THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF WATER

LAKE VICTORIA ENVIRONMENTAL MANAGEMENT
PROJECT PHASE II

ENVIRONMENTAL IMPACT STATEMENT FOR CONSTRUCTION OF MUSOMA SEWERAGE SYSTEM AND TREATMENT PLANT IN MUSOMA MUNICIPAL -MARA REGION

Submitted to:	**Prepared by**:
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CONSULTANT CERTIFICATION

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EXECUTIVE SUMMARY

1. **Project Title**: Construction of Musoma Sewerage System and Treatment Plant in Musoma Municipal -Mara Region

2. **Location**: The proposed project is located in **Musoma Municipal -Mara Region**. The sewerage pipe network is located in Musoma City Centre, Pumping stations located at Iringo, Kitaji, and Mukendo wards, Main pumping station near Mwisenge primary school; and Wastewater Treatment Plant at Makoko ward.

3. **Name of the Proponent:** Lake Victoria Environmental Management Project Phase II
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4. **Main Consultant**: The main consultant is UJAMAA IMPEX COMPANY LIMITED AZIKIWE/SAMORA AVENUE, Coronation House Apartment 102, P.O. Box 78833, Dar es Salaam. Tanzania Tel: 0732 027357 Email: malipulasr2006@yahoo.com

5. **Project Description**

   The overall implementation of this project is divided into two major phases; Phase I: 2012–2020 and Phase II: 2020 – 2030. Phase I will comprise piped sewerage system which will be constructed for the municipality only with the Wastewater Treatment Plant (WWTP) constructed at Makoko area to receive and treat the wastewater collected from the municipal centre.
   Phase II will cover the remaining western and eastern areas of the municipality, which currently have low population densities. Land availability in these areas strongly favours the continual use of proper on-site sanitation systems as acceptable solutions for environmental and economical reasons.

   The Proposed Musoma Sewerage System will consist of four major components, which include the collection sewers, sewage pumping stations, conveyance mains and wastewater stabilisation ponds (WWSP). The Collection sewers will cover the municipal centre within the Mukendo, Mwigobero, Iringo and Kitaji wards. The Sewage pumping stations will be located at the municipal in Iringo, Kitaji, Mukendo wards and the truck station near Mwisenge primary school which will pump wastewater to the waste water stabilization ponds at Makoko area.

6.0 Stakeholders consultations: Consultation with the stakeholders was aimed at positively conveying information about the planned project development, clear up misunderstandings, allow a better understanding of relevant issues and how they will be dealt with, identify and deal with areas which are controversial while the project is in implementation stage.
So far stakeholders identification considered all matters related to wastewater discharge. As such stakeholders were grouped at different levels. Therefore, stakeholders were consulted at the regional level; District level; Community level and association level. Grouping of stakeholder was based on the different positioning in terms of roles and responsibilities with regards to wastewater and related sectors. Consultation and public

meetings were conducted at Mukendo, Mwigobero, Iringo and Kitaji wards and within Musoma centre where ESIA focus is. Through these public consultations and meetings, community members had the opportunity to air their opinions and worries as well as expectations with regard to the project. A multidisciplinary team composed of environmental and social experts considered all aspects of the project that could cause environmental or socio- economic changes. They evaluated the significance of each aspect of the project in terms of defined criteria, which take account of the scale, extent, duration the potential to implement mitigation measures and controls and the likelihood and timescale of environmental recovery.

Key stakeholders identified for the proposed project include:

- Musoma Municipal Council (MMC);
- Kitaji Ward Council;
- Iringo Ward Council;
- Mwigobero Ward Council;
- Mukendo Ward Council;
- Makoko Ward Council;
- MUWASA;
- TANROADS;
- Regional Engineer;
- TANESCO;
- LVBWB;
- TMA;
- LVEMP;
- Water Supply Contractor (Spencon Kenya Ltd); and
- Water Supply Project Consultant (Lahmeyer).

Practically most part of the environmental impacts were addressed as per Terms of Reference and the Environmental Impact Assessment and Audit Regulation. Few impacts that were not covered were either regarded as insignificant or did not have an influence to the project but with experience obtained from the existing similar projects; this report has covered most of the required data to enable assessment of the project impacts.

6.1 Results of Public consultation

The meetings held in the project area revealed that overall the stakeholders are in favour of the project, especially in providing solution of wastewater management in the area, some of their concerns were as follows:

- The proposed project should abide by, the National Regulations and Policies governing land uses;
- Damage to road pavements and structures due to excavation of sewer pipeline trenches;
- Disruption of public service utilities due to excavation of sewer pipeline trenches;
- Risk on lake water pollution due to accidental overflow of raw sewage from WWTP;

- Air pollution due to emission of dust from soil excavations, stockpiling of soil material and emission of exhaust fumes from heavy construction machinery/ equipment and vehicles;
- Issue of compensation to be done promptly;
- The project shall assist the community in some of the development project which are initiated by the community;
- The project to give priority employment to local people for unskilled labour; and
- Creation of odour nuisance at the WWTP.

7.0 Anticipated Major Environmental and Social Impacts

7.1 Positive Project Impacts

7.1.1 Employment opportunities;
7.1.2 Improvement of community health;
7.1.3 Reduced pollution of Lake Victoria and hence increased biodiversity;
7.1.4 Increase of revenue collection for MUWASA;
7.1.5 Improved quality of surface and ground water resources;
7.1.6 Increased forage availability for aquatic life;
7.1.7 Improve aesthetic value of Musoma municipal; and
7.1.8 Economical benefits accrued by community from reduction of costs of piped sewerage system.

7.2 Negative Project Impacts:

On the negative impacts, the following are the key anticipated major environmental and social impacts:

7.2.1 Damage to infrastructure (roads, fenced wall and stone drive);
7.2.2 Loss of properties (houses, vegetable gardens, etc);
7.2.3 Dust, noise and vibration problems;
7.2.4 Impair air quality (dust and odour);
7.2.5 The loss of natural vegetation (trees);
7.2.6 Loss of connectivity of wetland habitat along the lake shore;
7.2.7 Health problems of workers from exposure to hazardous toxic materials and communicable diseases;
7.2.8 Road traffic flow problems (spillages, accidents and congestion);
7.2.9 Pollution of the Lake Victoria and ground water resources;
7.2.10 Soil Erosion; and
7.2.11 Nuisance and insect breeding.

7.3 Risks

The following risks may occur during the project operations:

7.3.1 Pump failure;
7.3.2 Electricity cut off;
7.3.3 Pond failure; and
7.3.4 Rising Lake Level.

8.0 Alternatives considered: Several project alternatives were considered in due consideration to minimize the likely environmental impacts. As a general rule "the without project alternatives" was considered. Other alternatives considered include, With Project Alternatives, Activity Alternatives, Location Alternatives, Design Alternatives, Technology Alternatives and Scheduling Alternatives

9.0 Environmental Mitigation Plan: In an effort to maximize project benefits the following enhancement measures have been proposed:-

i) Promote and give priority employment to local community and train individuals; assigned to manage the different departments for improved performance;
ii) Sensitization of the community to use the piped sewerage system rather than the ordinary pit latrines and septic tanks;
iii) Improved Service delivery by MUWASA;
iv) Encourage customers to use piped sewer system;
v) People willingness to pay for sewerage services;
vi) Adequate flow of piped water supply;
vii) Regular monitoring and maintenance of sewer system and WWTP;
viii) Monitor surface and ground water quality;
ix) Discharge effluent which meet discharge standard of receiving water bodies;
x) Repair of any leaking sewerage pipes;
xi) Cleaning manholes and chambers;
xii) Create a buffer zone of at least 60 m from the lake;
xiii) Use of sewer system to avoid high cost of hiring septic tanks empties;
xiv) Plant appropriate fish species and use of fishing gears;
xv) Employ Cooperate Officer (Liaison Officer); and
xvi) Participate in Local Community Development Projects.

Key measures for mitigating negative environmental and social impacts include:

i) Compensation in kind or cash;
ii) Avoid overloading WWTP through proper designs;
iii) Stabilize sludge by natural processes in the sludge drying beds;
iv) Isolate WWTP away from major centers of population;
v) Limit construction activities within the project impact area;
vi) Orientation of staff on new tasks;
vii) Train workers in occupational health, safety and emergency response;
viii) Provide Personal Protective Equipment (PPE);
ix) Provide First Aid facilities;
x) Limit noise levels to 90 dB for a continuous 8 hours exposure;
xi) Sprinkling water on bare surface;
xii) Covering transporting trucks;

xiii) Provide appropriate fire fighting equipments;
xiv) Prepare traffic management plan;
xv) Conduct root cause analysis of accidents;
xvi) Repair of any leaking sewerage pipes;
xvii) Cleaning of manhole chambers;
xviii) Regular monitoring of surface and ground water quality;
xix) Limiting earthworks to the dry season;
xx) Construct sand traps along water channels and storm drains;
xxi) Planting vegetation on disturbed areas;
xxii) Cleaning and cutting grass on pond embankment;
xxiii) Wide distribution and use of condoms;
xxiv) Employment opportunities for project-affected women;
xxv) Removal and appropriate disposal of demolishes, concrete slabs, cement blocks, wood parts, metal parts; and
xxvi) Site Cleanup, stabilization, top soil repro-filing, landscaping and Re-vegetation.

10.0 Environmental and Social Management Plan (EMP): An EMP comprising an impact enhancement plan, impact mitigation plan and impact monitoring plan has been put in place to guide implementation of the mitigation measures.
Key issues covered in the monitoring plan include effect of construction works on the biophysical environmental conditions, effectiveness of mitigation measures put in place to mitigate the identified impacts both social and biophysical, community feedback on issues of concern to their wellbeing, HIV/AIDS awareness among staff and visitors, project contribution to overall development of hospitality business and social wellbeing of the people.

11.0 Cost benefits analysis: The cost-benefit analysis was done in terms of project social benefits and the cost of mitigating the negative impacts against the total project development cost. Also the project inputs were valued in non-monetary terms and outputs in physical terms, with the "with project situation" found more realistic in achieving economic and social targets of the project objectives.

12.0 Decommissioning: Decommissioning of the project will involve demolition of temporally Contractor's camp sites which will be used during construction phase. The main activity during decommissioning will be cleaning up of the site before handing it over to the client. The decommissioning process will therefore entail the following actions: waste management and disposal; and shaping and grading of the disturbed areas.

However careful implementation of activities will ensure the size of the project does not translate into insurmountable negative impacts on the environment which is the very basis of the hospitality business in the area. To this effect, the management is committed to the process of dialogue and consensus building to ensure that the development meets both the aspirations of the Ministry of Water and MUWASA in particular; and management requirements stipulated and agreed upon by the authorities and other stakeholders.

13.0 Concluding Remark

This environmental and social impact assessment is a site specific study which covers Musoma Municipal and not an ESIA for Mara Region. This assessment therefore indicates that, development of the proposed project will have some negative environmental and social impact. However with the proposed enhancement and mitigation measures would result in mitigating the negative impacts to an acceptable standard. On the other hand it would yield significant positive socio-economic impacts.

Critical in the whole process of enhancing sustainable development in Musoma Municipality is the expansion of the water supply system which will increase the water production from the current 10,000 m^3 per day to 36,000 m^3. The municipality does not currently have a sewerage system for managing wastewater generated from the present and expanded water uses in the municipality. Therefore this project is very prudent as far as wastewater management is concerned.

It was the majority's view that the projects could be implemented in an environmentally friendly and socially responsive manner to the benefit of Musoma residents and the Nation as a whole as well as maintaining the Lake Victoria environment clean and safe.

In view of the above, the developer should adhere to the proposed environmental and social mitigation measures proposed in this EIS report.

ACKNOWLEDGEMENT

The Lake Victoria Environmental Management project phase II wishes to express sincere gratitude to the Consultant Ms Ujamaa Impex Company Limited for tireless work to ensure that the Environmental and Social Impact Assessment (ESIA) Study and preparation of an Environmental Impact Statement (EIS) for the proposed Construction of Musoma Sewerage System and Treatment Plant in Musoma Municipal is completed successfully. The Ujamaa Impex Director Mr. Shaban S. Malipula also wishes to thank LVEMP II members for their valuable guidance and support to the Consultant for undertaking the study.

Compilation of this report could not have been possible without the support and contribution of key professional staff Eng. Lait Simukanga (Environmental specialist and Team Leader), Dr. Patrick Valimba, (Water Resources Engineer) Dr. Cosmas Mligo (Ecologist), Prof. Hussein Sosovele (Sociologist) and Mr. Shaban Malipula (Valuer). Furthermore appreciation goes to the MUWASA and Musoma Municipal staff and other stakeholders in conducting field work, provision of information and availing their valuable time in discussing issues related to the subject matter and advise on how best to fulfil the study objectives. To all of these stakeholders too numerous to mention, LVEMPII remains indebted and renders deep appreciation.

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ACRONYMS AND ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
ARAP	Abbreviated Resettlement Action Plan
A_1	Anaerobic pond 1
ARI	Acute Respiratory Infection
BOD	Biochemical Oxygen Demand
BWOs	Basin Water Offices
CBD	Convention on Biological Diversity
CBA	Cost Benefit Analysis
COD	Chemical Oxygen Demand
DoE	Division of Environment
DEMO	District Environmental Management Officer
EAC	East African Community
EU	European Union
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMA	Environment Management Act
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
F1	Facultative pond 1
FSST	Faecal Sludge Settling and Thickening Tank
GEF	Global Environmental Facility
HIV/AIDS	Human Immuno-deficient Virus/Acquired Immunodeficiency Syndrome
LV	Lake Victoria
LVBWB	Lake Victoria Basin Water Board
LVBC	Lake Victoria Basin Commission
LVBWO	Lake Victoria Basin Water Office
LVEMP II	Lake Victoria Environmental Management Project Phase Two
MMC	Musoma Municipal Council
MUWASA	Musoma Water Supply and Sanitation Authority
MLD	Millions Litres per Day
MH	Manhole
MDGs	Millennium Development Goals
MLHHSD	Ministry of Land Housing and Human Settlement Development
MKUKUTA	Mkakati wa Kukuza Uchumi na Kuondoa Umaskini
NSGRP	National Strategy for Growth and Reduction of Poverty
MCL	Maximum Contaminant Level
MoW	Ministry of Water
M1	Maturation pond1
NEMA	National Environmental Management Act
NEMC	National Environment Management Council
NEP	National Environmental Policy
NGOs	Non Governmental Organisations
PPE	Personal Protective Equipments
PDO	Project Development Objective
RAS	Regional Administrative Secretary
RC	Regional Commission

REME	Regional Environmental Management Expert
RPCT	Regional Project Coordination Team
SIDA	Swedish International Development Agency
ToR	Terms of Reference
TRA	Tanzania Revenue Authority
TSS	Total Suspended Solids
TSB	Tanzania Bureau of Standards
TMA	Tanzania Metrological Agency
TANROADS	Tanzania Road Agency
TANESCO	Tanzania Electric Supply Company
URT	United Republic of Tanzania
UNCCD	United Nations Convention to Combat Desertification and Drought
UNFCCC	United Nations Framework Convention on Climate Change
UWASA	Urban Water and Sanitation Authority
VETA	Vacation Education Training Authority
VPO	Vice President's Office
WSDP	Water Sector Development Program
WWTP	Wastewater Treatment Plant
WWSP	Wastewater Stabilization Ponds
WHO	World Health Organisation
WBG	World Bank Group

CHAPTER 1: INTRODUCTION

1.1 PROJECT BACKGROUND

The Lake Victoria Environmental Management Project Phase Two (LVEMP II) is a compliment and upscale of LVEMP I which ended in December 2005 with an implementation period of eight (8) years (2009-2013 and 2014-2018). It is a regional initiative and a multi-sector approach on the management of the Lake Victoria Basin implemented in the five East African Community (EAC) Partner States, Burundi, Kenya, Rwanda, Tanzania and Uganda. Lake Victoria Basin Commission (LVBC) coordinates the project regionally through the Regional Project Coordination Team (RPCT) based in Kisumu, Kenya. Respective countries coordinate the activities through the Ministries responsible for management of water resources which coordinates the implementation of the project of which in Tanzania is the Ministry of Water. The project became effective on 20th August 2009 in Tanzania, and it covers a total of 23 districts in Mara, Shinyanga, Mwanza and Kagera Regions. The Project is funded by Agence Française de Développement (AFD) Global Environmental Facility (GEF), European Investment Bank and the Government of Tanzania.

1.2 OBJECTIVES OF LVEMP II

The Overall Objective is to contribute to achieve the vision of the EAC for the LVB of "*having a prosperous population living in a healthy and sustainably managed environment, providing equitable opportunities and benefits".* The achievement of this general objective is through achievement of its three main sub-objectives:

i) Strengthening institutional capacity for managing shared water and fisheries resources

This sub-objective focuses on strengthening the existing institutions to improve the cooperative management of shared transboundary natural resources of the LVB, and hence contribute to the achievement of the first Project Development Objectives (PDO). It is aiming at (i) improving the effectiveness of key regional and national institutions, through harmonization of national policies, legislation, and standards; (ii) developing options for long-term mechanisms for financing natural resources management interventions; and (iii) developing regional frameworks for the management of key transboundary natural resources – water and fisheries.

ii) Point sources pollution control and prevention

This sub-objective aims at reducing environmental stresses within the lake and littoral zone, through the implementation of mitigation and prevention measures, thus contributing to the achievement of the second PDO. It will finance investments aimed at reducing point sources of pollution in priority hotspots, identified during LVEMP I. These investments will complement on-going activities supported by other Bank-funded projects in water and sanitation. This sub-objective targets (i) rehabilitation of

wastewater treatment facilities, (ii) promotion of cleaner production technologies and (iii) pollution risk management and safety of navigation.

iii) Watershed management

This sub-objective seeks to reduce environmental stresses from the lake basin, through the implementation of non-point sources pollution mitigation and prevention measures. The reduction of the non-point sources of pollution (sediment loads, nutrients, and agro-chemicals); by scaling up successful models of watershed management practices piloted under LVEMP I will improve water use efficiency, and generate positive downstream externalities. The project will therefore support community-driven investments in rehabilitating in selected priority degraded sub-catchments of Lake Victoria, including the catchment of River Simiyu (11,577 Km^2) in Tanzania. There are two targets, (i) natural resources conservation and livelihoods improvement and (ii) community capacity building and participation.

1.3 PROJECT JUSTIFICATION

The town of Musoma is located on the eastern shores of Lake Victoria and about 250 km north of Mwanza. It has a total urban population of about 160,000. About 65% of the population is currently served with potable water by the Musoma Water and Sewerage Authority (MUWASA). The Musoma municipality water supply is being rehabilited and expanded, which will increase the water production from the current 10,000 m^3 per day to 36,000 m^3.

The municipality does not currently have a sewerage system for managing wastewater generated from the present and expanded water uses in the municipality and therefore, untreated wastewater flows into Lake Victoria are contributing to the pollution of the Lake. Moreover, improper wastewater disposal is responsible for poor health situation from water borne and water related diseases. Given the apparent occurrence of water borne diseases like typhoid and cholera, improved sanitation services would notably improve the well being of the residents of Musoma Municipality. Towns with clean environment can easily attract local and foreign investors in industrial as well as tourism. In this aspect the project will be of great importance in poverty alleviation of the targeted population.

The sewerage system project in Musoma Municipality will therefore address the sanitation problem in Musoma, controlling pollution of the lake, improve health, livelihood and stimulate economic development by providing a healthy enviroment.

1.4 NEED FOR ESIA

According to the World Bank conditions and the Environmental Management Act (EMA) No. 20 of 2004, such large projects must undertake environmental impacts

assessments prior to their implementation. This is also in accordance to WSDP project agreement that all projects in Urban Water Supply and Sewerage Authorities, which are classified as Category B Projects, must undergo ESIA and ESMP screening process. This sewerage system project therefore requires full, participatory and comprehensive ESIA because of its spatial, temporal and institutional dimension. The ESIA must address all the pertinent issues as per the national laws and regulations as well as international conventions.

After the screening process by the National Environment Management Council (NEMC), it was decided that Musoma Sewerage system project shall comply with the requirements of the Environmental Management Act of 2004. The project falls on the list for which environmental impact assessment study is mandatory. Therefore NEMC recommended preparation of the scoping report including the terms of reference (ToR) for NEMC review prior to commencement of the detailed Environmental and Social Impact Assessment including preparation of the Environmental and Social Management Plan (ESMP). The project was registered obtaining the registration number of 3432. The scoping report was prepared in order to guide and focus the EIA process in more detailed according to the EIA and Audit Regulations of 2005. It was submitted to NEMC and this report is the follow up as the final report detailing environmental and social impacts of the project and proposes mitigation measures.

1.5 EIA PROCESS METHODOLOGY

1.5.1 Assessment procedure and guidelines

This assessment was conducted in accordance with the Environmental Impact Assessment and Audit Regulations, 2005, which contain procedures for conducting the assessment in the United Republic of Tanzania and report production. The detailed impact assessment methodology is guided by the Environmental Impact Assessment Guidelines (2007), which are still in draft standard. The World Bank Operational Policy 4.0 Guidelines were also considered in the organisation of the assessment report in conformity with requirements of financial institutions.

1.5.2 Scoping

Scoping exercise is the first stage of the EIA study and it involves identification of main issues and concerns related to the project as well as key stakeholders who will be affected by project implementation. This exercise was conducted between January 2014 and February 2014 through literature review and field visits. The scoping report was prepared and submitted to NEMC through MoW-LVEMP Project Coordination Office (Mwanza) in February 2014. The scoping report contained draft ToR for the detailed EIA study. The scoping report and ToR was approved by NEMC in March 2014.

1.5.3 Stakeholders consultations

The fieldwork for this study was carried out between late January and March 2014 in Musoma Municipal and Mwanza City. The ESIA team met ministerial (central government), ward and municipal (local government) officials, institutions, ward administration, NGOs, water supply project consultants and individuals forming the core stakeholder pool for the project. The main meetings with ministerial and government institutions officials include the project inception meeting which took place in Musoma on 18th December 2013 and meetings with individual institutions during the January and March fieldworks. Brief at site meetings were held with inhabitants of Makoko and several sites where different components of the sewerage system will be installed. During these consultative meetings, stakeholders had opportunities to express their concerns, which were addressed by the ESIA team.

1.5.4 Impacts assessment

Impact assessment was done by superimposing project elements onto the existing social and environmental conditions in the project area. The checklist method was used to identify potential impacts from a combination of project activities on existing environments. Significant impacts were identified using a combination of consequence and significance rating criteria. A key guiding assumption in this study is that the project will be designed, constructed, operated and maintained with due care for safety and environmental matters using current and best engineering practices. The implementation schedule of the mitigation measures is summarized in ESMP. Environmental impacts have been evaluated for the selected optimum alternative. The impact assessment process included the following:

Collection of baseline data

The collection of baseline data was conducted during all phases of ESIA process from inception (through literature review), scoping and impacts fieldworks (reviews supplemented with consultative meetings). These data allow the ESIA team to establish the current status of environments and their historical evolution before actual implementation of project activities. Both primary and secondary data were collected with primary data collected by direct measurements, observations and semi-structured interviews and secondary data obtained from various relevant sources of information such as municipal profile, education and health reports, project documents and many other official and non-official documents.

Review of policies and legislations for environmental management

This allowed the study team to update and enhance their understanding of national policies and legislation which are important in relation to environmental and social management in Tanzania. The review covered also relevant international procedures to ascertain the optimal management of impacts.

Assessment of environmental impacts

The assessment of potential impacts of project activities on project environments was carried out in four steps:

- *Identification of impacts*
  This was undertaken by compiling a contender list of potential impacts on physical, biological and socio-economic/cultural environments.

- *Impacts predictions*
  The environmental and social impacts were identified and their potential size and nature predicted. The prediction of impacts specified mainly the causes and effects of impacts as well as their secondary and tertiary consequences to the environment and socio-economic aspects.

- *Impacts rating*
  This involved evaluation of the significance of impacts by making judgments about importance of impacts predicted at the project sites and therefore need to be mitigated.

- *Impacts mitigation*
  The options for dealing with identified and predicted impacts were considered. This enabled the study team to analyse proposed wide range of mitigation measures aiming at preventing, reducing, remedying or compensating for each of the adverse and enhancing beneficial impacts evaluated as being significant. Analysis of the implications of adopting different alternatives was done to assist in clear decision-making.

1.6 REPORT STRUCTURE

This report is presented the following table of contents that highlights the required contents of the final ESIA addressing NEMC Regulations and Guidelines contents. This ESIA report is therefore organised in thirteen (13) chapters. as follows: Chapter 1 provides the introductory background of project proposal as well as the tasks at hand. Chapter 2 seeks to give project background and description. Chapter three (3) is a description of existing policies, administrative and legal framework relevant to the project. Chapter 4 provides baseline environmental and socio-economic conditions of the project area and in particular District and villages where the proposed project will be located. Chapter 5 describes the assessment of impacts and identification of alternatives. Chapter 6 presents environmental and social impact mitigation measures for addressing potential adverse environmental impacts and enhancing the positive impacts. Chapter 7 presents the Environmental and Social Management Plan. Chapter 8 provides the environmental and social monitoring plan which is designed to put environmental mitigation measures into force. Chapter 9 presents the cost benefit analysis. Chapter 10 presents a decommissioning and closure plan. Chapter 11 presents summary and conclusion. Chapter 12 is the Bibliography which provided

reference materials and Chapter 13 is the appendices which contain the terms of reference, list of people consulted, issues raised by stakeholders and some legal documents for the proposed project.

CHAPTER 2: PROJECT DESCRIPTION

2.1 PROJECT IMPLEMENTATION

The overall implementation of this sewerage project is divided into two major phases:

i) Phase I: 2012 – 2020
ii) Phase II: 2020 - 2030

2.1.1 Phase I (2012 – 2020)

In this phase, the piped sewerage system will be constructed for the municipality only with the Wastewater Treatment Plant (WWTP) constructed at Makoko area to receive and treat the wastewater collected from the municipal centre. It comprises areas in Mukendo, Mwigobero, lrinqo and Kitaji Wards and a small portion of Kamunyonge Ward.

This phase implement the following:

i) Construction of piped sewerage system and Waste Water Treatment plant (Waste Water Stabilization Ponds - WWSP)
ii) Sludge treatment and disposal system from on-site excreta disposal facility namely pit latrines, septic tanks, pit and cesspits; and also includes measures to improve services for collection and transportation

2.1.2 Phase II (2020 – 2030)

This phase will cover the remaining western and eastern areas of the municipality, which currently have low population densities. Land availability in these areas strongly favours the continual use of proper on-site sanitation systems as acceptable solutions for environmental and economical reasons.

This phase implement the following:

i) Piped sewerage system and WWTP extension for Western District area
ii) Piped sewerage system and East WWTP for Eastern District area
iii) Collection, treatment and disposal of sludge from on-site sanitation systems for those households not exclusively connected to the piped sewerage systems of Phase 1

The scope of this present study is on ESIA for the proposed sewerage system and WWSP as part of Phase 1 activities. Therefore, not part of the second sludge treatment and disposal is covered in this study.

2.2 PROJECT COMPONENTS FOR PHASE I

The Proposed Musoma Sewerage System will consist of four major components, which include the collection sewers, sewage pumping stations, conveyance mains and waste water stabilisation ponds.

2.2.1 Collection sewers

This proposed network of sewers covers the municipal centre within the Mukendo, Mwigobero, Iringo and Kitaji wards (**Figure1**). There are 4 main sewers collecting water from different streets within the area before transmitting to Mukendo pumping station. The main sewer MU-1 starts at the Mukendo-Kitaji border (near MUWASA office) and ends at the Mukendo Pumping station. This sewer receives wastewater from sewer MU-1.4 followed by MU-1.2, MU-1.3 and MU-1.1 at the junction of Mukendo and Airport roads to discharge to Mukendo pumping station (**Figure1**). Its size varies from a diameter of 150 mm at the beginning to 200 mm (after joined by MU-1.4), 250 mm (after joined by MU-1.2), 375 mm (after joined by MU-1.3) to 450 mm (after joined by MU-1.1).

Figure 1: Proposed network of collection sewers in Musoma Municipality Centre

Sewer MU-2 starts around TANESCO Regional Office in Kitaji Ward and flows towards Iringo pumping station. It is joined by MU-2.2.1, then MU-2.9, MU-2.8, MU-2.7 (MU-2.7.1), MU-2.6, MU-2.5, MU-2.4, MU-2.3, MU-2.2 and lastly by MU-2.1 just at the Iringo pumping station (**Figure 1**). Sewer MU-3 starts at the end of the main road on the eastern side of the pond, going anticlockwise around the pond, joined by 150 mm MU-3.1 and MU-3.2 along the main road before discharging into

Kitaji pumping station (**Figure 1**). Sewer MU-4 collects wastewater from two immediate streets south of Kitaji pumping station (**Figure 2.1**). Its size varies from 150 mm to 250 mm (after joined by a 250 mm MU-4.1) to 300 mm (after joined by a 150 mm MU-4.2) to discharge into Kitaji pumping station.

2.2.2 Sewage pumping stations

The design indicates a proposal of four (4) sewage pumping stations. Two stations located at the municipal centre (**Figure 2**) will be used to pump sewage from sewerage network in the municipal centre to a transfer manhole MH 43. They consist of 3 m^3 (Kitaji) and 4 m^3 (Iringo) sump wells for provisional storage of sewage during pumping (**Figure 2**). The third pumping station is located at the Mukendo Peninsula will have a 10 m^3 sump well and will be pumping the entire sewage from the project area around municipal centre drained into Mukendo pumping station to WWSP. An intermediate booster pumping station with a 10 m^3 sump well will be located at Mwisenge North to boost up sewage pipe flow pressure to convey the entire volume to WWSP at Makoko.

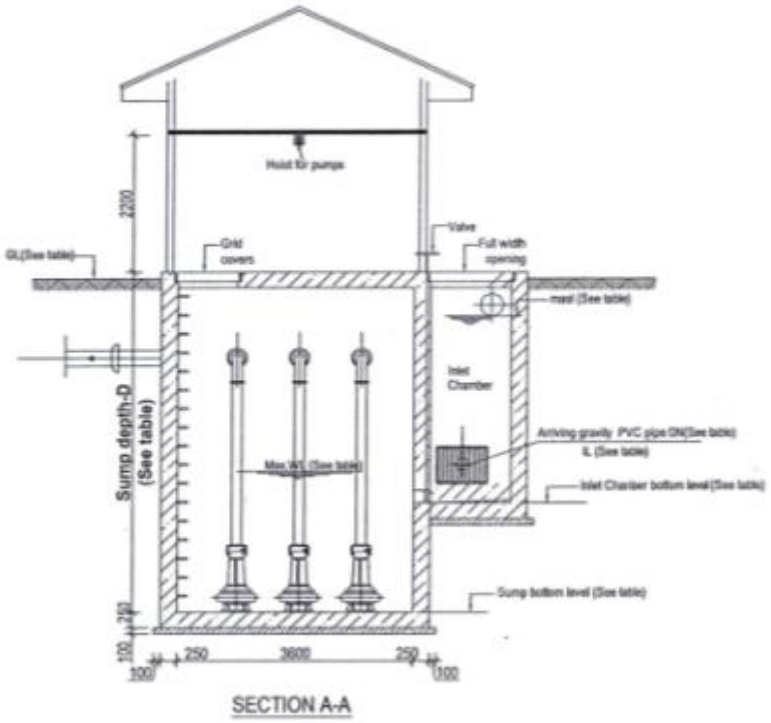


Figure 2: Layout of pumping stations.

2.2.3 Conveyance mains

The conveyance sewers take wastewater from the pumping stations to treatment waste stabilisation ponds located at Makoko. There are therefore four (4) conveyance mains sewers

i) A 250 mm pressure main from Kitaji pumping station to transfer MH 43

ii) A 200 mm pressure main sewer from Iringo pumping station to transfer MH 43

iii) A 375 mm gravity main sewer from transfer MH 43 to junction with MU-1 main sewer

iv) Main sewer from Mukendo pumping station to WWSP at Makoko (**Figure 3**)
This is a combination of pressure and gravity sewers. A 315 mm pressure sewer from Mukendo pumping station to transfer chamber at Mwisenge, a 315 mm gravity main sewer from this transfer chamber to Trunk Pumping Station at northern Mwisenge, a 315 mm pressure main sewer (fitted with an emergency bypass valve to discharge into a river in north Mwisenge) from Trunk pumping station to transfer chamber near WWSP at Makoko and a 315 mm gravity sewer from this transfer chamber to the first anaerobic ponds of the WWSP.

Figure 3: Main sewer from Mukendo pumping station to Makoko WSP.

2.2.4 Waste stabilisation ponds

The designed for treatment of incoming sewage indicates there the overall layout of wastewater stabilisation ponds includes three parallel anaerobic ponds (A1 – A3) discharging into two parallel facultative ponds (F1 – F2), which are discharging into a series of four maturation ponds (M1 – M4). WWSP effluents from the final M4 are discharged directly into Lake Victoria, which will be intersecting the proposed M4. The proposed WWSP will occupy 9.91 ha (372.69 m × 265.90 m) and together with its associated facilities will require an acquisition of available 17 ha of land space. An additional feature of the WWSP system is the faecal sludge settling and thickening tank (FSST) adjacent to A3 and F2 (**Figure 4**) that will receive sewage from directly from septic empties.

