REPUBLIC OF KENYA

MINISTRY OF ENVIRONMENT, WATER AND NATURAL RESOURCES
LAKE VICTORIA SOUTH WATER SERVICES BOARD

PROPOSED CONSTRUCTION OF SEWERAGE SYSTEM IN BOMET TOWNSHIP, BOMET COUNTY

LVEMP II - KENYA

LAKE VICTORIA ENVIRONMENTAL MANAGEMENT PROJECT II

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

PROJECT REPORT

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CERTIFICATION

This Environmental Impact Assessment project report for the proposed Rehabilitation of Bomet Sewerage System was conducted and the report prepared by Dayton Consultants. The Lead Consultant append his signatures are as follows

_____

Signature

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ACKNOWLEDGEMENT

We, the Directors of Dayton Consultants would like to express our appreciation to the following individuals and organizations for their overwhelming support in the journey that led towards the successful completion of this project report.

At the outset, it is our duty to acknowledge with gratitude LVEMP II for making available the opportunity to undertake the exercises that will contribute towards the licensing of the proposed Rehabilitation of Bomet Sewerage System.

The task of gathering data for the project report was much eased by the Bomet County Director of Environment Mr. Moses Morintat, who cordially assisted in data collection from different stakeholders and other County offices. The technical view expressed in this report is owed to him.

The final report is the result of a collaborative process which drew on the effort, knowledge, expertise and patience of Prof. Maurice Nyadawa, Lucas Nyamila, Calvince Ochieng, Peter Oluoch, Daisy Awuor, Laura Adhiambo and Jacob Omondi. Others that have not been named here, their efforts are earnestly recognized.

ACRONYMS AND ABBREVIATIONS

BCC	Bomet County Council
^0C	Degrees Celsius
BOD	Biological Oxygen Demand
CH_4	Methane
COD	Chemical Oxygen Demand
dB	Decibels
CDE	County Director of Environment
EO	Environment Officer
DOHSS	Directorate of Occupational Health and Safety Services
DO	Dissolved Oxygen
EHS	Environment, Health and Safety
EA	Environmental Audit
EMCA	Environmental Management and Coordination Act
EMP	Environmental Management Plan
KEBs	Kenya Bureau of Standards
KM^2	Square Kilometre
KWS	Kenya Wildlife Services
NEMA	National Environment Management Authority
NEAP	National Environmental Action Plan
NOx	Nitrous Oxides
LVEMP	Lake Victoria Environmental Management Project
OHS	Occupational Health and Safety
PPE	Personal Protective Equipment
SOP	Standard Operating Protocol
SWM	Sustainable Waste Management
TOR	Terms of Reference
TSS	Total Suspended Solids
WRMA	Water Resources Management Authority
WSps	Waste Stabilization Ponds
BOQ	Bills of Quantity
PDP	Physical Development Plan

EXECUTIVE SUMMERY

The Kenya Government received a credit from the International Development Association (IDA) towards the implementation of the second phase of Lake Victoria Environmental Management Project (LVEMP II). The second phase of Lake Victoria Environmental Management Project will contribute towards the achievement of the EAC's Lake Victoria Basin Development Vision and Strategy. The Project development/global environmental objectives are to: (i) improve collaborative management of the trans-boundary natural resources of LVB for the shared benefits of the EAC Partner States; and (ii) reduce environmental stress in targeted pollution hotspots and selected degraded sub-catchments to improve the livelihoods of communities dependent on the natural resources of the Lake Victoria Basin.

The sewage treatment plant for Bomet has been earmarked for rehabilitation during this phase of LVEMP II. This is necessary as the town lacks a suitable facility that can adequately serve the population. Consequently raw sewage is now frequently discharged into River Nyangores. The rehabilitation of the sewerage system will trigger environmental and social impacts. These potential impacts have to be mitigated for the project to be environmentally friendly, socially acceptable and economically viable.

In compliance with the laws and regulations governing environmental management, it is required that environmental and social impact assessments are done in order to achieve sustainable development. This is in line with the World Bank Safeguards and the Kenyan Environmental Management and Coordination Act (EMCA), 1999.

At the request of the LVEMPII, this Environmental Impact Assessment Project Report of the proposed Rehabilitation of Bomet Sewerage System is prepared in accordance with section 58 of the Environmental Management and Coordination act (EMCA) No.8 of 1999 and Environmental (impact assessment and Audit) Regulations (2003) that requires that all enterprises and project must undergo an Environmental Impact Assessment. The purpose is to predict all possible positive and negative impacts that the project may have on both human and natural environment and suggest mitigation measures for the significant negative impacts before the project is implemented.

The main objective of the EIA project is to provide information on the nature and extent of potential environmental impacts arising from the construction and operation of the proposed Rehabilitation of Bomet Sewerage System (hereinafter referred to as "the Project") and related

activities taking place concurrently and to contribute to decisions on the overall environmental acceptability of the Project after the implementation of environmental mitigation measures.

The methodologies used to conduct this EIA project were a) Questionnaires b) Interviews c) Field observations d) Still digital photography e) Desktop research f) Public consultation.
In carrying out the EIA for the project, various Acts of Parliament were reviewed: Environment Management and Co-ordination Act, 1999, The Science and Technology Act, Cap 250, The Water Act, Cap 372, The Public Health Act, Cap 242, The Local Government Act, Cap 265, Physical Planning Act, Cap 286 and Building Code, The land planning Act, Cap 303, The Penal Code, Cap 63 and The Occupational, Safety & Health Act, 2007, The Environmental Management and coordinating (water quality) regulation 2006, The Environmental Management and Co-ordination (Waste Management) Regulations, 2006.
The scope of the study was to describe the project, document all the baseline information, address both the positive and negative impacts and develop mitigation measures for negative impacts including designing environmental management plan for the project.

The NEMA Guidelines on EIA require that assessments of options available for a project are important considerations at the project planning stage. The environmental implications of each option should be considered before commitments are made.

The assessment should identify technical, economic and environmental reasons for selecting a preferred option. The alternatives to the proposed project should feasibly attain most of the basic project objectives but should as well avoid or substantially reduce any of the significant negative effects of the proposed project. The analysis of the alternatives summarized here is explained in details in the report. The following alternatives were identified: Design/ technological alternatives, No project alternative and the proposed Development Alternative. Different sites were considered to obtain the most preferable site.

The following are areas of concern that have been discussed at depth in the report and their mitigation measures outlined. a) Solid and liquid waste generation b) Noise nuisance c) Dust emissions and air pollution d) Occupational health and safety concerns e) Energy use f) Loss of vegetation g) Soil erosion h) Fire hazards and accidents i) Health hazards j) Increased water demand k) Gaseous emissions l) Increased pressure on existing infrastructure.
The positive impacts associated with the project include, employment, national economic benefits, availability of safe and hygienic sanitary facilities, control of notifiable diseases and decrease of environmental pollution through sustainable sanitation and reduction of inadequate sanitation methods and effluent disposal.

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1.0 INTRODUCTION

The Government of Kenya received a credit from the International Development Association (IDA) towards the cost of the second phase of the Lake Victoria Environmental Management Project (LVEMP II) and intends to apply part of the proceeds of this credit for rehabilitation of Bomet sewerage system.

The second phase of Lake Victoria Environmental Management Project will contribute towards the achievement of the EAC's Lake Victoria Basin Development Vision and Strategy-*'a prosperous population living in a healthy and sustainably managed environment providing equitable opportunities and benefits'*. The Project development/global environmental objectives are to: (i) improve collaborative management of the trans-boundary natural resources of Lake Victoria Basin for the shared benefits of the EAC Partner States; and (ii) reduce environmental stress in targeted pollution hotspots and selected degraded sub-catchments to improve the livelihoods of communities dependent on the natural resources of the Lake Victoria Basin.

The project has four components, namely

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

ii. Point source pollution control and prevention

iii. Watershed management and

iv. Project coordination and management

Under Point Source Pollution Control and Prevention component of the project, one of the activities to be undertaken is rehabilitation of Bomet Sewerage System through construction of sewerage stabilization ponds and lagoons. In compliance with the laws and regulations governing environmental management, it is required that Environmental and Social Impact Assessments are done in order to achieve sustainable development.

Currently the town has very low sewerage coverage and most residents, even in the CBD use onsite sanitation facilities. Also the existing sewage treatment plant has both design and operational defects which result in the discharge of final effluent that does not meet the acceptable effluent quality standards for discharge into a body of water. The designed infrastructure shall, therefore, ensure that the sewerage system efficiently conveys and treats wastewater to acceptable national effluent discharge standards. Bomet County is a county in the Rift Valley Province of Kenya. It has a Total Population of 585,072; 111,258 House holds and covers an area of 1,592 SQ. KM. The Population density is 367 people PER SQ. KM and 58.7% of the population live below the poverty line.

Some Strengths of Bomet County include:

1. Natural resources as forest, pasture, river, wildlife, arable land, diatomite, stone quarry
2. Tourist Attractions asKey Route to Maasai Mara Game Reserve, Traditional Ornaments
3. Main Economic Activities include tea & coffee farming, horticulture, cattle rearing

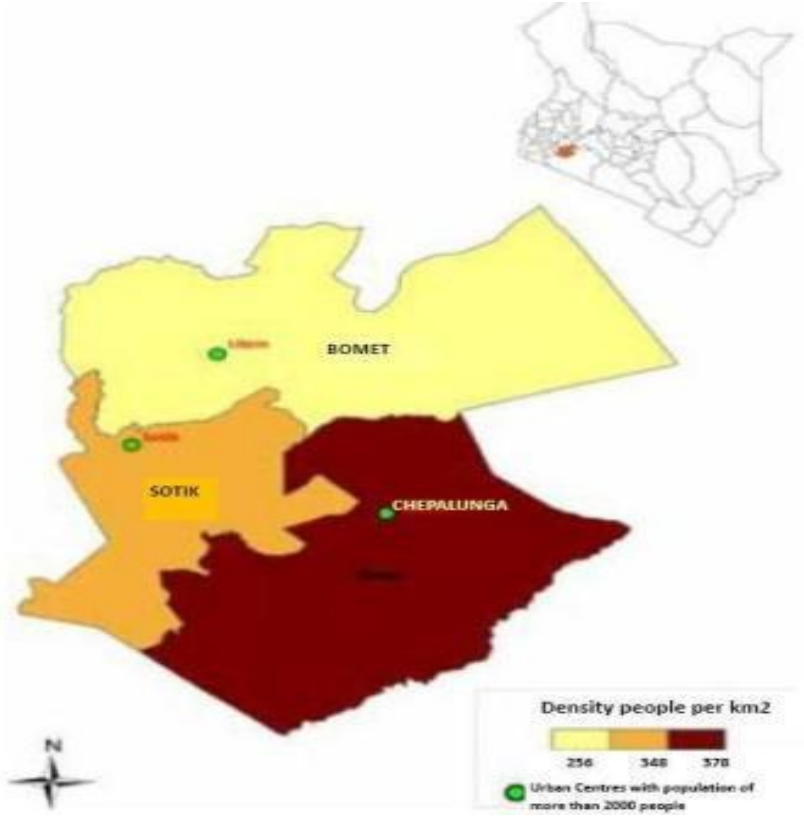

Figure 1: Location of Bomet County in Kenya map

Figure 2: Layout of the Reviewed Sewer Network

Proposed treatment ponds site location: GPS DMS Lat: 0°47'81'S

DMS Long: 35°20'20.18'E

The sewage system stabilization ponds will be done on a 7 acre piece of land

Figure 3: Layout of Proposed Sewerage treatment stabilization ponds

2.0 THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PROCESS

2.1Objectives of the ESIA Process

The purpose of undertaking an Environmental and Social Impact Assessment (EIA) is to ensure from the outset that the process will take account of both environmental and social impacts arising from the Project. This is in accordance with the Five Capitals model of Sustainable Development that was developed by Forum for the Future (UK) in the 1990's. It provides a way of looking at the various component parts of the development equation in such a way that decision makers, business people and developers can form balanced "capital enhancing" plans. The model describes the balance needed between Natural Social, Human, Manufactured and Financial Capital to achieve sustainable development. The approach will be adopted for the Bomet sewerage system and when undertaking the ESIA.

This approach will also meet the Kenyan legal laws on environmental and social standards in accordance with the National Environmental Management Authority's (NEMA) Environment and Co-ordination Act, 1999 and more recent draft amendments. In addition to following NEMA requirements, the Project will also be consistent with World/IFC standards and procedures.

2.2 Scope of the ESIA

In carrying out a study for proposed Bomet sewerage system, the following were determined:

i. The range of issues to be addressed in the Environmental Impact Assessment study:
ii. Significant issues that would need detailed study and reasons thereof;
iii. Study issues that are not significant, very well understood and explain reasons thereof;
iv. The boundaries for the Environmental Impact Assessment study in terms of geographical extent, timing and issues to be studied;
v. How the Environmental Impact Assessment Study will be conducted, the disciplines to be involved and the timings of the study;
vi. The main stakeholders who should be consulted during the Environmental Impact Assessment study, their concerns and values;
vii. The Terms of Reference for the Environmental Impact Assessment Study.

The procedure for carrying out this ESIA study shall entailed:

i. Consulting and informing the affected public about the proposed project;

ii. Consulting and gathering the views and concerns of Key Stakeholders and about the proposed project;

iii. Reviewing relevant documents such as policies, plans and programs;

iv. Documenting issues raised by the stakeholders.

