e) Contractor will develop and implement Labour Influx Management Plan, Workers Camp Management Plan and Code of Conduct. An example of the code of conduct for contractors and sub-contractors is provided in Appendix H.	Workers and community members live in harmony.	Number of cases reported	Throughout construction	Contractor	NWSC/MWE/ District Local Governments of Project Area	
7.2.3 Infrastructure	The communities along the road will further be sensitized and encouraged to be	Support infrastructure put	No complaints	Prior to commencement of	NWSC/ District Local	NWSC/MWE/ District Local	

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improvement	cooperative when this kind of infrastructure, for example, electric poles are being put in place.	in place without any hindrance		construction	Governments of Project Area	Governments of Project Area	
7.2.4 Improved health status of households and communities.	Educate users on the proper use, regular cleaning and effective maintenance of both the household and public facilities.	Improved health status of households	Clinical records of reported cases. Reduced incidences of illness at household level.		NWSC/ District Local Governments of Project Area	NWSC/MWE/ District Local Governments of Project Area	
	Water quality monitoring at supply points will be monitored to ensure that water supplied to communities meets portable water standards.	Safe water supplied to communities	Drinking water quality monitoring data	Monthly throughout the operation	NWSC/ DWD	District Local Governments of Project Area specifically the District Health Inspectors	
7.2.5 Educational Enrolment and Attendance	Encourage parents to take their children of enrolment age to school	Improved enrolment and attendance at all levels	Record of candidates at all institutional/ educational levels		NWSC/ District Local Governments of Project Area	NWSC/MWE/ District Local Governments of Project Area	
7.2.6 Acquisition of New Skills	Where the required skills are available locally, the local people should be given first priority commensurate to their level of training.	Improved capacity to handle assignment or repairs in the Project areas.	Number of local people employed for skilled jobs	Before commissioning of facilities	NWSC/ District Local Governments of Project Area	NWSC/MWE/ District Local Governments of Project Area	
7.2.7 Improvement in Household Economic Status	Water tariffs will be set taking into consideration the different levels of users. The users should also be educated to avoid wasteful use of the resources	Time saved for other income generating activities	Number of new connections; public majority comfortable water tariffs.	Regularly as need arises	NWSC/ District Local Governments of Project Area	NWSC/MWE/ District Local Governments of Project Area	

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7.2.8 Saving in the Cost of Medical Treatment	Educate users on the proper use, regular cleaning and effective maintenance of both the household and public facilities	Savings made for investment or other household requirements	Household investments/ activities arising from improved water supply	Regularly as need arises – community outreach activities	NWSC/ District Local Governments of Project Area	NWSC/MWE/ District Local Governments of Project Area	18,000,000
7.3 NEGATIVE IMPACTS							
7.3.1 Degradation of Land and Soil Erosion	a) The topsoil removed from the site during site preparation will be stored properly (away from runoff and possible contaminants) for reuse else.	No topsoil is washed away into the environment and is readily available for backfilling	Presence of well banded storage areas for topsoil to be re-used	Throughout construction	Contractor	NWSC/MWE/ District Local Governments of Project Area	
	b) All waste generated during site preparation and construction will be transported to an authorized disposal area. The contractor will seek guidance from Mbale City and the Respective District Local Governments in project area on the final disposal point.	All waste collected and disposed of properly	No complaint from communities around the site and road of poor management of waste. No litter at project site and complaints from authorities	Throughout construction	Contractor	NWSC/MWE/ District Local Governments of Project Area	50,000,000
	c) Use of old equipment or even damaged equipment that is most likely to have oil leakages thus contaminate soils will be avoided.	No soils or land are contaminated, by for example, oil and fuel spills, as a result of project activities	Soil quality data	Maintenance of equipment throughout construction	Contractor	NWSC/MWE/ District Local Governments of Project Area	
	d) A waste management plan will be developed prior to start of construction activities.	Waste management plan developed	No complaint of poor management of waste from communities around the site and road. No litter at project site and complaints from	Before construction	Contractor	NWSC/MWE/ District Local Governments of Project Area	

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			authorities				
	e) Construction equipment will be properly maintained and fully functional to avoid leakages.	Equipment functioning properly	Records of maintenance/ soil quality data	Throughout construction	Contractor	NWSC/MWE/ District Local Governments of Project Area	
	f) Sewers will be made watertight during maintenance to avoid intrusion of storm water into the network and cut-off drains provided to WSPs. Storm water will be guided away from all sanitary facilities using cut-off drains around them.	No contamination of Land or soil erosion by wastewater from the sewers.	No complaints from the communities and authorities of sewage leakages	Throughout operation	NWSC	NEMA/District Local Governments of Project Area	
	g) The staff of the WSP will be trained for proper management of screenings, sludge, etc., to avoid soil contamination.	Skills enhancement of Staff at WSP	Number of staff trained /Training records	Annually throughout operation	NWSC/MWE/ District Local Governments of Project Area	NWSC/MWE/ District Local Governments of Project Area	10,000,000
	h) Monthly tests will be done to assure the quality of effluent and treated sludge, to avoid partially treated wastewater and sludge from reaching the soils	No soils or land are contaminated as a result of project activities	Effluent quality data and sludge cake quality records	Monitoring activities throughout operation	NWSC/ District Local Governments of Project Area	NEMA/NWSC/MWE/ District Local Governments of Project Area	30,000,000 annually
	i) During construction, soil erosion will be controlled by placing crushed stone, sandbags and other similar materials in areas prone to runoff or that are heavily used where vegetation is hard to establish and maintain.	No soil is washed away	No sediment transport to water courses and property	Throughout construction	Contractor	NEMA/NWSC/MWE/ District Local Governments of Project Area	20,000,000
7.3.2 Pollution of water resources	a) All construction equipment will be kept in good operating condition to avoid oil or fuel leakages that might contaminate water resources	No oil and/ or fuel leakage in water courses	Water quality data	Throughout construction	Contractor	NEMA/NWSC/MWE/ District Local Governments of Project Area	

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	b) Fuel handling and oil spill measures will be implemented to prevent, control and address spill or leaks.	No oil and/ or fuel leakage in water courses	Water quality data	Monitoring throughout construction	Contractor	NEMA/NWSC/MWE/ District Local Governments of Project Area	12,000,000
	c) At Nabunyere (STP site), the concrete mixing will not be done on site to avoid polluting the nearby swamp with excess washwater.	No swamp pollution with cement/concrete wash water	Water quality data	Throughout construction	Contractor	NEMA/NWSC/MWE/ District Local Governments of Project Area	
	d) Laying of water pipelines and sewer lines will mainly be done during the dry season to avoid sediment transport to the nearby land, water courses and roads;	No sediment transported to the nearby river courses	Water quality data	Throughout construction	Contractor	NEMA/NWSC/ District Local Governments of Project Area	
	e) The leakages from sewers, sludge drying beds and WSPs will be minimized by regular monitoring and maintenance of the network; connections between sewers will be made water-tight to prevent leakages of wastewater to groundwater; and frequent effluent quality monitored to avoid release of poorly treated effluents into the River.	No leakages into water courses and Groundwater	Water quality data and No complaints from communities around project sites	Throughout Operation	NWSC	NEMA/NWSC/ District Local Governments of Project Area	
	f) Monthly quality tests for effluent and receiving water resources will be done to ensure that the quality of effluent meets the national discharge standards or requirements;	Compliant effluent standards being discharged into receiving water courses	Water quality data and No complaints from communities around project sites	Throughout Operation	NWSC	NEMA/NWSC/ District Local Governments of Project Area	Covered under 7.3.1 h
	g) A maintenance crew will be put in place to monitor and repair the network	Timely repairs made on the	Monitoring and repair records from maintenance crew.	Throughout Operation	NWSC	NWSC/ District Local	10,000,000 for

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	immediately a damage or leakage occurs to avoid accidental surface runoff intrusion to groundwater from the sewage network. Intrusion of storm water into the network and ponds can overburden facilities and cause discharge of partially treated wastewater into the water resources/ environment.	network to avoid further leakages				Governments of Project Area	monitoring activities
	h) Water abstraction permits shall be acquired by the Contractor and NWSC/DWD	Regulated water abstraction and protection of its quality	Availability of permit	Before construction for the Contractor and operation by NWSC/DWD	Contractor NWSC/DWD	MWE	
7.3.3 Generation of noise	a) Care will be exercised when selecting working equipment to avoid use of old equipment or damaged equipment with high level of noise emissions that would have a negative impact in the environment.	Construction activities generate permissible levels of noise.	No complaints from the communities and authorities/ record of noise levels	Before and during construction	Contractor	NWSC	
	b) Construction equipment will be properly maintained and fully functional.	Construction activities generate permissible levels of noise.	Record of noise levels/ no complaints from the communities and authorities/	Before and during construction	Contractor	NWSC	
	c) All generators and heavy duty equipment will be insulated or placed in enclosures to minimize disrupting ambient noise levels.	No excessive noise reaching neighbouring communities	No complaints from the communities and authorities/ record of noise levels	Before construction begins	Contractor	NWSC	
	d) Construction workers will be made aware of the silent nature of workplaces they are	No excessive noise from the site	Record of noise measurements	Throughout construction	Contractor	NWSC	

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	operating in and advised to limit verbal noise or other forms of noise. For example, metallic objects or tools can be passed on to a colleague rather than dropping or throwing them with loud bangs.						
	e) Noise levels emanating from machinery, vehicles and noisy construction activities will kept at a minimum (within the national noise level limits) for the safety, health and protection of people in the nearby buildings.	Construction activities generate permissible levels of noise.	Record of noise measurements	Throughout construction	Contractor	NWSC/ District Local Governments of Project Area	
	f) During periods of inactivity, equipment will be switched off whenever possible. A limited number of construction activities may have to continue on a 24-hour basis. These include horizontal direction drilling, pipeline cleaning and hydrostatic pressure testing which are relatively low noise activities. Consultation will be undertaken with the relevant authorities in advance of any such operations. Where appropriate, residents living near to the pipeline construction activities will be kept informed of the contractors proposed working schedule (through implementation of the Community Liaison Management Plan) and will be advised of the times and duration of any abnormally	No vehicle engines running unnecessarily	Record of noise measurements	Throughout construction	Contractor	NWSC/ District Local Governments of Project Area	

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	noisy activity likely to cause concern						
	g) No construction activities will take place at night for sites where the closest residence is within less than 150 m from the project site.	No excessive noise from equipment during night time	No complaints from communities about night time construction activities	Throughout construction	Contractor	NWSC	
7.3.4 Improper Handling of AC Pipes and Accessories	a) NWSC should ensure that the hired contractor demonstrates having experience and capability to observe international good practice standards with asbestos, including training of workers and supervisors, possession of (or means of access to) adequate equipment and supplies for the scope of envisioned works, and a record of compliance with regulations on previous work. The Contractor will be required to prepare a Hazardous Waste Management Plan.	Experienced contractor or sub-contractor hired to ensure that AC pipe wastes are handled well. Hazardous collected and disposed as per waste management plan	Qualification and experience profile of the contractor or sub-contractor; Hazardous Waste Management Plan	Before commencement of construction activities	Contractor	NWSC	
	b) The contractor shall follow NWSC procedures (Appendix I) for handling waste AC materials	Hazardous wastes handled properly and o workers and the public are exposed to Asbestos dust	Procedure followed on site in handling the hazardous waste, records of inspection and waste disposal	During construction	Contractor	NWSC/ NEMA	
	c) Decommissioned AC pipes and accessories will be managed through a third party contractor certified by NEMA.	Hazardous wastes handled properly	Records of waste disposal; Proof of waste delivery and safe disposal	Throughout construction	Contractor	NWSC/ Mbale District Local Government (MDLG)/ Mbale	

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						City Council (MMC)	
	d) The selected contractor shall provide adequate protection to his personnel handling asbestos, including respirators and disposable clothing.	No workers and the public are exposed to Asbestos dust	Presence and use of PPE on site	Through out handling activities for AC pipes	Contractor	NWSC/ MDLG/ MMC	
	e) Disposal of AC pipes shall be carried out in a way that minimizes worker and community asbestos exposure. AC pipes and other related asbestos containing material shall be packaged, labelled, transported, stored and disposed of at approved sites for disposal of hazardous waste, for example, Luweero Industries Limited in Nakasongola District or EnviroServe waste handling facility in Hoima District. Proof of delivery and safe disposal of waste will be provided and records maintained at all times.	No asbestos dust exposure	Records of waste disposal; Proof of waste delivery and safe disposal	Through out handling activities for AC pipes	Contractor	NWSC/ MDLG/ MMC	
	f) Before transportation, the properly sealed, labeled and secured AC pipes are kept inside a locked fenced area to prevent access by unauthorized personnel, and covered to prevent water accumulation.	Safe storage before transportation	Presence and condition of the storage facility	Throughout construction	Contractor/NWSC	MDLG/ MMC/ NEMA	250,000,000*
7.3.5 Improper management of waste	a) The Contractor will be required to prepare a Waste Management Plan.	Waste Management Plan in place.	Record/ Evidence of Waste management Plan being used by Contractor	Throughout construction	Contractor	NWSC/ District Local Governments of Project Area	

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (Uganda Shillings)
	b) Contractors will undertake waste segregation onsite to separate hazardous waste from non-hazardous waste	Hazardous waste separated from non-hazardous waste on site and each waste stream disposed of according to NEMA requirements in designated sites.	Separate containers for hazardous waste and non-hazardous waste on site	Throughout construction	Contractor	NEMA/NWSC/ District Local Governments of Project Area	10,000,000
	c) The contractor, MWE and NWSC Area Management will work hand in hand with Mbale City Council and respective Local governments to facilitate sound waste handling and disposal from the site. All wastes must be taken to the approved dumpsites. AC pipe waste will handled separately from other hazardous wastes	Amount of waste disposed/ minimized by reuse, wherever feasible	Record of waste types and estimated quantity disposed/ diverted for reuse	Throughout construction	Contractor	NEMA/NWSC/ District Local Governments of Project Area	45,000,000
	d) The contractor will hire and improve on existing sanitary facilities in the vicinity of the project area or provide his own facilities (e.g. mobile toilets) which should be adequate at construction sites.	No human waste disposed of at construction sites	Presence of mobile toilets at construction sites/ sanitary hire agreements	Throughout construction	Contractor	NEMA/NWSC/ District Local Governments of Project Area	
	e) NWSC/MWE together with the respective District Local Governments at the growth centres will ensure that the solid waste is collected by a firm licensed by NEMA and that the collected	Safe handling and disposal of solid waste by NEMA registered firm.	NEMA registration certificate of approved firm.	Throughout Operation	NWSC/ District Local Governments of Project Area	NEMA/NWSC/ District Local Governments of Project Area	

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	waste is disposed of at dumpsite or landfill approved by NEMA						
7.3.6 Air pollution	a) A maintenance programme for equipment and vehicles will be implemented, to ensure air emissions like particulates, SO2 and NO2 are minimised.	Emissions from vehicles complying with national standards.	No complaints of excessive fumes. No excessive emissions released to the atmosphere as a result of faulty equipment. Strict maintenance program	During construction	Contractor	NWSC/ District Local Governments of Project Area	
	b) Travel speeds of construction vehicles along the road especially at trading/ business centres will be controlled using humps and setting travel speeds not exceeding 40km/h	Humps and speed limit signage put in place in the appropriate areas	Number of accidents and/ or complaints reported/ Journey management records	During construction	Contractor	NWSC	
	c) Trucks will be covered during haulage of construction materials to reduce on spillage of materials	No spillage of materials along the transportation routes	Recognition of locales of contractor's efforts to minimise dust nuisance.	During construction	Contractor	NWSC/ District Local Governments of Project Area	
	d) Wherever dust suppression is necessary, water will be sprayed over dusty areas	No excessive dust	Air quality data/ Environmental monitoring report	Monthly throughout construction	Contractor	NWSC/ District Local Governments of Project Area	
	e) Construction work will be undertaken by an experienced and duly registered contractor with a verifiable sense of environmental awareness and responsibility	Employment of best Construction practices to minimise adverse impacts	Record of environmental responsiveness of the contractor/ Environmental Management Plan	During construction	Contractor	NWSC/ District Local Governments of Project Area	
	f) Workers will be provided with PPE and	Workers are not	No complaints of excessive	During	Contractor	NWSC/ District	

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	the use of PPE shall be enforced	exposed to elevated air pollution levels	fumes	construction		Local Governments of Project Area	
	g) NWSC will develop an Operations and Maintenance Manual for the Sewage Treatment Plan to guide staff on how to effectively run the WSPs;	Effective performance of WSPs run by knowledgeable operators	Record of operation procedures undertaken by staff	Throughout Operation	NWSC	NWSC/ District Local Governments of Project Area	
	h) Facultative ponds will be commissioned before anaerobic ponds to avoid odour nuisance when anaerobic pond effluent discharges into an empty facultative pond;	Controlled Odour from the Facultative pond	No complaints from communities near the WSPs	Throughout Operation	NWSC	NWSC/ District Local Governments of Project Area	
	i) NWSC/MWE will ensure adequate operation and management of both the existing and the new facilities to avoid bad odours that would arise from improper management of the facilities;	No odours from project facilities	No complaints from communities near the WSPs	Throughout Operation	NWSC	NWSC/ District Local Governments of Project Area	
7.3.7 Occupational health and safety (OHS) Risks	a) All construction workers will be oriented on safe work practices and guidelines and ensure that they adhere to them	Workers show a good understanding of and adhere to safe work practices	Records of workers' orientation	At the beginning of construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	b) Training will be conducted on how to prevent and manage incidences. This should involve proper handling of electricity, water etc. and sensitization on various modes of escape, conduct and	Up-to-date awareness of OHS requirements and preparedness by	Records of training and details of staff trained	At the beginning of and during construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (Uganda Shillings)
	responsibility during such incidences. All must fully be aware and mentally prepared for potential emergency	all workers to combat possible incidences					
	c) Regular drills should constantly follow on various possible incidences. This will test the response of the involved stakeholders.	Workers are alert and responsive in case of incidences. Public and other staff safety	Record of drills	Throughout construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	d) Use signage to warn staff and/ or visitors that are not involved in construction activities of dangerous places.	Public and workers' safety	Presence of signage	During construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	e) Strict instructions should be given for operators and drivers of equipment and vehicles	No risk of accidents on construction workers	Documentation of instructions	Throughout construction	Contractor	Traffic Officers, NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	f) Supervision of works should be done regularly to ensure that safety conditions are met while any deviation from safety regulations is immediately reclaimed following the best practices regarding safety at work equipment.	Public and workers' safety	Supervision record	During construction	NWSC/MWE & Supervision Consultant	MGLSD/ NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	g) Communication line must be ensured between workers and operators/drivers of equipment and vehicles.	Public and workers' safety; No injuries arise	Presence of radio calls/Megaphones being utilised	During construction		Traffic Officers, NWSC/ District Local	

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		from miscommunication				Governments of Project Area – SEO's, CDO's	
	h) Develop evacuation procedures to handle emergency situations.	Reduced health and safety risks to construction workers	Presence of a documented evacuation procedure	During construction	Contractor	MGLSD/ NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	i) Provide adequate OHS personnel protective gear for the employees.	All personnel have adequate PPE	Record of PPE provided and staff; use of PPE on site	During construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	Covered in 7.3.5 (f)
7.3.8 Risk of accidents	a) Best transport safety practices (Journey Management Plans) will be adopted with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public.	No road accident caused by project traffic	Record of traffic related accidents in each month of construction duration	During construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	b) All workers, including sub-contractors and casual labourers, will undergo an environmental, health and safety induction before commencing work on site. This will include a full briefing on site safety and rules.	Workers aware of environmental, health and safety requirements	Record of induction; interviewing a sample of workers on environmental, health and safety issues	Before construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	c) The affected communities will be informed of the timing and duration of the construction activities across access roads and any uncertainties or potential for change.	Safety of the public and workers	Activity schedule and evidence of communication to the would-be affected communities	Before and during construction	Contractor/ NWSC	NWSC/ District Local Governments of Project Area – SEO's, CDO's	

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	d) There will be restrictions on hours of driving (including night time restrictions where sensitive receptors may be affected) and timing of vehicle movements to avoid busy periods in urban areas, particularly the start and end of school and the working day	Safety of the public and workers	Activity schedule and journey management plans	During construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	e) No drivers or personnel under the influence of alcohol or any drug abuse will be allowed onsite	Public safety	Presence of a sound fence all around the site	During construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	f) The site, where possible, will be fenced and signalization put in place with security personnel to stop unauthorised people from accessing the site.	Public safety	Presence of a sound fence all around the site	During construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
7.3.9 Pressure on existing resources	a) Separate storage for water to use at the construction sites will be provided. Instead of connecting to the nearby/ communal water points, water bowsers will be adopted for water supply.	Uninterrupted water supplies to the communities	Presence of water bowsers/ storage tanks; water abstraction permit	Throughout construction	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	
	b) The NWSC/MWE, supervising consultant and contractor will phase the construction activities in such a way that water-consuming activities are not carried out concurrently but rather in combination with non-water-consuming activities in the same location, where possible.	Uninterrupted water supplies to the communities	Complaints of irregularities in water supply related to construction activities	Before construction	NWSC& Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's	

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	c) Through inductions and tool box meetings, NWSC/MWE will ensure that contractors are conversant with resource conservation practices in all project activities. Conservation awareness will focus on water use efficiency and general day-to-day measures such as turning off taps when water is not being used.	Uninterrupted water supplies to the communities	Record of water usage and conservation measures being implemented	During construction	Contractor NWSC DWD	District Local Governments of Project Area – SEO's, CDO's	
	d) Water abstraction will comply with rates allowed by the permit obtained from DWRM.	Contractor complies with Permit requirements/ conditions	Record of water abstracted	During construction	Contractor NWSC/MWE	DWRM	
	e) Earth materials will be sourced from a NEMA-approved source in a manner that reduces environmental and social impacts. Murram will be sourced in accordance with a NWSC approved murram/ subsoil extraction plan, which will be provided by the contractor prior to the start of works.	Project's material demand does not encourage environmental degradation	Approval from NEMA	ESIA for probable sources of materials before construction	Contractor	NEMA/ NWSC/DWD/ District Local Governments of Project Area – SEO's, CDO's	72,000,000
	f) Catchment management plans are being developed with the aim of conserving and allowing recharge of water resources.	Recharge of existing water resources	Increased volumes of water in existing water resources	Throughout operation	NWSC	NWSC/ DWD/ District Local Governments of Project Area – SEO's, District Engineer's, Water Officers'	
	g) Water conservation measures will be	Uninterrupted	Record of water usage and	Throughout	NWSC	NWSC/ DWD/	

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (Uganda Shillings)
	encouraged: saving water is an efficient way of reducing the overuse of ground water resources. It is not only decreases the amount of the water withdrawn, but may also reduce the threat of pollution	water supplies to the communities	conservation measures being implemented	operation		District Local Governments of Project Area – SEO's, District Engineer's, Water Officers'	
7.3.10 Landscape and land use impacts	a) Reinstatement Plan will be developed	Reinstatement plan developed and implemented	Record of the developed reinstated plan	Throughout operation	Contractor	NEMA/ NWSC/ DWD/District Local Governments of Project Area – SEO's, CDO's	
	b) Reinstatement of the water pipeline and sewer routes will be done in such as return the visual integrity of the landscape as closely as possible to its previous condition. Replant of trees should be done as long as they do not hinder the integrity of the pipe or sewer line.	Wherever practical, the subsoil graded during reinstatement to reflect the original profile across the working width with a stable landform that mirrors the pre-disturbed condition	Presence of heaped soils and/or materials; slope stability, relief, topographic diversity, acceptable surface water drainage capabilities, and compaction; level of vegetation regrowth	Throughout operation	Contractor	NEMA/ NWSC/DWD/ District Local Governments of Project Area – SEO's, CDO's	
	c) Where pipelines and sewers are not buried in ground, if any, they will be painted to blend with the environment. They will be adequately supported by concrete pillars and of such materials	No damage to exposed sections of pipelines and sewers by communities.		Throughout operation	NWSC	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's,	

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (Uganda Shillings)
	that cannot easily be damaged by the communities.					District Engineers	
7.3.11 Social misdemeanour by construction workers	a) As a contractual obligation, contractors shall be required to have an HIV/AIDS policy and a framework (responsible staff, action plan, etc.) to implement during project execution.	No illicit sexual relationships among construction workers and local community	All construction workers living in a camp adhere to "No fraternization" and comply with latest entry time into camp set to avoid prostitution. Monitor complaints from the community	Development of policy before construction	Contractor	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
	b) All construction workers shall be oriented and sensitized about responsible sexual behaviour in project communities.	No aggravated spread of HIV/AIDS due to project implementation	All construction workers are aware of HIV/AIDS risk and responsible living.	Before construction	Contractor	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
7.3.12 Disruption of communication routes	a) Appropriate signage will be used and impacted owners will be informed ahead of disruption	No property owners are inconvenienced in accessing their properties	No complaints from property owners	Before and during construction	Contractor NWSC	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
	b) Disruptions to public access shall be identified in the Contractor's Traffic Management Plan, under which suitable notice of intending delays and closures are given to all concerned parties and approved prior to commencing work. All road closures shall be separately notified	Traffic Management Plan developed Stakeholders informed of impending	Minimal or no interruption in pedestrian and traffic flow	Before and during construction	Contractor NWSC	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (Uganda Shillings)
	and agreed with the Local gov't administration.	closures in time and alternative routes communicated					
	c) Where access to or from an individual property is closed for a period of 2 hours or more, the owner shall be informed at least 24 hours in advance.	Stakeholders informed of impending closures in time	No complaints from property owners	Before and during construction	Contractor NWSC	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
	d) Vehicular access to and from hospitals, police stations and fire stations shall be maintained through the use of steel road plates over open trenches. Pedestrian access to schools, health facilities, and other premises frequently accessed by the public will be maintained with the use of walking boards.	Appropriate infrastructure put in place to allow continued access to hospitals, clinics, schools, etc.	Minimal or no interruption in pedestrian and traffic flow to public facilities	Before and during construction	Contractor NWSC	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
	e) The laying of pipelines and sewers, backfilling and temporary reinstatement shall follow trench excavation as quickly as possible and trenches will not be left open for extended periods.	Reinstatement done as quickly as possible	No complaints from affected communities	Before and during construction	Contractor	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
7.3.13 Loss and degradation of natural habitats	a) Construction activities should be restricted only to the areas that must be disturbed to avoid unnecessary disturbance	Minimal degradation of the habitat beyond the project foot print.	Area of restored habitat that had been disturbed.	During Construction	Contractor	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's,	

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (Uganda Shillings)
						District Engineers	
	b) All project workers should be sensitized to minimize damage to vegetation and flora	Minimal degradation of the habitat beyond the project foot print.	Record of worker sensitization about vegetation and flora.	During Construction	Contractor	NWSC/ DWD/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
	c) Close monitoring and supervision of the construction operations to ensure compliance and avoid causing further damage to un-designated project areas.	Minimal degradation of the habitat beyond the project foot print.	Record monitoring and supervision of the construction operations about project footprint.	During Construction	NWSC/ DWD	District Local Governments of Project Area – SEO's, CDO's, District Engineers	
	d) Support and encouragement of communities to plant trees by providing planting material for fast-growing and multiple use species e.g. *Maesopsis eminii* and *Markhamia lutea* AND continuous engagement of communities.	All cut trees are offset.	Number of community planted trees in relation to the project.	During Construction and operation	Contractor/ NWSC/ DWD	District Local Governments of Project Area – SEO's, CDO's, District Engineers	200,000,000
	e) Support monitoring of performance of the planted trees.	All replanted trees successfully grow.	Number of replanted trees that successfully grow.	During Construction and operation	Contractor/ NWSC/ DWD	District Local Governments of Project Area – SEO's, CDO's,	
	f) Where tree cutting is inevitable, replacement planting should be done wherever feasible.	All cut trees are offset.	Number of cut trees replaced.	During Construction and operation.	Contractor	NWSC/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (Uganda Shillings)
	g) Effluent/ wastewater discharge permits will be acquired	No pollution of natural habitats	Water quality data and compliance with requirements of the discharge permits	During Construction and operation.	Contractor NWSC/ DWD	NWSC/ District Local Governments of Project Area – SEO's, CDO's, District Engineers	
7.3.14 Disruption to public utilities	a) Prior to undertaking any works, the Contractor will obtain from the utilities agencies definition and details of all utilities sites within 50 m of the works.	Details of all utilities within 50m of the works obtained	Details and mapping of all utilities obtained	Before construction	Contractor & NWSC	Affected Utility firms, Local Governments of Project Area	
	b) Damage to any utility at a defined site shall be made good to the satisfaction of the responsible agency at the Contractor's cost. Damage to utilities not defined prior to construction, despite the Contractor having undertaken all reasonable liaisons with the responsible agencies, shall not be the responsibility of the Contractor. It shall be the responsibility of NWSC to ensure the utilities agencies respond in good time to the Contractor's requests for information.	All damages incurred rectified to the satisfaction of the respective utility agency	No damages incurred and where they happen, remedial measures implemented to the satisfaction of the utility agency	During construction	Contractor	NWSC/ Affected Utility firms	
	c) Contractors shall liaise with each of the agencies responsible for the maintenance of utilities that are to be crossed or temporarily diverted or otherwise affected by the works as to the timing and nature of any disruption of service. Where required, the responsible agency shall be	Tender documents contain all relevant information about the utilities within the project areas;	Details and mapping of all utilities obtained and remedial measures planned	Before and during construction	Contractor	NWSC/ Affected Utility firms	

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (Uganda Shillings)
	requested to carry out the necessary works at the time required and at NWSC's cost. The Tender Documents shall contain sufficient information on utilities crossings to permit the Contractor to include the cost of the works for which he is responsible in his bid.	Timely liaison made with the utility agencies to avoid inconveniences					
	d) The Contractor shall incorporate in his programme the proposed arrangements for traffic diversions in the form of a Traffic Management Plan, with details of all necessary signage and any temporary works for approval by the NWSC and the District/City Engineers. The programme shall also contain details of the timing of the proposed closure, dates of closing and re-opening the route, and of any necessary remedial works.	Minimal or no inconvenience to traffic flow caused	Approved Traffic Management Plan in place	Before construction	Contractor	NWSC/ GMC	

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (Uganda Shillings)
7.3.15 Permanent Land take	Land will be acquired in accordance with Uganda's Land Access and Compensation Procedure taking into consideration the Development Partner's requirements. Amongst others, this requires: ▪ Sensitisation of community members whose property will be affected. ▪ Completion of a full inventory of privately registered and/or cultivated, grazed,s structures and graves along the access road. ▪ Compensation to be paid in line with mandated rates agreed in consultation with District officials. ▪ Ensuring that the Chief Government Valuer approves the valuation rates.	Equitable compensation in accordance to National and international laws.	Displayed list of fully compensated PAPs against Monies paid out to them. List of fully compensated PAPs against Monies paid out to them.	Prior to commencement of construction.	NWSC/MWE	NWSC/ CGV Independent Hired External Monitor	
7.3.16 Septage Disposal	a) Institute and maintain a ticketing system for cesspool emptiers, where upon successful disposal, the operator of the sludge treatment facility would issue a receipt to the cesspool emptier.	Proper septage disposal in designated areas	Record of ticket issued at STP	During Operation	NWSC/ Kibuku Local Government	NEMA/ NWSC/ NWSC/ Kibuku Local Government – SEO's, CDO's	15,000,000
	b) Kibuku DLG/Kadama sub-county and MWE, should put in place a system to monitor cesspool emptiers and in addition, have a public educational campaign to educate and inform the	Compliance of cesspool emptiers in proper septage disposal		During Operation	NWSC/ Kibuku Local Government	NWSC/ NWSC/ Kibuku Local Government – SEO's, CDO's	

Impact	Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Monitoring Institution	Estimated annual cost (Uganda Shillings)
	public about the system.						
	c) MWE and Kibuku District Local Government will work closely with operators of Cesspool Emptiers if any and train them in the proper handling and transport of sewage/ sludge.	Good septage handling and sewage disposal	No complaints from communities in and around Nabunyere village	During Operation	NWSC/ Kibuku Local Government	NWSC/ NWSC/ Kibuku Local Government – SEO's, CDO's	
ESTIMATED GRAND TOTAL							***772,000,000***

***** The *cost is estimated for handling and storage of damaged parts of AC pipes in the process of excavation given that most ofthem will be plugged and left in the ground but during excavations some may be damaged. In the case when they are left interact in the ground, NWSC should ensure that call-first-before you excavate policy is put in place to ensure before any development takes place at particular site, these pipes are removed and handled in the proper manner.*

9 CONCLUSION

The proposed project has potential to significantly improve quality of life in the Mbale City and the neighbouring towns both during construction and operation phases. Like in other areas, the long term socio-environmental benefits of a reliable supply of potable water and access to sanitary facilities include reduced morbidity and increased productivity of households; and increased enrolment of children in educational institutions. In addition, project development and operation in the City and small towns or rural growth centres will provide considerable economic opportunity and attraction of other services.

However, development of the project can also bring with it negative impacts. The key significant negative impacts will arise from operation of the sewage treatment plants and public toilets if not managed well. NWSC and DWD should use their vast experience in their respective areas of jurisdiction in operating and maintaining such systems to reduce and / or avoid occurrence of adverse effects during construction and operation of the facilities.

If the project is developed and infrastructure put in place operated in conformity with the legal requirements and annual audits conducted following suggestions provided in the ESMP, the benefits of this project to the nation would by far outweigh potential negative effects.

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APPENDIX A: STAKEHOLDER ENGAGEMENT

Record 1: NALONDO B AND MAKO VILLAGES

Week	**45**	Meeting date	**3/11/2015**
		Recorded by	**Vivian Ochen**
Meeting/subject	**ESIA & RAP FOR MBALE WATER SUPPLY AND SANITATION PROJECT- MEETING NALONDO B AND MAKO VILLAGES, BUSOBA SUB-COUNTY**	Total pages	**02**

Present	Apology	Copy	Name	Organisation/Village	Designation
			Signed list of communities appended		
☒	☐	☐	Vivian Ochen	Air Water Earth Ltd	Water Engineer

Item	Update
1	**Introduction**
	The presentation provided a detailed description of the proposed Mbale Water Supply and Sanitation Project. An outline of the discussion was as follows: ▪ Project Background ▪ Project Location ▪ Project Description ▪ on-going Activities ▪ Project activities ▪ ESIA/RAP Process
	Question and Answer Session
1.1	**Compensation and pipeline** • Will my house be broken if it is along the pipeline? • Will we buy the pipes or shall the pipes be supplied free of charge? • Will I be compensated if my house is located on the reservoir tank site? • Will trees be compensated? • If the land through which the pipeline will pass belongs to another person, will I pay for the land in order to connect water to my house? • Contractors tend to destroy people's properties, what measures are in place to control them?

Week	**45**	Meeting date	**3/11/2015**
		Recorded by	**Vivian Ochen**
Meeting/subject	**ESIA & RAP FOR MBALE WATER SUPPLY AND SANITATION PROJECT- MEETING NALONDO B AND MAKO VILLAGES, BUSOBA SUB-COUNTY**	Total pages	**02**

1.2	**On Benefits** • Will the person seeking employment on the project apply through or get a recommendation letter from the LC1 only? • How are those far from the road reserve going to benefit? • Shall I pay for water at my home or use it freely? • The contractor should employ the youth in the village. Is the contract already awarded? • If people who are qualified contractors in plumbing come, which office should they apply to?
1.3	**On Ownership** • Does the Project belong to the Government or any politician?

Record 2: MAKHAI A AND B, AND NAMWARO VILLAGES

Week	**45**		Meeting date	**3/11/2015**	
			Recorded by	**Vivian Ochen**	
Meeting/subject	**ESIA & RAP FOR MBALE WATER SUPPLY AND SANITATION PROJECT- MEETING IN BUSOBA SUB-COUNTY**		Total pages	**01**	

Present	Apology	Copy	Name	Organisation/Village	Designation
			Signed list of communities appended		
☒	☐	☐	Vivian Ochen	Air Water Earth Ltd	Water Engineer

Item	Update
1	**Introduction**

Week	**45**	Meeting date	**3/11/2015**
		Recorded by	**Vivian Ochen**
Meeting/subject	**ESIA & RAP FOR MBALE WATER SUPPLY AND SANITATION PROJECT- MEETING IN BUSOBA SUB-COUNTY**	Total pages	**01**

	The presentation provided a detailed description of the proposed Mbale Water Supply and Sanitation Project. An outline of the discussion was as follows: ▪ Project Background ▪ Project Location ▪ Project Description ▪ on-going Activities ▪ Project Activities ▪ ESIA/RAP Process
	Question and Answer Session
1.1	**Compensation** • People in the road reserve await compensation? • Airtel constructed fibre optic cables. Compensation was not transparent; some people were paid while others were not. Will the same be done for this project?
1.2	**Water Supply and pipeline construction** • Shall we be provided with water from transmission main or another distribution line? • Is it the line being constructed currently? **Response:** No, that one goes to Nabumali.
1.3	**Recruitment** • Will it be at sub-county level or village level at LC I level?
1.4	**Comment** • Warn contractor's staff on the use of vulgar language lest they risk being arrested.

RECORD 3: MAXIMASA

Week	**45**	Meeting date	**4/11/2015**
		Recorded by	**Vivian Ochen**
Meeting/subject	**ESIA & RAP FOR MBALE WATER SUPPLY AND SANITATION PROJECT- MEETING IN MAZIMASA SUB-COUNTY**	Total pages	**02**

Week	**45**	Meeting date	**4/11/2015**
		Recorded by	**Vivian Ochen**
Meeting/subject	**ESIA & RAP FOR MBALE WATER SUPPLY AND SANITATION PROJECT- MEETING IN MAZIMASA SUB-COUNTY**	Total pages	**02**

Present	Apology	Copy	Name	Organisation/Village	Designation
			Signed list of communities appended		
☒	☐	☐	Vivian Ochen	Air Water Earth Ltd	Water Engineer

Item	Update
1	**Introduction**
	The presentation provided a detailed description of the proposed Mbale Water Supply and Sanitation Project. An outline of the discussion was as follows: ▪ Project Background ▪ Project Location ▪ Project Description ▪ Ongoing Activities ▪ Project Activities ▪ ESIA/RAP Process
	Question and Answer Session
	Dry Season • During dry season, there is no water; where will water come from?
1.1	**Water Supply and pipeline construction** • What do I do to extend water to my home?
1.2	**Compensation** • Do I get compensated for both trees and crops? • If a tree has been compensated, do I take it or you take it because it has already been paid for? • How do we benefit if the land is bare? • If the new pipes cross from the same place where the old pipe crossed on my land, will I be compensated?

Week	**45**	Meeting date	**4/11/2015**
		Recorded by	**Vivian Ochen**
Meeting/subject	**ESIA & RAP FOR MBALE WATER SUPPLY AND SANITATION PROJECT- MEETING IN MAZIMASA SUB-COUNTY**	Total pages	**02**

1.3	**Road Reserve** • I built in the road reserve, what do I do? • We are ignorant of the Road reserve boundary demarcated by UNRA, please clarify? • We built without knowing the extent of the road reserve, what do we do? • Why isn't it on the right high side and only on the left?
1.4	**Failure to remove property** • If I fail to remove my things within the time given, what do I do?
1.5	**Payment** • Contractor is not paying hotel bills and staff from the village. How do we tackle this when they run away?
1.6	**Willingness to pay** • How do you demonstrate willingness to pay?

Record 4: MUHAGO, KANHAYI, NAMUSERU, NEW SCHEME (DOHO RICE SCHEME), KOLI AND MUHUYU

Week	**45**	Meeting date	**4/11/2015**
		Recorded by	**Vivian Ochen**
Meeting/subject	**ESIA & RAP FOR MBALE WATER SUPPLY AND SANITATION PROJECT- MEETING IN MAZIMASA SUB-COUNTY**	Total pages	**01**

Present	Apology	Copy	Name	Organisation/Village	Designation
			Signed list of communities appended		
☒	☐	☐	Vivian Ochen	Air Water Earth Ltd	Water Engineer

Item	Update
1	**Introduction**

Week	**45**	Meeting date	**4/11/2015**
		Recorded by	**Vivian Ochen**
Meeting/subject	**ESIA & RAP FOR MBALE WATER SUPPLY AND SANITATION PROJECT- MEETING IN MAZIMASA SUB-COUNTY**	Total pages	**01**

	The presentation provided a detailed description of the proposed Mbale Water Supply and Sanitation Project. An outline of the discussion was as follows: ▪ Project Background ▪ Project Location ▪ Project Description ▪ Ongoing Activities ▪ Project Activities ▪ ESIA/RAP Process
	Question and Answer Session
1.1	**Compensation** • What do I do with seasonal crops? • If I have a title, how do I benefit if my land extends up to the road?
1.2	**Water Supply and pipeline construction** • Will residents have a chance to get connected and won't the tariff be high? • During dry periods, Bukedi College Kachonga reservoir is blocked and Nampologoma does not have water. Is it possible for every centre to have a reservoir tank? • Apart from residents close to the road, will other residents be given a chance to get connected? What distance? • What qualifies the first one hundred (100) to be connected? **Response:** Willingness to pay.
1.3	**Road reserve** • What is the width of the road reserve? • Having boreholes near the road reserve, won't the quality be affected? • In the event that a house falls in the road reserve, what happens?
1.4	**Comment**

Record 5: Bambone, nanyuru and Lukangole

Week	**45**	Meeting date	**4/11/2015**
		Recorded by	**Vivian Ochen**

Meeting/subject	**ESIA & RAP FOR MBALE WATER SUPPLY AND SANITATION PROJECT- MEETING IN BUTALEJA TOWN COUNCIL**	Total pages	**01**

Present	Apology	Copy	Name	Organisation/Village	Designation
			Signed list of communities appended		
☒	☐	☐	Vivian Ochen	Air Water Earth Ltd	Water Engineer

Item	Update
1	**Introduction**
	The presentation provided a detailed description of the proposed Mbale Water Supply and Sanitation Project. An outline of the discussion was as follows: ▪ Project Background ▪ Project Location ▪ Project Description ▪ on-going Activities ▪ Project Activities ▪ ESIA/RAP Process
	Question and Answer Session
1.1	**Water Supply and pipeline construction** • If I am 2km away, will I be able to get water amongst the first 100 people? • How do we know that water quality is good or bad?
1.2	**Compensation** • If I have a business under the tree, will I be compensated? • I have graves within the road reserves. Do I get paid first before I remove them or vice versa?
1.3	**Construction** • How long will it take for construction to take place?

Record 6: Bulindi, Buhobe, Butaleja, Buhehe, Busasi and Lunghule

Week	**45**	Meeting date	**4/11/2015**
		Recorded by	**Vivian Ochen**

Meeting/subject	**ESIA & RAP FOR MBALE WATER SUPPLY AND SANITATION PROJECT- MEETING IN BUTALEJA TOWN COUNCIL**	Total pages	**01**

Present	Apology	Copy	Name	Organisation/Village	Designation
			Signed list of communities appended		
☒	☐	☐	Vivian Ochen	Air Water Earth Ltd	Water Engineer

Item	Update
1	**Introduction**
	The presentation provided a detailed description of the proposed Mbale Water Supply and Sanitation Project. An outline of the discussion was as follows: ▪ Project Background ▪ Project Location ▪ Project Description ▪ on-going Activities ▪ Project Activities ▪ ESIA/RAP Process
	Question and Answer Session
1.1	**Water Supply and pipeline construction** • How will the distribution network be? • Is there a rate to be paid for the water? • Rates vis-à-vis distance to pipeline?
1.2	**Employment** • Can we get subcontracting jobs?
1.3	**Road reserve** • Can we build in the road reserve?

Record 7: Busolwe South Village

Week	**45**	Meeting date	**6/11/2015**
		Recorded by	**Vivian Ochen**
Meeting/subject	**ESIA & RAP FOR MBALE WATER SUPPLY AND SANITATION PROJECT- MEETING IN BUTALEJA TOWN COUNCIL**	Total pages	**01**

Week	**45**	Meeting date	**6/11/2015**
		Recorded by	**Vivian Ochen**
Meeting/subject	**ESIA & RAP FOR MBALE WATER SUPPLY AND SANITATION PROJECT- MEETING IN BUTALEJA TOWN COUNCIL**	Total pages	**01**

Present	Apology	Copy	Name	Organisation/Village	Designation
			Signed list of communities appended		
☒	☐	☐	Vivian Ochen	Air Water Earth Ltd	Water Engineer

Item	Update
1	**Introduction**
	The presentation provided a detailed description of the proposed Mbale Water Supply and Sanitation Project. An outline of the discussion was as follows: ▪ Project Background ▪ Project Location ▪ Project Description ▪ on-going Activities ▪ Project Activities ▪ ESIA/RAP Process
	Question and Answer Session
1.1	**Water Supply and pipeline construction** • To whom do we address the application process? • Will distribution to my house be for free or payment will be needed? • Wait, the Town Council wants to eat • Is it possible for the pipes to be relocated in other areas as opposed to going through Busolwe because, there are many shops?
1.2	**Compensation** • Full compensation, will it be fair?
1.3	**Road reserve** • Will I get compensated if the pipe is near the road?
1.4	**Benefit** • There are 19 villages, will they all benefit from this project?
1.5	**Request** • Please give us the contacts of the Ministry Officials?

Record 8: Kamonkoli, Kiralaka and Nyanza Villages

Week	**46**	Meeting date	**8/11/2015**
		Recorded by	**Vivian Ochen**
Meeting/subject	**ESIA & RAP FOR MBALE WATER SUPPLY AND SANITATION PROJECT- MEETING IN TIRINYI CENTRAL**	Total pages	**02**

Present	Apology	Copy	Name	Organisation/Village	Designation
			Signed list of communities appended		
☒	☐	☐	Vivian Ochen	Air Water Earth Ltd	Water Engineer

Item	Update
1	**Introduction**
	Agenda 1-Opening Prayer 2-Introduction remarks LC3 3-Welcome remarks LC1 Kamonkoli 4-Consultant's brief 5-Question and answer session 6-Closing remarks LC2 Kamonkoli 2 **The presentation** provided a detailed description of the proposed Mbale Water Supply and Sanitation Project. An outline of the discussion was as follows: ▪ Project Background ▪ Project Location ▪ Project Description ▪ on-going Activities ▪ Project Activities ▪ ESIA/RAP Process
	Question and Answer Session

Week	**46**	Meeting date	**8/11/2015**
		Recorded by	**Vivian Ochen**
Meeting/subject	**ESIA & RAP FOR MBALE WATER SUPPLY AND SANITATION PROJECT- MEETING IN TIRINYI CENTRAL**	Total pages	**02**

1.1	**Water Supply and pipeline construction** • What happens if existing pipes are cut, who replaces? • When do surveyors come? • When do they apply and who is it addressed to? • How do the first 100 people qualify? • Why Namatala? • Some projects do not complete within the time frame. When does it start and stop? • Are the 100 people from every town or the whole stretch? • What is the difference between the existing water system and the new one? • How are we catering for public institutions in this project? • If I already have a line, will I get connected to the new line or not? • If I am among the 100 lucky people, and pipes have to go through people's homes but have rejected, what do I do?
1.2	**Employment** • Give authority to locals to report a contractor if he or she does not employ locals.
1.3	**Road reserve** • Will I get compensated if the pipe is near the road?
1.4	**Benefit** • There are 19 villages, will they all benefit from this project?
1.5	**Request** • Please give us the contacts of the Ministry Officials?

