COUNTY GOVERNMENT OF KISUMU

DEPARTMENT OF AGRICULTURE, IRRIGATION, LIVESTOCK AND FISHERIES

KENYA CLIMATE SMART AGRICULTURE PROGRAMME.

THE WORLD BANK

ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED DRILLING AND EQUIPPING OF KALOO BOREHOLE AT NYABOLA AREA, NORTH KABODHO SUB-LOCATION, CENTRAL NYAKACH WARD, NYAKACH SUB COUNTY, KISUMU COUNTY

GPS COORDINATES: LAT SO^0 20'6'63612'' - & LON E34^{0}55'31.82952"

PROPONENT:	**FIRM OF EXPERTS:**
County Government of Kisumu,	**Hope Urban Environmental Research and Investments Limited-HUERI**
P.O. Box 2738 - 40100	**P.O.BOX 7128-40100**
KISUMU	**KISUMU**

SUBMITTED TO NEMA SEPTEMBER, 2019

This Report has been prepared in accordance with the requirements of the Environmental (Impact Assessments and Audit) Regulations, 2003, pursuant to the Environmental Management and Coordination Act, (EMCA 387)

SUBMISSION OF DOCUMENTATION

This Environmental Impact Assessment (EIA) Report was prepared in accordance with the EMCA CAP 387 and the Environmental Impact assessment and Audit Regulations 2003 for the proposed for the Proposed Kaloo Borehole on Plot Number: Kisumu/Kabodho West/160/84/1/019 at Nyabola Area, North Kabodho Sub-location, Central Nyakach Ward, Nyakach Sub-County Kisumu. We the undersigned confirm that the contents of this report are an accurate and truthful representation of all findings as relating to the project.

Firm of Experts:

Name: **Hope Urban Environmental Research and Investments Limited**
Registration No: 7718

Signature: ……..

Date: **……..**

Proponent:

Name: **COUNTY GOVERNMENT OF KISUMU.**

Address: **P.O. Box 2738 – 40100.**

KISUMU.

Signature: **…….**
Date: …….

ACRONYMS

EMCA	Environmental Management and coordination Act

EIA	Environmental Impact assessment
NEMA	National Environmental Management Authority
EMMMP	Environmental Management Mitigation and Monitoring Plan
WARMA	Water Resources Management Authority
WHO	World Health Organization
O&M	Operation and maintenance
TOR	Terms of Reference
EHS	Environment Health and Safety
NEC	National Environment Council
NEP	National Environment Policy
MDGs	Millennium Development Goals
NPEP	National Poverty Eradication Plan
LAU	Limits of Acceptable Use
LUZ	Low Use Zone
OHS	Occupational Health and Safety
M bgl	Metres below ground level
Swl	Static water level
Wsl	Water struck level (in m bgl
KCSAP	Kenya Climate- Smart Agriculture Project
VES	Vertical Electrical Soundings

FACT SHEET

Programme Name	Kenya Climate Smart Agriculture
Project Name	Proposed Drilling and equipping of Kaloo Borehole
Lead Implementing Agency	County Government of Kisumu- Department Of Agriculture, Irrigation, Livestock And Fisheries
Funding Agencies	World Bank and Government of Kenya
Objective of the Project	To solve the community's problem of persistent scarcity of water needs for domestic, livestock and irrigation subsidy.
Project Components	Site fencing, drilling and equipping of borehole.
Project Location	Nyabola Area, North Kabodho Sub-location, Central Nyakach Ward, Nyakach Sub-County, Kisumu County .
GPS Coordinates	***LAT SO^0 20'6'63612'' - & LON E34^{0}55'31.82952"***
Land Registration No:	Kisumu/Kabodho West/160/84/1/019
Designated Land Use	Agricultural

DEFINITIONS OF OPERATIONAL TERMS

Authority: Refers to the National Environment Management Authority (NEMA) established under section 7 of the Environmental Management and Coordination Act (EMCA)

Decommissioning: This is the permanent withdrawal from a site or close down of a facility for restoration.

Developer/Proponent: Means a person proposing or executing a project which is subjected to an Environmental Impact Assessment (EIA) or undertaking an activity specified in the second schedule of EMCA CAP 387.

Environmental Audit (EA): The systematic, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing in conservation or preservation of the environment.

Environmental Impact Assessment (EIA): A systematic evaluation of activities and processes of an upcoming project/facility to determine how far these activities and programs

conform to the approved environmental management plan of that specific project and sound environmental management practices.