An ESIA report takes into consideration the environmental, social, cultural and economic aspects and:

i. Describes the proposed project;

ii. Provide a brief description of the environmental characteristics of the project area;

iii. Identifies anticipated significant impacts and issues that may arise from the proposed project;

iv. Identifies impacts that may arise from the project, that are not considered significant and the reasons thereof;

v. Provide details of how the ESIA study will be undertaken, the constitution of the team and the duration and timings of the study;

vi. Provide Terms of Reference for the ESIA study.

2.3 Purpose of the ESIA Process

The primary objective of this report is to ensure that the key environmental and social issues associated with the project are identified early so that the necessary mitigation and management measures can be incorporated into the project design. This reduces the potential for issues relating to environmental impacts and environmental compliance to cause problems or delays at a later stage in the process.

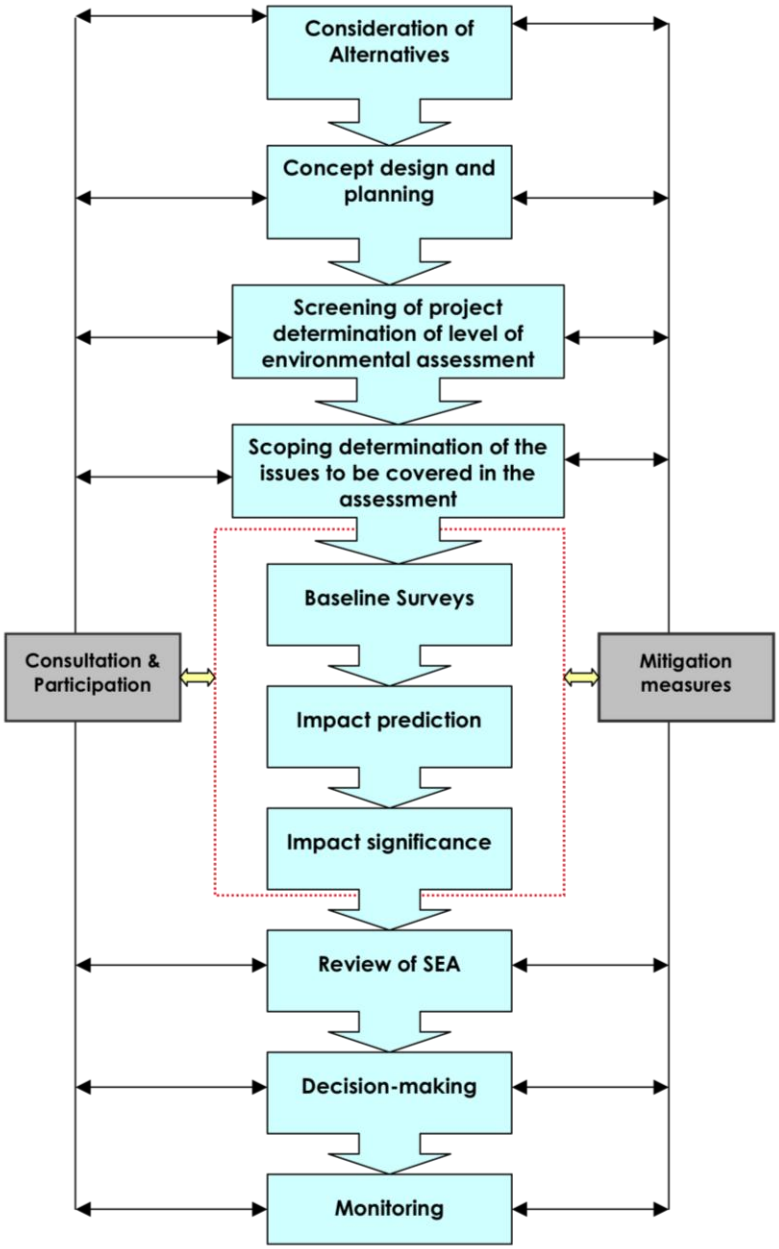

Figure 4: Flow Diagram of Typical ESIA Process

To elaborate further, the scoping report had the following key objectives:

- The identification of key environmental constraints and opportunities;
- The 'scoping' out of any issues unlikely to be significant;
- The identification of relevant local, national and international standards and legal requirements;
- Initiate the environmental process with NEMA;
- Submit the ESIA Terms of Reference (included in the Scoping Report);
- The identification of relevant environmental and social planning policies;

- The identification of existing proposals for the area which may conflict with the proposed project;
- The identification and evaluation of the baseline environmental conditions in the area to provide a basis for assessing the incremental impact of the development including existing baseline levels;
- The determination of the primary social and economic issues in the Social and Environmental Assessment;
- The establishment of assessment criteria for each of the environmental issues;
- The identification of areas where data required for the study is lacking and insufficient;
- The identification of further required studies, investigations and environmental assessment for the study area;
- The identification of any additional regulatory approval and government policies that need to be addressed within and outside Bomet County

3.0 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

Legislation, laws, policies and regulations specific to environmental management can directly or indirectly affect the development of proposed project. A brief discussion on the various legal frameworks involved for this project is presented in the following section. The authorizing client 'LVEMP and associate key stakeholders' will strive to ensure that all required environmental procedures described in this section will be complied with, in order to demonstrate their commitment and responsibility to protecting the environment.

3.1 Kenyan Environmental Legislation

Environmental regulations and standards in Kenya are determined and enforced through various levels of statutes the majority of which are sector specific. The Environment Management Act - 1999 is the governing law for the Protection and Development of the Environment in the Kenya, and is considered the base for various environmental regulations and guidelines.

3.2 The Environment Management Act (No.8 of 1999)

The principal Act covering environmental protection is the Environmental Management Act No. (8) of 1999 for the Protection and Development of the Environment. This law established the framework for environmental protection in Kenya and has been divided into 13 Parts, covering main areas of environmental concern as follows:

Part I - Preliminary;

Part II - General principles;

Part III - Administration;

Part IV - Environmental planning;

Part V - Protection and Conservation of the Environment;

Part VI - Environmental impact assessments (EIA), audits and monitoring;

Part VII - Environmental audit and monitoring;

Part VIII - Environmental quality standards;

Part IX - Environmental Restoration orders, Environmental Easements;

Part X - Inspection, analysis and records;

Part XI - International Treaties, Conventions and Agreements

Part XII - National Environment Tribunal;

Part XIII - Environmental Offences.

Part II of Environmental Management Act No. (8 of 1999) confers the right of every person to a clean environment and to its judicial enforcement. The Act therefore makes it mandatory to work in a clean environment and protect people living close to the project;

Part V Section 44 of this Act deals with protection of hilltops, hillsides, mountain areas and forests;

Section 51 and 54 of this Act deals with the conservation of biological resources and protection of areas of environmental significance;

Under section 58 (1) of Kenya Government's Environment Management Coordination Act (EMCA), Number 8 of 1999 and National Environmental Management Authority (NEMA) Regulations for Environmental Impact Assessment and Audit of June, 2003, the proposed sewerage project falls under the prescribed list of projects for which environmental impact assessment is mandatory.

According to the Environmental Management and Co-ordination Act (EMCA, 1999,

Second Schedule Part XII) and subsequent Environmental (Impact and Audit)

Regulations, 2003, it is mandatory to get environmental clearance for certain development projects. Among these projects are;

Waste disposal projects including:

i. Sites for solid wastes disposal;
ii. Sites for hazardous waste disposal;
iii. Sewage works disposal
iv. Works involving major atmospheric emissions
v. Works emitting offensive odours

The proposed project therefore falls in the category of those that require clearance from NEMA before development.

3.3 The Waste Management Regulations – 2006

The EMCA Waste Management Regulations, 2006 is the governing law for waste management in Kenya. This regulation is described in Legal Notice No. 121 of the Kenya Gazette Supplement No. 69 of September 2006. The objective of this Regulation is to protect human health and the environment. The regulations consist of eight parts and classify various types of waste and recommended appropriate disposal methods for each waste type. This also contains requirements for handling, storing, transporting and treatment of all waste categories as provided therein.

The regulations also specified a series of responsibilities for the waste generator.

As the raw sewage waste collection activities generate various waste streams (hazardous and non-hazardous waste) this will be of particular relevance to LVEMP

3.4 The Water Quality Regulations – 2006

The EMCA Water Quality Regulation – 2006 is concerned with the protection of water quality and applies to drinking water, industrial water, effluent discharge, water used for agricultural, recreational, fisheries, wildlife and other purposes. This Act is divided into 6 Parts as follows:

- Quality standards for sources of domestic water;
- Monitoring for sources of domestic water;
- Standards for effluent discharge into the environment;
- Monitoring guide for discharge into the environment;
- Standards for effluent discharge into public sewers and,
- Monitoring for discharge of treated effluent into the environment.

Part III of Water Quality Regulations – 2006 deals with Water for Industrial Use and Effluent Discharges. As per this,

> "No person shall discharge or apply any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or permit any person to dump or discharge such matter into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards set out in the Third Schedule to these Regulations".

The effluent standards are shown in Table below

Table 1: Table Standards for effluent Discharge into the Environment (Third Schedule)

THIRD SCHEDULE

STANDARDS FOR EFFLUENT DISCHARGE INTO THE ENVIRONMENT

Parameter	Max Allowable(Limits)
1,1,1-trichloroethane (mg/l)	3
1,1,2-trichloethane (mg/l)	0.06
1,1-dichloroethylene	0.2
1,2-dichloroethane	0.04
1,3-dichloropropene (mg/l)	0.02
Alkyl Mercury compounds	Nd
Ammonia, ammonium compounds, NO_3 compounds and NO_2 compounds (Sum total of ammonia-N times 4 plus nitrate-N and Nitrite-N) (mg/l)	100
Arsenic (mg/l)	0.02
Arsenic and its compounds (mg/l)	0.1
Benzene (mg/l)	0.1
Biochemical Oxygen Demand (BOD 5days at 20 °C) (mg/l)	30
Boron (mg/l)	1.0
Boron and its compounds – non marine (mg/l)	10
Boron and its compounds –marine (mg/l)	30
Cadmium (mg/l)	0.01
Cadmium and its compounds (mg/l)	0.1
Carbon tetrachloride	0.02
Chemical Oxygen Demand (COD (mg/l)	50
Chromium VI (mg/l)	0.05
Chloride (mg/l)	250
Chlorine free residue	0.10
Chromium total	2
cis –1,2- dichloro ethylene	0.4
Copper (mg/l)	1.0
Dichloromethane (mg/l)	0.2
Dissolved iron (mg/l)	10
Dissolved Manganese(mg/l)	10
E.coli (Counts / 100 ml)	Nil
Fluoride (mg/l)	1.5
Fluoride and its compounds (marine and non-marine) (mg/l)	8
Lead (mg/l)	0.01
Lead and its compounds (mg/l)	0.1
n-Hexane extracts (animal and vegetable fats) (mg/l)	30
n-Hexane extracts (mineral oil) (mg/l)	5
Oil and grease	Nil
Organo-Phosphorus compounds (parathion,methyl parathion,methyl demeton and Ethyl parantrophenyl phenylphosphorothroate, EPN only) (mg/l)	1.0
Polychlorinated biphenyls, PCBs (mg/l)	0.003
pH (Hydrogen ion activity----marine)	5.0-9.0
pH (Hydrogen ion activity--non marine)	6.5-8.5
Phenols (mg/l)	0.001
Selenium (mg/l)	0.01
Selenium and its compounds (mg/l)	0.1
Hexavalent Chromium VI compounds (mg/l)	0.5
Sulphide (mg/l)	0.1
Simazine (mg/l)	0.03
Total Suspended Solids, (mg/l)	30
Tetrachloroethylene (mg/l)	0.1
Thiobencarb (mg/l)	0.1
Temperature (in degrees celious) based on ambient temperature	± 3
Thiram (mg/l)	0.06
Total coliforms (counts /100 ml)	30
Total Cyanogen (mg/l)	Nd
Total Nickel (mg/l)	0.3
Total Dissolved solids (mg/l)	1200
Colour in Hazen Units (H.U)	15
Detergents (mg/l)	Nil
Total mercury (mg/l)	0.005
Trichloroethylene (mg/l)	0.3
Zinc (mg/l)	0.5
Whole effluent toxicity	
Total Phosphorus (mg/l)	2 Guideline value
Total Nitrogen	2 Guideline value

And any other parameters as may be prescribed by the Authority from time to time

Remarks

Standard values are daily/monthly average discharge values. Not detectable (nd) means that the pollution status is below the detectable level by the measurement methods established by the Authority.

Furthermore the regulations also defined the requirement of water and wastewater monitoring. Under this… "Every person who generates and discharges effluent into the environment under a license issued under the Act shall carry out daily effluent discharge quality and quantity monitoring and shall submit quarterly records of such monitoring to the Authority or its designated representative*".*

3.5 The Controlled Substances Regulations, 2007

This Regulations control the export, import, usage, and management of controlled substances (Ozone depleting substances). The EMCA *Controlled Substances Regulation* – 2007 also provides guidelines for packaging, labelling, Storage, distribution, transportation or handling and disposal of these substances.

3.6 The Draft Air Quality Regulations, 2008

The EMCA Draft *Air Quality Regulations – 2006* is aimed to provide prevention, control and abatement of air pollution to ensure clean and healthy ambient air. It provides emission standards for various sources such as mobile sources (e.g. motor vehicles) and stationary sources (e.g. industries). It also covers any other air pollution source as may be determined by the Minister in consultation with the Authority. The regulations provide the procedure for designating controlled areas, and the objectives of air quality management plans for these areas.

3.7The Noise and Excessive Vibration Pollution Control Regulations – 2009

The *EMCA Noise and Excessive Vibration Pollution Control – 2009* regulations control excessive noise and vibration. The Regulation prohibit making or causing any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. The Regulation also prohibits excessive vibration, which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment. The regulations consist of six Parts and eleven schedules. This regulation provides guidelines and maximum permissible noise limits in different environment. The first schedule of this regulation provides Maximum Permissible Intrusive Noise Levels.