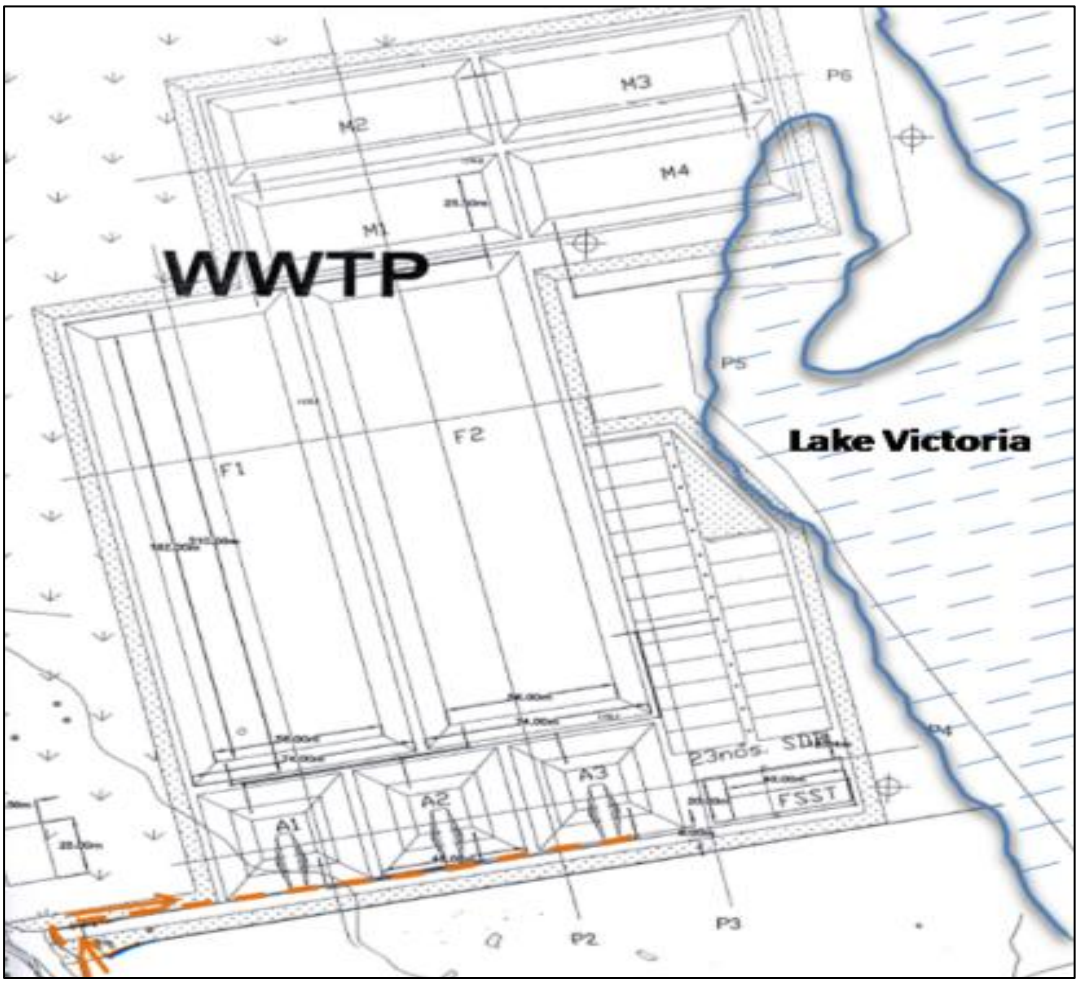


Figure 4: Layout of the proposed WSP at Makoko.

2.3 PROJECT ACTIVITIES RELATED TO PROJECT COMPONENTS

Following identification and description of project components, it is therefore important to identify types of activities that will be involved in the construction and operation of these components to make an efficiently performing sewerage system. It is these activities that are actually, once carried out, affect different types of environments within the project boundaries. The identified activities related to implementation (from mobilisation to operation phases) of each component of the sewerage system are given in **Table 1**.

2.4 PROJECT BOUNDARIES

Identification of boundaries within which the EIA process shall be undertaken was an important component of the exercise. The identification process focuses and delineates the project within an area where impacts both positive and negative will be felt on the environment, economy and local community. Three types of boundaries were considered in the scoping and EIA process, which are institutional, temporal and spatial boundaries.

2.4.1 Spatial boundaries

Spatial boundary refers to the areal extent that the project influences might be felt. In some cases, the impacts of the project extend in areas outside its actual implementation site. This therefore requires defining both the core, immediate and influential impact areas.

2.4.1.1 Core impacts area

The core impact area for this Musoma sewerage system project comprises sites where most activities will be carried out. This requirement identifies, therefore, 3 main core areas. They are:

i) The Musoma municipal centre where the network of collection sewers will be constructed and operated;
ii) The Makoko where WWSP will be constructed and operated;
iii) The Mukendo-Airport-Mwisenge roads where the main conveyance sewer from Mukendo pumping station to Makoko WWSP, intermediate transfer chambers and booster trunk pumping station will be constructed and operated

Table 1: Project components and related activities

Component	Related activities		
	Mobilisation	**Construction**	**Operation**
Collection sewers network (along road reserve)	- Site clearance including removal of vegetation and relocation of poles for power transmission line - Transportation of construction materials to sites - Labour force mobilisation	- Excavation of trenches and manholes along and across road infrastructure - Blasting of rocks - Pipe laying - Backfilling and compaction - Block and concrete works for manholes	- Periodic maintenance of pipelines and manholes
Sewage pumping stations (on private lands)	- Land acquisition at proposed sites - Site clearance including demolition of buildings and vegetation removal - Transportation of construction materials to sites - Labour force mobilisation	- Excavations - Removal of water from excavations - Block and concrete works for pumping infrastructure and administration offices - Pipe fitting to the pump house - Pump installations - Electrical installations	- Periodic maintenance of installed facilities (pumps, electrical system, pipes, slump well) - Maintenance of office buildings
Conveyance mains (along road reserve)	- Site clearance including removal of vegetation and relocation of poles for power transmission line - Transportation of construction materials to sites - Labour force mobilisation	- Excavation of trenches and manholes along and across road infrastructure - Blasting of rocks - Pipe laying - Fitting of an emergency bypass valve - Backfilling and compaction - Block and concrete works for manholes	- Periodic maintenance of pipelines and manholes - Operation of an emergency bypass valve
Waste stabilisation ponds (on public/ private lands?)	- Land acquisition at Makoko site - Site clearance including removal of vegetation - Fencing of the site and construction of temporary office buildings - Transportation of construction materials to sites - Labour force mobilisation	- Excavation earthworks to remove unwanted clay soils from the WSP foundation - Transportation of construction materials - Filling earthworks to raise elevation of WSP to at least 1.54 m (1133.74 m) above the average ground altitude (1132.2 m) - Construction of pond embankments/dykes	- Periodic cleaning of ponds - Maintenance of fencing - Slope stability maintenance works e.g. re-grassing, filling of eroded soils, etc

Component	Related activities		
	Mobilisation	Construction	Operation
		- Inlet and outlet pipes/structures construction - Construction of WSP fence - Construction of operations building - Removal of unwanted clayey soils from the site or its at site management - Site cleaning after construction	

Figure 5: Spatial core impacts areas.

2.4.1.2 Immediate impacts area

The immediate impact area is the neighbourhood to the site that some of the impacts such as those related to construction activities, moving vehicles and workers, dusts, noise, etc will be directly felt. This area therefore comprises all lands adjacent to identified core impacts areas (**Figure 5**).

2.4.1.3 Influential impacts area

The influential impact area is defined as the one comprising areas where decisions are made. For this project, decisions are made mainly in Dar es Salaam, Mwanza and Mara Regions regarding issues such as land ownership and permits, construction permit, project financing, etc. Therefore, the main influential area lies within these three regions.

2.4.2 Temporal boundaries

Temporal boundaries refer to the lifespan and reversibility of impacts. For example, the impacts of construction work may be short lived but the presence of erected structure at the site may have implications that stretch far into the future until its structural demolition. Moreover, considerations shall be given to what happens after the project in cases when restoration of project sites is required. The

adopted design year for this phase is 2020 and therefore this will be the temporal boundary considered.

2.4.3 Institutional boundaries

An institutional boundary refers to defining those institutions and sectors with which the project interacts. The sectors can be determined from political boundaries, Acts, Regulations and institutional mandates and structures. The proposed project may touch interest of surrounding institutions in one way or another. These institutions define the institutional boundary for this sewerage system and associate facilities development and were consulted. The identified institutions include Ministries of Water, Lands, Housing and Human Settlement Development; Health and Social Welfare, Education, Natural Resources and Tourism, Infrastructure, and Home Affairs. The Local governments include Musoma Municipal Council (MMC) and Musoma District Council; others include MUWASA, TANROADS, Regional Engineer, Water Supply Contractor (Spencon Kenya Ltd) and Water Supply Project Consultant (Lahmeyer).

CHAPTER 3: POLICY AND LEGISLATIVE FRAMEWORK

3.1 POLICY FRAMEWORK

3.1.1 National policies

The proposed sewerage system might have some positive and/or negative impacts on the environment and socio-economic systems. It is therefore, important to understand some aspects of the policy framework governing these issues including national policies governing the developments. Various national policies such as the National Environmental Policy (NEP), Tanzania Wildlife Policy, National Tourism Policy, National Land Policy, National Energy Policy and National Policy on HIV/AIDS (**Table 3.1**) are relevant for this project.

All these relevant policies recognize explicitly the need for an effective environmental framework and are supported by the legislative backing of Environmental Management Act (EMA) of 2004. The EMA (URT, 2004b) is the principal legislation governing environmental management in the country stating that full Environmental Impacts Assessment (EIA) is mandatory to major infrastructure development projects such as the proposed Musoma sewerage system project, which is explicitly indicated in EMA Regulations (URT, 2005).

Table 2: Tanzanian Policies relevant for proposed sewerage project

Policy Name	Year
National Environmental Policy	1997
National Land Policy	1995
National Community Development Policy	1996
Sustainable Industrial Development Policy	1996
National Human Settlement Development Policy	2000
National Water Policy	2002
National Policy on HIV/AIDS	2001
National Employment Policy	1997
National Energy Policy	2003
Tanzania Wildlife Policy	2009
Construction Industry Policy	2002

National Environmental Policy of 1997

The National Environmental Policy recognizes the need to improve natural resources conservation and the general environment as a cross-cutting issue. The policy emphasizes the sectoral and cross-sectoral co-operation and collaboration in dealing with environmental matters. The policy further states the use of

Environmental Impact Assessment (EIA) as an instrument for achieving sustainable development. Section 48 of the policy stipulates the support to the overall national objective to provide clean and safe drinking water within easy reach, satisfy other water needs, protect water sources and prevent pollution. Therefore, this project is in line with the policy as its principal activities are to ensure environments are protection through prevention of pollution that is caused by poor management of sewage and related wastewater from Musoma urban activities.

National Land Policy 1995

This policy aims at ensuring secure land tenure system, optimal use of land resource and socio-economic development vested in a balanced ecological environment. Amongst its specific aims is to ensure that land is put to its productive use to promote rapid socio-economic development. With the ecology and environment given due consideration, the aesthetic and economic environment in urban areas is among the issues related to wise use of land resources to promote social and economic development. To achieve this, the best engineering design and appropriate selection of Musoma sewerage system project component sites have taken into consideration of wise land uses. Land acquisition and utilisation for Musoma sewerage system project sites that are carried out by MUWASA shall be in line with the requirement of this policy for the ownership of land identified by Certificate of Title or Certificate of Occupancy for government and public properties issued by the Registrar of Titles.

National Community Development Policy of 1996

The National Community Development Policy recognizes the need to improve community livelihoods through involvement of communities themselves towards attaining government aim of self-reliance. The policy emphasizes among other issues on poverty eradication (by households training and group production activities), provision of basic needs of the community (food, nutrition, education, health, sanitation, water, etc). Therefore, the policy prohibits destruction of what the Musoma communities have attained while requiring any displacement measures to relocate the Musoma communities that would be affected by the implementation of the project shall protect their current socio-economical status so that they are not forced into poverty. The improved provision of sanitation facilities aimed by this project clean to Musoma urban communities during the operation of the project is also in line with the goals of this policy.

Sustainable Industrial Development Policy of 1996

Section 3.5.3 of the policy refers to sound environmental management. In order to ensure promotion of environmentally friendly and ecologically sustainable industrial development, the policy pledges to implement the following: sensitization on environmental awareness, forge deliberate and mandatory devices to reactivate legal mechanism to promote effective environmental management (including carrying out EIA), promote cleaner production. This EIA for the Musoma sewerage system project is therefore in line with requirement for sound environmental management through prevention of pollution from wastewater generated in Musoma Municipality.

National Human Settlement Development Policy of 2000

One of the objectives of National Human Settlement Development Policy (2000) is to protect human settlements, the environment and embedded ecosystems thereof from environmental pollution, environmental degradation and destruction or loss of biodiversity in order to attain sustainable development. The project objective of cessation wastewater flows in open drainage and discharges in Lake Victoria aims at preventing pollution, human health and ecosystem thereby complying with the requirement of this policy.

National Water Policy of 2002

The main objective of the National Water Policy is to develop a comprehensive framework for sustainable development and management of the Nation's water resources, in which an effective legal and institutional framework for its implementation will be put in place. Section 4.2 of the policy indicates the water conservation, water quality management and pollution control by improving and protecting environments (including ecological systems and wetlands) and managing water quality. This sewerage system project in Musoma is therefore in line with the policy directives.

National Policy on HIV/AIDS of 2001

The National Policy on HIV/AIDS aims at the prevention and control of the transmission of the infectious HIV virus and consequential AIDS disease through effective community based prevention, care and support interventions. The interventions include community participation in HIV testing, caring for the persons living with HIV/AIDS and community education of HIV/AIDS issues including transmission mechanisms and prevention. MUWASA shall ensure that the Contractor is taking necessary measures at described in this EIA report on prevention of new HIV infections through awareness raising and volunteered HIV testing, provision of prevention gears (e.g. condoms), etc during the construction while MUWASA shall take-on this responsibility during operation of the sewerage system project facilities.

National Employment Policy of 1997

Emanating from the growing number of unemployment labour force, the policy was established to provide strategies for employment creation and sustainability. Among its major aims is to create conducive environment that increase employment (wage and self-employment) opportunities for the unemployed. This includes, among other things, the identification of areas that are potential for creation of employment and establishment of appropriate strategies to tape the potential jobs for the unemployed. The implementation of the Musoma sewerage system project will consequently generate different types of employment (casual labour, semi- and skilled works) as well as trade opportunities that are attractive to local Tanzanians during construction and operation of the sewerage system and associated facilities. This is in line with the policy directives.

National Energy Policy of 2003

The policy generally aims at providing an input in the development process by establishing an efficient energy production, procurement, transportation, distribution and end-user systems in an environmentally sound manner and with due regard to gender issues. Among other issues, the policy emphasizes on the development and use of renewable energies and increasing affordability and efficient use of all types of available energies in Tanzania without compromising for the environmental well-being. The environmental issues could be incorporated during the EIA, which looks into the corresponding impacts of different energy-related and energy-consuming projects, and is supported by this policy. The Musoma sewerage system project will require an input of different amounts of energy on its various components during construction and operation. They will include fossil fuel energies for operation of vehicles and machines (e.g. construction equipment, generators, etc) during construction as well as electrical energy for use during sewage pumping operation. Energy serving electrical equipment and fittings are recommended for use during operation to save energy and consequently conserve the environment as required by the policy.

Tanzania Wildlife Policy, 2009

The Wildlife Policy aims to: conserve areas with great biological diversity which are representative of the major habitats of Tanzania; support and where necessary, enlarge the protected area network as the core of conservation activities; promote involvement of local communities participation in wildlife conservation in and outside the protected area network; integrate wildlife conservation with rural development; foster sustainable and legal use of wildlife resources; ensure that wildlife conservation competes with other forms of land use; enhance the recognition of the intrinsic value of wildlife to rural people; and minimize human-wildlife conflicts whenever it occurs.

The project has implications on wildlife protection, management and development of protected areas and promotion of international cooperation, particularly in light of emerging issues regarding human/wildlife conflict and encroachment into Lake Victoria.

Construction Industry Policy, 2002

The policy regards construction industry as a fundamental economic sector in the country. The important issues of major concern in the policy document range from planning, design, construction / production, procurement, repair, maintenance and demolition of physical infrastructure. It recognizes the need for delivery of good quality and valuable service in the development and maintenance of physical infrastructure. The policy recognizes the importance of involving various organizations and persons including companies, firms and individuals working as consultants, main contractors and sub-contractors, materials and equipment producers, plant and equipment suppliers, builders and merchants. According to the government as a purchaser, financier, regulator and operator maintain close relationship with clients and other financiers.

The relevance of this policy is that it requires the project management to give priority to local consultants and contractors, and to the use of locally available materials, as well as the need to ensure delivery of good quality structures.

3.1.2 National strategies

Several strategies have been implemented by the United Republic of Tanzania. However, the most relevant strategies for this work include the National Strategy for Growth and Reduction of Poverty (NSGRP) or *Mkakati wa Kukuza Uchumi na Kuondoa Umasikini* Tanzania (MKUKUTA) of 2005 is focusing on promoting economic growth and reducing poverty in Tanzania. The NSGRP is a five years programme from 20005/06 to 2009/10, which addresses the Tanzania Development Vision 2025 for high and shared growth, high quality livelihoods, peace, stability and unity, good governance, high quality education and international competitiveness. In addition, NSGRP is contributing to implementation of the Millennium Development Goals (MDGs).

The main objective of the NSGRP is to stimulate economic growth and reduce poverty, improve quality of life and social well-being and improve good governance and accountability. The strategy recognizes the close linkages between economic growth, good governance and improved quality of life and social well-being, and poverty reduction. The positive inputs of the sewerage system in terms of improved sanitation (wastewater and sewage management) in Musoma Municipality communities will ensure good health of the inhabitants and surrounding environments acting as one of stimuli for socio-economic

development of communities in Musoma. Therefore, this project is in line with the goals of MKUKUTA.

3.2 LEGISLATIVE FRAMEWORK

3.2.1 Legal status of the project land

All land in Tanzania is constitutionally a public property entrusted by law to the President of the United Republic of Tanzania. The Ministry of Lands, Housing and Human Settlements Development (MoLHHSD) carries the task of issuing land leasing title deeds to applicants on behalf of the President. The project has several sites that required acquisition from various owners. MUWASA has therefore to compensate different properties on the land belonging to these local landowners before it can fully acquire the proposed lands. This process is ongoing. The pipelines (collection sewers, conveyance mains) are presumed to utilise the road reserves along streets and roads within the project area. Since this land legally belongs to Municipal Council and TANROADS and since the project is partly owned by MUWASA and Musoma Municipal Council, the right to use those road reserves under the authority of TANROADS shall be obtained from TANROADS.

Several legislations are relevant to the proposed Musoma sewerage system project. They are mainly related to land, natural resources use, management and conservation and service provision (**Table 3**). They are briefly presented in subsequent sections.

Table 3: Tanzanian Acts relevant for the proposed Musoma sewerage system project

Area	Act Name	Act No.	Year
Natural Resources and Environment	Environment - Environmental Management Act	20/04	2004
	Land: - Land Act - Land (Amendment) Act	4/99 2/04	1999 2004
	Water: - Water Supply and Sanitation Act - Water Resources Management Act	12/09 11/09	2009 2009
	Plants: - Forest Act - Plant Protection Act	14/02 13/97	2002 1997
Socio-	Energy:		

Area	Act Name	Act No.	Year
economics	- Electricity Act	10/08	2008
	Employment:		
	- Workers Compensation Act	20/08	2008
	- Employment and Labour Relations Act	6/04	2004
	- Occupational Health and Safety Act	5/03	2003
	Transport:		
	- Road Traffic Act	30/73	1973
	- Road Traffic (Amendment) Act	4/90	1990
	- Road Traffic (Amendment) Act	16/96	1996
	Health:		
	- HIV and AIDS (Prevention and Control) Act	28/08	2008
	- Internationally Notifiable Disease (Prevention) Act	3/64	1964
	- Industrial and Consumer Chemicals (Management & Control)	3/03	2003

The Environmental Management Act No. 20 of 2004

Part VI of the EMA deals with Environmental Impact Assessments (EIA) and other Assessments and directs that an EIA is mandatory for all development projects. The Act requires that whenever conflicts occur between the existing Laws, the provisions of the EMA shall prevail. The Act identifies that a need of different organizations, institutions, NGOs, governments sectors to co-operate in managing and conserving the environment. However, low capacity at various government institutions particularly at local government affect the implementation of the Act. The Act requires the Department of Environment (DoE) in the Vice President's Office (VPO) to be the focal point in the implementation of the Act by supporting the National Environmental Management Council (NEMC).

Section 81(2) states that "An Environmental Impact Assessment study shall be carried out prior to the commencement or financing of a project or undertaking", while Section 81(3) states "a permit or licence for the carrying out of any project or undertaking in accordance with any written law shall not entitle the proponent or developer to undertake or to cause to be undertaken a project or activity without an environmental impact assessment certificate issued under this Act". The conduction of the EIA study of the proposed Musoma sewerage system project complies with the requirements of EMA.

The Land Act No. 4 of 1999 amended by No. 2 of 2004

The Acts relate to land-use planning processes and land-use management and guidance to land ownership in Tanzania. The laws vest all land in the President and grant occupancy rights to individuals, legal persons and territorial

communities. The President is empowered to revoke the Right of Occupancy of any landholder for the public or national interest shall the need arises. The President holds land in trust for all citizens and can acquire land for public use and benefit, for instance, to resettle people from densely populated areas to sparsely populated areas, settle refugees and so forth. The President can also acquire land for other national projects, like sanitation infrastructure. However, the laws declare the value attached to any piece of land and as such any land rights transfer is subject to compensation. Under the Government Standing Order on expropriation for public utility, the holder of a Right of Occupancy is guaranteed a free enjoyment of the land and is entitled to compensation if dispossessed by the Government for public use. This is the applicable case in this project in Musoma where affected properties are eligible for land and property compensation to leave the land for installation of components of the sewerage system as it is of national interest.

The Water Resources Management Act No. 11 of 2009

This Act repeals the Water Utilisation Act of 1974 and its subsequent amendments. It provides the right to water for domestic uses by any person from any surface water sources and rainwater without a permit as long as no works are constructed for the purpose. The Act indicates the need of a water use permit for any works for water abstractions or water abstraction for uses other than domestic ones. The Act further prohibits discharge of waste streams into any water body including rivers (e.g. small rivers within the project areas) and lakes (e.g. Lake Victoria) without written permit from the water officer (here, for Lake Victoria Basin). The Act requires adherence to preset environmental standards of receiving water bodies when legally discharging wastes and MUWASA and project Contractor shall observed this legal provision throughout construction, operation and decommissioning phases.

The Water Supply and Sanitation Act No. 12 of 2009

Part IV of the Act states obligations of water supply and sanitation authorities to provide water supply and sanitation services, indicates their functions, powers and duties. Consequently, it gives responsibilities for provision of adequate and reliable water supply and sanitation services in urban areas to Urban Water Supply and Sanitation Authorities (UWSAs). With respect to their responsibilities to ensure adequate and reliable service provision, the Act gives power to UWSAs to enter any land for the purpose of laying water pipe network and charge fees to facilitate financial obligation necessary for operation and maintenance of the water supply and sanitation networks. Therefore, the Musoma sewerage system

project aiming at improving wastewater management service to Musoma Municipality residents complies with this law.

Part XIV of the Act provides offences and penalties in relation to water supply and sanitation services. It indicates that any wilful or negligent i) damages to waterworks or any part of it be a sewer or supply pipeline, ii) misuse or wastage of water, iii) alteration of appurtenances and iv) use of water for any purposes other than those for which water is supplied are punishable offence. The public awareness on this provision is among the recommended mitigation measures against wasteful water uses and voluminous generation of wastewater during the construction and operation of the sewerage project.

The Forest 2002 and Plant Protection 1997 Acts

The Forest Act restricts the cutting and burning of vegetation in any land inclusive of land owned by individuals without the consent permit from authorities. The specialty plant ecosystem component of this EIA that aimed at identifying endangered and/or near-extinction plant species within the project sites is in line with this provision. The Plant Protection Act further restricts exportation from and importation into Tanzania of any plant species without written permit, the requirement which shall be adhered to by the Contractor and MUWASA during construction and operation of the sewerage system components.

The Electricity Act No. 10 of 2008

The Act gives the service provide the power to suspend electricity supply to the client whenever the need to do so arises, which might be due to danger/risk to life and property, emergencies, insufficient power in the system, operational breakdown in the power system and any activities requiring service suspension (such as maintenance, repairs, network expansion, etc). During the whole duration of power supply suspension, the client must seek supply from alternative sources. The Act further indicates the responsibilities of the service provider to compensate the client of any property lost from the provider's power supply problems. It further requires the client to compensate any losses incurred by the service provider due to client activities. The Act gives the powers to service provider to disconnect its supply to clients who breach the contractual agreements or is unlawfully connected. Owing to any rising demand to repair, maintenance and operation of the power supply facility, the service provider is entitled by the Act to entry to any public and private property upon prior issuance of written notice to the property owner and authorities. Accordingly, the stipulated clauses of the Act shall be clearly understood by the Contractor for any anticipated use of

electricity during construction and MUWASA or its leased utility during operation of the sewerage system.

The Workers Compensation Act No. 20 of 2008

This Act provides for compensation of employee for duties performed in course of their employment resulting in disablement (temporary or permanent) or death of employee. The employee is entitled by this Act for compensation from accidents or diseases attributed to being employed and working for the employer, which would otherwise not incurred if not employed. The Contractor shall be required to elaborate on the provisions of this Act to its employees and adhere to whenever such compensations arise.

The Employment and Labour Relations Act No. 6 of 2004

From the nature of construction activities and operations of the well-field and associated facilities, the Act prohibits employment of child labour (children below the age of 18 years) and forced labour. The Act prohibits any discrimination policies or practices and requires for equal opportunities to employment including the rights of employees to form and/or join a trade union. It further requires an establishment of a contract between employer and employee that specifically states the obligations of employer and employee. The contract term shall observe the labour requirements of hours of work, night work, public holidays, work leave, wages standards and employment termination procedures. The Act provides an access to employer's premises by the organisation representing the employee and gives the employees the rights to strike and lockout. These rights might be exercised by the Contractor during construction and MUWASA during operation of the project facilities.

The Occupational Health and Safety Act No. 5 of 2003

For the sake of employer and employees' safety, health and welfare, the Act requires at least one safety and health representative for every 100 employees working in offices. The Act requires submission of all important workplace drawings including detailed plan, elevations and sections drawings to relevant authorities (Town/Municipal Engineer's Offices for office buildings; Chief Inspector for factories) for approval prior to construction and use. The Act requires assurance of safety to workers during project construction, operation and demolition. Safety shall be ensured against any mechanical machinery (cranes, chains, vehicles, etc), chemicals (fumes from generators, etc), liquid and hazardous materials (electrical installations and apparatus, toxic materials, wastewater, etc) and fire. It is indicated that, for the assurance of workers safety, safety provisions will include fire extinguishers, first aid facilities, water supply

and sanitary facilities, etc. The Contractor shall therefore adequately address all these issues stipulated in this Act.

Public Health Act No. 1 of 2009

Part VIII of the public health act give general provision for any developer to design an area for the disposal of the waste generated from the area. Furthermore requires provision of adequate and functional sanitation facilities. Musoma Sewerage and Treatment Plant project will provide sewage collection system and provide treatment plant for the same. The project will also put mechanism for management of the sewerage and treatment plant for sustainability and pollution prevention and thus in compliance with the requirement of this act.

The Road Traffic Act No. 30 of 1973 amended by No. 4 of 1990 and No. 16 of 1996

According to the provisions of the Act, it is prohibited to erect any structure on or near any traffic and pedestrian signs that might lead to obstruction of the signs rendering them temporarily useless. The Act also provides for areas to be designated as parking places. Apart from road signs, it is required by the Act for the employer of any driver of motor vehicle to maintain written record of driver's name and driving licence. Moreover, if requested by authorities, the owner (employer) and hirer of the motor vehicle to provide information of the identity of the driver. These requirements shall strictly be observed by the Contractor during construction of project components.

The HIV and AIDS (Prevention and Control) Act No. 28 of 2008

The Acts generally requires that adequate information on the acquisition, transmission, prevention and post-infection of HIV/AIDS is provided to the public including workers at workplaces. It is required by this Act that every employer (here, MUWASA and Contractor), in consultation with MHSW, to establish and coordinate a workplace programme on HIV/AIDS. The programme must include, among other things, the provision of gender responsive HIV/AIDS education and protection gears including condoms, which meet Tanzanian standards as certified by TBS. As a consideration of right to privacy, the Act prohibits compulsory HIV testing to any person as a condition necessary to obtain its requirements including a job. It further requires total confidentiality of results of HIV tests of any person against his/her own will except for special cases involving children, disabled persons, spouse or sexual partner or court. In order to ensure persons living with HIV/AIDS are not discriminated, the Act prohibits any forms of such discriminations and requires that no person is denied admission, participation or continual job place after diagnosed with HIV and consequently living with HIV/AIDS. The Contractor shall therefore adhere to these provisions

during recruitment of employees and in the course of executing construction activities.

Industrial and Consumer Chemicals (Management & Control) Act of 2003

This Act and it Regulations provide for management and control of various chemicals listed in the 3rd, 6th, 7th and 8th Schedules of the Act. It also stipulates requirements for registration of chemicals, facilities and processes. This shall be observed by the Contractor during construction and MUWASA during operation of the project facilities.

3.3 REGULATIONS AND STANDARDS

3.3.1 Environmental Impact Assessment and Audit Regulations, 2005

This regulation provides how the Environmental Impact Assessment shall be conducted in Tanzania. It also provides Environmental Impacts Assessment steps and the format of Environmental Impact Statement as indicated under the section 18 (2) of these regulations. The regulation stipulates the procedures for undertaking Environmental Impact assessment as well as list of projects to be subjected to Environmental Impact Assessment (Appendix II). The procedures for conducting Environmental Impact Assessment in the country as per regulations are as follows:

Project Registration: Register the proposed project with NEMC, where you will be required to fill Environmental Impact Assessment Registration Form' for the project concerned. At a prescribed fee (No time limit)

Project Screening: Return to NEMC two copies of a dully-filled Registration Form attached with a project brief for screening by NEMC. The contents of the Project Brief shall be as directed in the ESIA and Audit Regulations of 2005; the decision of the Council on the project is communicated to the developer within 45 days of the date of submission of the brief.

The screening result by NEMC indicated carrying out full ESIA starting with preparation of scoping report and terms of refernce. The project followed these steps and thus in complince with the requirement of this regulation.

3.3.2 The Environmental Management (Air, Soil, Water Quality standards) Regulations 2007

These regulations are compiled into one booklet and provides for air, soil and water quality standards for various development projects. The regulations set out compliance and enforcement mechanism for discharge into air, soil or water bodies of any pollutants as described by the regulation. The project activities i.e waster water transportation and treatment touches the air quality, the soil and water quality. Thus the standards set out in the regulations will be adhered to when discharging the waste into the air, soil or water. The environmental

monitoring plan indicates how the project environmental issues will be monitored hence in compliance with the requirement of these regulations.

Ambient air quality

The guidelines require that where possible, facilities and projects shall avoid, minimize and control adverse impacts to human health, safety and the environment from emissions to air. This is sometimes not possible and therefore the generation and release of emissions of any type shall be managed through a combination of the following measures:

- Energy use efficiency;
- Process modification;
- Selection of fuels or materials whose processing may reduce polluting emissions; and
- Application of emissions control techniques.

In order to safeguard health and safety of human and the environment from adverse effects of emissions, limits have been established for different types of emissions beyond which impacts are inevitable. However, no ambient air quality and noise limits have been established for Tanzania. Consequently, the recommended limits by World Health Organisation (WHO), the World Bank Group (WBG) and European Union (EU) are adopted. In order to adhere to these standards, several mitigation measures are proposed to prevent or reduce impacts of construction and operation of the well-field facilities to acceptable levels.

Although there are several hundred components in the air potential harmful to human health and the environment, it is difficult to monitor all such potential air pollutants. As a result, a selection of a few indicator pollutants for monitoring the ambient air quality of a place. The assessment of air quality is currently based on effects related to respirable particulate matter (or suspended particles) in air (PM2.5/PM10 or particles with aerodynamic diameter < 2.5/10 μm), burning of fossil fuel emitting sulphur dioxide (SO_2) and nitrogen oxides (NO_x, e.g. nitrogen dioxide NO_2) related mainly to mobile sources principally traffic and to lesser extent other sources such as households. Recent results indicate that the PM2.5 might be a better indicator for anthropogenic suspended particulate matter than PM10. The recommended limiting values of indicators for the three commonest indicator variables (**Table 4**) indicate that in some cases WHO (WHO, 1999) do not provide limits while they are provided by the WBG (1998) and EU (2005) with differences in magnitudes quite evident.

Table 4: Various ambient air qualities limits

	Concentration Limit ($\mu g/m^3$)								
	WHO			**WBG**			**WHO-EU**		
Pollutant	**1 hr**	**24 hrs**	**1 yr**	**1 hr**	**24 hrs**	**1 yr**	**1 hr**	**24 hrs**	**1 yr**
Fine articles (PM2.5)	No	No	No						25
PM10	230	No	No	No	150	50		50	40
Sulphur dioxide (SO_2)	350	125	50	No	150	80	350	125	
Nitrogen dioxide (NO_2)	200		40	No	150	100	200		40

3.3.2.1 Noise

The limits for noise consider the impacts of noise to

- Noise interference with communication
- Noise-induced hearing impairment
- Sleep disturbance effects
- Cardiovascular and psychophysiological effects
- Mental health effects
- Effects on performance
- Annoyance responses
- Effects on social behaviour

For communities in urban environment, the impacts are mainly related to communication interference; sleep disturbance, annoyance and hearing impairment. The Musoma sewerage system project sites in Musoma fall within the category of urban environment. The guideline values to reduce the effects of noise (WHO, 1999) (**Table 5**) are for daytime and night time environment. The projected 24 hours, 7-days a week operation of the well-field requires the application of both day and night time guidelines. Among the major noise polluters during the construction phase are the construction equipment, machinery, trucks, workers and road traffic. During the project operational phase, continuous source of noise pollution would be pumping operation and occasionally vehicular traffic and periodic maintenance activities.