Record 9: Lupada1, Nambago and Busikwe Villages

Week	**46**			Meeting date	**8/11/2015**
				Recorded by	**Vivian Ochen**
Meeting/subject	**ESIA & RAP FOR MBALE WATER SUPPLY AND SANITATION PROJECT- MEETING IN TIRINYI CENTRAL**			Total pages	**01**

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☒	☐	☐	Vivian Ochen	Air Water Earth Ltd	Water Engineer

Item	Update
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	Question and Answer Session
1.1	**Water Supply and pipeline construction** • What is the distance of the distribution pipes? • If the pipe goes through people's property, who pays? • How do they demand for the bills/money? • Who brings or selects witnesses? • Do they start billing on day one or a grace period is first given? • Where do we pay? • How much does the water cost? • If I want for business, is there a difference in the tariff? • When does the project start? Is this a campaign ploy for the president?

Record 10: Budaka Township

Week	**46**	Meeting date	**8/11/2015**
		Recorded by	**Vivian Ochen**
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	Question and Answer Session
1.1	**Water Supply and pipeline construction** • When does the project start? • What is the cost of a unit of water? • Will 105,000/= be enough to connect water to their homes? • Who are the lucky 100 people, is it from Mbale or every town? • Private operator changes price, won't it be the same for this project? • Who is responsible for taking water into the house?

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1.2	**Employment** • Will drunkards be employed? • Can you give us assurance that the contractor will employ local residents?
1.3	**Conduct of contractor** • Who pays if contractor staff is caught with someone's wife?
1.4	**Compensation** • Will trees cut be compensated? • If pipes pass through people's property, who compensates? • Is the compensation in shifts or once and once for all?

Record 11: Nalado, Nalwaya and Nabweyo

Week	**46**			Meeting date	**9/11/2015**
				Recorded by	**Vivian Ochen**
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	Question and Answer Session
1.1	**Water Supply and pipeline construction** • If roads are not opened yet by the Town Council, but foot paths exist, what happens? • Who do we address the application for water to? • If I have a house plan but have not yet built a house, will I be considered in the 100? • When does the project start?
1.2	**Employment** • What jobs can be given to those who can read and write?
1.3	**Sensitization** • Will sensitization be effected in all centres up to Tirinyi or only this one?
1.4	**Compensation** • If I live behind someone whose house is by the roadside, who pays for the land?
1.5	**Cesspool** • Can cesspool trucks empty semi-permanent pit latrines?

Record 11: Nabunyere faecal sludge

Week	**46**	Meeting date	**10/11/2015**
		Recorded by	**Vivian Ochen**
Meeting/subject	**ESIA & RAP FOR MBALE WATER SUPPLY AND SANITATION PROJECT- MEETING IN TIRINYI CENTRAL**	Total pages	**01**

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	Question and Answer Session
1.1	**Water Supply and pipeline construction** • Will free taps be available? • Is it from the main on this road and to what distance? • If I live beyond 500m, what happens if I am in need of the water? • When does the contractor start? • What are the costs involved and how much does a unit of water cost?

Week	**46**	Meeting date	**10/11/2015**
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1.2	**Employment** • How do we apply and when do we apply for the jobs? • Will they allow our sons to work if language is a barrier?
1.3	**Sensitization** • Re-sensitization or provide brochures because, some points might be forgotten.
1.4	**Dam** • Talk about the dam?

Record 12: WSDF

Week	**46**	Meeting date	**11/11/2015**
		Recorded by	**Vivian Ochen**
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1.1	Catchments have been degraded. Communities need to co-exist with the catchment.
1.2	Communities are sensitive to land issues.
1.3	Incentives need to be given to the people to practice better methods of agriculture so as not to degrade the environment.
1.4	River Manafwa has seasonal flactuations; something needs to be done to guarantee sustainability.
1.5	River Namatala – How do we ensure that it is not disturbed?
1.6	Water resource assessment using existing data and water demand assessment especially with the JICA.
1.7	Incentives that the government provides for proper land utilisation. River Manafwa has a high demand for irrigation by people who are downstream. If the volume of abstraction is increased upstream, then downstream users will face problems.
1.8	Storage should be ensured during wet season and utilisation during the dry season.
1.9	Flows should be regulated.
1.10	Catchment conservation needs to be done.
1.11	Sustainable systems in place for catchment source protection: • Zoning with incentives; • Sensitizing people; and • What can be done to ensure activities encourage sustainability?
1.12	Sustainable rates (tariffs) for catchment protection.
1.13	Damming- Plan for a reservoir, displaced people and create a dam to store water during wet seasons. Short term-leisure parks, plant trees and minimise silting in the rivers.

Record 13: Namawondo II

Week	**46**	Meeting date	**11/11/2015**
		Recorded by	**Vivian Ochen**

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	Question and Answer Session
1.1	**Compensation** • If a house was built in a road reserve, will it be compensated? • If animals are knocked down, who compensates?
1.2	**Water Supply and pipeline construction** • If I reside behind your house 500m, do I get a chance to get connected? • Will every road in Namawondo II get those pipes 30m? • How long will they wash the tank? • If one is already connected to the existing line, do they have to re-apply?
1.3	**Benefit** • How do business owners operating under trees benefit?

Record 14: Bwikomba and Nyanza

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	Question and Answer Session
1.1	**Compensation** • If you built in the road reserve, do you get compensated? • If valuers find tree stumps, does one get compensated? • If my veranda is in the road reserve, what happens?
1.2	**Water Supply and pipeline construction** • If I need the water and some people in between do not want it, what happens? • Does the pipe have a reserve like the roads do?
1.3	**Benefit** • If a kiosk owner took a loan and operates in a road reserve, how do they get helped?
1.4	**Employment** • Are there other jobs for women other than cooking? • How many workers will the project employ in every village? • Can people be sub-contracted to dig pits? • If I cannot write now but need to apply, how do I go about it?

Record 15: Bugwene cell, Doko Nsambya, Doko cell, Nyanza and under the tree

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	Question and Answer Session
1.1	**Compensation** • Who gets compensated; landlord or tenant?

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1.2	**Water Supply and pipeline construction** • Will it reach Nakaloke? **Response**: Yes • Where will the water be distributed? • When/where do the applications get? • Will shops be required to be closed during construction? • When will the project start? • How were the demarcations of the areas where pipes will be laid done?
1.3	**Complaint** • Where do I raise my complaint if the Chairpersons are not involved?

Record 16: Naboa, Food and Cathedral

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	Question and Answer Session
1.1	**Compensation** • Are we paid? • Valuation was done in 2015, but payment will be done in 2018, but using 2015 price. What happens?
1.2	**Water Supply and pipeline construction** • Will the sewer lines be replaced because they are blocked?
1.3	**Concern** • City Council wants to take up contracts of pavers and slabs. There is need to be clear on roles. • Valuers differ. • How safe are the people living around? • Will local leaders be compensated? • Pass leaflets and brochures.

APPENDIX B: HYDROLOGICAL ASSESSMENT REPORT

1 Introduction

The project area is drained from east to west by three major rivers that have their sources on Wanale ridge and river Manafwa with it source in Mountains. River Nashibisho and its tributary Napwoli drain the southern part of the town. These are bound by an extensive plain under Mbale forest plantation. River Nabiyonga which as acts a current raw water source for Mbale and its major tributary Namatiso drains across the northern area of Mbale town. Several channels also drain from within the town into rivers. River Namatala also traverse the project on northern side of the project area and has a gauging station along Mbale soroti road. Off the slopes of Mt Elgon the river Namatala and Manafwa are draining westward, passing Mbale to the north and south, respectively. With springs in the Wanale Mountains east of Mbale the river Nabuyonga and Nabijo are draining into the Namatala River in the west of Mbale (Figure 1). Approximately between Budaka and Butaleja the River Manafwa is draining into the Namatala River, forming the seasonal wetlands of Namatala. In this area smaller tributaries and wetlands drain into the Namatala Wetlands from the higher altitude slopes in proximity of the growth centres. In the west of the study area close to Tirinyi the Namatala River is draining into the Mpologoma River.

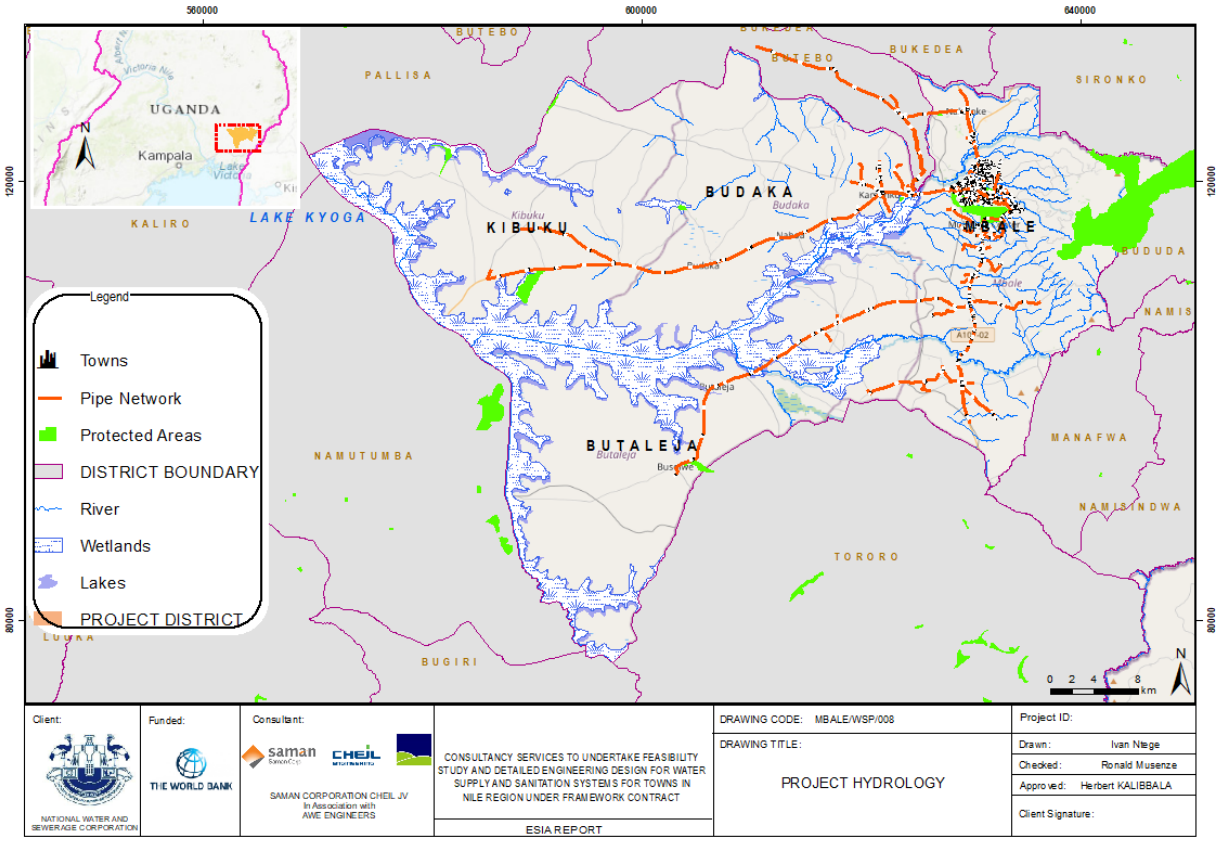

Figure 1 Project area hydrology and protected areas

Having an equatorial climate the project area enjoys plenty of rain and sunshine moderated by the relative high altitude, the climate is tropical wet and dry, however due to higher altitude, average temperatures are quite lower than what is typically seen in other tropical cities. Rainfall is major source of recharge for water resources in project area and most of it is noticed between March and October. The lowest rainfall is observed in January. Mbale City water supply is from river Manafwa, river Nabijo and Nabiyonga total production capacity of 130,000 m^3 per month. However the river discharge drastically reduces during the dry spells such that there will be insufficient amounts to meet the current and anticipated water demand by 2040.

2 Topography

Topography of Mbale and other small towns is influenced by Mt Elgon; the elevation is highest with altitudes of over 3000m at the slopes of Mt Elgon and approximately 1200-1700m in the river valleys to the east of Mbale (Figure 2). The area is characterized by steep slopes of gradients ranging from 20 to 50% in the mountains and approximately 2-10% in proximity of the main rivers. The overall slope percentage for the watersheds east of Mbale is approximately 18%. Towards the west of Mbale the mountainous character changes into swamps and wetland. The elevation for the wetlands along the Namatala River ranges from approximately 1110m close to Mbale and 1060 m in the west of the study area close to Tirinyi. The Growth Centres to the west of Mbale are approximately 20 to 80 m higher in altitude compared to the surrounding low flat planes of the wetlands.

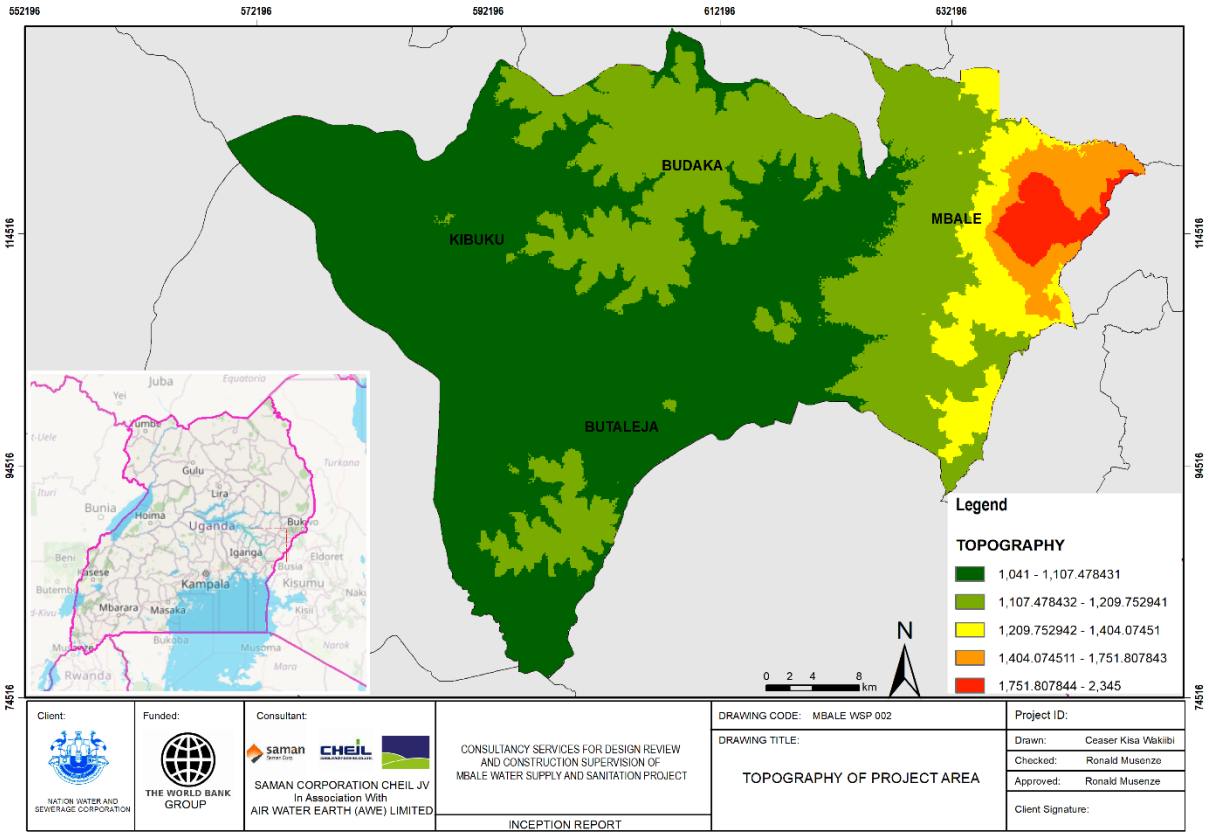

Figure 2 Project Area Topography and hydrology

3 Climatology

The climate in Mbale is tropical with mean annual temperatures and rainfall of 23.0^{0}C and 1183mm respectively. The region experiences a bimodal rainfall pattern with the driest month being January. The first rain season occur from late March to June and the second from September to November. Over the years there has been a shift from April to May as the wettest month and the onset of the first rains is sometimes delayed until April. The other observed trend has been towards more rainfall during the previously shorter rains periods of September to November. On average there is 32 mm of precipitation in January. With an average of 167 mm, most precipitation falls in May. With an average of 24.2 °C, February is the warmest month. July has the lowest average temperature of the year. It is 22.0°C (Figure 3).

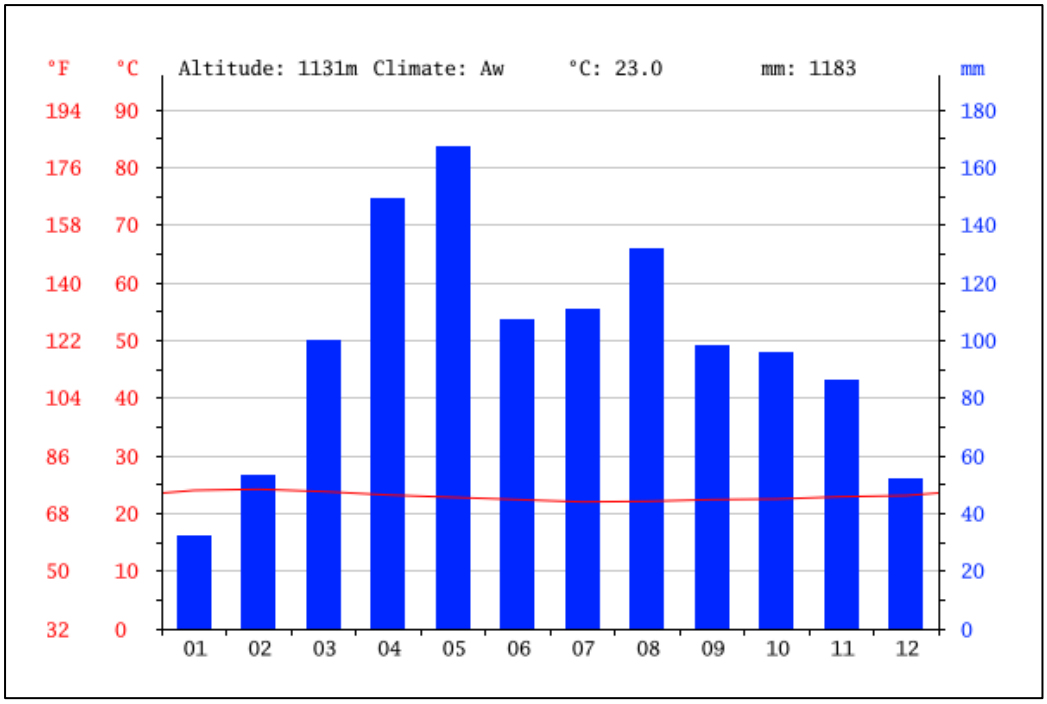

Figure 3 Temperature and rainfall patterns and trends over the project area

4 Location and description of proposed activity

The proposed Mbale and Small towns' water supply and sanitation project is located in Mbale, Budaka, Kibuku and Butelaja Districts of Eastern Uganda subregion. Among the areas to be served include Mbale Muncipality, Trinyi, Kadama, Kibuku, Butaleja, Busolwe and Budaka town councils. The applicant (MWE) wishes to abstract an amount of 0.313m^3/s from Namatala and Manafwa for domestic purposes to benefit an ultimate population of about 333,792 by 2040 (Figure 4). The total water demand to be supplied by Bungokho WTP is approximately between 27,000 m^3/d while the water demand to be met by Manafwa WTP is approximated to 6,700m^3/d by 2040.

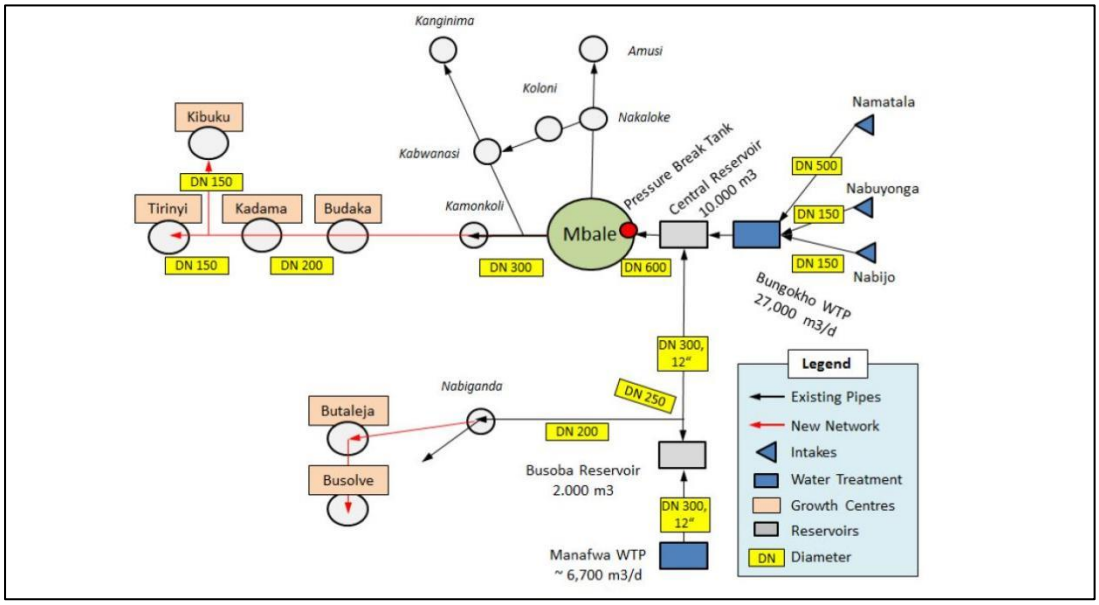

Figure 4 Overview of the new system

Figure 5 Proposed intake location on River Namatala to supply Mbale

The total distance to be covered is about 12 km from the intake to Bunghko Water Treatment plant where it will treated before it transmitted to the Triniyi, Kadama, Budaka and Kuibuku towns. The southern wing of the project including the towns of Busolwe and Butaleja is to be supplied by line off the main transmission line from river Manafwa. A reservoir will be constructed at Busoba to supply the areas near Busoba town council. The Reservoir at Busoba will have a capacity of 2000m^3 while the central reservoir at Bunghko has a capacity of 10,000m^3. The Namatala River has to be used as additional intake for the future water supply and as alternative to the existing intakes at Nabijo and Nabuyonga. A new raw water pumping main from Manafwa, only to bridge the dry period (December – March), is more expensive than the gravity main from Namatala. The transmission main from Namatala shall follow contours in the beginning through agricultural, forests and then cross a series of stream. Only 2 km of the pipeline alignment will follow existing roads. The intake location provides sufficient elevation difference to Bunghko WTP allowing the water to gravitate with minimum energy consumption through pumping. A small weir shall be constructed for water abstraction (Figure 1).

5 Namatala Catchment

5.1 Description of Namatala Catchment

Namatala watershed is located in Mbale district. The Upper Namatala catchment covers the part of the game reserve with the lower part transversing through seasonal and permanent wetlands before joining the river Mpologoma. The Namatala system specifically originates from Wanale Mountains and crosses the sub counties of Bungokho, Jami village of Bunyole County and Nakaloke County in Pallisa. Most of the area covered by this system is in the lowlands of Mbale District. The soils can be explained in terms of geology and geomorphological processes which have significant impact on soil formation processes. Namatala catchment at Mbale-Soroti road is approximately 123.6 km^2.

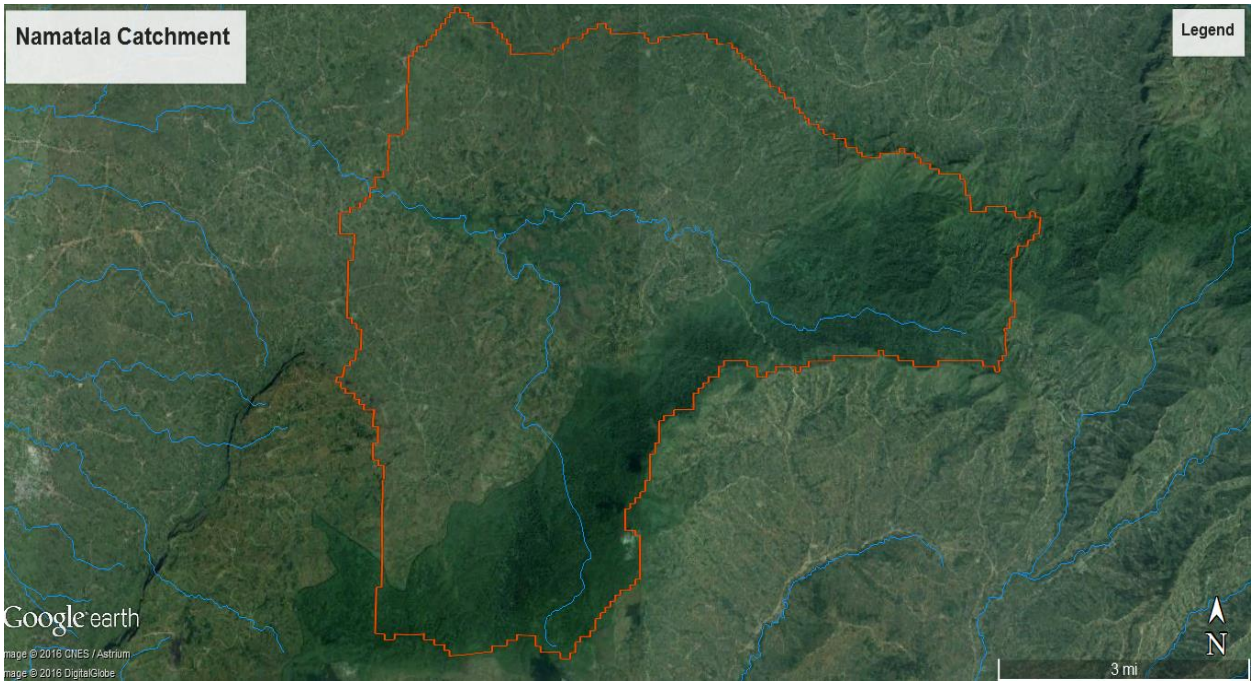

Figure 6 Namatala Catchment draining through gauge station on Mbale-Soroti road

5.2 Hydrological characteristics and analysis

Flow statistics: Hydrological data was obtained for the two major rivers that are going to be used as sources of raw water for Mbale and Small towns' water supply and Sanitation project. The two main rivers selected by CES consultant include River Namatala and River Manafwa. The gauging station for river Namatala is located on Soroti road north of Mbale town and approximately drains an area of 160km^2. The hydrograph and datasets used in this hydrological assessment were from 1997 to 2014. The hydrograph for river Namatala indicate two peaks in April, May and November. The flows in wet season vary between 2.15m^3/s to 15m^3/s with maximum flow close to 40m^3/s as indicated in Figure 7.

In the dry season the low flow reduce significantly and are in a range 0.326m^3/s to 1m^3/s. in the recent years from 2000's series onwards the min flow always fell below 0.4m^3/s. The surface water from the Namatala River, flowing on the outskirts of Mbale has been considered as a potential water source (with up to 2000 m^3/day).

5.3 Availability of Water at proposed intake site

Flow duration analysis: The flow duration curve for Namatala catchment indicated that it's a relatively stable cat chment with ability to sustain base flows for some of very high flows for very short time. Different indices extracte d provided vital information about the catchment. Q70 (0.43m^3/s) represented the base flow component of the flo w regime since the flow in River Namatala is highly variable between wet and dry season with flow regime in Riv er Namatala being largely intermittent. In the following figure the return period and exceedance probability of the discharge at Namatala River is shown. For a 95% exceedance probability based on all data a flow of approximat ely 0.52 m^3/s will occur. In other words it means that in 95% the flow will be higher than 0.52 m^3/s or in 5% the fl ow will be lower than 0.52 m^3/s. A 99% exceedance probability has a flow of approximately 0.37m^3/s.

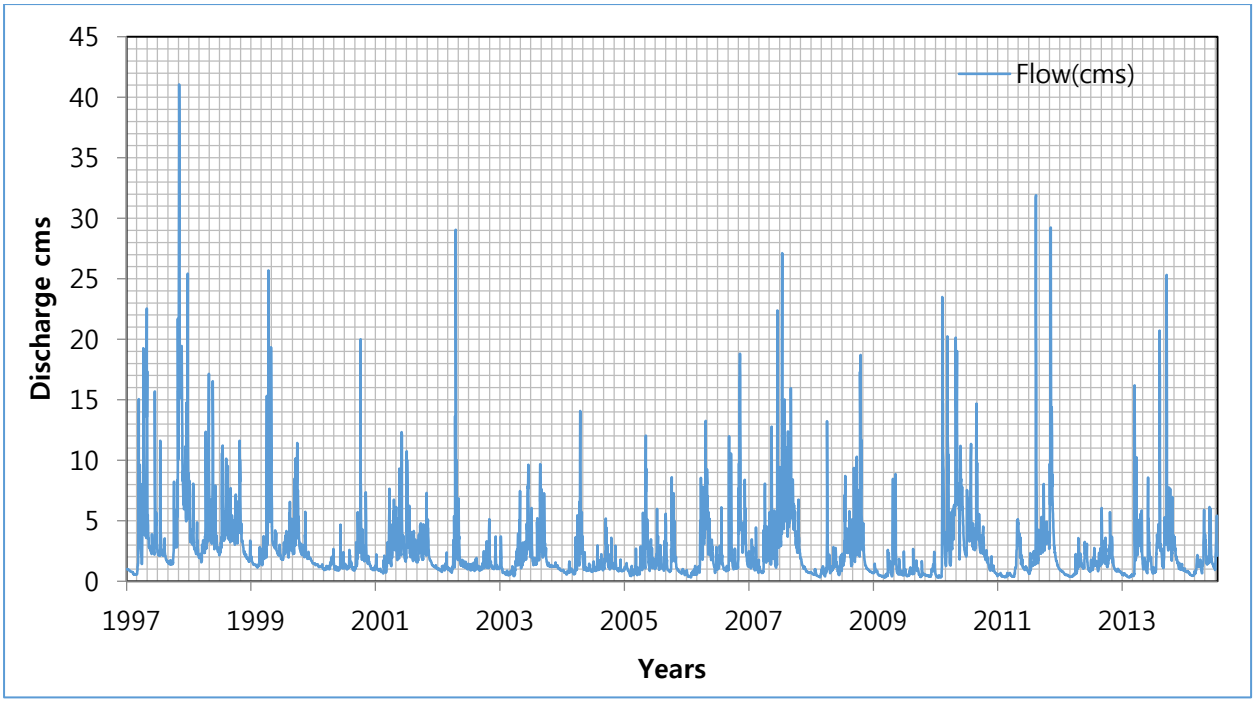

Figure 7 Flows of River Namatala at gauging station on Soroti Road (1997-2014)

The catchment had relatively sustainable base flow as a result of slow response to rainfall. The catchment and st ream's variability was investigated by Q20/Q90 ratio. The ratio (6.57) revealed catchment has capacity to store a nd recharge the flows slowly from saturated zones near the ground surface. Q90-Q10 expressed the variability w hich excludes the extremes at both ends (dry and wet).
The slow slopes of the flow duration curve shows significant contribution of base flow to stream flow, the ratio of Q90 to Q50 indicated the proportion contributed from ground water storage (Mohamoud, 2010). The percentage of time at zero flow helped distinguish between flow regime (ephemeral, seasonal and permanent stream).

The variability in daily flows characterized the stream as perennial. A daily discharge at 50th percentile (1.64 m^3/s) is recommended for designing the reservoir storage. The monthly flow-duration values are just like the annual flow-duration values, except that they are determined using only those daily discharges that fall within a certain month of the year. For example, in a 30-year stream flow record, there are exactly 900 daily values for the month of April. The value for Q10 is the flow that is exceeded exactly 10 percent of the time, or on 90 days. The low flow of the Namatala was revealed from the flow duration curve using the flows exceeded 95% of the time since the Namatala is perennial river. 95% exceeded flow was used to measure low flow towards the end of the dry season.

Flow descriptors into high flows (Q0.1, Q0.5, Q1 and Q5 and Q10), the median flows are indicated by Q20, Q30, Q40, Q59 and Q60 percentile flows and the low flows (Q80, Q90, Q95, Q99) according to Mohamoud (2010). A pragmatic approach led to the selection of the 80th percentile as the threshold of low flows, similarly 10% of flows above the 80th percentile can be selected as a suitable portion of water for abstraction. The flow duration analysis gives the low flow (Q80) as 0.8620 m^3/s. The flow caters for both reserve flow and domestic use. The difference between low flow (Q80) and reserve flow (Q95) is 0.359 m^3/s, which is the allocatable water as with normal flow; the flow balance is reduced by unregistered illegal abstractors. According to the Lake Kyoga Water Management Zone an environmental flow of 30% of the flow must always be retained in the river if there are no major downstream consumers. The environmental flow computed for Namatala River based Q95 gives a value of 0.1371 m^3/s leaving an abstractable flow of 0.3199 m^3/s in dry season. Available flow is sufficient to meet the demand of 0.313 m^3/s Considering our required flow of 0.313 m^3/s, 43% of the water would be retained in the river even in the period of the lowest flow of the dry season. The daily flow duration parameters at gauge site are extrapolated upstream to the proposed intake site using the catchment area ratio of 0.7619.

Low flow analysis: Low flow in Namatala catchment were associated with base flow, Wallace and Cox (2002), Hayes and Nelms (2001) recommended the use of Q90 (0.47 m^3/s) and Q50 (1.4 m^3/s) as conservation estimator of mean base flow. The base flow variability for Namatala basin was revealed by the ratio Q50/Q90 (2.48) and Q10/Q95 (10.42). Low flow quartiles are very crucial in water quality management applications including waste load allocations and discharge permits and in siting treatment plants and sanitary landfills with the catchment, the low flow statistics especially 10-year 7-day average low flow is very essential. A 10 year 7-day mean annual minimum for Namatala catchment was estimated to be 1.2 m^3/s. Daily mean stream flows were also analyzed for Namatala gauging station to calculate the annual 7-day low flow for each year. Different low flow indices have been developed as indicated in Tables 1 and 2 to ensure sustainable abstraction, ecosystem maintenance and water quality monitoring. Low flow 7Q10 (7-day 10 year low flow condition according to Singh (1974) is most commonly used for stream water quality standards. The water quality of Namatala stream can be considered acceptable unless the stream flow is 7Q10 which was estimated to be 0.3 m^3/s and any diversion beyond the 7Q10 could degrade the water quality of the stream beyond the accepted standard (Chiang and Johnson, 176). There are numerous and diverse reasons applied to the use of the 7Q10 flow for regulation purposes. For critical protection of protection of aquatic life, on which effects of contaminants are felt over relatively short period of time, the critical low flow used for toxic contaminants is the 7Q10 (0.3 m^3/s). For the protection of uses that consider the development of long-term effects, a critical low flow estimated for a longer period of time is more suitable while remaining safe. For the drinking water sources, the consumption of aquatic organisms and terrestrial wildlife, the flow 30Q5 (0.4 m^3/s), is used. This corresponds to the minimum average flow over 30 consecutive days with a probability of recurrence of once every 5 years. For conventional parameters (TSS, phosphorus, BOD_5) and faecal coliforms, the critical low flow 7Q2 (0.5 m^3/s) is used, that is, the minimum average flow over 7 consecutive days with a probability of once every 2 years can be adopted for Namatala catchment.

Table 1: Minimum flow frequency analysis for N-day aggregation periods for River Namatala

Percent of Time Exceed	1	3	7	15	30	60	90	120	183
99	2.2	1.6	1.6	1.7	1.7	1.9	2	2.3	3
95	1.3	1	1.1	1.1	1.2	1.4	1.5	1.6	2.1
90	1.0	0.8	0.9	0.9	1.0	1.1	1.2	1.4	1.8
80	0.7	0.7	0.7	0.7	0.8	0.9	1	1.2	1.5
50	0.5	0.5	0.5	0.5	0.6	0.7	0.8	0.8	1.1
20	0.3	0.3	0.4	0.4	0.4	0.5	0.6	0.6	0.9
10	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.6	0.8
5	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.7
2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.7
1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.6
0.5	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.6
0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.4	0.6

The low variability of river catchment flow was reflected in relatively flat slope of the flow duration curve, the low flow range for river Namatala was between 70% to 99% of the flow duration curve though Q95 **(0.47m^3/s)** and Q90 (0.60m^3/s) are most used as low flow indices in most of the review government literature and academic sources. Since the Namatala is perennial stream Q_{95} (0.47 m^3/s) was adopted as an indicator of extreme low flow conditions for the catchment. Q5 (1.47 m^3/s) according to Metcalfe et al. (2003) can be used to recommend seasonal minimum discharges to waterpower project and provide a basis for protection of aquatic biodiversity

within the catchment. The use of Q95 and Q90 are varied are similar to the 7Q low flow indices. Similar to the 7Q10 flow, the Q95 flow can be used as a biological index for licensing of water takings and for effluent discharge limits. To examine the links between climate warming and low stream flow monthly Q90 and monthly Q50 (Table 2) can be adopted according to Yulianti and Burn (1998).

Table 2: Monthly flow duration analysis for River Namatala

Percent of Time Exceeded	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
99.0	0.33	0.33	0.35	0.41	0.64	0.50	0.44	0.62	0.5288	0.39	0.38	0.45	0.37
95.0	0.38	0.36	0.41	0.75	0.90	0.63	0.62	0.87	0.868	0.65	0.48	0.63	0.47
90.0	0.43	0.40	0.46	1.02	0.98	0.79	0.89	0.95	0.972	1.10	0.84	0.69	0.60
80.0	0.56	0.44	0.59	1.37	1.19	0.98	1.05	1.08	1.3842	1.31	1.01	0.79	0.86
50.0	0.83	0.66	1.03	2.79	2.05	1.56	1.90	1.85	2.4755	2.52	1.51	1.02	1.49
25.0	1.18	1.17	1.96	4.87	3.27	2.57	3.19	3.23	3.7032	3.62	2.57	1.49	2.85
15.0	1.40	1.48	2.67	6.12	4.53	3.32	4.20	4.37	4.4864	4.40	4.39	1.89	3.85
10.0	1.61	2.00	3.39	7.39	5.41	4.53	5.40	5.40	5.3579	5.35	6.85	2.34	4.90
5.0	3.14	2.65	5.01	10.97	7.73	6.00	7.30	7.31	7.4558	7.62	15.19	5.86	7.17
2.0	4.31	5.66	9.54	15.74	9.93	8.00	10.03	11.16	9.9632	11.10	18.24	8.62	10.57
1.0	7.04	10.09	10.58	19.31	12.92	11.54	11.51	16.21	11.3858	15.67	25.03	10.27	14.90
0.1	8.31	23.49	20.25	29.05	19.03	22.39	27.11	31.90	25.332	21.68	41.06	25.42	29.16
Min	0.33	0.33	0.33	0.38	0.56	0.462	0.41	0.59	0.407	0.34	0.38	0.38	0.326
Max	8.31	23.48	20.25	29.05	19.03	22.388	27.11	31.90	25.332	21.68	41.06	25.42	41.057

Flood flow analysis: Annual peak daily flood flows were picked from the record of 17 years (1997 and 2014) and the frequency of occurrence computed as probability of exceedance and return period in years. The partial duration series was adopted to cater for such issues by considering all independent peaks which exceed a given threshold. The highest flood of 41.06 m^3/s was recorded in November 1997. The peak flows for Namatala catchment ranged between 41.06 m^3/s to 6.10 m^3/s with mean peak flow of 10.27 m^3/s. Because of the short record of data (15 years), the Q95 exceedance flood was estimated by extrapolating the frequency curve. Q95 annual flood was estimated at 6.24 m^3/s. Flood flow at Q50 (1.4925 m^3/s) less reserve flow Q95 (0.457m^3/s) leaves a balance of 1.0355m^3/s.

The Pearson Type III distribution with log transformation of the flood data (Log-Pearson Type III) is recommended as the basic distribution for defining the annual flood series (USWRC, 1967; IACWD, 1982; Griffs and Stedinger 2007b). The peak flows extracted from time series were fitted on Log Pearson Type 111 distribution to perform a flood frequency analysis for Namatala. A flood frequency curve was constructed at catchment outlet to show how often flood discharges of different sizes (magnitudes) will be equaled or exceeded. A plot of ranked extreme value and probability of exceedance yielded the frequency curve for catchment. K factors for a particular return period at corresponding coefficient of Skewness were obtained from the frequency tables. Using the general equation, extreme events at each return periods Tr were obtained. Table 3 shows flood events for different recurrent intervals based on Log-Pearson Type 3 distribution model.

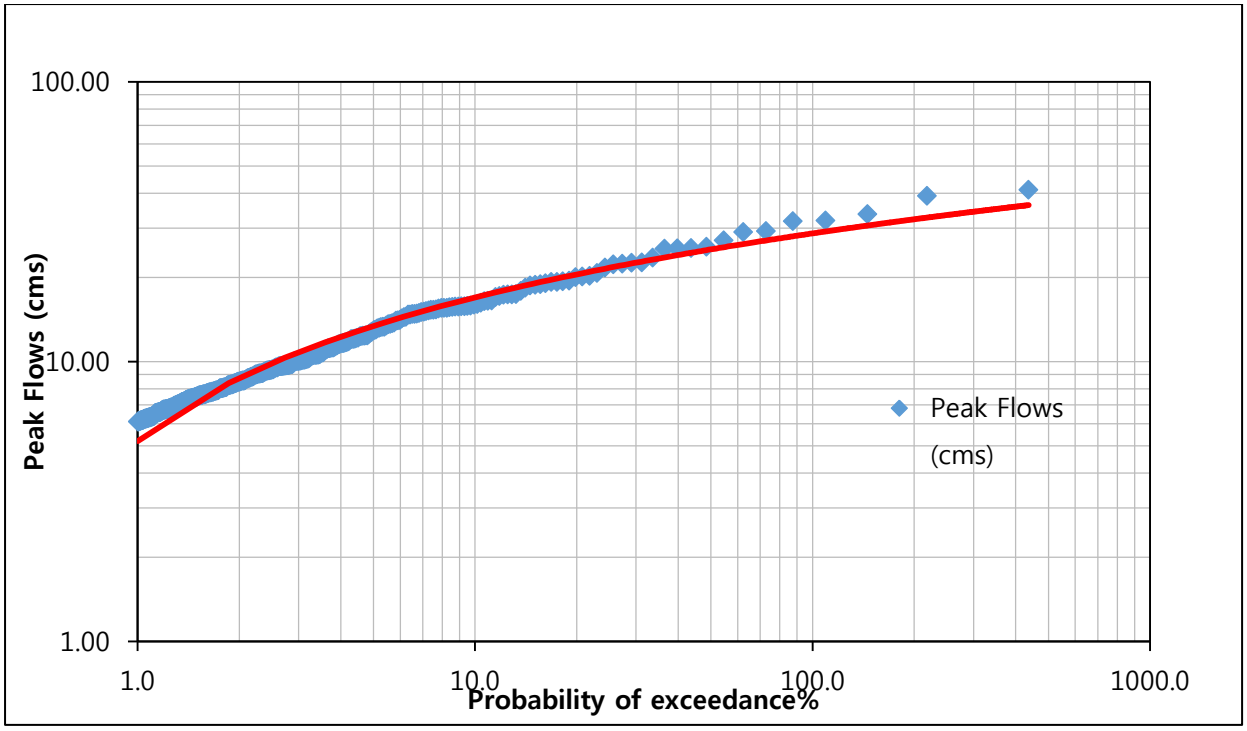

Figure 8 Analytical frequency curve for Peak flow for Namatala catchment

Table 3: Flood events for recurrence intervals of interest for Namatala Stream

Recurrence Interval	**2**	**5**	**10**	**25**	**50**	**100**	**200**
Frequency Factor **(K)** at coefficient of Skewness Cs	-0.195	0.732	1.34	2.087	2.626	3.149	3.661
Log X	0.94	1.10	1.20	1.32	1.41	1.49	1.58
Antilog X	**8.78**	**12.47**	**15.69**	**20.82**	**25.52**	**31.11**	**37.75**

Since there are seasonal variations during which the storms or floods do not occur or are not severe and other seasons when they are more severe, also damages associated with flood often vary with season of the year, thus it was important to establish frequency curves for each month based on the maximum flows for n-days aggregation period. The annual, seasonal or monthly maximum series of discharge is frequently required for flood analysis, whilst minimum series may be required for drought analysis.

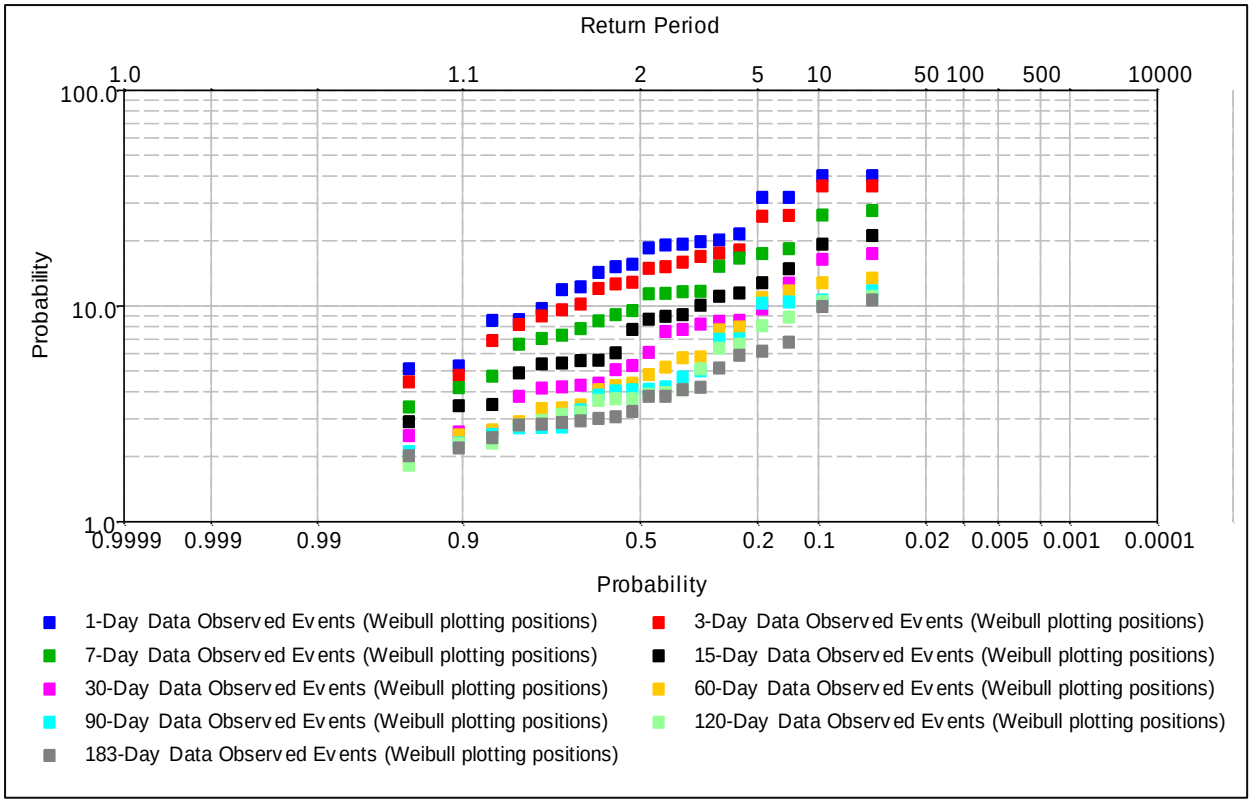

Figure 9 Maximum volume frequency analysis for Namatala

Table 4: Maximum volume frequency analysis for N-day aggregation periods

Percent of Chance Exceedance	1	3	7	15	30	60	90	120	183
0.2	78.6	74.8	55.5	47.2	42.3	32.2	27.5	25	24.1
0.5	66.9	61.6	45.8	37.4	32.5	25.2	21.8	19.9	18.9
1	58.6	52.7	39.3	31.2	26.4	20.7	18.1	16.6	15.6
2	50.7	44.6	33.3	25.8	21.4	16.9	15	13.8	12.8
5	40.7	34.9	26.2	19.7	15.9	12.8	11.4	10.5	9.7
10	33.5	28.2	21.3	15.7	12.5	10.1	9.1	8.5	7.7
20	26.4	22	16.7	12.3	9.6	7.8	7.1	6.6	6
50	16.7	14	10.8	8.1	6.3	5.2	4.6	4.4	3.9
80	10.5	9.2	7.2	5.8	4.6	3.7	3.3	3.1	2.8
90	8.2	7.5	5.9	5	4	3.2	2.8	2.7	2.4
95	6.7	6.4	5.1	4.4	3.7	2.9	2.5	2.4	2.2
99	4.6	4.7	3.8	3.7	3.2	2.5	2.1	2	1.9

6 Conclusions of Namatala Assessment

The dry season flow is relatively high 1.49 m^3/s for River Namatala compared to anticipated water demand of 0.313 m^3/s. Though lower flows can be experienced at the proposed abstraction point nevertheless the absolute

minimum flows (0.326 m^3/s) are still greater than the water supply demand required by 2040. The mean flow was estimated at 2.67 m^3/s while flows exceeded 95% and 99% of time was estimated to be 0.52 m^3/s and 0.37 m^3/s respectively. The analysis suggests enough water is available to meet water demand by design horizon of 2040; will having flow left for environmental issues for downstream users. However, minimum EF for the Project needs to be considered. Refer to Annex K for the determination of minimum EF for the Namalata River downstream of the proposed intake.