Table 2: Maximum Permissible Noise Levels (First Schedule**)**

Zone		**Sound Level Limits dB(A) L_{eq} 14 hr**		**Noise Rating Level (NR) L_{eq} 14 hr**	
		Day	**Night**	**Day**	**Night**
A	Silent Zone	40	35	30	25
B	Places of worship	40	35	30	25
C	Residential : Indoor Outdoor	45 50	35 35	35 40	25 25
D	Mixed residential (with some commercial and places of entertainment)	55	35	50	25
E	Commercial	60	35	55	25

Time Frame

Day: 6.01 a.m. – 8.00 p.m. (Leq, 14 h)

Night: 8.01 p.m. – 6.00 a.m. (Leq, 10h)

The second schedule of this regulation specifies the standards for construction site.

Table 3: Maximum Permissible Noise Levels for Construction sites (Measurement taken within the facility)

Facility		Sound Level Limits dB(A)	
		Day	**Night**
(i)	Health facilities, educational institutions, homes for disabled etc.	60	35
(ii)	Residential	60	35
(iii)	Areas other than those prescribed in (i) and (ii)	75	65

Time Frame

Day: 6.01 a.m. – 8.00 p.m. (Leq, 14 h)

Night: 8.01 p.m. – 6.00 a.m. (Leq, 14h)

The proposed Project will be required to comply with noise limits that are applicable in and will be compliant with the standards.

3.8 The Wetlands, River Banks, Lake Shores and Sea Shore Management Regulations, 2009

The EMCA *Wetlands, River Banks, Lake Shores and Sea Shore Management Regulations – 2009* ensures the conservation and sustainable use of wetlands, river banks, lake shores and sea shore. This regulation provides guidelines on management of these areas. This regulation also provides precautionary principal when working near wetlands in order to conserve them.

3.9 The Physical Planning Act – 1999 (Chapter 286)

The *Physical Planning Act Chapter 286* is the main Act that governs land planning. The respective Local Authority (Bomet County Government) must approve developments and issue a certificate of compliance. Section 29 of this Act gives the powers to local Authorities to reserve and maintain all land planned for open spaces, parks, urban forests and green belts.

3.10 The Water Act – 2002 (Cap 372)

The *Water Act, 2002* provides guidelines on use and management of the of the water resources and prohibits the water pollution. As per Part II, section 3 of this act states *"every water resource is hereby vested in the state, subject to any rights of user granted by or under the Act or any other law"*. The act also species that a permit is required from The Water Resource Management Authority in case of supply to over twenty (20) users.

3.11 The Environmental (Impact Assessment and Audit) Regulations – 2003

The *Environmental Impact Assessment and Audit Regulations, 2003* provide guidelines for conducting an EIA study as well as environmental auditing and monitoring. The Regulations state in Regulation 3 that *"the Regulations should apply to all policies, plans, programmes, projects and activities specified in Part III and V of the Regulations"* basically lists the guidelines of undertaking, submission and approval of the EIA/SEA Report.

3.12 NEMA's Draft Environment Impact Assessment Guidelines and Administrative Procedures – 2002

National Environmental Management Authority (NEMA) is the regulatory authority responsible for issuing, varying or cancelling environmental impact assessment licenses. The draft NEMA *Environmental Impact Assessment Guidelines and Administrative Procedures - 2002* provide guidelines in conducting EIA study and to assist in the integration of environmental concerns in economic development to foster sustainable development in Kenya.

3.13 Antiquities and Monuments Act, 1983 (Cap 215)

The Act is effective from 1983 and conserves the historical building/sites and monuments in Kenya.

3.14 The Forest Act – 2005

The *Forest Act – 2005* provide guidelines for the establishment, control and regulation of forests and forest areas. The Act controls the cutting, grazing and removal of forests and it goes on to provide that, *no cutting, grazing, removal of forest produce or disturbance of the flora shall be allowed except with the permission of the Director granted in consultation with other conservation agencies, which permission shall only be given with the object of facilitating research.*

3.15 The Water Resources Management Rules – 2007

The *Water Resources Management Rules – 2007* are described in Legal Notice Number 171 of the Kenya Gazette Supplementary Number 52 of 2007. These are applied to all water resources and water bodies in Kenya, including lakes, water courses, streams and rivers, whether perennial or seasonal, aquifers, and include coastal channels leading to territorial waters. These rules empower the authority to impose management controls on land use falling under riparian land.

3.16 The Lakes and Rivers Act Chapter 409 Laws of Kenya

This Act controls the dredging in lake or river. As per Part II – section 5 (1), No person shall dredge in a lake or river without a license from the Minister, which shall be in the form in the Second Schedule. Furthermore, the act species that..."a person who dredges in a lake or river without a license or contrary to the terms of his license shall be guilty of an offence and liable to a fine not exceeding one thousand five hundred shillings for every day during which the offence"

3.17 The Occupational Safety and Health Act, 2007 (No. 15 of 2007)

The Act applies to all workplaces where any person is at work, whether temporarily or permanently. The objective of this Act is to secure the safety, health and welfare of persons at work; and protect persons other than persons at work against risks to safety and health arising. Under Section 16 of this Act, it is mentioned that *no person shall engage in any improper activity or behaviour at the workplace, which might create or constitute a hazard to that person or any other person.* This Act repealed the Factories and Other Places of Work Act and provides general duties of occupiers of work places. The Act provides for safe use of plant, machinery and equipment and states that all plant, machinery and equipment whether fixed or mobile for use either at the workplace or as a workplace, shall only be used for work, which they are designed for and be operated by a competent person.

3.18 Work Injury Compensation Benefit Act 2007

The *Work Injury Compensation Benefit Act – 2007* provides guideline for compensating employees on work related injuries and diseases contacted in the course of employment and for connected purposes. The act includes compulsory insurance for employees.

3.19 The Employment Act, 2007

The *Employment Act, 2007*, declare and define the fundamental rights of employees, to provide basic conditions of employment of employees, to regulate employment of children, and to provide for matters connected with the foregoing.

3.20-The Labour Institutions Act, 2007

The Labour Institutions establish institutions and bodies involved in the administration of management of labour relations. It provides for the functions, powers and duties, and other related matters relevant with labour. The Act establishes and strengthens institutions, which deal with labour administration and management of labour relations.

3.21 The Labour Relations Act, 2007

The *Labour Relation Act, 2007* promotes protection of freedom of association for both employees and employers.

3.22 The Standards Act, Cap 496

The Kenya Bureau of Standard is the authority responsible for implementation of this act. The *Standard Act, Cap 496* provides standards on the requirements of equipments and project materials.

3.23 Public Health Act Cap 232

The *Public Health Act Cap 232* makes provisions for securing and maintaining health. It consists of directives that affect human health. Under Part IX section 115 of this Act, it is stated that no person or institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Any noxious matter or wastewater flowing or discharged into a watercourse is deemed as a nuisance.

3.24 The Agriculture Act Cap 318

This Act promotes and maintains a stable agriculture, to provide for the conservation of the soil and its fertility and to stimulate the development of agricultural land in accordance with the accepted practices of good land management and good husbandry. This Act controls cultivation, grazing and clearing of agriculture land.

3.25 The Malaria Prevention Act, Cap 246

The *Malaria Prevention Act Cap 246* provides measures to curb the breeding of mosquitoes at any development sites. The Act proposed measures to control the breeding of the vector mosquitoes. Sewage management activities handle liquid waste and create ponds that may become breeding places for vector mosquitoes. Therefore it is suggested to incorporate measures to control the vectors in line with this Act.

3.26 Public Roads and Roads of Access Act Cap.399 and Traffic Act Chapter 295

The *Public Roads and roads of Access Act Cap 399* relates to public road and road access. The Traffic Act strengthens the law relevant to traffic on all public roads. The Act prohibits encroachment and damage of roads including land reserved for roads.

3.27 Land Acts

Government Land Act Cap 280

The *Government Land Act Cap 280* provides regulation for leasing and other disposal of Government lands and for other purposes. It also provides for the disposal of land within townships, agricultural land, and land for special purposes.

Land Control Act Cap 302

The *Land Control Act Cap 301* provides for controlling of transactions in agricultural land. The Act elaborates on the establishment of land control areas and boards.

Land Planning Act (Cap. 303)

The *Land Planning Act* provides the guidelines for land planning. Under Section 9 of the subsidiary legislation (*The Development and Use of Land Regulations, 1961*) under this Act requires that before the local authorities submit any plans to then Minister for approval, steps should be taken as may be necessary to acquire the owners of any land affected by such plans. Particulars of comments and objections made by the landowners should be submitted.

The Land Acquisition Act Cap 295

The *Land Acquisition Act Cap 295* makes provisions for the compulsory acquisition of land for the public benefit. Under this Act, where land is acquired compulsorily under this Act, full compensation shall be paid promptly to all persons interested in the land.

4.0 DESCRIPTION OF THE RECEIVING ENVIRONMENT (BOMET COUNTY)

4.1 Bomet County profile

Bomet is one of the Kenya's 47 counties. It falls within the Great Rift Valley. It covers an area of 1,450Km2. It lies between latitudes 0^0 38' and 1^0 03' south of the Equator and longitudes 35^0 01' and 35^0 33' east. Bomet is the capital and largest town of Bomet County. Bomet town has a total population of 110,963 (2009 census) segregated as follows:-

Core Urban	7,035
Peri-Urban	76,694
Rural Areas	27,234.

It is located along the B3 road between Nairobi and Kisii via Narok.

The entire County has a population of 440,842, a density of 304 persons perKm2 (2009 estimates), and 70,769 households with an average farm holding of 5 acres. The County's altitude ranges from 1,689m to 2,328m above sea level, while rainfall ranges between 1,000mm to 1,400mm per annum. Temperatures are in the range of 10 ^{0}C to 27 ^{0}C, with a mean monthly temperature of 18^{0}C. The coldest months are July and August with monthly temperatures of 17.6oC and 19.8oC respectively. It has Agro -Ecological zones from upper highland O to Upper Middle 5. Arable land is approximately 1204 Km2 (83% of the County), while gazetted forest occupies 50 Km2.

The major part of the County is characterized by undulating topography that gives way to flatter terrain in the south. The overall slope of the land is towards the south. Consequently, drainage is in that direction. The County receives rainfall throughout the year with the long rains occurring from March to May and the short rains from August to October. The upper zone that represents the high potential part of the County is suitable for tea, pyrethrum, maize, potatoes, and horticultural crops production, rearing of sheep and dairy cattle. This area is predominantly in the four divisions of Bomet Central, Longisa, Mutarakwa and Ndanai. The lower zone is suitable for rearing of indigenous sheep and goats, bee-keeping, poultry, beef cattle, pigeon peas and cassava production. The area is predominantly in the two divisions of Sigor and Siongiroi. Sigor and Siongiroi divisions are particularly constraint by persistent prolonged dry spells, high temperatures and high incidence of livestock diseases outbreaks. Certain areas of the lower zones have potential for horticultural crops such as citrus, mangoes, avocados, paw-paws and passion fruits as well as coffee, but the average acreage under these crops is currently very low. The community generally relies on maize and livestock production activities.

4.2 Soils and land use

This sub-chapter provides information on the types, extent, status, and trends of soils and land use. Land is the basic natural resource. It forms the basis for the Bomet County socioeconomic development. It supports agriculture, livestock, forests and wildlife. With increasing population, poverty levels and demand for the resources, instances of over-exploitation and degradation of the natural resources are now common across the country. This chapter therefore seeks to outline the major goods and services derived from soils/land in the County, and establish their utilization patterns. The chapter will also seek to establish uses of soils/land that cause or are likely to lead to resource degradation and propose mitigation measures and monitoring plans. The topography of the Bomet County exhibits a general undulating to rolling topography in the upper zones in the north and north eastern parts that give way to flatter terrain in the south. The soil in the north/northeastern parts range from high to moderately fertile. Those in the southern tip range from low to very low in fertility. Those in the central part of the County and the south western tip range from moderately/high to variable in their fertility.

4.3 Agriculture, livestock and fisheries

Agriculture and Livestock are the main sources of livelihoods for rural populations. The three broad agricultural production systems are crop cultivation, livestock rearing, and fisheries. Each of the production system has the potential to significantly affect human and environmental health. This identifies specific activities under each system, status and trends, institutional arrangements, key environmental issues and interventions. The main farming practices/systems in the County are determined by the nature of farm labour that a farmer has at his disposal. This is in turn determined by financial resources available to the farmer, motivation behind the farming (either for commercial or subsistence), and the topography of the farm. According to the Annual Agricultural Report (2011), 29% of farmers in the County use Tractors as a source of power, 35% use family/hand labor while 36% use draught power, mainly oxen. 50% of the farmers in the County (mainly concentrated in the lower, drier zones) use organic fertilizers (manure) on their farms. The other 50% (mainly concentrated in the upper, wetter, Tea growing areas) use inorganic fertilizers on their farms. The percentage area coverage of the various crops grown in the County indicates Maize, Beans, Tea, Irish Potatoes, and Finger Millet are the most important crops in the County in terms of area coverage. The cropping patterns in the County are closely intertwined with the rainfall patterns.