Table 5: WHO limits for community noise levels

Receptor	Maximum Allowable Level dB(A)	
	Day Time (7:00 – 22:00)	Night Time (22:00 – 7:00)
Residential, institutional, educational	50 – 55	45 (30*)
Industrial, commercial	70	70

** Night time guideline for Europe (WHO, 2007).*

3.3.2.2 Receiving water bodies

The quality of surface and ground water is influenced by geological formation and human activities. A wide variety of chemicals and compounds can contaminants to surface and ground water resources if discharged to such environments. They are organic, inorganic and synthetic compounds, such as organics from urban areas (households, industries, institutions, businesses, etc). For every substance, the Maximum Contaminant Level (MCL), that is the maximum permissible level of a contaminant in water that is delivered to any user of a public water system, is quoted beyond which concentrations could cause health problems in humans.

In urban areas, the major sources of surface and groundwater pollution include household wastes, leaks and spills at factories, workshops, commercial facilities and vehicles, improper waste disposals, injection wells for domestic wastewater disposal (e.g. septic systems, cesspools, etc), liquid waste storage reservoirs, improper management of animal and human wastes and pipeline (including sewers) leaks and breaks. Depending on the type of chemicals related to these sources, different types of pollutants can be released to the water resources. However, the extent of water pollution is related to potential uses of water by humans and ecosystem. Accordingly, for various water uses, there are three major categories of receiving water bodies (**Table 6**). Monitoring of water pollution in urban centres requires a limited but representative list of common water quality parameters for physical, chemical and biological characteristics monitoring (**Table 6**).

Table 6: Categories of receiving water bodies in Tanzania (TBS, Table 8.7)

Category 1	Water suitable for drinking water supplies, swimming pools, food and beverage industries, pharmaceutical industries or industries requiring a water source of comparable quality
Category 2	Water to be suitable for use in feeding domestic animals, in fisheries, shell culture, recreation and water contact sports

Category 3	Water suitable for irrigation and for industrial activities requiring water which does not have to meet the standards of category 1 and 2

Table 7: Standards for receiving water in Tanzania

Substance Characteristics	Units	Maximum Permissible Concentrations		
		Category 1	Category 2	Category 3
General				
Suspended matter (turbidity)	mg/L	Discharge of effluents shall not cause formation of sludge or scum in the receiving water		
Colour	Number (Pt-Co Scale)	Discharge of effluents shall not cause any change in the natural colour of the receiving water		
Taste and odour	-	Discharge of effluents shall not cause any change in the natural taste or odour of the receiving water		
Temperature	^{o}C			
Total dissolved solids	mg/L	2,000	2,000	No Limit
pH	-	6.5 – 8.5	6.5 – 8.5	6.5 – 9.0
Dissolved oxygen	mg/L	6	5	3
Oxygen solution	%	80	60	40
B.O.D.	mg/L	5	5	10
	mg/L	6	6	11
	mg/L	6	6	12
	mg/L	7	7	13
Permanganate value	mg/L	20	20	30
Inorganic substances				
Aluminium (Al)	mg/L	0.3	0.3	0.5
Arsenic (As)	mg/L	0.05	0.1	0.1
Barium (Ba)	mg/L	1.0	1.0	1.5
Boron (B)	mg/L	1.5	1.5	1.5
Cadmium(Ca)	mg/L	0.05	0.1	0.2
Chromium III (Cr^3)	mg/L	0.1	0.3	0.5
Chromium IV (Cr^4)	mg/L	0.05	0.1	0.1
Cobalt (Co)	mg/L	0.1	0.1	0.5
Copper (Cu)	mg/L	3.0	3.0	4.0
Iron (Fe)	mg/L	1.0	1.2	1.5
Lead (Pb)	mg/L	0.1	0.1	0.2
Manganese (Mn)	mg/L	0.5	0.8	0.8
Mercury (Hg)	mg/L	0.001	0.001	0.005
Nickel (Ni)	mg/L	0.05	0.05	0.1
Selenium (Se)	mg/L	0.05	0.05	0.5

Substance Characteristics	Units	Maximum Permissible Concentrations		
		Category 1	Category 2	Category 3
Silver (Ag)	mg/L	0.05	0.05	0.05
Tin (Tn)	mg/L	0.5	0.5	1.0
Vanadium (V)	mg/L	0.005	0.005	0.01
Zinc (Zn)	mg/L	0.2	0.2	1.0
Ammonia + Ammonium ($NH_3 + NH_4$)	mg/L	0.5	0.5	2.0
Chlorides (Cl)	mg/L	200	200	400
Fluorides (F)	mg/L	8.0	8.0	8.0
Cyanides (CN)	mg/L	0.05	0.05	0.1
Nitrates (NO_3)	mg/L	50	50	100
Sulphate (SO_4)	mg/L	600	600	600
Sulphides (S)	mg/L	0.01	0.01	0.1
Organic Substances				
Alkl Benzene Sulphonates (ABS)	mg/L	0.5	1.0	1.0
Aromatic and aliphatic hydrocarbons	mg/L	0.05	0.05	0.1
Aromatic nitrogen containing compounds (eg. Aromatic amines)	mg/L	0.01	0.01	0.1
Chloroform extract (CE)	mg/L	0.5	0.5	1.0
Formaldehyde	mg/L	0.2	0.2	0.5
Grease and Oils (Petroleum ether extract)	mg/L	0.5	1.0	5.0
Non volatile chlorinated compounds	mg/L	0.005	0.005	0.01
Volatile chlorinated hydrocarbons	mg/L	0.005	0.005	0.01
Organochlorine pesticides (CI)	mg/L	0.0005	0.0005	0.001
Other pesticides	mg/L	0.001	0.001	0.005
Phenols mg	mg/L	0.002	0.002	0.1
Resins, tar etc.	mg/L	0.1	0.1	0.5

3.3.3 Land (Assessment of the value of land compensation) Regulations 2001

National regulation: The approach used for valuation in Tanzania is outlined in the Land (Assessment of the Value of Land Compensation) Regulations 2001 and the Village Land Regulations 2001.

The 2001 Land Regulations states that compensation will be calculated using Comparative Method or Replacement Cost Method:

- Comparative Method: the market value of any land and unexhausted improvement is arrived at by use of comparative method evidenced by actual recent, sales of similar properties.

- Replacement Cost Method: where the property is of special nature and not saleable. A full definition of replacement cost method is not present in the Land Regulations. However, the World Bank does provide a clear definition on this.

The World Bank approach also advocates the valuation of lost assets to be made at their Replacement Cost. They provide a detail definition which includes the market value of the affected land, the cost of preparing the land to levels similar to those of the affected land, and the cost of any registration and transfer taxes. This ensures all costs incurred in replacing assets are covered.

3.4 RELEVANT WORLD BANK SAFEGUARD POLICIES

The World Bank safeguard policies that are triggered by the proposed Musoma Sewerage System and Treatment Plant activities are: *OP/BP 4.01 Environmental Assessment*; *OP/BP 4.12 Involuntary Resettlement Policy; OP/BP 4.04 Natural Habitats; and OP/BP 7.50 Projects on International Waterways.* Most of the project activities fall under the list of such projects for which environmental impact assessment is mandatory, prior to their implementation, and in that regard, an EIA and other mandatory actions have been be taken.

The proposed LVEMP II has been assigned an environmental risk Category A. Applicable safeguard policies for the project which are triggered by the project are: (i) Environmental Assessment (OP/BP 4.01); (ii) Natural Habitats (OP/BP 4.04); (iii) Involuntary Resettlement (OP/BP 4.12); and (v) Projects on International Waterways (OP/BP 7.50).

The World Bank triggered policies are summarised above and further discussed in the sub-sections below:

3.4.1 Environmental Assessment

The objective of Environmental Assessment is to ensure that projects are environmentally sound and sustainable, and that decision-making is improved through appropriate analysis of actions and mitigation of their likely environmental impacts. This policy is triggered because Musoma Sewerage system and treatment plant will have some adverse environmental risks and impacts in its area of influence. The implementation of various projects activities including construction of sewer pipe line, pump stations and Treatment Plant will have environmental impacts which require mitigation.

Therefore, in line with this Operational Policy, this Environment and Social Impact Assessment for Musoma Sewerage System and Treatment Plant has been has been prepared.

3.4.2 Involuntary Resettlement

The objective of Involuntary Resettlement is to avoid or minimise involuntary resettlement where feasible, exploring all viable alternative project designs. Furthermore, it intends to assist displaced persons in improving their former living standards; it encourages community participation in planning and implementing resettlement and in providing assistance to affected people, regardless of the legality of title of land. This policy is triggered because the project will involve physical relocation of land parcels and few asserts.

The ESIA has determined exactly where the construction activities will require land acquisition and resettlement. The resettlement plan and compensation has been prepared to provide guidelines on how to deal with resettlement issues.

3.4.3 International Waterways

The objective of Projects on International Waterways is to ensure that projects that impact on international waterways do not affect other states of the Lake Victoria areas. It is recognised that the cooperation and goodwill of riparian states is essential for the use and protection of the waterways. Due to great importance to all Lake Victoria shared countries an appropriate agreements or arrangements for the entire waterway or any part thereof is organized including notifications for all activities that could impact other countries. This policy is not triggered because the project will not affect relations of riparian states negatively by the increased use of water resources or by significantly polluting the water. Thus the proposed Musoma Sewerage System is in line with this requirement

3.4.4 International Conventions

Tanzania and other the East African Community countries have signed and ratified four major international conventions namely, Convention on Biological Diversity (CBD), United Nations Convention to Combat Desertification and Drought (UNCCD), United Nations Framework Convention on Climate Change (UNFCCC), and the RAMSAR Wetlands Convention. The signed conventions are summarized in the Table below:

Table 8: International Conventions signed and ratified by Lake Victoria basin countries

Countries Conventions	UNCCD (Entry into Force)	CBD (party to)	UNFCCC (Entry into Force)	Ramsar (Entry into Force)
Burundi	√	√	√	√
Kenya	√	√	√	√
Rwanda	√	√	√	√

Tanzania	√	√	√	√
Uganda	√	√	√	√

Under the RAMSAR Convention, which recognizes the fundamental ecological functions of wetlands as regulators of water regimes and habitats supporting flora and fauna, the Musoma Sewerage System and Treatment Plant has put in place measures to control pollution and encroachment of Lake Victoria and thus have not trigged these treaties.

3.5 INSTITUTIONAL FRAMEWORK

3.5.1 Overall Environmental Management Responsibility

The institutional arrangement for environmental management in Tanzania is well spelt out in the EMA (2004). As stipulated in the Act, the Vice – President's Office (VPO) is therefore responsible for overall policy guidance and advice on the development of strategic environmental vision, including formulation, analysis and appraisal of broad environmental policy, as well as formulation and review of broad environmental goals, in conformity with such vision. The VPO's office provides a basis for a broad political legitimacy for the administration of strategic policy decisions on a routine and continuous basis for coordinated environmental management.

Relevant Ministries are supposed to establish environmental management sections, which liaise with the ministry responsible for environmental matters. In particular, it is the Environmental Section's responsibility to ensure that environmental concerns are integrated into Ministry developmental planning and project implementation in a way that it protects the environment. The Environmental Management Sections of Sector Ministries are charged with overseeing the preparation of EIAs required for investment in their sectors (EMA paragraph 31 (k).

Each Sector Ministry is required to appoint a Sector Environment Coordinator to coordinate and report on all activities and performance of functions related to the environment and the Ministry. In addition, at the regional level there is a Regional Environmental Management Expert (REME) to advise local authorities on matters relating to the Act.

In Musoma Municipality there is an appointed Environmental Management Officer (MEMO). The MEMO's responsibilities include the monitoring of the environmental quality of projects and report to the Director of the Environment on implementation of the Act within the area of his/her jurisdiction.

Similarly, Committees and Environmental Management Officers are to be appointed Wards (WEMO) and Mtaa (MEMO) as directed by the EMA 2004.

They are empowered to coordinate all activities geared towards the protection of environment within their local areas.

3.5.2 Organization set up of MUWASA

Once the project on Construction of Musoma Sewerage system and treatment plant is completed, MUWASA shall introduce a section of sewerage within the technical department in its current structure. The possibility of establishing fully fledged department on sewerage will be looked into due to expected increase volume of activities in terms of sewer connection, operation and maintenance of the sewer and WWTP systems.

Among the responsibility of the in-charge of sewerage system will be to:

i) Provides leadership to ensure all staff comply with environmental and social management systems;
ii) Co-ordinates environmental and social management interfaces with stakeholders connected to sewer;
iii) Report major defects of sewer and WWTP systems and non compliances and arranging appropriate corrective actions;
iv) Primary contact for environmental and social complaints and enquiries; raise the awareness of environmental and social problems to all sewer stakeholders;
v) Work in close relation with the Ward Executive officers;
vi) Produce regular reports on actions carried out on the site in terms of environmental and social protection.
vii) Prevent injuries and damage to sewer and pond system;
viii) Choose, supply and enforce use of Personal Protective Equipments;
ix) Devise new working methods, equipment or materials which could reduce risks and propose changes as the case may be;
x) Assesses potential hazards on new site before work starts and health and safety factors affecting the selection of tools or equipment,
xi) Carry out health and safety checks according to the schedule in place. Provide an inspection and audit report to MUWASA Manager or other nominated person(s) and communicate with all Management levels giving advices on how to resolve problems that affect Health & Safety related to sewerage system.
xii) Check and report on the effectiveness of Sewer system and procedures established to deal with disasters; and
xiii) Conduct safety orientation training to all staff and labors to ensure that the safety requirements are fully understood and complied with.

The proposed organization structure is given in the figure below:

Figure 6: Recommended organization structure of MUWASA technical department after establishment of sewer system

CHAPTER 4: BASELINE ENVIRONMENTAL AND SOCIO-ECONOMIC CONDITIONS

4.1 GENERAL

Following identification of project spatial boundaries, it was imperative to identify and describe environments that will be affected by activities related to implementation of components of the sewerage project. The environments were identified from the following environmental groups:

i) Physical environments;
ii) Biological environments; and
iii) Socio-economic and cultural environments.

4.2 PHYSICAL ENVIRONMENTS

4.2.1 Climate

Climate of the area is related to occurrence of rainfall in the two main rainy seasons, the Vuli (short) rains received in October-December and the Masika (long) rains experienced between March and May. The June-September is relatively dry receiving a few events of light daily events in certain years. The temperature varies between 20^{o}C in August and 35^{o}C in January/February.

4.2.2 Air

The air within the project areas is rather fresh. This is a low level of motorised traffic within the municipal centre, smoke generating activities (e.g. burning of litter), etc.

4.2.3 Water

Surface water resources

This comprises the vast Lake Victoria, a fenced Kitaji pond (6.24 ha) and small rivers draining through northern Mwisenge and Makoko wetlands into the lake (**Figure 4.1**). Analysis of water quality of the lake and borehole at Makoko indicated that the lake has relatively good quality water except for a high lead concentration at location A (**Table 9**).

Figure 7: Surface water resources within and around project areas

Table 9: Water quality analysis results for Lake Victoria and borehole close to lake

S/N	PARAMETER	Units	L Victoria A	L Victoria B	Borehole	WHO Standards
1	pH		7.14	7.39	7.48	6.5-8.5
2	Turbidity	NTU	5	10	93	25
3	Colour	Hazen^{o}	26	15	104	50
4	Salinity	‰ (ppt)	0.0	0.0	0.1	na
5	Electric conductivity	µS/cm	151.2	95.30	348	1000
6	Total Dissolved solids	mg/l	72.10	45.20	167.40	1000
7	Phosphate	mg/l	0.59	0.31	1.40	na
8	Nitrate –Nitrogen	mg/l	0.30	0.30	1.20	6.7
9	Nitrite –Nitrogen	mg/l	<0.01	<0.01	<0.01	1.0
10	Ammonia-Nitrogen	mg/l	0.42	0.10	0.27	0.5
11	Chloride	mg/l	33	19	86	600
12	Total hardness	mg/l	47	28	150	500
13	Iron	mg/l	0.20	0.20	0.26	1.0
14	Magnesium	mg/l	6.075	3.645	20.655	150
15	Calcium	mg/l	22	13	65	75
16	Sodium	mg/l	13.83	9.632	24.20	150

S/N	PARAMETER	Units	L Victoria A	L Victoria B	Borehole	WHO Standards
17	Potassium	mg/l	2.248	1.871	2.22	150
18	Lead	mg/l	0.095	<0.01	<0.01	0.01
19	Manganese	mg/l	<0.01	<0.01	<0.01	0.5
20	Copper	mg/l	<0.01	<0.01	<0.01	0.05
21	Zinc	mg/l	<0.01	<0.01	<0.01	5

Ground water resources

Groundwater table is rather high due to presence of the vast Lake Victoria within a few meters and relatively flat topography in many parts of the project areas. The locations of pumping stations are rather closest to the lake (Iringo pumping station, Mukendo pumping station), a few meters from the lake (Trunk pumping station) or at the pond (Kitaji pumping station) where groundwater table is almost at the surface. At Makoko WWSP site, the altitudinal difference between lake and elevated part is only 0.8 m indicating that groundwater table is only less than 1 m from the ground. Consequently, groundwater is fresh water at WWSP and pumping stations. This shallow groundwater table is highly vulnerable to pollution from anthropogenic activities and therefore its quality shall be analysed during impact assessment stage. Analysis of borehole water indicates high turbidity and colour far above recommended limits.

4.2.4 Geology

The geology of Musoma Municipality and project areas consists of granite, granodiorite, foliated, gneisses and magnetite rock formations.

4.2.5 Topography

Musoma Municipality is a bay with rock outcrops resulting into small hills. The altitude ranges between 1,140 m and 1,320 m. The highest point within the project area is on rock Mount Mkendo from where the land generally sloping to lower altitudes towards the lake.

4.2.6 Landscape

Except for a wetlands-farming landscape at Makoko WWSP proposed site, landscape in other project areas is a built-up planned urban area. The streets are

straight with houses/buildings with block of plots bounded by 4 streets. The streets consist of roadway and surface runoff drainage systems.

4.2.7 Cultural sites

The Mwisenge Primary School lying within the immediate spatial boundary for the project is political monument due to being the first school in a series of many that the father of the nation, Mwl Julius K Nyerere attended. This school shall therefore be preserved. There are generally no grave yards within the project area while AICT church is located at the Iringo pumping station.

4.2.8 Infrastructure

Transport

Airport

There is one public airport within the immediate impact area. It is on the other side of the road where pipe MU-1 will pass and is surrounded by built-up area making it difficult for expansion. It has a murram runway 1600 m long, a 125 m × 45 m parking (**Figure 8**) and therefore capable of handling light to medium aircrafts. It is currently under suspended operation.

Harbours

There is an older small Musoma Port at Iringo located within the immediate impact area of the project (**Figure 9**). A Mwigobero ferry terminal, on the other hand, is located within the project area and it serves small passenger boats to several villages (Kinesi, Busweta, Rukuba, Sumbatu, Kiamawi, Ruhu and Sonjo) and also as a fish landing site/market. The port could be part of the large scale development related the Tanga-Musoma railway project and this could mean significant changes in the area due to new port infrastructure, facilities and activities.

Roads

Roads in Musoma municipality and within project areas are predominantly gravel. The majority are part of the street networks representing short roads of 450-1100 m long. The longest roads within the project area are the main Musoma-Mwanza road (1020 m), which is currently undergoing upgrading to a 4-way tarmac road, tarmac/gravel Mukendo-town centre road (1050 m), Mukendo-Airport tarmac road (1440 m) and Airport-Makoko tarmac road to the junction with a street going to proposed WWSP site (1760 m).

Figure 8: Musoma airport.

Figure 9: Musoma port and Mwigobero ferry terminal.

Figure 10: Road conditions within project areas.

Water supply and sewerage networks

The water supply system comprises intakes, transmission, storage and distribution components. There are three intakes at Mwisenge, Mutex and Bweri abstracting a total of 9.7-15.3 MLD. Water from Mutex and Bweri intakes is directly pumped to end users while that from Mwisenge intake is pumped to end users through Mukendo tanks. There are a number of small storage tanks around Musoma municipality capable of storing 2.5 ML. A booster pump is located at Kamunyonge and boost water pressure to Mara and Buhare storage tanks. The distribution pipelines are in four zones (A – D) with the oldest part (zone A-B) laid in the 1950s-1970s and the recent part (zones C – D) laid in the 1970s and 1990s. The entire system is currently upgraded to replace the old leaking pipelines and expand to cover wider area of the municipality including the sewerage project area. The work is underway with construction of intake and treatment plant at Bukanga.

Currently, there exists no sewerage network in the municipality and basic sanitation options are latrines and septic tank systems. Sludge collected from different areas of the municipality by existing emptiers is disposed at

Nyamitwebiri in Bweri Ward. The site is located far in the terrestrial habitat away from the high sensitive habitat the "wetlands of Lake Victoria". This may allow sufficient oxidation and adequate stabilization of sludge that eventually flow through the River Bweri to Lake Victoria with potentially minimum environmental impacts. The land area at Bweri where this disposal site is located is large enough to accommodate reasonable sized oxidation ponds.

Power lines

These are owned by TANESCO and are located along the road reserves. They are found in all streets within the project areas running on left or/and right hand sides of these streets and roads. The lines are either 33 KV transmission or 11 KV distribution lines.

Buildings

The built-up landscape comprises a variety of buildings type that serve for specific purposes. The dominant group is normal non-storey residential houses (e.g. **Figure 11**) that characterise the largest area of Kitaji and Iringo that will be served by sewers MU-2 and MU-3. The area also comprises several single and multi-storey commercial buildings predominantly hotels and guest houses. Institutional buildings are found around Mount Mkendo and include Mara Regional Commission (RC) Office, Regional Administrative Secretary (RAS) Office, MUWASA, TRA, Magereza (Prisons), General Hospital and financial institutions (banks).

Figure 11: Typical normal residential houses at Iringo

4.3 BIOLOGICAL ENVIRONMENTS

4.3.1 Flora

The vegetation among sites such as stabilization ponds, transmission pipelines and pumping stations was composed of indigenous, exotic and crop plants. Some of them form the riparian corridor along the shores of Lake Victoria separated from the adjacent terrestrial vegetation. The general biodiversity present at the project sites is low and can be grouped according to habitat and site locations.

4.3.1.1 Wetlands and riparian vegetation

This was essentially identified at Makoko sites which is an area identified potential for the construction of sewerage treatment ponds. The Makoko site is located close to the lake zones which were characterized with riparian and wetland habitat that need special considerations. Within the riparian habitat the plant communities recognized are related to the anthropogenic disturbance history. However the wetland habitats associated with the shore and the floodplain of the Lake Victoria can be considered to be ecologically sensitive. This habitat will be threatened from the transformation associated with construction of WSP.

The riparian corridor along the lake shore is locally a narrow habitat type with unique fauna and flora. The vegetation type identified on the floodplain or lake shore at the proposed project sites is, however commonly distributed throughout the lake shores. Based on the biodiversity field study, it was not found any plant species of conservation importance in this sites, but a large cover of riparian plant species represented by *Aechynomene elaphroxylon, Cyperus papyrus, Water hyacinth, Vosia cuspidata, Phragmites mauritianus* and *Ficus sur.* was observed on the lake shores that commonly mark the boundary of the lake north-east of the project sites (**Figure 12**).

Figure 12: Wetland vegetation communities at the Makoko WSP site

The species distribution at Makoko sites is in such as way that, the hippo grass *Vosia cuspidata* found in the deeper side of the lake margins co-existing with *Cyperus papyrus* in deeper flow zone of the lake site and the next to the outside is *Phragmites mauritianus*, *Hygrophylla auriculata* and *Aeschynomene elaphroxylon*. The *Phragmites mauritianum* had extended distribution far to the terrestrial habitat where its colonization is favored by the lake water level dynamic and the available belowground high water table determined by the lake water level. The deeper zone is also colonized with water hyacinth which covered the open water body, extending through the narrow channel lobes of the lake margin.

4.3.1.2 Exotic vegetation

The project is located within Musoma town where a dense settlement can be recognized. The plant species in town are dominated by exotic trees and crops (**Figure 13**). There are some land pieces embedded within the open spaces of the settlements in Musoma Town where some fruit trees and vegetables are grown. There are also trees grown along the streets which are privately own, which were identified and their potential usage shown (**Table 10**). These trees will be uprooted upon laying out the sewage pipes hence the owners need to be known and if necessary compensated. Since a lot of land tilling will be implemented, alien plant invasion will not be avoided, although there is already representative invasive species around Musoma Town.

Figure 13: Some crop plants and exotic trees in the project area in Musoma Town.

Table 10: The types of trees that will be cut down for laying sewage pipes, constructing pumping stations and the main trunk

Plant Names	MU 1	MU 2	MU 3	MU 4	USES
Acacia robusta	5	5	6	2	Firewood and shade
Acacia senegale	0	0	0	0	Firewood and shade
Alamanda cathatica	4	0	0	0	Firewood and shade
Albizia leberk	11	2	2	2	Firewood and shade
Araucaria heterophylla	0	0	0	0	Timber and shade
Asimina triloba	0	0	0	0	Fruits for oil Medicinal
Azaradachta indica	0	0	1	0	Firewoodand shade
Bahuinia piñata	0	0	0	0	Firewood and shade
Casuarina equisetifolia	4	8	1	8	Timber, Firewood and shade
Cedrela sinsensis	2	0	0	0	Timber, Firewood and shade
Croton megalocarpus	0	0	0	1	Firewood and shade

Delonix regia	25	5	0	0	Firewood and shade
Elaeis guineensis	6	0	0	0	Food
Eucalyptus saligna	3	0	0	0	Firewood and shade
Ficus sur	8	0	0	1	Firewood
Annona squarosa	0	2	0	0	Fruit
Grevillea robusta	2	4	3	6	Firewood and shade
Gymnospermae tree	0	0	0	0	Timber, Firewood and shade
Jacaranda mimosoides	0	0	0	0	Firewood and shade
Juniperus procera	0	0	0	0	Timber, Firewood and shade
Kigelia africana	0	1	0	0	Firewood and shade
Leucaena leucocephala	1	1	0	0	Firewood and shade
Makhamia lutea	0	0	0	0	Firewood and shade
Mangifera indica	0	0	0	0	Fruit, Firewood and shade
Phoenix reclinata	0	0	0	0	Shade
Pinus patula	0	0	0	0	Timber Firewood and shade
Pithecellobium dulce	2	0	0	0	Firewood and shade
Polyalthia longifolia	0	3	0	1	Shade
Psidium guajava	0	1	0	0	Fruits
Senna elata	2	0	0	0	Firewood and shade
Senna siamea	24	2	0	2	Firewood and shade
Terminalia brownii	0	2	0	3	Firewood and shade
Terminalia giganteus	4	1	0	0	Firewood and shade
Trichilia emetica	0	0	0	1	Firewood and shade

4.3.2 Fauna

Based on the field survey conducted in the proposed project area, it was found less potential habitats for wildlife particularly in the proposed sites for construction of the treatment ponds and pumping stations.

4.3.2.1 Mammals

The mammalian community at the site was of very low diversity due to disturbances at the Mkoko site and the sites for construction of pumping stations. Low diversity of animals is contributed by the available limited range of habitats for wildlife at the site. The current fauna status is determined by the current disturbance associated with wetland cultivation and vegetable farming along the lake shores around Musoma town particularly at Makoko site. The available

habitat cannot favour a diverse animal community since they are surrounded by settlements where the remaining few plant cover supported low animal diversity at the project site. It was noted the presence of *Hippopotamus amphibious, which* graze on crop plants and the natural vegetation of the lake shore at Makoko site. The presence of a few plant species, including *Vosia cuspidata, Aeschynomene elaphroxylon, Phragmites mauritianus, Sedges* and crop plants at Makoko site appears to be a significant forage resource for the resident Hippopotamus available at the site.

4.3.2.2 Birds

A number of birds found along the shores of Lake Victoria. It has been reported about 255 bird species to include kingfisher in the Lake Victoria (Serem 2013). These species are distributed throughout the shores and islands of Lake Victoria supported by the available habitats. However, due to the settlement's establishment and other developments, low numbers of species were available co-existing with the ongoing anthropogenic activities in Musoma town. Eleven (11) bird species were identified during the EIA in the project area that include Little egret (*Egretta garzetta*), Marabou stork (*Leptoptilos crumeniferus*), Sacred ibis (*Threskiornis aethiopicus*), Long toed Lapwing (*Vanellus crassilrostris*), Hadada ibis (*Bostrychia hagedash*), Open billed stork (*Anastomus lamelligerus*), Black winged stilt (*Himantopus himantopus*), Aegyptian gees (*Alopochen aegyptiacus*), Grey heron (*Ardea cinerea*), cattle egret (*Bubulcus ibis*), African jacan (*Actophilornis africanus*) and some of these are shown in **Figure 14**.

Figure 14: Birds feeding in the Kitaji pond Pumping Station

4.3.2.3 Freshwater fish of Lake Victoria

Lake Vitoria is a fresh water body characterized by a number of freshwater fishes. It has been reported about 183 fish species distributed throughout in Lake Victoria (Serem, 2013). Some of the fish species commonly found in the shores of lake Victoria in areas arround the project area include *Rastrineobola argentea, Protopterus aethiopicus, Clarias gariepinus, Schilbe intermedius, Barbus profoundus, Bagrus docmac , Brycinus Sadleri, Brycinus jacksonii , Synodontis victoriae, Clarias allund, Afromastercembalus frenatus, Caridina niloticus, S. afrofischeri,Tilapia rendalii, L.victorianus, M. kanume, Lates niloticus, Halochromine, Oreochromis niloticus and T.zilli* and some have been shown in **Figure 15**. However some of the lagoons and peninsula around the project area are breeding and feeding sites for most of the lake species.

	
Kamongo (*Protopterus aethiopicus*)	(Sato) *Oreochromis niloticus*
	
Sangara (*Lates niloticus*)	Kamable (*Clarias gariepinus*)
	
Dagaa(*Rastrineobola argentea*)	*Brycinus sadleri*

Figure 15: Some fish species commonly found in the lagoons of lake Victoria at Musoma Town

The fish species that feed on the lake shore around the project area include *Brycinus sadleri*, *Brycinus jacksonii* and *Synodontis afrofishery.* These fish species essentially feed on insects found in the vegetation communities on the lake shore and the insects have been the potential source of food that contributes 100% to their diet. Since waste treatment ponds will involve tillage of soils, part of the feeding habitat at the Makoko sites will be laden with sediments and this will minimize the feeding habitat for the above named fish species. Also the discharge of sewerage will cause changes of habitat quality which may favour some species of fish that perform in high level of nutrients originating from terrestrial pollutants. The increased nutrient levels from the sewerage discharge increases abundance of food resource through sewerage fertilization. Since the project will impact only part of it, a minimum effect to the feeding and breeding of fish around the project area is expected.

4.3.2.4 Amphibians

A few habitats for frogs and toads (*Xenopus Victorians*) were noted on the project site. They live on land but most of them return to the swamps in wetland areas of the lake shore to breed. The only amphibians recorded in Lake Victoria Basin are frogs and toads which are represented by 31 species were Bufo and Xenopus species are the most common around Lake Victoria, particularly in wetlands.

4.3.2.5 Reptiles

Musoma is part of the largest known ecosystem with very aggressive and hungry reptiles in the planet namely the Nile crocodile. Apart from that there are other reptiles species found in the area including lizards, chameleon, snakes and tortoises. The crocodile are localizing in the rivers and river mouth of the lake and a few cases reported on the availability of these species in the lake shore. No any case reported on the existence of crocodile in shores of Lake Victoria around the Musoma town. Regardless of the clearance of terrestrial habitat for settlement establishment of settlements in Musoma area including the riparian habitat where settlement cannot be accommodated, there are a few remaining habitat in some parts in Musoma Town, where reptiles can survive in the under disturbed conditions.

There are two reptile species identified in the vegetation and trees grown in town i.e. chameleon *Chamaeleo dilepis* and toroties (*Leopard tortoi*s) (**Figure 16**). The two reptile species can co-exist with disturbance activities. The presence of food resource in the simple linked food chain ensures the survival of some wildlife in town. The chameleon feed on insects which feed on plants grown in the gardens among the residents in Musoma town. Also the tortoise can access foods resource from the plants grown in the same gardens in town and the remaining natural vegetation communities in the outskirt in town. Due to the close proximity of the city with wildness in the lake zone and the surrounding natural habitat, wildlife including tortoise, chameleon can migrate in and out of the dense settlements in Musoma Towns

A chameleon species (*Chamaeleo dilepis*) one of the commonly found reptile species feeding on insects on trees grown along the streets of Musoma Town	The tortoise (*Leopard tortois*) one of the reptile species identified feeding on soft grasses/soft leaves on the riparian plant communites along the shores of lake Victoria at Makoko sites

Figure 16: Some of the reptile's species identified in the project area.

4.4 SOCIO-ECONOMIC AND CULTURAL ENVIRONMENTS

4.4.1 Economic base - employment

The main economic activities in the project area include waged employment and non-waged self-employment in private businesses. Waged employment is generally in public and private service and financial institutions (e.g. government and local government offices, banks, prison, police force, schools, etc) and commercial facilities (hotels, restaurants, guest houses, etc) as well as factories and processing industries (e.g. Musoma Fish Processors Ltd). Self employment group includes petty trades in small shops, fisheries, fish market and transport (daladala) service.