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APPENDIX C: ECOLOGICAL REPORT

DESCRIPTION OF THE BIOLOGICAL ENVIRONMENT IN THE PROPOSED PROJECT AREAS FOR THE ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT OF THE WATER AND SANITATION DEVELOPMENT FACILITY IN EASTERN UGANDA IN MBALE AND BUTALEJJA

FIELD SURVEY TEAM

Dr. Robert Martin Kityo – Team Leader

Samuel Mutebi - Plants

Herbert Kasozi - Mammals

Micheal Kibuule - Birds

Sadic Waswa - Hepertiles

1 GENERAL INTRODUCTION

The Ministry of Water and Environment throughWater and Sanitation Department, implements the Water and Sanitation Development Facility – East (WSDF-E) in 39 districts of eastern Uganda including Manafwa, Mbale, Butaleja, Pallisa and Budaka. This is focused on development of piped water systems in Small Towns and Rural Growth Centers, expansion and rehabilitation of existing schemes in participating districts, execution of planned/uncompleted activities inherited from the North Eastern Towns Water and Sanitation Project (NETWSP) addressing water supply and sanitation, establishment of structures to ensure sustainable operation and maintenance of newly constructed water supply systems. These activities have capacity to cause impacts on the biological diversity especially during the development and implementation phase.

The set environmental protection and conservation policies, laws and regulations require all development activities with capacity to adversely affect the environment (social, physical and biological) be subjected to Environmental Impact Assessment (EIA). This is based on the ground that projects that can cause adverse impacts on the social and bio-physical environment are anticipated, scored and alternatives thought before implementation.

Today phenomena of rapid loss and degradation of habitats and habitat fragmentations are listed as the most important causes of biodiversity loss in the contemporary world. These phenomena are happening across a range of natural and manipulated ecosystems, including sensitive areas such as watershed, riparian ecosystems, biodiversity hotspots and protected areas. Environmental sustainability and future depend on conservation of biodiversity and maintenance of life support systems, which are being affected by human activity. This devastation of biodiversity and general degradation are taking place in the wake of minimal monitoring of various biodiversity and ecological aspects. Therefore in an attempt to develop a system or mechanisms for timely interventions to minimize impact of human activity on biodiversity and ecosystem health, all development projects (small, Medium to large) are subjected to environmental impact studies so as to assess their impact on the biological diversity, and set the required monitoring indicators necessary to conserve and maintain the integrity of ecosystems and habitats were different taxa thrive. This served as the basis for vegetation and flora studies, to assess the impact of water developed activities in the district of Mbale and Butallejja, all in eastern part of Uganda on vegetation and flora diversity, which is the primary terrestrial and semi-aquatic habitat component.

2 PURPOSE OF THE STUDY

The study aimed at:

i) Ascertaining species richness and diversity; identifying species of conservation concern (in terms of range restriction, rarity and threat), identify ecologically sensitive sites, altered habitats and provide a quick review of vegetation and flora assemblages at the proposed site.
ii) Carry out detailed baseline survey on fauna within and around the project area.
iii) Mammals: The surveys were essentially aimed at;
iv) Identifying and assessing potential impacts of the project on the species and their habitats.
v) Proposing mitigation/management measures and a monitoring protocol necessary to minimize negative impact on the species and habitats.

3 BIODIVERSITY RATIONALE

Plants, birds, small mammals, amphibians, reptiles, fish and butterflies, satisfy most of the criteria specified for good indicator groups that can be used for environmental evaluation and monitoring (Pearson, 1995; Pollard, 1977). These taxa are taxonomically well-known and stable; their populations are readily surveyed, and may be specialized in most cases within a narrow range of habitats. All taxa are sensitive to environmental change and anthropogenic modifications, and as such serve as ideal indicators of habitat condition. For this reason, plants

that form a basis for most terrestrial and sub terrestrial habitats were targeted during focused rapid habitat assessment survey across the proposed pipeline area.

Herpetiles: Although Uganda covers just 241,551 Km^2 and accounts for only 0.18% of the world's terrestrial and fresh water surface, Uganda is also considered as one of the world's biodiversity hotspots. there are however instances where it is required that the natural environment is transformed to other forms of utilization such as infrastructural development, with these changes happening, there is always a need for an assessment of the extent to which the ecosystems and the biodiversity there in will be affected is important.

Ecologically, amphibians are important; they are mostly predators, acting as primary and secondary carnivores. Their prey consists mostly of insects, some of which are pests to crops or disease vectors. They are also inter-linked in food chains, often acting as food for other vertebrates, such as cats, birds, snakes and sometimes man. Amphibians are known to be an easily recognizable taxon in given habitats; and populations are sometimes specialized within a narrow habitat. This makes it easy and practical to monitor changes in composition over time, given different conditions (Heyer *et al.,* 1994). Impacts on their habitat are reflected in changes in numbers and species diversity in a short time. These are some of the factors that have made amphibians to be recognized, as good indicators of habitat change.

Reptiles are important in nature. They are important predators within the food webs of their habitats. As such, they help keep animals that humans regard as pests under control.

Given their sensitivity to habitat alteration and pollution, amphibians may serve as indicators of overall environmental health. Amphibians are bio indictors of an altered ecosystem and are very sensitive environmental monitors. Significant declines could indicate deterioration in the quality of the environment. This role as indicators can be based on the assumption that the adverse effects of environmental degradation will be reflected in reduction of hepertilian diversity (Magurran, 1988). Amphibians unlike people respire at least partly through their skin making them much sensitive to environmental disturbance (IUCN/SSC, 2003).

The eggs and embryos of frogs in wetlands are very sensitive indicators of any adverse changes in the water chemistry (Channing, 2001).

4 STUDY AREA

Birds: Twelve study sites were randomly and or subjectively selected along the pipeline route. Each site was visited once and at different times of the day, the counts went on well despite two occasions of rainfall in the first two site counts (Namatale and Kama-Lower). Generally, the area to be affected has mainly two habitat components; Most of the area surveyed is cultivated and the rest is covered by wetlands. Bananas, Maize, indigenous and exotic trees dominated most of the agricultural area. Most wetland sites are being used for rice growing. Human settlement facilities (houses) along the route are relatively low. The study identified three major bird critical areas; this was based on the nature of the site, number and nature of the bird species composition in such areas. The most critical area is Doho rice scheme which is an Important Bird Area, the second area is the one inhabited by Namatale River (proposed water source for the project) and the third is Manafwa water treatment plant area. The opportunistic observations in all the selected twelve sites brought the total number of species see to 119 out of 1040 currently known from Uganda (Nature Uganda, unpubl). Site species list was here attached as an appendix.

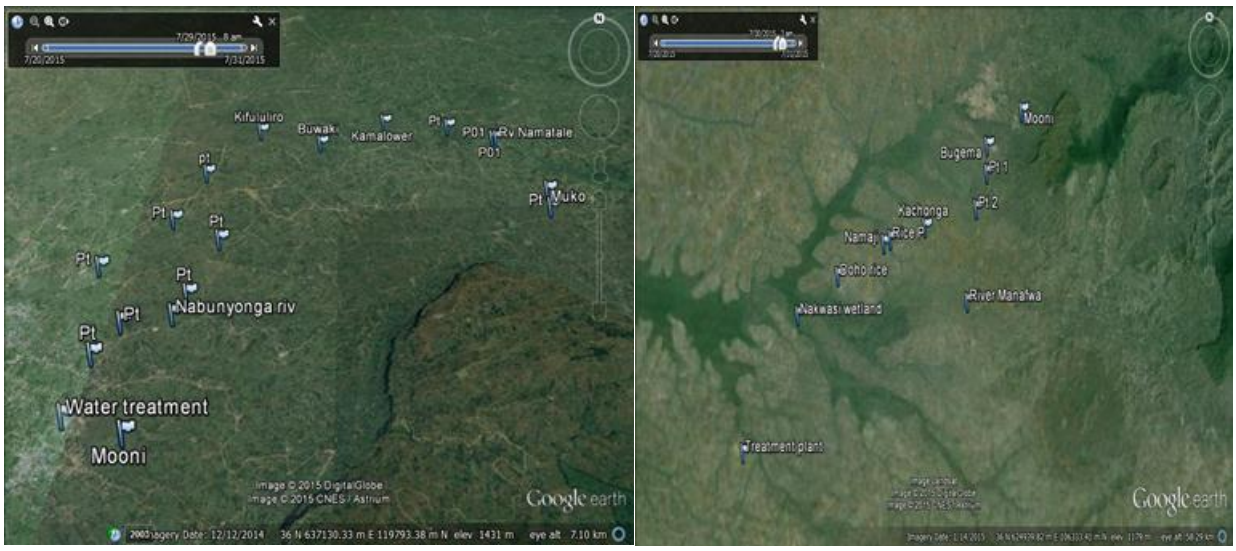
Plants: Vegetation forms the basis for occurrence of all the other components of biodiversity since it serves as food for many animal groups, provides and shapes habitats in which they stay and regulates many survival functions of ecosystems. These latter include climate moderation, control and/or moderation of runoff and flooding, controlling erosion, and maintaining the balance of vital gases (Oxygen, and Carbon dioxide among others) in the atmosphere. Plant species richness and habitat occurrence were surveyed in the project areas to

inform about the habitat integrity and species richness and therefore to gain an understanding of the potential negative impacts that could arise from the proposed development.

The survey was conducted within a radius of 100m of the proposed water pipeline, within 250m at mini reservoir sites (Mooni and Busolwe) and major water treatment sites of Manafwa and Mukhubu. The choice of the survey sites was largely influenced by the sensitivity of the habitat either for protection/conservation of biological resources or habitat variability. Fortitudes however were made to get the position where most disturbances were expected to be.

Three pipelines which include a pipeline from Bumadirila intake to Mukhubu water treatment plant???; Mbale town to Manafwa treatment plant and Mbale –Busolwe pipeline were chosen for the study see fig 1(a) and (b) below.

Studies were also done at sites of the mini water reservoirs of Mooni and Busolwe. The Bumadirila–Mukhubu pipeline covered the following villages; - Bumadirila, Kama lower, Makku, Buwaki B, Makhosi, Kifululiro, Makudui and Nankobe all in Mbale district. The second pipeline from Bugema town to Manafwa treatment plant covered villages of Bugema town, Bungokho, Busooba, and Manafwa where the treatment plant is located; all these are also in Mbale. The Mbale-Busolwe pipeline pass via Buhumwa, Kachonga Nampologoma, Naweyo, Namazi, Doho irrigation scheme, Lwabi & Nakwasi wetland, Nakwiga and Busolwe town to the mini water reservoir on Busolwe –Tororo road.



a) Bumadirila intake point to Mukhubu treatment plant

b) Bugema- Manafwa and Mbale- Busolwe pipelines

Figure 1 Satellite imagery showing the pipeline route surveyed

Hepertiles: The project is going to be implemented in Mbale district within the Mountain Elgon conservation area and Butalejja. Part of the study Area is in the foothills of Mountain Elgon but most is along settlements in Mbale district and Butalejja. The climate is moist to moderate dry with an annual rainfall of over 1,270mm (http://www.ugandawildlife).

5 METHODS

Plants: Specific points along each pipeline were identified for vegetation and flora studies. All these sample sites were geo-referenced (figure 1) producing a baseline of information on the basis of which future impacts could be

evaluated. Characterization of the project area was based on the floristic, and landscape features observed at the different sites. The sample points were effectually random points along the proposed pipeline and existing community roads.

The area traversed by water pipeline is relatively large and traverses largely through built up environment, extensive subsistence farmland including coffee and banana plantation, and seasonal and permanent wetlands including Lwabi and Nakwasi wetland system. The pipeline area negotiates steep slopes, valley bottoms and flat lands but it largely follows the river course in many places. Ninety five percent (95%) of the natural vegetation stands have therefore been modified for settlement and agricultural purposes and as such vegetation cover is already of a modified state. This was done to provide information necessary for ascertaining species richness and diversity; identifying species of conservation concern (in terms of range restriction, rarity and threat), identify ecologically sensitive sites, altered habitats as well as providing a quick review of vegetation and flora assemblages at the proposed site.

During the course of vegetation and flora baseline studies, data were sourced from possible areas through desk-based studies. These reinforced findings of the field surveys conducted from the proposed site for pipeline development. The field survey was conducted in July 2015 to collect further site-specific information on habitats and species presence. Global Positioning System (GPS) units were used to record the geographical coordinates of the survey locations. The vegetation specialist traversed the proposed site making points of interest depending on the set objectives. Photographs were taken and notes made at each different point of interest to record the habitat and species of flora as well as landscape features of importance.

Species richness, abundance, invasive, and sensitive habitat were investigated. Sensitivity of habitats was assessed from presence of i) threatened taxa in accordance to IUCN conservation assessment, ii) rarity, iii) endemism; presence of iv)fragile watersheds, v) steep slopes, and vi) riparian areas.

Transect: During the actual field surveys, records of the features of the landscape and environment including the dominant habitats and common species within the survey area, were made along transects. A transect method was used to sample the vegetation and flora in the proposed pipeline areas from the three pipelines. Vegetation types traversed by each transect was identified. Along each transect estimation of species abundance on DAFOR scale, presence of disturbances, signs of usability and presences of invasive species were made at determined points in a space of 20 m radius. Opportunistic recording of species not recorded at the regular survey locations was done in between survey locations. The three transects were designed to follow the 3 pipelines as designed.

Photo 1: Bumadibira intake – Maize gardens and Eucalyptus woodlots

Photo 2: Banana plantation at Buwaki along Bumadibira-Mukhubu pipeline

Photo 3: A remnant bushland patch along Madibirila-Mukhubu pipeline

Photo 4: Manafwa river and treatment plant

Photo 5: Eucalyptus woodlot along Mbale-Busolwe pipeline

Photo 6: Doho irrigation scheme-rice gardens

Images captured in different sections of the proposed project area which demonstrate the already human impacted nature of the landscape are presented in Photos 1 to 6. These kinds of scenario suggest the areas are no longer natural, but never the less they will still have a biodiversity value for species that stay on even in agro-ecosystems.

The vegetative communities in the study area were classified using the Langdale-Brown et al. (1964) system. This system recognizes 22 ecosystem types, identified by letters between A to Z. Although the Langdale-Brown (L-B) system is now 50 years old, it was used in preference to the more recent National Biomass Study (1996) for several reasons as indicated by Van Breugel*et al,*. 2011). The L-B system is based on plant community composition rather than just plant biomass, which was more relevant to the goal of characterizing vegetation and identifying sensitive habitats. Secondly, although much of Uganda's vegetation has been extensively altered over the past few decades the L-B system can still be considered to represent the potential of an area to support an ecosystem type, which is relevant for a study of environmental impacts (Kalema J, et al,. 2010, Pomeroy D, et al,. 2002). Finally the L-B system provides 22 vegetative categories compared to the 13 adopted by the National Biomass System (USAID 2014), this greater level of resolution allows us to assess the potential impacts of water development project on ecosystems at a finer scale.

Herpetiles: Field data was obtained by conducting a survey of amphibians and reptiles in and around Mbale and Butalejja water pipeline project area. Various methods i.e. Visual Encounter Surveys, opportunistic surveys and local consultations were used. The species were identified, counted and recorded. The conservation status of the hepertofauna is reported using the IUCN Red Listing (IUCN 2014).

Visual Encounter Surveys (VES) - This method involved walking through the study areas or habitats for a prescribed time period systematically searching for amphibians turning logs or stones, inspecting retreats, watching out for surface-active species and listening out for frog calls. Visual encounter survey method is commonly used to determine the species richness of an area, to compile a species list and to estimate relative abundances of species within an assemblage.

Opportunistic Encounters - This method involves recording any amphibian or reptilian species encountered anywhere and at any time within the study area, or brought in / reported by local people. Opportunistic searches were used to maximize the number of species encountered in the study area.

Local Consultations - Local people are a valuable source of information since they are constantly in touch with their environment; they encounter amphibians and reptiles of different kinds as they carry out their daily activities. We talked to some local people who informed us about the availability of some species of reptiles and amphibians. Some of the records were later confirmed by encountering some of them in the field. The reptiles and amphibians were identified using standard reference books available namely; Schiotz (1972) and Drewes (2006).

Mammals: These are some of the principal biodiversity components of great importance in environmental assessment and conservation planning. They are often used as indicators of environmental health and continue to be of great value in conservation decision making. This is largely due to their ecological importance (as regulators of food chain, seed dispersers, regulators of communities of plants and other animals etc.) and economic importance as food sources, tourist attractions, and disease vectors among others. They are included in the environmental impact assessment studies of the impending water development works as part of the Mbale water and sanitation project. This report among other things outlines the results of a mammal survey conducted as part of the latter project.

Village transects and Consultations - A reconnaissance tour around the project area was conducted to identify areas of conservation importance and those suitable for sampling. In this effect a drive through was conducted and no site was identified as being a critical mammal habitat. Transects were moved through the villages on foot to identify any prospects of mammal presence (especially through foot prints and dung deposition) and to consult the local people. The consultations basically involved asking local people of the animals they encounter in their day to day activities. Respondents were picked randomly and responses from all were collated to generate one species list for the area.

Opportunistic encounters - This involves opportunistic sightings while moving through the project area. These records are ideally not from designated sampling areas but within the larger project area. They are essential in enriching the species list of the project area. While moving through the villages, different animals were opportunistically encountered.

Birds: Site species composition was managed by Timed Species Count (TSC) method (Pomeroy 1992), where all species positively identified were listed in order seen or heard. For each site each TSC lasted for 40 minutes. To make the count, we moved slowly around the study sites listing any species which were anywhere within the

site, regardless of how far away from the transect, species flying over the transect were also recorded. Along each count, predominant vegetation type of the habitat was recorded

Twelve sites were randomly and or purposively selected basing on habit type and expected species abundance and richness. Four were predominantly wetland sites (Doho rice scheme, Bugema, Manafwa and Busolwe). Whereas eight sites where predominantly agricultural and these include; Namatale, Kama-lower, Makhosi, Bungukho, Buwaki, Makudui, Mooni and Kifuluriro.

6 RESULTS

6.1 Vegetation and Flora

The area traversed by the pipeline from Bumadirila intake to Mukhubu treatment plant cuts across built up area, subsistence farmland (including maize, banana, coffee, Ground nuts, and sugarcane gardens), woodlots (including Eucalyptus spp, Pinus spp, and *Grevilia robusta*), and mixed woodlots of *Eucalyptus, Pinus, Tectonia, Maesopsis eminii, Albizia* spp*, Milicia excelsa & Azadirachta indica)* and patches of post-cultivated light bushland and grassland with scattered trees. The Bugema-Manafwa pipeline crosses built up area including small towns and linear settlement along the Mbale-Tororo road, subsistence gardens mainly maize, taro (wetland yams), rice, cassava and Banana. It also cuts across a small patch of fallow land dominated mainly by herbaceous plants of *Bidens pilosa, Panicum maximum* and *Sorghum arundinaceum*. The Mbale-Busolwe line traverse through built up area, subsistence gardens of maize, banana, Potatoes, Beans, cassava, and rice; it also cuts across extensive rice farmland of Doho irrigation scheme, and the only remnant *Cyperus papyrus-Cyperus dives* swamp in areas of Lwabi and Nakwasi. Table 1 below gives a description of the vegetation type and major/dominant flora from all the three pipelines.

Table 35: Vegetation types and dominant species at the project site

Pipeline route	Vegetation description	Dominant species
Bumadibira –Mukhubu Pipeline	✓ Subsistence farmland ✓ Post cultivated grassland with scattered trees ✓ Post cultivated light bushland ✓ Woodlots	- *Zea mays* - *Coffea spp* - *Musa sp* - *Albizia coriaria* - *Mangifera indica* - *Thevetia peruviana* - *Synedrella nodiflora* - *Saccharum officinarum* - *Psidium guajava* - *Persea amaricana* - *Maesopsis eminii* - *Manihot escelenta* - *Markhamia lutea* - *Cymbopogon nardus* - *Cynodon dactylon* - *Artocarpus heterophyllusEucalyptus grandis* - *Grevilia robusta*
Bugema- Manafwa pipeline	✓ Subsistence farmland ✓ Post cultivated grassland with scattered trees ✓ Post cultivated light bushland ✓ Woodlots	- *Zea mays* - *Oryza sativa* - *Acacia polyacantha* - *Cynodon dactylon* - *Markhamia lutea* - *Eucalyptus grandis* - *Tithonia diversifolia* - *Grevilia robusta* - *Persea americana* - *Psidium guajava*

Pipeline route	Vegetation description	Dominant species
		- *Milicia excelsa* - *Manihot esculenta*
Mbale- Busolwe pipeline	✓ Subsistence farmland ✓ Post cultivated grassland with scattered trees ✓ Post cultivated light bushland ✓ Woodlots ✓ Cyperus swamp	- *Oryza sativa* - *Zea mays* - *Artocarpus heterophyllus* - *Albizia coriaria* - *Grevilia robusta* - *Pinus caribaea* - *Panicum trichocladum* - *Senna siamea* - *Senna spectabilis* - *Sesbania sesban* - *Mangifera indica* - *Manihot escelenta* - *Markhamia lutea* - *Ficus natalensis* - *Ficus ovata* - *Eucalyptus grandis* - *Cyperus dives* - *Cyperus rotundus* - *Cyperus papyrus*

The images in Table 2 highlight the fact that except in a few sections covered by species of *Cyperus*, the natural vegetation cover in general landscape is already very much simplified in some cases into mono-cultures such as rice growing.

				
Zea mays and ground nuts garden with scattered *Albizia-Mangifera-* *Erythrina* trees at geographical coordinates N1.11437 , E34.22278	Post cultivated mixed light bushland in between gardens and a small river at geographical coordinate N1.09439, E34.20867	*Zea mays* garden at geographical N1.10399, E34.21481 along Ndega road	*Eucalyptus* woodlot along Mbale- Busolwe route.	*Cyperus dives* wetland along Mbale –Busolwe pipeline route. This is continuous with Nakwiga *Cyperus* papyrus swamp
				
Eucalyptus woodlots, *Musa* sp gardens and *Zea mays* gardens at Bumadibira intake Point	*Eucalyptus-Grevilia* woodlot, Banana plantation with scattered tress of *Milicia excelsa, Ficus natalensis; Zea mays* and Ground nuts gardens besides Mooni mini water reservoir. Geographical coordinate N1.06215, E34.21148	Open grassland with scattered trees of *Mangifera indica* at Mukhubu water treatment plant.	*Cyperus papyrus* swamp along Mbale- Busolwe pipeline. This is located a few kilometers from Doho irrigation scheme. It's the only natural intact vegetation remnant within the project site. Its edges are affected by *Oryza sativa* growing.	Busolwe mini water reservoir in a seasonally flooded grassland located along Busolwe – Tororo road
				
Oryza sativa, *zea mays* gardens and *Eucalyptus* woodlot in a reclaimed wetland on the Mbale- Tororo high way within Bugema village.	Banana plantation along Bugema –Manafwa pipeline route.	Mixed *Casuarina- pinus* woodlot along the Bugema-Manafwa pipeline route	*Oryza sativa* at Doho irrigation scheme	

Photo 7: Vegetation types along the three proposed Pipeline routes

Species Richness: The surveyed sites yielded a total of 149 plant species in 120 genera and 40 families in the sampled areas altogether of which 44 species were trees and 31 shrubs. Figure 3plots the species richness by growth form and appendix 1 presents the full list of all plants encountered. While shrubs and trees encountered formed the woody biomass in the study area, they are found scattered in extensive crop land.

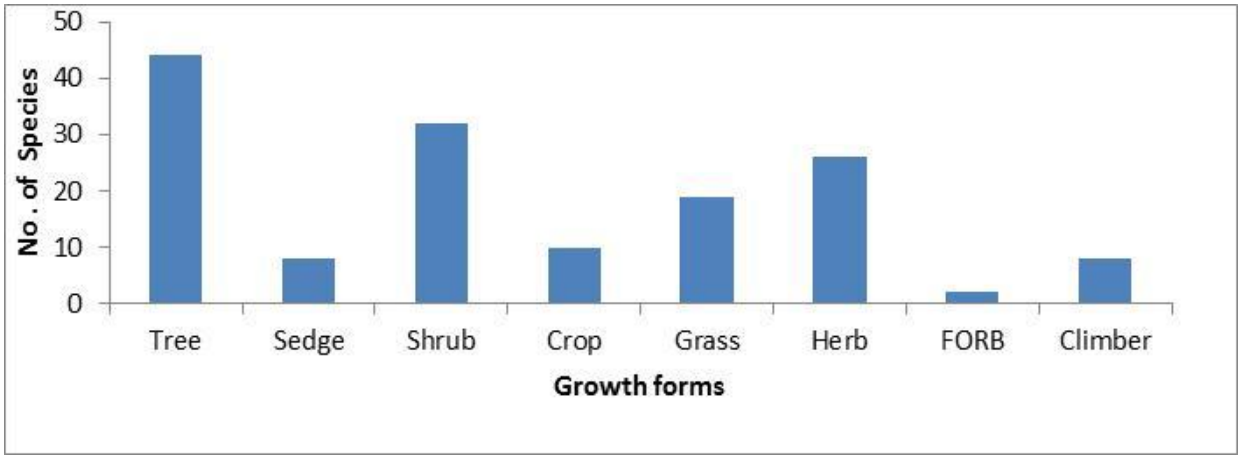


Figure 3 Distribution of the recorded plant species in the different growth forms

Species of conservation concern: Some plant species of conservation concern (in terms of range restriction, rarity, and threat) were observed in the project area. These include the following:

d) Species recorded that are listed by IUCN

Milicia excelsa is one of the species listed under IUCN Red List of Threatened Species, version 2015.3I as a nearly threatened species (IUCN red list (2015)). This species is sparsely distributed within the project site.

e) Species recorded that are listed by NFA

Milicia excelsa, Tarmarindus indica, Markhamia lutea andMaesopsis eminii are all on Uganda's National Forestry Authority Reserved Species list, and are therefore protected from exploitation and threat to their habitats. *Milicia excelsa* is on the list because of commercial logging and its use for timber, specifically for quality indoor and outdoor furniture, firewood and charcoal. The fruits of *Tarmarindus indica* are commonly used as food but are threatened with felling for fuel wood. *Maesopsis eminii*and *Markhamia lutea* are used for poles, timber and fire wood.

f) Invasive species

The following species are all a result of introduction in Uganda, with a large potential to suppress the indigenous species of plants (Global Invasive Species Programme 2003):

v) ***Eichhornia crassipes*** is one of the most notorious invasive species that has been recorded in the fresh waters of Uganda and beyond (Howard & Matindi 2003). It was recorded from permanent Cyperus papyrus swamp along Mbale-Busolwe pipeline.

vi) ***Mimosa pigra*** is a moist ground invasive shrub capable of covering large parts of wetlands once disturbances are chronic. This is scattered within the reclaimed wetlands especially along the Bugema-Manafwa pipeline.

vii) ***Lantana camara*** invades areas that are drier than *Mimosa pigra*. Both species thrive with disturbance (Cronk & Fuller 2001). Their presence makes the indigenous flora in any given area susceptible to suppression effects (Global Invasive Species Programme 2003).
viii) ***Other invasive species*** encountered include*Senna siamea, Senna spectabilis* and *Ricinus communis.*

However, since the project impact zone is very narrow and small, little destruction of valuable species is expected.

6.2 Hepertiles

Most of the Water pipeline is going to pass through settlements and a few areas with pertinent biodiversity concerns. A total of 13 species of Hepertiles were recorded in the entire project area.

Intake: This is located along river Namatale in Bumadibira, it's mostly dominated by cultivated areas with patches of fallow lands. Six species were recorded here; they are *Ptychadena mascareniensis, Mabuya striata, Amietophrynus maculirabris, Hyperolius viridiflavus, Hyperolius kivuensis* and *Amientia angolensis*

Reservoir: There are two mini water reservoirs in Mooni and Busolwe. Both of the reservoirs are located in settlement and cultivated areas. Busolwe is located in Butalejja while mooni is located in Mbale. Specimens recorded in the two areas area; *Hemidactylus brookii Mabuya striatus* and *Acanthocercus atricolis.*

Treatment plant: This is located in Bungokho a settlement area, two hepertiles were recorded here ie *Mabuya striatta* and *Acanthocercus atricolis.*

Water pipeline route: Most of the areas through which the pipeline will pass are located in settlement and gardens. However a few areas especially along small streams, rice puddles, fallow lands and swamps represented some of the areas from which hepertiles were recorded.

River Namatala: This is located at 0640501N, 0122858E with most of its banks heavily cultivated. Are total of 10 species were recorded from this survey point, they included; *Phrynobatrachus natalensis, Hyperolius viridiflavus, Amietophrynus maculatus, Amietophrynus regularis, Amietia angolensis, Xenopus victorianus, Haplobatrachus occipitalis, Mabuya striata, Mabuya maculilabris* and *Acanthocercus atricolis.*

Three species of amphibians were recorded at a small stream right after Bugema town along Tororo road (630936 N, 113848 E). The species include *Phrynobatrachus natalensis, Ptychadena mascareniensis* and *Psammophis mossambicus*

Rice puddles in the Doho irrigation system had a reasonable number of amphibian species abundance. *Ptychadena mascareniensis* was the most abundant. Other species recorded are, *Amietophrynus maculatus* and *Phrynobatrachus natalensis,.*

Nakwasi wetland, is a papyrus swamp located at 610162 N, 102613 E, its part of the Kyoga wetland system with permanent standing water. Species recorded hear are *Hyperolius nasutus, Hyperolius viridiflavus, Xenopus victorianus, Haplobatrachus occipitalis, Naja melanoleuca,* and *Ptychadena mascareniensis.*

The conservation status of amphibians in Uganda is generally unknown because of data deficiency. However, according to the IUCN Red List Category, all amphibians recorded during the study are of least conservation concern.

Table 3: Amphibians fauna of Mbale water pipeline project

Species	Common Name	IUCN Status
Amientia angolensis	Angola River Frog	Least Concern (LC)
Ptychadena mascareniensis	Mascarean frog	Least Concern (LC)
Phrynobatrachus natalensis	Natal puddle frog	Least Concern (LC)
Xenopus victorianus	Victoria clawed frog	Least Concern (LC)
Hyperolius kivuensis	Kivu reed frog	Least Concern (LC)
Hyperolius viridiflavus	Common reed frog	Least Concern (LC)
Hyperolius nasutus	Sharp nosed reed frog	Least Concern (LC)
Amietophrynus maculatus	Flat backed toad	Least Concern (LC)
Haplobatrachus occipitalis	Common bull-frog	Least Concern (LC)
Amietophrynus regularis	Common toad	Least Concern (LC)

Table 4: Reptilian fauna of Mbale water pipeline project

Species	Common Name	IUCN Status
Mabuya striata	Striped Skink	Not Evaluated
Naja melanoleuca	Forest water cobra	Least Concern (LC)
Psammophis mossambicus	Olive sand snake	Least Concern (LC)
Acanthocercus atricolis	Blue headed Agama	Least Concern (LC)
Mabuya maculilabris	Speckled skink	Least Concern (LC)
Hemidactylus brooki	Brook's gecko	Least Concern (LC)

6.3 Mammals

Species accounts: A total of 7 mammal species were recorded in the project area (Table 5). Six of the encountered species are listed as Least Concern (LC) on the IUCN Red List of Threatened Species (Version 2015.2). The Leopard (*Panthera pardus*) is listed as Near Threatened (NT). This however does not raise any conservation issues as the animals seen or noticed to appear around the villages are vagrants from the forests of the Wanale Mountain only wandering through the villages at night. The critical habitats where these animals come from are beyond the project scope therefore will not be affected.

Current state of the habitats: The habitats along the pipeline are majorly human settlements, small towns and cultivated areas with a range of crops including cassava, maize, bananas, rice etc. There are majorly fruit trees interspersed with in, the most notable ones including Mango (*Mangifera indica*), Ovacado (*Persea americana*) and Jack fruit.

Table 5: Mammal species recorded in the project area and their conservation status

Common Name	Scientific Name	Conservation Status
Side Striped Squirrel	*Euxerus erythropus*	LC
Leopard	*Panthera pardus*	NT
African Grass Rat	*Arvicanthis niloticus*	LC
Striped Grass Mouse	*Lemniscomys striatus*	LC
Savanna-hare	*Lepus victoriae*	LC
Common Jackal	*Canis aureus*	LC
Banded Mangoose	*Mungos mungo*	LC

The key sites of the project i.e. the water treatment plant (in Mukhubu village); the reservoir (in Mooni village) and the intake (in Bumadibira village) all form a continuum of human settlements, small towns and cultivated areas with no considerable conservation importance as far as mammals are concerned. The villages in the project area in Mbale surround the Wanale Mountain range. This is largely forested and is the most likely source of the reported wild animals in the villages. River Namatale is also an important habitat feature to point out in the project area.

A section of R. Namatale in Bumadibira

One of the cultivated areas in Makudui village

A section of the Wanale Mountain in Mooni village

A cultivated rice field in Nakwasi village

Photo 8: Different habitat sections in the project area.

Photo 8 demonstrates the nature of the vegetation cover at selected points in the pipeline routes. There is a clear absence of natural vegetation cover which has been cleared for either settlement or farmland. These kinds of areas do not hold significant populations (if any) of medium to large sized mammals. Small mammals will still continue to exist in the search areas although species with particular habitat requirements such as forest interior and/or intact wetland specialists will also be displaced and lost out.

6.4 Birds

A summary of the bird species richness and habitat preference of the birds recorded from the different survey points is presented in Table 6. Over all species that are dependent on availability of some tree stand (f – forest visitors) were the most numerous in most survey areas. There was a near absence of forest specialist species (FF) except for one species in the Makhosi area. Wetland species were also widely occurring although the numbers of species encountered were generally lower than those of the forest visitors.

Table 6: Number of bird species for each transect site in the categories shown

Sites		Doho	Manafwa	Mooni	Bungukho	Makudui	Bugembe	Busolwe	Kifuluriro	Makhosi	Buwaki	Kama-Lower	Namatale
Habitat Specialist	FF Forest specialist									1			
	F Forest generalist		3	3	1	3	4	1	2	1	1	1	2
	f Forest Visitor	7	13	11	12	17	16	7	14	12	7	13	15
	W Wetland specialist	18	3	1	1	1	13	10		2	2	1	3
	w Wetland associate	9	5	3	6	5	13	13	8	2	4	6	8
	G Glassland specalist	4	4	2	4	2	3	3	2	1	2	1	3
	Ae Aerial feeder	1	2	1	2	1	4	3	1	1	2	3	3
Migrant	P Palearctic	2		1	1	2	2	1	1	1			
	A Afrotropical	3	3	1	1	1	5	4	2	1		1	1
Conservation status	G-EN Globally endangered	1			1								
	R-Vu Regionally Vulnerable	2	1			1	1	4					2
	R-NT Regionally Near threatened	4	2		1	2	1	1	1	1			2
	R-RR Regional Responsibility	1	2	2	2		4	2	1	1	2	3	

The two globally endangered species identified were the Grey Crowned Crane *Balearica regulorum* and the Hooded Vulture *Necrosyrtes monachus* , Doho rice scheme is very important for breeding of the Grey Crowned crane (Gumonye-Mafabi 1991). However no information is known about breeding of the Hooded Vulture in the country. Forest species were well represented including one forest generalist; such numbers could be attributed to high numbers of local trees in the cultivated areas and especially areas close to Mt Elgon. The number of wetland species was high especially in areas around Bugembe, Busolwe, Doho and Manafwa.

Aerial feeders such as, Palm swifts, little swifts and Angola swallows where numerous throughout the study sites. Generally, number of Afro tropical species was higher than that of Palearctic species since the later are expected to return around September. Forest visitors and Grassland specialist where well represented, this could be due to too much rain in the area which impacted on the nature of vegetation and birds too.

c) Wetland dominated sites

Doho: Thirty seven (37) species were recorded, 1 of which is endangered (Grey Crowned Crane), 18 were wetland specialist. The Doho rice scheme (IBA) is known for its, in particular the large number of papyrus and terrestrial endemics. The area is important for the breeding of Grey Crowned crane (Gumonye-Mafabi 1991) which is classified endangered (Birdlife International 2015), and other species such as Black-headed Heron, Sacred Ibis and African Spoonbill (Byaruhanga per.comm).

The rice scheme is an important site for some migratory species and big congregations are occasionally recorded (Byaruhanga, Kasoma & Pomeroy 2001). Species such as the Black winged stilt, black-tailed Godwit and Spotted Redshank are sometimes numerous.

Photo 9: Part of Doho which formed part of the transect

Manafwa: There were 38 species, majority were forest specialist (13), nine were wetland birds, thre raptor species were observed saring into the sky above and they were; Brown Snake Eagle Circaetus cinereus which is a *Regionally Near Threatened* (R-NT) species, Dark Chanting Goshawk Melierax metabates and Lizard Buzzard Kaupifalco monogrammicus. There were several tree with Black headed weaver nests.

Busolwe: Opportunistic observations through this site resulted into 40 species; the most conspicuous species is the African Spoonbill *Platalea alba* (Photo 10).

Photo 10: Spoonbill

It is one the few areas in the country where spoonbills nest. Other species which nested together with spoonbills included, Long-Tailed Cormorant *Phalacrocorax africanus* , Black-Headed Heron *Ardea melanocephala* andCattle Egret *Bubulcus ibis*.

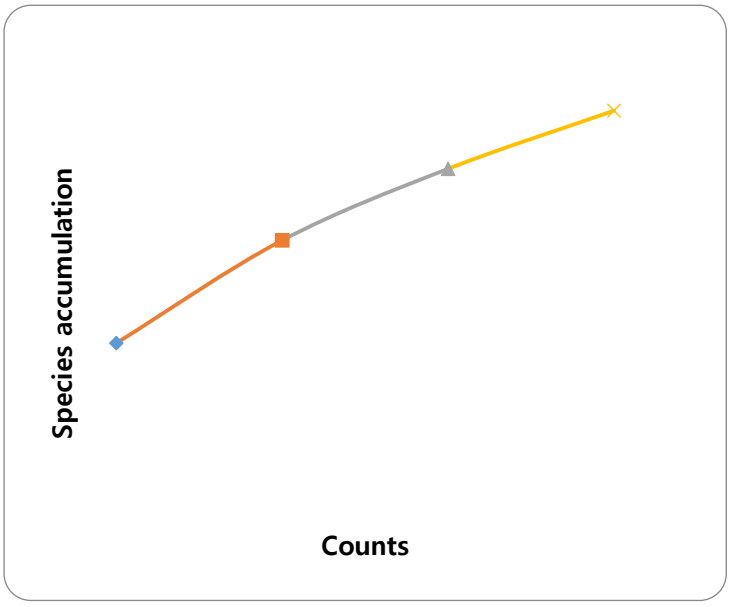


Figure 9 Species accumulation curve for birds in wetland dominated sites

The number of new species for any preceding count increased at afast rate, the curve suggests that there could be other wetland predominant species which were not identified, and thus there is need for more counts to come up with a complete habitat list.

Bugema: This was the most species richest site; we recorded 51 species, of which 16 were forest visitor, 13 were wetland specialist and 13 were wetland generalist. No Forest specialist and endangered species were recorded.

d) Predominantly cultivated site

There were eight sites which were predominantly cultivated namely; Namatali, Kama-lower, Buwaki, Makhosi, Kifuruliro, Makudui, Mooni and Bungukho.

Namatale: River Namatale (the proposed water source) is part of this site; there were 37 species, of the which majority were forest specialist (15), no forest specialist, 8 wetland associate, 3 were grassland and wetland specialists, the three aerial feeders were palm swifts, Angola swallows and the Rock martin, it was found nesting on the walls of the bridge on the river. Vieillot's Black Weaver *Ploceus nigerrimus* were also nesting besides the river together with Black headed weavers.

Figure 10 Section of River Namatale that is within the proposed project impact area

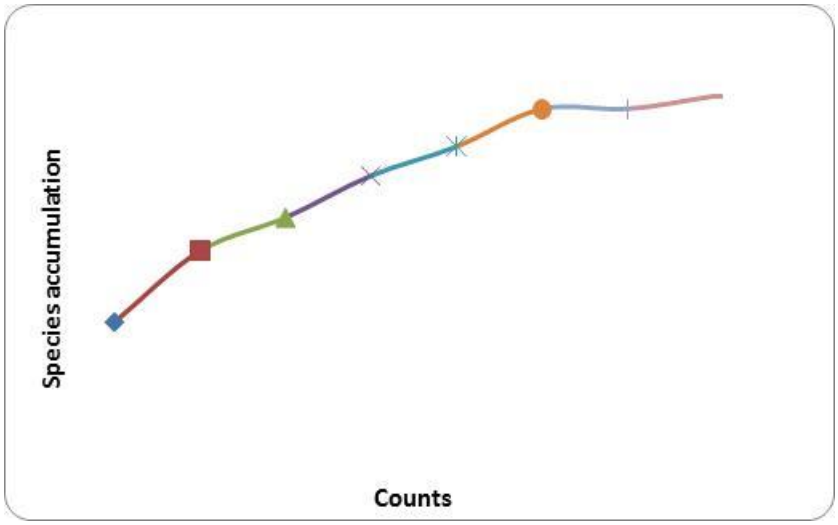


Figure 11 Species accumulation curve in the agricultural sites

After count six (Figure 11), the rate at which the number of new species added to the overall list was much lower suggesting that to a greater extent, the species list for the area was close to complete for the survey period.

7 POTENTIAL ENVIRONMENTAL IMPACTS

7.1 Likely impact to flora

There will be minimal vegetation clearance during installation of pipeline especially during excavation of land. This is expected to cause minimal disturbance since almost all natural vegetation were converted into farm land.

Loss of tree cover may occur along all the routes during pipeline construction but this will notably be in areas where the proposed pipeline route passes through mixed patches of post cultivated areas, woodlots, and agricultural gardens (Coffee and). However, no significant impacts or loss of habits will result from construction and operation of the proposed pipeline.

These negative impacts will occur both during pipeline construction and operation where clearing of vegetation especially tall trees and shrubs will occur. The impacts are short-term and of local spatial extent.

7.2 Likely Impacts on hepertiles

Human activities in any natural environment affect amphibian and reptilian fauna in two ways: adversely, by destroying natural habitat, and favorably, by creating new habitats Khan (1990). Most of the impacts will be due to vegetation clearance, road and drainage system construction, and harassment of the reptiles especially the snakes. The parent ecosystems which provided the amphibians with suitable habitats for reproduction, habitats including cover and breeding places will be destroyed in the project area, thus leading to exposure of hepertiles to the brutality of humans who have negative attitudes towards them.

7.3 Likely impacts to mammals and birds

The natural habitats are already largely modified into cultivated areas, settlements and towns. The large mammals reported to occur in the area are likely vagrants from the close forests of the Wanale Mountain Range which is out of the project scope. These were identified as the only critical habitat and they face no impending adverse impact. No impending adverse impacts on mammals and their habitats can be therefore pointed out. We don't envisage major impacts on birds either since we don't see the project resulting into very major habitat conversion.

7.4 Impact significance

i) The likelihood of impact on flora is low since the pipeline does not require constant vegetation clearance during installation and maintenance.
ii) Impact severity is considered low and significance is relatively low since there are no natural forested stretches along the pipeline route. Moreover where natural vegetation exists along the proposed pipeline route, it exists in a post cultivated form except at Lwabi and Nakwasi Cyprus swamp. Here minimal to moderate disturbances are expected but with low significance.
iii) Of the hepertiles, the species encountered during the study are widely distributed in Uganda and in other countries. No species of conservation concern were encountered or recorded. On the above basis, the water pipeline project will have minimal impact on amphibian and reptilian populations.
iv) For birds and mammals we don't envisage major negative impacts.

7.5 Mitigation measures

i) The contractor should considerately limit vegetation clearance along the line corridor so as to avoid excessive and unnecessary loss of trees outside the projected useable area. Where woodlot exists, the pipeline should be planned to pass through gaps between tree stands.
ii) The pipeline installation could consider adopting a proactive approach of being involved in reforestation programs, or supporting tree-planting as a compensatory measure for vegetation cover lost during development of pipeline.

iii) The surrounding area having been cleared of the natural vegetation, for crop growing, there will be a need to encourage the communities to grow high variety trees particularly improved fruit trees to increase on the woody vegetation.
iv) The pipeline should be designed to pass on the surface where permanent swamps exist.
v) During construction habitat disturbance should be minimized as much as possible. To minimize death, vegetation clearance should always be done first, as this scares away some amphibians and reptiles, as opposed to direct use of graders to clear the way for access road construction, or direct dumping of construction materials and excavated soils. Also people involved in the construction should be encouraged and sensitized not to harass amphibians and reptiles.
vi) Many species of birds require trees – for nesting, roosting, and as a source of food (insects on the leaves, flowers, fruits, etc). Thus during pipeline development, areas with many trees should be avoided.
vii) A big number of wetland birds normally breed in the wetland edges, and most of them are species of conservation concern. Therefore, maximum care during excavation process should be taken so as to minimize on nest losses.