Environmental Management and Monitoring Plan (EMP): Means all details of project activities, impacts, mitigation measure, time, schedule, costs, impact or activities, including monitoring and environmental audit during implementation and decommissioning phase of a project.

Mitigation: Measures which include engineering works, technology improvement management ways and means of minimizing negative aspects, including socioeconomic and cultural losses suffered by communities and individuals, whilst enhancing positive aspects of the project.

Standards: Means the limit of discharge or emission established under the Act or under Regulations.

Waste: Includes any matter whether liquid, solid, gaseous or radioactive, which is discharged, emitted or disposed in the environmental in such a volume composition or manner likely to cause an alteration of the environment.

Cone of Depression: Cone-shaped, circular depression of de-water aquifer that forms around a pumping well.

Radius of Influence: The distance from the center of the well to the top limit of the con of depression

Circle of Influence: The top surface area of the cone of depression.

Static Level: The water level in the well casing when the pump is off. Measured from ground level

Pumping Level: The water level in the well casing when the pump is running measured from the ground level.

Draw down: The difference between static level and pumping level

Table of Contents

EXECUTIVE SUMMARY

I. Project

The County government of Kisumu with the help of Kenya Climate- Smart Agriculture propose to construct a community bolehole complete with its axillary at kaloo community for irrigation. The borehole drilling project is to be at Kolal Upper village in Nyabola area,Central Nyakach Ward, North Kabodho Sub location, Nyakach Sub County.

The Project is planned to be financed under the Kenya Climate-Smart Agriculture projects which is a Project funded jointly by the World Bank and Government of Kenya. The Project is aimed at responding to and reducing adverse effects of climate change and thereby help Kenya meet the rising demand for food; and attain the Sustainable Development Goals (SDGs) of ending poverty (SDG1), hunger (SDG2) and combating climate change and its impacts (SDG13).

II. Policy and Legal Regulatory Instruments

The EIA Report preparation was guided by provision of relevant policies, legislation and institutional frameworks that guide preparation of EIA in Kenya and the World Bank Safeguards Policies. These instruments are presented in 1 below:

Table 1: National Policy and Legal Instruments

Policy Provision

- National Policy for Disaster Management in Kenya 2009
- National Disaster Response Plan, 2009,
- Constitution of Kenya 2010
- Kenya Vision 2030
- Nairobi metro 2030
- The Sustainable Development Goals
- National Environment Policy (NEP)
- National water policy
- National Land Policy
- HIV and AIDS Policy 2009
- Gender Policy 2011 Acts of Parliament
- Environmental Management and Coordination Act (EMCA) 1999 amended in 2015
- Public Health Act (Cap.242)
- Water Act 2002 amended in 2016
- Environmental and co-ordination (water quality) regulation
- Physical Planning Act 1996 (286)
- Occupational Health and Safety Act (OSHA 2007),
- Urban areas and cities act 2011
- Works Injuries and Benefits Acts (2007)

International Safeguard Policies and Standards

- World Bank OP 4.01 on Environment Assessment
- International Finance Cooperation (IFC) Performance Standard (PS) 2: Labour and Working Conditions
- World Bank Group Environment, Health and Safety Guidelines

III. Project cost

The project has a total project cost of Kshs. **8,398,000** The implementation of the EMMP is included into the BOQ.

IV. Project description

The proposed project will involve the excavation and drilling of the borehole, embankment compaction and vegetative protection, fencing off the facility, Reservoir tanks mounted on concrete platforms, and construction of axillary structures.

V. Scope of works

The main contractual works comprise of:

- excavation and laying of drilling of a borehole,

- fencing off the facility,
- Reservoir tanks mounted on concrete platforms,
- and construction of axillary structures and supply of solar Irrigation pump as directed by the engineer as per bills of quantities and technical specifications.

VI. Objective(s) of the project

• To increase area under crop production and productivity through irrigation during dry spells.

• Provide water for livestock and human/domestic use and

• To improve farmer incomes and livelihoods through practicing climate smart agriculture

VII. Objective of the EIA

The objective of this E&SIA study is to evaluate the potential impacts of the proposed project and develop mitigation measures that aim at minimizing the negative impacts of the project while optimizing the positive impacts.

The report covers the EIA Regulations requirements of EMCA CAP 387. It involved largely an understanding of the project background, the project design and the implementation plan as well as commissioning. In addition, baseline information was obtained through physical Investigation of the site areas, public consultations with members of the community in the project areas, desktop research, and discussions with the Proponent.