4.4.2 Demography

According to results of the 2012 Population and Housing Census, the three wards of Mwigobero, Iringo and Kitaji, where the main collection sewers are proposed, have a total population of 12,964 inhabitants (**Table 11**). Iringo and Kitaji Wards have comparable population while Mwigobero Ward has less than half the population in any of these two wards. However, the average household size in Mwigobero and Kitaji Wards is similar at 4.3, which is less than 4.6 for Iringo Ward. These ward populations and average household sizes indicates that Kitaji Ward has the highest number of houses (1,271) followed closely by Iringo Ward (1,157) while Mwigobero Ward has only 507 houses giving a total of 2,934 houses in the three wards.

Table 11: 2012 Population in wards within project areas

Ward	Population	Household size
Mwigobero	2,179	4.3
Iringo	5,321	4.6
Kitaji	5,464	4.3
Total:	**12,964**	

4.4.3 Social services

4.4.3.1 Health

The main health facility within the core and immediate impacts areas is the Mara Regional Hospital, which is located along the Mukendo road adjacent to Magereza (prison).

4.4.3.2 Education

There are a number of primary and secondary schools within and around core impact project areas. Primary schools include Mkendo, Mwisenge A, Mwisenge B, Mtakuja, Nyasho, Kamnyonge and Azimio while secondary schools include Mwembeni, Mwisenge, Makoko and Nyamiongo. Other education institutions w`ithin the area include the Vocational Education and Training Authority (VETA), Buhare Community Development Training Institute and St. Alberto Teachers Training College.

4.4.3.3 Water supply

Water supply service is mainly provided by MUWASA where the old distribution network reaches. Other private systems mainly private boreholes (e.g. at Mara Milk Ltd) or lake source (e.g. Musoma Fish Processors Ltd) are supplying water to domestic, institution and commercial areas not reached by the distribution network or supplied below their actual demands.

4.4.3.4 Sanitation

Wastewater generation is primarily from domestic areas throughout the project areas, a few commercial outlets (mainly hotels, restaurants and guest houses), a few institutions (including government offices, health facilities – Regional Hospital, Magereza, etc) and industries (e.g. fish and milk processing). All generated wastewater from activities in these sources are disposed through

latrines, septic tanks-emptiers-Nyamitwebiri pond or runoff drains-river/lake systems.

Largest part of surface runoff generated within the planned project area is collected and disposed to nearby rivers and Lake Victoria by a network of runoff drains. Most of generated domestic wastewater within the project areas is disposed using latrines while hotels/restaurants/guest houses, institutions and a few households with septic tank system are served by available septic emptiers (Charge: TShs 40,000 – 60,000), which disposal the faecal sludge into the Nyamitwebiri pond in Bweri Ward. Industrial wastewater is undergoing pre-treatment before disposed into the lake or nearby rivers.

4.4.3.5 Energy

The main source of cooking energy within the project area is charcoal while lighting is using predominantly electricity from national grid.

4.4.3.6 Transportation

Most transportation services are using private or public facilities. Road transport is facilitated by private cars and public vehicles dominated by commuter (daladala) transport. There is a small daladala stand at Kitaji within the core project area. Air transport is enabled by the Musoma airport, which is within the project impacts area. Lake navigation between places in project and elsewhere is facilitated by the Mwigobero Ferry Terminal located in Mwigobero Ward.

4.4.3.7 Recreation

Apart from being used for other income generating socio-economic activities, Lake Victoria is also used for recreational purposes such as swimming, boat riding and other water sports.

CHAPTER 5: IMPACTS IDENTIFICATION ASSESSMENT AND PROJECT ALTERNATIVES

5.1 GENERAL

This section describes the methodology used in impacts assessment from the identification to significance rating of identified impacts. It finally provides lists of identified potential impacts during construction, operation and decommissioning phases of the Musoma sewerage system project with their significance levels before and after proposed mitigation measures have been implemented.

5.2 IMPACTS ASSESSMENT METHODOLOGY

5.2.1 Impacts identification

The possible impacts associated with the construction of Musoma sewerage system and wastewater treatment plant were preliminarily identified during scoping through expert opinion and stakeholder consultations. Further impacts were identified through expert analyses of information and consultations during Impacts Assessment Phase. In summary, the identification process involved

i) Identification of project boundaries
ii) Identification of stakeholders within the project boundaries
iii) Stakeholders identification of issues to emanate from project implementation
iv) Expert identification of potential impacts from linkages between project components/activities and environments
v) Harmonising potential impacts

5.2.2 Impacts prediction

Impact prediction involved the assessment of probable impacts which were not identified based on the existing environmental conditions but can occur depending on the nature of the project.

5.3 IDENTIFICATION OF POTENTIAL IMPACTS

Musoma Municipality generally and the area adjacent to Lake Victoria are characterize by a complex assortment of interacting, and sometimes conflicting issues. The need for economic development and growth in the area must be matched with the preservation of the natural resources on which that development is based. For example, the fishing industry, prime commercial activities in the area is highly dependent on maintaining biologically acceptable levels of water quality, along with the health of the population of Musoma Municipal. Priority must therefore be given to providing new developments with suitable infrastructure to accommodate the growth and to simultaneously preserve the

natural resource base on which economic growth ultimately depends. At the same time, consideration must be given to providing the best economic uses of available resources within sound, implementable and staged development projects.

When identifying the potential impacts of the proposed Musoma sewerage system and Wastewater Treatment Plant, the environmental impacts was measured against the existing baseline conditions and also predicted according to the experts experience on similar projects. The impacts identified are beneficial but sometimes detrimental especially the land takes for construction of various project infrastructures.

In general, construction of Musoma Sewerage and Wastewater Treatment Plant will have a positive environmental impact on the Municipal and the immediate environment of Lake Victoria. It is expected to produce a long-term improvement in public health of the citizens of the Municipal as well as to significantly reduce a source of chronic water pollution of an ecologically valuable portion of Lake Victoria. Specific impacts that are anticipated or forecasted are discussed in greater detail in this section.

The most important adverse environmental effects of the project is the resettlement caused by land take for construction of piped sewer system, pumping stations, treatment plant and the impacts on receiving water connected with disposal or use of the sludge and the treated water caused by; microbiological contamination, oxygen depletion due to high load of organic faecal matter and uetrophication of the lake caused by nutrients.

The Consultant performed field inspections at all possible sites for sewerage system facilities, such as piped sewer network; pump stations sites at Mkendo, Kitaji and Iringo; truck pumping main near Mwisenge primary school; and Wastewater Treatment Plant at Makoko area.

5.3.1 Linking components/activities and environments

5.3.1.1 Collection sewers

Field findings

The Consultant inspected the various streets of Musoma Municipality area particularly the municipal centre, which is highly populated with various utilities. The nature of the houses around the site is scattered widely with large distances in between the proposed pipe sewer route, road shoulder and houses allowing for construction of the sewer pipe. All streets in this central area have drainage channels for storm water and some space varying in size between houses and the road embankment.

Activity / environment linkages

The main environments at collection sewer sites are water, air, infrastructure – houses, roads, electricity poles, water supply pipes (physical), trees (biological) and hospital, businesses, offices, prison, schools/colleges, employment (socio-

economic). These will be affected by project activities and summarised in **Table 12**.

Table 12: Linking activities for collection sewers installation and environments in which they will be installed

Component	Stage		
	Mobilisation	**Construction**	**Operation**
Activities	- Site clearance including removal of vegetation and relocation of poles for power transmission line - Transportation of construction materials to sites - Labour force mobilisation	- Excavation of trenches and manholes along and across road infrastructure - Blasting of rocks - Pipe laying - Backfilling and compaction - Block and concrete works for manholes	- Periodic maintenance of pipelines and manholes
Environments affected	- Physical: air, houses, electricity poles - Biological: trees - Socio-econ: hospital, businesses, offices, prison, schools/colleges, employment	- Physical: air, water supply pipes, roads - Biological: none - Socio-econ: hospital, businesses, offices, prison, schools/colleges	- Physical: air, water supply pipes - Biological: none - Socio-econ: employment

5.3.1.2 Sewage pumping stations

Field findings

Mkendo pumping station

Mukendo pump station is located in the northern part of municipality at Mukendo Peninsula in Mukendo Ward. It will receive wastewater from its secondary sewers, Kitaji and Iringo pump stations which are will be pumping to a transfer manhole, after which sewage will flow by gravity to Mukendo pump

station. The area is currently an unconstructed space surrounded by residential houses and fish processing industries on the other side of the road.

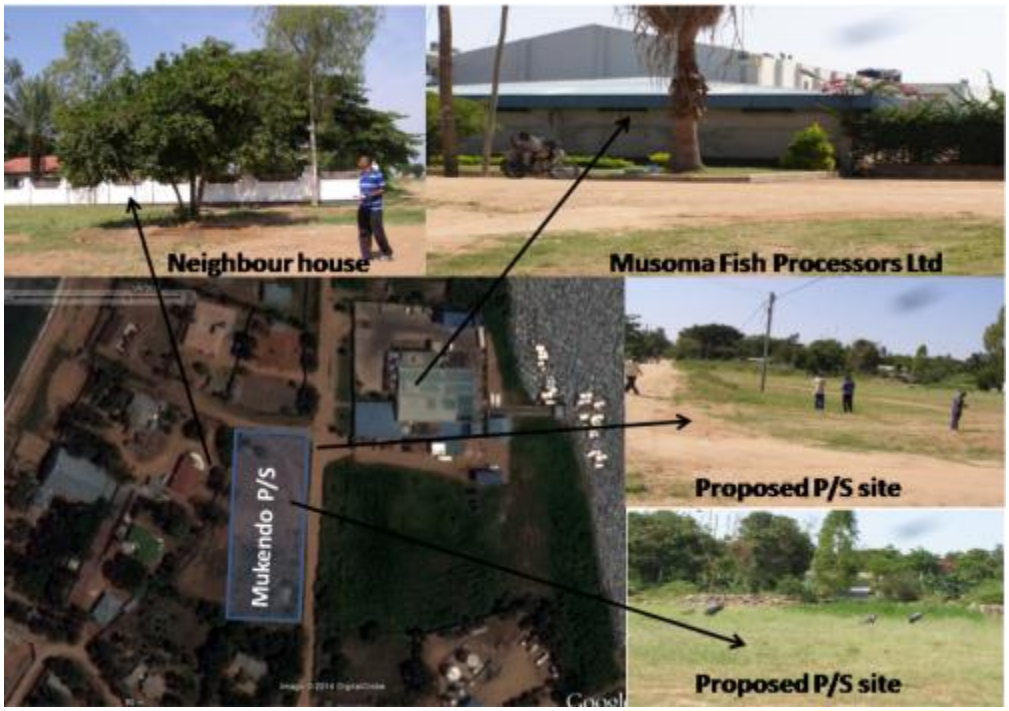


Figure 17: Observed environments at Mkendo Pumping Station

Kitaji pumping station

The pumping station will be positioned at the lowest possible location so as to be able to catch all incoming sewage at the same time minimizing the depth of the sump. In case the pumps are not functioning, the flow will be by-passed to the outflow of the pumping station through an emergency by-pass chamber provided within the pump well. The area which is seen to be an open land, (see figure 15), is a surveyed land and allocated to several people. The area frontage of nearby houses namely, plot Nos 112, 114 and 116 Block 'R' Kitaji (see Map No.2). At this site there is some limited amount of sugarcane and vegetable gardens.

Figure 18: Observed environments at Kitaji Pumping Station Site

Iringo pumping station

The proposed Iringo pump station which is located within Mwigobero ward along Lake Victoria shore close to AICT church have the boundaries clearly demarcated separating the church land and a space identified for the construction of pump station. This land is currently being used as a vegetable garden having beds of vegetable at nursery stage, fruit trees and few shades tree. It is owned by AICT church. The sewerage pipe to the pump station will pass through AICT church area where the church's ablution block stands and it will affect some few mature trees within the church compound.

Figure 19: Observed environments at Iringo Pumping Station site

Trunk pumping station

The area which was proposed for construction of the truck pump station in the detail engineering design report has already been utilized by building residential house. The new proposed area is located at the junction from the tarmac road to earth road which goes to Makoko WWTP. The area is a swampy area which is not utilized for buildings. The area is used for cultivation of paddy. During Construction stage the supervising engineer shall investigates and discuss with the owners of the area for mutual agreement on compensations.

Figure 20: Observed environments at Trunk pumping station site

Activity / environment linkages

The main environments at collection sewer sites are water, air, infrastructure – houses, roads, electricity poles, water supply pipes (physical), trees (biological) and hospital, businesses, offices, prison, schools/colleges, employment (socio-economic). These will be affected by project activities and summarised in **Table 13**.

5.3.1.3 Conveyance main sewers

Field findings

The conveyance gravity/pressure sewers (Kitaji/Iringo-Mukendo and Mukendo-Airport) will use same environments as collection sewers within the municipal central area. The conveyance sewers from airport to Makoko will use Mwisenge road and a street to the proposed WWSP site. The fieldwork identified availability of sufficient space within the road reserve on the right hand side moving towards Mwisenge (**Figure 20**). However, available space at the Mwisenge transfer chamber is limited and the terrain is a rock outcrop that might require blasting to establish required depth for laying the sewer.

Table 13: Linking activities for sewage pumping stations construction and environments in which they will be constructed

Component	Stage		
	Mobilisation	**Construction**	**Operation**
Activities	- Site clearance including removal of vegetation and relocation of poles for power transmission line - Transportation of construction materials to sites - Labour force mobilisation	- Excavation of trenches and manholes along and across road infrastructure - Blasting of rocks - Pipe laying - Fitting of an emergency bypass valve - Backfilling and compaction - Block and concrete works for manholes	- Periodic maintenance of pipelines and manholes - Operation of an emergency bypass valve
Environments affected	- Physical: landscape (scenic view), air, buildings/houses, electricity lines, water distribution pipes, land, runoff drains - Biological: trees, weeds, birds - Socio-econ.: employment, farming, worshiping, health services	- Physical: landscape (scenic view), lake, groundwater, air, buildings/houses, roads, electricity lines, water distribution pipes, land, runoff drains - Biological: trees, weeds, birds - Socio-econ.: worshiping, health services, employment	- Physical: landscape (scenic view), lake, groundwater, air, water distribution pipes - Biological: birds - Socio-econ.: worshiping, health services, employment

Activity / environment linkages

The main environments at collection sewer sites are water, air, infrastructure – houses, roads, electricity poles, water supply pipes (physical), trees (biological) and hospital, businesses, offices, prison, schools/colleges, employment (socio-economic). These will be affected by project activities and summarised in **Table 14**.

5.3.1.4 Wastewater Stabilization Ponds

Field findings

The area appears to have enough space to construct the wastewater treatment pond at Makoko area. It is estimated that the location in Makoko area has a potential of about 17 ha. Furthermore, Makoko area has a low land elevation and seems to have been a swampy area in the past. Currently, the land is being used by few people of Makoko having small portions of vegetable gardens (**Figure 18**). This area is a surveyed land with an approved plan and the whole land is already allocated to individuals.

Table 14: Linking activities for conveyance main sewers installation and environments in which they will be installed

Component	Stage		
	Mobilisation	**Construction**	**Operation**
Activities	- Land acquisition at proposed sites - Site clearance including demolition of buildings and vegetation removal - Transportation of construction materials to sites - Labour force mobilisation	- Excavations - Removal of water from excavations - Block and concrete works for pumping infrastructure and administration offices - Pipe fitting to the pump house - Pump installations -	- Periodic maintenance of installed facilities (pumps, electrical system, pipes, slump well) - Maintenance of office buildings
Environments affected	- Physical: landscape air, noise, vibration, buildings/houses, electricity lines, water distribution pipes, roads, river - Biological: trees - Socio-econ.: employment, education	- Physical: landscape (scenic view), air, noise, vibration, buildings/houses, water distribution pipes, river, roads - Biological: trees - Socio-econ.: employment, education, health	- Physical: landscape (scenic view), air, noise, water distribution pipes, rivers - Biological: none - Socio-econ.: employment

Activity / environment linkages

The main environments at collection sewer sites are water, air, infrastructure – houses, roads, electricity poles, water supply pipes (physical), trees (biological)

and hospital, businesses, offices, prison, schools/colleges, employment (socio-economic). These will be affected by project activities and summarised in **Table 15.**

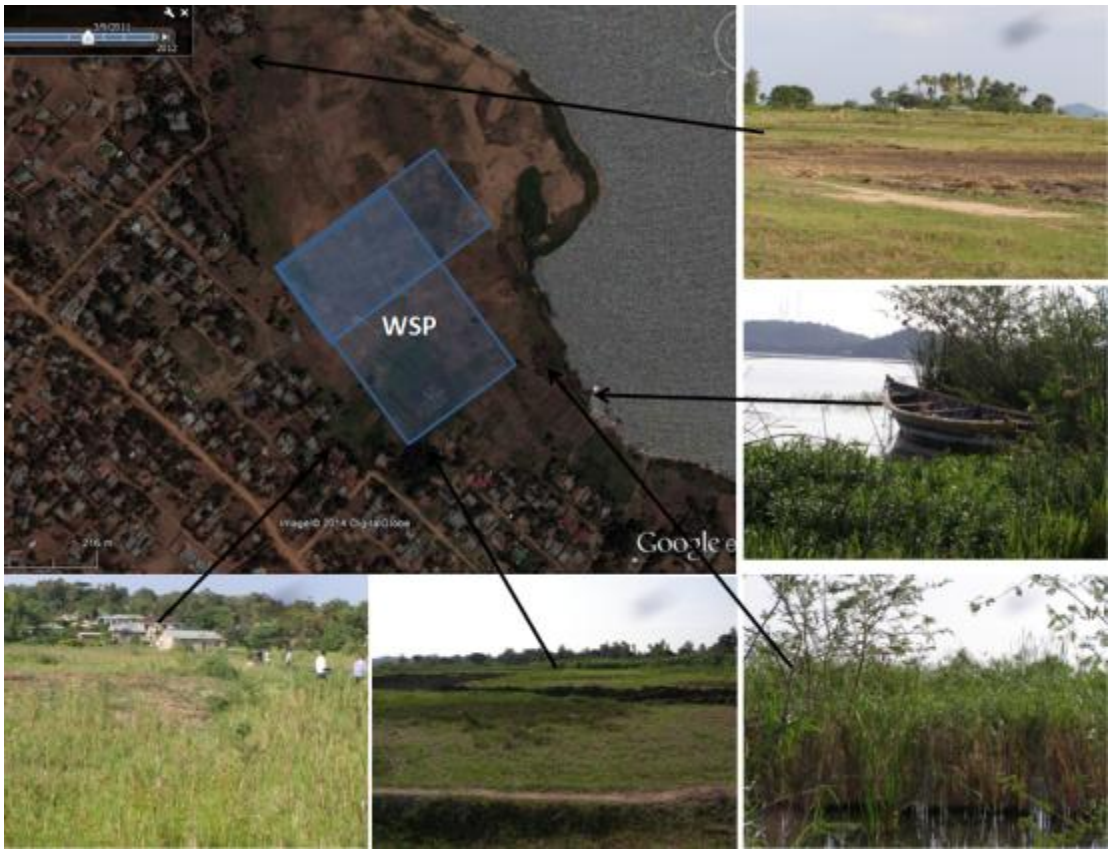


Figure 21: Observed environments at Makoko WWSP site

Table 15: Linking activities for WSP construction and environments in which they will be constructed

Component	Stage		
	Mobilisation	**Construction**	**Operation**
Activities	- Land acquisition at Makoko site - Site clearance including removal of vegetation - Fencing of the site and construction	- Excavation earthworks to remove unwanted clay soils from the WSP foundation - Transportation of construction materials - Filling earthworks to raise	- Periodic cleaning of ponds - Maintenance of fencing - Slope stability maintenance works e.g. re-

Component	Stage		
	Mobilisation	**Construction**	**Operation**
	of temporary office buildings - Transportation of construction materials to sites - Labour force mobilisation	elevation of WSP to at least 1.54 m (1133.74 m) above the average ground altitude (1132.2 m) - Construction of pond embankments/dykes - Inlet and outlet pipes/structures construction - Construction of WSP fence - Construction of operations building - Removal of unwanted clayey soils from the site or its at site management - Site cleaning after construction	grassing, filling of eroded soils, etc
Environments affected	- Physical: landscape (scenic view), air, noise, vibration, roads, lake - Biological: trees, lake ecology - Socio-econ.: employment, farming, fishing	- Physical: landscape (scenic view), air, noise, vibration, roads, land - Biological: trees, lake ecology - Socio-econ.: employment (waged, trade), health, fishing	- Physical: landscape (scenic view), air, lake, groundwater - Biological: lake ecology - Socio-econ.: employment, health, fishing

5.3.2 Identified potential impacts

5.3.2.1 Positive impacts

5.3.2.1.1 During mobilisation and construction stage

5.3.2.1.1.1 Physical environments

None of positive benefits are anticipated during a short period of construction.

5.3.2.1.1.2 Biological environments

None of positive benefits are anticipated during a short period of construction.

5.3.2.1.1.3 Socio-economic and cultural environments

The main potential positive impacts of implementation of the sewerage project on social, economic and cultural environments are

i) Employment creation for waged labour, businesses (food, drinks, construction materials, lodging, etc)

5.3.2.1.2 During operation stage

5.3.2.1.2.1 Physical environments

The main potential positive impacts of implementation of the sewerage project on physical environments are

i) Improved scenic view particularly at WWSP and pumping station sites
ii) Improved quality of surface and ground water resources due to reduction of wastewater pollution

5.3.2.1.2.2 Biological environments

The main potential positive impacts of implementation of the sewerage project on biological environments are

i) Improved vegetation cover from trees that would be planted at WSP site
ii) Increased forage availability for aquatic life due to overgrowth of aquatic plants at the exit / constructed wetlands at the lake margins due to nutrient supply from the oxidation ponds

iii) Reduced pollution of Lake Victoria and hence increased biodiversity

5.3.2.1.2.3 Socio-economic and cultural environments

The main potential positive impacts of implementation of the sewerage project on social, economic and cultural environments are

i) Employment creation for waged labour
ii) Improvement of community health due to reduction of water borne and water related diseases from reduction of water sources pollution
iii) Increase of revenue collection for MUWASA due to additional source of revenue generation from sewerage service connection and use charges
iv) Economical benefits accrued by community from reduction of costs of piped sewerage system compared to current high costs of septic emptier.

5.3.2.2 Negative impacts

5.3.2.2.1 During mobilisation and construction stage

5.3.2.2.1.1 Physical environments

The main potential negative impacts of implementation of the sewerage project on physical environments are

i) Impaired air quality;
ii) Damage to infrastructure (roads and other utilities);
iii) Loss of properties (houses, vegetable garden, etc);
iv) Dust, noise and vibration problems; and
v) Land degradation in areas where construction materials will be acquired.

5.3.2.2.1.2 Biological environments

The main potential negative impacts of implementation of the sewerage project on biological environments are

i) The loss of natural vegetation
ii) Loss of faunal habitat and disturbance
iii) Loss of connectivity of wetland habitat along the lake shore
iv) Loss of land for vegetable growing at Makoko and Iringo sites
v) Loss of trees due to establishing sewerage pipes along the street lines

5.3.2.2.1.3 Socio-economic and cultural environments

The main potential negative impacts of implementation of the sewerage project on social, economic and cultural environments are

i) Health problems of workers from exposure to hazardous toxic materials and communicable diseases;
ii) Involuntary resettlement and proper compensation for land and properties lost; and
iii) Road traffic flow problems (spillages, accidents, congestion, etc).

5.3.2.2.2 During operation stage

5.3.2.2.2.1 Physical environments

The main potential negative impacts of implementation of the sewerage project on physical environments are

i) Impaired air quality from unpleasant odour from WWSP;
ii) Pollution of surface (lake and river) and ground water resources from inefficient WWSP, emergency operation of bypass valve, leaking sewers and/or highly elevated lake levels that will connect with WWSP;
iii) Damage to infrastructure (roads, sewers); and
iv) Impaired capacity of rivers and runoff drains to convey water due to obstruction by crossing sewers.

5.3.2.2.2.2 Biological environments

The main potential negative impacts of implementation of the sewerage project on biological environments are

i) The loss of natural vegetation;
ii) Loss of faunal habitat and disturbance;
iii) Loss of connectivity of wetland habitat along the lake shore;
iv) Loss of land for vegetable growing at Makoko and Iringo sites; and
v) Loss of trees due to establishing sewerage pipes along the street lines.

5.3.2.2.2.3 Socio-economic and cultural environments

The main potential negative impacts of implementation of the sewerage project on social, economic and cultural environments are

i) Contamination of water supply by the wastewater system if they are laid adjacent to one another, the condition which might trigger diseases;

ii) Increased pollution due to un-affordability of sewerage system connection and use charges to the wider group of potential low-income customers.

5.4 IMPACTS PREDICTION

5.4.1 Construction phase impacts

5.4.1.1 Physical environments

5.4.1.1.1 Soil Erosion

Construction of the sewer pipes, sewerage pump stations, and WWSP ponds will require "cut and backfill". Some erosion during construction is unavoidable and will occur temporarily as a result of runoff in areas of excavation. Other earth disturbances and erodible materials may also eventually find their way into the nearby streams and rivers causing temporary increases in the suspended sediment concentration in the local rivers and streams.

The removal of trees and other vegetation will accelerate soil erosion, which if not abated will result into gully erosions.

5.4.1.1.2 Land Degradation

Most of the landscape modification and probably land degradation will be caused by material extraction activities (stone quarry sites) for sewer lines, pump stations and WWSP ponds. Furthermore, the Makoko area has a low land elevation and seems to have been a swampy area in the past, although some parts of this area has been developed for small vegetable gardens, apparently by importing topsoil to the site. Earth embankments shall be constructed around the WWTP facilities to a level based on the 50-year ARI maximum water level of +1135 for Lake Victoria. In this case, there will be major earth excavations from a borrow pit of good soil material. The impacts here will be degradation of land at the borrow pit site and impacts of dust and accidents associated with transport of materials. Currently construction of domestic water supply system is ongoing in Musoma Municipal. The source of construction material is from Butiama district at a place known as Nyabange, about 15 km from Musoma Municipal. This area is also expected to be the source of construction material for the Musoma sewerage system project.

5.4.1.1.3 Safety Risk

There will be an unavoidable increase in truck traffic during construction of the sewerage infrastructures and WWSP ponds. There is a potential safety issue associated with increase in traffic in the vicinity of residential areas and schools. There are also risks associated with infrastructure construction like injuries and accidents.

5.4.1.2 Biological environments

Insect vector breeding

The sludge produced by the Wastewater Treatment Plant will be air-dried on-site in sludge drying lagoons before being moved to a sludge stockpile area. The sludge drying and stockpiling process will also allow flies, mosquitoes and other insects to breed. The impact of these insect vectors is not expected to be great and will prove amenable to control if problems arise.

The sludge disposal will be used for agricultural purposes in vegetable gardens in Musoma municipal, therefore; sludge quality will be monitored to ensure that human health is protected and that the sludge quality will comply with the Tanzania standards for sludge re-use in agriculture. Pathogens and nematodes will likely be the major health concern. The sludge will be

5.4.1.3 Socio-economic environments

5.4.1.3.1 Health and Sanitation Issues

Projects activities may also lead to the creation of stagnant water in borrow pits and quarries associated with the construction activities. The resultant stagnant water bodies may favour breeding of mosquitoes, snails, and other disease vectors. Additionally, the sites may also form foci for other water related diseases particularly cholera, typhoid and dysentery shall people bath and drink such water.

During construction, much solid wastes will be produced at the campsites as well as at the construction sites. The type of waste to be produced includes scrapers, domestic waste, boxes and building materials. The construction workers will require proper services for sanitation.

5.4.1.4 Project Impacts on Gender Issues

In Tanzania, the traditional image of women as a mother, and housewife underlies a clear-cut division of labour between men and women. Women perform the bulk of household work. Their domestic responsibilities including food production, processing preparation and storage as well as the provision of fuel and water, sanitation and hygiene, cleaning the house, laundry.

Hence, it is envisaged that the provision of new and better sanitation facilities closer to family homes will save their resources that would have been previously devoted to the arduous task of collecting water. Therefore, at least some of the time and energy will go into education, leisure and productive pursuits. Improved sanitation services will, in particular, benefit girls and women who bear the brunt of taking care of sick family members. Indeed, it is likely that some of the saved time and energy will be released for increased education of girls who would otherwise have been kept from school because of sickness and ill-health.

5.4.1.5 Improved water quality and tourism

Under normal conditions, the proposed treatment facility will stop the discharge of untreated sewage into Lake Victoria, and thereby reduce the possibility of beach contamination along the Lake shore. It shall be noted that the major threat to the Lake shore is, and will remain, that due to sewerage pollution from Musoma Municipal.
Tourism is likely to be enhanced as a result of Wastewater Treatment Plant. This is because it will allow expansion of tourist facilities and produce an improvement in Lake Victoria's water quality while safeguarding the Lake shore.

5.4.2 Operation phase

5.4.2.1 Pollution of Lake Victoria

After being treated in the WWSP ponds treated wastewater will be discharges into Lake Victoria. If the treated wastewater does not attain the needed standard, then pollution in the lake may affect the health and the life of the lake users as well as organism that live in the lake. Also, if the outfall pipe will discharge treated wastewater directly at the shoreline, then the wastewater is likely to concentrate at the shoreline. To mitigate the impact, the final outlet structure is designed to be a diffuser pipe with a minimum flow velocity of 1m/s and a maximum flow velocity at a pick design flow of six times the average flow. A diffuser pipe will have a diameter between 100mm and 150mm where a velocity of discharge at a diffuser point will be 3m/s. this will ensure dispersion of effluent into the lake to deeper water.

5.4.2.2 Nuisance and pollution from sewer pipes and manhole blockages

When sewer pipes or manhole chambers have blockages, wastewater will overflow to the environment creating nuisance and can also contaminate the surrounding water to be used for domestic issues, leading to the outbreak of diseases such as cholera.

5.4.2.3 Affordability and willingness- To-pay

The willingness of the water consumer to pay for sewerage services depends primarily whether the household has any problems with its on-site sanitation facility. It also depends on the household's affordability to pay for services of sewer pipe connection and to empty its on-site sanitation facility.
Through meetings and face-to-face discussions, the consultant received different views regarding willingness-to-pay. The detailed design report indicated that people were willing to pay for sewerage services if there is also adequate flow of piped water supply. The domestic water supply system is being improved in Musoma Municipal by constructing a new intake site along the shore of lake Victoria. This will encourage people to pay for sewerage services.

5.4.2.4 Air pollution

The proposed Sewerage system is likely to cause odours from manholes or Wastewater Treatment Plant if not well designed, constructed and maintained. However they are likely to be significantly reduced over those resulting from the present open channel conveyance system of raw wastewater directly into Lake Victoria. In addition air pollution may result from methane gas production at the WWTP. In order to minimize odour and nuisance to the community, the WWTP will be located at least 200 m from the residential houses with due consideration to wind direction.

5.4.2.5 Risks

The following risks may occur during the project operations:

5.4.2.5.1 Pump failure

Pump failure may occur during the operation of the sewerage system. This may cause nuisance and overflow of sewerage at pumping stations. This has been identified as potential risks and mitigation measures provide for in section 6.0.

5.4.2.5.2 Electricity cut off

This is a problem in most towns in Tanzania. Thus it is likely also that Nusoma Municipal may face electricity cut off sometimes.

5.4.2.5 3 Rising Lake Level.

Lake Victoria water levels have been observed to fluctuate over periods of times. This may pose risks to the proposed WWSP. This requires long term review of available data on long term lake water level variation. Embankment designs have considered situation if lake water levels rise and flood the site. The embankments will need to keep water out of the pond.

5.4.2.5.4 Migratory birds

Normally waste stabilization ponds attract birds. However the WWSP are located far from the air strip. Thus their effect to the air craft is not foreseen.

5.5 IMPACT ANALYSIS

Major changes or impacts which the project would create on the biophysical, socio-economic/cultural and biological environmental conditions, both positive and negative were identified in section 5.1 above and analyzed in this section based on each identified impact and their significance. Impact significance was assessed using both the measurable and normative criteria. The measurable criteria were based on the following factors:

i) The Sensitivity of the environmental element being impacted;
ii) The spatial extent of the impact;
iii) The verity /intensity of the impact;
iv) The duration of the impact; and
v) The Probability/frequency of occurrence of the impact or source of impact:

On the other hand, the normative criteria involved an assessment of deviation from established norms or acceptable change limits. Impact significance was characterized at four (4) levels i.e. Non Significant, Low Significance, Moderately Significant and Highly Significant.

The following definitions were adopted for impact characterization:

i) Highly Significant Impact: A frequent impact and or one with highly severe effects;
ii) Moderately Significant Impact: A frequent impact of moderate severity;
iii) Low Significant Impact ; An infrequent impact of moderate severity; and
iv) Non Significant Impact; An improbable impact or one with non severe effects.

Impact severity or intensity was characterized as follows:

i) One infringing on Legal provisions or established social norms;
ii) One with widespread effect i.e. impact affecting areas outside the immediate;
iii) Confines of the defined project area;
iv) One causing irreversible damage; and
v) One causing high public outcry.

Moderately Severe Impact was characterized as follows:

i) One causing serious but reversible damage
ii) One causing moderate public outcry

Non Severe Impact was characterized as follows:

- One not subscribing to any of the above

The Sensitivity of the element being impacted was characterized as follows:
Highly Sensitive: Fragile and highly susceptible elements with potential to suffer permanent Damage.

- Moderately sensitive: Fragile and highly susceptible elements with potential to suffer permanent damage;
- Insensitive: Elements neither fragile nor susceptible to damage

The spatial extent of the impact was characterized as follows:

i) Localized: Effects limited to defined project site only;
ii) Limited: Effects limited to project site and immediate neighbourhood only; and
iii) Widespread: Effects felt beyond immediate neighbourhood;

The frequency or probability of occurrence of the source of impact was characterized as follows:

i) Frequent: Definitely expected impact;
ii) Infrequent: Expected but rare impact; and
iii) Improbable: Unlikely impact.