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Appendices

Appendix 1: List of Plants Encountered within the Project area

Family	Species	Growth form	Bamadibira – Mukubhu line	Bugema-Manafwa line	Mbale-Busolwe line
Acanthaceae	*Acanthuspolystachyus*	Shrub		O	
Acanthaceae	*Asystasia gangetica*	Herb		O	
Acanthaceae	*Justicia* sp	Herb	O		
Amaranthaceae	*Aerva lanata*	Herb		F	
Amaranthaceae	*Amaranthus lividus*	Herb		O	F
Anacardiaceae	*Lannea* sp	Shrub	O		
Anacardiaceae	*Mangifera indica*	Tree	D	F	F
Anacardiaceae	*Rhus natalensis*	Shrub		O	
Anacardiaceae	*Rhus vulgaris*	Shrub	O		
Annonaceae	*Annona senegalensis*	Shrub	O		
Apiaceae	*Centella asiatica*	Herb	O		
Araceae	*Colocasia esculenta*	Crop	O	F	
Arecaceae	*Borassus aethiopum*	Tree			O
Arecaceae	*Elaeis guineensis*	Tree	O		
Arecaceae	*Phoenix reclinata*	Tree			O
Asteraceae	*Acmella oleracea*	Herb	F		F
Asteraceae	*Ageratum conyzoides*	Herb	O	O	O
Asteraceae	*Aspilia africana*	Herb	F		
Asteraceae	*Bidens pilosa*	Herb	O	O	F
Asteraceae	*Conyza floribunda*	Herb	O	O	
Asteraceae	*Eclipta alba*	Herb			O
Asteraceae	*Galinsoga parviflora*	Herb	O		
Asteraceae	*Helichrysum*	Herb	O		
Asteraceae	*Microglossa pyrifolia*	Shrub	O		
Asteraceae	*Synedrella nodiflora*	Herb	F		F
Asteraceae	*Tagetes minuta*	Herb		O	
Asteraceae	*Tithonia diversifolia*	Herb	O	F	
Asteraceae	*Vernonia amygadalina*	Shrub	O	O	
Asteraceae	*Vernonia smithiana*	Shrub	O		
Bignoniaceae	*Markhamia lutea*	Tree	F	F	A
Bignoniaceae	*Spathodea campanulata*	Tree	O	O	O
Bignoniaceae	*Stereospermum kunthianum*	Tree	O		
Boraginaceae	*Cordia sp*	Tree	O		
Brassicaceae	*Brassica oleracea*	Crop	F		

Family	Species	Growth form	Bamadibira – Mukubhu line	Bugema-Manafwa line	Mbale-Busolwe line
Casuarinaceae	*Casuarina equisitifolia*	Tree			F
Combretaceae	*Terminalia superba*	Tree			F
combretaceae	*Terminalia brownii*	Tree	O		
Convolvulaceae	*Ipomoea cairica*	Climber		O	O
Convolvulaceae	*Ipomoea obscura*	Climber			O
Convolvulaceae	*Ipomoea wightii*	Climber			O
Cucurbitaceae	*Momordica foetida*	Climber			O
Cucurbitaceae	*Luffa cylindrica*	Climber		O	
Cupressaceae	*Cupressus* sp	Tree	O	F	
Cyperaceae	*Abildgaardia ovata*	Sedge	O		
Cyperaceae	*Bulbostylis hispidula* subsp. *filiformis*	Sedge	O		
Cyperaceae	Cyperus cyperoides	Sedge	O		
Cyperaceae	*Cyperus dives*	Sedge		O	A
Cyperaceae	*Cyperus latifolius*	Sedge			O
Cyperaceae	*Cyperus papyrus*	Sedge			D
Cyperaceae	*Cyperus rotundus*	Sedge		O	F
Cyperaceae	*Kyllinga pumila*	Sedge	O		
Euphorbiaceae	Acalypha villicaulis	Shrub	O		
Euphorbiaceae	*Alchornea cordifolia*	Shrub	O		O
Euphorbiaceae	*Euphorbia heterophylla*	Herb	O		
Euphorbiaceae	*Macaranga schweinfurthii*	Tree	R		
Euphorbiaceae	*Manihot esculenta*	Crop	F	F	F
Euphorbiaceae	*Ricinus communis*	Shrub	O		O
Euphorbiaceae	*Sapium ellipticum*	Tree	O		
Euphorbiaceae	*Thevetia peruviana*	Shrub	F	F	F
Fabaceae	*Acacia hockii*	Shrub	O		
Fabaceae	*Acacia polyacantha*	Tree	O	D	
Fabaceae	*Acacia sieberiana*	Tree			O
Fabaceae	*Aeschynomene uniflora*	Shrub			F
Fabaceae	*Albizia coriaria*	Tree	F	A	D
Fabaceae	*Albizia grandibracteata*	Tree		O	
Fabaceae	*Chamaecrista mimosoides*	Herb	F	F	F
Fabaceae	*Crotalaria* sp	Herb		O	
Fabaceae	*Desmodium salicifolium*	Herb	O		
Fabaceae	*Entada abyssinica*	Tree	O		

Family	Species	Growth form	Bamadibira – Mukubhu line	Bugema-Manafwa line	Mbale-Busolwe line
Fabaceae	*Erythrina abyssinica*	Tree	O		
Fabaceae	*Arachis villosulicarpa*	Crop	F		
Fabaceae	*Indigofera arecta*	Shrub	O	O	
Fabaceae	*Indigofera spicata*	Herb	O		
Fabaceae	*Leucaena leucocephala*	Tree	O		
Fabaceae	*Mimosa pigra*	Shrub			O
Fabaceae	*Phaseolus vulgaris*	Crop			F
Fabaceae	*Piliostigma thonningii*	Tree	O		
Fabaceae	*Pseudarthria hookeri*	Shrub	O		
Fabaceae	*Rhynchosia* grandifiora	Climber	O		
Fabaceae	*Rhynchosia stipulosa*	Climber	O		
Fabaceae	*Senna bicapsularis*	Shrub	O		
Fabaceae	*Senna obtusifolia*	Herb	O	O	O
Fabaceae	*Ssenna siamea*	Tree	O	O	F
Fabaceae	*Senna spectabilis*	Tree		F	F
Fabaceae	*Sesbania sesban*	Shrub			F
Fabaceae	*Tamarindus indica*	Tree			O
Fabaceae	*Tephrosia linearis*	Herb	O		
Lamiaceae	*Hoslundia opposita*	Shrub	O		
Lamiaceae	*Leonotis nepetifolia*	Herb	R	O	O
Lamiaceae	*Ocimum gratissimum*	Shrub	F		
Lauraceae	*Persea americana*	Tree	F	F	O
Malvaceae	*Dombeya sp*	Shrub	R		
Malvaceae	*Sida acuta*	Herb	O	O	
Malvaceae	*Triumfetta rhomboidea*	Herb	O		
Meliaceae	*Azadirachta indica*	Tree		F	
Moraceae	*Artocarpus heterophyllus*	Tree	F	F	D
Moraceae	*Ficus exasperata.*	Tree	O		
Moraceae	*Ficus mucuso*	Tree	O	O	O
Moraceae	*Ficus natalensis*	Tree	O	F	F
Moraceae	*Ficus ovata*	Tree	O		F
Moraceae	*Ficus platyphylla*	Tree		O	
Moraceae	*Ficus vallis-choudae*	Tree	O	O	O
Moraceae	*Milicia excelsa*	Tree	O	F	O
Musaceae	*Musa* sp	Crop	A	F	F
Myrtaceae	*Eucalyptus grandis*	Tree	A	D	A

Family	Species	Growth form	Bamadibira – Mukubhu line	Bugema-Manafwa line	Mbale-Busolwe line
Myrtaceae	*Psidium guajava*	Shrub	F	F	
Myrtaceae	*Syzygium cumini*	Tree		O	
Nymphaeaceae	*Nymphaea lotus*	Herb			O
Onagraceae	*Ludwigia octovalvis*	Herb			O
Phyllanthaceae	*Phyllanthus sp*	Shrub	R		
Phytolaccaceae	*Phytolacca dodecandra*	Shrub	O		
Pinaceae	*Pinus caribaea*	Tree		F	A
Poaceae	*Brachiaria brizantha*	Grass	O		
Poaceae	*Cymbopogon nardus*	Grass	F		
Poaceae	*Cynodon dactylon*	Grass	F	F	F
Poaceae	*Digitaria abyssinica*	Grass	F	O	
Poaceae	*Digitaria velutina*	Grass	O	O	
Poaceae	*Echinochloa colona*	Grass			F
Poaceae	*Echinochloa pyramidalis*	Grass		O	
Poaceae	*Hyparrhenia filipendulla*	Grass	F		
Poaceae	*Imperata cylindrica*	Grass	O		
Poaceae	*Leersia hexandra*	Grass			F
Poaceae	*Melinus repens*	Grass		O	
Poaceae	*Oryza sativa*	Crop		A	D
Poaceae	*Panicum maximum*	Grass	F		
Poaceae	*Panicum trichocladum*	Grass			A
Poaceae	*Paspalum conjugatum*	Grass	F		
Poaceae	*Paspalidum scrobiculatum*	Grass	O		
Poaceae	*Phragmites mauritianum*	Grass			O
Poaceae	*Saccharum officinarum*	Crop	F		
Poaceae	*Sorghum arundinaceum*	Grass			F
Poaceae	*Sporobolus pyramidalis*	Grass	R		
Poaceae	*Sporobolus africanus*	Grass		O	
Poaceae	*Zea mays* L.	Crop	A	A	A
Polygonaceae	*Persicaria senegalensis*	Forb			F
Polygonaceae	*Persicaria setosula*	Forb		O	O
Pontederiaceae	*Eichhornia crassipes*	Herb			O
Proteaceae	*Grevillea robusta*	Tree	F	F	F
Rhamnaceae	*Maesopsis eminii*	Tree	F		
Rubiaceae	*Coffea arabica*	Shrub	A		
Rubiaceae	*Coffea canephora*	Shrub	F		

Family	Species	Growth form	Bamadibira – Mukubhu line	Bugema-Manafwa line	Mbale-Busolwe line
Rutaceae	*Citrus sinensis*	Shrub	R		
Solanaceae	*Solanum incanum*	Shrub	O		
Solanaceae	*Solanum melongena*	Crop	O		
Verbenaceae	*Lantana camara*	Shrub	O	F	O
Verbenaceae	*Lantana trifolia*	Shrub	R		
Verbenaceae	*Tectona grandis*	Tree		O	O
Verbenaceae	*Vitex doniana*	Tree	O		
Verbenaceae	*Vitex sp*	Tree	R		

Appendix 2: Number of species along the proposed pipeline arranged according to Atlas numbers

Atlas No.	Species name	Habitat	Conservation status
6	LONG-TAILED CORMORANT Phalacrocorax africanus	W	
7	AFRICAN DARTER Anhinga rufa	W	R-VU
9	PINK-BACKED PELICAN Pelecanus rufescens	W	
14	SQUACCO HERON Ardeola ralloides	W	
17	CATTLE EGRET Bubulcus ibis	G	
22	INTERMEDIATE EGRET Egretta intermedia	W	
23	GREAT WHITE EGRET Egretta alba	W	R-VU
24	PURPLE HERON Ardea purpurea	W	R-NT
25	GREY HERON Ardea cinerea	W	R-NT
26	BLACK-HEADED HERON Ardea melanocephala	w	
28	HAMERKOP Scopus umbretta	w	
29	YELLOW-BILLED STORK Mycteria ibis	W	
30	AFRICAN OPEN-BILLED STORK Anastomus lamelligerus	A,w,G	
33	WOOLLY-NECKED STORK Ciconia episcopus	W	R-NT
36	MARABOU STORK Leptoptilos crumeniferus	w	
39	HADADA IBIS Bostrychia hagedash	w	
42	SACRED IBIS Threskiornis aethiopica	W	
44	AFRICAN SPOONBILL Platalea alba	W	
48	WHITE-FACED WHISTLING DUCK Dendrocygna viduata	W	
51	SPUR-WINGED GOOSE Plectopterus gambensis	W	
73	BLACK-SHOULDERED KITE Elanus caeruleus	G	
75	BLACK KITE Milvus migrans	p,A	
80	HOODED VULTURE Necrosyrtes monachus	f	G-EN
86	BROWN SNAKE EAGLE Circaetus cinereus		R-NT
90	AFRICAN HARRIER HAWK Polyboroides typus	f	
96	DARK CHANTING GOSHAWK Melierax metabates		
100	SHIKRA Accipiter badius	f	
109	LIZARD BUZZARD Kaupifalco monogrammicus	f	
120	BOOTED EAGLE Hieraaetus pennatus	P	
122	LONG-CRESTED EAGLE Lophaetus occipitalis	f	
142	HELMETED GUINEAFOWL Numida meleagris	G	
154	CRESTED FRANCOLIN Francolinus sephaena		
178	BLACK CRAKE Amaurornis flavirostris	W	
185	GREY CROWNED CRANE Balearica regulorum	W,G	G-EN
197	BLACK-WINGED STILT Himantopus himantopus	p,W	
243	SPOTTED REDSHANK Tringa erythropus	P,W	

Atlas No.	Species name	Habitat	Conservation status
268	AFRICAN GREEN PIGEON Treron calva	F	
271	BLUE-SPOTTED WOOD DOVE Turtur afer	f	
281	SPECKLED PIGEON Columba guinea		
283	RED-EYED DOVE Streptopelia semitorquata	f	
289	LAUGHING DOVE Streptopelia senegalensis		
290	GREY PARROT Psittacus erithacus	FF	R-NT
302	ROSS'S TURACO Musophaga rossae	F	
305	EASTERN GREY PLANTAIN EATER Crinifer zonurus		
309	RED-CHESTED CUCKOO Cuculus solitarius	A,F	
320	DIDRIC CUCKOO Chrysococcyx caprius		
326	BLUE-HEADED COUCAL Centropus monachus	w	
358	AFRICAN PALM SWIFT Cypsiurus parvus	Ae	
365	LITTLE SWIFT Apus affinis	Ae	
368	BLUE-NAPED MOUSEBIRD Urocolius macrourus		
369	SPECKLED MOUSEBIRD Colius striatus		
373	GREY-HEADED KINGFISHER Halcyon leucocephala	A,f,w	
375	WOODLAND KINGFISHER Halcyon senegalensis	A	
378	AFRICAN PYGMY KINGFISHER Ceyx picta	f,w	
383	PIED KINGFISHER Ceryle rudis	W	
385	LITTLE BEE-EATER Merops pusillus	G	
401	BROAD-BILLED ROLLER Eurystomus glaucurus	A,f,w	
422	BLACK-AND-WHITE-CASQUED HORNBILL Bycanistes subcylindricus	F	
431	YELLOW-RUMPED TINKERBIRD Pogoniulus bilineatus	F	
433	YELLOW-FRONTED TINKERBIRD Pogoniulus chrysoconus	f	
443	DOUBLE-TOOTHED BARBET Lybius bidentatus	f	
473	CARDINAL WOODPECKER Dendropicos fuscescens		
498	WHITE-HEADED SAW-WING Psalidoprocne albiceps	f,Ae	R-RR
507	ROCK MARTIN Hirundo fuligula	Ae	
509	WIRE-TAILED SWALLOW Hirundo smithii	w,Ae	
512	ANGOLA SWALLOW Hirundo angolensis	w,Ae	
515	YELLOW WAGTAIL Motacilla flava	P,w,G	
520	AFRICAN PIED WAGTAIL Motacilla aguimp	w	
547	YELLOW-THROATED GREENBUL Chlorocichla flavicollis	f	
562	COMMON BULBUL Pycnonotus barbatus	f	
576	WHITE-BROWED ROBIN-CHAT Cossypha heuglini	f	
586	SPOTTED MORNING THRUSH Cichladusa guttata		
601	SOOTY CHAT Myrmecocichla nigra		

Atlas No.	Species name	Habitat	Conservation status
612	AFRICAN THRUSH Turdus pelios	f	
621	AFRICAN MOUSTACHED WARBLER Melocichla mentalis		
626	AFRICAN REED WARBLER Acrocephalus baeticatus	w	
638	RED-FACED CISTICOLA Cisticola erythrops	w	
647	WINDING CISTICOLA Cisticola galactotes	w	
658	TAWNY-FLANKED PRINIA Prinia subflava	f,w	
677	GREY-BACKED CAMAROPTERA Camaroptera brachyura	f	
701	GREY-CAPPED WARBLER Eminia lepida	f,w	R-RR
713	NORTHERN BLACK FLYCATCHER Melaenornis edoliodides		
732	AFRICAN BLUE FLYCATCHER Elminia longicauda	f	
739	AFRICAN PARADISE FLYCATCHER Terpsiphone viridis	f	
761	BROWN BABBLER Turdoides plebejus		
787	SCARLET-CHESTED SUNBIRD Chalcomitra senegalensis	f	
790	BRONZE SUNBIRD Nectarinia kilimensis	f	
801	BEAUTIFUL SUNBIRD Cinnyris pulchella		
803	RED-CHESTED SUNBIRD Cinnyris erythrocerca	W	R-RR
808	VARIABLE SUNBIRD Cinnyris venusta	f	
810	COPPER SUNBIRD Cinnyris cuprea	f,w	
811	YELLOW WHITE-EYE Zosterops senegalensis	f	
812	COMMON FISCAL Lanius collaris	G	
815	GREY-BACKED FISCAL Lanius excubitoroides	A,f,w	
828	SULPHUR-BREASTED BUSH-SHRIKE Malaconotus sulfureopectus	f	
831	BROWN-CROWNED TCHAGRA Tchagra australis		
833	BLACK-CROWNED TCHAGRA Tchagra senegala		
841	TROPICAL BOUBOU Laniarius aethiopicus	f	
843	BLACK-HEADED GONOLEK Laniarius erythrogaster	f	
853	FORK-TAILED DRONGO Dicrurus adsimilis	f,F	
855	PIED CROW Corvus albus		
858	PIAPIAC Ptilostomus afer		
871	SPLENDID STARLING Lamprotornis splendidus		
872	RUPPELL'S LONG-TAILED STARLING Lamprotornis purpuropter	F	
881	GREY-HEADED SPARROW Passer griseus		R-RR
895	LITTLE WEAVER Ploceus luteolus	f,W	
907	VIEILLOT'S BLACK WEAVER Ploceus nigerrimus	w	R-NT,R-RR,G-NT
908	BLACK-HEADED WEAVER Ploceus cucullatus	f	
908	BLACK-HEADED WEAVER Ploceus cucullatus	f	
910	YELLOW-BACKED WEAVER Ploceus melanocephalus	F	R-VU

Atlas No.	Species name	Habitat	Conservation status
925	RED-BILLED QUELEA Quelea quelea	A	
928	BLACK-WINGED RED BISHOP Euplectes hordeaceus	w	
932	FAN-TAILED WIDOWBIRD Euplectes axillaris	G	
959	RED-BILLED FIREFINCH Lagonosticta senegala	f	R-NT,f
969	COMMON WAXBILL Estrilda astrild	w	
974	RED-CHEEKED CORDON-BLEU Uraeginthus bengalus		
980	BRONZE MANNIKIN Lonchura cucullata	G	
981	BLACK-AND-WHITE MANNIKIN Lonchura bicolor		
985	PIN-TAILED WHYDAH Vidua macroura		
995	YELLOW-FRONTED CANARY Serinus mozambicus		

APPENDIX D: NEMA APPROVED TERMS OF REFERENCE FOR THE ESIA

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
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Website: www.nemaug.org

NEMA/4.5

20th November, 2015

Dr. Adolf Spitzer,
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National Water and Sewerage Corporation,
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KAMPALA.

Tel: +256 414 315000 / 312 260401

26/11/15 RECEIVED Astimwe

RE: REVIEW OF SCOPING REPORT AND TERMS OF REFERENCE PERTAINING TO THE PROPOSED MBALE WATER SUPPLY AND SANITATION PROJECT

This is in reference to the Scoping Report and Terms of Reference (TOR) for carrying out an environmental and social impact assessment (ESIA) for the above-mentioned Project, which you submitted to this Authority for review and consideration for approval. This Authority has finalised the review and grants formal **APPROVAL** of the said Scoping Report and TOR.

In addition, you are advised to consider during the conduct of the EIAs and preparation of the EIA report, the key aspects highlighted below,

(i) Carry out comprehensive stakeholder consultations involving, among others, the Bushenyi and Sheema District Local Government Authorities, the concerned local communities in the targeted project areas that will accommodate the project infrastructure and the related activities, and other Authorities responsible for provision and management of other public utilities *(road network, among others)*, respectively; and, ensure that the concerns/views of the stakeholders **are well-documented and appended to the ESIA report.**

(ii) Provide **correct citation of full details of the location of the project areas/towns** targeted to accommodate the proposed project components, auxiliary support structures, and activities – preferably in tabulated format – that is, *by names of villages, zones, parishes, sub-counties, municipal council, town councils, counties, and district – whichever is applicable.*

(iii) Provide comprehensive **baseline information and data** relating particularly to the proposed project areas that will accommodate the project components and characteristics of the immediate environs, other existing facilities, regulated sensitive and fragile areas, settlements, as well as the **water source(s)** targeted to support the respective Project Towns; and **a set of coloured photographs** showing the current state of some of the critical sections within the respective Project Towns, respectively.

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(iv) Include in the ESIA report **coloured location / google maps** *(preferably covering A-4 or A-3 paper size)* that are clear, well-labelled and legible and showing the project areas, and a set of **GPS coordinates.**

(v) Append to the EIA report **a set of proposed lay-outs of the project components** – *preferably each covering A-3 paper size* – that are clear, well-labelled and legible.

(vi) Provide comprehensive narratives on all the proposed **project components, activities** to be set up in the Project Towns, and the size of the workforce.

(vii) Provide comprehensive **analyses of alternatives/options,** in terms of the project design, type technology, alignment of infrastructure, and other aspects.

(viii) Provide comprehensive narratives on **any identified project-affected communities/entities** and compensation aspects, among other factors.

(ix) Provide **detailed evaluation of the potential environmental impacts and risks** associated with the proposed project components and activities.

(x) Include in the ESIA report **comprehensive mitigation and environmental management and monitoring plans,** respectively *(preferably in table matrix format)*, that relate to the identified potential environmental impacts.

(i) Consider any other critical environmental aspects/concerns not been initially foreseen during the preparation of the Scoping Report and TOR, and **include an evaluation of such aspects/concerns in the ESIA report.**

(xi) Indicate the **total project (investment) cost** covering all the project components and activities.

This is, therefore, to recommend that you proceed with carrying out the ESIA for the proposed Project. We look forward to receipt of copies of a comprehensive environmental and social impact statement, for our further action.

Margaret Aanyu
FOR: EXECUTIVE DIRECTOR

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Directorate of Water Resources Management,
ENTEBBE.

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APPENDIX E: ARCHAEOLOGICAL RESOURCES CHANCE FINDS PROCEDURE FOR THE PROPOSED MBALE & SMALL TOWNS WATER SUPPLY AND SANITATION PROJECT

ABBREVIATIONS

CFP: Chance Finds Procedure

ESMP: Environment and Social Management Plan

IFC: International Finance Corporation

KIP: Key performance indicators

MTTI: Ministry of Tourism, Trade & Industry

NEMA: National Environment Management Authority

PS: Performance Standard

RAP: Resettlement Action Plan

DEFINITIONS

Chance find: Tangible cultural heritage encountered unexpectedly during project implementation.

Chance find procedure: A project-specific procedure that outlines actions to be taken if previously unknown cultural heritage is encountered.

1 INTRODUCTION

This Chance Finds Procedure (CFP) is proposed for the Mbale & Small Towns Water Supply and Sanitation Project, implementation of which will be a responsibility of the contractor.

1.1 Purpose of the CFP

This CFP will serve the following purposes:

- translate commitments in the ESIA into implementation procedures that will protect physical cultural resources during construction of the project;
- Serves as a key tool the contractor can utilise to manage and monitor preservation of resources of cultural heritage significance; and
- Provide transparency to stakeholders that commitments made in the ESIA in regard to preservation of finds of heritage value are actually being fulfilled.

This CFP provides:

- Responsibilities for implementation of the procedure;
- Impact management measures to be implemented;
- Verification and monitoring; and
- Records and reporting requirements.

1.2 Objective of CFP

Through its contractor, NWSC seeks to ensure that impacts on cultural heritage resources are minimized as far as possible. Thus the overall objective of this CFP is to describe an approach and procedures to be undertaken by the contractor with regard to protection of chance finds encountered during project implementation.

1.3 Scope of CFP

This CFP sets out requirements for management of cultural heritage resources during project implementation. The focus of the procedure is primarily mitigation during earthworks at the project site. It is expected that earthworks will be undertaken at following sites, at which chance finds may be encountered.

- Wastewater/ sewage and sludge management facilities;
- Water pipelines and sewers;
- Borrow sites where gravel may be obtained (if any).

1.4 Definition of "Cultural Heritage"

For purposes of this CFP, cultural heritage includes:

i) Archaeological deposits and remains;
ii) Historical monuments, sites and buildings;
iii) Places of worship;
iv) Cemeteries and graveyards; and,
v) Places associated with folklore, mythology (and traditions) and the location of historical and cultural festivals, events and rituals.

1.5 Commitments

This CFP is developed based on target areas and commitments below:

Table 1: Target areas and commitments

	Target area	Commitment
1	Unidentified archaeological features	This CFP will be implemented to fulfill requirements of Uganda's Historical Monuments Act, 1967.
2	Early earthworks involving excavations (see Sec 1.4 above)	A specialist archaeologist from the *Department of Museums and Monuments* in the *Ministry of Tourism, Trade & Industry* (MTTI) will be on site at the stage of commencing civil works entailing excavations and on call to come to site to investigate, inspect and retrieve any chance finds encountered. Retrieved chance finds will be submitted to the National Museum.

1.6 Relationship to Other Project Documents

This CFP should be implemented in conjunction with:

- Contractor's environment & social management plan;

- Project overall ESMP that specified project-wide requirements for environmental and social management;
- The ESIA report for this project; and
- Resettlement Action Plan (RAP) that covers the framework and procedures to be followed during land acquisition for construction of the project.

1.7 Uganda's Historical Monuments Act, 1967

This CFP is to be executed in compliance with Uganda's *Historical Monuments Act, 1967*. In this Act, sub-section 12(1) requires that any portable object discovered in the course of an excavation is surrendered to the Minister who shall deposit it in the Museum.

Management of archeological chance finds is a responsibility of the Department of Museums and Monuments in the Ministry of Tourism, Trade & Industry.

2 CHANCE FINDS MANAGEMENT PROCEDURE

2.1 Personnel and Responsibilities

This procedure is based on three recommendations below:

vii) The contractor will have a *Socio-Environmental Officer* (SEO) on the site during project construction. The contractor's SEO will closely work with the developer's socio-environmental staff to ensure compliance with national and financier's requirements as well as implementation of this chance finds procedure.
viii) During ground opening and excavations, the developer will facilitate an Archaeologist from the *Department of Museums and Monuments* in MTTI to be on site and ensure that any chance finds encountered are managed according to requirements of The Historical Monuments Act, 1967.
ix) All construction staff involved in earthworks should be trained in basis skills of recognising suspected chance finds and the procedure of notifying the SEO and Archeologist.

Specific roles of persons to be involved in implementation of this procedure are outlined below

2.1.1 Role of the contractor's Socio-Environmental Officer

The SEO is required to:

xv) Communicate contents and requirements of this plan to contractor;
xvi) Sensitise workers to ensure that all are aware of their responsibilities in regard to protection chance finds;
xvii) Inform the Archaeologist of any chance finds encountered on site;
xviii) Coordinate inspection and monitoring by the MTTI Archaeologist. The SEO should keep in close contact with the archaeologist throughout the construction period;
xix) Implement measures recommended by the archaeologist for management of "chance finds" encountered;
xx) Conduct cultural heritage tool box talks to construction personnel as advised by the Archaeologist; and
xxi) Maintain records (daily logs) related to archaeological finds during construction.

2.1.2 Role of the MTTI archaeologist

An archaeologist contracted (on a non-permanent basis) from the department responsible for museums and monuments in MTTI will have the following roles:

xxi) Archaeological monitoring of all earthworks;

xxii) Advice/ guidance to the contractor with respect to halting construction activities if earthworks encounter chance finds;
xxiii) Conducting preliminary assessment of all previously unidentified archaeological features encountered and submission of these to the National Museum;
xxiv) Provision of advice on the significance and management of unidentified archaeological features encountered;
xxv) Processing/ excavation of any unidentified subsurface archaeological features encountered in accordance with standard procedures recommended by the Department of Museums and Monuments;
xxvi) Maintain watching briefs during opening up site or deep excavations at any location during construction, with clear procedures for protection and documentation of any "chance finds" encountered;
xxvii) Maintain monitoring records of all unidentified archaeological features encountered;
xxviii) Develop a set of points to be discussed in "Tool Box" sessions to create awareness among construction crews on "chance finds"/ archaeological features. Note that as part of their sensitization, workers will be required to cease work if they encounter archaeological features and report to Contractor's SEO, who will notify the Archaeologist; and
xxix) Write a report for the developer upon completion of construction. This report will be submitted to the Supervising consultant, Contractor, Developer and Department of Museums and Monuments. The report will summarise findings of archaeological monitoring, describing any features encountered and their preservation significance.

The archeologist will also undertake "Watching briefs" as the primary element of management and protection of cultural heritage during project construction. Watching briefs will consist of passive visual investigation during ground breaking at excavation sites.

Objectives of the "watching briefs" will be to:

- Record subsurface archaeological features discovered during earth-moving activities;
- Provide advice to the contractor on significance of subsurface archaeological features discovered; and
- Provide advice to the contractor on areas where ground disturbing activities may continue or where necessary need to be "worked around" or stopped.

The following will be implemented during the "watching brief":

- Prior to commencing any construction activities, the contractor will give a brief to the archaeologist about site(s) they plan to excavate;
- The archaeologist will conduct a walkover to identify site's archaeological sensitivity through characteristics such as soil type, topography, etc.; and
- The archaeologist will witness/ observe site clearance, soil stripping and excavations for presence of subsurface archaeological features.

2.1.3 Role of the Contractor

The contractor will be required to:

iii) Heed advice from the Archaeologist in respect to halting earthworks when chance finds are encountered; and
iv) Provide cultural heritage tool box talks to construction crews as advised by the Archaeologist.

2.2 General Rule When Chance Finds are Encountered

Upon identification of suspected archaeological remains, the location must not be disturbed until it is inspected by the archaeologist from MTTI.

2.3 Procedures

In the event that genuine archaeological remains are encountered, the procedures to be adopted are described in the sections below.

2.3.1 Human remains

If encountered during earthworks, human remains must be handled with dignity and respect. If identified before disturbing the ground, such a location should be staked or flagged off to prevent additional disturbance. However, for uncemented graveyards, it may not always be possible to identify, distinguish and protect a burial ground from construction activities and therefore the following procedures will be followed if suspected human remains are found:

i) Work will immediately cease in affected location and contact the contractor's SEO who will notify the MTTI Archaeologist;
ii) If the affected location is likely to be disturbed by other workers on site, an employee will be assigned to stand watch until the archaeologist arrives;
iii) Any exposed bones will be covered with plastic sheeting but not backfilled, until the archaeologist arrives to inspect the chance finds;
iv) If excavated fill has been loaded into a truck, it will be emptied at a suitable location for inspection by the archaeologist; and
v) The contractor will resume work once the archaeologist's inspection is completed and an instruction to recommence works issued.

2.3.2 Artefact scatters

The following procedures will be adopted when unanticipated artifact scatters are encountered:

i) The contractor will immediately stop work at the location where finds are encountered and contact the SEO who will notify MTTI Archaeologist;
ii) The affected location will be staked or flagged off to prevent further disturbances;
iii) If excavated fill has been loaded into a truck, it will be emptied at a nearby secure location for inspection by the archaeological consultant; and
iv) The contractor will resume work only after the archaeologist has completed a site inspection and given the go-ahead for works to resume.

2.3.3 Isolated artefact finds

Due to their shape and colour, which often contrasts with the surrounding soil, artifacts are easy to identify by non-archaeologists during earthworks or other activities on site.

Should an isolated artifact be observed, the following procedures will be adopted:

i) If the artifact is in imminent danger of being destroyed or damaged, it will be collected and its location marked with a flag;
ii) Whenever possible, the artifact will be left on the ground where it was found;

iii) The SEO will be notified that the location requires an archaeological inspection;
iv) The SEO will notify the archaeologist of the chance find;
v) The SEO will ensure that other workers near the location are aware of the need to avoid disturbing the area until inspected by the archaeologist; and
vi) The archaeological consultant will inspect the affected location, after which the SEO will be advised that construction works can proceed.

2.3.4 Historical remains

All types of historic archaeological materials are subsumed within this category, including isolated historical artifacts. When historic remains or suspected historic archaeological remains are encountered the following procedures will be adopted:

i) SEO will order cessation of work will and notify the archaeologist;
ii) The affected location will be staked or flagged off to prevent further disturbances;
iii) The archaeologist will determine if the materials encountered are of real historic significance; and
iv) The contractor will resume work only after the archaeologist issues instruction for the works to resume.

If isolated historic or suspected historic archaeological artifacts are observed, the following procedures will be followed:

i) If the artifact is in imminent danger of being damaged, it will be collected by the SOE and put in a bag (e.g. a Ziploc bag), along with any fragments thereof;
ii) If detached fragments are found, a label must be included with the date of the find and its position;
iii) Its depth and location must be marked with a stake or flag,
iv) Otherwise, whenever possible, the artifact mbe left on the ground at the location where it was found; and
v) The SEO will notify the archaeologist, who will determine if an inspection is required. If no follow-up inspection is necessary, the archeologist will advise the SEO that construction can continue.

3 TRAINING

General awareness training will be provided by an archaeologist from MTTI to all construction crews and the contractor's SEO. The training will incorporate information on cultural heritage, its significance, protection status of previously unidentified subsurface archaeological features in the area and construction activities that may destroy them.

This awareness will be maintained through tool-box talks that should be regularly conducted with all construction crews.

4 MONITORING

Monitoring will be done by the contractor's SEO with the principal objective being to provide assurance that:

- Project construction is compliant with this procedure; and
- Evidence is collected to demonstrate that commitments related to cultural heritage protection are being effectively met.

Key performance indicators below will be utilised in the monitoring

4.1 Key Performance Indicators

The contractor's SEO will undertake monitoring of chance finds management based on KIPs in Table 2.

Table 2: **Monitoring criteria**

	KIP/ measure	Rationale	Performance target	Monitoring frequency
1	Conduct cultural heritage awareness training	Ensures workers are aware of cultural heritage in the area and the possibility of sub-surface resources to be encountered.	90%	Every 3 months
2	Number of "chance finds" damaged by construction activities	Monitors effectiveness managing chance finds	Zero	Monthly

4.2 Action Tracking

All non-compliance with this procedure shall be followed up and corrective action taken. The contractor's SEO is expected to maintain an *actions tracking system* as part of archaeological monitoring. Cultural heritage management action tracking including close out of actions (solutions and preventive actions taken) will be reported quarterly by the contractor to the project developer.

5 REPORTING AND RECORD KEEPING

Records in sections below will be kept by indicated personnel.

5.1 MTTI's Archaeologist

The archaeologist will report the following to the Contractor's Socio-Environmental Officer:

- Daily log of activities on a weekly basis;
- Results of any assessments of "chance finds" as soon as the assessment is completed; and
- A detailed report of field activities, findings and conclusions following a period of major earthworks.

5.2 Contractor's Socio-Environmental Officer

The Contractor's SEO will report the following to Frontier's Socio-Environment Manager.

- Awareness records on cultural heritage resource among workers on a weekly basis;
- Bi-weekly report summarizing cultural heritage management activities;
- Action tracking system on a weekly basis; and
- Performance against key indicators (KPI).

REFERENCES

Republic of Uganda, 1967: Historical Monuments Act.

NEMA 2010: Environmental Sensitivity Atlas for the Albertine Graben, Kampala.

APPENDIX F: PHOTOGRAPHS OF SOME PROJECT SITES

Proposed site for the waste stabilisation pond system for the Northern Cluster

Proposed site for the intake works on River Namatala

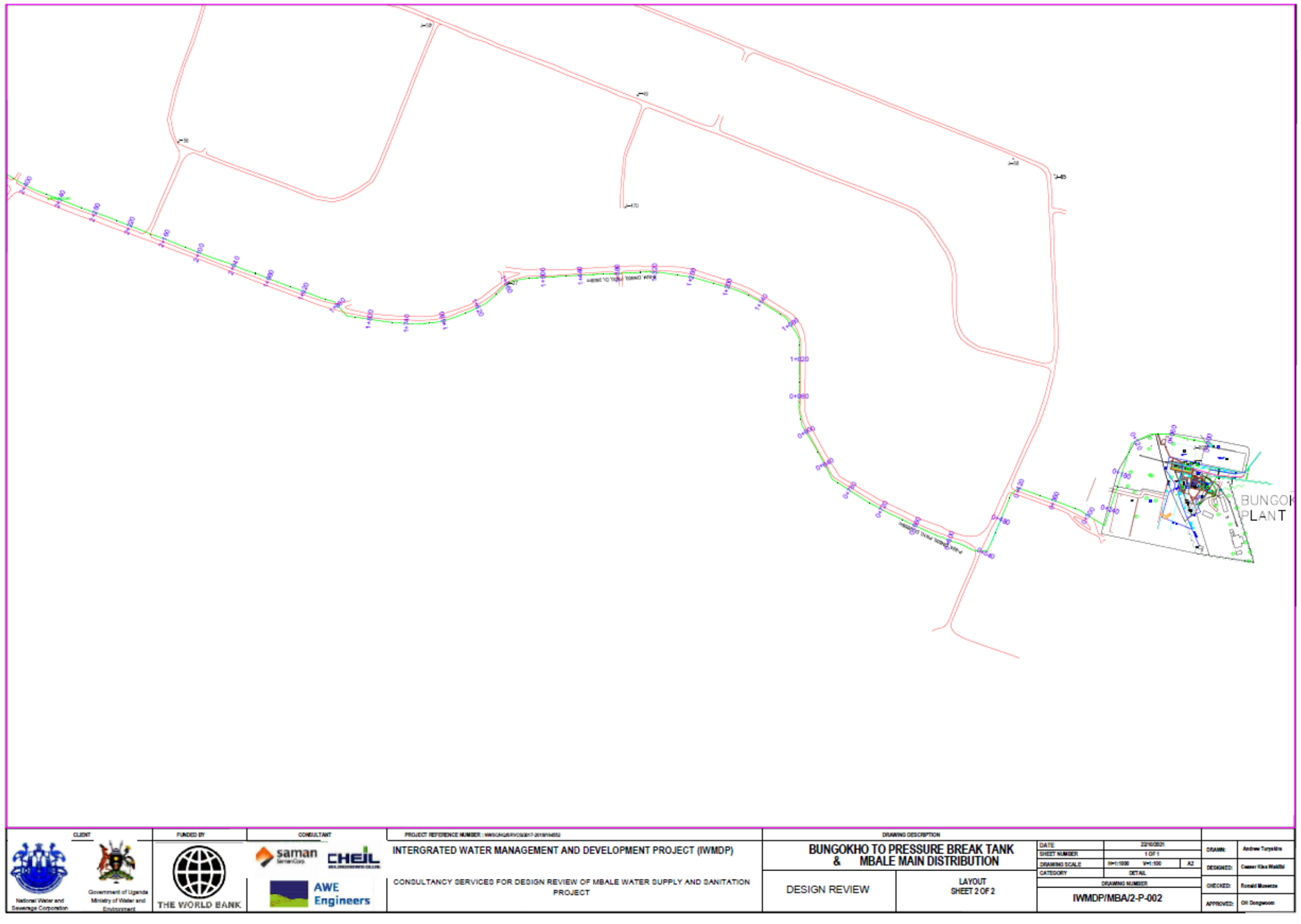
Proposed site for the pumping station for the Senior Quarter network

Proposed site for the Butaleja water reservoir

Proposed site for the Busolwe water reservoir

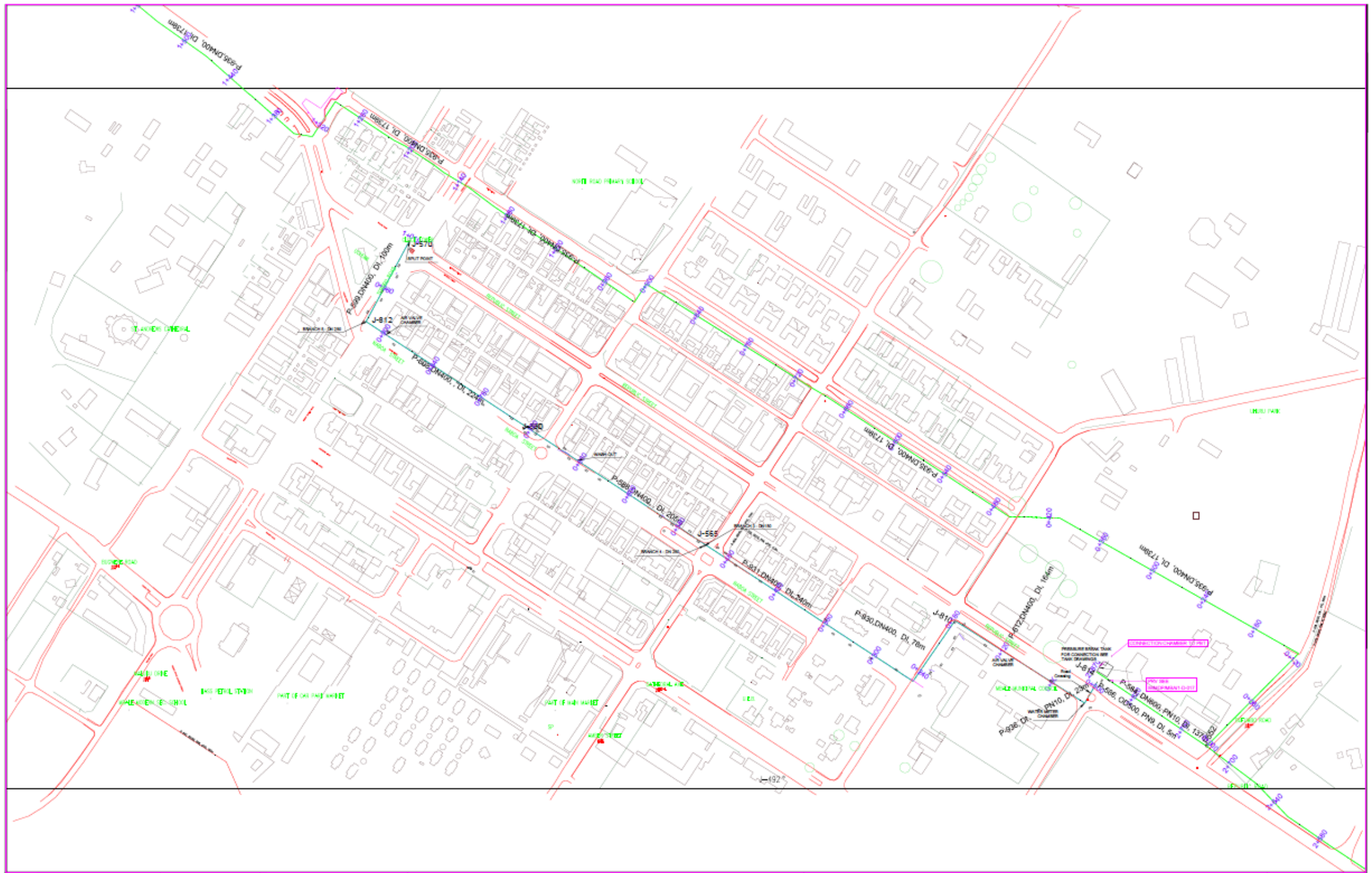
APPENDIX G: PROJECT LAYOUT DRAWINGS

BUNGOKHO TO PRESSURE BREAK TANK & MBALE MAIN DISTRIBUTION

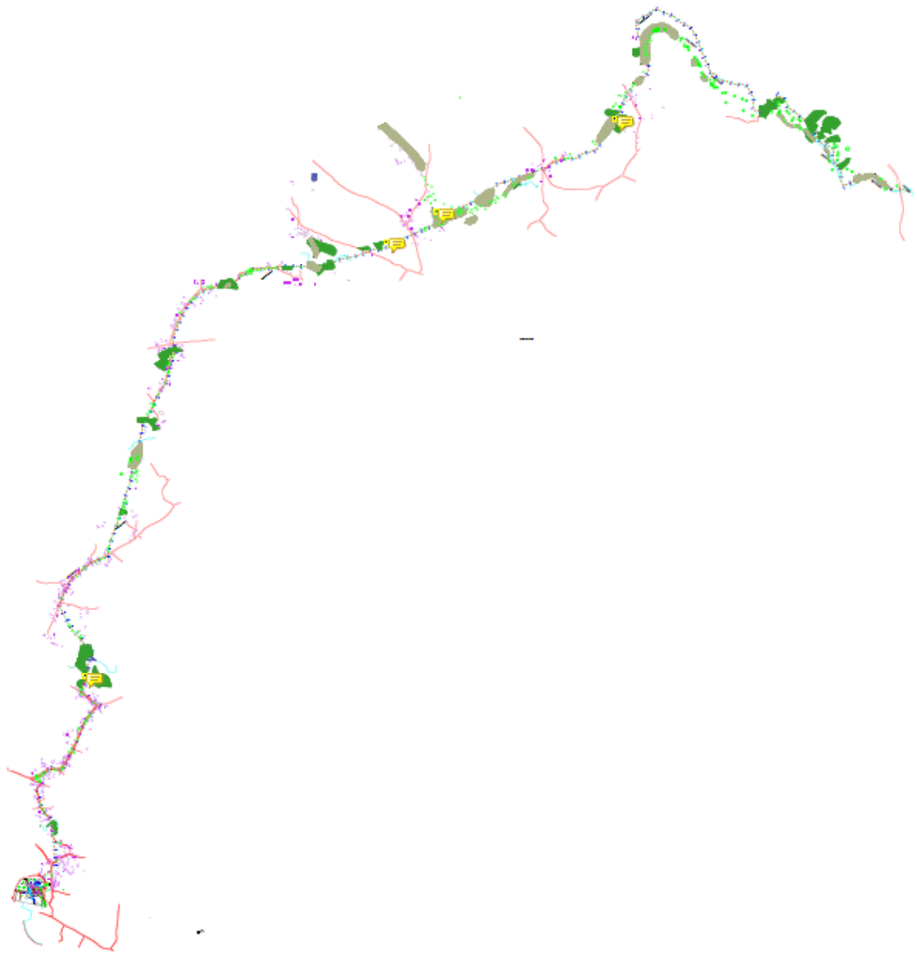


CLIENT: National Water and Sewerage Corporation; Government of Uganda Ministry of Water and Environment	FUNDED BY: THE WORLD BANK	CONSULTANT: saman; CHEIL; AWE Engineers	PROJECT REFERENCE NUMBER : MWSAGSERVICS0017-2018154852	DRAWING DESCRIPTION: BUNGOKHO TO PRESSURE BREAK TANK & MBALE MAIN DISTRIBUTION	DRAWN: Andrew Turyahira
			INTERGRATED WATER MANAGEMENT AND DEVELOPMENT PROJECT (IWMDP)	DESIGN REVIEW / LAYOUT SHEET 2 OF 2	DESIGNED: Ceaser Kiza Waddi
			CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER SUPPLY AND SANITATION PROJECT	DATE: 22/10/2021; SHEET NUMBER: 1 OF 1; DRAWING SCALE: H=1:1000 V=1:100 A2; CATEGORY: DETAIL; DRAWING NUMBER: IWMDP/MBA/2-P-002	CHECKED: Ronald Muwanza
					APPROVED: Oli Dongwoom

BUNGOKHO TO PRESSURE BREAK TANK & MBALE MAIN DISTRIBUTION



NAMATALA RAW WATER TRANSMISSION LINE LAYOUT



AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MBWW0.0.0
4. For Node details, see Dwg. MBWW6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- (N01) — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

CONSULTANT:

saman Saman Corp.