The following are the anticipated significant impacts and the proposed mitigation measures;

Table 1.2: Summary of the potential impacts and their mitigation measure

Potential Impact	**Suggested mitigation measures**
Destruction of Vegetation along the project site	Site Clearance and Construction activities will be limited to the area set-out by the Project engineer; this will be done in order to minimize destruction to vegetation cover. Reinstatement of the project sites to their original state to be carried out once construction works are completed to allow growth of vegetation.

Vibration, Noise, air pollution and dust generation by traffic	Strict control under construction contract to limit these impacts to acceptable levels Watering to be enforced to keep dust levels low Exercise shall be carried during normal working hours
Material, oil and gasoline for machinery storage Workforce accidents by unsafe working practices	Strict control by Supervising Engineer to ensure acceptable storage practices Periodic awareness workshops for workforce on safe working practices, Workers to be provided with proper protective Safety kits. Strictly follow the EMP
Soil erosion and compaction	Develop soil erosion management measures Limit the circulation of heavy machinery to minimal areas
Geologic risks	Ensure appropriate casing during drilling Adhere to the recommendations in the hydrogeological report during drilling Obtain authorization from WRMA before undertaking activities
Increased Water Demand	Install a master meter on the borehole to monitor water usage Observe the Water Act 2007
Solid waste management	Disposal to be done by authorized refuse handlers Regular collection of wastes to avoid accumulation at the site
Water Quality	The chemical and bacteriological quality tests to be done regularly The water should be disinfected before use by the community
Influx of Workers during Project Construction	Adhere to provisions of Works Injuries and Benefits Act (WIBA 2007) and International Finance Cooperation Performance standard 2 on Labour and Working Conditions

Increased Transmission of HIV/AIDS	• HIV/AIDS Awareness Program to be instituted and implemented as part of the Contractor's Health and Safety Management Plan to be enforced by the Supervising. This will involve periodic HIV/AIDS Awareness Workshops for Contractor's Staff • Access to Contractor's Workforce Camps by outsiders to be controlled • Contractor to provide standard quality condoms to personnel on site
Increased Crime and Insecurity	• Contractor and Supervision Team to liaise regularly with the Local Administration and Police Service to address any security and crime arising during project implementation. • Contractor to provide 24 hours security to Workforce Camps, Yards, Stores and to the Supervising Team's Offices
Risk of Accidents at Work Sites	• Contractor to provide a Healthy and Safety Plan (HSP) prior to the commencement of works to be approved by the Supervising Engineer. •Provide Personal Protective Equipment (PPE) including gloves, gum boots, overalls and helmets to workers, use of PPE to be enforced by the Supervising Engineer

Table 1.3: Potential Negative Impacts and proposed Mitigation measure during Operation

ISSUES	**ACTION REQUIRED**
Ground water pollution	• Groundwater quality must be safeguarded by a correct territorial planning and protection of surface waters since these are strictly linked to ground water resources. • Ensure that all potential sources of pollution are eliminated for example by ensuring that the sewage disposal system are well protected and does not leak even during exhaustion • The proponent will adhere to the regulations set by the WRMA,

Ground water depletion	• The borehole should be installed with a Master Meter and an Airline/Piezometer to monitor ground water abstraction and to facilitate regular measurements of the static water level in the borehole, respectively • The maximum ground water abstraction permitted from the borehole is limited to the authorized volume per day for the domestic/industrial use only subject to availability from 60% of the tested yield for a maximum abstraction period not exceeding ten (10) hours per day • Install auto-shut water taps to reduce water wastage

VIII. Findings and Recommendations

Assessment findings

The assessment described in the report identified the below listed main findings:

- The project design has ensured that the project is constructed within existing public land and no private land will be acquired.
- The world Bank Operation Policy OP 4.12 is not triggered due to the fact that the proposed site is clear land free from encroachment.
- The Environmental and Social Screening undertaken for the project revealed that the investment will result in low impact on both social and biological environment; therefore, this project is categorized as a category B project.

Assessment Recommendations

The project is recommended for implementation provided the mitigation measures identified in the study for the potential negative impacts are implemented, the recommendations will also form part of Environment Licence that will be issued for the Project.

The Environmental Impact Assessment (EAI) study has been found necessary for this borehole drilling project in order to incorporate environmental issues during implementation and operation. Environmental Impact Assessment for such projects is a requirement in Kenya under Environmental Management and Co-ordination Act (EMCA),

Other relevant legislations include the Water Act (2002) which provides for the management, conservation, use and general control of water resources. The public health Act regulates activities detrimental to the human health, physical planning Act and land planning Act which makes the necessary provision for development control.