Finally, the duration or timing of the impact was characterized as follows:

i) Short Term: Lasts during project activity only (reversible);
ii) Medium Term: Lasts for a limited period after project activity (eventually reversible);
iii) Long Term: Permanent (irreversible)

Impact severity/intensity and probability were used as key determining factors for impact significance while the other parameters (sensitivity, spatial extent and duration) were used as supplementary qualifiers.

Impacts were further characterized as direct, indirect, residual and cumulative. The following definitions were adopted for this purpose:

i) Direct Impacts: Immediate effects of an action or implementation of project activities;
ii) Indirect Impacts: Secondary or induced effects of an action which occur later in time or at a place different from the project site;
iii) Residual Impacts: Impacts which cannot be fully mitigated and are expected to remain even after mitigation measures have been implemented;
iv) Cumulative Impacts: Impacts arising from incremental effects of an action when added to other past, present or reasonably foreseeable actions. These impacts may be insignificant when considered individually but their collective impact may be significant.

Finally mitigation measures aimed at preventing, reducing, or managing the impacts were identified for all significant impacts with monitoring activities proposed for residual impacts.

It shall be mentioned that stakeholder views expressed during the ESIA consultation process were taken into consideration throughout the process.

5.5.1 Positive impacts

5.5.1.1 Employment opportunity

Nature and Source of Impact: During construction phase employment opportunities in Musoma Municipal will increase. More people will be directly and indirectly employed working as hired labourers during construction, other business opportunities will also emerge such as selling of food, drinks, construction material and lodging.
Increase in such jobs is important in economic terms as they would have a positive impact on the economic aspects of community at large, mainly by virtue of increased buying capacities of people within the project area.

Impact Significance: High positive impact

Rationale for Designated Significance: Definite impact with widespread benefits of moderate to high significance.

5.5.1.2 Improvement of community health

Nature and Source of Impact: Given the apparent poor quality of water and the significant occurrence of water-borne diseases like typhoid and cholera, improvement of sanitation services would notably improve the well being of the residents of Musoma municipality; In this aspect, the project will be an important factor in poverty alleviation of the target population. Musoma municipality has no sewerage systems in place yet, so people and institutions are using septic tanks to dispose of their wastewater. Health improvements will reduce the cost of health care and medicines to households, with the greatest impact experienced by the poorest section of society.

Impact Significance: High positive impact

Rationale for Designated Significance: Definite impact with widespread benefits of high significance over long time period.

5.5.1.3 Increase of revenue collection for MUWASA

Nature and Source of Impact: The municipality is currently offering septic tank emptying services. It is envisaged that such services will in future be provided by MUWASA with greater capacity than existing institutions. By establishing piped

sewerage systems, MUWASA will have additional source of revenue generation from sewerage service connection and use charges.

Impact Significance: High positive impact

Rationale for Designated Significance: Definite impact with widespread benefits of high significance over long time period.

5.5.1.4 Improved quality of surface and ground water resources

Nature and Source of Impact: since the project is aiming at improving the wastewater collection, transportation, treatment and disposal at low cost compared with other methods. This will have positive impact on the environment as the pollution to natural water bodies will be reduced significantly. The wastewater will be collected from households and treated in the WWTP before disposal to Lake Victoria after meeting the specified standards

Impact Significance: Moderate positive impact

Rationale for Designated Significance: This is an indirect, definite impact of moderate severity and limited spatial extent for a limited to long term basis.

5.5.1.5 Increased forage availability for aquatic life

Nature and Source of Impact: The design of the waste stabilization pond includes the discharge part of the treated wastewater to Lake Victoria through a constructed wetland. The overgrowth of aquatic plants at the exit / constructed wetlands at the lake margins due to nutrient supply from the stabilization ponds will increase forage availability for aquatic life.

Impact Significance: Moderate positive impact

Rationale for Designated Significance: This is an indirect, definite impact of moderate severity and limited spatial extent for a limited to long term basis.

5.5.1.6 Improve aesthetic value of Musoma municipal

Nature and Source of Impact: The municipality does not currently have a sewerage system for managing wastewater generated from the present and expanded water uses in the municipality. Untreated wastewater flows into Lake Victoria and open drains contributing to the pollution of the Lake and surrounding environment in the Municipal Provision of piped sewerage system and treatment plant will reduce discharge of wastewater into open draind and thus keep the environent clean and safe

Impact Significance: Moderate positive impact

Rationale for Designated Significance: This is an indirect, definite impact of moderate severity and limited spatial extent for a limited to long term basis.

5.5.1.7 Economical benefits accrued by community from reduction of costs of piped sewerage system

Nature and Source of Impact: The municipality is currently offering septic tank emptying services at a cost of about Tsh 50,000 per trip for septic emptier. It is envisaged that such services will be improved through connecting houses with piped sewerage system at an affordable price. This will assist the community of Musoma from using a lot of money for emptying their toilets

Impact Significance: Moderate positive impact

Rationale for Designated Significance: This a direct, definite impact of moderate severity and limited spatial extent for a long time of period

5.5.2 Negative impacts

5.5.2.1 Damage to infrastructure (roads, fenced wall and stone drive)

Nature and Source of Impact: Musoma sewerage and treatment plant will pass through municipal streets along the road shaller where water supply mains, stone dive way and brick fence occurs. About 70 m in length of road pavement, $6m^3$ of drive way will be affected.

Impact Significance: High

Rationale for Designated Significance: This a direct, definite impact of high severity and limited spatial extent for a long time of period

5.5.2.2 Loss of properties (land and vegetable gardens)

Nature and Source of Impact: Construction of pumping station at Mwisenge area will cause land take some few patches of paddy plot, the pumping station at Iringo and Kitaji; and WWTP at Makoko area will take up the land currently used for vegetable gardening. Land and garden fields will be lost as a result of infrastructure construction as detailed in evaluation report in Appendix 5.

Impact Significance: High

Rationale for Designated Significance: This a direct, definite impact of high severity and limited spatial extent for a long time of period

5.5.2.3 Dust, noise and vibration problems

Nature and Source of Impact: Construction of piped sewer system, WWTP and associated infrastructure will result into dust emission, noise pollution and vibration from working machinery.

Impact Significance: Moderate

Rationale for Designated Significance: This a direct, definite impact of moderate severity and limited spatial extent for a short time of period

5.5.2.4 Impaired air quality (odour from WWTP and manholes)

Nature and Source of Impact: Construction of piped sewer system, WWTP and associated infrastructure will result into dust emission. Operation of the WWTP and blocked manholes may result into odour and nuisance.

Impact Significance: Moderate

Rationale for Designated Significance: This is a direct, definite impact of moderate severity and limited spatial extent occurring for a short to long period of time.

5.5.2.5 The loss of natural vegetation (trees)

Nature and Source of Impact: Construction of piped sewer system, WWTP and associated infrastructure will result into loss of trees in Musoma streets. Detailed of trees to be lost is presented in Appendix 5.

Impact Significance: Moderate

Rationale for Designated Significance: This is a direct, definite impact of moderate severity and limited spatial extent for a long time of period.

5.5.2.6 Loss of connectivity of wetland habitat along the lake shore

Nature and Source of Impact: Construction of the WWTP and associated infrastructure close to the lake will impede wetland habitats connected to the lake shore.

Impact Significance: Low

Rationale for Designated Significance: This is an infrequent impact of moderate severity and limited spatial extent for a short period of time

5.5.2.7 Health problems of workers from exposure to hazardous toxic materials and communicable diseases

Nature and Source of Impact: Construction of wastewater collection sewer and WWTP and associated infrastructure will involve skilled and non skilled labours who will be exposed to health hazards such as accidents, injuries and diseases.

Impact Significance: Moderate

Rationale for Designated Significance: This is an infrequent impact of moderate severity and limited spatial extent for a short to long period of time.

5.5.2.8 Road traffic flow problems (spillages, accidents and congestion

Nature and Source of Impact: Construction of wastewater collection sewer and WWTP and associated infrastructure will involve transport of materials from the source to the construction site. This will increase traffic volume in the municipal streets and thus traffic flow will be high.

Impact Significance: Moderate

Rationale for Designated Significance: This is a direct, definite impact of moderate severity and limited spatial extent for a short period of time

5.5.2.9 Pollution of surface (lake and river) and ground water resources

Nature and Source of Impact: The pollution may result from inefficient WWSP, emergency operation of bypass valve, leaking sewers and/or highly elevated lake levels. Increased pollution may also be due to un-affordability of sewerage system

connection and use charges to the wider group of potential low-income customers. Contamination of water supply by the wastewater system may also happen if the sewer pipes are laid adjacent to one another

Impact Significance: Moderate

Rationale for Designated Significance: This is a direct, definite impact of moderate severity and limited spatial extent for a short period of time

5.5.2.10 Soil Erosion

Nature and Source of Impact: Construction of the sewer pipes, sewerage pump stations, and WWSP ponds will involve removal of trees and other vegetation which will accelerate soil erosion if not abated.
Some erosion during construction is unavoidable and will occur temporarily as a result of runoff in areas of excavation. Other earth disturbances and erodible materials may also eventually find their way into the nearby streams and rivers causing temporary increases in the suspended sediment concentration in the local rivers and streams.

Impact Significance: Moderate

Rationale for Designated Significance: This is a direct, definite impact of moderate severity and limited spatial extent for a short period of time

5.5.2.11 Nuisance and insect breeding

Nature and Source of Impact: The sludge produced by the Wastewater Treatment Plant will be air-dried on-site in sludge drying lagoons before being moved to a sludge stockpile area. The sludge drying and stockpiling process will also allow flies, mosquitoes and other insects to breed. The impact of these insect vectors is not expected to be great and will prove amenable to control if problems arise.

Impact Significance: Moderate

Rationale for Designated Significance: This is a direct, definite impact of moderate severity and limited spatial extent for a short period of time.

5.6 Pump failure

Nature and Source of Impact: Pump failure may occur during the operation of the sewerage system. This may be caused by mechanical failure or electricity cut-off.

Impact Significance: Moderate

Rationale for Designated Significance: This is a direct, definite impact of moderate severity and limited spatial extent for a short period of time.

5.7 Electricity cut off

This is a problem in most towns in Tanzania. Thus it is likely also that Musoma Municipal may face electricity cut off sometimes.

Nature and Source of Impact: Power shortage, rationing or mechanical failure may cause this problem. Electrical cut off may be experienced during operation of the sewerage system.

Impact Significance: Moderate

Rationale for Designated Significance: This is a direct, definite impact of moderate severity and limited spatial extent for a short period of time.

5.8 Rising Lake Levels

Nature and Source of Impact Lake Victoria water levels have been observed to fluctuate over periods of times due to Climate change. During heavy rains such as the el-Nino the lake water levels increases. This may pose risks to the proposed WWSP. This requires long term review of available data on long term lake water level variation.

Impact Significance: High

Rationale for Designated Significance: This is a direct, wide spread impact of high severity and occurring infrequent a medium to long time of period.

Table 16: Environmental Impact Assessment Matrix for major environmental and social issues

		Project Component							
	Musoma Sewerage and Pumping station Environmental and Social Impact	**Piped sewer network**	**Iringo Pumping station**	**Kitaji Pumping station**	**Mukendo Pumping station**	**Trunk Pumping station**	**Makoko WWTP**	**Borrow pit area**	**Remarks**
Positive Impacts	Employment opportunities	+3	+3	+3	+3	+3	+3		
	Improvement of community health	+3	+3	+2	+2	+2	+3		
	Reduced pollution of Lake Victoria and hence increased biodiversity	+3	+2	+2	+2	+2	+3		
	Increase of revenue collection for MUWASA	+3	+2	+2	+2	+2	+3		
	Improved quality of surface and ground water resources	+2	+2	+2	+2	+2	+2		
	Increased forage availability for aquatic life	+1	+1	+1	+1	+1	+1		
	Improve aesthetic value of Musoma municipal	+2	+2	+2	+2	+2	+2		
	Economical benefits accrued by community from reduction of costs of piped sewerage system	+1	+1	+1	+1	+1	+1		
Negative Impacts	Damage to infrastructure (roads, fenced wall and stone drive)	-3	-3	0	-2	-3	-2		
	Loss of properties (land and vegetable gardens)	-2	-3	-1	-1	-3	-3		
	Land degradation	-2	-2	-2	-2	-2	-3		
	Dust, noise and vibration problems	-2	-2	-2	-2	-2	-2		
	Impaired air quality (Dust, odour from WWTP and manholes)	-2	-2	-2	-2	-2	-2		

		Project Component							
	Musoma Sewerage and Pumping station Environmental and Social Impact	**Piped sewer network**	**Iringo Pumping station**	**Kitaji Pumping station**	**Mukendo Pumping station**	**Trunk Pumping station**	**Makoko WWTP**	**Borrow pit area**	**Remarks**
	The loss of natural vegetation (Trees)	-2	-2	-2	0	-2	-2		New trees are being planted at Makoko area
	Loss of connectivity of wetland habitat along the lake shore	0	0	0	0	0	-1		
	Health problems of workers from exposure to hazardous toxic materials and communicable diseases	-2	-2	-2	-2	-2	-2		
	Road traffic flow problems (spillages, accidents and congestion	-2	-2	-1	-1	-1	-1		
	Pollution of surface (lake and river) and ground water resources	-1	-1	-1	-1	-1	-1		
	Soil Erosion	-2	-2	-2	-2	-2	-2		
	Nuisance and insect breeding	-1	-1	-1	-1	-1	-2		
	WWTP Rupture	0	0	0	0	0	-1		Rarely occurred phenomena
	Pump failure	-2	-2	-2	-2	0	0		
	Electricity cut off	-2	-2	-2	-2	0	0		
	Raising Lake water levels	0	0	0	0	0	-3		Rarely occurred phenomena

Impact Rating:
+3 = Major Positive, +2 = Moderate Positive, +1 = Minor Positive, 0 = No Impact,
-3 = Major Negative, -2 = Moderate Negative, -1 Minor Negative

5.6 IDENTIFICATION OF ALTERNATIVES

The purpose of developing alternatives is to investigate whether any solution exist that are environmentally sustainable, socially acceptable and economically feasible. Comparing such alternatives including the autonomous development (or "no-project) alternative, provides relevant and transparent information for decision making.

5.6.1 No Project Alternative

A number of alternatives were considered for realizing the project objectives. As a standard practice, the "No project alternative" was also considered (i.e. continue generation of waste water all over the town, using septic tanks or pit latrines as disposal system with sludge disposal by municipal emptying service and dumped in open dug pits).

In the event that the proposed sewerage system, treatment plant and improved on site sanitation system is not allowed to take off, socio-economical benefits and economical gains anticipated from the project would all be lost. Employment opportunities anticipated from the undertaking would be lost while improved sanitation and clean environment which would have contributed to improved public health and attracting local and foreign investors in industrial as well as tourism would also not be realized thereby resulting in a "nil" scenario in development efforts.

A number of multiplier benefits (employment opportunities) and resultant entrepreneur establishments that would have benefited the local people would no longer be within sight of the local people.

In terms of economic, the "no-project" alternative would eliminate the opportunity for the provision of income generation activity for MUWASA and Municipal.

Also, this option is not favoured by the Ministry of Water Sanitation Strategy of improved urban water and sanitation. The local community will continue living in abject polluted environment, missing the numerous socio-economic benefits of the project such as employment and improved health conditions and sanitation.

In addition, the much anticipated development and growth of Musoma Municipal would have remained unchanged due to lack of this additional thrust for the development of sewerage system and improved on-site sanitation in the area as a whole.

5.6.2 With Project Alternative

The establishment and development of the proposed sewerage system and treatment plant and; improved on site sanitation would bring to the fore numerous socio-economic benefits as outlined below:

i. Improve the well being of the Musoma residents in sanitation;

ii. Improve aesthetic value of the municipal;
iii. Clean environment will attract investors and tourist;
iv. Reduced incidents of water borne disease such as typhoid and cholera;
v. Health improvement will reduce the cost of health care and medicines to household with the greatest impact experienced by the poorest section of the society;
vi. When the children get sick an adult career is taken out of the productive work to look after them thus stunting socio-economic development at a community level;
vii. Employment creation and improved local income during construction and operation phase;
viii. Increased public revenues for MUWASA and Musoma Municipal (collection taxes);
ix. Waste water will be collected from households ant treated before disposal to Lake Victoria after meeting the specified standards thereby reducing pollution of Lake Victoria;
x. Widened multiplier effects leading to economic diversification and entrepreneurship development in Musoma Municipality ;
xi. Increase employment opportunity for private sector service providers for emptying and transportation of waste sludge from septic tanks and cesspits; and
xii. Enhanced and improved environmental management and protection.

Public consultation and discussions with ward executive officers, municipal council, MUWASA and majority of the residents are in great need of for improved sewerage system and concluded that the socio-economic benefits of the project to the communities in Musoma Municipal outweigh the "without project" scenario. The project is therefore being recommended for implementation especially in light of environmental mitigating measures and plans outlined in this report.

5.6.3 Location Alternatives

Location areas for piped sewerage system were based on the following criteria:

i. Highly populated areas covering Mukendo, Mwigobero, Iringo, Kitaji wards and a small portion Kamunyonge ward;
ii. Affordability to pay for the services of connection and maintenance of sewer pipes;
iii. Topography of the area to avoid heavy pumping of sewerage; and
iv. Provision of greater economic and environmental benefit than improvements obtained from other means of human waste and wastewater disposal.

After analysis of the above factors the sewer system was proposed to be constructed at the city centre with high population density. The other areas were left to continue receiving on-site sanitation facilities with the strategy of improving services for emptying septic tanks sludge, transport, dispose and treatment of this sludge.

Location Site for wastewater treatment plant
Before selecting location site for construction of Waste Water Stabilisation Ponds, site inspection was done thoroughly to find the best sites which fit the following criteria:

i. Adequate space that would allow construction of the waste waster stabilization ponds and;
ii. A land space that can allow construction of the waste waster stabilization ponds which can store relatively large volume of waste water with low embankment height.

After analysis of alternative site locations, the present site at Makoko area was found to be more suitable and fits well all criteria mentioned above. Other areas inspected include Bweri area which is relatively small and within the Lake shore.

The other site visited was at Bweri Bukoba (Nyamtwabiri) area. This area is currently being used for disposal of sewerage from septic tanks, soak away pits and cesspits. The area is away from the Lake, about 4 km. This area is more suitable for sludge disposal and treatment.

5.6.4 Design Alternatives

Plans design alternatives
Several alternatives designs for Musoma Sewerage system were considered before selecting the best design option. The design options were mainly for the development plans for sewerage pipe networks, services area and design of the size of the waste water treatment plant. Each option was discussed in terms of its impacts on environmental and socio economic conditions. The following design plans were considered:

General Plan A was proposed to construct piped sewerage for City Centre only. This alternative would construct Waste water treatment plant at Makoko area using land area of 6.7 ha with remaining 10.4 ha reserved for Phase 2.

General Plan B was proposed to construct piped sewerage for City Centre area, plus East and West Extension areas. This alternative would construct waste water treatment plant at Makoko area using land area of 10.4 ha with remaining 6.7 ha reserved for Phase 2.
If General Plan A is selected for Phase 1, then construction costs for piped sewerage' are expected to be less than construction costs for water supply development and expansion of Musoma water supply project.

Piped sewerage network Design alternative
After comparison of different designs for sewerage piped network, the City Centre Service area was selected based on the following criteria:

- Wastewater generation is greatest (area of highest water consumption);
- Concentration of important commercial; institutional and industrial activities;
- Local environment most sensitive to poor sanitation practices; and

- Highest affordability and willingness-to-connect.

Willingness-to-pay for piped water supply is much higher than the willingness-to-pay for piped sewerage. Furthermore, without water supply development and expansion to be provided by the Musoma Water Supply Project, then General Plan B becomes less feasible, because expansion of the water supply system is needed to generate the wastewater to be collected in the two extension areas.

In this case, affordability of general plan B becomes questionable, and is certainly less feasible on economical basis than general plan A.

As conclusion the general plan A for Phase 1 was selected for implementation:

Design alternative for risks associated with rising water levels of Lake Victoria

The detailed design report indicated that the historical water level data (since Year 1900) of Lake Victoria measured at a level gauge in Jinja was +1134.86 masl based on a 50-year average recurrence interval (ARI).
During the 1960's, there was a period of heavy rains ("Uhuru rains") whereby the water levels in Lake Victoria rose to as high as +1136 masl. Based on this experience, there is an expectation that Lake Victoria is sensitive to extreme periods of rainfall, and design of the WWTP at Makoko area shall respect this possibility.
For the design of wastewater treatment plant at Makoko area earth embankments shall be constructed around the plant facilities to a level based on the 50-year ARI maximum water level of +1135 for Lake Victoria. The costs of such earth works will be expensive, but proper design will be acceptable and account for an event of extreme probability will low risk of failure. Such earth works would also be necessary regardless of the WWTP process technology. In this case, there is no need for major earth excavations, but instead use the existing land level as the bottom levels of the ponds, and then build-up the embankments.

This approach is suitable because: (a) borrow material of good soil quality are now used for road construction works in Musoma, and (b) good quality control of the imported soil will provide pond structures of stable integrity. The biggest issue with this approach is then suitable borrow areas to obtain the embankment material, and the associated transport costs and environmental impacts.

5.6.5 Technology Alternatives

There are various methods of wastewater treatment for communal population. The common methods are Activated sludge, Trickling filters, Aerated Lagoon, Vertical flow method, Horizontal flow method and Waste Stabilization Ponds. Waste stabilization ponds are shallow, manmade basin into which wastewater flows and from which, after a retention time of several days, a well treated effluents is discharged.
As compared to other wastewater treatment technologies, WWSP are simple to construct, less expensive than other wastewater treatment process, WWST are particularly efficient

in removing excreta pathogens while as other treatment process are very inefficient in this and require a tertiary treatment process such as chlorination.
The principal requirement of WWSP are that sufficient land shall be available and that the soil shall preferably have a coefficient of permeability less than 10^{-7} m/s to avoid for need of pond lining.
Based on these technologies, the WWSP was selected as the best wastewater treatment technology for Musoma Municipal.

5.6.6 Scheduling Alternatives

Scheduling of piped sewerage system is not applicable for sewer pipe network. The system shall be functional throughout the life period to avoid further pollution of Musoma Municipal. Scheduling alternatives is only applicable for domestic water supply systems. Scheduling can also be possible for on-site sewerage collection and disposal where collection scheduled can be arranged depending on the availability of collection facilities. The scheduling alternative for sewerage system is not suitable when wastewater supply is a constraint and therefore was not considered in this project.

CHAPTER 6: IMPACTS ENHANCEMENT AND MITIGATION

The following section hereunder describes measures that shall be followed by the management of MUWASA to ensure that the anticipated environmental and social impacts are enhanced, avoided, abated, or remediated. This chapter presents enhancement and mitigation measures for the potential positive and negative impacts identified in Chapter 5. These mitigation measures are presented according to the impact category occurring in different phases. If the impact occur in all stages of the project development i.e mobilization; construction; operations and maintenance; and decommissioning phase, then the proposed mitigation measure is discussed only once.

6.1 Enhancement of positive impacts

6.1.1 Employment opportunity

The proposed enhancement measures include the MUWASA management to prioritize employment of the local community for non skilled labour and employment of skilled Tanzanians to manage the different departments for improved performance.

6.1.2 Improvement of community health

The proposed enhancement measures include sensitization of the community to use the piped sewerage system rather than the ordinary pit latrines and septic tanks.

6.1.3 Increase of revenue collection for MUWASA

Enhancement measures for this positive impact include improved service delivery by MUWASA and encourage customers to use piped sewer system. People are willing to pay for sewerage services if there is also adequate flow of piped water supply.

6.1.4 Improved quality of surface and ground water resources

Enhancement measures include regular monitoring and maintainer of sewer system and WWTP. Monitor water quality.

6.1.5 Increased forage availability for aquatic life

Enhancements measures include continue supply of piped domestic water supply and operation of the WWTP. Discharge effluent which meet discharge standard of receiving water bodies.

6.1.6 Improve aesthetic value of Musoma municipal

MUWASA will ensure that repair of any leaking sewerage pipes and cleanness of the manhole chambers are done as early as possible, to stop nuisance and contamination of the wastewater with the surroundings result into polluted environment and eruption of water borne diseases.

6.1.7 Economical benefits accrued by community from reduction of costs of piped sewerage system

Enhancements measures include continue connection and using sewer system to avoid high cost of hiring septic tanks empties.

6.2 Mitigation of negative impacts

The potential negative environmental impacts described above can be avoided or minimized when appropriate mitigation' measures are incorporated in the design, construction, and operation phases of the proposed project. Feasible and cost-effective mitigation measures are outlined to minimize the potential adverse impacts of the proposed project and to provide a justifiable social and economic benefit to the affected communities in the project area.

6.2.1 Impact: Damage to infrastructure (roads, fenced wall and stone drive)

Proposed mitigation measures: In areas where the land owned by the community is to be used, whether for construction of the sewers, pump stations or wastewater treatment plant, the Consultant has identified affected properties and therefore the project shall initiate compensations for the communities in those areas before land is acquired.
During construction phase the supervising Consultant will prepare an accurate census of the people to be affected by the proposed project depending on the final survey for alignment of various project infrastructures.

In order for the compensation plan to have broad-based popular acceptance, MUWASA shall consult and educate the affected population about the project impacts and requirement. MUWASA in conjunction with MUSOMA Municipality shall start the process of acquiring land for the sites of the pumping stations and WWTP immediately.

6.2.2 Impact: Loss of properties (houses and vegetable gardens)

Proposed mitigation measures: In areas where the land owned by the community is to be used, whether for construction of the sewers, pump stations or wastewater treatment plant, the Consultant has identified affected properties and therefore the project shall initiate compensations for the communities in those areas before land is acquired.
During construction phase the supervising Consultant will prepare an accurate census of the people to be affected by the proposed project depending on the final survey for alignment of various project infrastructures. For details refer appendix 5.

For the compensation plan to have broad-based popular acceptance, MUWASA shall consult and educate the affected population about the project impacts and requirement.

6.2.3 Impact: Noise and vibration problems

Proposed mitigation measures: It is recommended that construction producing nuisance level noise be minimized to cause the least disturbance to the local population

The contractor will familiarize himself with the legislation pertinent to noise generation. The contractor must take measures to limit noise levels during construction, taking into account the urban setting of the project.

Noise control measures will be implemented in the project areas according to the Tanzanian standard. If the noise levels exceed 90 dB for a continuous 8 hours exposure then protection measures such as ear muffles will be used to curb the effect of the noise exposure among the workers. Sound levels reaching the inner ear may be effectively attenuated by the use of hearing protective devices, such as earplugs and earmuffs. Appropriate selection of machinery fitted with sound muffles would also minimize noise pollution. The sewer pipe trenches in Musoma streets are expected to be small in size such that the use of heavy equipments for excavation and compaction after filling the trench is not foreseen. Thus vibration is expected to be minor.

6.2.4 Impact: Impaired air quality (dust and odour)

Proposed mitigation measures:

Mitigation measures against dust

The contractor will be responsible for the control of dust arising from his operations and activities. Control measures could include regular spraying of working / bare areas with water, at an application rate that will not result in mud and soil erosion. Workers will be provided with personal protective equipments such as dust musk when working in active construction sites.

Mitigation measures against odour

Operation and maintenance of the wastewater treatment pond will observe the following:

- The pond system will be commissioned at the beginning of summer so as to establish as quickly as possible the necessary microbial population to effect waste stabilization;
- The facultative and maturation ponds will be filled with fresh lake water so as to permit the gradual development of the algae and bacterial population. The facultative ponds will be left three to four weeks to allow the bacteria population to develop before filling with wastewater; and
- Anaerobic ponds will be filled with raw sewerage from septic tanks. The pond will then be loaded gradually to the design loading rate over the following week.
- The pH will be maintained at 7 to enable development of methanogenic bacteria. If necessary the ponds will be dosed with lime or soda ash in order to achieve the desired pH.

The maintenance requirements of ponds to minimize odour are very simple and will be carried out regularly as follows:

- Removal of screenings and grit from the inlet works;
- Cutting the grass and removing it so that it does not fall into the pond;

- Removal of floating scum and floating macrophytes from the surface of facultative and maturation ponds and spread the scum on anaerobic pond to maximize re-aeration and prevent fly and mosquito breeding in facultative and maturation ponds;
- Repair of any damage to the embankments caused by rodents, rabbits or other animals; and
- Repair any damage to external fence and gates.

Any odours that are produced by the proposed Wastewater Treatment Plant are likely to be significantly reduced by implementing the mitigation measures mentioned above. In addition, the site of the treatment plant will be located 200m from residential houses.

De-sludging and sludge disposal

Sludge from the aerobic lagoons will be removed frequently, spread in sludge drying beds, and allowed to dry in the sun naturally. There will be small odour problem from this operation because the sludge will be stabilized by natural processes in the aerobic lagoons. Anaerobic ponds will be disludged when they are one third full of sludge by volume. The sludge will be used for agricultural purposes in vegetable gardens and nearby fields.

Because of reasonable rainfalls during the rainy seasons, the ponds shall be emptied an interval of two times per year. This would cut in half the required surface of the sludge drying beds. Shorter periods are not recommended. However, the provision of separate faecal sludge settlement tanks reduces the required desludging interval of the anaerobic ponds. The same pond system is used at Mwanza WWTP.

6.2.5 **Impact: The loss of natural vegetation (Trees)**

Proposed mitigation measures: Only trees falling in the corridor of impact will be removed. Where possible tree will be left as much as possible because it takes years for trees to grow.

6.2.6 **Impact:** Loss of connectivity of wetland habitat along the lake shore
Proposed mitigation measures: The contractor will limit construction activities within the project impact area and avoid disturbance of areas outside the pre-scribed area.

6.2.7 **Impact: Health problems of workers from exposure to hazardous toxic materials and communicable diseases**

Proposed mitigation measures:

a) Employing qualified personnel and orientation of staff on new tasks;
b) Regular training of workers in occupational health, safety and emergency response;
c) Provision of appropriate personal protective equipment (PPE);

d) Provision of in-house medical personnel and First Aider together with provision of first aid facilities;
e) Provision of appropriate fire fighting equipment together with designation of a Fire Assembly Point; and

Personal protection

To protect skin from cement and cement mixtures, workers working in severe cement/concrete environment shall wear:

i) Alkali-resistant gloves;
ii) Overalls with long sleeves and full-length trousers (pull sleeves down over gloves and tuck pants inside boots and duct-tape at the top to keep mortar and concrete out);
iii) Waterproof boots high enough to prevent concrete from flowing in when workers must stand in fresh concrete;
iv) Suitable dust/respiratory protective gear (dust masks) when cement dust can't be avoided; and
v) Suitable eye protection where mixing, pouring, or other activities that may endanger eyes (minimum – safety glasses with side shields or goggles, under extremely dusty conditions, tight-fitting unvented or indirectly vented goggles).

Work practices

The contractors shall ensure that workers:

i) Work in ways that minimize the amount of cement dust released;
ii) Mix dry cement in well ventilated areas;
iii) Make sure to work upwind from dust sources;
iv) Where possible, use ready-mixed concrete instead of mixing on site;
v) When kneeling on fresh concrete, use a dry board or waterproof kneepads to protect knees from water that can soak through fabric; and
vi) Remove jewellery such as rings and watches because wet cement can collect under them.

Hygiene

The contractors shall ensure that construction workers adhere to the following:

i) Clothing contaminated by wet cement is quickly removed;
ii) Skin in contact with wet cement is washed immediately with large amounts of cool clean water;
iii) Do not wash hands with water from buckets used for cleaning tools; and
iv) Provide adequate hygiene facilities on site for workers to wash hands and face at the end of a job and before eating, drinking, smoking, or using the toilet. Facilities for cleaning boots and changing clothes shall also be available at the campsite.

Fencing of construction sites and completed facilities is needed for safety purposes for both the construction and operation phases to prevent animals and un-authorised people to enter the areas. For the wastewater treatment facilities, the fence shall be at least 60 metres from Lake Victoria shore so that fishermen could continue their present fishing activities without any objections.

6.2.8 Impact: Road traffic flow problems (spillages, accidents and congestion

Proposed mitigation measures: The mitigation measures include preparation of the traffic management plan during construction stage including allocation of specific routes for haulage vehicles. The Contractor will prepared the accident reporting forms indicating the root cause of accidents and the possible mitigation measures to avoid similar accidents in the feature.

6.2.9 Impact: Pollution of surface (lake and river) and ground water resources

Proposed mitigation measures:

Pollution could result from the release, accidental or otherwise, of chemicals, oils, fuels during the construction period, also the disposal of the effluent which has not met the required standards. The contractor and the operator must ensure that pollution of the environment particularly water bodies (in this case Lake Victoria) do not occur as a result of any activities on site as per section 123 – 129 of the EMA.

The contractor shall take all measures necessary to protect surface and groundwater from contamination by fuels and lubricants. He shall:

i. Protect all tanks for fuels and oils to contain any possible spills;
ii. Provide spill mitigation equipment including absorbents and oil skimmers; and
iii. Establish and maintain an emergency preparedness program.

Construction equipment may require on-site re-fuelling on a daily basis. It is recommended that fuel storage and maintenance of equipment shall not occur in or adjacent to watercourses. It is also recommended that petroleum products be handled in such a way that these materials do not enter the surface or groundwater system.

Repair any leaking sewerage pipes and cleanness of the manhole chambers as early as possible to stop nuisance and contamination of the wastewater with the surroundings resulting to the eruption of water borne diseases.

Manholes shall be always watertight. As long as the manholes will not be located in the paved road they will be raised by a maximum of 10 cm above the adjacent ground.