CHEIL ENGINEERING

AWE Engineers

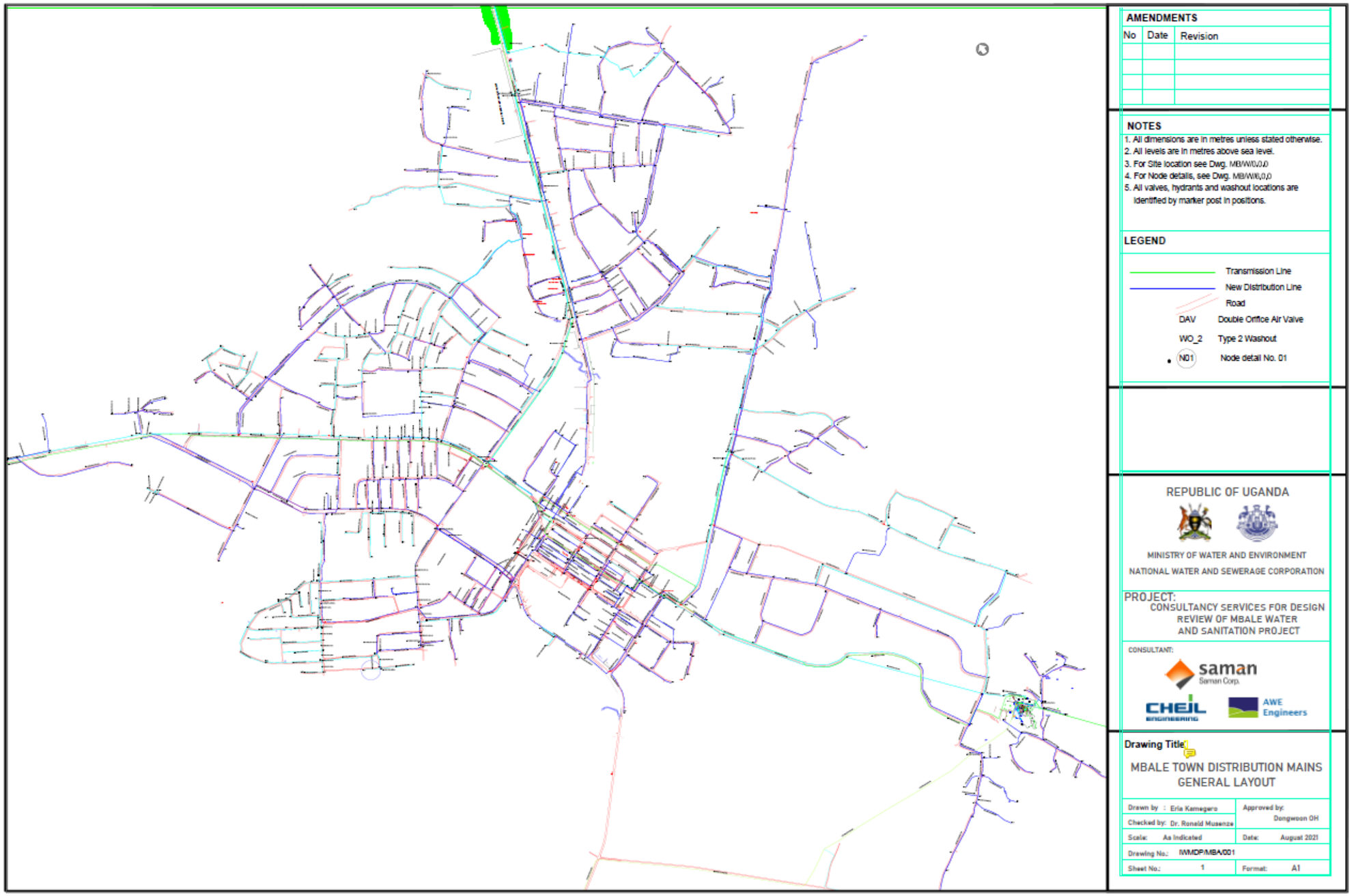
Drawing Title:

NAMATALA RAW WATER TL

LAYOUT

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.: IWMDP/MBA/NAM/001	
Sheet No.: 1	Format: A1

MBALE TOWN DISTRIBUTION MAINS GENERAL LAYOUT



AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MB/WI/0,0,0
4. For Node details, see Dwg. MB/WI/6,0,0
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LEGEND

- Transmission Line
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REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

CONSULTANT:

saman Saman Corp.

CHEIL ENGINEERING

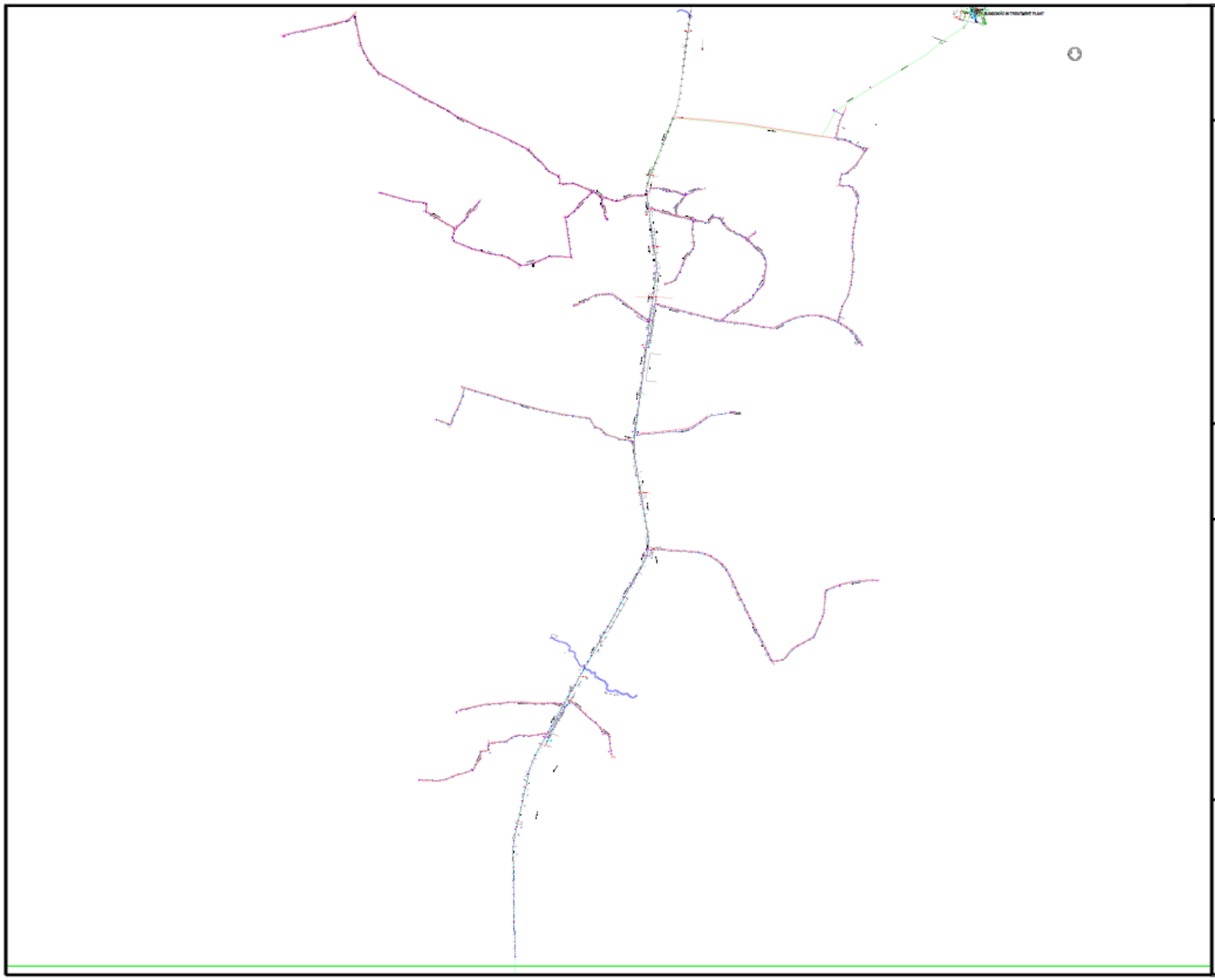
AWE Engineers

Drawing Title

MBALE TOWN DISTRIBUTION MAINS GENERAL LAYOUT

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.: IWMDP/MBA/001	
Sheet No.: 1	Format: A1

MBALE SOUTH GENERAL LAYOUT



AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MB/WI/0.0.0
4. For Node details, see Dwg. MB/WI/6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- N01 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

CONSULTANT:

saman Saman Corp.

CHEIL ENGINEERING

AWE Engineers

Drawing Title

MBALE SOUTH
GENERAL LAYOUT

Drawn by : Eria Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.: MWDP/MBA/MS/0.0.0	
Sheet No.: 1	Format: A0

MBALE WSSP NAKALOKE & KAMONKOLI GENERAL LAYOUT

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MBWI0.0.0
4. For Node details, see Dwg. MBWI6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- (N01) — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

CONSULTANT:

saman Saman Corp.

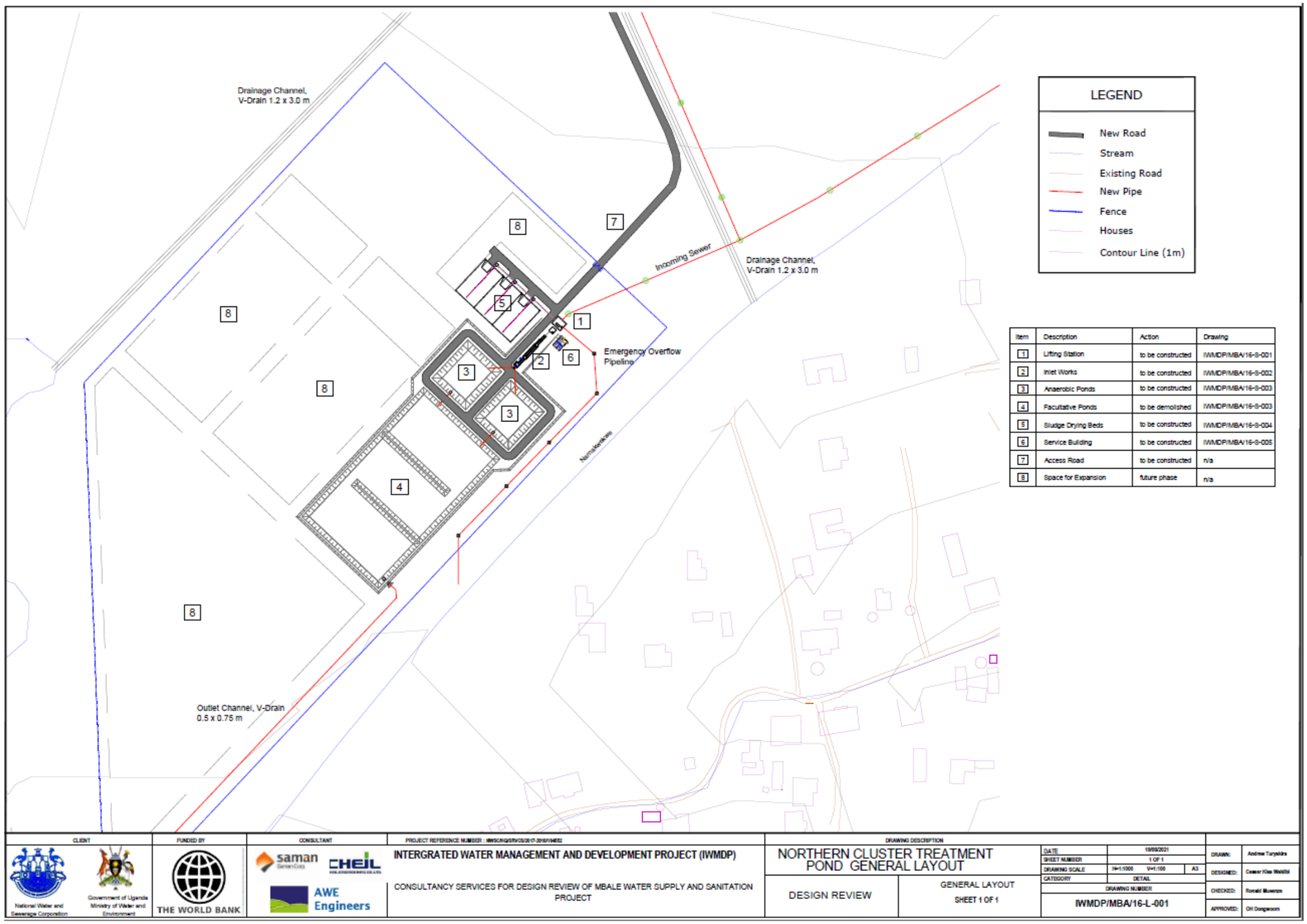
CHEIL ENGINEERING

AWE Engineers

Drawing Title:
MBALE WSSP
NAKALOKE & KAMONKOLI
GENERAL LAYOUT

Drawn by : Erie Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.: IWMDP/MBA/KAM/001	
Sheet No.: 1	Format: A1

NORTHERN CLUSTER TREATMENT POND GENERAL LAYOUT



Item	Description	Action	Drawing
1	Lifting Station	to be constructed	IWMDP/MBA/16-S-001
2	Inlet Works	to be constructed	IWMDP/MBA/16-S-002
3	Anaerobic Ponds	to be constructed	IWMDP/MBA/16-S-003
4	Facultative Ponds	to be demolished	IWMDP/MBA/16-S-003
5	Sludge Drying Beds	to be constructed	IWMDP/MBA/16-S-004
6	Service Building	to be constructed	IWMDP/MBA/16-S-005
7	Access Road	to be constructed	n/a
8	Space for Expansion	future phase	n/a

CLIENT: National Water and Sewerage Corporation; Government of Uganda Ministry of Water and Environment
FUNDED BY: THE WORLD BANK
CONSULTANT: saman; CHEIL; AWE Engineers
PROJECT REFERENCE NUMBER : MWSCR/NS/RVCS/20/17-2018/154/02

INTERGRATED WATER MANAGEMENT AND DEVELOPMENT PROJECT (IWMDP)

CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER SUPPLY AND SANITATION PROJECT

DRAWING DESCRIPTION: NORTHERN CLUSTER TREATMENT POND GENERAL LAYOUT

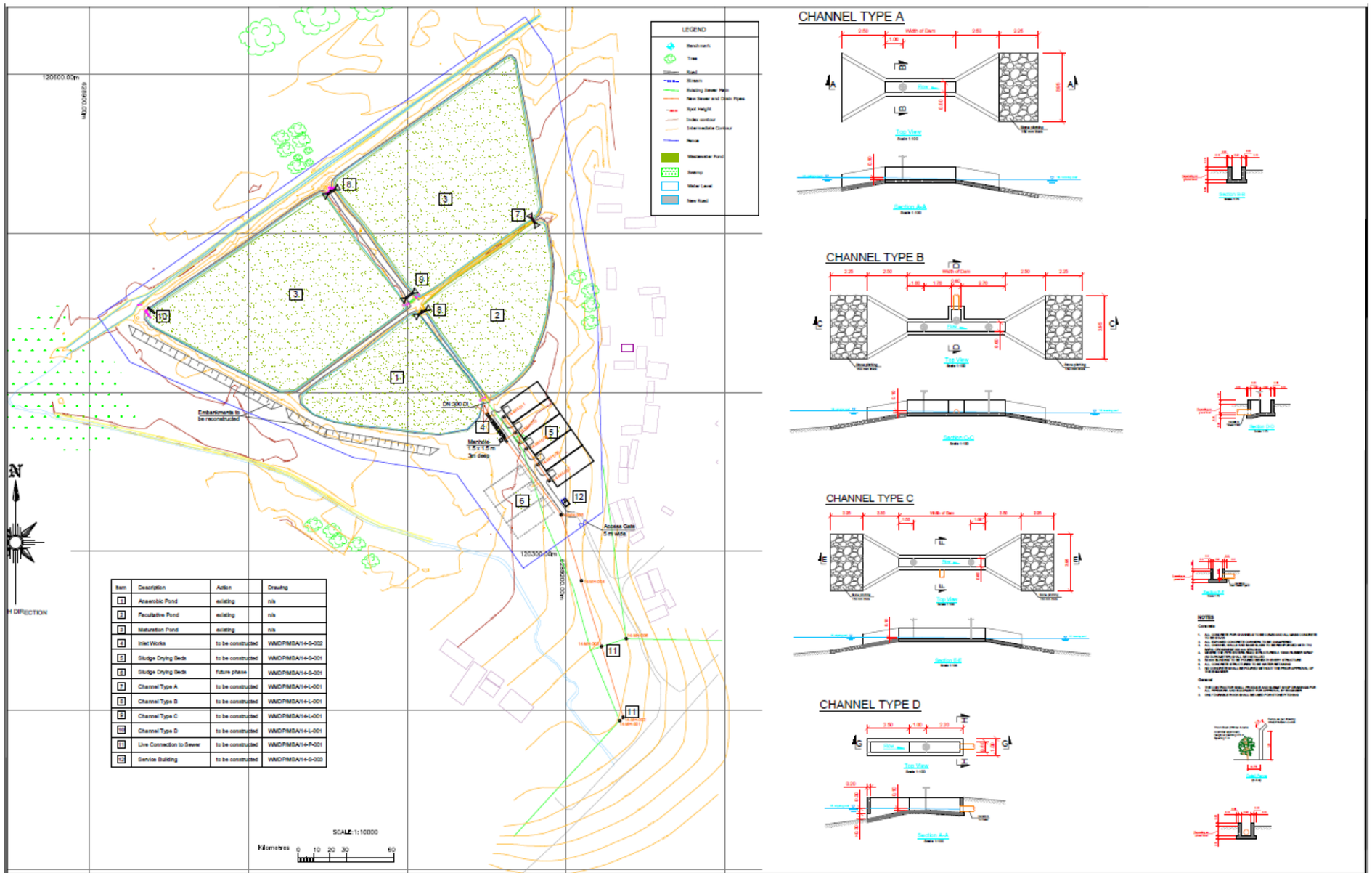
DESIGN REVIEW

GENERAL LAYOUT
SHEET 1 OF 1

DATE	10/09/2021
SHEET NUMBER	1 OF 1
DRAWING SCALE	H=1:1000 V=1:100 A3
CATEGORY	DETAIL
DRAWING NUMBER	IWMDP/MBA/16-L-001

DRAWN:	Andrew Turyahikra
DESIGNED:	Ceaser Klea Welchi
CHECKED:	Ronald Muwanga
APPROVED:	Ori Dongwoom

REHABILITATION NAMATALA TREATMENT PONDS GENERAL LAYOUT



Item	Description	Action	Drawing
1	Anaerobic Pond	existing	n/a
2	Facultative Pond	existing	n/a
3	Maturation Pond	existing	n/a
4	Inlet Works	to be constructed	WMDPIMBA/14-S-002
5	Sludge Drying Beds	to be constructed	WMDPIMBA/14-S-001
6	Sludge Drying Beds	future phase	WMDPIMBA/14-S-001
7	Channel Type A	to be constructed	WMDPIMBA/14-L-001
8	Channel Type B	to be constructed	WMDPIMBA/14-L-001
9	Channel Type C	to be constructed	WMDPIMBA/14-L-001
10	Channel Type D	to be constructed	WMDPIMBA/14-L-001
11	Live Connection to Sewer	to be constructed	WMDPIMBA/14-P-001
12	Service Building	to be constructed	WMDPIMBA/14-S-003

CLIENT	FUNDED BY	CONSULTANT	PROJECT REFERENCE NUMBER : MWSCIN/GTVCS/2017-2018/154652	DRAWING DESCRIPTION			
National Water and Sewerage Corporation; Government of Uganda Ministry of Water and Environment		saman; CHEIL; AWE Engineers	INTERGRATED WATER MANAGEMENT AND DEVELOPMENT PROJECT (IWMDP) CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER SUPPLY AND SANITATION PROJECT	REHABILITATION NAMATALA TREATMENT PONDS GENERAL LAYOUT DESIGN REVIEW GENERAL LAYOUT SHEET 1 OF 1	DATE: 19/09/2021; SHEET NUMBER: 1 OF 1; DRAWING SCALE: H=1:1000 V=1:100 A3; CATEGORY: DETAIL; DRAWING NUMBER: IWMDP/MBA/14-L-001	DRAWN: Andrew Turyahikra; DESIGNED: Ceaser Kiss Walidzi; CHECKED: Ronald Musenze; APPROVED: Oli Dongwoom	

APPENDIX H: CONTRACTORS/ WORKERS' CODE OF CONDUCT

Code of Conduct

Implementing ESHS and OHS Standards

Preventing Gender Based Violence and Violence Against Children

I, ……, acknowledge that adhering to environmental, social, health and safety (ESHS) standards, following the project's occupational health and safety (OHS) requirements, and preventing gender based violence (GBV) and violence against children (VAC) is important.

The Contractor considers that failure to follow ESHS and OHS standards/ requirements, or to partake in GBV or VAC activities, be it on the work site, the work site surrpoundings, at workers' camps, or the surrounding communities, constitute acts of gross misconduct and are therefore grounds for sanctions, penalties or potential termination of employment. Prosecution by the Police of those who commit GBV or VAC may be pursued if appropriate.

I agree that while working on the project I will:

a) Attend and actively partake in training courses or activities related to ESHS, OHS, HIV/AIDS, GBV and VAC as requested by my employer
b) Will wear my personal protective equipment (PPE) at all times when at the work site or engaged in project related activities
c) Take all practical steps to implement the Contractor's Environmental and Social Management Plan (CESMP)
d) Implement the OHS Management Plan
e) Adhere to a zero-alcohol policy during work activities, and refrain from the use of narcotics or other substances which can impair faculties at all times
f) Consent to Police background check
g) Treat women, children (persons under the age of 18 years), men and the elderly with respect regardless of race, colour, language, religion, political or other opinion, national, ethnic or social origin, property, disability, birth or other status.
h) Not use language or behavior towards women, children or men that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate.
i) Not engage in sexual harassment, for instance, making unwelcome sexual advances, requests for sexual favours, and other verbal or physical conduct, of a sexual nature, including subtle acts of such behavious (for example, looking somebody up and down; kissing; howling or smacking sounds; handing around somebody; whistling and catcalls; giving personal gifts; making comments about somebody's sex life, etc.).
j) Not engage in sexual favours, for instance, making promises or favourable treatment depending on sexual acts, or other forms of humiliating or exploitative behavious.
k) Not participate in sexual contact or activity with children – including glooming, or contact through digital media. Mistaken belief regarding the age of a child is not defense. Consent from the child is also not a defense or excuse.

l) Unless there is full consent by all parties involved, I will not have sexual interactions with members of the surrounding communities. This includes relationships involving the withholding or promise of actual provision of benefit (monetory or non-monetory) to community members in exchange for sex – such sexual activity is considered "non-consensual" within the scope of this Code.
m) Consider reporting through the GRM or to my manager any suspected or actual GBV or VAC by a fellow worker, whether employed my company or not, or any breaches of this Code of Conduct.

With regard to children under the age of 18

n) Wherever possible, ensure that another adult is present when working in the proximity of children.
o) Not invite unaccompanied children unrelated to my family into my home, unless they are at immediate risk of injury or in physical danger.
p) Not use any computers, mobile phones, video and digital cameras or any other medium to exploit or harass children or to access child pornography.
q) Refrain from physical punishment or discipline of children.
r) Refrain from hiring children for domestic or other labour below the minimum age of 18.
s) Comply with all relevant local legislation including labour laws in relation to child labour and World Bank safeguard standards on child labour and minimum age.
t) Take appropriate caution when photographig or filming children.

I also take note of the following:

1 Abuse shall include the following, but is not limited to:

a) Any type of physical hitting or corporal punishment inflicted in any manner upon the body.
b) Deprivation of life-sustaining treatment.
c) Harm or threatened harm, meaning damage or threatened damage to physical or emotional health and welfare of any person.
d) Physical injury including, but not limited to, any contusion of the skin, laceration, malnutrition, burn, fracture of any bone, subdural hematoma, injury to any internal organ, any injury causing bleeding, or any physical condition which imperils a person's health or welfare.
e) Unlawful confinement.

2 Sexual misdemeanor will include, but not be limited to:

a) Engaging in exploitive or manipulative sexual intercourse with any person. There will be zero tolerance to sexual misdemeanor including rape, defilement of minors/ sexual child abuse, sexual harassment and elopement.
b) Taking indecent liberties with a person, or causing an individual to take indecent liberties with a person, with the intent to arouse or gratify sexual desire of any person.
c) Employing, using, persuading, inducing, enticing, or coercing a person to pose in the nude.
d) Employing, using, persuading, inducing, enticing or coercing a person to engage in any sexual or simulated sexual conduct for the purpose of photographing, filming, recording, or displaying in any way the sexual or simulated sexual conduct. This includes displaying, distributing, possessing for the purpose of distribution, or selling material depicting nudity, or engaging in sexual or simulated sexual conduct.
e) Use of profanities and obscene language in communities or when instructing others.

3 Neglect may include but is not limited to:

a) Denial of sufficient nutrition to any person.
b) Denial of sufficient sleep to nay person.
c) Denial of sufficient protective gear to any person.
d) Failure to provide adequate supervision; leading to drug use in workplaces, accidents and impairment of employees.
e) Failure to arrange for medical care and/or medical treatment for any person in an emergency.
f) Failure to drive courteously at all times, leading to accidents.
g) Failure to avoid damage public property.
h) Neglecting public and employee complaints.

4 Drug abuse may include but is not limited to:

a) Smoking in public or smoking in undesignated areas
b) Consumption of alcohol while on duty/at work
c) Use and trading in narcotics

5 Illegal trade activities without necessary licenses:

a) Trade in protected fauna or flora species
b) Trade in ivory or similar regulated wildlife products including game meat
c) Trade in processed, semi-processed minerals and their ores

6 Financial exploitation will include, but is not limited to:

Utilizing labor of without paying for it, or at a non-commensurate financial rate/ wage.

7 Mistreatment will include, but is not limited to:

a) Physical exercises, such as running laps or performing pushups,
b) Unauthorized chemical, mechanical or physical restraints except,
c) Assignment of unduly physically strenuous or harsh work.
d) Failure to behave in a polite and courteous manner to the general public
e) Requiring or forcing the individual to take an uncomfortable position, such as squatting or bending, or forcing people to repeat physical movements when used solely as a means of punishment.
f) Group punishments for misbehavior of individuals except in accordance with the written policy.
g) Verbal abuse: engaging in language whose intent or result is demeaning
h) Denial of any essential service solely for disciplinary purposes
i) Denial of visiting or communication privileges with family or significant others
j) Requiring the individual to remain silent for long periods of time solely for the purpose of punishment.

Sanctions

I understand that if I breach this Code of Conduct, my employer will take disciplinary actions which could include:

- Informal warning
- Formal warning
- Additional Training

- Suspension of employment
- Termination of employment
- Report to Police if warranted.

I understand that it is my responsibility to ensure that the environmental, social, health and safety standards/ requirements of the project are met. That I will adhere to the occupational health and safety management plan. That I will avoid actions or behaviours that could be construed as GBV or VAC. Any such actions will be a breach of this Code of Conduct. I do hereby acknowledge that I have read the foregoing Code of Conduct, do agree to comply with the requirements and standards contained therein and understand my roles and responsibilities to prevent and respond to ESHS, OHS, GBV and VAC issues. I understand that any action inconsistent with this Code of Conduct or failure to act by this Code of Conduct may result in disciplinary action and may affect my ongoing employment.

The Employee

Signature:……

Printed Name:…….

Title:……..

Date:……..

The Company

FOR THE COMPANY

Signature:…….

Printed Name: …….

Title:……

Date:……

The Project Manager

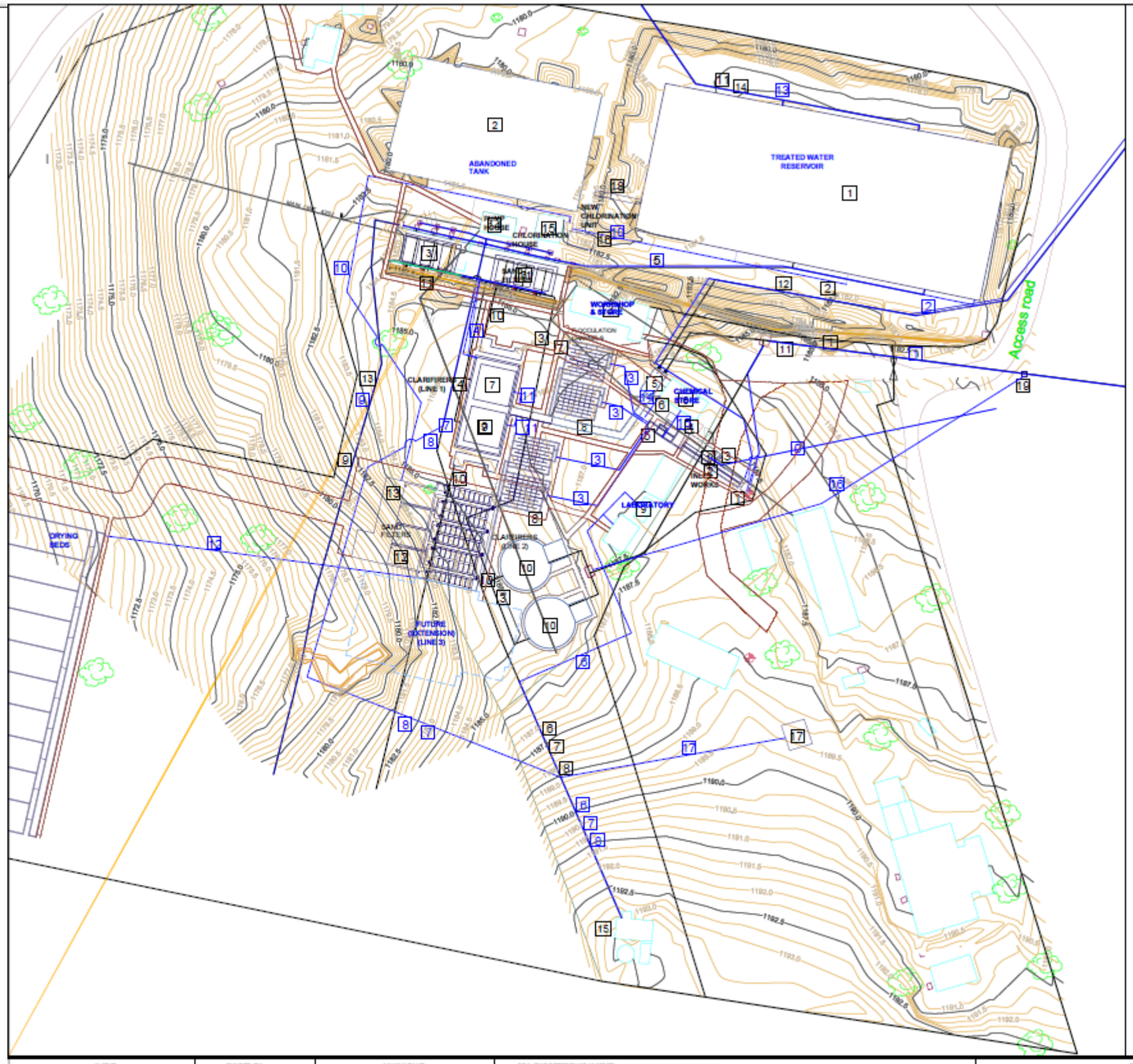
FOR THE EMPLOYER

Signature:…….

Printed Name:…….

Title:……

Date:……

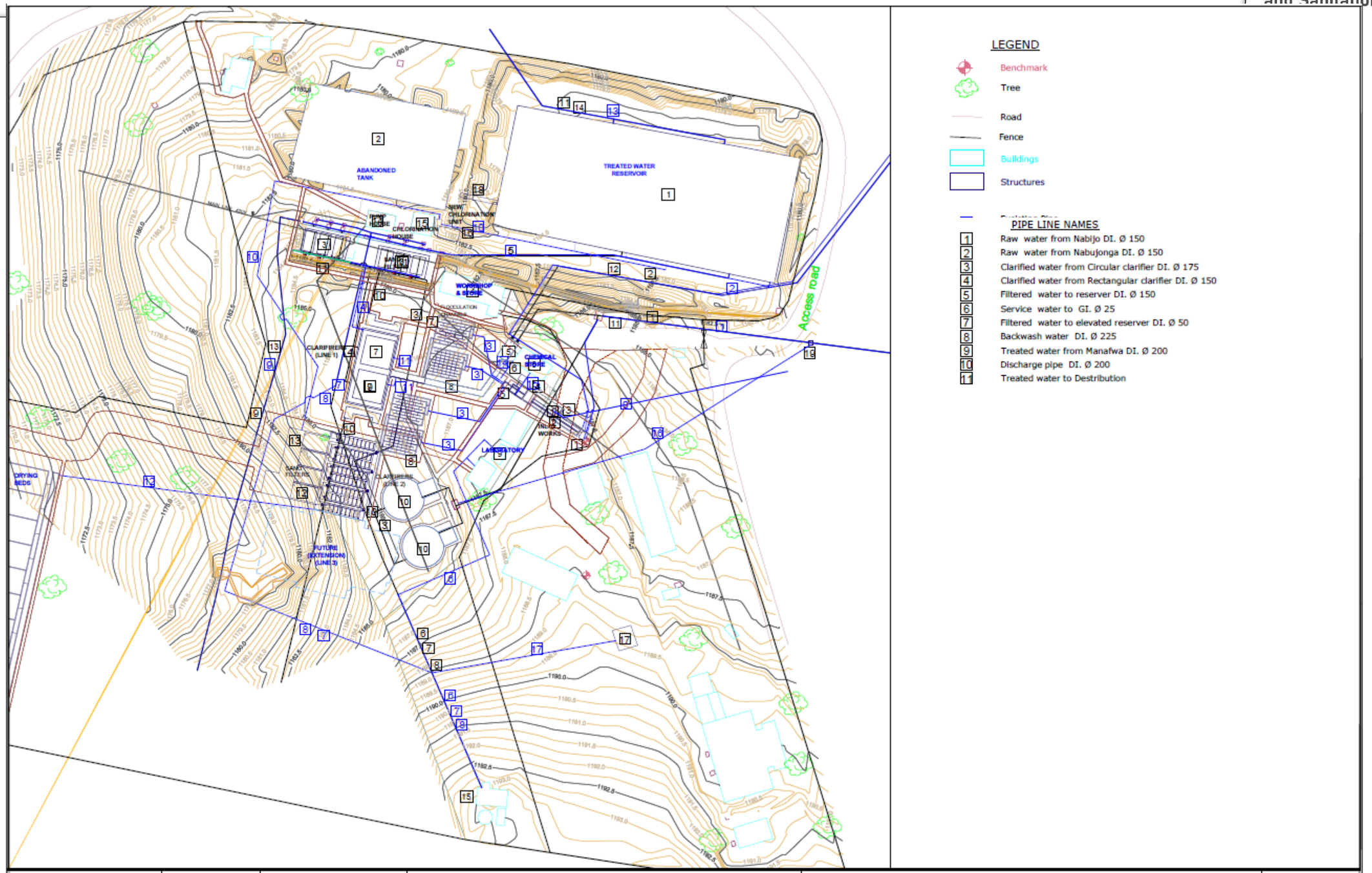


Benchmark
Tree
Road
Fence
Intermediate Contour
Buildings
Structures
Exsisting Pipe
New Pipes

2 Abandoned Tank
3 Sand Filters
4 Workshop and Stores
5 Raw water inlate
6 Chemical Store
7 Rectangular clariffiers
8 Mixing Channels
9 Laboratory
10 Circular clariffiers
11 Nabijo Raw water Pipeline
12 Nabujonga Raw water pipeline
13 Treated water from Manafwa
14 Treated water from the Reservoir
15 Backwash water Reservoir

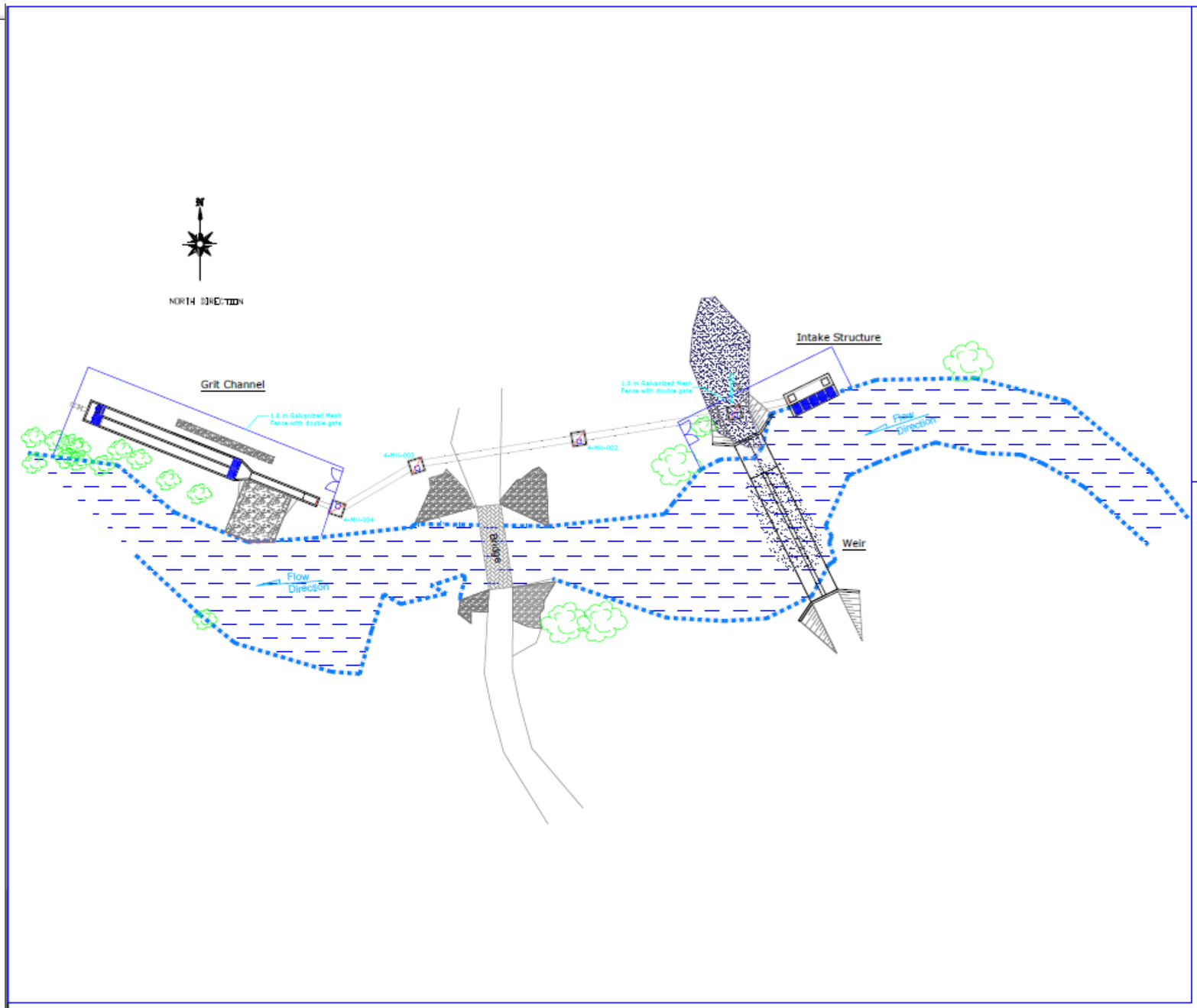
PIPE LINE NAMES

CLIENT	FUNDED BY	CONSULTANT	PROJECT REFERENCE NUMBER :	DRAWING DESCRIPTION			
National Water and Sewerage Corporation; Government of Uganda Ministry of Water and Environment	THE WORLD BANK	saman; CHEIL; AWE Engineers	INTERGRATED WATER MANAGEMENT AND DEVELOPMENT PROJECT (IWMDP) CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER SUPPLY AND SANITATION PROJECT	UPGRADE AND EXTENSION BUNGOKHO WATER TREATMENT PLANT - GENERAL LAY OUT OF EXISTING PLANT DESIGN REVIEW GENERAL LAYOUT SHEET 1 OF 1	DATE: 15/09/2021; SHEET NUMBER: 1 OF 1; DRAWING SCALE: H=1:1000 V=1:100 A3; CATEGORY: DETAIL; DRAWING NUMBER: IWMDP/MBA/9 /10-L-001	DRAWN: Andrew Turyakira; DESIGNED: Ceaser Kisa Wadibi; CHECKED: Ronald Muwanze; APPROVED: Oli Dongwoom


LEGEND
Benchmark
Tree
Road
Fence
Buildings
Structures
PIPE LINE NAMES
1 Raw water from Nabijo DI. Ø 150
2 Raw water from Nabujonga DI. Ø 150
3 Clarified water from Circular clarifier DI. Ø 175
4 Clarified water from Rectangular clarifier DI. Ø 150
5 Filtered water to reserver DI. Ø 150
6 Service water to GI. Ø 25
7 Filtered water to elevated reserver DI. Ø 50
8 Backwash water DI. Ø 225
9 Treated water from Manafwa DI. Ø 200
10 Discharge pipe DI. Ø 200
11 Treated water to Destribution
ABANDONED TANK
TREATED WATER RESERVOIR
NEW CHLORINATION UNIT
CHLORINATION HOUSE
WORKSHOP & STORE
CLARIFIERS (LINE 1)
CHEMICAL HOUSE
LABORATORY
SAND FILTERS
CLARIFIERS (LINE 2)
DRYING BEDS
FUTURE EXTENSION (LINE 3)
Access road
CLIENT
National Water and Sewerage Corporation
Government of Uganda Ministry of Water and Environment
FUNDED BY
THE WORLD BANK
CONSULTANT
saman
CHEIL
AWE Engineers
PROJECT REFERENCE NUMBER
INTERGRATED WATER MANAGEMENT AND DEVELOPMENT PROJECT (IWMDP)
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER SUPPLY AND SANITATION PROJECT
DRAWING DESCRIPTION
UPGRADE AND EXTENSION BUNGOKHO WATER TREATMENT PLANT - EXISTING PIPES
DESIGN REVIEW
EXISTING PIPES SHEET 1 OF 1
DATE 15/09/2021
SHEET NUMBER 1 OF 1
DRAWING SCALE H=1:1000 V=1:100 A3
CATEGORY DETAIL
DRAWING NUMBER
IWMDP/MBA/9 / 10-L-002
DRAWN: Andrew Turyakira
DESIGNED: Ceaser Kisa Wakibi
CHECKED: Ronald Muwanga
APPROVED: Oli Dongwoom


N
NORTH DIRECTION
LEGEND
Tree
Road
Buildings
Structures
Fence
1 Inlet of raw water from Nabijo and Nabujonga
2 Sand Sedimentation Channels
3 Inlet of raw water from Namatala
4 Pressure break chember
5 Flow measurement, flash mixing and flow distribution
6 Coagulant dosing pumps and MCC- 2
7 Flocculation channels line 1
9 Lamellar clarifiers line 1
11 Sand filters line 1
14 Pump house with backwash pumps and blowers of line 1 and MCC-1
15 Existing Chlorination house
16 New chlorination unit
ABANDONED
WATER
Access road
CLIENT
National Water and Sewerage Corporation
Government of Uganda Ministry of Water and Environment
FUNDED BY
THE WORLD BANK
CONSULTANT
saman
CHEIL
AWE Engineers
PROJECT REFERENCE NUMBER : IWMDP/MBA/9-L-004
INTERGRATED WATER MANAGEMENT AND DEVELOPMENT PROJECT (IWMDP)
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER SUPPLY AND SANITATION PROJECT
DRAWING DESCRIPTION
UPGRADE OF BUNGOKHO WATER TREATMENT PLANT - GENERAL LAYOUT
DESIGN REVIEW
GENERAL LAYOUT SHEET 1 OF 1
DATE 19/09/2021
SHEET NUMBER 1 OF 1
DRAWING SCALE H=1:1000 V=1:100 A3
CATEGORY DETAIL
DRAWING NUMBER
IWMDP/MBA/9-L-004
DRAWN: Andrew Turyahikra
DESIGNED: Ceaser Kisa Wasiibi
CHECKED: Ronald Muwonge
APPROVED: Oli Dongwoom

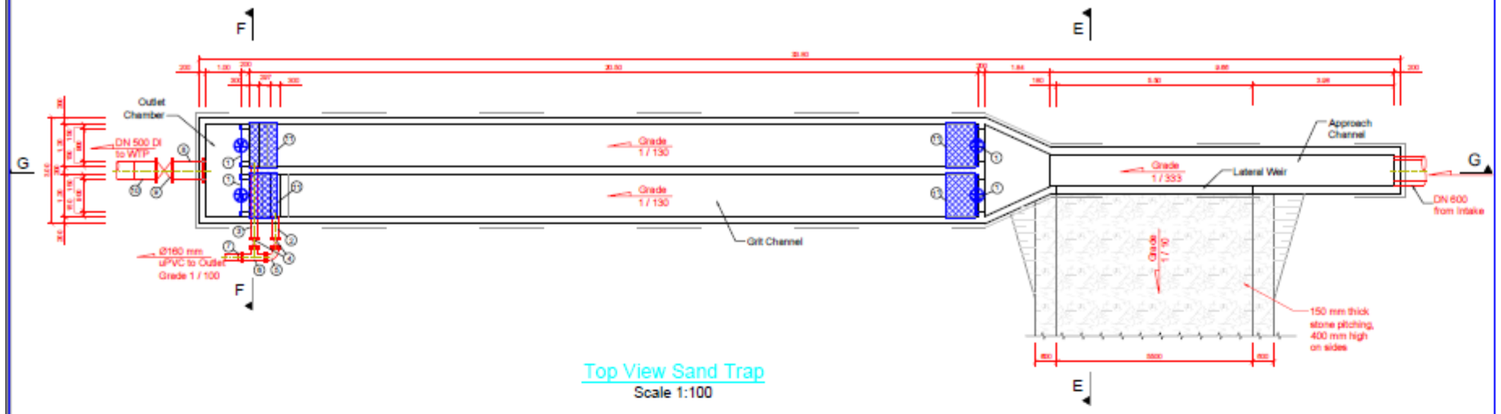
NAMATALA RAW WATER



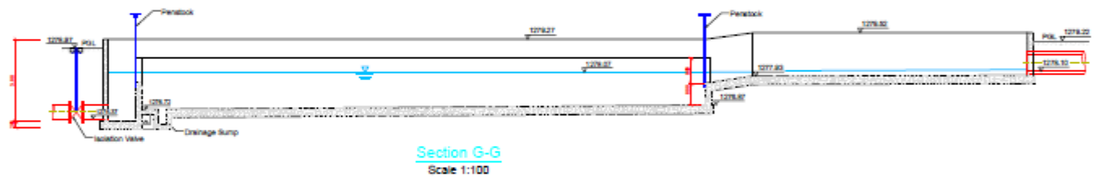
LEGEND

- Tree
- Road
- Index contour
- Intermediate Contour
- Fencing
- Water
- Rock
- Gabion

CLIENT	FUNDED BY	CONSULTANT	PROJECT REFERENCE NUMBER : IWSCN/Q/ST/VCS/2017-2018/134832	DRAWING DESCRIPTION			
National Water and Sewerage Corporation; Government of Uganda Ministry of Water and Environment	THE WORLD BANK	saman; CHEIL; AWE Engineers	INTERGRATED WATER MANAGEMENT AND DEVELOPMENT PROJECT (IWMDP) CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER SUPPLY AND SANITATION PROJECT	NAMATALA INTAKE DESIGN REVIEW Namatala Intake SHEET 1 OF 1	DATE: 15/09/2021; SHEET NUMBER: 1 OF 1; DRAWING SCALE: H=1:1000 V=1:100 A3; CATEGORY: DETAIL; DRAWING NUMBER: IWMDP/MBA/4-L-001	DRAWN: Andrew Turyakira; DESIGNED: Ceaser Kisa Wakibi; CHECKED: Ronald Muwanza; APPROVED: Oh Dongwoon	



Top View Sand Trap
Scale 1:100



Section G-G
Scale 1:100

Notes

Pipework, Valves and Equipment

1. ANY INCOMPATIBILITIES WITH REGARDS TO THE SPECIFICATION MUST BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE ORDERING THE MATERIALS
2. ALL RSV GATE VALVES MUST BE CLOCKWISE CLOSING
3. ALL FITTINGS AND FLANGES TO BE PRESSURE RATED 10 BAR UNLESS OTHERWISE SPECIFIED
4. GASKETS FOR FLANGED JOINTS SHALL BE OF COMPRESSED NON-ASBESTOS SYNTETIC FIBER TO BS 7531 GRADE Y AND FULL FACED WITH A MINIMUM THICKNESS OF 2 mm
5. FOR ALL BOLTS, ONE WASHER ON THE BOLT AND WASHER ON THE NUT SIDE TO BE FITTED. A MINIMUM OF 2-4 THREADS IS TO BE PROTRUDING THE NUT SIDE AFTER THIGHTENING
6. ALL BOLTS, NUTS AND WASHERS TO BE HOT DIP GALVANIZED IN ACCORDANCE WITH BS EN ISO 1461, MINIMUM 70 MICRONS THICK
7. ALL THREADED JOINTS TO BE TREATED WITH 'HICHEM' SOLVENTLESS TRAVELLING FILLER OR 'EPIDERMIX 372' ACCORDING TO SUPPLIERS
8. WELDING AND MAKING GOOD OF GALVANIZED JOINTS ONLY WHERE APPROVED BY THE ENGINEER
9. ALL BURIED BOLTS AND FLANGES SHALL BE WRAPPED IN PETROLEUM MASTIC AND TAPE, IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION
10. ALL BURIED STEEL PIPEWORK OUTSIDE THE CHAMBER TO BE BITUMEN TAPE WRAPPED, DENSOCLAD 70 (OR EQUAL APPROVED)