During the long season, (November – May) almost 100% of the farm families go into cropping as compared to 50% - 60% of farm families who go into cropping during the short season (June – October). The community's feeding habits are heavily skewed towards a higher intake of carbohydrates in the form of Maize and its products. Ugali, Porridge, Milk and local vegetables are the main diet components for

most households in the County. Because of this, the bulk of annual farm yields and percentage area coverage is taken by Maize at 19.8%. Agriculture is the most important form of livelihood for a large proportion of the population of Bomet. There are three major agricultural categories, namely Crop Cultivation, Livestock and Fisheries production. Agricultural activities have varied impacts on people and the environment. The factors with potential to significantly affect human and environmental health and safety include; inappropriate agricultural practices, agro-chemicals, biotechnology and inability to control introduced alien species. The continued growth in demand for food items due to population increase and accessibility to more markets is expected to drive the demand for more cultivated land and more livestock products. This will of course have an effect on the environment especially in the area of increased use of agro-chemicals, increased encroachment of fragile ecosystems, and increased soil erosion

4.4 Human and Environmental Health

Malaria, respiratory infections, intestinal worms, diarrhea, scabies, eye infections and bilharzia are most prevalent in the County. Malaria affects about 26% of the population across the County. It is followed by respiratory infections (20%), intestinal worms (15%), diarrhea (13%), scabies (9%), eye infections (6%), and bilharzia (1%). Improved human and environmental health is a function of several factors. Key among them are pollution and waste management, onsite sanitation in human settlements, radiation control, management of chemical pollutants of health significance, proper use of pesticides, monitoring and management of the effects of heavy metals and food safety(source Kenya Bureau of Statistics 2010)

4.4.1 Solid waste

Solid waste is categorized as trade, industrial, municipal, agricultural, institutional, domestic, and construction debris. Bomet town and indeed the entire County are faced with solid waste related problems. Poor planning and coordination of environmental activities coupled with inadequate financial resources in the town and among the community are some of the drivers and pressures giving rise to the current state of continued accumulation of solid waste across the County. It is estimated that the Bomet Township will generate close to about 45 tonnes of waste per day in 2020. Currently, Bomet County collects about 2 tonnes of solid waste per day. This small amount of waste can be explained by the fact that most of the households within the County are rural-based, and are able to manage their waste without having to rely on the County Government. But it is important to design an efficient solid waste management system that ensures regular collection, separation, transportation, treatment, and disposal of this waste in a way that will be environmentally friendly and sustainable.

The greatest challenge in terms of solid waste management will come from the fast growing, unplanned shopping centres across the County. The main ones where the pressure is already being felt include, Mulot sunset, Longisa, Kipsorwet, Kapkwen, Siongiroi, Silibwet, Chebunyo, Sigor, Ndanai and Chebole.

4.4.2 Pollution and Waste Generated from Human Settlement

Major pollution sources in the County include soil erosion, domestic, municipal sources, and hospitals and other public institutions. The main types of waste are solid and effluent waste from the municipal, residual farm chemicals from farms and household waste. Air and noise pollution are minimal. The County of Bomet has an open dumping site for solid waste and an open effluent disposal pit for effluent municipal waste. It also occasionally provides an exhauster at a cost to exhaust pit latrines within the Township. Within Bomet County and local shopping Centres across the County, the main types of wastes identified include, effluent waste, household wastes, commercial refuse mainly from markets and shops, and institutional refuse. These need to be managed with the overall aim of attaining an improved quality of living conditions in the County. It is estimated that by the year 2015, the Bomet Township will generate about 6 tonnes of solid waste per day. Several options for managing these wastes have been proposed. But the one that appears to be most feasible is a decentralized system of storage, collection, transport and disposal.

4.4.3 Proposed interventions (Development report 2005)

i. **Installation of a Water and Sewerage Handling Infrastructure**

The Bomet County is in the process of developing a Water and Sewerage System to provide a comprehensive Effluent waste management program. This is particularly important to the Municipal because of the high water table that prevails within its jurisdiction. During the rainy season, most Pit Latrines overflow due to this factor, hence causing major health risks across the Bomet and its environs. A sanitation and sewerage study has already been carried out and a report prepared with the assistance of the World Wide Fund for Nature (WWF). A comprehensive feasibility study has also been conducted.

ii. **Public Mobilization and Enforcement of Standards and Guideli**nes

It is imperative to enhance and sustain coordinated community mobilization to promote improved human and environmental health and build capacity at the grassroots for surveillance and enforcement of environmental quality standards and guidelines.

4.5. Water and water resources

The County has several permanent rivers. These are, Amalo River, which flows along the southern boundary of the County, Nyangores River (bordering the proposed project site) which flows from Southwestern Mau Forest, and proceeds southwards through Tenwek, Bomet town and joins Amalo River to form Mara River, and Kipsonoi River, which flows along the boundary with Buret. It eventually flows

into Lake Victoria. Kiptiget/Tebenik River flows along the northern boundary of the County. Sisei and Kagawet Rivers are seasonal. There is no available record of the streams (either seasonal or permanent) in the County. There are several protected springs. They include, Kiproroget, Uswet, and Kimolwet. Masaibei and Menet springs are in the process of being protected. There are also rehabilitated Dams and water pans. These are, Kapsaiyelel, Ngocho, Birirbei, Cheboin, Nyambugo, and Kapcheruse. The ones in the process of being de-silted include, Oldarakwa, Kugunoi, and Kagawet. According to a baseline survey of the Mara River Basin, on average, households in Bomet get their water at a distance of 4KM. During the wet season, 70.8% of households spend less than one hour to get water, as compared to 47.9% during the dry season. 1.1% of households spend three to four hours to get water during the wet season compared to 7.4% during the dry season. Only a small proportion of households (0.3%) spend more than five hours during the dry season to get water.

4.5.1 Water resources

This sub-chapter outlines the key Water sources and Uses, Main catchments, Major drainage patterns, Status and trends of Water resources, Regulatory and management arrangements, key Environmental issues in the Management and Utilization of Water resources and Proposed interventions in the County. Bomet County has three permanent rivers. These are, Amalo River, which flows along the southern boundary of the County, Nyangores River, flowing through Bomet town and joining Amalo River to form Mara River, and Kipsonoi River, which flows along the northern boundary of the County. Sisei and Kagawet Rivers are seasonal. There's no available record of the streams (either seasonal or permanent) in the County.

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4.5.2 Main Catchments

The main catchment for the three permanent rivers is the Mau Natural Forest Complex that lies administratively in Narok County. As elsewhere in this plan, the indiscriminate deforestation of the Mau Forest Complex is considered to be the main cause of wide river flow fluctuations in these three rivers.

4.5.3 Drainage

The main drainage area is the Lake Victoria Basin. The Mara River drainage basin, which lies within the Lake Victoria South drainage area, is the dominant drainage area in the County. It forms part of the wider Lake Victoria Basin.

4.5.4 Status and Trends of Water Resources

Although there is no reliable data available, most stakeholders in the water sector in the County have observed declining water flows in the three main rivers, drying up of some streams and wells and non-appearance of seasonal streams even in the rainy seasons. The indiscriminate deforestation of the Mau Forest Complex is considered to be the main cause of wide river flow fluctuations. The quality of water flowing in the rivers has also been adversely affected. Sediment loads are increasing, as are other forms of pollution. The sources of sediment are mainly cultivated agriculture and poor drainage resulting from structural works in the upper catchment areas (roads, tracks, and footpaths). Data on sediment load is scarce, however combined estimates for Amalo and Nyangores rivers vary between 113 and 432 tones/day (Ongwenyi 1979). Forest clearing in the upper, high potential agricultural areas, cultivation along the banks of rivers, monocultures, and lack of appropriate soil conservation measures and overgrazing has increased soil erosion in the County and subsequently the sediment load and nutrient runoff into the rivers.

According to a baseline survey of the Mara River Basin (2004), 76% of households in Bomet have adequate water throughout the year, while 24% of households have inadequate water at one time or the other during the year. However, the quality of the water they access was not determined. Going by increasing incidences of water born diseases in the County and barring other circumstances, it would be easy to conclude that the quality of water has been declining over time. According to the same survey, only 36% of households in Bomet treat their water in some form or the other. The other 64% does not treat their water in any way.

4.6 Forestry and wildlife resources

Forests are ranked among the country's most important natural resources. They conserve water, and soils, regulate gaseous balance in the air, and serve as reservoirs of biological diversity. Sustainable forest management is therefore an integral component of the overall National development. The overall goal of a sustainable forest management plan is to increase the quality of life of communities through employment creation and provision of raw forest products for both domestic and industrial use.

The County has only one gazetted forest, – Chepalungu Forest – that is managed by the Kenya Forest Service. It has an estimated area of 5,000ha. It consists of exotic plantations and indigenous forest of

various species on a relatively flat terrain in Siongiroi and Ndanai divisions. The forest is home to such animals as Monkeys, Antelopes and abundant bird life. The indigenous forest cover is estimated to cover an area of 4,700ha, while the rest is covered by an Exotic/Established plantation of mainly *cuppressus lusitanica* (Common Cypress), *pinus radiata*, and *eucalyptus saligna* among others.

Due to a general increase in population in the County, the pressure to settle people in the forest has been increasing. Already, 134ha of the forest has been used to settle some people and put up amenities, though their settlement has not been formalized. Like most other counties in the country, Bomet's forest cover is very low. Although there has been no survey carried out to establish the exact forest cover, the overall national estimate of 1.7% or thereabout would apply in the County. The Environment Committee is currently exploring ways of encouraging the community to conserve the little forest cover and intensify efforts in tree planting. The Forest Service office has been undertaking replanting programs in the past. These have concentrated mainly in the gazetted forest, but a few other areas have been covered as well. It is estimated that a total of 100Ha have been replanted in the last ten years (2003 – 2012).

The Kenya Forest Service has also introduced an aspect of participatory forest management where farmers living next to the forest are involved in the management and protection of the forests through the formation of community forest associations (CFA) for one forest (Chepalungu). They will require applying to the service for friendly user rights such as grazing, bee keeping, shamba system, eco-tourism but activities such as charcoal burning will not be allowed.

Other organizations that have been involved in reforestation in the County include the Worldwide Fund for Nature (WWF), Action Aid – Kenya, and Friends of the Mau Watershed (FOMAWA), Adventist Development and Relief Agency (ADRA), which implemented a Project funded by the Community Development Trust Fund (CDTF) called the Mau South West Conservation Project. The project is supporting the establishment of Tree nurseries, Beekeeping, Agroforestry, and Water Resources Development.

4.7 Food safety

Food borne diseases pose a serious threat to public health in Bomet County as evidenced by frequent outbreaks of cholera, typhoid and other diarrheal diseases. Besides microbial food safety, pesticide residues, veterinary drugs, lead, zinc, and mercury have been found in foods. Food hawking (especially maize and milk) in Bomet has become a common feature, thus posing danger to the health of the public. Factors that contribute to poor food safety include poverty, inadequate enforcement of existing laws and regulations, inappropriate storage facilities, poor hygiene practices and use of contaminated food. The country has moved to address the issue of food safety in various ways. Sanitary and phytosanitary

certification of foods is one effective response in addition to the application of existing regulations. Other intervention measures include the Kenya

Health Policy Framework of 1994, the Health Strategic Plan 2008-20012, Food, Drugs and Chemical Substances Act (Cap 254), the Meat Control Act (Cap 356), and the Dairy Act (Cap 336). At the County level, the Public health department remains alert to the dangers posed by urbanization, increasing population and lack of proper sanitation facilities.

The prevalence of respiratory diseases may reflect poor living conditions with inadequate ventilation. But in Bomet, the concentration of the cases in the highland parts of the County indicates a strong correlation between upper respiratory tract infections and the cold weather. The high prevalence of intestinal worms, and diarrhea in the County could be linked to poor sanitary facilities and low food hygiene among the community. When water is scarce, it becomes difficult to maintain clean hands, food and the general household environment that are essential in controlling these diseases. Within the County, the prevalence can be easily linked to lack of a water and sewerage system and poor solid and effluent waste disposal system.

4.8 Physical attributes at the proposed project site

The following at the physical attributes of the proposed sites

- ✓ Proposed project site is located on a gentle sloping land there by suitable for the stabilization pond as water will flow though force of gravity
- ✓ The sight has no vegetation
- ✓ The site is located adjacent to river Nyagores
- ✓ The site, at the point which overlooks River Nyagores has no wetland.
- ✓ Proposed WSPs site occupied by vegetables owned by the prisons department
- ✓ The site is adjacent to a cemetery site to be affected by proposed project.
- ✓ There are no settlement within a radius of 1km from the proposed site

The plates below were captured during site visit

	
Proposed WSPs site occupied by vegetables owned by the prisons.	Cemetery site to be affected by proposed project.

5.0 PROJECT DESCRIPTION

5.1 Bomet Sewerage

Bomet Sewerage treatment ponds have been designed to treat 1,469m^3/day mainly to be generated in Chepngaina Sub-location which forms Bomet Township. Two trains have been designed each with six ponds (A1,F1, M1, M2, M3 and M4) with each train capable of treating 734.5m^3/day.

Due to the problem in identifying for land for WSP, only one train with capacity to treat 734.5m^3/day with associated structures has been considered

5.2 Designed WSPs

Tahal/Bhundia Consulting Engineers had designed four trains of Waste Stabilization Ponds, two on either side of each other at the quarry site.

1. One Anaerobic Pond was to serve two trains. The Anaerobic Pond had dimensions of:

   Length - 61m (51m+5x2)
   Width 37m (27m+5x2)
2. Facultative Pond - F1

   Length - 117m (107m+5x2)
   Width - 65m (55m+5x2)
3. Maturation Pond - M1/1

   Length - 53m (43m+5x2)
   Width - 65m (55m+5x2)
4. Maturation Pond - M1/2 and M1/3

   Length - 49m (39+5x2)
   Width - 65m (55+5x2)

Hence the total dimensions are as follows:-

Width - 65m

Length - 280m

Area for Phase 1 - 18,200m^2 = 4.55Acres

The Works was is to be executed in two phases.