The consultant recommends that MUWASA makes house connections compulsory for all houses which have individual water supply connections.

6.2.10 Impact: Soil Erosion

Proposed mitigation measures:

For cleared land, it will be re-vegetated to slow down the movement of storm water. Tree and grasses planting campaign shall be undertaken to raise awareness and to minimize soil erosion. The contractor must ‘take all reasonable measures to prevent soil erosion resulting from diversions, restrictions or increases in the flow of storm water or river flow caused by the presence of temporary and permanent works, operations and activities. Proper compaction of raised embankment s will also reduce soil erosion.

6.2.11 Impact: Nuisance and insect breeding

Proposed mitigation measures

The sludge produced by the Wastewater Treatment Plant will be air-dried on-site in sludge drying beds before being moved to a sludge stockpile area. The sludge drying and stockpiling process will also allow flies, rnosquitoes and other insects to breed- The impact of these insect vectors is not expected to be great and will prove amenable to control if problems arise.

6.2.12 Risk management

Mitigation measures against electricity failure

Provision is made for standby generators at all pumping stations.

Mitigation against pump failure

Consideration will be given to the provision of additional storage at pumping stations in case of pump breakdowns - If space is available a lagoon will be provided to receive the overflow of waste water for at least one hour. In case of limited space an enclosed overflow tank will be constructed although the cost may be higher. Enclosed tanks are more environmentally acceptable than lagoons particularly in residential areas in order to avoid nuisance and odour.

Sewerage pumping stations only becomes a nuisance if not well operated and serviced. Regular monitoring and services will be done by pump attendants to be employed by MUWASA in collaboration with Musoma Municipal.

Pumps to be installed

1. Kitaji PS 1pump + (1 standby pump), Q = 17.5 l/s, H = 20.4 m
2. Iringo PS 1pump + (1standby pump), Q = 27.63 l/s, H = 16.9 m
3. Mukendo PS 2 pumps + (1 standby pump), Q = 64.26 l/s, H = 23.7 m
4. Trunk Main PS 2 pumps + (1standby pumps), Q = 64.26 l/s, H = 10 m

Note: 1 + (1): one pump operates and one pump as stand-by
2 + (1): up to two pumps operate simultaneously and one pump is stand-by

Mitigation against Raise in Lake Levels

The long term available data on Lake water level variation were studied during the Feasibility study and considered during the project design. The embankment design shall consider situation if lake water levels rise and flood the site. According to the Report of Geotechnical Investigations of Final Engineering Design (2011), nine (9) trial pits were dug at sewage treatment plant site. The report recommends for construction of embankments that the ground shall be excavated to the level of the toe of the outside slope and built up in layers of compacted thickness of 15 cm each. For the WWTP at Makoko, the earth embankments shall be constructed around the WWTP facilities to a level based on the 50-year ARI maximum water level of +1135 for Lake Victoria. Data of

long term water level of Lake Victoria at Bukoba gauge for the years 1986 – 2013 the design consultant received from Lake Victoria Basin Office through the LVEMP Representative indicate a maximum level in 1998 slightly above 1134.50 amsl.

CHAPTER 7: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

This chapter presents a plan for implementing enhancement and mitigation measures for addressing positive and negative environmental and social issue as presented in previous chapters. The measures are aimed at ensuring minimal disturbance and continuity of the existing ecological balances and socio-economic wellbeing of the area. The plan is also aimed at ensuring timely fulfilment of institutional requirements of the EMA 2004 and other regulatory agencies as well as MUWASA own policies on environmental sustainability, health and. The plan is summarized in tables covering Impact Enhancement; Impact Mitigation; Impact Monitoring and Reporting; and Emergency Response.

7.1 Enhancement plan for positive environmental and social impacts

The table below gives a summary of proposed interventions for enhancement of positive impacts associated with projects' implementation. The table further provides guidance on management objectives, performance indicator and specific management responsibility for each intervention. An implementation schedule has been included as well to guide timely implementation of the proposed management interventions together with costing for budgetary purposes.

Table 17: Enhancement plan for positive environmental and social impacts

No	Identified Impact	Enhancement Measures	Performance Indicator	Responsibility	Time frame	Cost Estimate
A.	**CONSTRCUTION PHASE**					
1	**Employment opportunity**	Promote and give priority employment to local community and train individuals assigned to manage the different departments for improved performance	Local residents to constitute the majority on the establishment list	MUWASA Musoma Municipal Council Residents	Construction period Operation period	Included in the cost of construction
2	**Improvement of community health**	Sensitization of the community to use the piped sewerage system rather than the ordinary pit latrines and septic tanks.	Number of household connected with sewer	MUWASA Musoma Municipal Council Residents	Construction and Operation Phase	3,000,000
B.	**OPERATION PHASE**					
1	**Increase of revenue collection for MUWASA**	Improved Service delivery by MUWASA; Encourage customers to use piped sewer system; People willingness to pay for sewerage services; and Adequate flow of piped water supply.	Increase revenue collected Improved service delivery	MUWASA	Construction and Operation Phase	NIL
2	**Improved quality of surface and ground water resources**	Regular monitoring and maintenance of sewer system and WWTP; Monitor surface and ground water	Low rate of disease incidences	MUWASA	Operation phase	6,000,000 annually

No	Identified Impact	Enhancement Measures	Performance Indicator	Responsibility	Time frame	Cost Estimate
		quality.				
3	**Increased forage availability for aquatic life**	Discharge effluent which meet discharge standard of receiving water bodies.	Forage availability	MUWASA Contractor	Construction and Operation phases	NIL
4	**Improve aesthetic value of Musoma Municipal**	Repair of any leaking sewerage pipes; Cleaning manholes and chambers; Create a buffer zone of at least 60 m from the lake;	Aesthetics of the surroundings; Increased tourist and business people	MUWASA Musoma Municipal Council	Operation phase	Included in the cost of operation
5	**Economical benefits accrued from reduction of costs of piped sewerage system**	Use of sewer system to avoid high cost of hiring septic tanks empties	Increased serving from cost of emptying septic tanks	Musoma Residents	Operation Phase	NIL
6	**Opportunity for fish farming**	Plant appropriate fish species and use of fishing gears	Number of catch fish	MUWASA Youth group	Operation Phase	800,000
6	**Social corporate responsibility and partnerships**	Employ Cooperate Officer (Liaison Officer) Participate in Local Community Development Projects	Less complaints from the residents	MUWASA Musoma Municipal Council	Operation Phase	Included in the total cost of the project

7.2 Mitigation plan for negative environmental and social impacts

Table 7.2 below is a summary of proposed interventions for mitigating identified negative Environmental and Social Impacts of the proposed Musoma Sewerage system and Treatment Plant works covering the preparatory, construction and operational phases. The table provides guidance on management objectives, performance indicator and specific management responsibility for each intervention. An implementation schedule has been included as well to guide timely implementation of the proposed management interventions together with costing for budgetary purposes.

Table 18: Mitigation Plan for Negative Environmental and Social Impacts

No	Identified Impact	Mitigation Measures	Performance Indicator	Responsibility	Time frame	Cost Estimate
A	**CONSTRUCTION PHASE**					
1	**Damage to infrastructure (roads, fenced wall and stone drive)**	Compensation in kind or cash Minimize land clearance to designated areas only	Number of complaints from owners	Contractor MUWASA Musoma Municipal	Periods of construction phase	10,000,000
2	**Loss of properties (land, farmlands, etc)**	Compensation in kind or cash Minimize land clearance to designated areas only	Number of houses and size of farmland lost	Contractor MUWASA	Periods of construction phase	82,000,000
4	**Land degradation**	Reinstatement of all areas disturbed during construction, Grading and shaping of borrow pits embankment to attain a slope of 1:3 for easy access by people and livestock.				
3	**Impaired air quality (Dust, odour from WWTP and manholes)**	Sprinkling water on bare surface; Covering transporting trucks;	Clean environment Number of workers using PPE	Contractor MUWASA	Periods of construction and operation phase	2,000,000

No	Identified Impact	Mitigation Measures	Performance Indicator	Responsibility	Time frame	Cost Estimate
		Provide PPE like dust masks Avoid overloading WWTP through proper designs; Stabilize sludge by natural processes in the sludge drying beds. Isolate the plant away from major centers of population				
4	**The loss of natural vegetation (Trees)**	Limit construction activities within the project impact area; Avoid disturbance of areas outside the project corridor of impact ; and Compensations for lost tress	Number of trees lost	Contractor MUWASA	Periods of construction phase	8,000,000
5	**Health problems of workers from exposure to hazardous toxic materials and communicable diseases**	Orientation of staff on new tasks; Train workers in occupational health, safety and emergency response; Provide Personal Protective Equipment (PPE); Provide First Aid facilities; and Provide appropriate fire fighting equipments; Establish a Health and Safety Committee.	Number of accidents and injuries	Contractor MUWASA Musoma Municipal	Periods of construction and operation phase	2,500,000
6	**Road traffic flow problems (spillages, accidents and congestion**	Prepare traffic management plan; Prepare accident reporting forms; Conduct root cause analysis of accidents;	Traffic jam Number of accidents	Contractor MUWASA Municipal Engineer	Periods of construction	Included in the cost of operations

No	Identified Impact	Mitigation Measures	Performance Indicator	Responsibility	Time frame	Cost Estimate
		Regular servicing of vehicles		TANROAD		
B	**OPERATION PHASE**					
1	**Pollution of surface (lake and river) and ground water resources**	Repair of any leaking sewerage pipes; Cleaning of manhole chambers Regular monitoring of surface and ground water quality. MUWASA to make house connections compulsory for all houses which have individual water supply connections	Clean environment	Contractor MUWASA	Periods of operation	Included in the cost of operations
2	**Soil Erosion**	Limiting earthworks to the dry season; Limiting the area subjected to soil disturbance; Construct sand traps along water channels and storm drains; Paving or stone pitching of storm drains; and Planting vegetation on disturbed areas.	Soil erosion by run-off water reduced; and Collapse of pond embankment prevented.	Contractor MUWASA	Periods of construction	Included in the cost of Construction

No	Identified Impact	Mitigation Measures	Performance Indicator	Responsibility	Time frame	Cost Estimate
3	**Nuisance and insect breeding**	air-dried sludge on-site in sludge drying beds Cleaning and cutting grass on pond embankment;	Insect vectors on WWTP	MUWASA Musoma Municipal	Periods of operation	Included in the cost of operations
4	**Increase Transmission of STI/HIV**	Wide distribution and use of condoms; Employment opportunities for project-affected women; Provision of family accommodation for construction workers; and Counseling	Number of HIV positive cases reduced	MUWASA Musoma Municipal		1,000,0000
	Pump failure	Provide stand by pumps Provide additional overflow storage lagoon or an enclosed overflow tank Frequent monitoring and repair	Overflow of wastewater Odour at pumping stations	MUWASA Musoma Municipal	Periods of operation	Included in the cost of construction
	Electricity cut off	Provide standby generators at all pumping stations	Over flow of waste water	TANESCO MUWASA	Periods of operation	Included in the cost of construction
	Raising water levels	Raise WWTP embankment above the anticipated lake water level Monitoring hydrological data	Damage to pond embankment	Contractor TMA MUWASA LVBWO	Periods of operation	Included in the cost of construction
C	**DECOMMISSIONING PHASE**					
1	Solid waste management	Removal of demolishes, concrete slabs, cement blocks, wood parts, metal parts and	Clean environment	Contractor MUWASA	During decommissioning phase	5,000,000
2	Shaping and Grading	Site Cleanup, stabilization, top soil repro-filing, landscaping and Re-vegetation	Aesthetic appearance of the surroundings	Contractor MUWASA	During decommissioning phase	10,000,000

CHAPTER 8: ENVIRONMENTAL AND SOCIAL MONITORING PLAN

Monitoring is a long-term process, which shall begin during construction and continue throughout the life of the project. Its purpose is to establish benchmarks so that the nature and magnitude of anticipated environmental and social impacts can be continually assessed. Monitoring involves the continuous or periodic review of construction and maintenance activities to determine the effectiveness of recommended mitigation measures. Consequently, trends in environmental degradation or improvement can be established, and previously unforeseen impacts can be identified or pre-empted and averted.

The overall objective of environmental and social monitoring is to ensure that recommended mitigation measures are incorporated, and that activities carried out during construction and operation are environmentally and socially acceptable, and therefore sustainable.

8.1 Monitoring Indicators

In identifying performance indicators, it is important to select indicators that are simple to monitor, and which will not necessitate the use of highly technical equipment or require specialized training. Performance targets have to be established before performance indicators are identified. In the case of this project, five overall performance targets can be put forward to cover the construction, operation and maintenance phases of the project.

i. Improved environmental management;
ii. Improved social management;
iii. Enhanced occupational health and safety;
iv. Increased gender sensitivity; and
v. Increased capacity at institutional level.

Various project impacts and aspects related to these overall performance targets. When the activities and indicators are established, the first activity is to collect baseline data which serves as a benchmark and against which changes in the identified indicators can be measured. The types of parameters that can be monitored may include mitigation measures or design features, or actual impacts. In some cases, such as blockage of sewers or manholes and soil erosion, monitoring is fairly straightforward and can be done as part of routine or periodic maintenance. However, other parameters, particularly those related to effluent and influent wastewater quality, Lake's water and socio-economic issues can only be effectively assessed over a period of 1 to 3 years.

Water quality, influent and effluent monitoring

Water quality monitoring (lake and groundwater) will be instituted to monitor water quality for Lake Victoria. Baseline data has been established at the start of the project

followed by subsequent monitoring during the operation phase. Detail of monitoring frequency is presented in the environmental and social monitoring plan. The quality of influent and effluent will also be monitored to access the performance of the WWTP as well as the quality of the effluent to be discharged into Lake Victoria. Details of parameters to be monitored are presented in table 8.1 below which includes but not limited to the following Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), COD (as an indicator of BOD), Amrnonia Nitrogen (NH3-N), Dissolved Oxygen and Ph.

The concentration of the parameter (pollutant) in the receiving river will be calculated using mass balance equation:

$$C = \frac{C1Q1 + C2Q2}{Q1 + Q2}$$

Where
C= Concentration of the parameter into the receiving water body (Lake Victoria) downstream the discharge point;
C_1= Concentration of the parameter in the Lake;
Q_1= Quantity of effluent flow in the Lake;
C_2= Concentration of the parameter in the effluent; and
Q_2= Quality of effluent from WWTP.

The monitoring plan in Table 8.1 below lists the indicators that shall be monitored during the course of this project. It describes parameters that can be monitored, and suggests how monitoring shall be done, how frequently, and who shall be responsible for monitoring and action.

Table 19: Environmental Monitoring Plan for both project components

No	Environmental Parameter to be Monitored	Frequency	Verifiable indicator	Means of Verification	Responsibility	Cost Estimate (Tsh)
1	Water and Wastewater Quality	Daily on WWTP Twice per year in the Lake	Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), COD (as an indicator of BOD), Amrnonia Nitrogen (NH3-N), Dissolved Oxygen and pH.	Monitoring Inspection Reports	MUWASA LVBWO NEMC	2,000,000 per month
2	Influent and Effluent discharge	Quarterly	Flow (m^3/s)	Flow Records	MUWASA LVBWO	Part of WWTP operations
3	Soils Quality	Twice per year in dry and wet season	pH, Electrical, conductivity, Nitrates, Sulphates, Phosphates , Borates Hydrocarbon Permeability Texture/structure.	Inspection Report	MUWASA LVBWO	500,000
4	Meteorological Data	Daily	Temperature, Rainfall, Humidity, Sunshine, Wind speed	Meteorological data	MUWASA LVBWO	Part of operation cost
5	Occupational Hazards	Once	Operation Manuals on Safety, Health and Environment for construction workers is developed and available on site.	Occupational Health and safety Monitoring and Audit Reports	MUWASA	600,000

No	Environmental Parameter to be Monitored	Frequency	Verifiable indicator	Means of Verification	Responsibility	Cost Estimate (Tsh)
6	Public Relations	Twice per year	Number of conflicts, Court cases, Grievances reduced	Labour laws	MUWASA Musoma Municipal	NIL
7	Socio-economic environment	Once per Month	Education Program for Workers on STDs and HIV/AIDS is developed	Awareness Campaign Sensitization reports Number of Condoms distributed	MUWASA LVBWO Musoma Municipal Ministry of Water	NIL
8	Employment to the local people	Once	Employees address Number of local people employed.	Establishment list	MUWASA LVBWO Musoma Municipal	Included in the cost of the project

8.2 Emergency response and rescue plan

The proposed Emergency Response Plan is hereby proposed to guide timely and effective response to emergency situations with the aim of safeguarding life and properties. It outlines basic procedures to follow during emergencies together with identification of roles and responsibilities for each individual. Emergency respondent contacts will also be maintained to that effect.

The table below gives a summarized Emergency Response Plan. The plan identifies likely emergency situations followed by an elaboration of the proposed response and finally identifies the respondents. It is anticipated that implementation of the plan would safeguard the health and safety of workers, community as well as to safeguard infrastructure against excessive damage, odour and loss of life and properties.

Table 20: Emergency response and rescue plan for both Musoma sewerage project

No	Emergency	Action in Response	Responsible for Action	Period	Requirements
1	Risk and end use of by products (Sludge)	Drying sludge in sludge drying bed Use small lagoon enclosed chambers	MUWASA Contractor	Construction and operation phase	
2	Pump failure	Use of by pass Frequent monitoring and servicing of pumps All electrical supply points to be switched off immediately. Report matter to authorities	MUWASA	Operation phase	Alarm installation
3	Injuries amongst workers and/or other people	Apply first Aid, Evaluate and Evacuate victim to nearest hospital if necessary	Site engineer/ Duty manager/ First Aid attendants	Construction and Operation phase	First Aid facilities and Aid Attendant, Stand-by medical evacuation services
4	Pond embankment failure	Regular embankment inspection	Site engineer	Construction and operation Phase	Safety Engineers
4.	Drowning in the reservoir	Fencing pond area Rescue from water, Administer First Aid, evaluate and evacuate to nearest hospital if necessary	Life server First Aid Attendant	Operation Phase	First Aid facilities and Trained First Aid Attendant,

CHAPTER 9: COST BENEFIT ANALYSIS

Cost-benefit analysis (CBA) and related economic appraisal methodologies allow investors to determine the economic return to potential disaster risk reduction interventions, to support a rational comparison of available options and to help ensure that investment decisions are accountable. Such tools can be used to determine the net economic benefits both of dedicated disaster risk reduction projects and of the inclusion of disaster risk reduction features in other development projects.

Economic criteria are not the only ones by which projects are judged and only multilateral lending agencies routinely undertake formal economic analysis as part of their project appraisal process. However, in the face of this project which is being implemented under the Lake Victoria Environmental Management Project Phase Two (LVEMP II) is a compliment and upscale of LVEMP I which ended in December 2005. As such, the consultant requires robust secondary evidence that the investment decisions are economically and environmentally sound. Evidence on the potential social economic benefits of the project played a more fundamental role in securing initial attention in and commitment to investment.

In this case a decision has already been made in principle to proceed with the intended project investment. It will finance investments aimed at reducing point sources of pollution in priority hot spots, identified during LVEMP I.

The total investment cost of the proposed project is estimated at **TZS 21,173,460,000/=** while the cost of mitigation the negative impact is estimated at **TZS**. **184,835,700/=** or 0.009% of the total project cost.

The geographical boundary for CBA is Musoma Municipal but can readily be extended to wider limits.
Some environmental and social mitigation measures will be done while implementing the primary project activities such that the cost of mitigating the impacts is seen in the light of project investment and not as a separate cost (cost of mitigating the impact is included as part of the project cost).
The cost of vegetation and some crops loss in the proposed pumping stations and WWTP is not significant as there are no rare specifies in the areas. The vegetable that is grown in the area has no tangible value as residents are cultivating in small patches. Other cost that may raise e.g the cost of compensations for the house structure at the Trunk pumping station may be proved to be the expensive cost as it will take away the plot which is surveyed and semi developed. For the proposed project the fear of WWTP rapture is minimal since proper design will be employed. Therefore based on good engineering design and periodic WWTP safety inspection coupled with community sensitization, the probability of WWTP failure is low hence not significant as compared to its benefit.

CHAPTER 10: DECOMMISSIONING AND CLOSURE PLAN

The term decommissioning refers to administrative and technical actions taken to allow removal of some or all of a facility. It is a controlled process used to safely retire a facility that is no longer needed. During decommissioning, waste materials, equipment or structures are cleaned or secured so that the facility does not pose risks to public health or the environment at present or in the future.

The project which involves construction of piped sewerage system and treatment plant is not like a manufacturing facility or mining where the method used to manufacture some products are increasingly replaced by modern technology or a new process or in case of mining where minerals diminished the decommissioning do apply. The design life of this project is 10 to 20 years based on how the infrastructure will be maintained. Therefore decommissioning of this project will be mainly be decommissioning of temporally structures used during construction phases. The main activity during decommissioning will be cleaning up of the site before handing it over to MUWASA. The decommissioning process will therefore entail the following actions:

i) Waste management and disposal;
ii) Shaping and grading.
iii) Reinstatement of borrow pits

10.1 Waste management and disposal

Decommissioning is likely to generate a certain amount of waste and debris that must be safely handled, managed and disposed. The wastes that will be generated include:

i) Material wastes which will include concrete wastes;
ii) Empty barrels and tins;
iii) Timber, plastics, and paper packaging; and
iv) Used equipment parts.

Some of the materials may be suitable for salvage and recycling rather than disposal. Waste disposal will consider the different categories of waste produced during decommissioning and aim at the safe management of such waste. Reuse and recycling strategies have the potential of reducing the amounts of waste to be managed.

10.2 Shaping and grading

This will involve earthwork and top soil restorations along the sewer line, around pond embankment and in all sand and borrow pits that will be used as a source of construction material for the project.

The following activities will be undertaken:

Site Cleanup: The sites will be cleaned up by removing any litter and debris lying about and disposed of safely.

Site Stabilization: Actual works will include levelling, slope profiling and compacting as appropriate.

Top Soil repro-filing and landscaping: Top soil stripped and stockpiled during site preparation will be repro-filed back in an appealing landscape to aid vegetation re-colonization and blending of the site into the surrounding aesthetic view.

Re-vegetation: Grass will be planted around the re-profiled area preferably at the beginning of the rainy season. The grass will be transplanted from surrounding areas to avoid introduction of alien species. Other works will involve fencing in the case of the pumping stations and WWTP site to prevent entrance the area.

Post Rehabilitation Care, Maintenance and Monitoring: Post planning preventive maintenance works will be carried out at the sites to ensure successful site healing and establishment of vegetation. This would include watering and replanting where weather conditions are not favourable, erosion reduction works such as stone pitching and gully formation control will be applied.

10.3 Reinstatement of borrow pits

i) Reinstatement as closely as possible to original condition of property occupied, used, damaged or destroyed by the works. Note that reshaping and replanting of borrow pits to the Engineer's satisfaction is a requirement for the issuance of the Taking-Over Certificate;
ii) Replacement and spreading of topsoil as part of the reinstatement by landscaping of borrow pits and areas used for the disposal or storage of surplus materials;
iii) Burying and use for shaping borrow areas of material unsuitable for supporting vegetation, and subsequent laying of soft material over the unsuitable material. Spreading of all available soft material evenly;
iv) Scarification along contours of borrow areas to avoid undue erosion when sufficient soft material is not available to cover the entire borrow area;
v) Shaping and reinstatement of areas in such a manner that they will drain properly wherever practicable and, where required, placing of earth banks to divert surface water from the borrow area;
vi) Scarification of all work areas not seeded or replanted, providing a condition that facilitates natural re-vegetation and proper drainage, and prevents erosion;
vii) Fencing of steep quarry and pit walls to prevent livestock and people falling in the borrow pit:

Table 21: Decommissioning Plan

S/N	ITEM	COST ESTIMATE (Tsh)
1	**Waste Management and Disposal**	5,000,000
	i) Removal of concrete wastes, empty barrels and tins, timber, plastics, and paper packaging.	
2	**Shaping and Grading**	10,000,000
	i) Site Cleanup	
	ii) Site Stabilization	
	iii) Top Soil repro-filing and landscaping	
	iv) Re-vegetation	
3	**Reinstatement of borrow pits**	5,000,000

CHAPTER 11: SUMMARY AND CONCLUSION

This report is the Environmental Impact Statement that has been prepared to meet the requirement of the Environmental Management Act, 2004 and the Environmental Impact Assessment and Audit Regulations, 2005.

In conducting the ESIA, consideration was taken such that the ESIA concentrate within the area of the project, as such, extensive baseline studies have been undertaken with the aim of understanding the environmental settings of the project area in order to devise the appropriate mitigation measures for potential impacts. In addition, specialized experts who undertook these studies have been drawn from different disciplines in order to ensure that the generated data, analysis and hence recommendations, meet the required standards.

To summarize it the entire project will improve the health and environmental conditions of the Musoma urban communities and strengthen the environmental planning, management and monitoring functions of MUWASA. Full environment benefits will be achieved through effective operation and maintenance. The sewage treatment plant will reduce the pollution load on surface water and improve the quality of receiving water of the Lake Victoria.

REFERENCES

1. **NEMC (2002),** General Environmental Impact Assessment Guidelines and Procedure

2. **The United Republic of Tanzania (2004).** The Environmental Management Act

3. **The United Republic of Tanzania (2005).** The Environmental Impact Assessment and Audit Regulation

4. **URT (2008a).** The Strategic Environmental Assessment Regulations, Dar es Salaam

5. **URT (2002),** National Water Policy 2002

6. **Mara, D. and Pearson, H. 1998**. Design manual for Waste Stabilization Ponds in Mediterranean countries.

7. **Poyry Environment GMBH and Don Consult Ltd, 2011**. Final Engineering Design Report for Sewerage System for Musoma Municipality. Ministry of Water.

8. **LVEMP II March 2008**; Environmental and Social Management Framework

9. **Ministry of Water, April 2014**: Water Sector Development Programme. Environmental and Social Management Framework

APPENDICES

Appendix I: Terms of Reference for Impacts Assessment

1.1 INTRODUCTION

The town of Musoma is located on the eastern shores of Lake Victoria and about 250 km north of Mwanza. It has a total urban population of about 160,000. About 65% of the population is currently served with potable water by the Musoma Water and Sewerage Authority (MUWASA). The Municipality does not currently have a sewerage system. Management of water and sewerage services is the responsibility of MUWASA.

The government of Tanzania with assistance from development partners intends to implement a sewerage system in Musoma Municipality. The Musoma municipality water supply will also be rehabilited and expanded, which will increase the water production from the current 10,000 m^3 per day to 36,000 m^3. The water supply project implementation is planned to start before the end of 2012. Currently there is no waste water system to treat the waste water resulting from the present water use nor for the planned expansion. The waste water generally flows untreated into Lake Victoria contributing to the pollution of the Lake.

The sewerage system project in Musoma Municipality is intended to address the sanitation problem in Musoma, controlling polution of the lake, improve health, livelihood and stimulate economic development by providing a healthy enviroment. Studies and designs of expansion of water supply and a sewerage system were completed in 2010 and 2011 respectively by Poyry Environmental Gmbh.

In order to comply with environmental legislation, an environmental and social impact assessment is required before the project is implemented. Therefore, LVEMP II is supporting Musoma Urban Water and Sanitation Authority (MUWASA) to carry out this required by law environmental and social impact assessment (ESIA) study.

1.2 OBJECTIVE OF THE ASSIGNMENT

The main objective of the consultancy services is to undertake Environmental and Social Impact Assessment (ESIA) for the proposed sewerage system project in Musoma Municipality.

1.3 SCOPE OF WORK

The Consultant shall perform all technical investigation studies of the project. In particular the consultant shall review all the available and relevant documents, maps, previous studies if any and perform **Environmental and Social Impact Assessment**. The scope of services is further detailed as follows:

Task 1 – Description of the Proposed Project

The Consultant shall provide a brief description of the relevant parts of the project using illustrations where necessary and produce the Report as per the National Environmental Impact Assessment Guidelines

Task 2 – Description of the Environment

The Consultant shall assemble, evaluate and present baseline data on the relevant environmental characteristics of the study area. The Consultant shall include information on any changes anticipated before the project commences and modify the lists below to show the critical information for this project or which is relevant to it.

a) ***Physical environment:*** This shall cover geology; topography; soils; climate; ambient air quality; surface and groundwater hydrology; existing sources of air pollution and other emissions; existing water pollution discharges; receiving water quality and infrastructure (roads, water supply, etc) that are relevant to the project.
b) ***Biological environment:*** This shall cover aquatic and terrestrial flora and fauna to identify rare and endangered species that could be affected in any ways by the project implementation.
c) ***Socio-economic and cultural environment:*** This shall include population, land use, planned development activities, community structure, employment, distribution of income, goods and services, public health, gender issues and HIV/AIDS that are deemed to be influenced by the project.

Task 3 – Legislative, Policy and Institutional Framework

The Consultant shall describe the pertinent regulations and standards governing environmental quality, health and safety, protection of sensitive areas, protection of endangered species, sitting, and land use control at international, national, regional and local levels. The Consultant shall undertake a review of policies, legislation and institutional frameworks within which the environmental management of the proposed project will be carried out.

Task 4 – Identification and Assessment of Potential Impacts

The Consultant shall identify and assess potential environmental and social impacts of the proposed project. The Consultant shall distinguish between positive and negative impacts, direct and indirect impacts and immediate and long-term impacts. The Consultant shall identify impacts that are unavoidable or irreversible and wherever possible, shall describe impacts quantitatively in terms of environmental components affected (area, number), environmental and social costs and benefits and assign economic values when feasible. The Consultant shall characterize the extent and quality of available data, explaining significant information deficiencies and any uncertainties associated with the predicted impacts.

The assessment shall focus on the potential for negative environmental and social impacts caused by planned and unplanned migration of people and increased pressure on land; social disruptions and conflicts and any threats to ecology. The assessment shall also consider beneficial (positive) impacts that might need enhancements to maximise the benefits.

An overview shall be provided of different groups of people and their cultural, ethnic, and socio-economic characteristics, and how they are likely to benefit and/or be negatively affected by the project. Negative impacts may include but not be limited to physical relocation, loss of land or other physical assets, or loss of access to livelihood.

The significance of impacts of the proposed project shall be assessed and the basis of this assessment shall be specified. The Consultant shall take into consideration existing by-laws, national and international environmental standards, legislation, treaties and conventions that may affect the significance of identified impacts. The Consultant shall use the most up to date data and methods of analyzing and assessing environmental and social impacts. Uncertainties concerning any impact shall be indicated.

Task 5 – Mitigation Measures

The Consultant shall suggest cost-effective measures for minimizing or eliminating adverse (negative) impacts and recommend measures for enhancing beneficial (positive) impacts of the proposed sewerage system construction project. The costs of implementing these measures shall, wherever possible, be estimated and presented. If compensation is recommended as one form of mitigation, the Consultant shall identify all the names and physical addresses of people to be compensated.

Task 6 – Environmental and Social Management Plan (ESMP)

The Environmental and Social Management Plan (ESMP) focuses on three generic areas, i) implementation of mitigation measures and ii) institutional strengthening and training and iii) monitoring. The Consultant shall prepare an ESMP, which will include proposed work programme, budget estimates, schedules, staffing and training requirements and other necessary support services to implement the mitigation measures. Institutional arrangements required for implementing this management plan shall be indicated.

The Consultant shall identify institutional needs to implement environmental assessment recommendations. The Consultant shall review the authority and capability of institutions at local, regional and national levels and recommend how to strengthen the capacity to implement the environmental and social management and monitoring plans. The recommendations may cover such diverse topics as new laws and regulations, new agencies or agency functions, inter-sectoral arrangements, management procedures and training, staffing, operation and maintenance training, budgeting, and financial support.

Task 7 – Environmental and Social Monitoring Plan (ESMoP)

The Consultant shall prepare detailed arrangements to monitor the implementation of mitigating measures and the impacts of the project during construction, operation and decommissioning. The plan shall include an estimate of capital and operating costs and a description of other required inputs. The cost of implementing the monitoring and evaluation including staffing, training and institutional arrangements must be specified. Where monitoring and evaluation will require inter-agency collaboration, this shall also be indicated.

1.4 DURATION

The duration to carry out the ESIA for Musoma Sewerage System shall be 90 days. This will cover all aspects of ESIA from impacts assessment to public disclosure of the findings.

1.5 EXPERTISE

1.5.1 Coordinator and Environmental Scientist/Engineer

Taking cognizant of the entire exercise for the environmental and social assessment and the nature of the project, the study will be led by a Coordinator. This is a seasoned environmentalist capable of putting together different ideas that will come out during the assessment and be included into the final Environmental and Social Impact Statement (ESIS). The Coordinator will

- Identify and mobilise the experts (Environmentalist, Sociologist, Water Engineer, Land /Town Planner, Valuer) required for undertaking the EIA
- In consultations with the experts, formulate the respective scopes of work and assign the experts tasks to be accomplished
- Put together the reports from the experts into a consolidated ESIS and submit the report to the client
- Assist the client staff during the review session organized by the National Environment Management Council (NEMC)
- Answer any questions and queries that will arise from the review meeting and incorporate the answers into the final report.

The Coordinator shall have at least a degree in environmental management or related discipline and with training or appreciable experience on environmental and social sciences or related disciplines. He/she must have done EIAs of at least five (5) projects of a similar nature within the past ten (10) years. As a mandatory, he/she shall be fluent in written and spoken Kiswahili and English.

Apart from coordination role, coordinator shall be responsible for carrying out an environmental impact assessment of the project and prepare Environmental Management Plan (EMP) in order to minimize any negative impacts that the project will have on the environment.

The Environmentalist shall have a degree in environmental management or related discipline and with training or appreciable experience on some social sciences or related disciplines. He/she must have done EIAs of at least two (2) projects of a similar nature within the past ten (10) years. As a mandatory, he/she shall be fluent in written and spoken Kiswahili and English.