Concrete

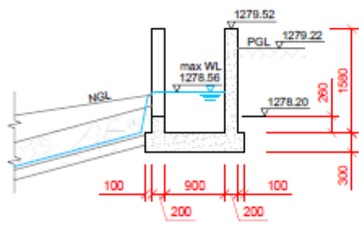
11. ALL STRUCTURAL CONCRETE TO BE C25/19 AND ALL MASS CONCRETE TO BE ST4/20
12. ALL EXPOSED CONCRETE CORNERS TO BE CHAMFERED
13. WHERE THE PIPE ENTERS RIGID STRUCTURES A 10mm RUBBER WRAP (50 DUROMETER) SHALL BE INSTALLED
14. 50 mm BLINDING TO BE POURED BENEATH EVERY STRUCTURE
15. ALL CONCRETE STRUCTURES TO BE WATER RETAINING
16. NO CONCRETE SHALL BE POURED WITHOUT THE PRIOR APPROVAL OF THE ENGINEER

Site Works

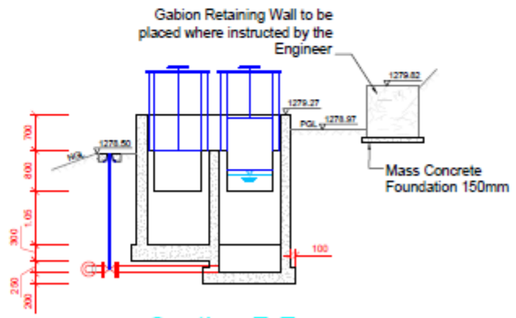
17. A GEOTEXTILE SHALL BE PLACED BEHIND THE GABIONS
18. ONLY DURABLE ROCK SHALL BE USED FOR THE STONE PITCHING AND THE GABIONS

General

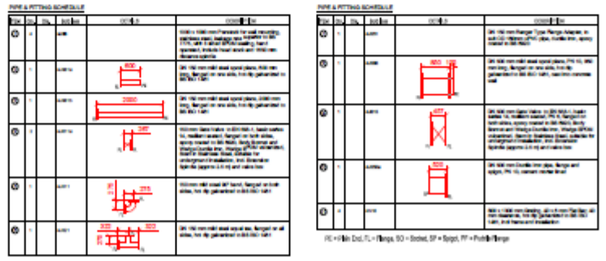
19. THE CONTRACTOR SHALL PRODUCE AND SUBMIT SHOP DRAWINGS FOR ALL PIPEWORK AND EQUIPMENT FOR APPROVAL BY ENGINEER
20. TECHNICAL DATASHEETS SHEETS OF ALL FITTINGS AND SPECIALS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL



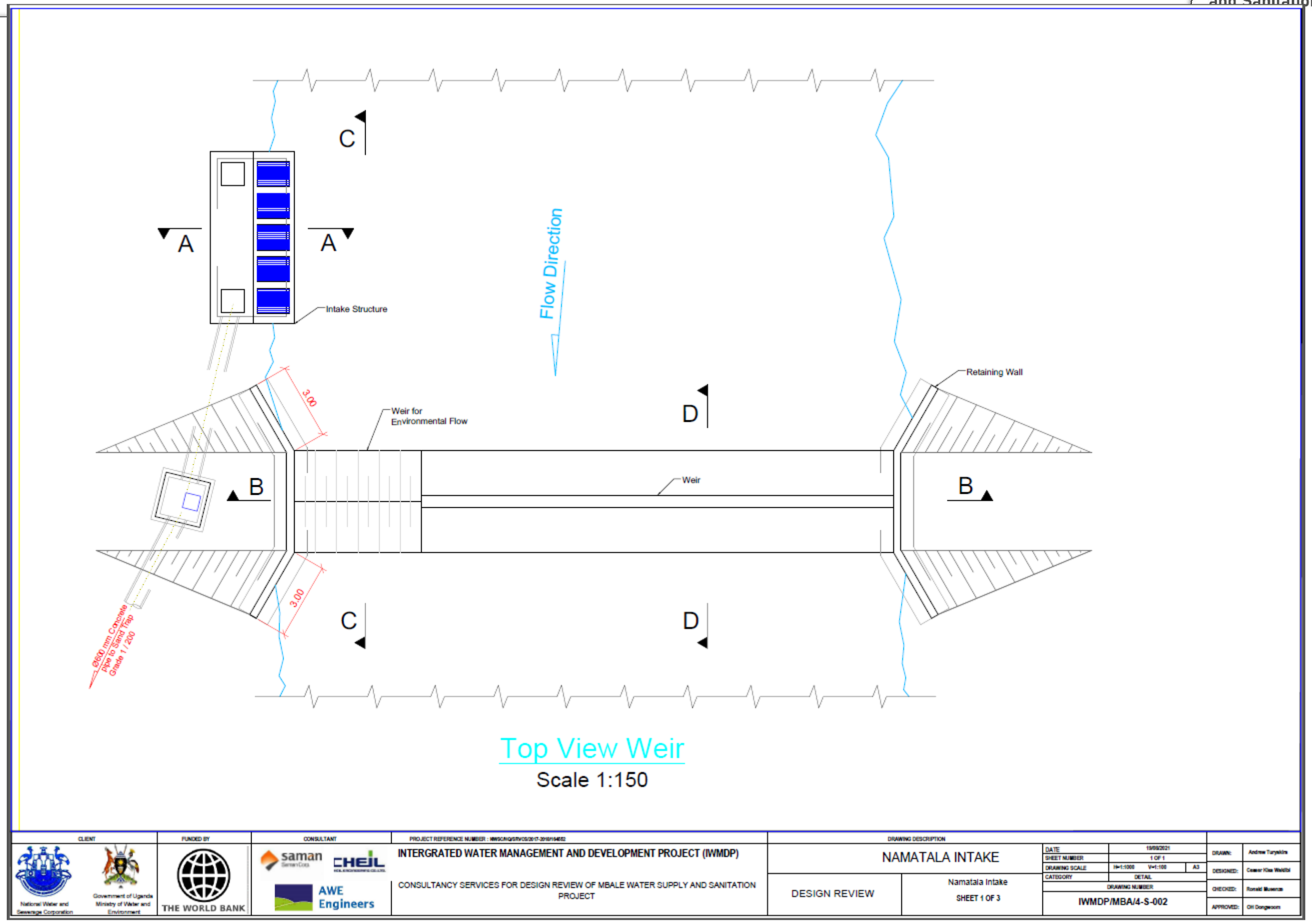
Section E-E
Scale 1:75



Section F-F
Scale 1:75



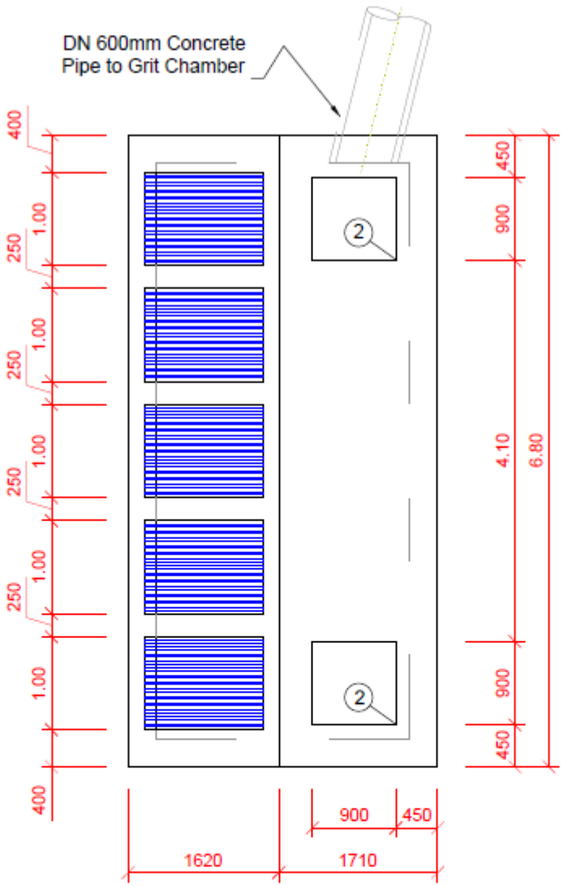
CLIENT	FUNDED BY	CONSULTANT	PROJECT REFERENCE NUMBER : IWSCN/QS/RFQS/2017-2018/194832	DRAWING DESCRIPTION			
National Water and Sewerage Corporation; Government of Uganda Ministry of Water and Environment	THE WORLD BANK	saman; CHEIL; AWE Engineers	INTERGRATED WATER MANAGEMENT AND DEVELOPMENT PROJECT (IWMDP) CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER SUPPLY AND SANITATION PROJECT	NAMATALA INTAKE DESIGN REVIEW Namatala Intake SHEET 1 OF 1	DATE: 19/09/2021 SHEET NUMBER: 1 OF 1 DRAWING SCALE: H=1:1000 V=1:100 A3 CATEGORY: DETAIL DRAWING NUMBER: IWMDP/MBA/4-S-001	DRAWN: Andrew Turyahika DESIGNED: Ceaser Kiss Welchi CHECKED: Ronald Muwanza APPROVED: Ofi Dongwoon



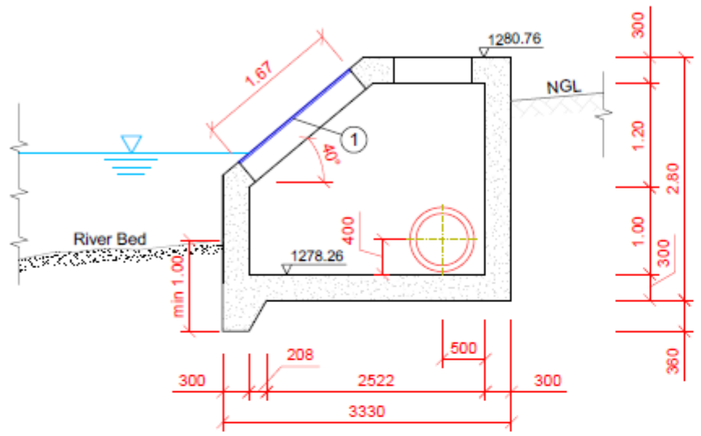
Top View Weir

Scale 1:150

CLIENT	FUNDED BY	CONSULTANT	PROJECT REFERENCE NUMBER : IWMSCN/Q/ST/CS/2017-2018/1/MB02	DRAWING DESCRIPTION			
National Water and Sewerage Corporation; Government of Uganda Ministry of Water and Environment	THE WORLD BANK	saman; CHEIL; AWE Engineers	INTERGRATED WATER MANAGEMENT AND DEVELOPMENT PROJECT (IWMDP) CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER SUPPLY AND SANITATION PROJECT	NAMATALA INTAKE DESIGN REVIEW	Namatala Intake SHEET 1 OF 3	DATE: 18/08/2021; SHEET NUMBER: 1 OF 1; DRAWING SCALE: H=1:1000 V=1:100 A3; CATEGORY: DETAIL; DRAWING NUMBER: IWMDP/MBA/4-S-002	DRAWN: Andrew Turyakira; DESIGNED: Ceaser Kiss Wadibi; CHECKED: Ronald Muwanze; APPROVED: Ofi Dongwoon



Top View Intake
Scale 1:50



Section A-A
Scale 1:50

Notes

Pipework, Valves and Equipment

1. ANY INCOMPATIBILITIES WITH REGARDS TO THE SPECIFICATION MUST BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE ORDERING THE MATERIALS
2. ALL STAINLESS STEEL TO BE OF GRADE 304 TO ASTM A 240 OR 1.4301 TO DIN 17007 OR BETTER
3. HOT DIP GALVANIZING TO BS ISO 1641. NO GALVANIZING SHALL BE CARRIED OUT WITHOUT PRIOR APPROVAL OF SHOP DRAWINGS
4. ON-SITE WELDING OF GALVANIZED IRON ONLY WHERE APPROVED BY THE ENGINEER

Concrete

5. ALL STRUCTURAL CONCRETE TO BE C25/20 AND ALL MASS CONCRETE TO BE ST4/20
6. ALL EXPOSED CONCRETE CORNERS TO BE CHAMFERED
7. WHERE THE PIPE ENTERS RIGID STRUCTURES A 10mm RUBBER WRAP (50 DUROMETER) SHALL BE INSTALLED
8. 50 mm BLINDING TO BE POURED BENEATH EVERY STRUCTURE
9. ALL CONCRETE STRUCTURES TO BE WATER RETAINING
10. NO CONCRETE SHALL BE POURED WITHOUT THE PRIOR APPROVAL OF THE ENGINEER
11. AT WEIR, ROCK DOWEL TO BE DRILLED 800 MM INTO THE BEDROCK, SPACING 250 MM

General

12. THE CONTRACTOR SHALL PRODUCE AND SUBMIT SHOP DRAWINGS FOR ALL PIPEWORK AND EQUIPMENT FOR APPROVAL BY ENGINEER
13. TECHNICAL DATASHEETS SHEETS OF ALL FITTINGS AND SPECIALS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL

PIPE & FITTING SCHEDULE

ITEM	Qty.	Dia.	BoQ Item	DETAILS	DESCRIPTION
①	5		4N22		1670 x 1000 mm Stainless Steel Screen, 25mm round bars, 50 mm clearance, incl. fixation
②	2		4N231		900 x 900 mm Access Lid including Frame and Lock Box, hot dip galvanized to BS ISO 1461, as per drawing nr WMDP/MBA/1-D-006

CLIENT: National Water and Sewerage Corporation; Government of Uganda Ministry of Water and Environment
FUNDED BY: THE WORLD BANK
CONSULTANT: saman; CHEIL; AWE Engineers
PROJECT REFERENCE NUMBER : IWMDP/CW/QS/ITVCS/2017-2018/104832

INTERGRATED WATER MANAGEMENT AND DEVELOPMENT PROJECT (IWMDP)

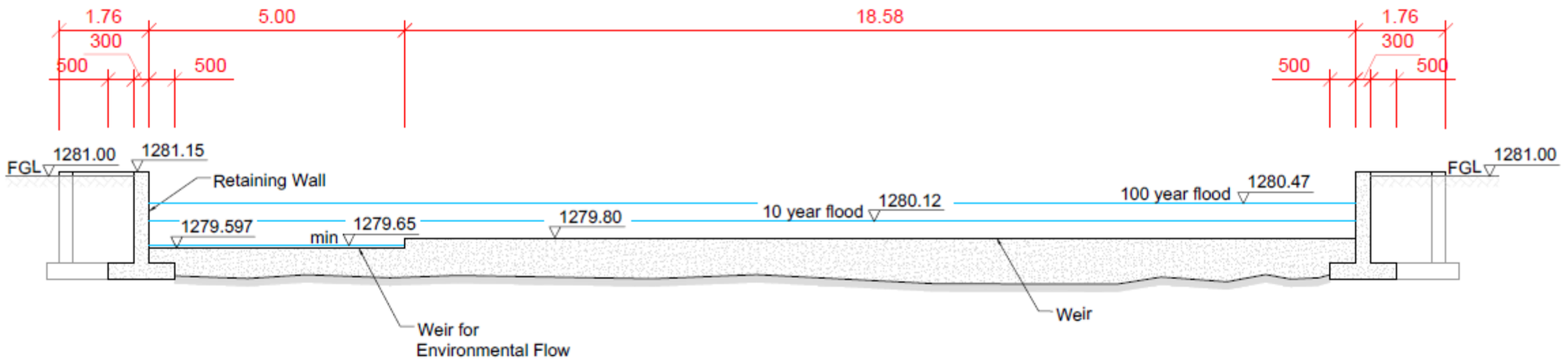
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER SUPPLY AND SANITATION PROJECT

DRAWING DESCRIPTION: NAMATALA INTAKE

DESIGN REVIEW | Namatala Intake | SHEET 2 OF 3

DATE	15/09/2021		
SHEET NUMBER	1 OF 1		
DRAWING SCALE	H=1:1000	V=1:100	A3
CATEGORY	DETAIL		
DRAWING NUMBER	IWMDP/MBA/4-S-002		

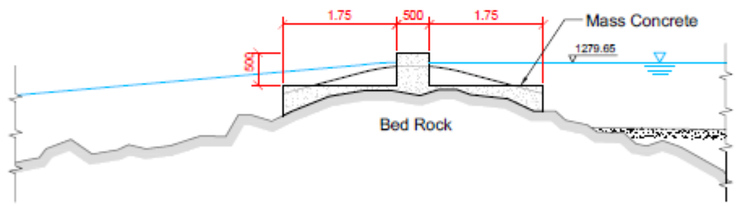
DRAWN:	Andrew Turyakira
DESIGNED:	Ceaser Kiss Wadibi
CHECKED:	Ronald Muwonge
APPROVED:	OH Dongwoon



Section B-B

Scale 1:100

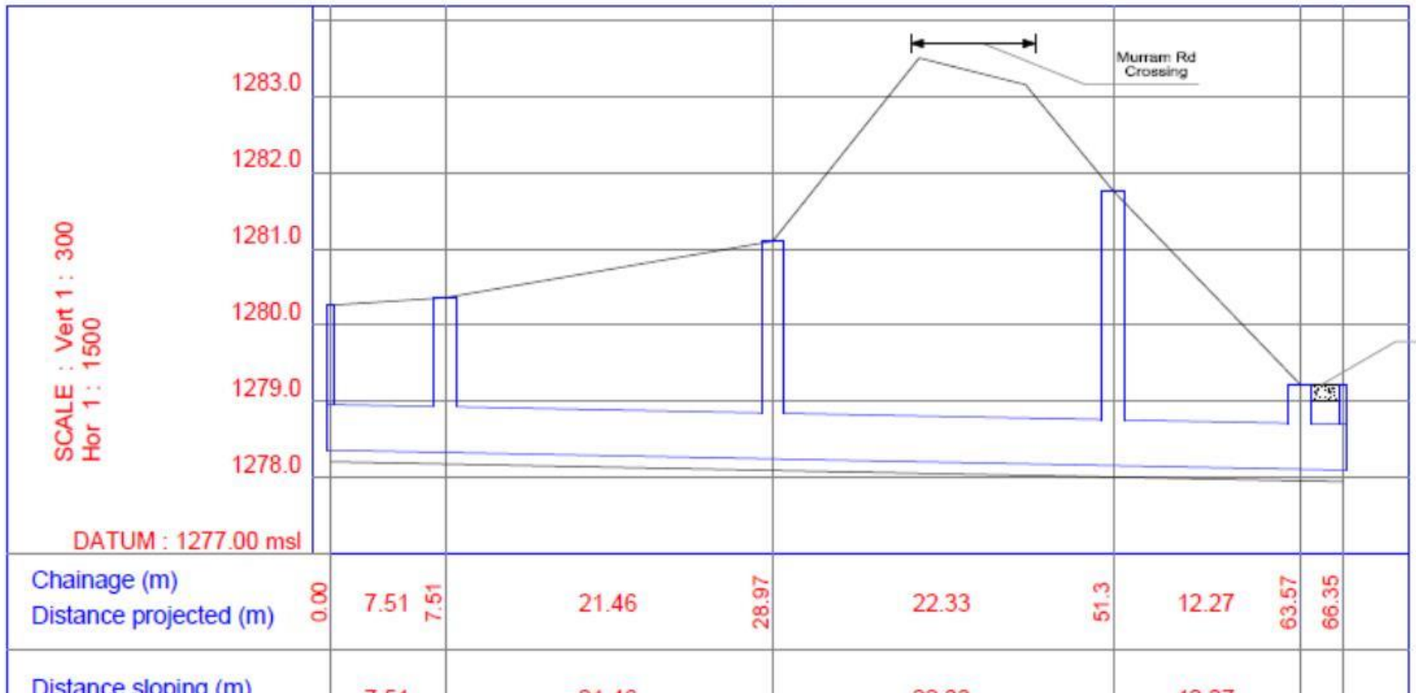
Section C-C
Scale 1:50



Section D-D
Scale 1:50

CLIENT	FUNDED BY	CONSULTANT	PROJECT REFERENCE NUMBER :
National Water and Sewerage Corporation; Government of Uganda Ministry of Water and Environment	THE WORLD BANK	saman; CHEJL; AWE Engineers	INTERGRATED WATER MANAGEMENT AND DEVELOPMENT PROJECT (IWMDP) CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER SUPPLY AND SANITATION PROJECT

DRAWING DESCRIPTION				
NAMATALA INTAKE		DATE	15/09/2021	DRAWN: Andrew Turyakira
		SHEET NUMBER	1 OF 1	DESIGNED: Ceaser Kisa Wakibi
		DRAWING SCALE	H=1:1000 V=1:100 A3	CHECKED: Ronald Muwanga
		CATEGORY	DETAIL	APPROVED: Oli Dongwoom
DESIGN REVIEW	Namatala Intake SHEET 3 OF 3	DRAWING NUMBER	IWMDP/MBA/4-S-002	



Chainage (m)	0.00	7.51	7.51	21.46	28.97	22.33	51.3	12.27	63.57	66.35
Distance projected (m)										
Distance sloping (m)		7.51		21.46		22.33		12.27		
Ground level (m)	1280.26	1280.36		1281.10		1281.76		1278.22	1279.22	
Invert Level (m)	1278.36	1278.33		1278.25		1278.16		1278.11	1278.10	
Depth (m)	1.90	2.03		2.85		3.60		1.11	1.12	
Grade (1:_)	200									
Pipe description	600mm dia. CONCRETE PIPE TO BS 5911-1, flexible sand bedding									
Reference	Intake	4-MH-001		4-MH-002		4-MH-003		4-MH-004	Grit Chamber	

Notes

1. CONCRETE PRESSURE PIPES TO BS 5911-1 WITH SBR GASKETS TO BS EN 681-1
2. IN AREAS OF LOW COVER (<0.9 M) A REINFORCED CONCRETE SLAB SHALL BE PLACED ON TOP OF THE TRENCH TO PROTECT THE PIPE, WIDTH 1.6 M, THICKNESS 200 MM, ONE LAYER OF Y10 300 MM SPACING IN BOTH DIRECTIONS, CONCRETE C25/19
3. FLEXIBLE SAND BEDDING TO BE USED ALONG ENTIRE LENGTH
4. ALL MANHOLES 1500 MM X 1500 MM AS PER STANDARD DRAWING

FOR TENDER PURPOSES ONLY!

The Republic of Uganda

MINISTRY OF WATER AND ENVIRONMENT
DIRECTORATE OF WATER DEVELOPMENT
NATIONAL WATER AND SEWERAGE CORPORATION

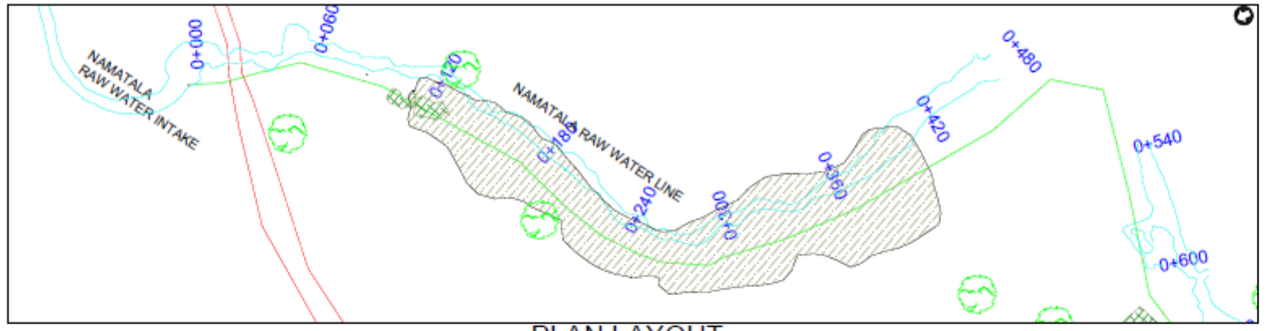
CES
Consulting Engineers
Salzgitter GmbH

PROJECT TITLE:
WATER SUPPLY AND SANITATION PROJECT

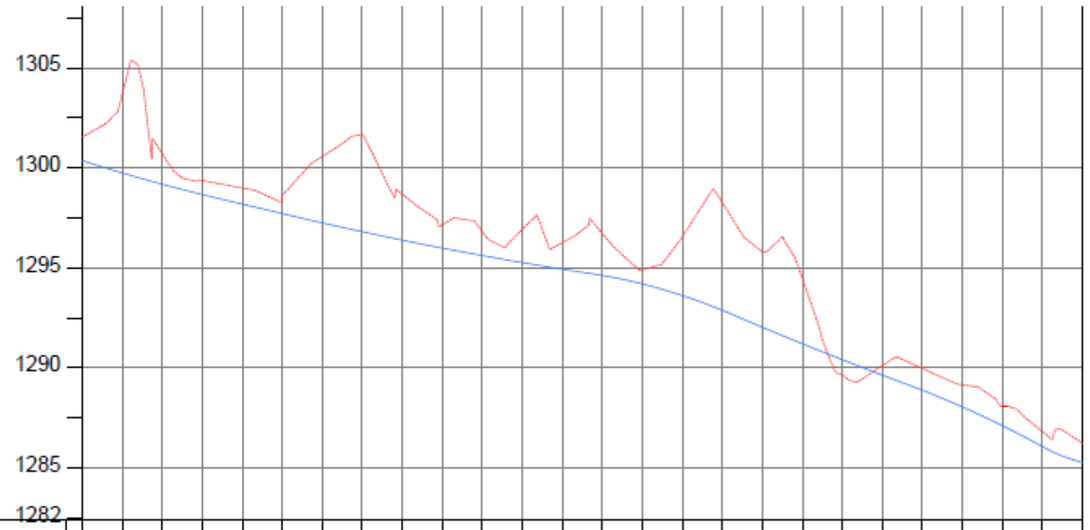
DRAWING TITLE:
NAMATALA INTAKE - CONCRETE PIPE

	NAME	SCALE: as indicated
DESIGNED:	Stefan Kall	FORMAT: A3
DRAWN:	Stefan Kall	DATE: May 2018
APPROVED:	Dieter Gerstenkorn	

DRAWING NO.: WMDP/MBA/4-P-001
SHEET NO.: 1 of 1 REVISION: 1



PLAN LAYOUT



CHAINAGE	0+000		0+040		0+080		0+120		0+160		0+200		0+240		0+280		0+320		0+360		0+400		0+440		0+480	0+500
GROUND LEVEL(m)	1301.546	1303.709	1300.709	1299.362	1298.995	1298.631	1300.572	1301.674	1298.677	1297.161	1296.813	1296.939	1296.263	1296.723	1294.915	1296.557	1298.260	1295.822	1294.493	1289.647	1290.111	1289.970	1289.154	1288.098	1286.816	1286.237
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1300.361	1299.747	1299.181	1298.665	1298.188	1297.715	1297.249	1296.807	1296.386	1295.989	1295.614	1295.263	1294.934	1294.621	1294.200	1293.619	1292.880	1292.033	1291.207	1290.408	1289.635	1288.880	1288.047	1287.111	1286.073	1285.261

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MB/W/0.0.0
4. For Node details, see Dwg. MB/W/6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- ND1 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

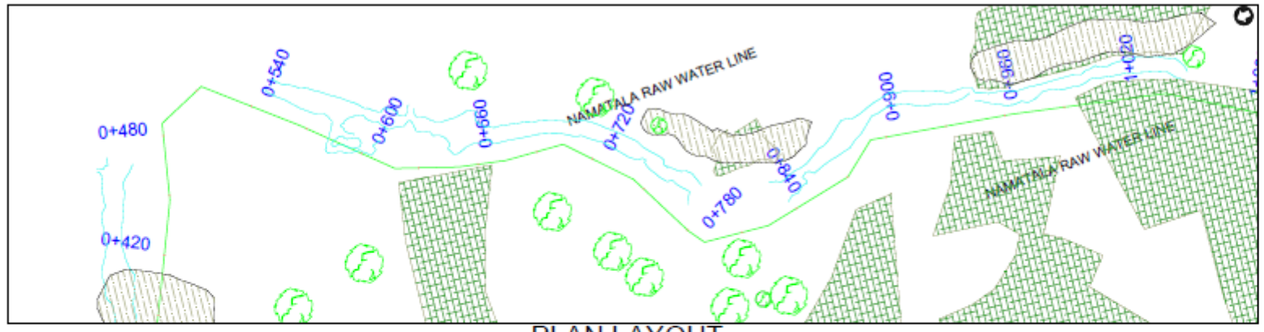
NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

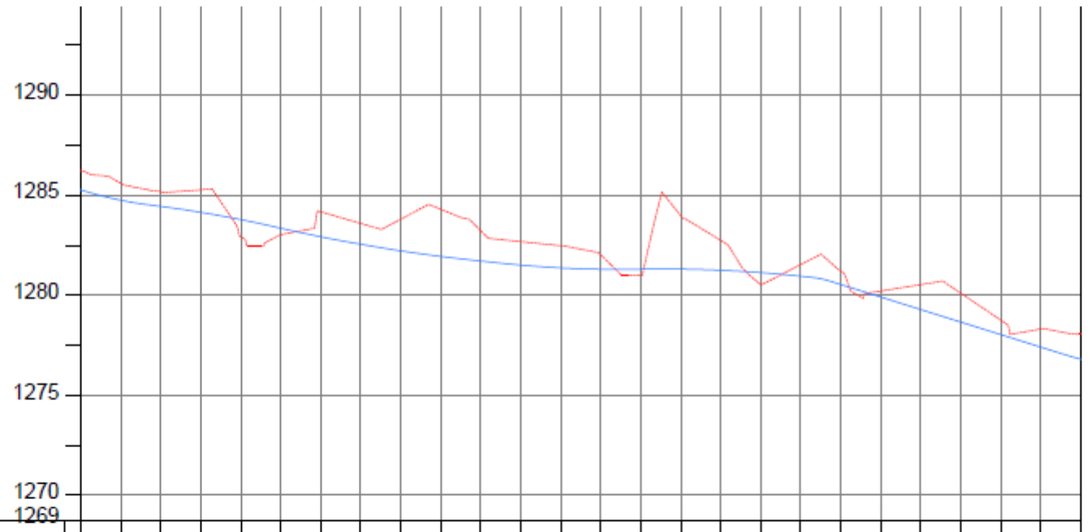
CONSULTANT:
saman Saman Corp.
CHEIL ENGINEERING
AWE Engineers

Drawing Title:
NAMATALA RAW WATER TL
NAM (CH 0+000.00 - 0+500.00)

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	IWMDP/MBA/NAM (CH 0+000.00 - 0+500.00)
Sheet No.: 1	Format: A3



PLAN LAYOUT



CHAINAGE	0+500	0+520		0+560		0+600		0+640		0+680		0+720		0+760		0+800		0+840		0+880		0+920		0+960		1+000
GROUND LEVEL(m)	1286.237	1285.590	1285.179	1285.267	1282.917	1283.031	1284.167	1283.588	1283.801	1284.295	1283.222	1282.680	1282.472	1282.013	1280.985	1283.967	1282.741	1280.509	1281.533	1281.211	1280.211	1280.532	1280.105	1278.760	1278.313	1278.044
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1285.261	1284.750	1284.440	1284.145	1283.780	1283.348	1282.923	1282.547	1282.219	1281.940	1281.710	1281.506	1281.365	1281.297	1281.300	1281.305	1281.249	1281.131	1280.953	1280.534	1279.909	1279.284	1278.659	1278.034	1277.409	1276.805

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MB/W/0.0.0
4. For Node details, see Dwg. MB/W/6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- ND1 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

CONSULTANT:

saman Saman Corp.

CHEIL ENGINEERING

AWE Engineers

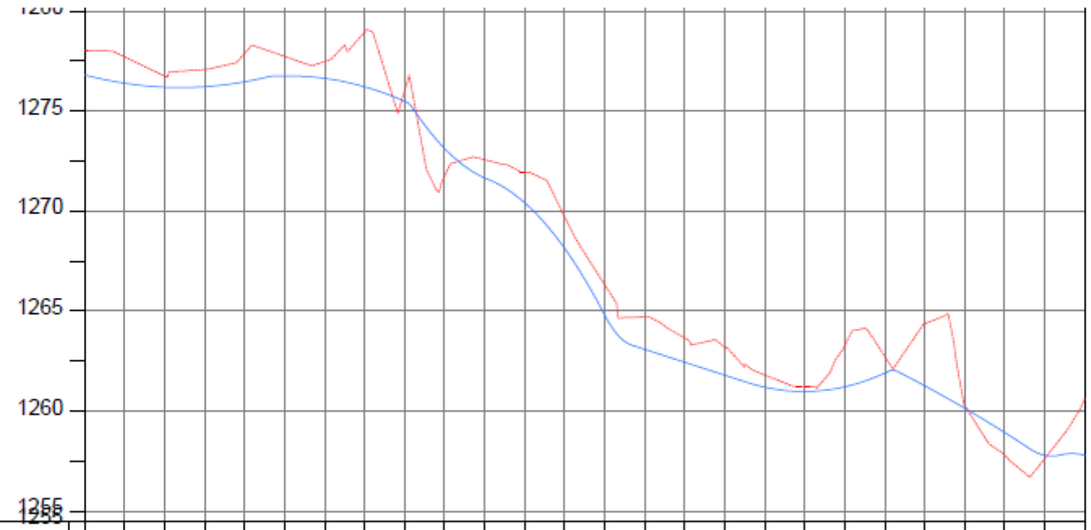
Drawing Title:

NAMATALA RAW WATER TL

NAM (CH 0+500.00 - 1+000.00)

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	IWMDP/MBA/NAM (CH 0+500.00 - 1+000.00)
Sheet No.: 2	Format: A3

PLAN LAYOUT



CHAINAGE	1+000		1+040		1+080		1+120		1+160		1+200		1+240		1+280		1+320		1+360		1+400		1+440		1+480	1+500
GROUND LEVEL(m)	1278.044	1277.702	1276.742	1277.076	1277.885	1277.730	1277.476	1278.958	1276.029	1271.747	1272.562	1271.942	1269.707	1266.311	1264.695	1263.650	1263.173	1261.799	1261.226	1263.269	1262.735	1264.367	1260.266	1257.804	1257.619	1260.607
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1276.805	1276.387	1276.191	1276.216	1276.463	1276.756	1276.633	1276.210	1275.486	1273.115	1271.651	1270.410	1268.127	1264.794	1263.084	1262.437	1261.790	1261.189	1260.972	1261.206	1261.891	1261.262	1260.141	1258.924	1257.780	1257.782

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MB/WT0.0.0
4. For Node details, see Dwg. MB/WR0.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- ND1 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

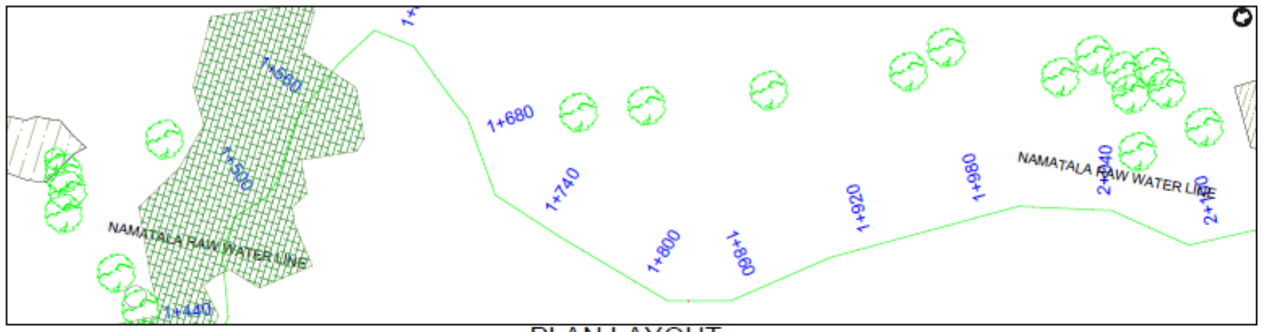
NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

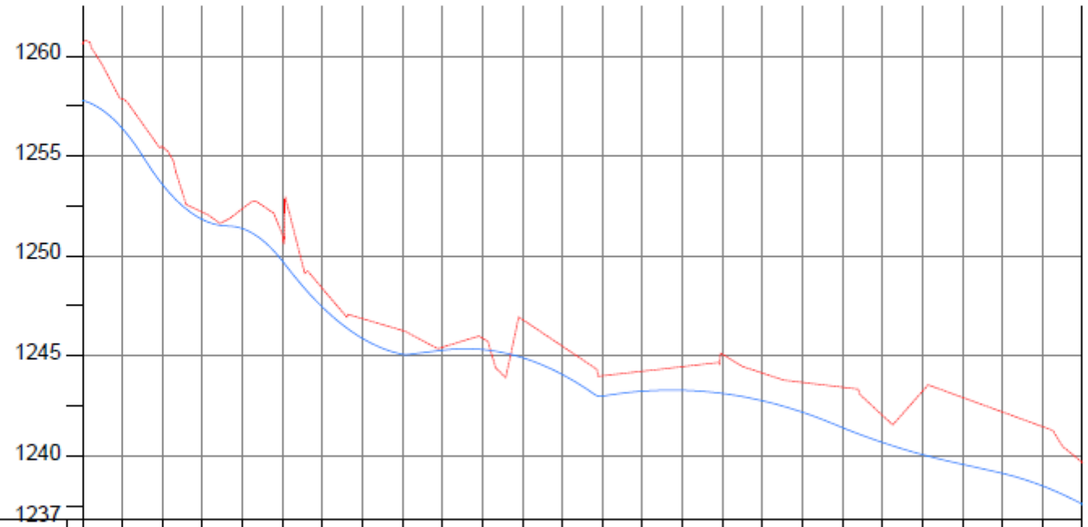
CONSULTANT:
saman Saman Corp.
CHEIL ENGINEERING
AWE Engineers

Drawing Title:
NAMATALA RAW WATER TL
NAM (CH 1+000.00 - 1+500.00)

Drawn by : Eria Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	IWMDP/MBA/NAM (CH 1+000.00 - 1+500.00)
Sheet No.: 3	Format: A3



PLAN LAYOUT



CHAINAGE	1+500	1+520		1+560		1+600		1+640		1+680		1+720		1+760		1+800		1+840		1+880		1+920		1+960		2+000
GROUND LEVEL(m)	1260.607	1257.851	1255.465	1252.185	1252.365	1251.022	1248.369	1246.862	1246.274	1245.435	1245.888	1246.823	1245.482	1244.005	1244.234	1244.463	1245.083	1244.141	1243.677	1243.436	1242.030	1243.232	1242.927	1242.197	1241.468	1239.666
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1257.782	1256.366	1253.570	1251.821	1251.366	1249.739	1247.436	1245.875	1245.079	1245.286	1245.318	1244.912	1244.068	1242.986	1243.237	1243.284	1243.124	1242.758	1242.186	1241.415	1240.673	1240.065	1239.582	1239.128	1238.503	1237.585

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MBWW0.0.0
4. For Node details, see Dwg. MBWW6,0,0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- ND1 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

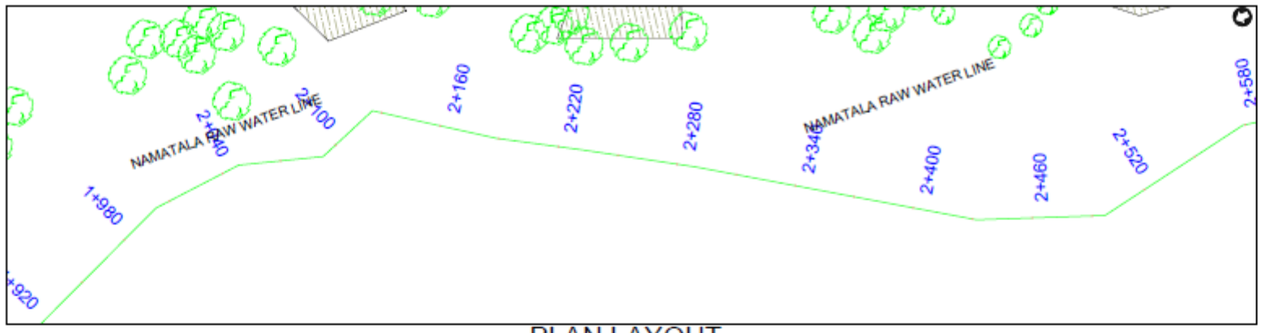
NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

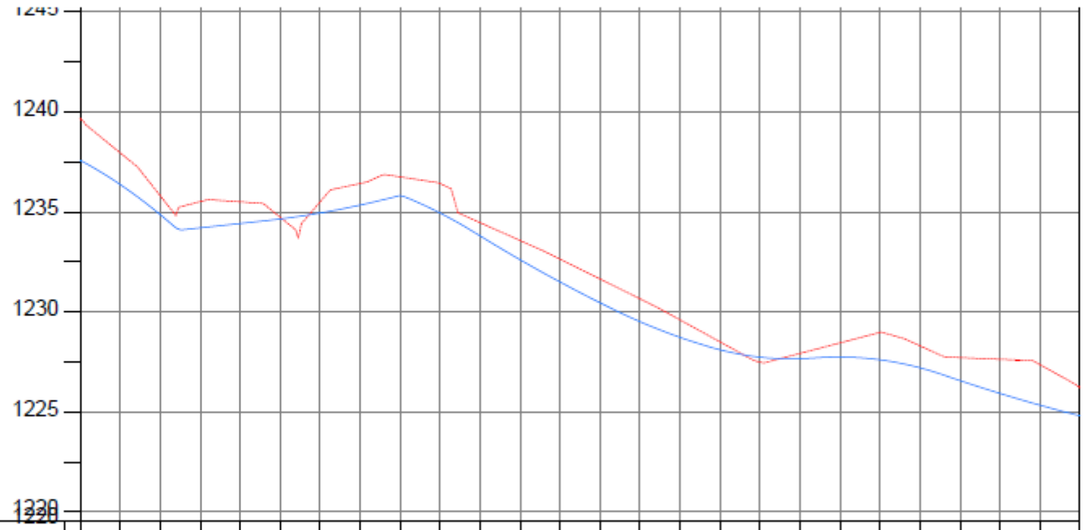
CONSULTANT:
saman Saman Corp.
CHEIL engineering
AWE Engineers

Drawing Title:
NAMATALA RAW WATER TL
NAM (CH 1+500.00 - 2+000.00)

Drawn by : Eria Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	NWDP/MBA/NAM (CH 1+500.00 - 2+000.00)
Sheet No.: 4	Format: A3



PLAN LAYOUT



CHAINAGE	2+000		2+040		2+080		2+120		2+160		2+200		2+240		2+280		2+320		2+360		2+400		2+440		2+480	2+500
GROUND LEVEL(m)	1239.666	1237.959	1235.816	1235.517	1235.508	1234.738	1235.508	1236.425	1236.757	1236.421	1234.466	1233.572	1232.639	1231.647	1230.655	1229.603	1228.501	1227.494	1227.930	1228.454	1228.978	1228.305	1227.716	1227.634	1227.363	1226.224
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1237.585	1236.375	1234.873	1234.205	1234.423	1234.649	1234.950	1235.343	1235.810	1234.948	1233.804	1232.612	1231.496	1230.456	1229.512	1228.727	1228.107	1227.738	1227.658	1227.747	1227.607	1227.206	1226.568	1225.925	1225.337	1224.805

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MBWW0.0.0
4. For Node details, see Dwg. MBWW6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- (N01) — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

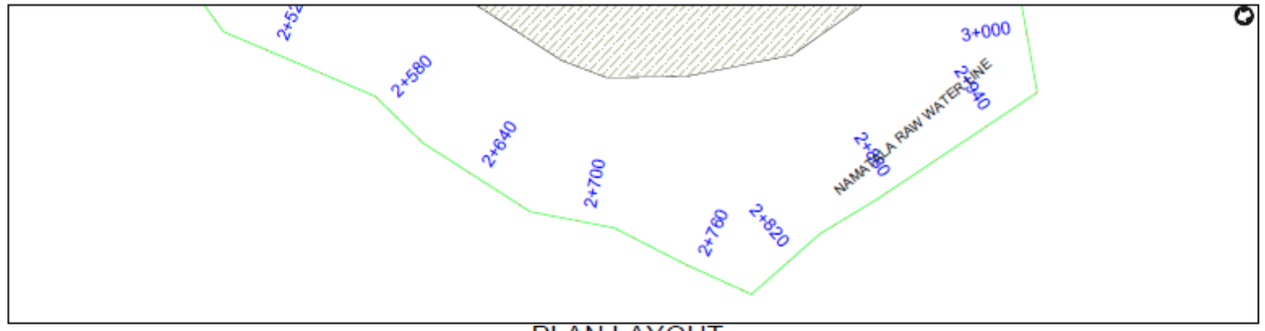
NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

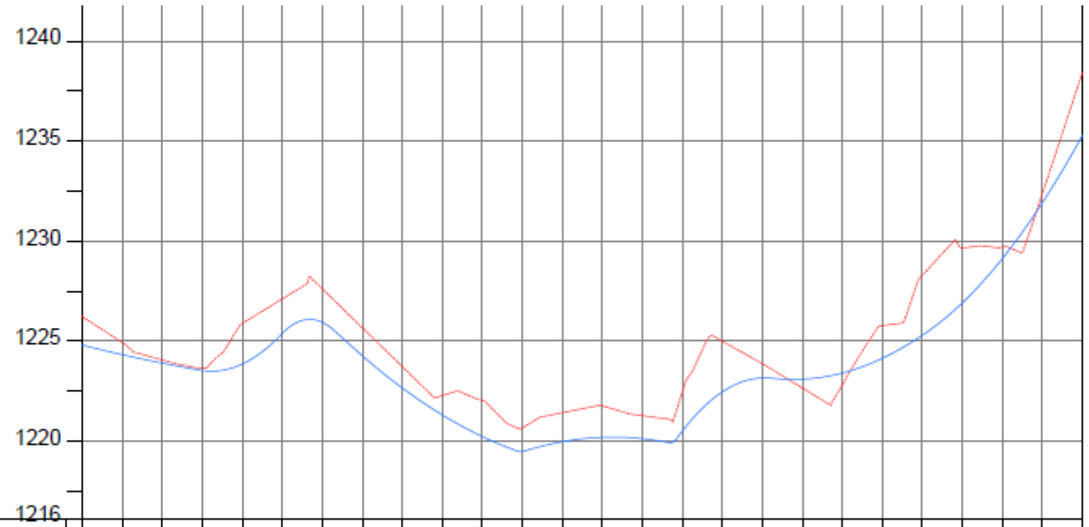
CONSULTANT:
saman Saman Corp.
CHEIL ENGINEERING
AWE Engineers

Drawing Title:
NAMATALA RAW WATER TL
NAM (CH 2+000.00 - 2+500.00)

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	NMDP/MBA/NAM (CH 2+000.00 - 2+500.00)
Sheet No.: 5	Format: A3



PLAN LAYOUT



CHAINAGE	2+500	2+520		2+560		2+600		2+640		2+680		2+720		2+760		2+800		2+840		2+880		2+920		2+960		3+000
GROUND LEVEL(m)	1226.224	1224.934	1224.063	1223.663	1225.892	1227.123	1227.617	1225.673	1223.728	1222.284	1222.038	1220.660	1221.426	1221.774	1221.278	1222.468	1225.002	1223.881	1222.665	1222.799	1225.778	1228.301	1229.668	1229.705	1232.378	1238.423
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1224.805	1224.327	1223.904	1223.537	1223.864	1225.400	1225.945	1224.273	1222.659	1221.312	1220.233	1219.489	1219.978	1220.197	1220.131	1220.509	1222.470	1223.168	1223.102	1223.413	1224.148	1225.295	1226.923	1229.131	1231.920	1235.290

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MB/W/0,0,0
4. For Node details, see Dwg. MB/W/6,0,0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- N01 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

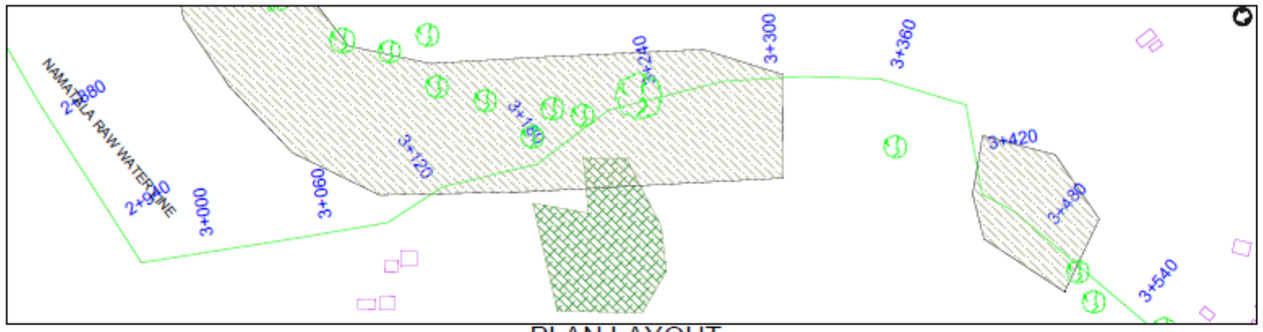
NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

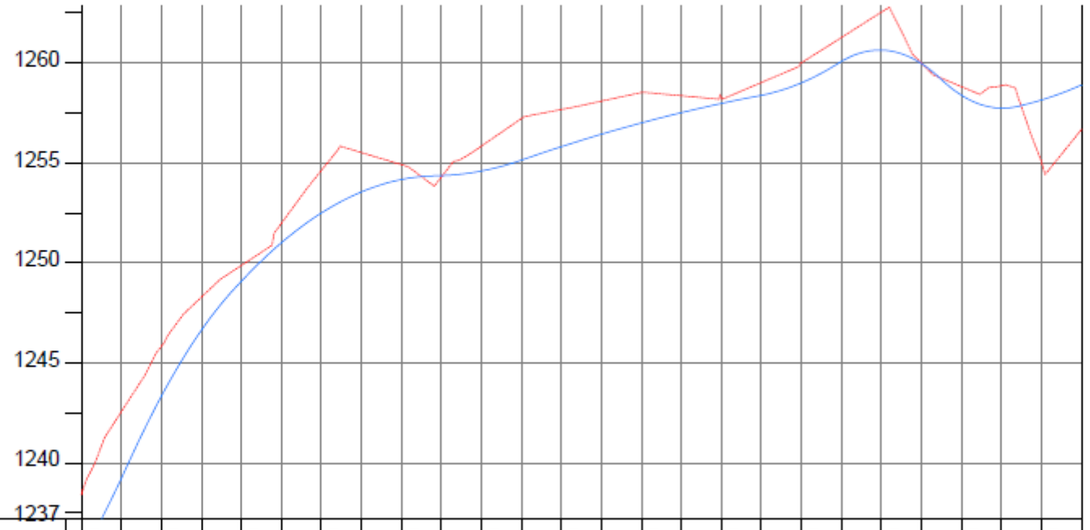
CONSULTANT:
saman Saman Corp.
CHEIL ENGINEERING
AWE Engineers

Drawing Title:
NAMATALA RAW WATER TL
NAM (CH 2+500.00 - 3+000.00)

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	IWMDP/MBA/NAM (CH 2+500.00 - 3+000.00)
Sheet No.: 6	Format: A3



PLAN LAYOUT



CHAINAGE	3+000		3+040		3+080		3+120		3+160		3+200		3+240		3+280		3+320		3+360		3+400		3+440		3+480	3+500
GROUND LEVEL(m)	1238.423	1242.570	1245.837	1248.294	1249.879	1251.982	1254.630	1255.521	1254.919	1254.302	1255.845	1257.223	1257.675	1258.093	1258.528	1258.364	1258.251	1259.025	1260.008	1261.274	1262.540	1259.996	1258.819	1258.861	1255.068	1256.662
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1235.290	1239.241	1243.347	1246.640	1249.093	1251.013	1252.500	1253.554	1254.175	1254.370	1254.599	1255.142	1255.817	1256.439	1257.006	1257.519	1257.977	1258.382	1259.007	1260.078	1260.645	1259.973	1258.391	1257.743	1258.147	1258.899

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MB/W/0.0.0
4. For Node details, see Dwg. MB/W/6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- (ND1) — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

CONSULTANT:

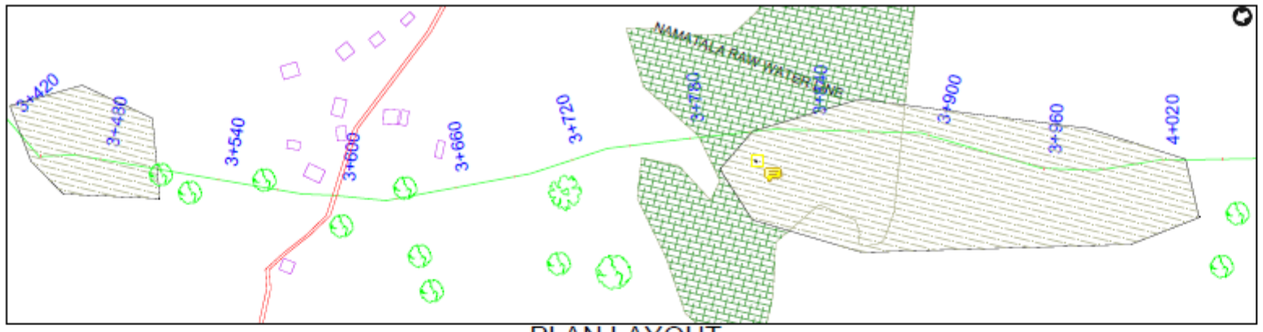
saman Saman Corp.