5.3 Siting of Ponds and Geotechnical features

1. No part of the system is within 500 m of any dwelling house. If possible, ponds should are sited downwind from dwellings, roads and other public places.

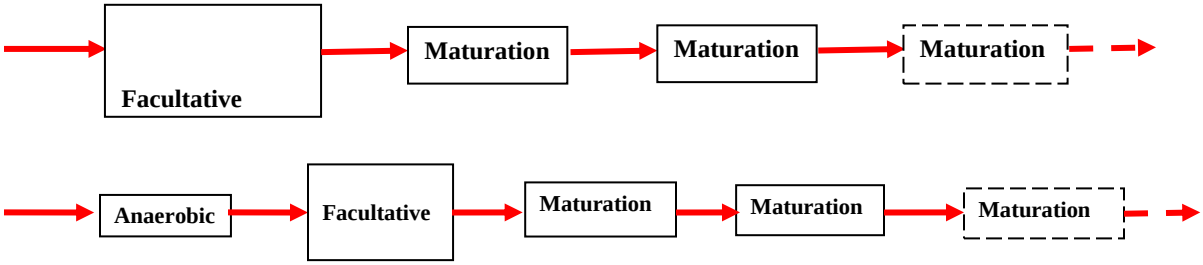
2. Soils are suitable for pond stability for a stable and impermeable embankment

3. Embankments must be well constructed to prevent seepage, excessive settlement and erosion over time.

4. Embankment are sloping are 1 (vertical) to 3 (horizontal) internally and 1 to 1.5-2 externally.

5.3.1Typical Pond Layouts

There are two alternative pond layouts that are acceptable in tropical countries.



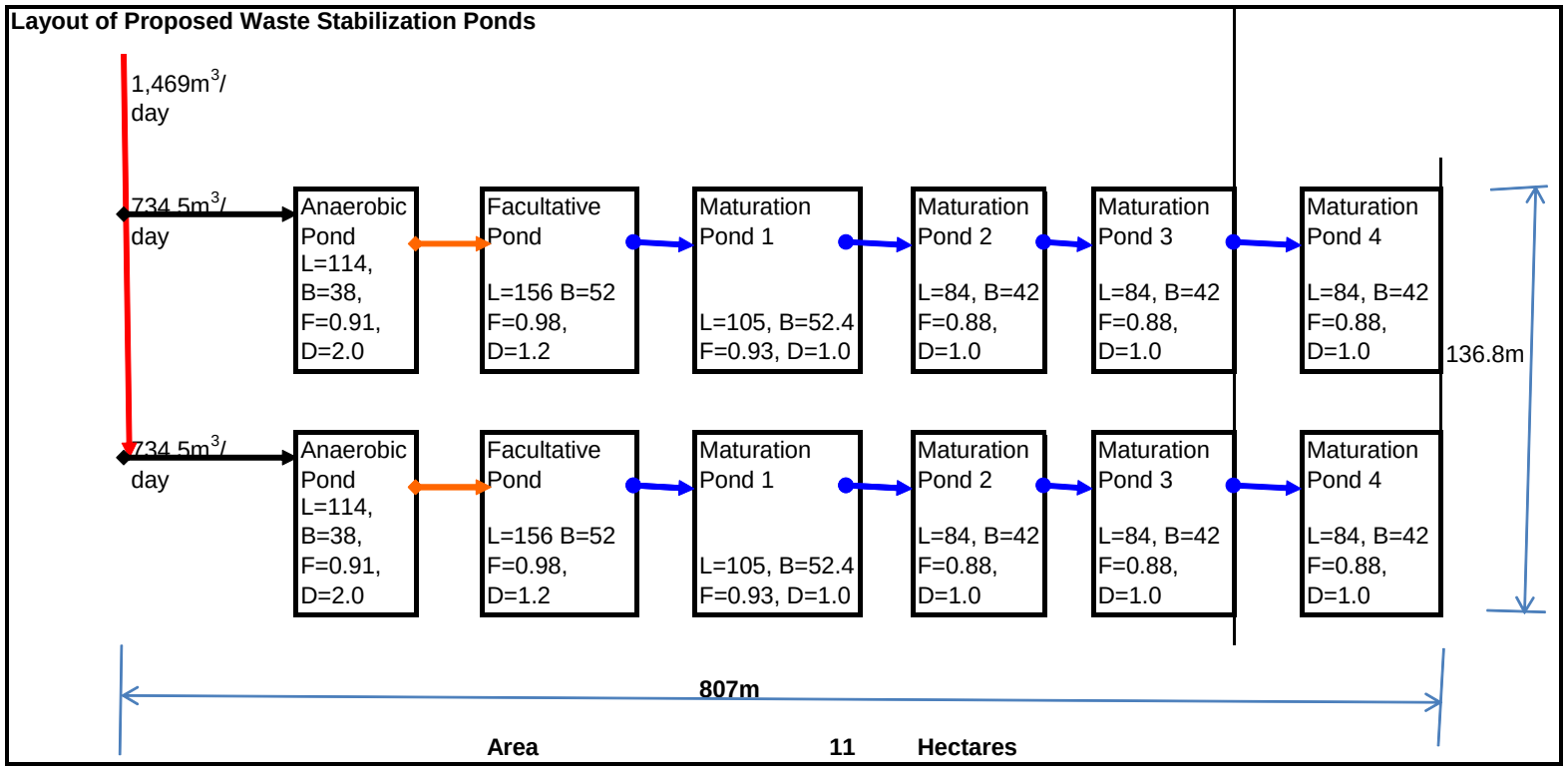


Figure 5: Layout of proposed Waste Stabilization Ponds

1Hectare=10,000m^2

5.3.2 Summary

Table 4: table of overall retention time model

Description of structure	**Volume of each,m^3**	**Mid depth Area, m^2**	**Retention Time, days**
Anaerobic Ponds (2No.)	1,487	743.5	2.0
Facultative Ponds (2No.)	9,729.6	8,108	13.4
Maturation Ponds (8No.)			
Maturation Pond No. 1	5,478	5,478	7.5
Maturation Pond No. 2	3,558	3,558	5
Maturation Pond No. 3	3,558	3,558	5
Maturation Pond No. 4	3,558	3,558	5
Total	**27,368.6**		**37.9**
Effluent Analysis			
Description	**Influent**	**Effluent**	**% Reduction**
Faecal Coliforms	10^8	10^3	99.99

The overall retention time is thus 37.9 days and the removal of filtered BOD and FC throughout the pond series is as follows: -

Assuming a Cumulative removal of filtered BOD of 90 percent in the Anaerobic and Facultative Ponds and 25 percent in each of the 3 maturation ponds the final effluent will have a filtered(non Algae)BOD of 500 x 0.1 x 0.75 x 0.25 = 12.5mg/L which is satisfactory.

Table 5: Model of BOD removal

ITEM	**% BOD Removal**	**BOD(mg/L)**
Raw Wastewater		500*
Anaerobic Pond Effluent	54.7	226.5*
Facultative Pond Effluent	45.9	122.5
1st Maturation Pond Effluent	25	91.875
2nd Maturation Pond Effluent	25	68.90625
3rd Maturation Pond Effluent	25	51.68
4thMaturation Pond Effluent	25	38.76

NOTE

The Anaerobic Pond has been included due to the following reasons:-

i. To substantially reduce the retention time and thus land area requirement

ii. Losses due to Evaporation (Change in Humidity Effect)

5.4 Physical Design of WSP

The section of the sewerage system is as follows

i. Anaerobic Ponds
Total Depth=2.91M

ii. Maturation Pond 1
$F=(\log_{10}A)^{1/2}-1$ $=(\log_{10},5,478)^{1/2}-1=0.93m$ d = 1.0m

iii. Maturation pond 2

iv. Maturation pond 3

v. Maturation pond 4

5.5 project cost

Tabulated below are summary of the anticipated cost of carrying out the entire project

Table 6: Project Cost

Table 7: Estimated Cost of Sewers

	BILL NO 2. COLLECTION SHEET				
BOQ NO.	DESCRIPTION				**Amount**
					(KShs)
2.1	PRIMARY SEWER A				49,278,438
2.2	PRIMARY SEWER B				35,651,162
2.3	PRIMARY MAIN SEWER LINE K				36,048,444
	Total C/F to Summary Collection for BOQ 2				**120,978,044**

Table 8: Estimated Cost of Waste Stabilization Ponds (One Train) and Associated Infrastructures.

BILL NO. 4 - WASTE STABILIZATION PONDS					
COLLECTION PAGE					
BOQ NO.	**DESCRIPTION**				**AMOUNT (KSHS)**
-					

4.1	WASTE STABILISATION PONDS AND ASSOCIATED WORKS				64,965,001
4.2	OVERFLOW/ OUTFALL SEWER AO				10,385,587
4.3	SLUDGE DRYING BEDS				7,131,741
4.4	UTILITY BUILDING				5,877,506
4.5	DOUBLE GRADE 9 STAFF HOUSE				6,056,445
4.6	**WATER SUPPLY SYSTEM**				4,011,252
4.7	SEWERAGE SYSTEM				2,143,940
4.8	SITE WORKS AND ACCESS ROADS				**23,226,793**
4.90	ELECTRICAL AND MECHANICAL WORKS				**8,057,271**
Total Carried to BOQ Summary Page for BOQ No. 4					**131,855,536**

Table 9: Grand Summery

BOMET SEWERAGE		
SUMMARY		
BOQ NO.	**DESCRIPTION**	**AMOUNT**
		KSHS
1	PRELIMINARIES AND GENERAL ITEMS	153,738,529
2	SEWERS	120,978,044
3	INLET WORKS	4,992,753
4	WASTE STABILIZATION PONDS	131,855,536
	Sub-Total	411,564,862
	Add 10% Contingencies	41,156,486
	GRAND TOTAL	**452,721,348**

5.6 Project alternatives

5.6.1 Site Selection

The best site for setting up of sewerage treatment system would be a site that allows waste water to flow freely by gravity from the urban areas to the treatment facility. Site identification was based on feasibility studies done for waste water management for the Bomet town by Tahal Group in Association with Bhundia Associates Consulting Engineers.

The site is relatively an ideal site for setting up a treatment facility as the land was set aside by Bomet County Government for this infrastructure.

The site is considered ideal for setting up a treatment plant for that Serves Bomet Township

Some of the benefits of putting up the sewerage stabilization ponds at the point will be

- ✓ No cases of land acquisition as the land belongs to Bomet County Government
- ✓ No pumping will be required as the Sewer will flow by gravity from Bomet town to the treatment works hence saving on energy required for pumping.

5.6.2 Technology Design Analysis – Technical Project Alternatives

Option 1 – Conventional Wastewater Treatment (Trickling Filters)

The first option entails the use of this method, facilities and techniques for the waste water treatment process. Due to the stringent environmental management standards that are becoming tighter day after day, a constructed wetland is proposed as a final waste treatment for this alternative.

This option can achieve the highest removal of pollutants in the waste stream compared with the other options and requiring the lowest land requirements. The possibility of generating electricity through the capture of methane could lead to revenue from carbon credits and sale of electricity to the grid. This option will be can be explored.

Option 2 – Constructed Wetlands

The second option entails the use of constructed wetlands to treat the waste water after preliminary screening and grit removal. This option is a practical alternative to the conventional treatment of sewerage but not to the waste stabilization ponds. This option is disadvantaged in that it requires a very big space of land for the treatment process. This option also requires very thorough operation and maintenance activities therefore making the operation costs very expensive. The capacity of the wetlands to treat wastewater is limited, both in terms of the quantity of water, and the total quantity of the pollutants. Also, the chemical and biological processes occur at a rate highly dependent on environmental factors,

including temperature, oxygen and pH. A slight change in the above parameters greatly affects the treatment process.

Option 3: A septic tank

The key component of a septic system is a small scale sewage treatment system common in areas with no connection to main sewage pipes provided by private corporations or local governments. A septic tank generally consists of tanks between the size of 1,000 and 2,000 gallons (4000 - 7500 litres) which is connected to an inlet wastewater pipe at one end and a septic drain field at the other. These pipe connections are generally made via a T pipe which allows liquid entry and egress without disturbing any crust on the surface. Today the design of the tank usually incorporates two chambers (each of which is equipped with a manhole cover) which are separated by means of a dividing wall which has openings located about midway between the floor and roof of the tank.

This proposal will involve individual plot owners constructing standard septic tanks for liquid waste management. They will then be making subsequent arrangements with draining companies to be draining the septic tanks periodically. Apart from the financial implications of this alternative, there are a number of environmental and operational problems that works against this alternative.

Operational problems associated with septic system include the following among others:

- ✓ Excessive dumping of cooking oils and grease can fill up the upper portion of the septic tank and can cause the inlet drains to block. Oils and grease are often difficult to degrade and can cause odor problems and difficulties with the periodic emptying.
- ✓ Flushing non-biodegradable hygiene products such as sanitary products and cotton buds may rapidly fill or clog a septic tank
- ✓ Excessive water entering the system will overload it and cause it to fail.
- ✓ Even well maintained septic tanks release mucus-producing anaerobic gut bacteria to the drainage field. The mucus "slime" will slowly clog the soil pores surrounding the drain pipe and percolation can slow to the point where backups or surfacing effluent can occur. This slime is called biomat and such a failure is referred to as "Biomat failure".
- ✓ Trees in the vicinity of a concrete septic tank have the potential to penetrate the tank as the system ages and the concrete begins to develop cracks and small leaks. Tree roots can cause serious flow problems due to plugging and blockage of drain pipes, but the trees themselves tend to grow extremely vigorously due to the continuous influx of nutrients into the septic system.