1.5.2 Sociologist/Socio-economist

The sociologist/socio-economist shall be responsible for carrying out social impact assessment of the project and prepare Social Management Plan (SMP) in order to minimize any negative impacts that the project will have on the communities and their livelihoods. He/she shall also be responsible for conducting the economic impact assessment and prepare mitigation plan in order to minimize any negative impacts that the project will have on the people around the project site.

The socio-economist shall have a degree in social/economic or related discipline and with training or appreciable experience on environmental sciences or related

disciplines. He/she must have done EIAs of at least two (2) projects of a similar nature within the past ten (10) years. He/she shall be fluent in written and spoken Kiswahili and English.

1.5.3 Civil & Water Resources Engineer

The engineer shall be responsible for interpreting the design drawings and layouts in relation to existing facilities including buildings, roads and storm and wastewater management systems. He/she shall assist environmentalist and socio-economist on issues relevant for the preparation of ESMP.

The engineer shall have at least a degree in civil engineering knowledgeable in building drawings, water supply and wastewater management. He/she shall have an experience in working with similar types of projects in similar roles.

1.5.4 Ecologist

The ecologist shall be responsible for carrying out field surveys of flora and fauna within the project sites. He/she shall assist coordinator and sociologist/socio-economist on issues relevant for the preparation of ESMP.

The plant ecologist shall have at least a degree in terrestrial/aquatic ecology or related fields. He/she shall have an experience in working with similar types of projects in similar roles.

1.5.5 Resettlement Expert / Valuer

The resettlement expert shall be responsible for carrying out field surveys of people and properties within the project sites that might be affected by the implementation of the Musoma sewerage system project. He/she shall assist environmentalist and socio-economist on issues relevant for the preparation of ESMP.

The resettlement expert shall have at least a degree in economics or related fields. He/she shall have an experience in working as land and property valuer in projects of similar nature and be knowledgeable of World Bank Group and Tanzanian resettlement guidelines and procedure.

1.6 REPORTING

The ESIS shall be concise and limited to significant environmental issues. The main text shall focus on findings, conclusions and recommended actions supported by summaries of the data collected and citations for any references used in interpreting data. Detailed or uninterpreted data are not appropriate in the main

text and shall be presented in appendices or a separate volume. Unpublished documents used in the ESIA may not be readily available and shall also be assembled in appendices. Organize the reports according to the Environmental Impact Assessment and Environmental Audit Act of 2005 provisions.

Appendix 2: Summary of views and concern from stakeholders

4.3 STAKEHOLDERS CONCERNS

4.3.1 Consulted stakeholders

In respect of the intended project activities, the stakeholders that were consulted raised concerns on a number of issues that need attention. The issues are grouped into:

Concerns on physical environments

i) Pollution of Lake Victoria from existence of WSP closest to the lake

ii) Land unavailability for installation of sewers since most streets are narrow with gravel/tarmac lanes and wide surface runoff drains

iii) Destruction of roads when installing sewers across roads and there is a need for using underground drilling technology

Concerns on biological environments

The main concerns of consulted stakeholders during scoping stage in relation to biological environments were:

i) Loss of lake biodiversity from lake pollution once WSP operate at lower than intended/estimated efficiency

Concerns in socio-economic and cultural environments

The main concerns of consulted stakeholders during scoping stage in relation to socio-economic and cultural environments were:

i) Employment mainly during construction

ii) Compensation for properties and land that will be acquired from the community

iii) Compensation process from who does the evaluation, evaluated amounts to timing of actual compensation

iv) Land availability for those displaced from the acquired land

v) Benefits accrued from reduction of costs of piped sewerage system compared to current high costs of septic emptiers

vi) Affordability of sewerage system charges to the wider group of potential low-income customers

vii) Contamination of water supply by the wastewater system if they are laid adjacent to one another, the condition which might trigger diseases

4.3.2 Consultant team

Expert analysis following fieldwork in Musoma Municipality and specifically in the project areas indicated several additional issues that need consideration during impacts assessment stage. They include

Concerns on physical environments

i) Noise, dust and vibrations during material mobilisation, site clearance, construction and demolition

ii) Odour nuisance to nearby community from poorly performing WSP

iii) Liquid and solid wastes management infrastructural problems particularly during construction

iv) Sewerage pipe crossing of rivers might affect conveyance capacity of the river and affected/damaged by flood water

v) Pollution of rivers from emergency operation of the bypass valve at north Mwisenge

vi) Lake pollution from inefficient WSP and emergency operation of bypass valve

vii) Demolition of properties (e.g. houses at proposed trunk Pumping Station)

Concerns on biological environments

i) Loss of aquatic biodiversity from lake and river pollution from inefficient WWSP and emergency operation of bypass valve to discharge into small rivers at northern Mwisenge

ii) Loss of plants/vegetation at locations where sewers are passing and at WWSP site

Concerns in socio-economic and cultural environments

i) Health problems of workers from exposure to hazardous toxic materials and communicable diseases

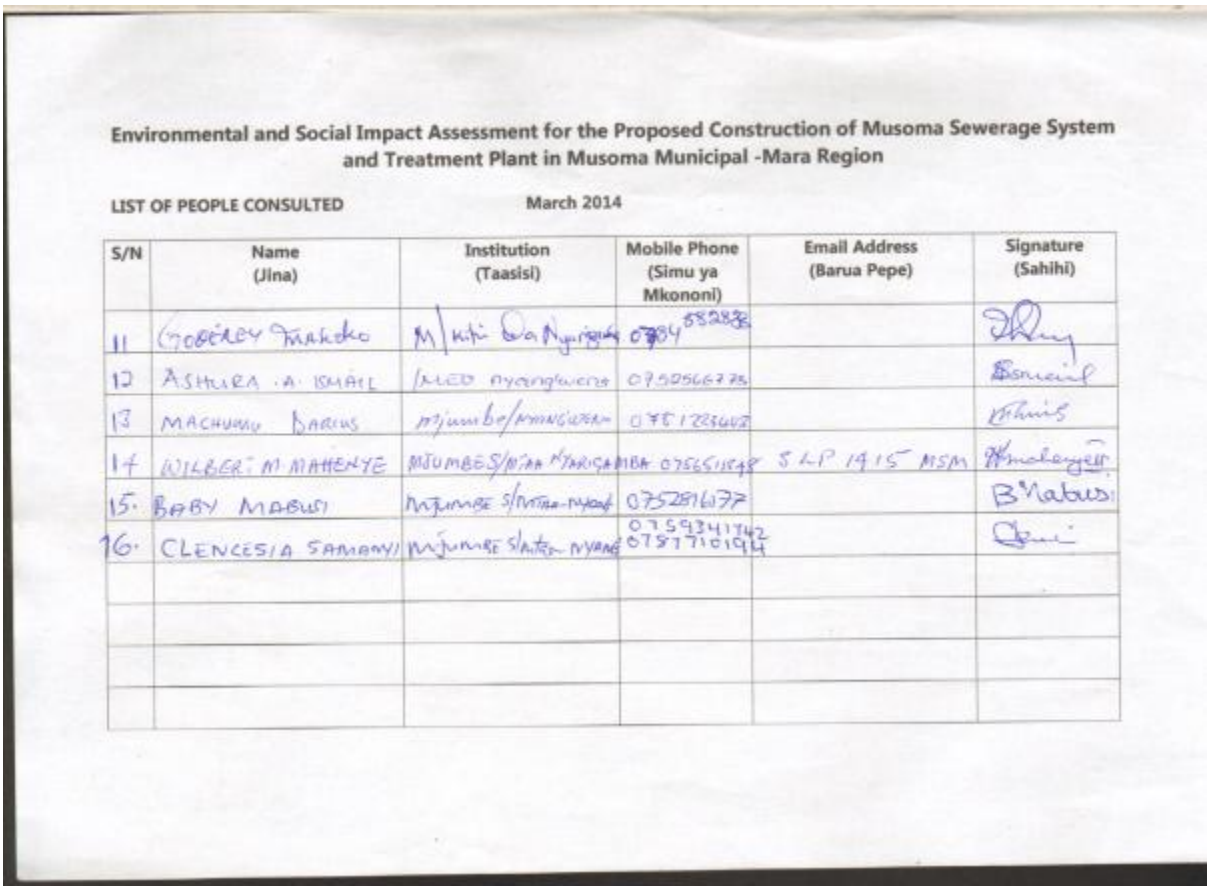
ii) Employment during clearance, construction, operation and maintenance of the project facility

iii) Loss of land by the community using for various purposes with or without permits (certificate of occupancy)

iv) Involuntary resettlement

v) Road traffic flow problems (spillages, accidents, etc)

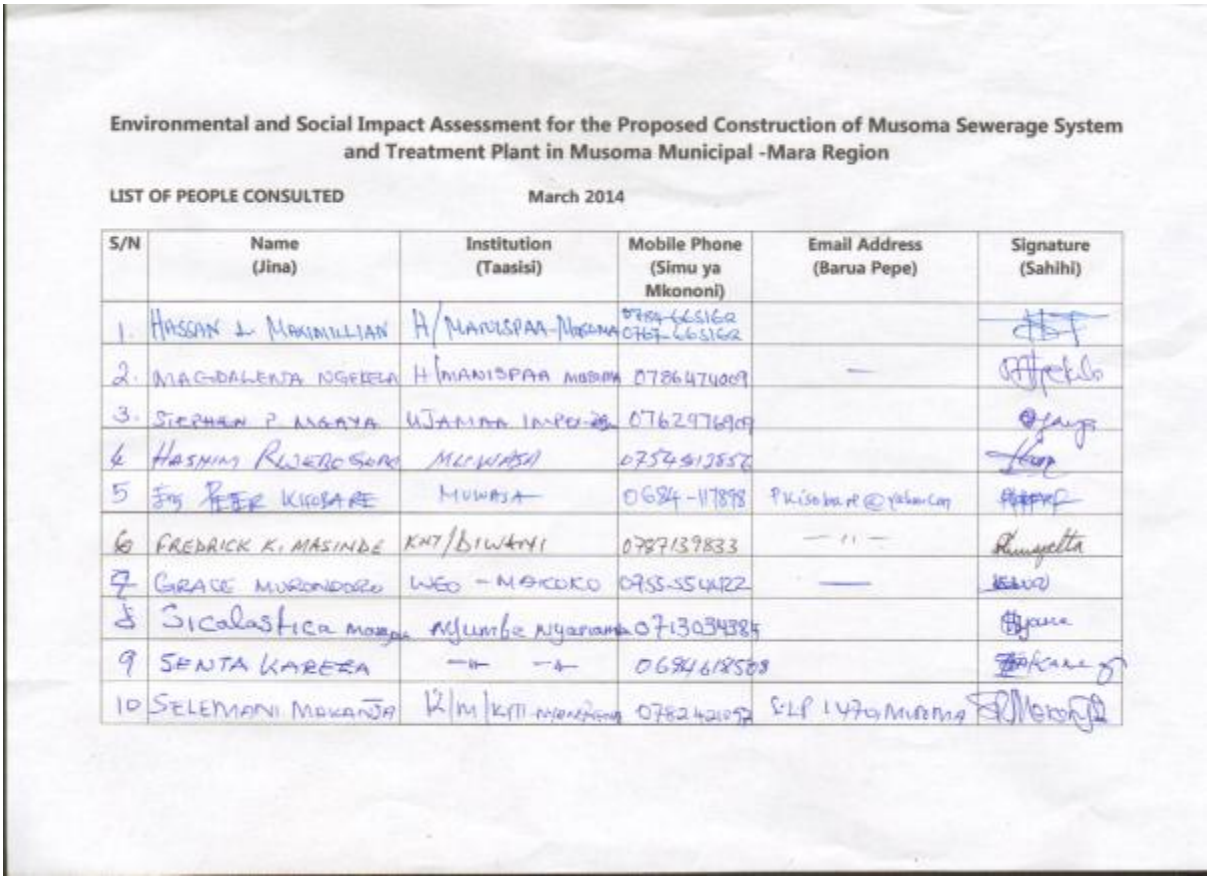
Appendix 3: List of people consulted



Environmental and Social Impact Assessment for the Proposed Construction of Musoma Sewerage System and Treatment Plant in Musoma Municipal -Mara Region

LIST OF PEOPLE CONSULTED **March 2014**

S/N	Name (Jina)	Institution (Taasisi)	Mobile Phone (Simu ya Mkononi)	Email Address (Barua Pepe)	Signature (Sahihi)
11	GODFREY Makoko	M/kti Wa Nyirobi	0784 552838		
12	ASHURA A. ISMAIL	MUCO nyanguera	0755066778		
13	MACHUMU DARIUS	mjumbe/MWANGUSA	0751223662		
14	WILBERT M MAHENYE	MJUMBE S/MTAA MYARIGAMBA	0756511848	S.L.P 1915 MSM	
15.	BABY MABUSI	mjumbe s/mtaa-nyan	0752916177		
16.	CLENCESIA SAMANYI	mjumbe s/mtaa nyang	0759341742 0787710194		

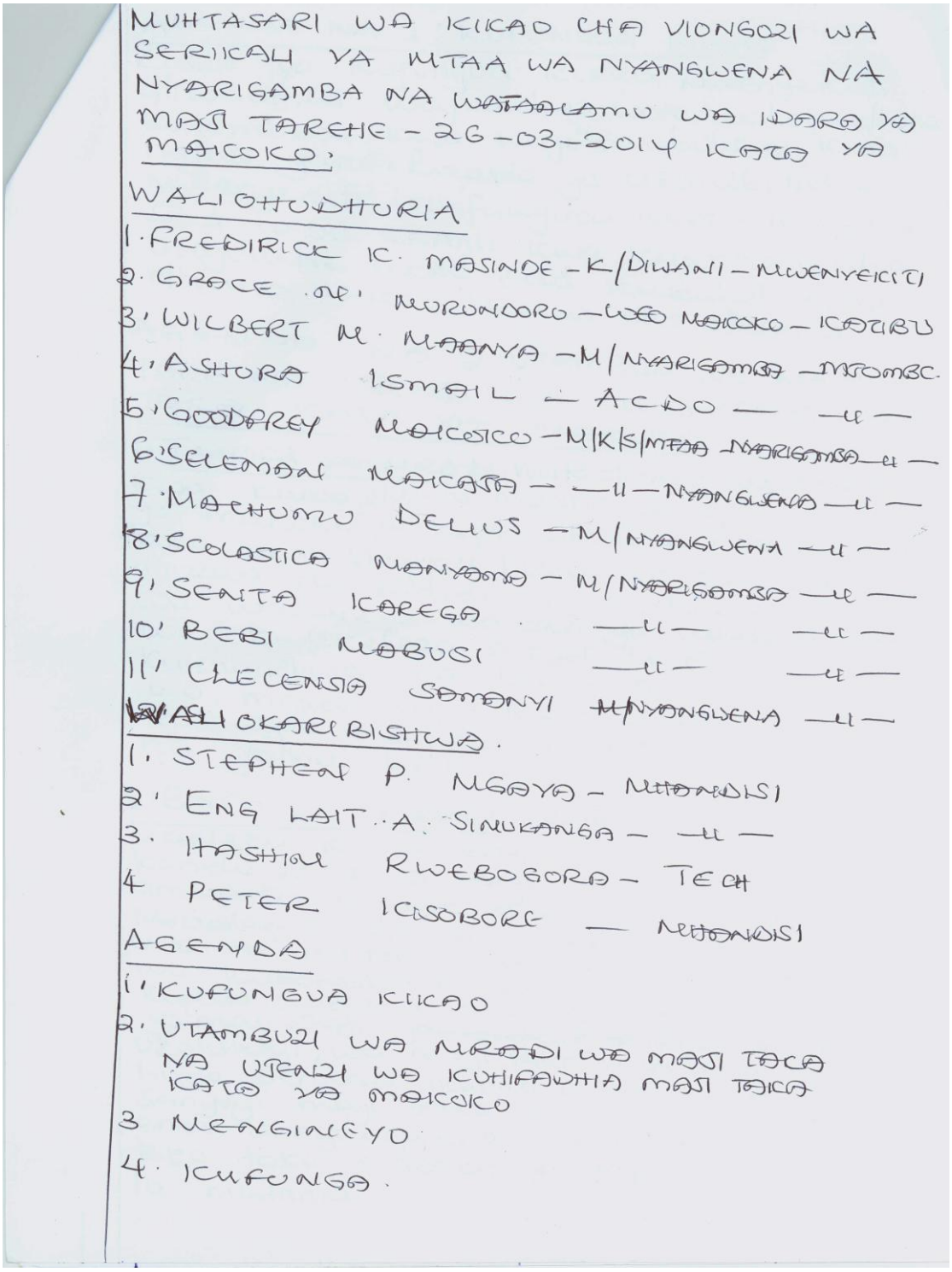


Environmental and Social Impact Assessment for the Proposed Construction of Musoma Sewerage System and Treatment Plant in Musoma Municipal -Mara Region

LIST OF PEOPLE CONSULTED **March 2014**

S/N	Name (Jina)	Institution (Taasisi)	Mobile Phone (Simu ya Mkononi)	Email Address (Barua Pepe)	Signature (Sahihi)
1.	HASSAN L MAKUNULIAN	A/MANISPAA-MUSOMA	0754-665162 0767-665162		
2.	MAGDALENA NGEREJA	H/MANISPAA MUSOMA	0786474009	—	
3.	STEPHEN P NGAYA	UJAMAA IMPEX	0762976909		
4	HASNIM RWEYEMAMU	MUWASA	0754913857		
5	[illegible] KISOBARE	MUWASA	0684-117898	Pkisobare@yahoo.com	
6	FREDRICK K. MASINDE	KNY/BIWATA	0787139833	— " —	
7	GRACE MUKONDORO	WEO - MAKOKO	0755-554122	——	
8	Sicalastica [illegible]	Mjumbe Nyasaka	0713034384		
9	SENTA KAREZA	—" —	0684618588		
10	SELEMANI MAKANJA	K/M/KITI MAKUTANO	0782401097	S.L.P 1470, MUSOMA	

Appendix 4: Minutes of stakeholder's consultation meeting



MUHTASARI WA KIKAO CHA VIONGOZI WA SERIKALI YA MTAA WA NYANGWENA NA NYARIGAMBA NA WATAALAMU WA IDARA YA MAJI TAREHE - 26-03-2014 KATIKA YA MAICOKO:

WALIOHUDHURIA

1. FREDRICK IC. MASINDE - K/DIWANI - NYENYEKITI
2. GRACE .M. MURONDORO - AFISA MAICOKO - KATIBU
3. WILBERT M. MAANYA - M/NYARIGAMBA - MJUMBE.
4. ASHORA ISMAIL - ACDO - "
5. GODFREY MAICOKO - M/K/S/MTAA NYARIGAMBA - "
6. SELEMANI MAICABA - " - NYANGWENA - "
7. MACHUMU DELIUS - M/NYANGWENA - "
8. SCOLASTICA NYAMOMO - M/NYARIGAMBA - "
9. SENITA ICAREGA - " - "
10. BEBI NYABUSI - " - "
11. CHECENSIA SOMONYI M/NYANGWENA - "

WALIOKARIBISHWA.

1. STEPHEN P. NGAYA - MTHAMINI
2. ENG LAIT. A. SINUKANGA - "
3. HASHIM RWEBOGORA - TECH
4. PETER ICHOBORE - MTHAMINI

AGENDA

1. KUFUNGUA KIKAO
2. UTAMBUZI WA MIRADI WA MAJI TAKA NA UTAMBUZI WA KUHIFADHIA MAJI TAKA KATIKA YA MAICOKO
3. MENGINEYO
4. KUFUNGA.

AGENDA NA 1: KUFUNGUA KIKAO

Kabla ya Kufungua kikao mwenyekiti aliwaomba wajumbe wote waliohudhuria kutambua kwa kujitambulisha, kwa nafasi yake. Baada ya utambulisho mwenyekiti alifungua kikao saa 10.00 kamili kwa mwakaribisha wajumbe wote kwa kuwakaribisha dhuria kikao hicho cha dhanda.

AGENDA NA 2: UTAMBUZI WA MRADI TAKA NA UJENZI WA KUTIRADHIA MAJI TAKA KATA YA MAKOKO

1: TAARIFA YA MRADI. Wataalamu walianza kwa kuwajulisha maana ya ujio wao kata ya makoko, ni kujitambulisha mradi wa maji taka kwa viongozi husika wa eneo linalozunguzwa na mradi na upato ushirikishwaji wa wananchi wakati ya ujenzi/uanzishaji wa kutekeleza mradi huo na wananchi kuelimishwa na kuelewa umuhimu wa, mradi huo, Mara mradi utakapopata kusimepo msigishano kati ya serikali na jamii husika.

2: ENEO LA MRADI: wajumbe walipata maelezo kuwa eneo la mradi litakuwa kando ya ziwa eneo la nyangwena ambako kutachotwa mahanga. Pia Mtaalamu aliendelea kueleza kuwa mradi huo ni mradi endelevu kwa kuwa mradi wa kuboresha manispaa ya musoma wananchi kupata huduma ya maji safi, hivyo mahitaji ya maji safi ~~yataongezeka~~ yataongezeka hivyo uzalishaji wa maji taka utakuwa mkubwa hivyo serikali ikaona uwepo mradi wa ukusanyaji maji taka utakaotengeneza matanki eneo la nyangwena na mabomba ya maji taka toka maeneo ya mji mpaka eneo la matanki

3. UMUHIMU WA MRADI

1. Ukusanyaji wa maji taka, hivyo yatajengwa matanki 4 na mwisho linaweza kuwa Bwala la kufugia samaki, wananchi kufaidika na mradi huo ~~wa~~

2. Wananchi kushirikishwa asilimia 100% kwa kufanyo mazungumzo na jamii kwa makubaliano kwa waathirika wa eneo hilo

3. Jamii kupata Ajira, Uboreshaji wa Vyoo katika taasisi na kupata usafiri

4. Kata Hapata msaada wa kujengewa/kufanya maendeleo kutokana kipaumbele chochote watakochotaka.

4. USHAURI / MAONI

1. Wananchi kulipwa fidia zao mapema ili kuondoa usumbufu.

2. Kuhamasisha jamii kupitia mikutano ya hadhara ili kupata utambuzi wa mradi huo. Pia wataalamu kushirikishwa.

3. Viongozi walipata Elimu kuwa chachu wa wananchi wengine

4. Kutambua eneo la mradi ili kutambit ujenzi holelo, katika eneo hilo na kueli misha jamii

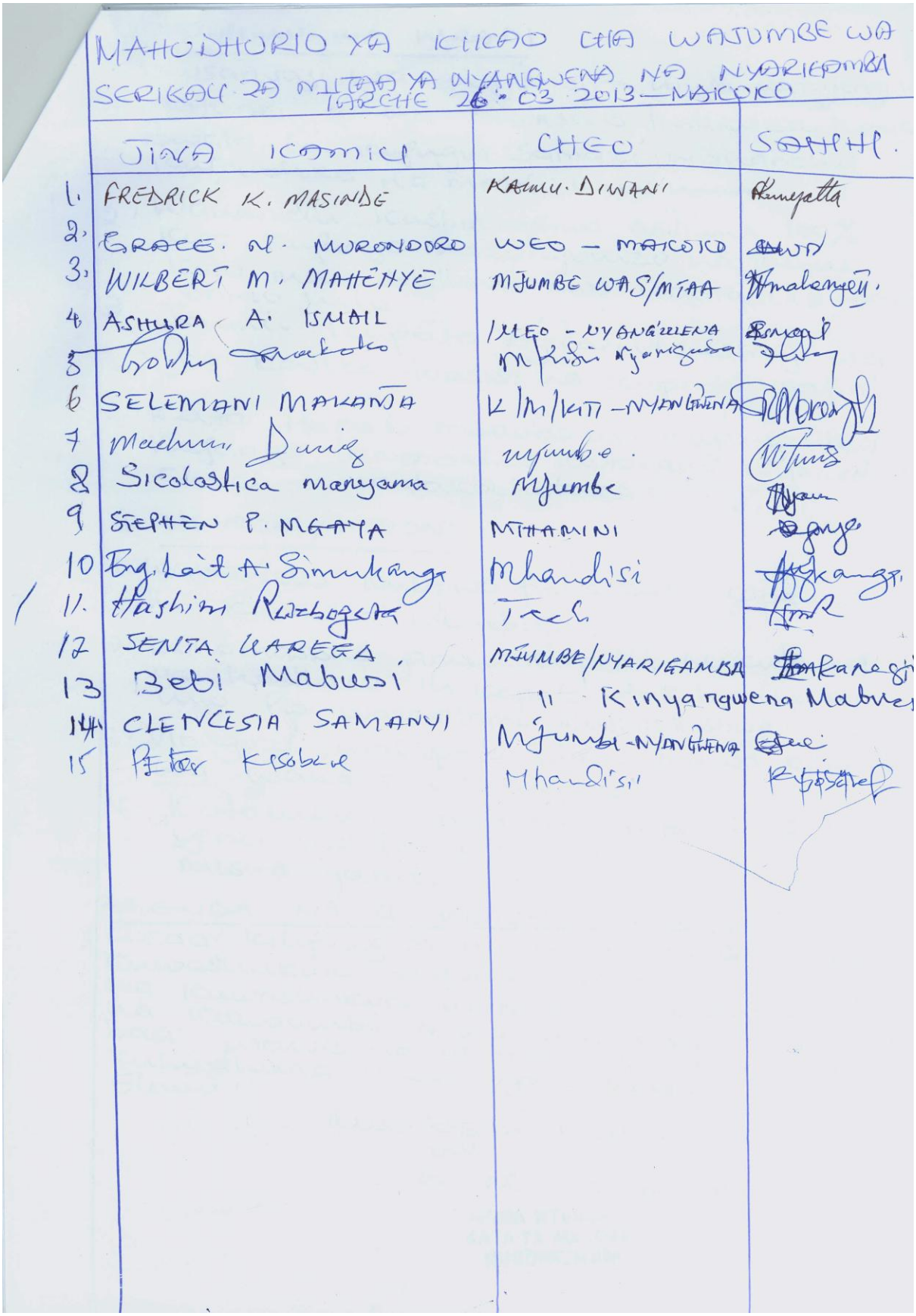
AGENDA NA 4: KUFUNGA KIKAO

Kikao kilifungwa mnamo saa 12:00 kwa kuwashukuru wajumbe kwa uvumilivu wa na kuwashukuru wataalamu waliohudhuria na kuwaomba mara watakapohitajika basi wawe na uharaka na wepesi wa kuhudhuria vikao vya wananchi ili kutoa Elimu.

Kumbukumbu hii umetayarishwa na.

G. N. Nyandoro

AFISA MTENDAJI
KATA YA MAKOKE
MUSOMA MJINI



MAHUDHURIO YA ICHUO CHA WAJUMBE WA SERIKALI ZA MITAA YA NYANGWENA NA NYARIEGAMBA TAREHE 26-03-2013 — MAICOKO

	JINA KAMILI	CHEO	SAHIHI
1.	FREDRICK K. MASINDE	KAIMU DIWANI	
2.	GRACE. N. MURONDORO	WEO – MAICOKO	
3.	WILBERT M. MAHENYE	MJUMBE WA S/MTAA	
4	ASHURA A. ISMAIL	MJUMBE – NYANGWENA	
5			
6	SELEMANI MAKANDA	K/M/KITI – NYANGWENA	
7	Machuru Duma	mjumbe.	
8	Sicolastica Manyama	Mjumbe	
9	STEPHEN P. MGAYA	MTHAMINI	
10	Eng. Lait A. Simukanga	Mhandisi	
11.	Hashim Rubogora	Tech	
12	SENTA WAREGA.	MJUMBE/NYARIGAMBA	
13	Bebi Mabusi	" Kinyangwena	
14	CLENCESIA SAMANYI	Mjumbe-Nyangwena	
15	Peter Kisobe	Mhandisi	

Appendix 5: Valuation Report for Assets to be compensated

1.0 INTRIDUCTION

The scope of work covers the following:-

1. Rapid assessment survey of features found:
   i. Along proposed sewerage system network in Mukendo, Mwigobero, Iringo, Kitaji and a Small portion of Kamunyonge wards,
   ii. Within proposed pump station as identified at Iringo,Kitaji, Mukendo and proposed waste water stabilization ponds at Makoko area in Musoma Municipality.
2. To investigate and verify any addition information relative to proposed project sites as mentioned above
3. To provide estimated values of features likely to be affected by project.

1.1 APPROACH

In older to achieve this task, relevant authorities had to be contacted physically. They include; the Musoma Water Authority officials, Municipal land surveyor, and Ward executive officials. in special cases, where necessary, we visited the proposed site for verification.

2.0 DATA COLLECTION

The data collected are divided into two parts;

i. Observed features along proposed sewerage network
ii. Features observed within proposed pump stations and waste water stabilization ponds area.

3.0. ADDITIONAL INFORMATION

3.1. IRINGO PUMP STATION

The proposed pump station of Iringo is located within Mwigobero ward along Lake Victoria shore close to AICT church area. The boundaries are clearly demarcated separating the church land and a space identified for the construction of pump station. This land is currently being used as a vegetable garden having beds of vegetable at nursery stage, fruit trees and few shades tree as indicated in table No.2. It is taken care by one of the church members.

However, sewerage pipe to the pump station pass through AICT church area where the church's ablution block stands and it will affect some few mature trees within church plot.

3.2 NORTH MWISENGE TRUNK PUMP STATION

The proposed site for Northern Mwisenge Trunk pump station is used for small gardening and small portion of paddy cultivation. This area need to be negotiated with the land owner for compensations.

3.3 KITAJI PUMP STATION

This is located in Kitaji ward south of Kitaji pond. The area which is seen to be an open land is a surveyed land and allocated to several people. The area a frontage of nearby houses namely, plot Nos 112, 114 and 116 Block 'R'Kitaji. At this site no feature is found likely for compensation.

3.4 MAKOKO WASTEWATER STABILIZING PONDS

The proposed site for the ponds located at Makoko, north of Musoma town is surrounded by several residential houses and close to the lake shore. Currently, the land is being used by few people of Makoko having small portions of vegetable gardens.
This area is surveyed land with an approved plan and the whole land is already allocated to individuals. (See Map No. 3)

4.0 RECOMENDETIONS

The pipe sewerage network is located along identified streets with densely housing within Musoma Township where trees, crops and other features are privately owned. All there are likely to be uprooted, upon laying the sewerage pipes some structures have to be demolished to give way for new construction. A number of people who have devoted their time, money and energy will be affected

It is therefore recommended that:-

i. For the affected persons, where sewerage pipes pass, be identified and listed by the Local authority officials in collaboration with Municipal land officials, before valuation process takes place.

ii. For the northern Mwisenge main pump station site the owner of the plot will be notified by land officials who will evaluate the land, crops and asses disturbance allowance for compensation purposes.

iii. At Iringo pump station compensation will be paid, to whoever maintains the garden, for crops and tress found on the land nearby church plot. The church authority will be compensated for an ablution block together with few trees where sewerage pipe passes to the pump station.

iv. At Kitaji pump station, it is suggested that the site shall be beyond 43 meters away from Shabani Street towards the pond as the site is a frontage to plot Nos.112, 114, and 116 Block 'K' Kitaji.

For Makoko waste water ponds, as the land is surveyed and allocated to individuals, the only alternatives is to acquire land from individuals for public interest,
Procedure for land acquisition has to be taken by Municipal land officer who will be required to give notice of intention to acquire land as required by Land Law No 4 of 1999 and other process before valuation takes place. If this is accepted the land officer will have to identify alternative plots for the displaced people.

5.0 PROPOSED PROCEDURE

i. During survey for data collection it has been found that most people are not aware of the project. It is suggested that general public be notified of the project and its impacts through awareness meetings,
ii. mobilization, i.e., identification of all people likely to be affected by the project so as their properties be valued for compensation purpose,
iii. Local leaders shall investigate project sites in order to avoid new development by the people,
iv. Valuation of features where by a standard form will be filled by the Valued, listing all the features on site, signing of forms by the affected person, Local authority leader and the Value.

There after data processing and preparation of compensation schedule ready for final compensation payment. However, compensation procedures usually take time and are a tedious process. It is suggested that whoever does the valuation exercise would be required to prepare a schedule, timing from valuation to actual compensation, not exceeding six months.

Summary of Estimated Compensation Cost by project area

S/N	PROJECT COMPONENT	TOTAL COST (Tsh.)
1	Sewer pipe network	8,600,000
2	Iringo pumping station	5,000,000
3	Kitaji pumping station	5,400,000
4	Mukendo pumping station	9,400,000
5	Makoko Wastewater Treatment Plant	136,000,000
	GRAND TOTAL	**165,300,000**

Summary of Estimated Compensation Cost by Category of Asset

S/N	FEATURES	ESTIMATED VALUE (Tshs)
1	Land	150,000,000
2	Crops and Trees	10,200,000
3	Other Utilities	1,200,000
4	Disturbance allowances at 5%	3,900,000
	GRAND TOTAL	**165,300,000**

Appendix 6: Resettlement proposal

Before project operations commence plans for resettlement of displaced indigenous people have to be conceded. This will serve to avoid or minimize unnecessary conflicts.
As revealed in recent survey of Musoma town ship, two proposed sites for Trunk pumping station at Mwisenge area and Makoko stabilization ponds are seen to be surveyed lands which have been allocated to individuals for different uses. It has been recommended that the two lands be acquired legally for public interest, regardless of legality of title to the land.
The World Bank has set out a Resettlements policy framework for Lake Victoria environmental Project phase II (LVEMP II) with the aim of providing guidelines to deal with resettlement matters. However, practical suggestions are listed below to assist implementation of resettlement plan and as pre-acquisition requirements.