CHEIL ENGINEERING

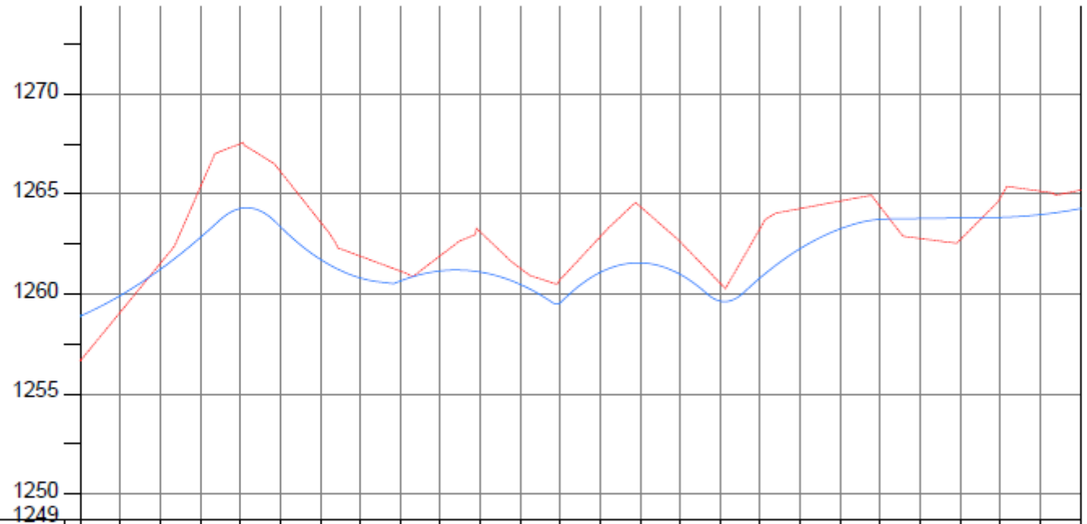
AWE Engineers

Drawing Title:
NAMATALA RAW WATER TL
NAM (CH 3+000.00 - 3+500.00)

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	IWMDP/MBA/NAM (CH 3+000.00 - 3+500.00)
Sheet No.: 7	Format: A3



PLAN LAYOUT



CHAINAGE	3+500	3+520		3+560		3+600		3+640		3+680		3+720		3+760		3+800		3+840		3+880		3+920		3+960		4+000
GROUND LEVEL(m)	1256.662	1259.098	1261.533	1265.346	1267.521	1266.145	1263.619	1261.898	1261.155	1261.922	1263.113	1261.296	1260.728	1262.870	1264.382	1262.620	1260.545	1263.294	1264.280	1264.655	1264.373	1262.783	1262.720	1264.811	1265.152	1265.198
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1258.899	1259.929	1261.239	1262.827	1264.283	1263.375	1261.744	1260.810	1260.654	1261.161	1261.106	1260.488	1259.569	1261.088	1261.565	1260.990	1259.652	1260.820	1262.278	1263.265	1263.745	1263.783	1263.810	1263.839	1263.974	1264.277

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MBWI0.0.0
4. For Node details, see Dwg. MBWI6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- (N01) — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

CONSULTANT:

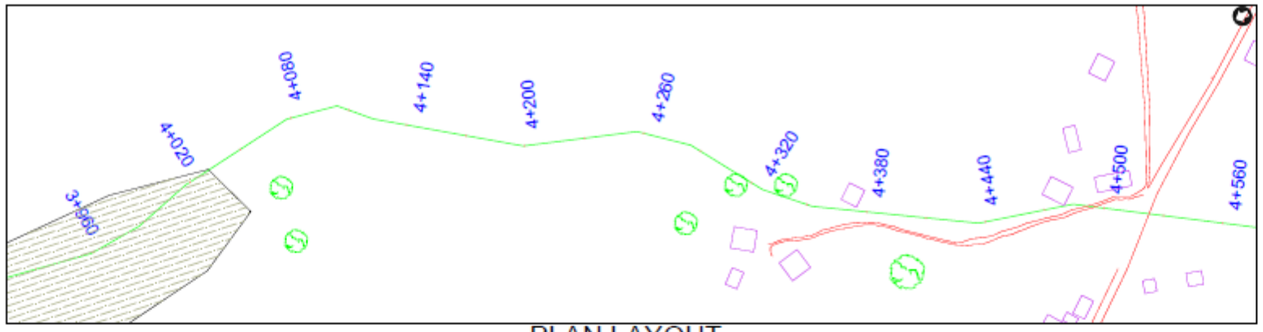
saman Saman Corp. | CHEIL ENGINEERING | AWE Engineers

Drawing Title:

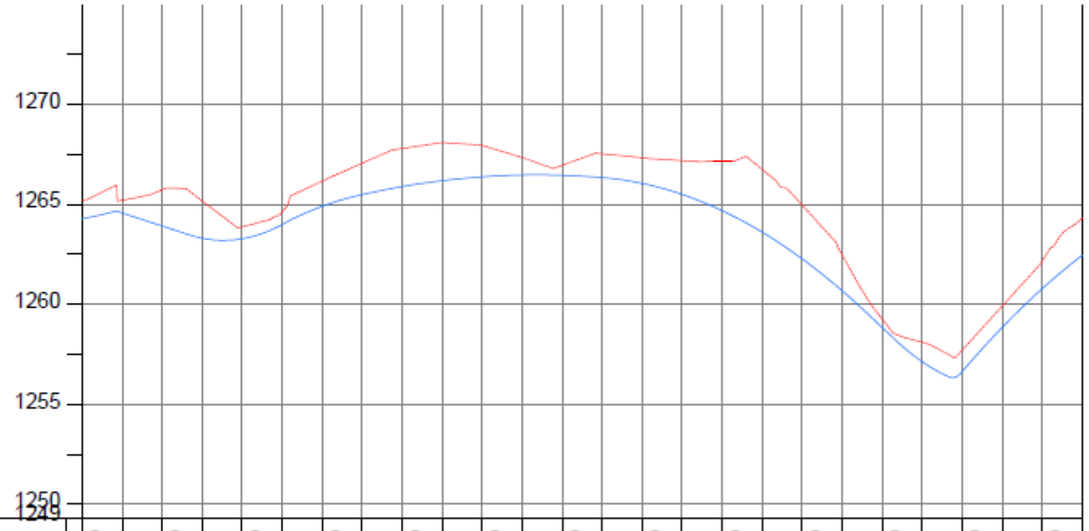
NAMATALA RAW WATER TL

NAM (CH 3+500.00 - 4+000.00)

Drawn by : Eria Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	IWMDP/MBA/NAM (CH 3+500.00 - 4+000.00)
Sheet No.: 8	Format: A3



PLAN LAYOUT



CHAINAGE	4+000		4+040		4+080		4+120		4+160		4+200		4+240		4+280		4+320		4+360		4+400		4+440		4+480	4+500
GROUND LEVEL(m)	1265.198	1265.203	1265.729	1265.169	1263.872	1264.628	1266.161	1267.055	1267.787	1268.087	1267.944	1267.339	1266.952	1267.520	1267.327	1267.185	1267.170	1266.748	1264.960	1262.475	1259.272	1258.106	1257.706	1259.904	1262.169	1264.305
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1264.277	1264.569	1263.916	1263.306	1263.277	1263.991	1264.902	1265.487	1265.886	1266.183	1266.376	1266.465	1266.452	1266.337	1266.047	1265.496	1264.684	1263.611	1262.276	1260.680	1258.839	1257.134	1256.635	1258.840	1260.777	1262.446

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MBWW0.0.0
4. For Node details, see Dwg. MBWW6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- N01 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

CONSULTANT:

saman Saman Corp.

CHEIL ENGINEERING

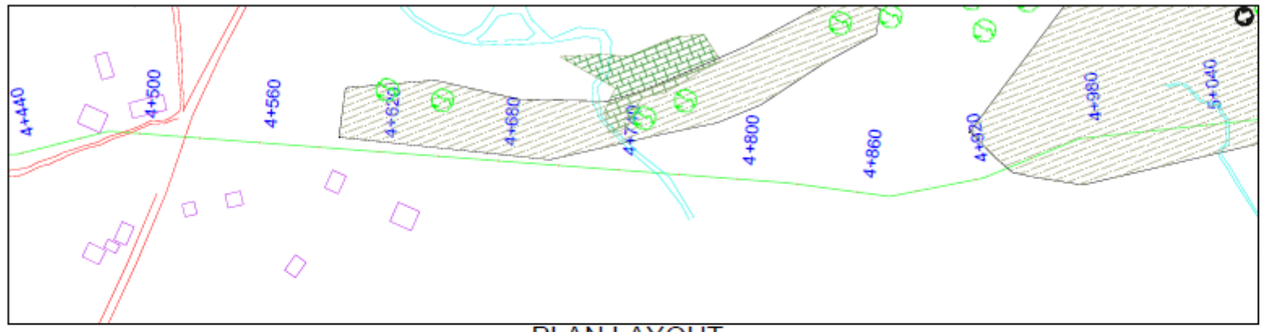
AWE Engineers

Drawing Title:

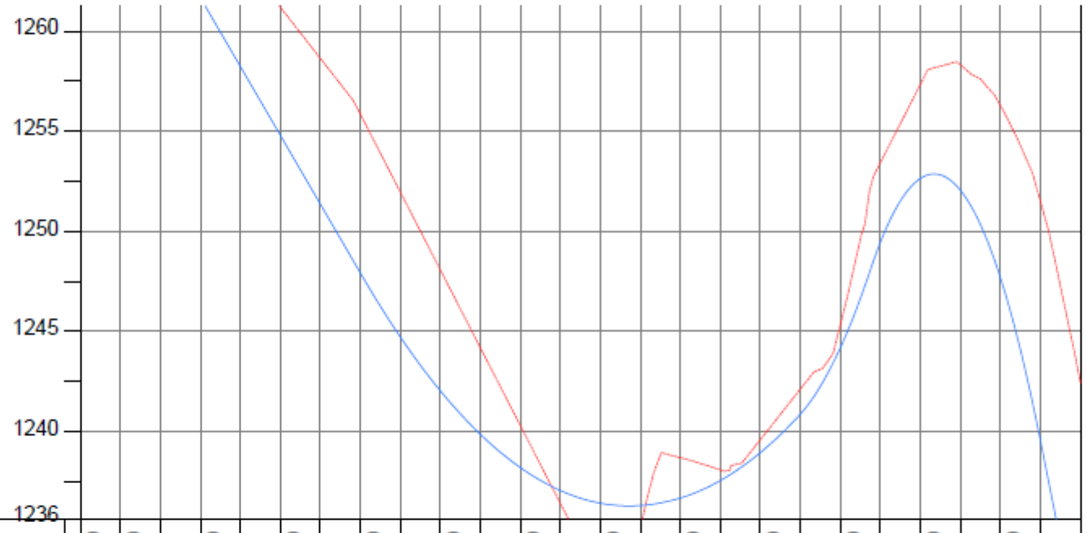
NAMATALA RAW WATER TL

NAM (CH 4+000.00 - 4+500.00)

Drawn by : Eria Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	NWDP/MBA/NAM (CH 4+000.00 - 4+500.00)
Sheet No.: 9	Format: A3



PLAN LAYOUT



CHAINAGE	4+500	4+520		4+560		4+600		4+640		4+680		4+720		4+760		4+800		4+840		4+880		4+920		4+960		5+000
GROUND LEVEL(m)	1264.305	1265.735	1266.758	1266.313	1263.759	1261.204	1258.649	1255.857	1251.968	1248.078	1244.189	1240.299	1236.410	1231.145	1235.182	1238.693	1238.087	1239.591	1242.125	1245.336	1253.430	1257.343	1258.330	1256.310	1251.522	1242.462
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1262.446	1263.845	1264.342	1261.686	1258.246	1254.807	1251.367	1247.928	1244.725	1242.036	1239.862	1238.201	1237.054	1236.422	1236.303	1236.681	1237.553	1238.948	1240.866	1244.185	1249.452	1252.647	1252.065	1247.707	1239.571	1229.946

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MB/W/0,0,0
4. For Node details, see Dwg. MB/W/6,0,0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- N01 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

CONSULTANT:

saman Saman Corp.

CHEIL ENGINEERING

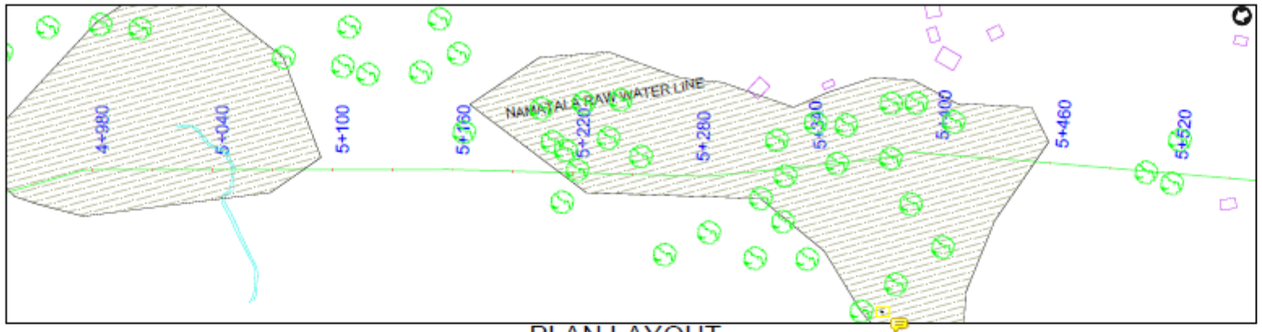
AWE Engineers

Drawing Title:

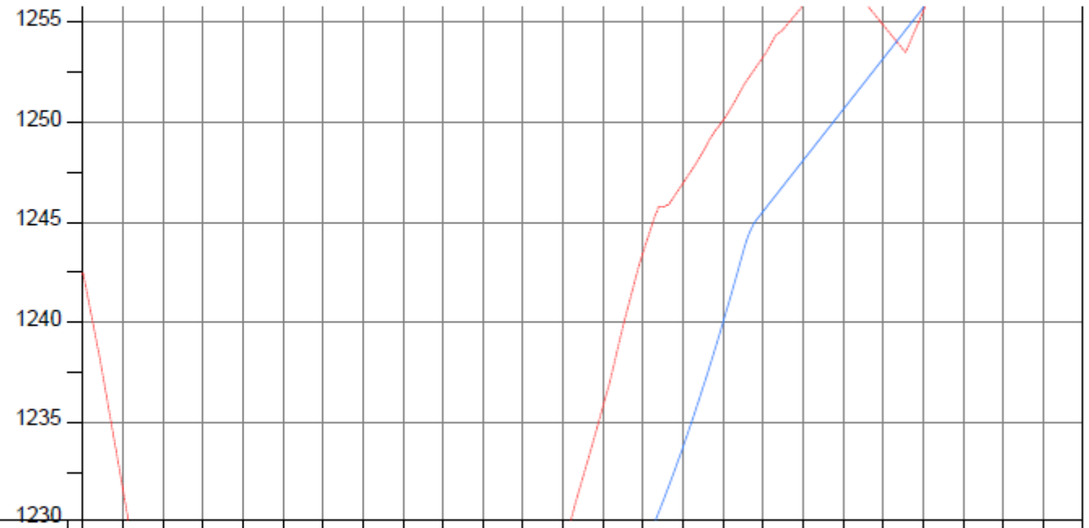
NAMATALA RAW WATER TL

NAM (CH 4+500.00 - 5+000.00)

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	IWMDP/MBA/NAM (CH 4+500.00 - 5+000.00)
Sheet No.: 10	Format: A3



PLAN LAYOUT



CHAINAGE	5+000		5+040		5+080		5+120		5+160		5+200		5+240		5+280		5+320		5+360		5+400		5+440		5+480	5+500
GROUND LEVEL(m)	1242.462	1231.582	1221.576	1220.014	1220.000	1221.197	1222.130	1222.365	1220.821	1218.614	1218.951	1222.228	1228.576	1235.801	1243.488	1246.958	1250.097	1253.260	1255.832	1256.724	1254.872	1255.526	1260.046	1263.671	1265.936	1268.456
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1229.946	1222.694	1218.119	1217.384	1218.584	1219.785	1220.986	1221.231	1219.280	1218.475	1218.578	1219.491	1221.468	1224.506	1228.607	1233.770	1239.995	1245.543	1248.089	1250.634	1253.180	1255.726	1258.281	1260.855	1263.445	1266.053

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MBWW0.0.0
4. For Node details, see Dwg. MBWW6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- ND1 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

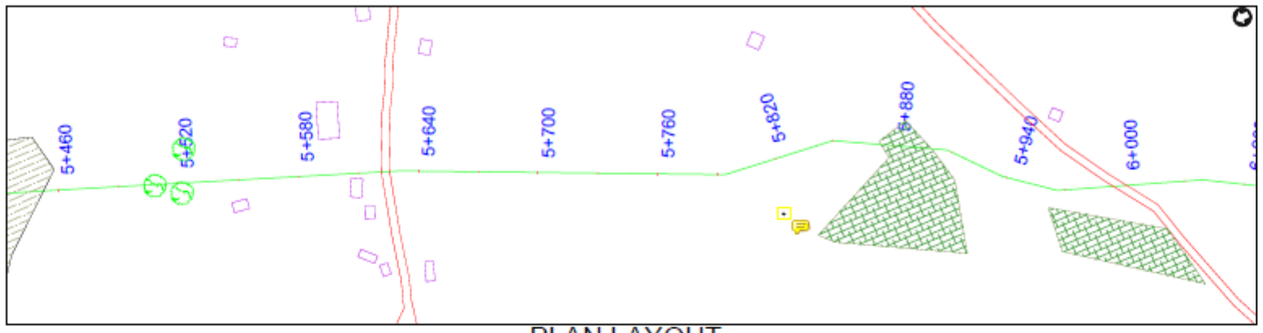
NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

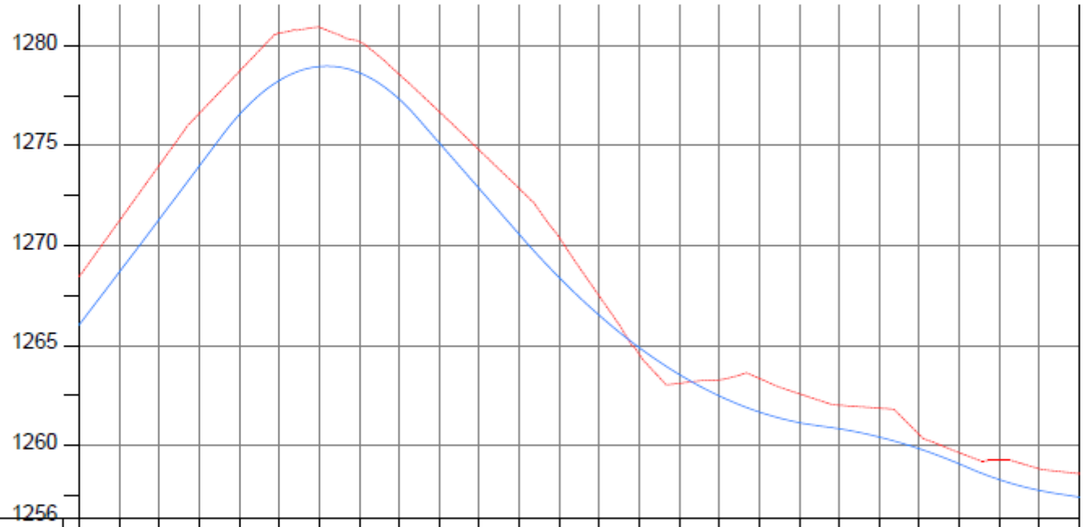
CONSULTANT:
saman Saman Corp.
CHEIL ENGINEERING
AWE Engineers

Drawing Title:
NAMATALA RAW WATER TL
NAM (CH 5+000.00 - 5+500.00)

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	IWMDP/MBA/NAM (CH 5+000.00 - 5+500.00)
Sheet No.: 11	Format: A3



PLAN LAYOUT



CHAINAGE	5+500	5+520		5+560		5+600		5+640		5+680		5+720		5+760		5+800		5+840		5+880		5+920		5+960		6+000
GROUND LEVEL(m)	1268.456	1271.240	1274.025	1276.615	1278.710	1280.631	1280.923	1280.205	1278.564	1276.700	1274.778	1272.854	1270.404	1267.478	1264.567	1263.114	1263.290	1263.361	1262.593	1262.019	1261.873	1260.553	1259.646	1259.248	1258.842	1258.596
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1266.053	1268.679	1271.321	1273.982	1276.551	1278.259	1278.958	1278.646	1277.324	1275.140	1272.850	1270.560	1268.402	1266.516	1264.900	1263.556	1262.482	1261.680	1261.148	1260.842	1260.429	1259.844	1259.086	1258.302	1257.760	1257.424

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MBWW0.0.0
4. For Node details, see Dwg. MBWW6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- (N01) — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

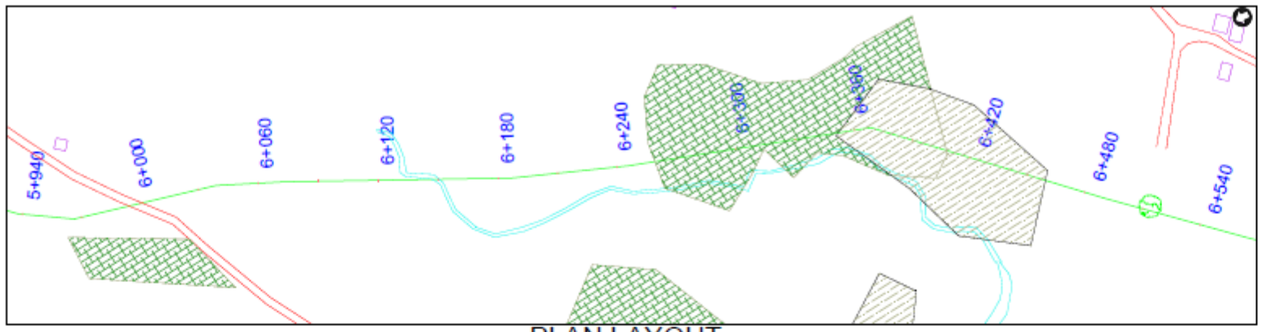
NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

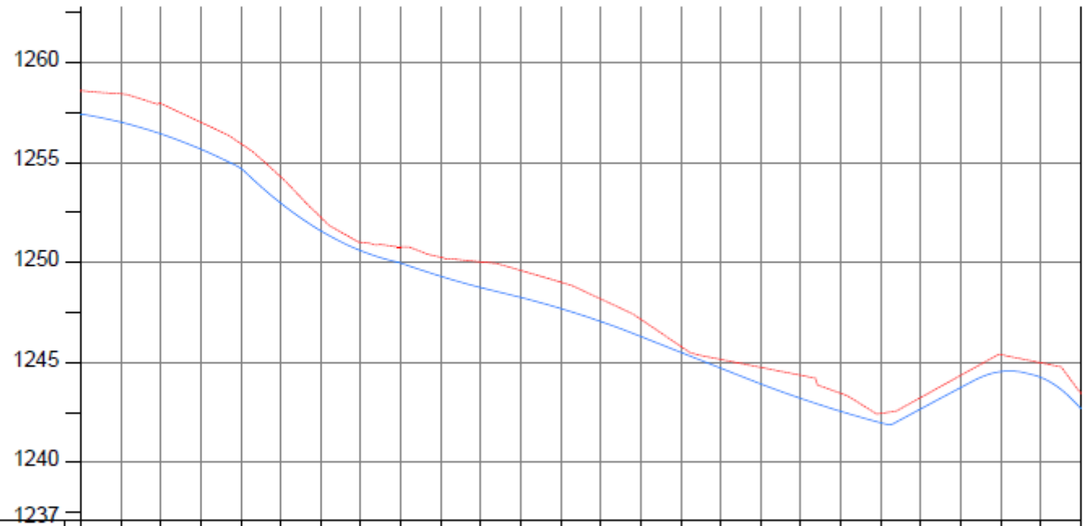
CONSULTANT:
saman Saman Corp.
CHEIL ENGINEERING
AWE Engineers

Drawing Title:
NAMATALA RAW WATER TL
NAM (CH 5+500.00 - 6+000.00)

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	IWMDP/MBA/NAM (CH 5+500.00 - 6+000.00)
Sheet No.: 12	Format: A3



PLAN LAYOUT



CHAINAGE	6+000		6+040		6+080		6+120		6+160		6+200		6+240		6+280		6+320		6+360		6+400		6+440		6+480	6+500
GROUND LEVEL(m)	1258.596	1258.430	1257.948	1257.009	1255.943	1254.272	1252.259	1251.011	1250.779	1250.260	1250.029	1249.602	1249.013	1248.174	1247.159	1245.806	1245.150	1244.754	1244.358	1243.457	1242.449	1243.248	1244.355	1245.389	1244.985	1243.455
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1257.424	1257.016	1256.430	1255.666	1254.704	1252.964	1251.581	1250.587	1249.964	1249.308	1248.742	1248.254	1247.697	1247.046	1246.299	1245.507	1244.715	1243.927	1243.200	1242.552	1241.983	1242.677	1243.745	1244.540	1244.254	1242.688

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MBWW0.0.0
4. For Node details, see Dwg. MBWW6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- (N01) — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

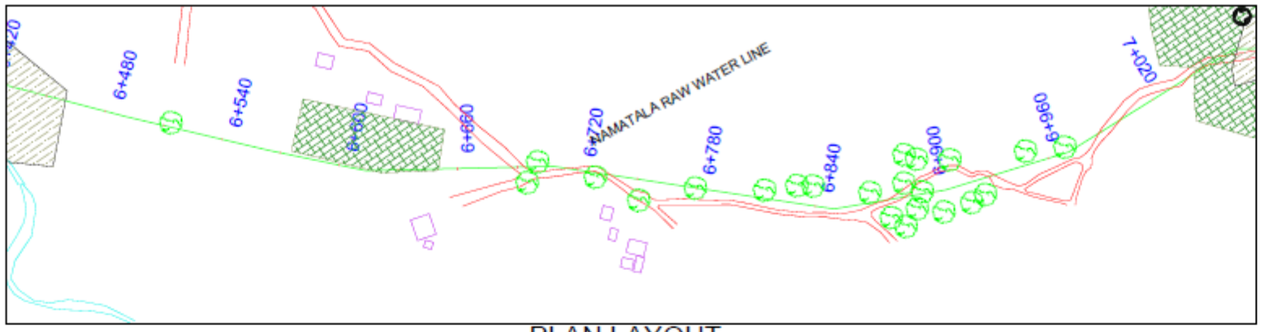
NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

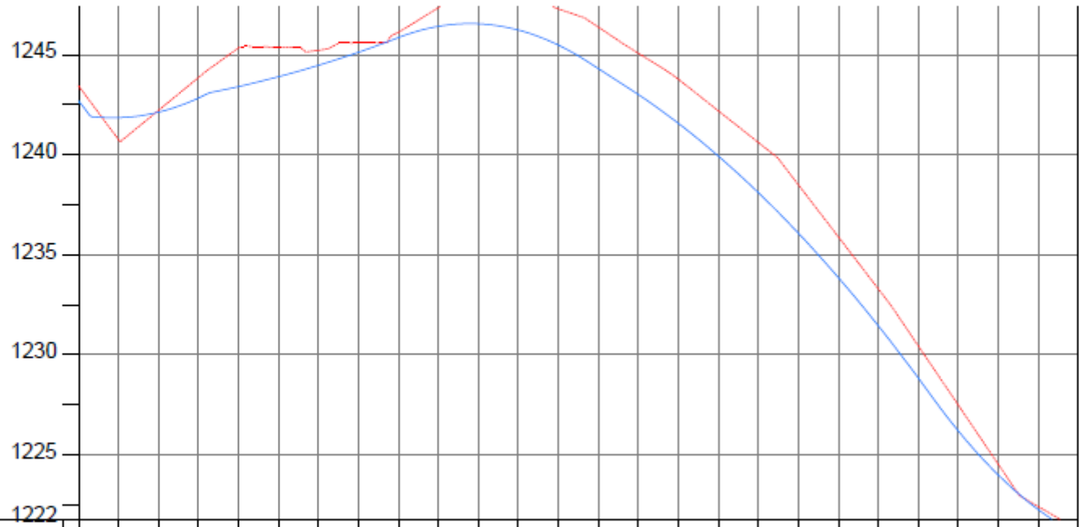
CONSULTANT:
saman Saman Corp.
CHEIL ENGINEERING
AWE Engineers

Drawing Title:
NAMATALA RAW WATER TL
NAM (CH 6+000.00 - 6+500.00)

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	IWMDP/MBA/NAM (CH 6+000.00 - 6+500.00)
Sheet No.: 13	Format: A3



PLAN LAYOUT



CHAINAGE	6+500	6+520		6+560		6+600		6+640		6+680		6+720		6+760		6+800		6+840		6+880		6+920		6+960		7+000
GROUND LEVEL(m)	1243.455	1240.762	1242.227	1243.869	1245.350	1245.390	1245.233	1245.594	1246.134	1247.363	1248.602	1248.380	1247.299	1246.386	1245.081	1243.785	1242.198	1240.616	1238.501	1235.896	1233.292	1230.440	1227.479	1224.517	1222.411	1221.243
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1242.688	1241.862	1242.134	1242.844	1243.415	1243.907	1244.480	1245.132	1245.865	1246.430	1246.556	1246.242	1245.489	1244.312	1243.015	1241.574	1239.939	1238.108	1236.082	1233.862	1231.446	1228.835	1226.189	1223.985	1222.256	1221.003

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MBWW0.0.0
4. For Node details, see Dwg. MBWW6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- (N01) — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

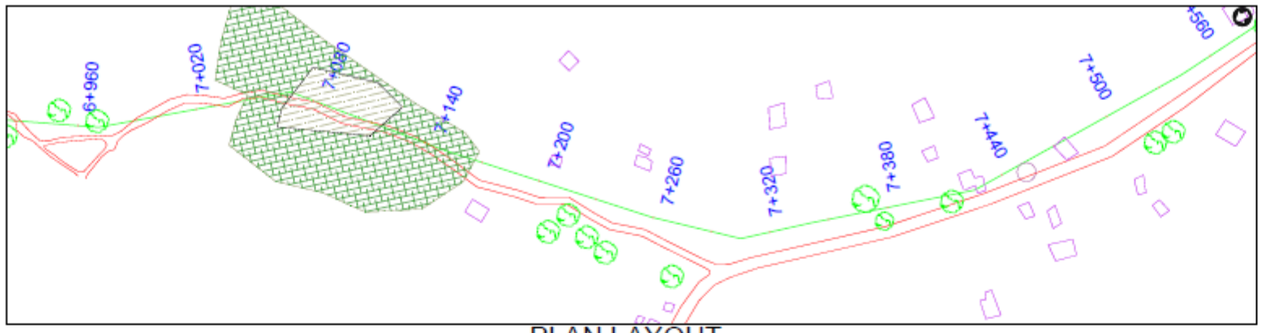
NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

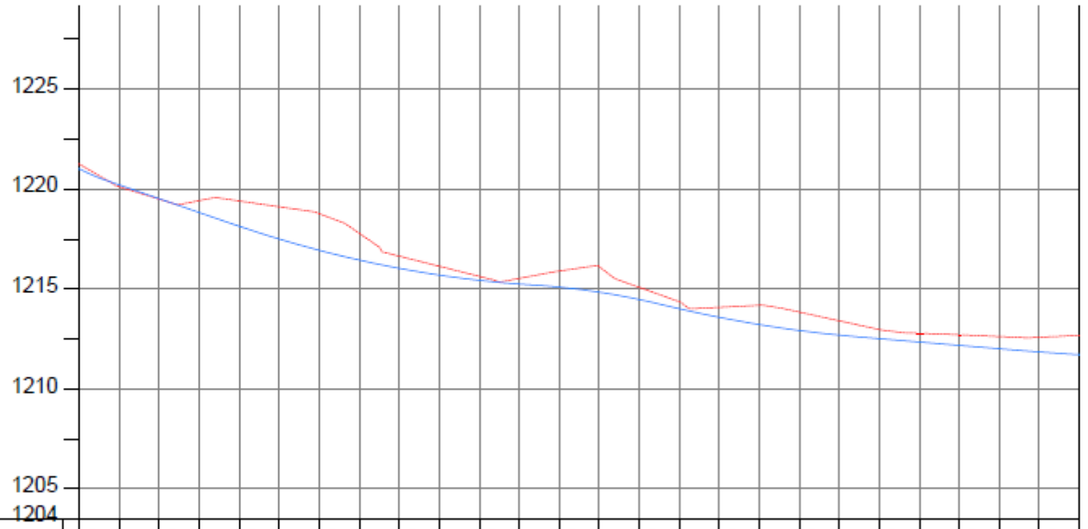
CONSULTANT:
saman Saman Corp.
CHEIL ENGINEERING
AWE Engineers

Drawing Title:
NAMATALA RAW WATER TL
NAM (CH 6+500.00 - 7+000.00)

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Mussenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	NWDP/MBA/NAM (CH 6+500.00 - 7+000.00)
Sheet No.: 14	Format: A3



PLAN LAYOUT



CHAINAGE	7+000		7+040		7+080		7+120		7+160		7+200		7+240		7+280		7+320		7+360		7+400		7+440		7+480	7+500
GROUND LEVEL(m)	1221.243	1220.109	1219.491	1219.421	1219.403	1219.111	1218.765	1217.783	1216.641	1216.137	1215.632	1215.532	1215.900	1216.111	1215.080	1214.367	1214.084	1214.188	1213.847	1213.408	1212.970	1212.786	1212.709	1212.623	1212.583	1212.681
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1221.003	1220.202	1219.513	1218.823	1218.135	1217.497	1216.934	1216.446	1216.033	1215.695	1215.433	1215.245	1215.093	1214.840	1214.474	1214.011	1213.584	1213.222	1212.925	1212.693	1212.518	1212.350	1212.182	1212.014	1211.852	1211.714

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MBWW0.0.0
4. For Node details, see Dwg. MBWW6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- ND1 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

NATIONAL WATER AND SEWERAGE CORPORATION

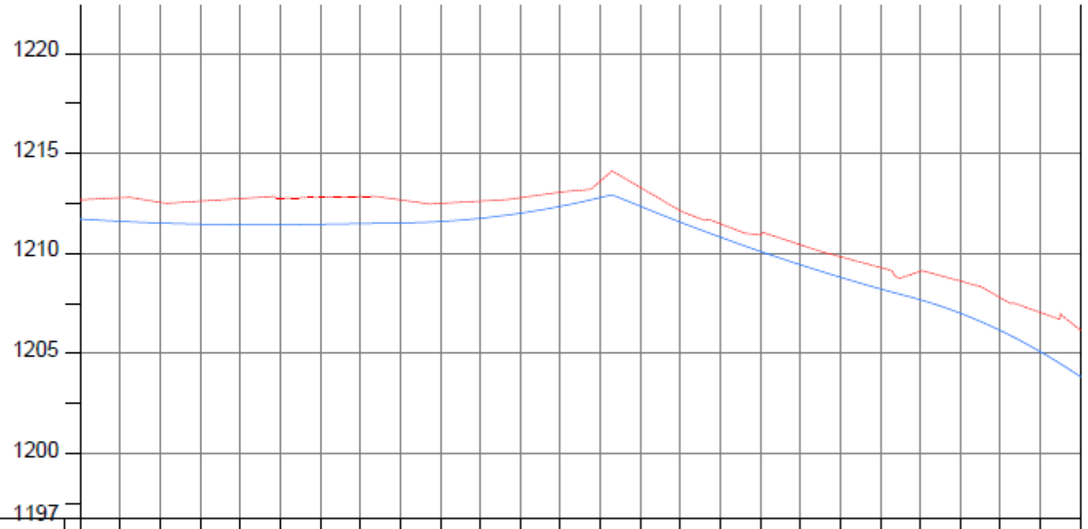
PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

CONSULTANT:
saman Saman Corp.
CHEIL ENGINEERING
AWE Engineers

Drawing Title:
NAMATALA RAW WATER TL
NAM (CH 7+000.00 - 7+500.00)

Drawn by : Eria Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	IWMDP/MBA/NAM (CH 7+000.00 - 7+500.00)
Sheet No.: 15	Format: A3

PLAN LAYOUT



CHAINAGE	7+500	7+520		7+560		7+600		7+640		7+680		7+720		7+760		7+800		7+840		7+880		7+920		7+960		8+000
GROUND LEVEL(m)	1212.681	1212.779	1212.551	1212.613	1212.740	1212.760	1212.802	1212.844	1212.678	1212.498	1212.613	1212.784	1213.061	1213.620	1213.298	1212.132	1211.479	1210.914	1210.432	1209.834	1209.296	1209.099	1208.618	1207.785	1207.047	1206.169
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1211.714	1211.603	1211.519	1211.462	1211.433	1211.430	1211.455	1211.490	1211.525	1211.594	1211.754	1212.007	1212.353	1212.792	1212.357	1211.563	1210.811	1210.101	1209.433	1208.808	1208.225	1207.682	1207.009	1206.144	1205.087	1203.837

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MBWW0.0.0
4. For Node details, see Dwg. MBWW6,0,0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- ND1 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

CONSULTANT:

saman Saman Corp.

CHEIL ENGINEERING

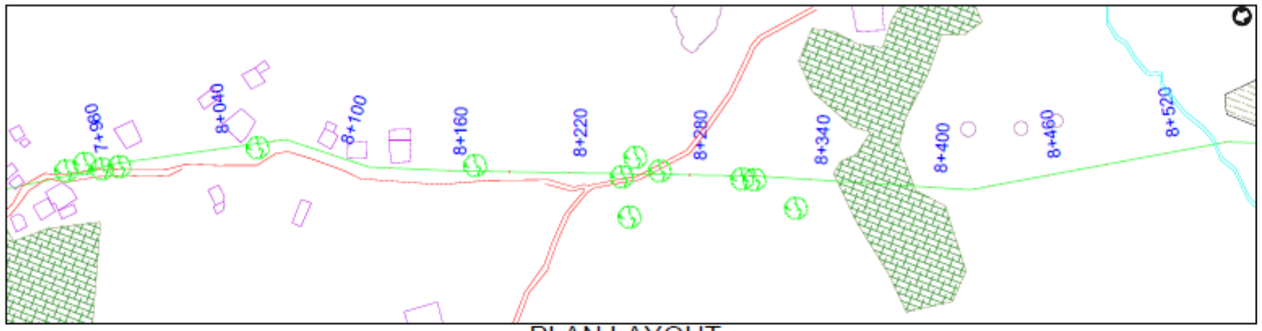
AWE Engineers

Drawing Title:

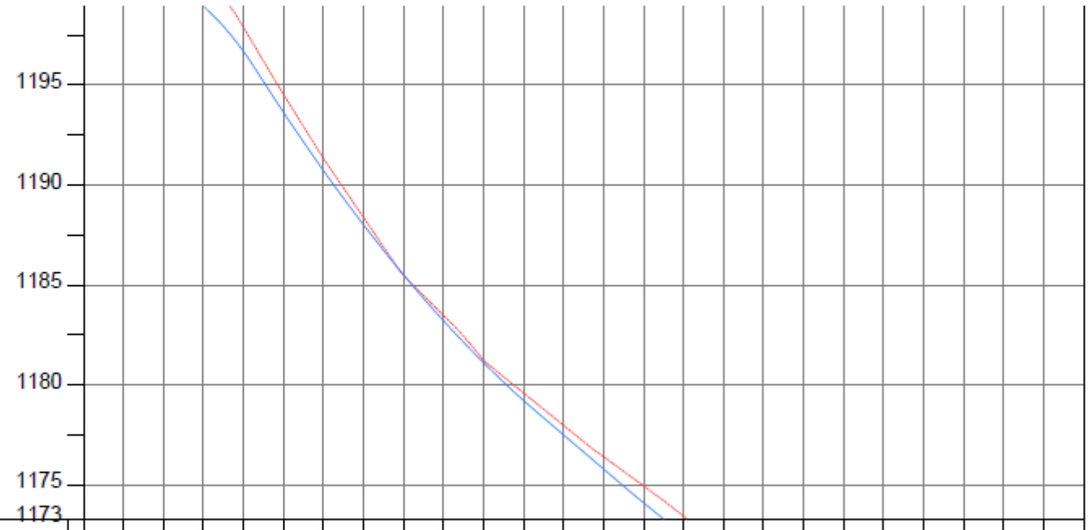
NAMATALA RAW WATER TL

NAM (CH 7+500.00 - 8+000.00)

Drawn by : Eria Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	NWDP/MBA/NAM (CH 7+500.00 - 8+000.00)
Sheet No.: 16	Format: A3



PLAN LAYOUT



CHAINAGE	8+000		8+040		8+080		8+120		8+160		8+200		8+240		8+280		8+320		8+360		8+400		8+440		8+480	8+500
GROUND LEVEL(m)	1206.169	1204.873	1203.399	1200.712	1197.870	1194.529	1191.321	1188.374	1185.487	1183.478	1181.231	1179.601	1177.979	1176.415	1174.952	1173.437	1172.036	1170.603	1169.908	1169.762	1170.458	1171.153	1170.950	1169.391	1168.240	1167.181
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1203.837	1202.394	1200.760	1198.932	1196.672	1193.626	1190.715	1188.007	1185.505	1183.207	1181.113	1179.224	1177.503	1175.798	1174.107	1172.525	1171.071	1169.745	1168.669	1168.825	1169.329	1169.630	1169.167	1168.266	1167.362	1166.458

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MB/WT0.0.0
4. For Node details, see Dwg. MB/WT0.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- ND1 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

CONSULTANT:

saman Saman Corp.