NB: Apart from the above mentioned operational problems associated with a septic tank, there are several environmental problems that result from the use of this wastewater treatment technology. Some pollutants, especially sulfates, under the anaerobic conditions of septic tanks, are reduced to hydrogen

sulfide, a pungent and toxic gas. Likewise, nitrates and organic nitrogen compounds are reduced to ammonia. Because of the anaerobic conditions, fermentation processes take place, which ultimately generate carbon dioxide and methane. The fermentation processes cause the contents of a septic tank to be anoxic with a low redox potential, which keeps phosphate in a soluble and thus mobilized form. Because phosphate can be the limiting nutrient for plant growth in many ecosystems, the discharge from a septic tank into the environment can trigger prolific plant growth including algal blooms which can also include blooms of potentially toxic cyanobacteria.

Soil capacity to retain phosphorus is large compared with the load through a normal residential septic tank. An exception occurs when septic drain fields are located in sandy or coarser soils on property adjoining a water body. Because of limited particle surface area, these soils can become saturated with phosphate. Phosphate will progress beyond the treatment area, posing a threat of eutrophication to surface waters. In areas with high population density, groundwater pollution levels often exceed acceptable limits. This is a likely scenario if this technology is to be pursued.

5.6.3 No project alternatives

Under the "No Project" alternative, the proposed project shall not be constructed. This would mean that the negative impacts associated with poor wastewater management in Bomet will continue.

This alternative would also mean that the resultant socio-economic benefits that would accrue from the proposed development would be foregone. Looked at from the point of view of the benefits that are likely to accrue to the general public in terms of revenue and taxes to the Central Government and Local government, and employment opportunities to the local people, this alternative is not recommended.

5.6.4 Comparison of Alternatives

From the above discussion three alternative technologies have been considered and their relative merits discussed. The technologies include Conventional Wastewater Treatment; Constructed Wetlands; Septic tanks and the "No project" alternatives. Based on the various disadvantages of other options that has been discussed above, Conventional Waste Water Treatment System would be the most ideal alternative to be constructed due the advantage of utilizing limited space and still performing at optimum as compared to waste water stabilization ponds. The proposed project is therefore appropriate to the extent that it will improve service delivery to the people of this area and economically utilize the land. It will also lead to a cleaner environment over and above creating employment and business opportunities for more people during construction stage.

6.0 IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS

6.1 Existing impacts.

Domestic waste water is disposed of through sewers that outfall into septic tanks or cesspools, and through pit latrines. In Bomet there is widespread use of septic tanks as a method of disposing of domestic waste water in the households. There are several reported cases of overflowing septic tanks and pit latrines observed in high density areas. The Bomet Township lacks a comprehensive storm water drainage system, leading to flooding in some areas. This provides breeding places for mosquitoes especially during the rainy season. Most of the waste water from the town ends up in local water sources with little or no treatment. This has led to significant pollution of this resource.

6.2 Anticipated impacts.

The anticipated impacts of the proposed project on the environmental elements are both positive and negative. The magnitude of each impact is described in terms of being significant, minor or permanent, short-term or long term, specific (localized) or widespread, reversible or irreversible. The assessment criteria for the significant impacts are as shown in the table below:

Table 10: Leopold's Matrix of Impacts Analysis

IMPACT ON		**Social economic environment**						**Biological Environment**								**Human Env**		**Physical Environment**									
PROJECT PHASE	**PROJECT COMPONENT**	Conflicts	Employment	Public Health	Social responsibility	Benefit to community	Cost to community	Ecological Function	Wetlands ecosystems	Migratory Species	Aquatic ecosystems	Vegetation	Alien Species	Species Diversity	Pests and Disease Vectors	Diseases	Health and safety	Water quality	Soil Erosion	Groundwater Recharge	Siltation	Surface Run-off Control	Solid waste management	Aesthetic/scenic quality	Dust levels	Surface Water	Air pollution
Operation Phase	Water treatment process	0	+2	0	0	+2	+2	+2	+1	0	-1	0	0	0	-2	0	-1	+1	0	+1	0	0	0	-1	0	-1	-1
	Discharge of treated effluents	-1	+2	+1	0	+2	+3	-1	-1	0	-1	0	0	0	_1	+2	0	-1	0	0	+1	+1	0	-1	0	_1	0

+ positive
- negative

Table 11: Table of potential due impacts

Impacts on or due to	Construction	Operation	Remarks
Noise Pollution	✓		During construction, hooting of construction vehicles and Communication from workers may generate noise and vibration that may have negative effect to the neighborhood. This will however be very minimal and will be restricted to the construction stage of the project.
Oil waste pollution	✓	✓	Petroleum oils and grease used in vehicles and construction machinery may spill or leak on/into the ground hence into the soil or water system within the neighbourhood.
Air/Dust Pollution	✓		During construction, dust and exhaust emission from the construction activities and machinery, may Pollute the ambient air.
Soil erosion	✓		Earth works during project construction Usually influence soil erosion. By incorporating appropriate soil conservation measures and proper drainage facilities both

			during construction and operation phases of the project, soil erosion will be completely minimized.
Public Health		✓	During the construction process, there will be health threats to workers on site. During operation phase, public health threats will be from blocked Sewerage piping system that may pollute the environment and bad odour
Water pollution		✓	The proposed location of the sewerage treatment ponds and lagoons borders River Nyangores. Taking into account of this proposed location, it is likely that implementation of the project may result into pollution of River and finally lake Victoria environment in general depending on how the implementation is carried out.

6.3 Potential Positive Impacts

There are a number of positive benefits associated with the proposed project. They include the following:

- ✓ There is significant positive impact to be gained through elimination of discharges of untreated sewage to the local environment, and this (assuming suitable mitigation measures are incorporated) far outweighs any other negative impacts associated with the proposed development.

- ✓ The project will provide wastewater management infrastructure for Bomet town. This will lead to environmental conservation and management as pollution from septic tank leakages will be eliminated.
- ✓ Provision of employment opportunities during both construction and operation phases of the project.
- ✓ The proposed project will centralize the town's wastewater treatment and will make pollution monitoring easy and more effective.
- ✓ Potential investors will develop the Township as they will be guaranteed of good infrastructure of sewer disposal.
- ✓ Improved health of the people- Reduced cases of respiratory and water borne diseases associated by poor sanitation due poor domestic waste water management.
- ✓ Improved water quality in River Nyangores, downstream environment that depend on it
- ✓ Reduced transboundary point source pollution that reaches far areas lake Victoria, Nile basin and Mara ecosystem
- ✓ Improved aesthetic value of the area of the area due to cleaning up of the mess that is currently experienced in Storm water drains in the towns.
- ✓ Creation of job opportunities during implementation phase for the ponds/ lagoon operators
- ✓ Sludge from the ponds is a rich resource that can be utilized by the community around as fertilizers, but Bomet Water Sewerage Company should put stringent measures to ensure that no effluents from industries are disposed into the sewer system before pretreatment. Community sensitization and enlightenment is also needed to ensure that the communities accept use of human wastes as fertilizer
- ✓ Better positioning to adapt to climate change as a water infrastructure project

6.4 Potential Negative Environmental Impacts and Mitigation Measures

Table 12: potential negative environmental impacts and mitigation measures

IMPACT ACTIVITY	POTENTIAL IMPACT	MITIGATION MEASURES
Effluent handling	✓ Water contaminations from effluents from construction machinery , contamination include oil leaks and fuel leaks ✓ Possibilities of foul smell from the stabilization ponds are inevitable if improper technologies are adopted. ✓ Possibility of continual river Nyangores contamination by unsatisfactory treated effluents from the system ✓ Possibility of river contamination by overflowing manholes blocked sewer trunks during operation phase, history of sewer puncturing to irrigate ✓ Possibility of underground contamination of ground water resources (aquifers) within the proposed site for sewerage ponds	⇒ The system must be designed and adequately sized to be able to treat all the effluent generated from the Bomet Township to the required standards ⇒ Proper servicing of machineries on site according to manufactures details, proper liquid waste collection system should be provided on site, stabilizing lagoons could be constructed to hold waste water before releasing into the river ⇒ Management to apply for a license to discharge effluent to environment; ⇒ Employees to be trained on the operation and maintenance of whatever effluent treatment system that will be put in place; ⇒ Any pipes leakages and bursts in the system to be promptly fixed; ⇒ Local ground water to be monitored periodically by sampling and testing water from borehole in the neighbourhood every three months to check whether there are any traces of effluent finding their way to ground water aquifers; ⇒ Periodic Sampling of two strategic points within River Nyangore ⇒ Treated effluent to be periodically analysed

IMPACT ACTIVITY	POTENTIAL IMPACT	MITIGATION MEASURES
		(every three months) to ensure BOD is maintained at 30mg/l or less and COD at 50mg/l or less. ⇒ Sweeping up solid materials for use as by-products, instead of washing them down the drain; ⇒ Fitting drains with screens and/or traps to prevent solid materials from entering the effluent system; ⇒ Wastewater to be treated to environmental acceptable standards before discharge to the environment. ⇒ All sewage (regardless of what system that will be in place) to be first treated as provided for in the fourth schedule of the Environmental Management and Coordination (Water Quality) Regulations, 2006 before discharge into the environment; ⇒ Sewage line and allied infrastructure to be regularly maintained; ⇒ Manhole covers and those of inspection chambers, be tightly fastened (air tight) to avoid escape and release of odour;
Sludge waste from the ponds	⇒ Foul Gases generated from sludge interferes with air quality ⇒ Possibilities of inhabitation of the area by Marabou stork, cattle egret	⇒ Tapping 100% of gases generated from the facility, this will be tapped in the sludge digesters, the gases of which are responsible for the foul smell associated by with wastewater treatment system.

IMPACT ACTIVITY	POTENTIAL IMPACT	MITIGATION MEASURES
	and Hadada ibis. The birds could be a nuisance both to the community and charter planes flying in the area	⇒ Maintain high standards of hygiene within the system ⇒ The sludge wastes should be promptly removed from site and disposed appropriately in a designated landfill. ⇒ Sludge waste from the facility to be handled, managed and disposed in accordance to the EMCA waste management regulations 2006; ⇒ If possible sludge should be used for farming. ⇒ Contract a NEMA certified waste collection firm to collect sludge waste for central disposal point ⇒ Construction of storm water drainage system; and ⇒ Construction of offsite pit for handling of sludge ✓ Ensure only NEMA licensed company exhausts the sludge from the waste water treatment plant; ✓ Ensure the vehicle used to carry exhausted sewage is NEMA registered; ⇒ Ensure that once exhausted the sewage is disposed at a NEMA licensed facility for sewage management and disposal.
Water usage	Increased demand for water	⇒ Approximate volumes of water to be required during construction of the project

IMPACT ACTIVITY	POTENTIAL IMPACT	MITIGATION MEASURES
		to be computed in order to put in place mechanisms of reliable supply; ⇒ Approximate volumes of water to be required per project in a specified time period to be computed in order to put in place mechanisms of reliable supply;
Public and occupation Safety and Health	⇒ Possibility of river contamination by overflowing manholes blocked sewer trunks during operation phase ⇒ Fowl smell from the system ⇒ Falling of human and animals into the open ponds	⇒ Enlighten staff on the requirement of OSHA 2007 through arranging regular training sessions; provision of PPE to staff including fire fighting equipments on site. ⇒ Regular inspection of the system to ensure performance is maintained at high levels; ⇒ Blockages should be detected and promptly replaced; Regular monitoring and sampling of the waste water at influent and effluent points as well as in the receiving water bodies ⇒ Communities living within the river basins where the trunk sewers will be constructed should be enlightened on dangers of using raw sewerage to irrigate farmlands. ⇒ Training secession should be organized by NEMA and Bomet County Government through the supervising ⇒ firm assigned to the project, the cost of the training should be included in the bidding ⇒ documents under environmental restoration item to be included in the Preliminary and

IMPACT ACTIVITY	POTENTIAL IMPACT	MITIGATION MEASURES
		General ⇒ The contractor should appoint an Environment Liaison Person to work closely with an ⇒ Environment Compliance Officer from the client side to ensure mitigation measures ⇒ proposed in the report are strictly compliant to, regular Environmental Audit will also be required on a twice per year to ensure the mitigation measures proposed the Environment Management Plan are being followed. ⇒ Proper personal protective equipment; ⇒ Contractor use barriers and guards as necessary to protect employees, animals from falling into stabilization ponds ⇒ Signage -danger warning or CAUTION will be put at strategic places; ⇒ The contractor and management shall adhere to the provisions of environmental health and safety plan (EHS); ⇒ Development of occupational safety and health guidance plans; and ⇒ Form a safety and health committee to coordinate safety and health issues at workplace.

7.0 PROPOSED ENVIRONMENTAL MANAGEMENT PLAN

7.1 Introduction

The use of environmental action or management plans as a means to address environmental impacts is a standard response in EIA practice and, as such, falls within Kenya's EIA legislation, regulations and guidelines. The need for a plan of action to deal with the environmental impacts associated with the stabilization ponds and lagoons therefore recommended in this environmental report.

This chapter layout the systematic plans packaged as the environmental management plan (EMP). The goal of the EMP developed is to address the key potential impacts identified in the preceding chapter as well as setting the relevant policies and actions plans needed to achieve an environmentally sound and sustainable project venture.

The EMP developed for the proposed sewerage project proposes that the management of project develop and document policies to address environment, safety and health; and community concerns. Further the EMP proposes environmental action plans to address, effluent, solid waste, dust, noise, and occupational injuries.