(i) Resettlement area

The identification of new area for resettlement of the displaced persons is the one of the most important aspect before acquisition of the said lands, sites for Mwisenge pump station and Makoko stabilization ponds. At this stage, Local leaders are very important personalities for identification of resettlement area and the land owner(s).
Therefore, Ward chair persons and related members will have to be involved in this exercise.

(ii) Land purchase

It is known that land surrounding Town ship is not free from third party interests. Knowing the required land for the projects, equivalent size of land can be found and arrangement for purchasing the same be made. Usually, at this stage prices are negotiable. Local leader's participation is again required as they know better of the market values prevailing.

Land requirements for pumping stations

S/N	Pumping station	Plot size required (m)	Area (m^2)	Remarks
1	Itingo	20.85x13.55	282.5	Including fencing
2	Kitaji	20.85x13.55	282.5	Including fencing
3	Mukendo	16.00x25.55	408.8	Including fencing
4	Trunk main pumping station	21.60x14.40	311.0	Including fencing

(iii) Planning and survey.

Land, where affected people must move to, will be planned by Municipal planner and later be surveyed by Municipal surveyor, ready for resettlement of the displaced people.
Finally, awareness aspect on this exercise is important because it can lower the number of objections.

Appendix 7: Water quality test results

ARDHI UNIVERSITY
School of Environmental Science and Technology

Telephone: (255-022) - 2771272, 2775004, 2772291/2
Fax: (255-022) - 2775391,2775479
Telegrams: ARDHICHUO

P. O. Box 35176
Dar es Salaam
e-mail: aru@aru.ac.tz
website: http://www.aru.ac.tz

ENVIRONMENTAL ENGINEERING LABORATORY

Water Analysis Results

Client: Ujamaa Imprex Co Ltd
Date Received: 1 April 20134
Source: Lake Victoria & B/H

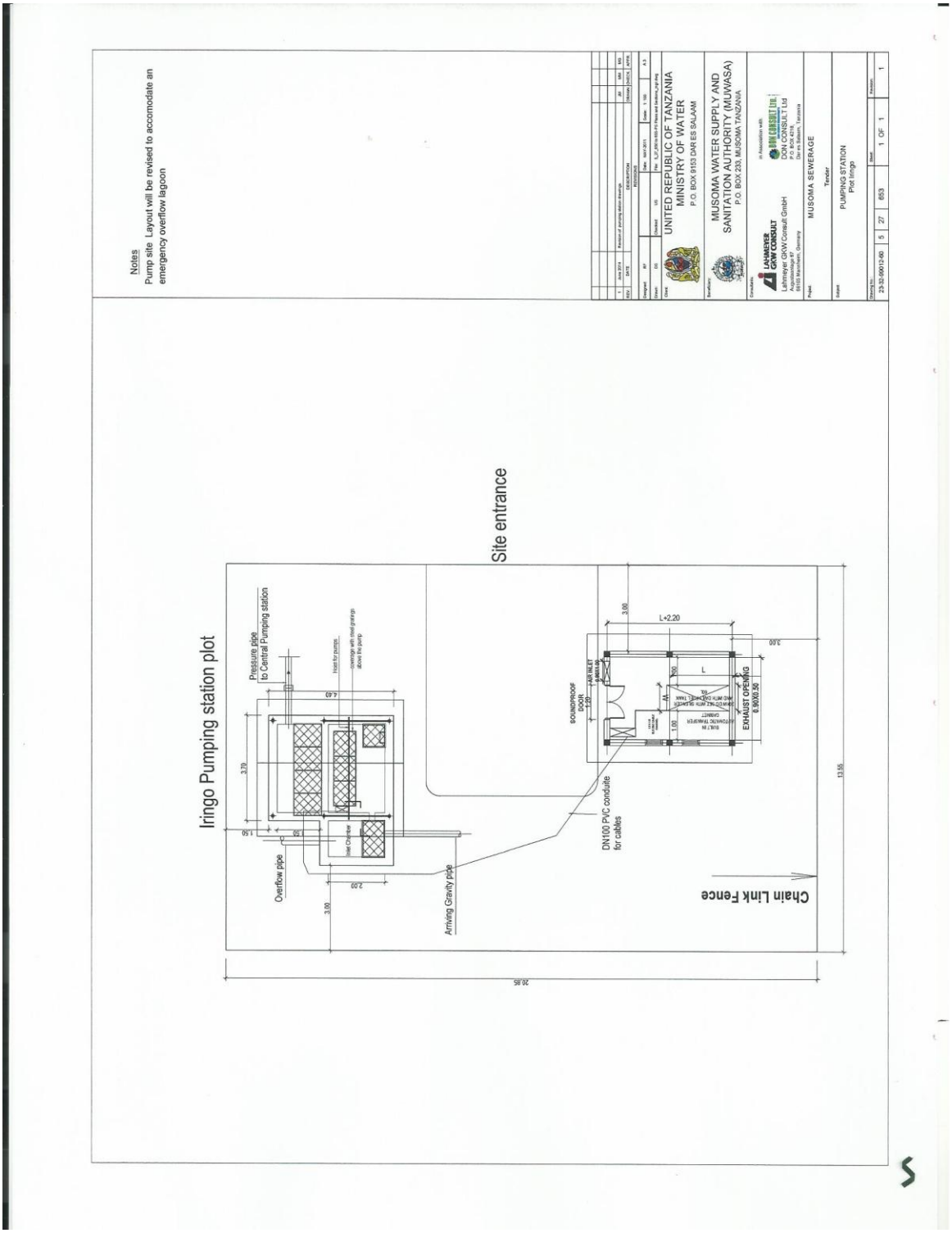
S/N	PARAMETER	Units	Lake Victoria A	Lake Victoria B	B/H Around Lake	(WHO) Standards
1	pH		7.14	7.39	7.48	6.5-8.5
2	Turbidity	NTU	5	10	93	25
3	Colour	Hazen°	26	15	104	50
4	Salinity	‰ (ppt)	0.0	0.0	0.1	na
5	Electric conductivity	µS/cm	151.2	95.30	348	1000
6	Total Dissolved solids	mg/l	72.10	45.20	167.40	1000
7	Phosphate	mg/l	0.59	0.31	1.40	na
8	Nitrate –Nitrogen	mg/l	0.30	0.30	1.20	6.7
9	Nitrite –Nitrogen	mg/l	<0.01	<0.01	<0.01	1.0
10	Ammonia-Nitrogen	mg/l	0.42	0.10	0.27	0.5
11	Chloride	mg/l	33	19	86	600
12	Total hardness	mg/l	47	28	150	500
13	Iron	mg/l	0.20	0.20	0.26	1.0
14	Magnesium	mg/l	6.075	3.645	20.655	150
15	Calcium	mg/l	22	13	65	75
16	Sodium	mg/l	13.83	9.632	24.20	150
17	Potassium	mg/l	2.248	1.871	2.22	150
18	Lead	mg/l	0.095	<0.01	<0.01	0.01
19	Manganese	mg/l	<0.01	<0.01	<0.01	0.5
20	Copper	mg/l	<0.01	<0.01	<0.01	0.05
21	Zinc	mg/l	<0.01	<0.01	<0.01	5

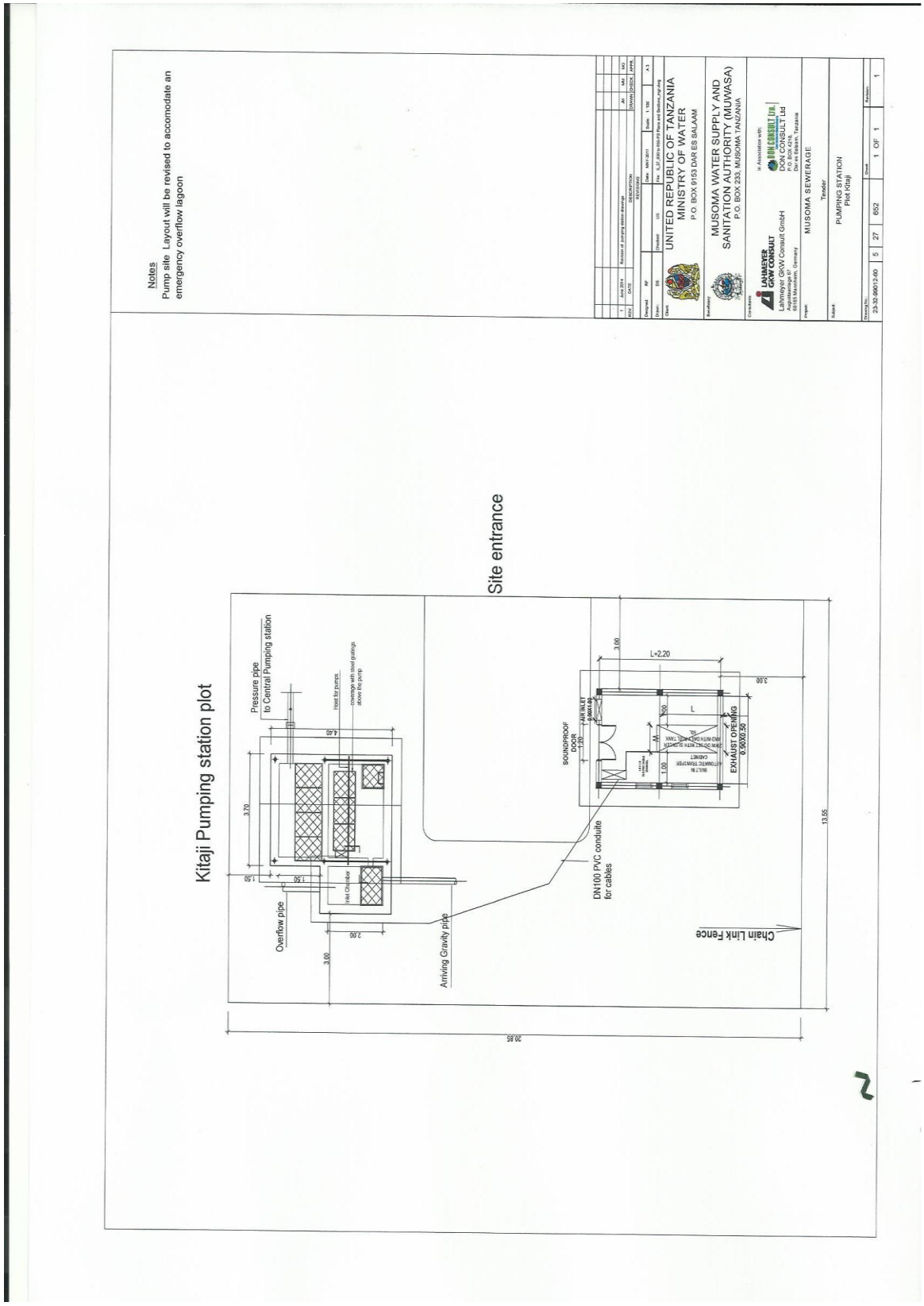
na= Not available/applicable
Sampling done by *Client*

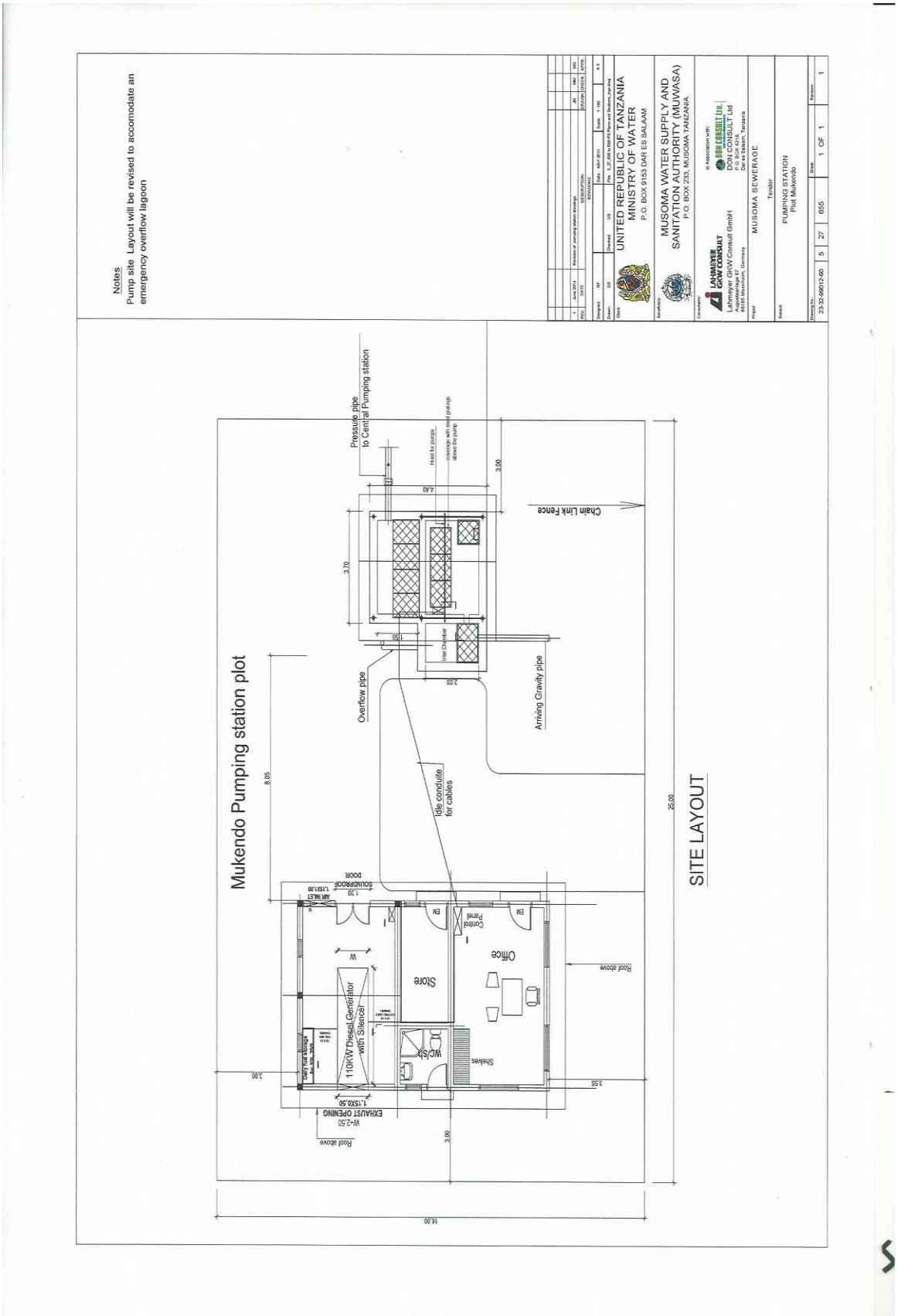
Reporting Officer
Ndimbo A.M

DEPARTMENT OF ENVIRONMENTAL ENGINEERING
Box 35176
DAR ES SALAAM

Appendix 8: Pumping Stations




Notes
Pump site Layout will be revised to accomodate an emergency overflow lagoon
UNITED REPUBLIC OF TANZANIA
MINISTRY OF WATER
P.O. BOX 9153 DAR ES SALAAM
MUSOMA WATER SUPPLY AND SANITATION AUTHORITY (MUWASA)
P.O. BOX 233, MUSOMA TANZANIA
Lahmeyer GKW Consult GmbH
DON CONSULT Ltd
MUSOMA SEWERAGE
PUMPING STATION
Plot Kitaji
Site entrance
Kitaji Pumping station plot
Pressure pipe to Central Pumping station
Overflow pipe
Arriving Gravity pipe
DN100 PVC conduite for cables
Chain Link Fence
SOUNDPROOF DOOR
EXHAUST OPENING
L=2.20
20.85
13.55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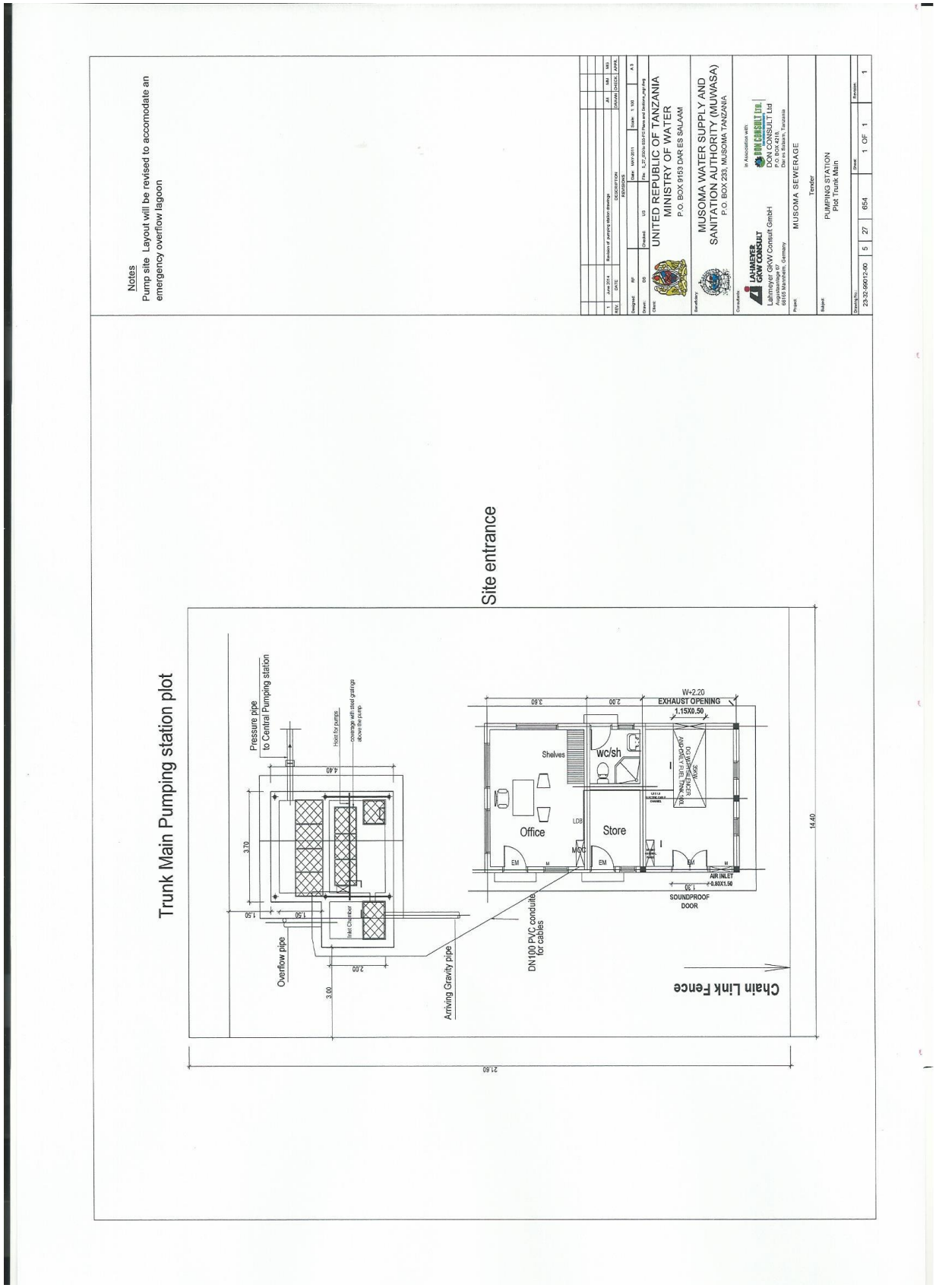
Pump site Layout will be revised to accomodate an emergency overflow lagoon
UNITED REPUBLIC OF TANZANIA
MINISTRY OF WATER
P.O. BOX 9153 DAR ES SALAAM
MUSOMA WATER SUPPLY AND SANITATION AUTHORITY (MUWASA)
P.O. BOX 233, MUSOMA-TANZANIA
Lahmeyer GKW Consult GmbH
DON CONSULT Ltd
MUSOMA SEWERAGE
Tender
PUMPING STATION
Plot Mukendo
Mukendo Pumping station plot
SITE LAYOUT
Pressure pipe to Central Pumping station
Chain Link Fence
Overflow pipe
Arriving Gravity pipe
Idle conduite for cables
Office
Store
Shelves
W/C/Sh
Control Panel
110KW Diesel Generator with Silencer
Daily fuel storage tank 250L
SOUNDPROOF DOOR
EXHAUST OPENING
Roof above
16.00
26.60
8.95
3.00
3.70
4.40
2.20
3.55


Notes
Pump site Layout will be revised to accomodate an emergency overflow lagoon
UNITED REPUBLIC OF TANZANIA
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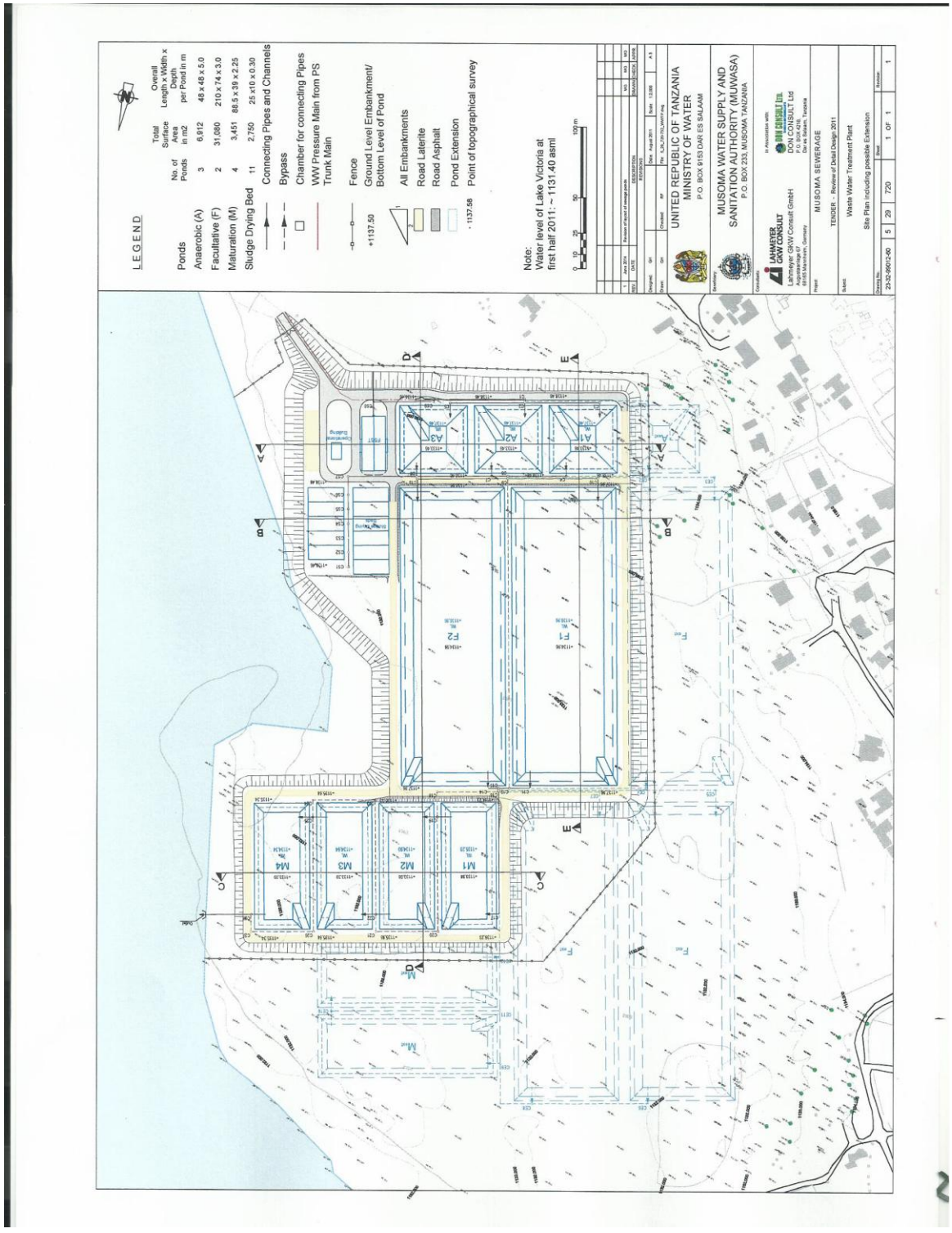
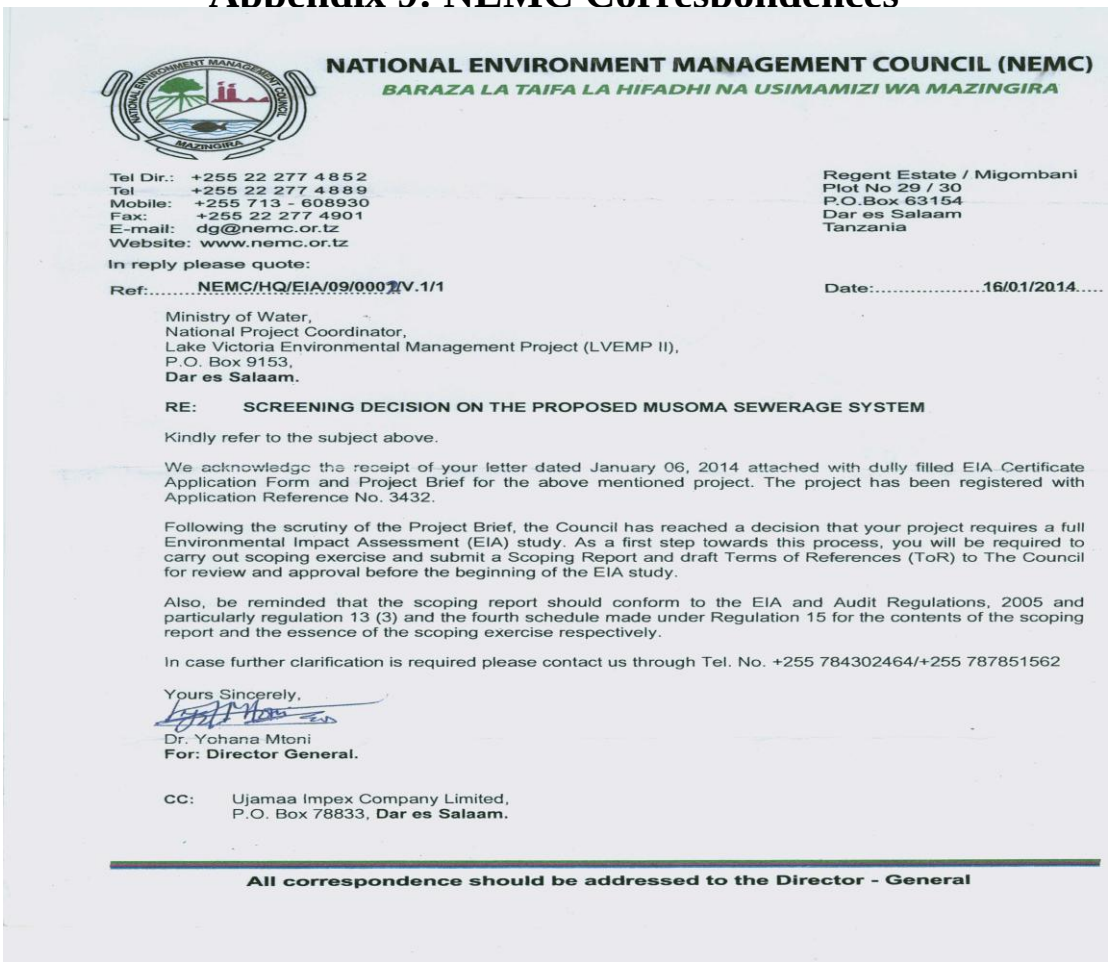
MUSOMA WATER SUPPLY AND SANITATION AUTHORITY (MUWASA)
P.O. BOX 233, MUSOMA TANZANIA
LAHMEYER GKW CONSULT
DON CONSULT LTD.
Lahmeyer GKW Consult GmbH
DON CONSULT Ltd
MUSOMA SEWERAGE
Tender
PUMPING STATION
Plot Trunk Main
Trunk Main Pumping station plot
Site entrance
Pressure pipe to Central Pumping station
Hoist for pumps
Stoerage with steel grairage above the pump
Inlet Chamber
Overflow pipe
Arriving Gravity pipe
DN100 PVC conduite for cables
Chain Link Fence
Shelves
wc/sh
Office
Store
LDB
M/CC
EM
W+2.20
EXHAUST OPENING
1.15X0.50
AIR INLET
0.80X1.50
SOUNDPROOF DOOR
21.80
14.40


LEGEND
Ponds
No. of Ponds
Total Surface Area in m2
Overall Length x Width x Depth per Pond in m
Anaerobic (A) 3 6,912 48 x 48 x 5.0
Facultative (F) 2 31,080 210 x 74 x 3.0
Maturation (M) 4 3,451 88.5 x 39 x 2.25
Sludge Drying Bed 11 2,750 25 x10 x 0.30
Connecting Pipes and Channels
Bypass
Chamber for connecting Pipes
WW Pressure Main from PS
Trunk Main
Fence
+1137.50 Ground Level Embankment/ Bottom Level of Pond
All Embankments
Road Laterite
Road Asphalt
Pond Extension
· 1137.58 Point of topographical survey
Note:
Water level of Lake Victoria at first half 2011: ~ 1131.40 asml
UNITED REPUBLIC OF TANZANIA
MINISTRY OF WATER
P.O. BOX 9153 DAR ES SALAAM
MUSOMA WATER SUPPLY AND SANITATION AUTHORITY (MUWASA)
P.O. BOX 233, MUSOMA TANZANIA
LAHMEYER GKW CONSULT
Lahmeyer GKW Consult GmbH
DON CONSULT Ltd
Dar es Salaam, Tanzania
MUSOMA SEWERAGE
TENDER - Review of Detail Design 2011
Waste Water Treatment Plant
Site Plan including possible Extension
23-32-0901-2-90
5
29
720
1 OF 1
1

Appendix 9: NEMC Correspondences



NATIONAL ENVIRONMENT MANAGEMENT COUNCIL (NEMC)

BARAZA LA TAIFA LA HIFADHI NA USIMAMIZI WA MAZINGIRA

Tel Dir.: +255 22 277 4852
Tel +255 22 277 4889
Mobile: +255 713 - 608930
Fax: +255 22 277 4901
E-mail: dg@nemc.or.tz
Website: www.nemc.or.tz

Regent Estate / Migombani
Plot No 29 / 30
P.O.Box 63154
Dar es Salaam
Tanzania

In reply please quote:

Ref:.....NEMC/HQ/EIA/09/0007/V.1/1 Date:.....16/01/2014.....

Ministry of Water,
National Project Coordinator,
Lake Victoria Environmental Management Project (LVEMP II),
P.O. Box 9153,
Dar es Salaam.

RE: SCREENING DECISION ON THE PROPOSED MUSOMA SEWERAGE SYSTEM

Kindly refer to the subject above.

We acknowledge the receipt of your letter dated January 06, 2014 attached with dully filled EIA Certificate Application Form and Project Brief for the above mentioned project. The project has been registered with Application Reference No. 3432.

Following the scrutiny of the Project Brief, the Council has reached a decision that your project requires a full Environmental Impact Assessment (EIA) study. As a first step towards this process, you will be required to carry out scoping exercise and submit a Scoping Report and draft Terms of References (ToR) to The Council for review and approval before the beginning of the EIA study.

Also, be reminded that the scoping report should conform to the EIA and Audit Regulations, 2005 and particularly regulation 13 (3) and the fourth schedule made under Regulation 15 for the contents of the scoping report and the essence of the scoping exercise respectively.

In case further clarification is required please contact us through Tel. No. +255 784302464/+255 787851562

Yours Sincerely,

Dr. Yohana Mtoni
For: Director General.

CC: Ujamaa Impex Company Limited,
P.O. Box 78833, **Dar es Salaam.**

All correspondence should be addressed to the Director - General

NATIONAL ENVIRONMENT MANAGEMENT COUNCIL (NEMC)

BARAZA LA TAIFA LA HIFADHI NA USIMAMIZI WA MAZINGIRA

Tel: Dir: +255 22 277 4852
Tel: +255 22 277 4889
Mob: +255 713 - 608930
Fax: +255 22 277 4901
E-mail:nemc@nemctan.org

Regent Estate Plot No. 29/30,
P.O.Box 63154,
DAR ES SALAAM
TANZANIA

In reply please quote:
NEMC/HQ/EIA/09/0001/V.1/2

Ref:.....

Date: **06/03/2014**

Ministry of Water,
National Project Coordinator,
Lake Victoria Environmental Management Project (LVEMP II),
P.O. Box 9153,
Dar es Salaam.

RE: SCOPING REPORT AND TERMS OF REFERENCE ON THE PROPOSED MUSOMA SEWERAGE SYSTEM

This is to acknowledge receipt of your EIA Consultants letter dated 24th January, 2014 attached with copies of the Scoping Report and Draft Terms of Reference (ToR) for undertaking an EIA study for the above mentioned project.

The Council has reviewed the scoping report and ToR and found that they are generally adequate and can be used to guide the EIA study. Therefore we emphasize that you undertake the EIA study, prepare the EIA report and submit the EIS to the National Environment Management Council according to the requirements of the EIA and Audit Regulations, 2005.

Upon submission of the EIA report (15 copies), the Council will arrange for a technical review of the document by the Cross-Sectoral Technical Advisory Committee (TAC). Prior to the review, representatives of the TAC will visit the proposed project area to inspect the site and verify the adequacy of the EIS.

The budget for these review activities amounts T-shillings **7,051,000/=** as elaborated on the attached sheet. Please note that this budget does not include the transport cost for the site visit team from Dar es Salaam to and from the site. The funds can be paid by to the Council by Cheque or in Cash on the date of submission of the EIS.

Yours Sincerely,

Dr. Yohana Mtoni
For: Director General

CC: Ujamaa Impex Company Limited,
P.O. Box 78833, **Dar es Salaam.**

All correspondence should be addressed to the Director - General