CHEIL ENGINEERING

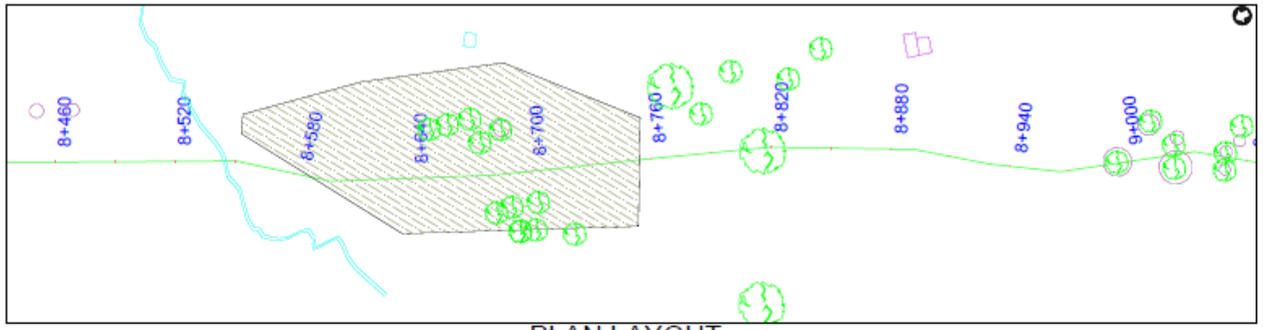
AWE Engineers

Drawing Title:

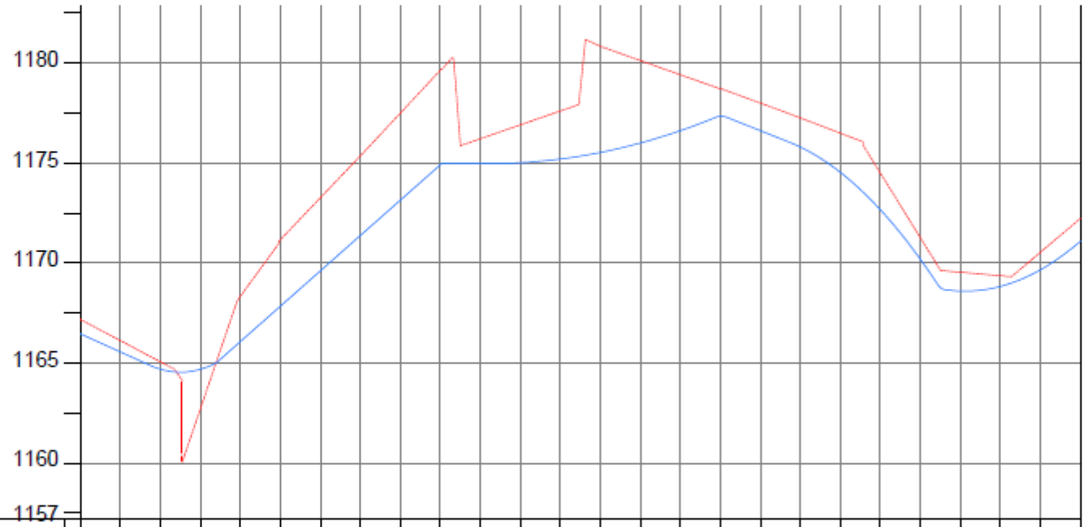
NAMATALA RAW WATER TL

NAM (CH 8+000.00 - 8+500.00)

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	IWMDP/MBA/NAM (CH 8+000.00 - 8+500.00)
Sheet No.: 17	Format: A3



PLAN LAYOUT



CHAINAGE	8+500	8+520		8+560		8+600		8+640		8+680		8+720		8+760		8+800		8+840		8+880		8+920		8+960		9+000
GROUND LEVEL(m)	1167.181	1166.122	1165.063	1162.710	1168.340	1171.170	1173.266	1175.363	1177.500	1179.644	1176.218	1176.912	1177.605	1180.844	1180.129	1179.419	1178.736	1178.002	1177.260	1176.498	1174.506	1171.275	1169.543	1169.369	1170.536	1172.229
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1166.458	1165.554	1164.693	1164.687	1166.078	1167.846	1169.614	1171.382	1173.150	1174.918	1174.973	1175.017	1175.203	1175.533	1176.005	1176.621	1177.339	1176.623	1175.804	1174.541	1172.672	1170.197	1168.603	1168.832	1169.660	1171.080

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MBWW0.0.0
4. For Node details, see Dwg. MBWW6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- ND1 — Node detail No. 01

REPUBLIC OF UGANDA

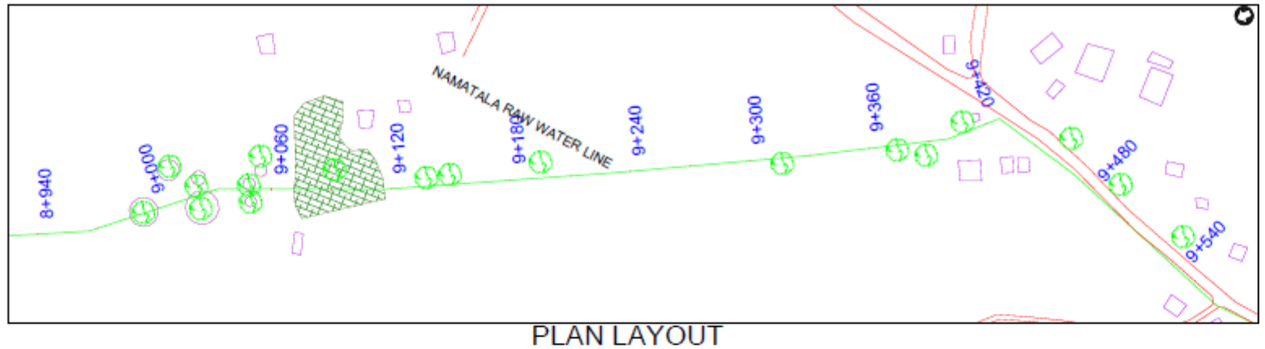
MINISTRY OF WATER AND ENVIRONMENT
NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

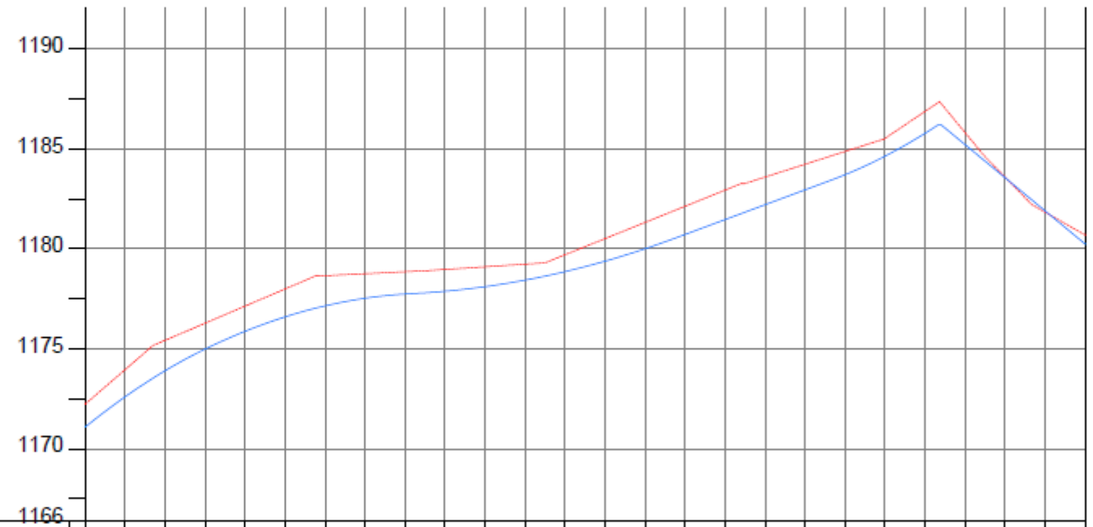
CONSULTANT:
saman Saman Corp.
CHEIL engineering
AWE Engineers

Drawing Title:
NAMATALA RAW WATER TL
NAM (CH 8+500.00 - 9+000.00)

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	IWMDP/MBA/NAM (CH 8+500.00 - 9+000.00)
Sheet No.: 18	Format: A3



PLAN LAYOUT



CHAINAGE	9+000		9+040		9+080		9+120		9+160		9+200		9+240		9+280		9+320		9+360		9+400		9+440		9+480	9+500
GROUND LEVEL(m)	1172.229	1173.958	1175.426	1176.282	1177.138	1177.994	1178.660	1178.758	1178.856	1178.971	1179.103	1179.234	1179.705	1180.513	1181.321	1182.129	1182.937	1183.590	1184.230	1184.870	1185.523	1186.871	1185.819	1183.591	1181.840	1180.697
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1171.080	1172.601	1173.905	1174.990	1175.876	1176.598	1177.150	1177.532	1177.743	1177.880	1178.109	1178.436	1178.861	1179.384	1180.004	1180.719	1181.462	1182.206	1182.949	1183.706	1184.634	1185.778	1185.217	1183.561	1181.905	1180.249

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MB/W/0.0.0
4. For Node details, see Dwg. MB/W/6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- (N01) — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

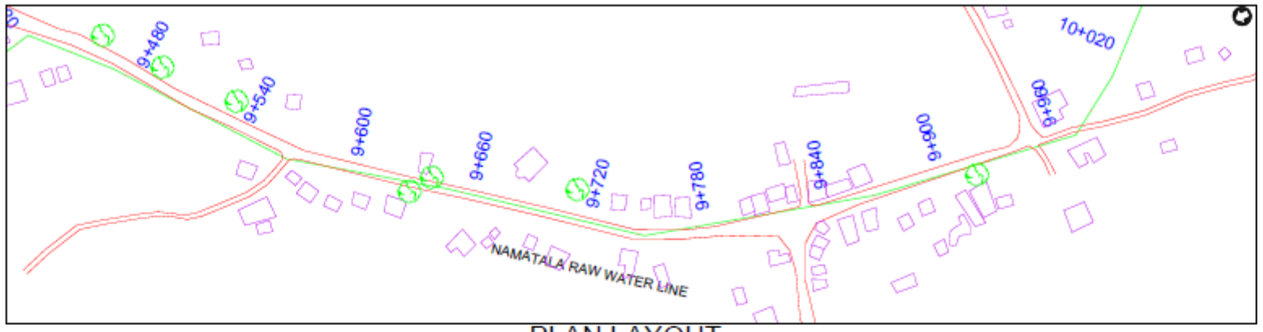
NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

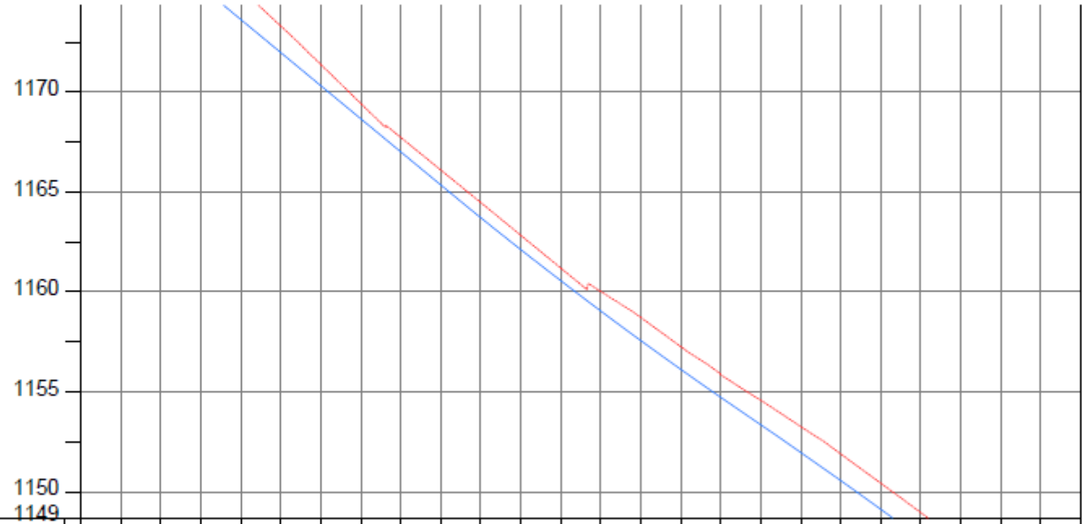
CONSULTANT:
saman Saman Corp.
CHEIL ENGINEERING
AWE Engineers

Drawing Title:
NAMATALA RAW WATER TL
NAM (CH 9+000.00 - 9+500.00)

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	IWMDP/MBA/NAM (CH 9+000.00 - 9+500.00)
Sheet No.: 19	Format: A3



PLAN LAYOUT



CHAINAGE	9+500	9+520		9+560		9+600		9+640		9+680		9+720		9+760		9+800		9+840		9+880		9+920		9+960		10+000
GROUND LEVEL(m)	1180.697	1179.555	1178.344	1176.742	1175.128	1173.291	1171.371	1169.423	1167.722	1166.094	1164.466	1162.829	1161.190	1160.023	1158.722	1157.263	1155.858	1154.578	1153.262	1151.892	1150.434	1148.962	1147.477	1146.095	1144.812	1143.448
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1180.249	1178.592	1176.936	1175.280	1173.624	1171.968	1170.311	1168.655	1166.999	1165.343	1163.709	1162.114	1160.558	1159.041	1157.564	1156.125	1154.726	1153.357	1151.971	1150.562	1149.129	1147.680	1146.280	1144.946	1143.677	1142.475

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MB/W/0.0.0
4. For Node details, see Dwg. MB/W/6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- N01 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

CONSULTANT:

saman Saman Corp.

CHEIL ENGINEERING

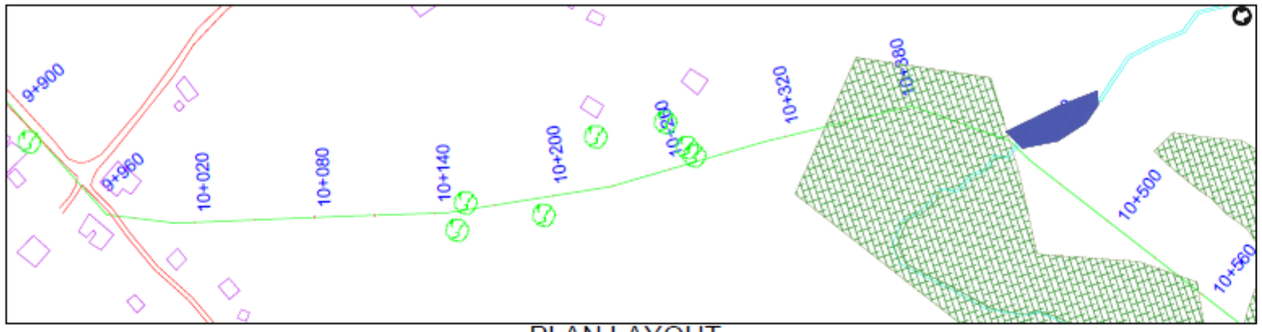
AWE Engineers

Drawing Title:

NAMATALA RAW WATER TL

NAM (CH 9+500.00 - 10+000.00)

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	IWMDP/MBA/NAM (CH 9+500.00 - 10+000.00)
Sheet No.: 20	Format: A3



PLAN LAYOUT

CHAINAGE	10+000		10+040		10+080		10+120		10+160		10+200		10+240		10+280		10+320		10+360		10+400		10+440		10+480	10+500
GROUND LEVEL(m)	1143.448	1142.365	1141.337	1140.310	1139.285	1138.789	1139.585	1140.460	1141.449	1142.390	1143.330	1144.271	1145.041	1145.715	1146.389	1147.112	1146.730	1145.539	1144.525	1143.534	1141.687	1139.584	1137.889	1137.825	1138.256	1138.687
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1142.475	1141.338	1140.267	1139.328	1138.761	1138.578	1138.780	1139.367	1140.270	1141.181	1142.059	1142.903	1143.713	1144.490	1145.233	1145.943	1145.580	1144.470	1143.229	1141.803	1140.193	1138.400	1136.755	1136.800	1136.953	1137.107

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MBWW0.0.0
4. For Node details, see Dwg. MBWW6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- N01 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

CONSULTANT:

saman Saman Corp.

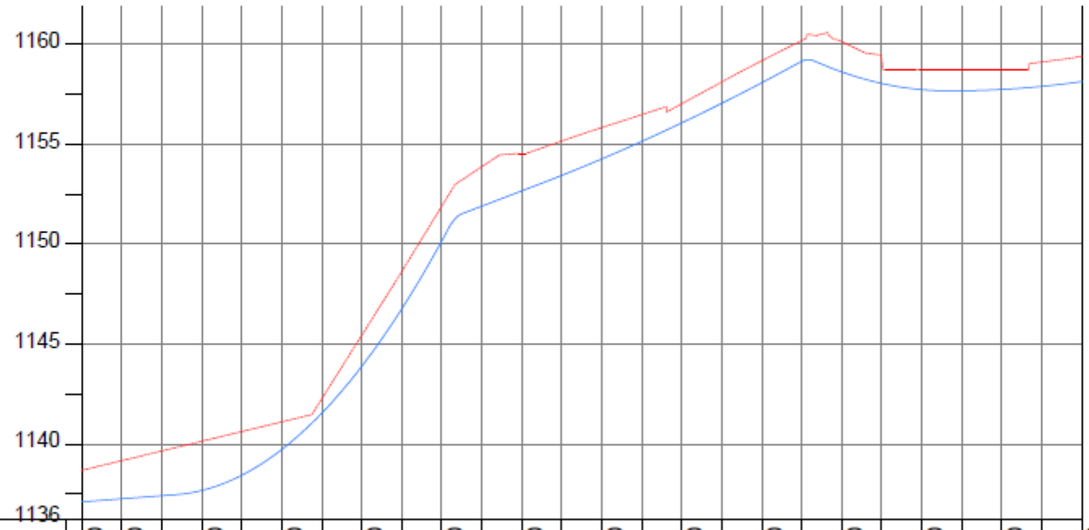
CHEIL ENGINEERING

AWE Engineers

Drawing Title:
NAMATALA RAW WATER TL
NAM (CH 10+000.00 - 10+500.00)

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Mussenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	IWMDP/MBA/NAM (CH 10+000.00 - 10+500.00)
Sheet No.: 21	Format: A3

PLAN LAYOUT



CHAINAGE	10+500	10+520		10+560		10+600		10+640		10+680		10+720		10+760		10+800		10+840		10+880		10+920		10+960		11+000
GROUND LEVEL(m)	1138.687	1139.171	1139.656	1140.140	1140.625	1141.109	1142.262	1145.442	1148.633	1151.896	1153.869	1154.527	1155.154	1155.826	1156.474	1157.018	1158.109	1159.167	1160.182	1160.120	1159.178	1158.731	1158.729	1158.726	1159.104	1159.392
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1137.107	1137.261	1137.414	1137.680	1138.441	1139.729	1141.545	1143.888	1146.759	1150.158	1151.894	1152.657	1153.433	1154.258	1155.134	1156.061	1157.038	1158.066	1159.143	1158.607	1158.030	1157.721	1157.667	1157.732	1157.884	1158.124

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MB/W/0.0.0
4. For Node details, see Dwg. MB/W/6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- ND1 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

CONSULTANT:

saman Saman Corp.

CHEIL ENGINEERING

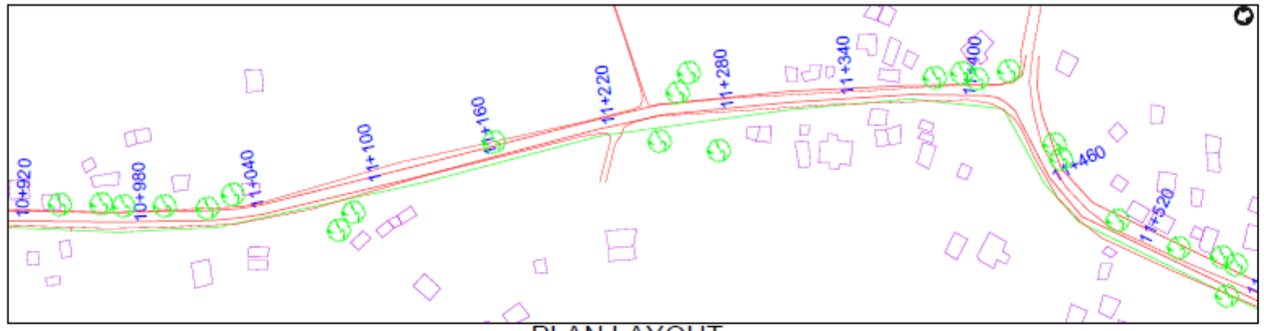
AWE Engineers

Drawing Title:

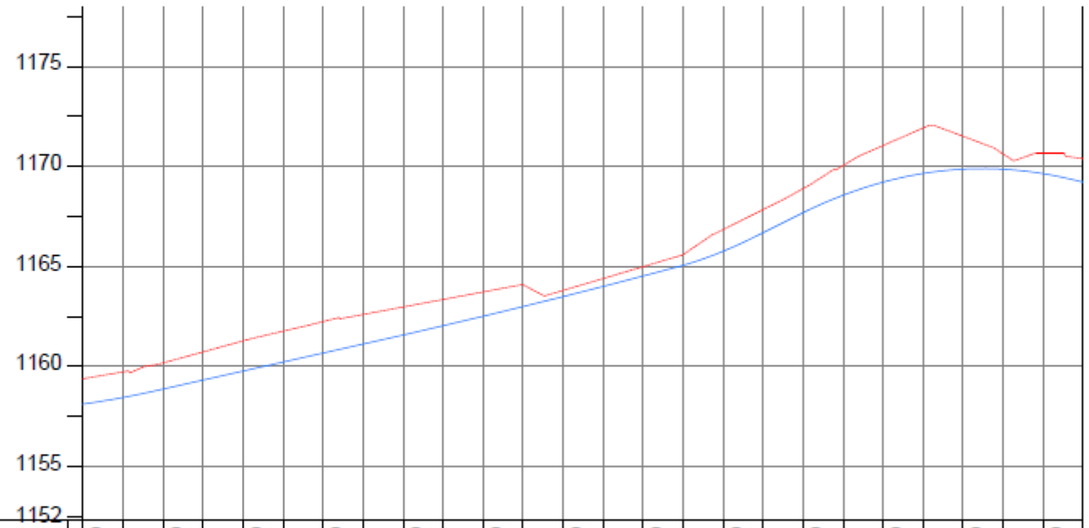
NAMATALA RAW WATER TL

NAM (CH 10+500.00 - 11+000.00)

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.: IWMDP/MBA/NAM (CH 10+500.00 - 11+000.00	
Sheet No.: 22	Format: A3



PLAN LAYOUT



CHAINAGE	11+000		11+040		11+080		11+120		11+160		11+200		11+240		11+280		11+320		11+360		11+400		11+440		11+480	11+500
GROUND LEVEL(m)	1159.392	1159.732	1160.181	1160.731	1161.282	1161.767	1162.247	1162.602	1162.978	1163.354	1163.729	1164.085	1163.807	1164.400	1164.994	1165.597	1166.847	1167.850	1168.897	1170.051	1171.052	1171.927	1171.512	1170.629	1170.649	1170.399
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1158.124	1158.450	1158.875	1159.324	1159.774	1160.224	1160.674	1161.123	1161.576	1162.040	1162.515	1163.001	1163.498	1164.006	1164.525	1165.061	1165.763	1166.694	1167.695	1168.567	1169.221	1169.655	1169.871	1169.868	1169.646	1169.219

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MB/W/0.0.0
4. For Node details, see Dwg. MB/W/6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- N01 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

CONSULTANT:

saman Saman Corp.

CHEIL ENGINEERING

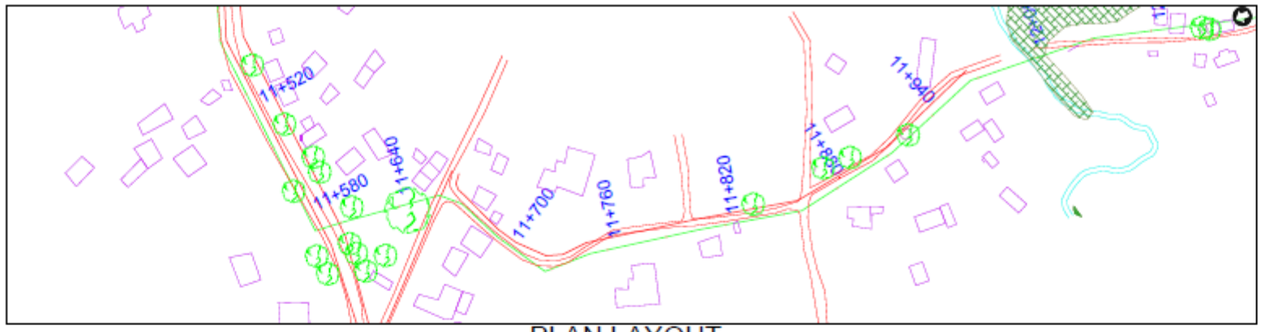
AWE Engineers

Drawing Title:

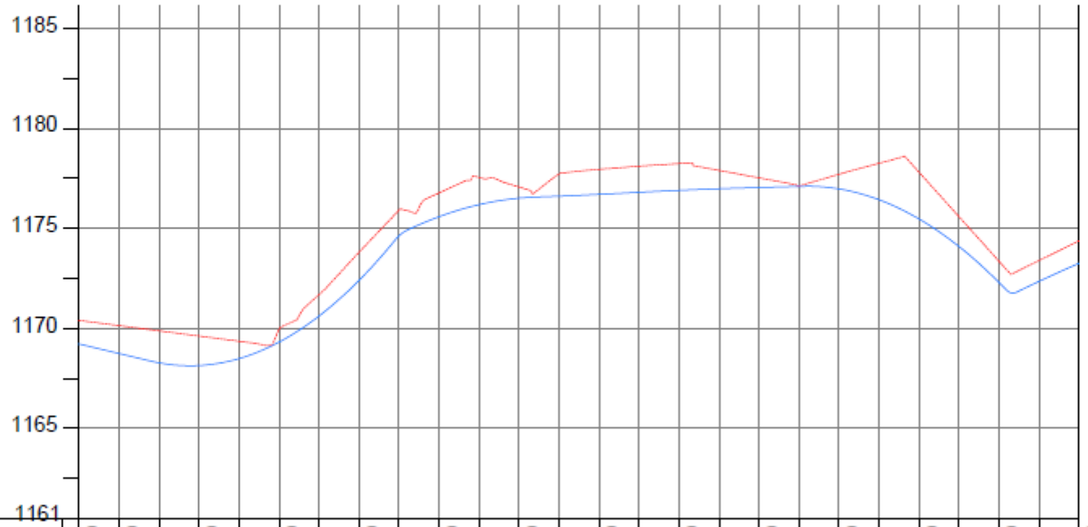
NAMATALA RAW WATER TL

NAM (CH 11+000.00 - 11+500.00)

Drawn by : Erla Kamagero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	IWMDP/MBA/NAM (CH 11+000.00 - 11+500.00
Sheet No.: 23	Format: A3



PLAN LAYOUT



CHAINAGE	11+500	11+520		11+560		11+600		11+640		11+680		11+720		11+760		11+800		11+840		11+880		11+920		11+960		12+000
GROUND LEVEL(m)	1170.399	1170.138	1169.878	1169.618	1169.358	1169.957	1171.693	1173.809	1175.915	1176.774	1177.552	1177.071	1177.721	1177.951	1178.114	1178.242	1177.901	1177.529	1177.123	1177.707	1178.256	1177.814	1175.587	1173.360	1173.392	1174.379
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1169.219	1168.743	1168.278	1168.145	1168.490	1169.315	1170.618	1172.400	1174.628	1175.588	1176.189	1176.514	1176.612	1176.701	1176.808	1176.905	1176.985	1177.047	1177.101	1176.977	1176.435	1175.475	1174.096	1172.298	1172.352	1173.253

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MBW/0.0.0
4. For Node details, see Dwg. MBW/6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- ND1 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

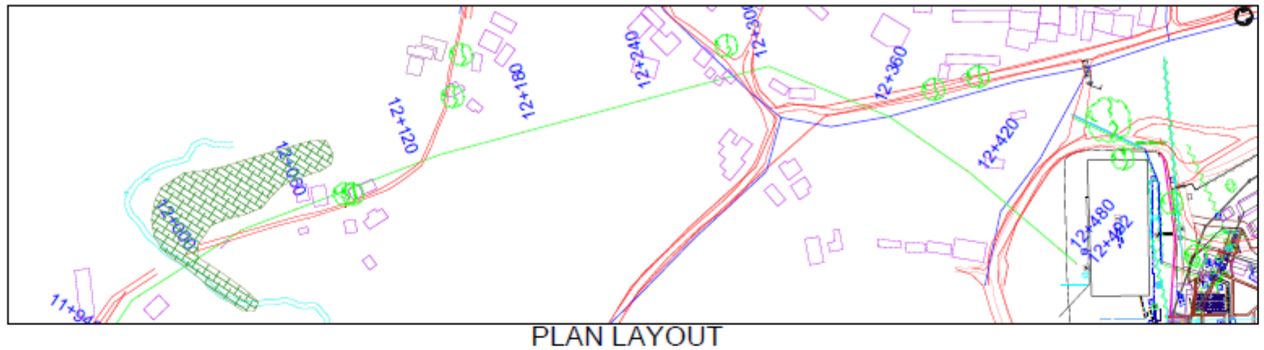
NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

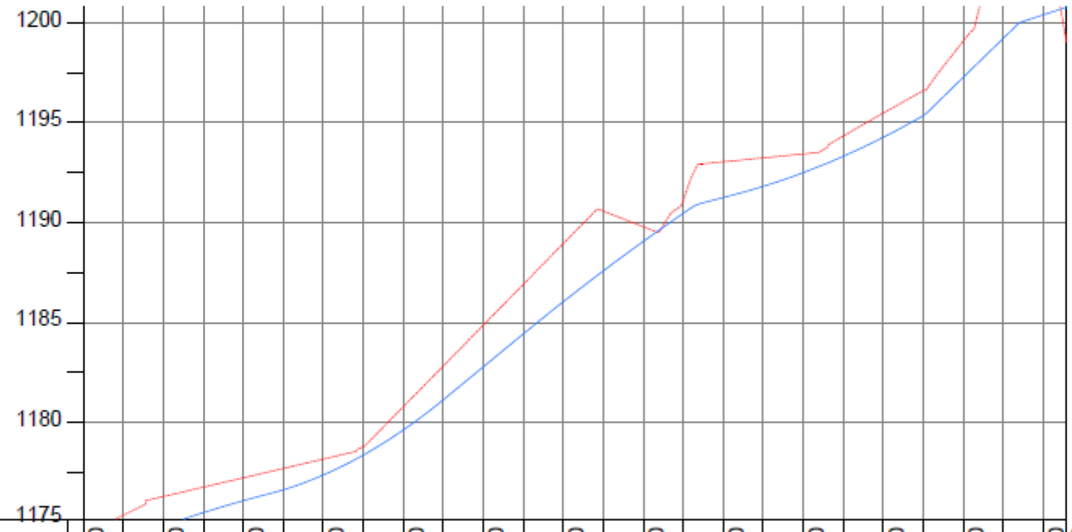
CONSULTANT:
saman Saman Corp.
CHEIL ENGINEERING
AWE Engineers

Drawing Title:
NAMATALA RAW WATER TL
NAM (CH 11+500.00 - 12+000.00)

Drawn by : Eria Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.:	NMDP/MBA/NAM (CH 11+500.00 - 12+000.00
Sheet No.: 24	Format: A3



PLAN LAYOUT



CHAINAGE	12+000		12+040		12+080		12+120		12+160		12+200		12+240		12+280		12+320		12+360		12+400		12+440		12+480	12+492
GROUND LEVEL(m)	1174.379	1175.366	1176.303	1176.771	1177.238	1177.707	1178.175	1178.795	1180.791	1182.830	1184.870	1186.909	1188.948	1190.577	1189.795	1191.114	1193.042	1193.237	1193.433	1194.329	1195.479	1196.601	1199.071	1201.406	1202.450	1199.041
PIPE DETAILS	DN 500,STEEL PIPE																									
PIPE INVERT(m)	1173.253	1174.077	1174.825	1175.498	1176.094	1176.639	1177.378	1178.374	1179.628	1181.138	1182.787	1184.435	1186.043	1187.583	1189.057	1190.465	1191.254	1191.812	1192.498	1193.316	1194.266	1195.356	1197.260	1199.212	1200.389	1200.768

AMENDMENTS

No	Date	Revision

NOTES

1. All dimensions are in metres unless stated otherwise.
2. All levels are in metres above sea level.
3. For Site location see Dwg. MB/W/0.0.0
4. For Node details, see Dwg. MB/W/6.0.0
5. All valves, hydrants and washout locations are identified by marker post in positions.

LEGEND

- Transmission Line
- New Distribution Line
- Road
- DAV — Double Orifice Air Valve
- WO_2 — Type 2 Washout
- ND1 — Node detail No. 01

REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

NATIONAL WATER AND SEWERAGE CORPORATION

PROJECT:
CONSULTANCY SERVICES FOR DESIGN REVIEW OF MBALE WATER AND SANITATION PROJECT

CONSULTANT:

saman Saman Corp.

CHEIL ENGINEERING

AWE Engineers

Drawing Title:

NAMATALA RAW WATER TL

NAM (CH 12+000.00 - 12+491.59)

Drawn by : Erla Kamegero	Approved by: Dongwoon OH
Checked by: Dr. Ronald Musenze	
Scale: As Indicated	Date: August 2021
Drawing No.: IWMDP/MBA/NAM (CH 12+000.00 - 12+491.59)	
Sheet No.: 25	Format: A3

MBALE TRANSMISSION MAIN

(REFER TO ATTACHMENT 1)

BUSOLWE TRANSMISSION MAIN

(REFER TO ATTACHMENT 2)

TIRINYI TRANSMISSION MAIN

(REFER TO ATTACHMENT 3)

SENIOR QUARTERS SEWERAGE

(REFER TO ATTACHMENT 4)

NAMATALA PONDS LAYOUT

(REFER TO ATTACHMENT 5)

DOKO PONDS LAYOUT

(REFER TO ATTACHMENT 6)

PUBLIC TOILETS

(REFER TO ATTACHMENT 7)

APPENDIX I: PROCEDURE FOR HANDLING WASTE AC PIPES & ACCESSORIES

NWSC GENERAL PROCEDURE FOR HANDLING WASTE ASBESTOS CEMENT MATERIALS

NWSC shall make sure the Contractor shall comply with OSH Standards and shall develop a Safety and Health Plan that complies with NEMA Specification Construction Safety and Health Program requirements.

The Contractor shall uncover, dislodge, handle, remove, transport, and dispose of all AC pipe specified in the contract documents for this project using wet technique procedures.

All work involving AC pipe and other ACM products must be addressed in the Disposal Plan.

The Contractor shall take precautions to prevent damage to adjacent structures and material finished material not required for AC pipe handling Prohibited Work Practices and Engineering Controls Contractors shall not use procedures that subject the AC pipe to forces that will crumble, pulverize, or reduce to powder the AC pipe.

The following work practices and engineering controls are not be used for work related to AC pipe or for work which disturbs ACM, regardless of asbestos exposure or the results of Initial Exposure:

A. High speed abrasive disc saws and sanders not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air;
B. Carbide tipped cutting blades;
C. Electrical drills, chisels, and rasps used to make field connections in AC pipe;
D. Shell cutters used to cut entry holes in AC pipe A hammer and chisel without using wet techniques to remove pipe connections
E. Compressed air used to remove asbestos or material containing asbestos
F. Dry sweeping, dry shoveling or other dry clean-up of dust and AC debris
G. Employee rotation as a means of reducing employee exposure to asbestos The Contractor is responsible for isolating the existing mains to remain in place by capping, plugging and blocking as necessary. The opening of an abandoned AC water main and all other openings or holes shall be blocked off by manually forcing cement grout or concrete into & around the openings in sufficient quantity to provide a permanent watertight seal.
H. Abandonment of AC water mains will be considered subsidiary to the work required
I. Abandonment of Valves that contain AC: Valves to be abandoned in the execution of the work shall have the valve box and extension packed with sand to within eight inches (8) of the street surface.

The remaining eight inches (8) shall be filled with 3,000psi concrete or an equivalent sand cement mix and finished flush with the adjacent pavement or ground surface.

The valves covers shall be salvaged & returned to Central Storage (Waste).

The abandonment of valves containing ACM will be considered subsidiary to the work required, and no direct payment will be made Verification of Removal & Clean up Procedures:

The Contractor's on site Competent Person shall inspect the work area verify and certify that no residual AC pipe fragments and debris remain.

Submition of disposal copies to NEMA and if applicable Environmental representatives of all transport manifests, and disposal receipts for all asbestos waste materials removed from the work area during the project.

APPENDIX J: NEMA ASBESTOS HANDLING AND DISPOSAL PROCEDURE

National Environment Management Authority (NEMA)

DEPARTMENT OF ENVIRONMENTAL MONITORING AND COMPLIANCE (EMC)

Safe Work Procedure

Asbestos Handling and Disposal

Introduction

Asbestos dust and fibres has been found to be hazardous causing cancer and other lung related illnesses and disease.

Persons engaged in the removal, handling and disposal of materials containing asbestos should take standard precautions to avoid potential health risks.

This procedure defines the minimum precautions that shall be taken before and during the handling of asbestos.

The preferred method of handling the asbestos materials is wet them with water and dust suppressant mixture sprayed in fine mist. Time should be allowed for the material to soak thoroughly to control airborne fibres.
Items containing asbestos fibre should be allowed to mechanically disintegrate or be broken into small pieces.

I. Specific Risks

- Falling through the fragile asbestos roofing sheets.
- Falls from a height
- Dust / Fibre inhalation
- Spreading the dust / fibres in the atmosphere and water streams.

II. Personnel prerequisites

- Suitable health profile (e.g. no breathing, allergic or asthmatic problems)
- Suitable physical condition
- Suitable qualification and experience for performing the work (trained to handle asbestos and work at height.)

III. Personal Protective Equipment

- Respirator – half face, air purifying dual cartridge respirators with high efficiency filters. Ensure proper fitting.
- Overalls – several pairs of disposable overalls.
- Safety boots – Rubber boots that can be washed or disposed as part of debris.
- Eye protection – each person removing should have non-fogging safety goggles.
- Hand protection – Several pairs of disposable rubber gloves should be supplied to the workers.
- Fall protection – full body safety harness plus retractable life line should be used.
- Ear protection – protect ears from dust and noise.

IV. Tools

- Appropriate work at height equipment (e. g ladders, safety harness, scaffolding may be used)
- Garden hose equipped with an automatic shutoff spray nozzle.
- Garden pump Sprayer
- Suppressant material – Liquid dish washing detergent
- Removal tools:
  - a pry bar for lifting nails. A bar equipped with a blade at least two inches wide is most recommended.
  - A nail puller or nail-head cutter or drilling (screw remover) machine.
  - A knife or scissor to cut polythene sheeting.
  - Debris containers – plastic lined containers or plastic lined metal containers provide thorough containerisation.
  - Six mm thick polyethylene plastic sheeting to cover the ground at the base of walls.
  - If waste is to be bagged, then the labelled asbestos disposable bags should be used.
  - Duct tape – several rolls are required for sealing the bags and wrapped debris.

V. Preparation

The safety objective is to keep the fibres or dust out from air by minimising breakage, keeping materials wet and containing all debris.

This will be attained by preparing as shown below:

- It is mandatory to have written authorisation from Environment Management Authority before starting demolition work
- Evacuate people from operational area, isolate area and post warning signs before start of the work.
- Make temporary enclosure to isolate work area from public.
- Lay a six foot wide strip of 6-mm plastic sheeting along the side of the house

and inside the house.

- Create an entrance / exit point to the work area by laying down an additional six by six foot piece of plastic sheet next to the plastic strip along the wall and keep a plastic disposable bag at this location.
- Mix half cup of detergent in a garden pump sprayer with water.
- The team members have to be trained before the work and risk assessment must be done. Their signature in a specific paper confirms that they properly understood the requirements of the job.
- The responsible person ensures that :
  - Workers at site have all the necessary PPE.
  - All workers have understood the procedure and risks involved.
  - work area is fully isolated from the public and un authorised persons.
  - only properly configured access equipment (scaffolding and ladders) and lifting equipment (hoists) are used;
  - all equipment associated with the work permit is inspected prior to use;
  - all the necessary permits to work are obtained and risk assessment done.

VI. Removal Work

- Remove pieces of siding or sheeting by pulling nails, cutting nail heads so as to minimise breakage. Drilling machine fitted for screw removal should be used. *Do not hammer the sheets.*
- If siding or sheeting begins to crack or crumble, immediately wet the cracked or broken areas with the garden sprayer. *Breakage releases asbestos fibres*.
- Carefully lower the siding or sheeting to the ground. *Do not throw or drop it*.
- Keep all debris on the plastic strips at the base of the walls and floors and keep it wet until packaged and sealed.

Note: *Once removal work begins, do not leave the plastic without first removing disposable overalls and other protective equipment at the "transition zone". Each re-entry will require a new pair of overalls and gloves.*

VII. Decontamination

- Ensure that the workers spray themselves with enough water to wet down any asbestos debris /fibres on the outside of their respirators and disposal overalls etc.
- Remove the boots and the rest of the PPE, and leave the contaminated items on the transition zone plastic for disposal.
- Wrap the remaining debris and disposable items in properly labelled asbestos disposal bags.
- Tightly seal each bag with duct.
- Use wet rags for any further clean up. *Do not attempt to vacuum or sweep up asbestos debris.*

VIII. Clean up and Disposal

- Load wet debris and other contaminated materials into sturdy containers then wrap the containers in layers of six mil plastic material.
- Obtain a waste disposal approval certificate from NEMA.
- Asbestos debris from the site must be disposed off at a clearly marked and well constructed disposal site approved by NEMA. Impermeable concrete protected dump site is most appropriate, such as the Kiteezi Land Site owned and operated by Kampala City Council.
- The site must be secured, marked and warning signs (Asbestos damp site) posted at the licenced dump site.
- The debris must be transported in covered truck.
- Plastics bags or wrapping must not be perforated.
- The quantity of waste generated must be weighed and documented.
- The asbestos debris must be legally disposed as per the National Environment Act Cap.153 and the National Environment (Waste Management) Regulations, 1999 and other subsidiary legislations.

APPENDIX K: ENVIRONMENTAL FLOW ASSESSMENT-RIVER NAMATALA

Extract from the Final Augmented Water Supply Report (Pages 204-207)

Revised E-flow assessment

The E-flow demand has been revised using the Tennants (1976) method which estimates instream wat er requirements as a fixed percentage of the Annual Average Flow (AAF). As noted in the previous ESI A in 2018, the use of median flow is usually more recommended in case of extreme flow and has been used. Downstream water uses have been taken have also been considered part of the environmental w ater demand. This has also been taken into account given that the catchment under consideration has s ignificant levels of human activities as observed in the field investigations.

Domestic water needs

There is a considerable proportion of the population that relies on the river Namatala for domestic water uses. The baseline information used in this review is shown in the Appendix where it is assumed that a certain proportion of the population (taken as 50%) in all parishes bordering River Namatala and downs tream of the intake rely on it. In the 2018 ESIA, sub-counties were used yet there are other sources of water in the project area.

Based on the national average per capita water consumption prescribed by the Directorate of Water De velopment (DWD, 2013: Water Supply Design Manual, 2013), the total estimated domestic water Dw is: Dw = 0.5*25 l/c/d x 139,293 = 1,741,163 l/day = 0.020 m^3/s.

Livestock water needs

The main types of livestock reported for Namatala sub-catchment (M1) are shown in Table 11-4. These were based on information from the “National Livestock census report, 2008” (UBOS). Livestock sizes were quantified in form of Livestock unit (TLU) which refers to a mature animal with a live weight of 500 kilograms. TLUs for different livestock are provided in the Uganda Water Act (1995). The total livestock water needs was then obtained by multiplying the total TLU and the unit consumption. 1 TLU = 50 l/day of water.

Table 11-4: Livestock water needs in Namatala catchment

Livestock type	Number	TLU conversion f actor	TLU of each livestock (TLU)
Cattle	74964	0.7	52474.8
Goats	98503	0.15	14775.45
Sheep	7037	0.15	1055.55
Chickens	422592	0.06	25355.52
Pigs	19464	0.4	7785.6

		Total	**101,447**

Source: MWE, 2017

The livestock water needs is = Lw =101,447 * 50 = 5,072,346 liters/day = = 0.06 m^3/s.

Irrigation water needs

The local community living near the river rely on it especially in the dry season (December to February) to irrigate their crops. These crops are grown on small scale between ¼ an acre to 1 acre (0.5 acres pe r household on average). Considering only parishes bordering the river, the total number of households depending of the river can be estimated from the total population (158,998) divided per the average hou sehold size (about 5 occupants).

giving a total number of households of 31,800. Hence, the total estimated acreage relying on the river is about 31,800 * 0.5 = 15,900 acres or 64,346 m^2. The irrigation requirements for horticulture crops are e stimated to be between 400 – 600 mm/season with an average of 500 mm/season (FAO). Hence, the to tal water requirements can be obtained as:

Total irrigation requirement = 64,346 m^2 (acreage) x 0.5/1000 m (water) = 32,172.9 m^3/season.

Assuming two growing seasons per year, the irrigation water (Iw) = **0.002 m^3/s.**

Permitted water abstractions (Pw)

The only permitted water abstraction along River Namatala other than the proposed intake is Moto Engl i Engenharia Construcao Africa (Permit number MBL203675/1SWJDW 2019) which is 60m^3/day Hence, the permitted water abstraction, Pw = 0.000694 m^3/s.

Fish/Aquatic life water needs

The environmental flow requirements for meeting the aquatic water needs as well as water needs for re creation has been estimated using the Tennants (1976) method. It was noted during the field investigati ons that there are very few fish and aquatic stocks in River Namatala. The river is also utilized for recre ation but mainly be children who swim in the river. Hence, it can be concluded that a minimum flow woul d be acceptable to sustain the existing aquatic biota and some recreation activities.

Therefore, allowing for 10% of the median annual discharge (MAF) as the minimum flow, the water nee ds for the aquatic life and recreation activities, Fw is: Fw = 10% x 1.119 m^3/s = 0.11 m^3/s.

Minimum environmental flow recommended for River Namatala

From the values of Dw, Lw and Fw calculated above, the environmental flow recommended for River N amatala is

EF = Dw + Lw+ Iw + Pw + Fw = 0.020 + 0.06 + 0.002 + 0.000694 + 0.11 = **0.19 m^3/s.**

E-flow assessment for Manafwa, Nabuyonga and Nabijo intake

Using the same approach as for River Namatala, an estimate of the E-flows for the other intakes of Manafwa, Nabuyonga and Nabijo has been carried out and is summarized in the **Table 11-5**.

Table 11-5: E-Flow assessments for Manafwa, Nabuyonga and Nabijo

Component	Environmental water requirement		
	Manafwa (MAF=5.403)	**Nabuyonga (MAF=0.17)**	**Nabijo (MAF=0.121)**
Domestic water, Dw (m^3 /s)	0.009454	0.005966	0.001605
Livestock water demand, Lw (m^3 /s)	0.048	0.001056	0.00088
Small-scale irrigation water, Iw(m^3 /s)	0.000419	0.000529	0.000142
Permitted water, Pw (m^3 /s)	0.00674	**0**	**0**
Total	**0.064613**	**0.007551**	**0.002627**

MAF = mean annual flow

APPENDIX L: PIPES NETWORK MBALE