Additionally, management needs to develop and put in place management plans to address effluent, solid waste, dust, noise, resource use and occupational injuries during the construction and operation phases of the sewerage and associated infrastructure. To achieve this management of the sewerage system and allied infrastructure will need to put in place and document policies that will govern its operations, including safety, health and welfare of workers and local community. This will ensure that management and project contractor will avail necessary finances to ensure necessary systems are put in place to address safety, health and welfare of all workers during construction and management of dust, noise, solid waste, treated effluent and from the infrastructure.

This section outlines in tabular format the key impacts associated with the establishment of the proposed project, it is presented from a sectoral perspective developed by the assessment team and outlines where relevant the significance of each impact, as well as the main mitigation measures that could be included in an appropriate environmental management plan.

Table 13: EMP during Pre-Operation Stage

ENVIRONMENTAL IMPACT	RECOMMEDED MITIGATION MEASURES	RESPONSIBLE PARTY	TIME FRAME	APPROX. COST (Ksh)
PLANNING AND DESIGN				
1. Planning	Construction of Bomet Sewerage must all relevant permits needed prior to constructions; these include NEMA, BCC, WRMA, Public Health Department, Mine and Geology approvals among others.	Contractor Surveyor Consultants, Site acquisition agents	2 months	200,000
CONSTRUCTION PHASE				
2. Minimization of Noise pollution				
Noise pollution	-Ensure engines and machinery are switched off when not in use.	Contractor	Throughout construction period	200,000 one off
	-Ensure regular servicing of equipment and machinery			
	-Enforce workers discipline on site.			
	-Programme work to take minimum time			
	-Construction works to be done during day time.			
	-Provide appropriate personal protective clothing to the working crew and enforce their use			
	-Heavy constructing machinery to be enclosed			
3.Minimization of soil erosion				
Soil erosion	-Ensure that any compacted areas are ripped to reduce run off	Contractor	Through construction	200,000 p.a
	-Water channels to be regularly maintained			

	and repaired to avoid point discharge in case of breakage and or blockage		period	
	-source building materials from known sustainable sites to minimize extraction impact			
4. Reduce dust emission				
Dust emission	-Water be sprayed on excavated areas during construction phase	Contractor and workers	Through construction period	200,000
	-Use of appropriate PPE by construction workers			
	-Sensitize the employees on sound environmental management.			
	-Use dust nets at high level of the building			
	-Provide appropriate enclose for concrete mixers			
5. Minimize of energy consumption				
Increased energy consumption	-Ensure working machinery are properly maintained and are working at their design efficiency	Contractor, proponent	Through construction period	200,000 one off
	-Ensure planning of transportation materials to ensure that fuel are not consumed in excessive amounts	Contractor, proponent	Through construction period	
6. Efficient water use				
Water utilization/ management.	-Sensitize all the workers on the need to utilize the water on site efficiently	Contractor and workers	Through construction period	
7. Occupational Safety Concerns				50,000 p.a
Workers	-Provide appropriate personal protective clothing to the working on sites	Contractor and workers	Through construction period	
	-Hiring of competent staff with previous work experience to perform works			
	-Follow proper work guidelines			

	-All the project participants should have functional insurance work men's compensation			
	-There should be presence of fully equipped first aid kit at site.			
	-To have emergency preparedness plans in place.			

Table 14: Operation Phase Management Plan

Activity / Issue	**Action required**	**Performance / Monitoring Indicator**	**Responsibility**	**Provisional Budget KES**
Project overall management during operation of the plant	⇒ Identify environmental issues that need mitigation during project operation. ⇒ Identify occupational health and safety issues related to operation of the sewerage system ⇒ Develop management plans and procedures needed to address the environmental concern ⇒ Set environmental performance targets and adhere to them ⇒ Programme for performance Improvement especially on Environmental matters ⇒ Set management roles and responsibilities for staff operating the facility ⇒ Monitor and evaluate the performance against set targets ⇒ Set a budget for environmental	• Project environmental technical economic and social sustainability. • Implement a monitoring and evaluation schedule • Provide regular Monitoring and Evaluation reports including Environmental Audit Reports as required under EMCA 1999.	• LVEMP • Bomet County Government	1,000,000

	management; and restorations ⇒ Schedule for revising and updating the EMP. ⇒ Initiate sensitization programmes on best practices on solid waste management right from the source, sorting, transportation and disposal ⇒ Conducting an initial audit in the first year of operation of the facility			
Pollution of river Nyagores by unsatisfactory treated waste water	⇒ Regular inspection of the system to ensure performance is maintained at high levels ⇒ Blockages should be detected and promptly replaced ⇒ Regular monitoring and sampling of the waste water at influent and effluent points as well as in the receiving water bodies ⇒ Creation of an artificial wetland along the boundary between River Nyangores and the stabilization ponds	• water quality results of the adjacent water resources • operation efficiency of the system	• Bomet County Government • Lvemp • Local community	1,500,000 annually
Methane /	⇒ Methane can be captured and converted	• Operation efficiency of	• LVEMP	

Hydrogen Sulphide and other gaseous management during Operation of the Sewer system	to energy ⇒ clean the gases and flare them to reduce them to CO2 and H2O	systems • Levels /intensity of foul smell odour in the area	• Bomet County Government • Contractor **NB**: Installation to be included at construction phase	
Risks of Birds scavenging in the ponds and sludge	⇒ Proper handling of solid wastes from the screens at the inlet works. The wastes should be sorted and taken to a solid waste treatment station.	• Regular site Inspections Recording in the log books on a daily basis	• LVEMP • Bomet County Government • Contractor	500,000
Risks of wildlife / rodents presence at to the site	⇒ Proper fencing of the Plant to keep off wildlife is recommended ⇒ Maintaining high standards of hygiene at the site throughout the operation phase of the facility ⇒ Constant consultations with KWS in event that wildlife is spotted in the area	• Fencing of the area	• LVEMP • Bomet County Government	500,000
Aesthetic/ visual	⇒ The facility should be properly kept collecting any litters within the sites ⇒ Reinstatement of sites to original status or better after any repair / service	• Site conditions during implementation n and completion of civil works	• LVEMP • Bomet County Government	1,000,000

	works ⇒ Planting of suitable trees			
Occupational Health and safety	⇒ Liaise with the Directorate of Occupational Health and Safety Department to provide for appropriate training and regular updating of worker skill on occupational health and safety matters; ⇒ Provide appropriate personal protective equipment (PPE) to workers and any visitors Provide for First Aid facilities for field and localised staff as per the Occupational Safety and Health Act,2007; ⇒ Develop and implement a detailed and site specific Emergency Response Plans.	• Health and safety awareness among staff; • Frequency of incidents/acid ents and fatalities	• LVEMP • Bomet County Government • DOSH	1,000,000

8.0 STAKEHOLDERS CONSULTATIONS

Initial consultation included engaging with different stakeholders that would potentially be impacted by the construction and operation of the proposed sewerage activity. The aim of the stakeholder engagement was to provide information regarding the project to people who live and work within the local area and to understand their current social conditions, including residence, occupation and income streams and if they had any concerns or perceived benefits regarding the proposed project. The consultation was vital as it served to:-

- ✓ Inform all stakeholders of the ESIA process and proposed development within their locality;
- ✓ Explain to the stakeholders the nature of the proposed project, its objectives and scope;
- ✓ Get their views, concerns and issues regarding the proposed development; and
- ✓ Obtain suggestion from stakeholders on possible ways that potential negative impacts can be effectively mitigated.

The consultation was in the form of site visits and office consultation. During site visits, The ESIA team held consultative meetings with the following offices

i. Office of the Governor, Bomet County
ii. Physical planning Department-Bomet
iii. National Environment Management Authority
iv. Local community group residents groups
v. Public Health Office-Bomet County
vi. Learning Institutions-Bomet Teachers Training College and St. Michaels Secondary School
vii. Ministry of Environment-County Government of Bomet

8.1 Site Visits

Visits to the proposed project site were carried out by the team of ESIA Experts in the company of County Director of Environment. A total of two site visits were done during which, informal discussions were carried out within the proposed project area. The ESIA team of Experts informally explained to the stakeholders their expectations they encountered during site visits the proposed project. The stakeholders encountered presented their views and concerns informally to the team of experts. The experts explained to them that the team of ESIA Experts will be arrange a formal consultative forum which will draw all neighbours to come and discuss the proposed project, the experts also explained to them that a thorough questionnaire survey will also be carried out in the neighbourhood of the proposed project site.

8.2 Views/concerns

The concerns (that need to be mitigated) that were expressed by stakeholders encountered during site visits include:-

- ✓ Nearness of the proposed sewerage treatment plant to a cemetery
- ✓ The Health of River Nyagores which is likely to be impacted by the establishment of the sewerage treatment plant
- ✓ Maintenance of good air quality to the neighbouring homes and institutions

	
View of proposed waste stabilization ponds project area.	Indoor consultation with Deputy Governor-Bomet County
	
View of nearby River Nyangores.	Field visit by the ESIA study team.

9. 0 ENVIRONMENTAL MONITORING PROGRAMME

The location of sewerage treatment system the will require that regular monitoring of possible change in environmental parameters to be undertaken during the operational life the plant.

The possible impacts of this especially on ground water resource will require to be constantly monitored. With increased urban development come the challenges of waste handling and disposal. The monitoring programme to be developed must take into account possible impacts of waste disposal. All contents from the sewerage system must be monitored to ensure no environmental degradation arises.

With these factors in mind, there will be a need to put in place elaborate and sound environmental management system and mechanisms of monitoring on a continuous basis the environmental performance of the treatment system. Undertaking monitoring and auditing of key environmental parameters and putting in place of all approved recommendation of the environmental management plan and conditions of the licence will achieve this. Monitoring to be undertaken will be both active and reactive.

9.1 Active monitoring

Active monitoring will include:

- Monitoring of the achievements of specific plans of the EMP, performance criteria and fulfilment of objectives;
- Systematic inspection of work place;
- Surveillance and monitoring of the work environment, including the organization of work and activities involved;
- Monitoring of workers' health; and
- Monitoring of compliance with laws, regulations and other requirements.

9.2 Reactive monitoring

This would include:

- Work related injuries, ill health (including record keeping and monitoring of sickness/absence), disease and accidents;
- Deficient safety and health performance including OHSMS failures;
- Workers rehabilitation and health restoration programmes.

9.3 Parameters

Monitoring will involve measuring, observing, recording and evaluation of physical, socio-economic and ecological variables within the project area and the neighbourhood. This may include the following: -

- Water quality monitoring for sources of domestic water on River Nyangore
- sludge disposal monitoring; and
- Sewage treatment infrastructure monitoring.

Water quality monitoring for sources of domestic water will involve monitoring in changes of the following variables:

Table 15: Standards for water quality

Parameter	**RESULTS**	
	Observed value	**Guide value (maximum allowable)**
pH		6.5-8.5
Nitrate NO_3		30 mg/l
Ammonia-NH_3		10 mg/l
Nitrite- NO_2		3 mg/l
Total Dissolved Solids		1200 mg/l
E-coli		Nil/100mL
Fluoride		1.5 (mg/L)
Phenols		Nil (mg/L)
Arsenic		0.01 (mg/L)
Cadmium		0.01 (mg/L)
Lead		0.05 (mg/L)
Selenium		0.01 (mg/L)
Copper		0.05 (mg/L)
Zinc		1.5 (mg/L)
Alky benzyl sulphonates		0.5 (mg/L)
Permanganate value		1.0 (mg/L)

Source: Environmental Management and Coordination (Water Quality) Regulations; 2006.

9.4 Effluent monitoring for discharge into the environment

Effluent monitoring for discharge into the environment will carried out as stipulated in the fourth schedule of the Environmental Management and Coordination (Water Quality) Regulations; 2006. The following parameters will be monitored for discharge into the environment; Biological Oxygen Demand (BOD), Total Dissolved Solids, pH, Feacal coliforms, oils and greases, temperature, colour, total phosphorus, Ammonia (as N), organic nitrogen (as N) and flow.

9.5 Monitoring schedule

Table 16: Environmental monitoring schedule

Description of parameter	Monitoring schedule and duration
Ground water quality/sources of domestic water	Every three months
Sludge disposal	Daily throughout project life
Sewage effluent systems	Every three months

9.6 Environmental Auditing

Annual Environmental Audits should be carried out as provided for in the Environmental (Impact Assessment and Audit) Regulations of June 2003. The Audits will serve to confirm the efficacy and adequacy of the proposed Environmental Management Plan. The audits should include but not limited to the following;

- Waste management and disposal,
- Water analysis,
- Views and comments from neighbours; and
- Progress in implementation of Environmental Management Plan.

10.0 CONCLUSION AND RECOMMENDATION

We conclude the following from the studied project report

i. The design will ensure comprehensive waste water treatment to allowable limits by NEMA and WHO standards and the World Bank Environmental Health and Safety Guidelines, before releasing into the river Nyangores

ii. Involvement of all relevant stakeholders is proposed throughout the process to ensure project acceptability Proper measures should be taken into account to ensure the land acquisitions process is done properly according to the law and OP 4.12

iii. All construction waste will be properly disposed off in a timely manner, the excavated material wherever possible will be used as raw material for a range of activities, such as road repair or construction, and for use as building material e.g. stones

iv. Provisional Budget should be included in the bidding documents for implementation of mitigation measures that will be proposed in the detailed study.

v. NEMA Bomet County, Bomet County Government and Public Health Office should ensure that all industries and institutions within the township have an effluent pre-treatment system

REFERENCES

1. Millennium Development Goals, Ministry of Planning and National Development, 2005
2. Housing and Population census report 2009, Ministry of Planning and National Development
3. Environmental Management and Coordination Act 1999
4. Environmental Impact Assessment and Audit Regulation 2003
5. Population census report of 2009
6. World Bank Operation Policy on Environmental Assessment OP 4.01
7. Ministry of Environment and Natural Resources
8. Hand Book for Preparation of Resettlement Action Plan International Finance Cooperation 2002
9. World Bank Operation Policy on Environmental Assessment OP 4.02
10. Environmental Impact Assessment and Audit Regulations Regulation 2003
11. WHO (2006): Guidelines for the Safe Use of Wastewater, Excreta and Greywater, Vol. II: Wastewater use in agriculture. World Health Organisation, WHO Press. Geneva, Switzerland
12. Republic of Kenya (1998). Laws of Kenya: The Science and technology Act, Cap 250. Government Printer, Nairobi.
13. Republic of Kenya (1999). Population and Housing Census. Central Bureau of statistics, Ministry of Finance and Planning, Nairobi.
14. Republic of Kenya (1999). The Environmental Management and Co-ordination Act, No. 8 of 1999. Government Printer, Nairobi.
15. Republic of Kenya (2003). Legislative Supplement No. 31, Legal Notice No. 101: The Environmental (Impact Assessment and Audit) Regulations, 2003. Government Printer, Nairobi.
16. Republic of Kenya. Physical Planning Act, CAP 286. Government Printer, Nairobi.
17. Republic of Kenya. The Occupational Health and Safety Act 2007.
18. Republic of Kenya. The Water Act 2007, Cap 372.
19. Republic of Kenya. The Public Health Act, Cap 286.
20. Republic of Kenya. The Occupational Health and Safety Act 2007
21. Republic of Kenya. The Land Planning Act, Cap 303
22. Republic of Kenya. The Penal Code Act, Cap 63

APPENDICES

Appendix 1: Photolog

Appendix 2: Letter of identification of land for Water and Sewerage Plant

Appendix 3: Commitment by Bomet Municipal Council to avail 5Acres for Construction of WSPs

Appendix 4: Dayton Consultants Operating license

Appendix 5: Public Participation Questionnaires

PHOTO LOG

Plate 1: View of proposed waste stabilization ponds project area.

Plate 2: Indoor consultation with Deputy Governor-Bomet County

Plate 3: View of nearby River Nyangores.

Plate 4: Field visit by the ESIA study team.

Plate 5: Proposed WSPs site occupied by vegetables currently owned by the prisons department.

Plate 6: Cemetery site to be slightly affected by proposed project.

Appendix 1: Letter of identification of land for Water and Sewerage Plant

Ministry of Environment and Mineral Resources
LAKE VICTORIA ENVIRONMENTAL MANAGEMENT PROJECT
PHASE II

MEETING IN BOMET	
COMPONENT 2	POINT SOURCE POLLUTION CONTROL AND PREVENTION
ACTIVITY:	**Rehabilitation of Wastewater Treatement Facilities**
SPECIFIC /SUB	2.1.4 Rehabilitatethe Sewerage Treatement Facility in Bomet: Redesign of sewerage treatement ponds and trunk sewer line for Bomet sewerage system.
DATE:	1st – 3rd July 2013
VENUE:	**Bomet Governor's Office**

ATTENDANCE LIST

1. Hon. Stephen Mutai – Deputy Governor - Bomet County
2. Dr. Kipkorir Sigi Langat – Executive Committee Member i/c of Environment, Bomet County.
3. Mr. Kilelson Mutai – Administration Officer, Bomet County
4. Mr.Philip K.Sitonik – Works officer, Bomet County
5. Mr.Daniel Cheruiyot – Excutive Member i/c of Finance, Bomet County.
6. Mr.Sammy K. Keter – County Attoney, Bomet County.
7. Mr.Daniel K.Omwansa – CDE-NEMA, Bomet County.
8. Mrs. Agnes Yobteric – DPP&SI- MEWNR.
9. Mrs Francisca Owuor – NCP, LVEMP II.
10. Mr. John Okungu – Water Specialist, LVEMP II.
11. Mr. John Okere – Senior Hydrologist Assistant, LVEMP II
12. Mr. Wilbon Cheruiyot – Surveyor, District Lands Survey Office.
13. Mr. Kiplangat kosgey – Surveyor, District Lands Survey Office.

AGENDA:- CONSULTATIVE MEETING

DELIBERATION OF THE MEETING:-

The Deputy Governor called the meeting to order with self introduction from the members. He informed the members that the Governor was away on official duty. He was impressed by the sewarage project which was to be carried out in the Bomet Town by LVEMP II.
The members were notified that currently there is Bomet Water Company which is in-charge of water supply and sanitation in Bomet County.

The **DPP&SI** gave an overview of the interventions to be done by the project and said that LVEMP II will carry out the following activities :,

a) Provide Eco- Sanitary public toilets (Bio-Toilets) in one of the schools in Bomet.
b) Purchase one Exhauster vehicle for Bomet Town .
c) Rehabilitate the Sewarage Treatment Facility.

She said that the work must be done in 18 months.

NATIONAL PROJECT COORDINATOR

The National Project Coordinator presented to the members a brief overview of second phase of Lake Victoria Environmental Project II on the Project Objectives, Project Components, Project Location and Project Financing, Implementation Arragements, Implementation Progress, Major Achievements, Challenges and Proposed Measures. (see the attarched ***Annex***)

WATER SPECIALIST

The Water Specialist presented to the members a brief on the waste water facilities rehabilitation by **LVEMP II**. The rehabilitation and improvement of waste water treatement facilities are to be carried out in Kisumu, Homa Bay and Bomet and constructed wetlands used for tertiary treatement. Onsite sanitation will also be provided and unserviced areas.

The Activities that have been undertaken for Bomet interventions are as follows:-

i) LVEMP II team visited Bomet on 23rd. July 2010 to see the project site and discuss with the Municipal Council Officers. The following were noted:-
- High water table
- No existing sewerage system for the town.
- Lagoon done by WWF was inadequate
- Plot allocated for sewerage treatement ponds was plot 6.1 which is 1.1 Ha
- Possible Eco sanitary public toilet suggested for Itembe or Silibwet.
- Nile Basin Initiative expanded water supply 2008.
- Design for sewarage treatement ponds done on used quarry instead of the allocated land.
- Challenge was for the municipality that included solid waste management, poor roads networks, low water and low sanitation coverage.

ii) To start the rehabilitation process a technical team was used to carry out review and Feasibility Study and design.

iii) Review done on 13rd to 16th October 2010, it was found that:-
- Feasibility study done by the Tahad Group in joint venture with Bundia and Associates in 2008.
- Design was done by the same team
- EIA was done by Ecolife Consortium Ltd in April 2007.
- Watsewater ponds would require KShs. 20.5m to construct
- Noted that the allocated land was inadequate.

iv) The To Town Clerck confirmed allocation of extra land by Planning Committee meeting Min. 84/TP/2011 and a full council meeting on 30/11/2011 adding 3 acres in his letter of 7/12/2011

v) A Technical Team was appointed to redesign Bomet Sewerage System and held a kick off meeting and visited the site from 5 – 7th October 2012. The team discussed with the Municipal Offier and it was agreed that:-
- Additional land min. 6 acres
- Water Quality and Quatity Monitoring be done.
- Allocated site be demarcated and beaconed.

vi) Workplan by Technical Team indicated that one month is required to complete the remaing work.
- Expected completion in mid of August 2013.

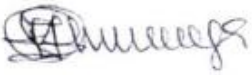
THE MEETING RESOLVED THE FOLLOWING:-

- The Water Specialist to complete TOR by 5th July 2013.
- Survey and Beaconing to be carried out by 5th July 2013 by Lands Survey Office to acertain the actual measurement of the site for sewarage project .
- 8th July 2013- The Technical Team to carry out the Geo-technical survey work and hand in their report by 31st August 2013.
- 9th July 2013-The survey report to be submitted to the County Executive Committee of Environment and Urban planning for ratification .The Minister noted that one day was enough to review the report .
- EIA Initial finding results to be incoporated to improve on the design of sewarage works.
- To ensure that the early inputs are incoporated, the Environmental Expert needs to guide on the decision making for the sewarage design.
- The Technical Team to give a Master Plan on Sewarage Treatment Works in Bomet Town.

SITE VISIT.

The members visited the site on which the sewarage ponds were to be constructed .The members noted the following :-

a. The Beacons were installed by the Lands Surveyor, however one of the beacons could not be located as the area is under cultivation by the Prisons Department.
b. Additional 4 acres of slaughter house land plot 1.11 is to be added to previously allocated land making the total area of the site to be about 7 acres.

SIGNATURE  **DATE:** 10th July 2013

John Okere

Senior Hydrologist Assistant

LAKE VICTORIA ENVIRONMENTAL MANAGEMENT PROJECT PHASE II

Appendix 2: Commitment by Bomet County Government to avail 5Acres for Construction of WSPs

MUNICIPAL COUNCIL OF BOMET

P.O. BOX 382 • BOMET • TEL: (020) 3512014 / 3512015

In replying please quote Ref No. and Date

WS

BMC 1/142/VOL.5(19)
7TH DECEMBER 2011

The National Project Co-ordinator,
Lake Victoria Environmental Management Project II,
National Project Co-ordination office,
Reinsurance Plaza, 2nd Floor,
P.O.Box 9220,
KISUMU.

28 DEC 2011

Dear Sir,

RE: REHABILITATION OF SEWERAGE TREATMENT SYSTEMS BY LVEMP II-KENYA

Reference is made to your letter dated 22nd November 2011 on the above stated subject matter and the urgent need to avail additional land for Bomet sewerage treatment ponds.

The need to avail the additional land for the treatment ponds was tabled and discussed in a Town planning meeting held on 29th November 2011 Min.84/TP/2011 and ratified in a Full Council meeting held on 30th November 2011. It was therefore resolved that an additional 3 acres be approved to make a total of 5 acres for the proposed construction of a sewerage treatment ponds for Bomet Town.

Yours faithfully,

J.Mosongo
Town Clerk

Appendix 3: Operating licenses

FORM 7 (r.15(2))

Application Reference No. 2920

Licence No: 6504

FOR OFFICIAL USE

nema
mazingira yetu|uhai wetu|wajibu wetu

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)

THE ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT / AUDIT (EIA / EA) PRACTICING LICENSE

M/S DAYTON CONSULTANTS (individual or firm) of

Address P.O. BOX 17185-00510

NAIROBI

is licensed to practice in the capacity of a (Lead Expert / Associate Expert / Firm of Experts)

FIRM

in accordance with the provisions of the Environmental Management and Coordination Act, 1999

Dated this 25TH Day of FEBRUARY 13

Signature .....

(Seal)
Director General
The National Environment Management Authority

CONDITIONS OF LICENSE

1. This license expires on 31st December of the year it is issued.
2. The expert shall comply with the code of practice and professional Ethics for EIA/EA experts.
3. The expert shall comply with the attached conditions.

P.T.O.

FORM 7 (r.15(2))

Application Reference No. 2706

Licence No. 2549

FOR OFFICIAL USE

nema
mazingira yetu|uhai wetu|wajibu wetu

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)

THE ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT / AUDIT (EIA / EA) PRACTICING LICENSE

M/S **LUCAS NYAMILA OWITI** (individual or firm) of

Address **P.O BOX 299-40601**

BONDO

is licensed to practice in the capacity of a (Lead Expert / Associate Expert / Firm of Experts)

LEAD

in accordance with the provisions of the Environmental Management and Coordination Act, 1999

Dated this **08TH** Day of **FEBRUARY** **13**

Signature .....

(Seal)
Director General
The National Environment Management Authority

CONDITIONS OF LICENSE

1. This license expires on 31st December of the year it is issued.
2. The expert shall comply with the code of practice and professional Ethics for EIA/EA experts.
3. The expert shall comply with the attached conditions.

P.T.O.

FORM 7 (r.15(2))

Application Reference No. 2155

Licence No: 2524

FOR OFFICIAL USE

nema
mazingira yetu|uhai wetu|wajibu wetu

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)

THE ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT / AUDIT (EIA / EA) PRACTICING LICENSE

M/S PETER OLUOCH OUMA (individual or firm) of

Address P.O. BOX 569-80100

MOMBASA

is licensed to practice in the capacity of a (Lead Expert / Associate Expert / Firm of Experts)

ASSOCIATE

in accordance with the provisions of the Environmental Management and Coordination Act, 1999

Dated this 08TH Day of FEBRUARY 13

Signature .....

(Seal)
Director General
The National Environment Management Authority

CONDITIONS OF LICENSE

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3. The expert shall comply with the attached conditions.

P.T.O.

FORM 7 (r.15(2))

Application Reference No. 2631

Licence No: 2666

FOR OFFICIAL USE

nema
mazingira yetu|uhai wetu|wajibu wetu

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)

THE ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT / AUDIT (EIA / EA) PRACTICING LICENSE

M/S CALVINCE OCHIENG ONGINJO (individual or firm) of

Address. P.O. BOX 488-40601

BONDO

is licensed to practice in the capacity of a (Lead Expert / Associate Expert / Firm of Experts)

ASSOCIATE

in accordance with the provisions of the Environmental Management and Coordination Act, 1999

Dated this 13TH Day of FEBRUARY 13

Signature .....

(Seal)
Director General
The National Environment Management Authority

CONDITIONS OF LICENSE

1. This license expires on 31st December of the year it is issued.
2. The expert shall comply with the code of practice and professional Ethics for EIA/EA experts.
3. The expert shall comply with the attached conditions.

P.T.O.