The important standards controlling environmental quality are the national standards and those developed by World Health Organization, WHO (1993).

CHAPTER ONE: BASELINE INFORMATION.

1.0 INTRODUCTION

1.1 Project background and EIA rationale

The County Government of Kisumu through the Department of Agriculture, Irrigation, Livestock and Fisheries proposes to drill one borehole for the Kaloo community. The borehole is intended to supply the local community with clean and portable water for both household use and agricultural production.. This project is one of the smart Agriculture initiatives financed by a grant from the World Bank under the Kenya Climate-Smart Agriculture Project (KCSAP) .Water from the borehole is expected to be used for irrigation as well as to solve the problem

of water scarcity for domestic purposes among the community members. Currently residents obtain their water supply from a seasonal riverOlwalo, rain harvesting and shallow unprotected water pans which is not hygienically safe. These sources are also likely to be contaminated by leachate from the pit latrines which are the mode of sanitation in the area.

It's a requirement under the Environmental Management and Co-ordination Act CAP 387 that such a project undergoes Environmental Impact Assessment which therefore the proponent commissioned the environmental expert to conduct the study.

The aim of EIA is to maintain a delicate balance between the human, social economic needs and environmental protection and to enhance sustainability of the available resources.

This EIA study is to enable the public, local county government, approving authority and the developer to properly consider the potential environmental consequences of this proposed project.

1.2 Kenya Climate-Smart Agriculture Project

Kenya Climate-Smart Agriculture Project (KCSAP) is one of the projects in the agricultural and natural resources sector that is addressing the climate change impacts in Kenya. The Project is aimed at responding to and reducing adverse effects of climate change and thereby help Kenya meet the rising demand for food; and attain the Sustainable Development Goals (SDGs) of ending poverty (SDG1), hunger (SDG2) and combating climate change and its impacts (SDG13). The KCSAP will contribute to GoK's Vision 2030 development strategy as well as the Agricultural Sector Development Strategy 2010–2020 (ASDS).

The project cost is estimated at USD 279.7 million to be jointly funded by Kenya Government (USD 24.2million) and The World Bank (USD 250 million). The project beneficiaries are also expected to contribute USD 5.5 million in cash or cash equivalent. The project will be implanted in 24 counties covering 72 sub-counties and 144 wards.

The Project Development Objective (PDO) is "to increase agricultural productivity and build resilience to climate change risks in the targeted smallholder farming and pastoral communities in Kenya, and in the event of an Eligible Crisis or Emergency, to provide immediate and effective response." The project has four main components as summarized below:

Component 1: Upscaling Climate-Smart Agricultural Practices focuses on interventions that promote and facilitate the adoption of TIMPs to achieve the CSA triple-wins: increased productivity; enhanced resilience (adaptation) and reduced GHG emissions (mitigation) per unit of output, as co-benefits.

Component 2: Strengthening Climate-Smart Agricultural Research and Seed Systems supports the development, validation and adoption of context-specific CSA TIMPs to target beneficiaries under Components 1 and 3; and also develop sustainable seed production and distribution systems. The component will also strengthen technical and institutional capacity of Kenya Agricultural and Livestock Organization (KALRO) to deliver its mandate and GRIFTU Pastoral Training Institute to deliver training.

Component 3: Supporting Agro-weather, Market, Climate and Advisory Services, supports development of agro-weather forecasting and marketing information system and their dissemination tools.

Component 4: Project Coordination and Management, supports activities related to national and county-level project coordination and management, including annual work planning and budgeting (AWP&B); fiduciary aspects (financial management and procurement); human resource (HR) management; safeguards compliance monitoring; development and implementation of Management Information System (MIS) and information, communication technology (ICT)-based platforms; monitoring and evaluation (M&E) and impact evaluation (IE) studies; and communication strategy and citizen engagement.

1.2.1 Objective(s) of the project

- To increase area under crop production and productivity through irrigation during dry spells,
- Provide water for livestock and human/domestic use and
- To improve farmer incomes and livelihoods through practicing climate smart agriculture

1.3 Purpose of the EIA

The proposed project, falls under the second schedule of section 58 (1), (5) in EMCA, CAP 387 and with that it requires an EIA study. As stipulated by the legal notice No. 101, 2003, part VI, Section 31 (3) (a) (i) and (ii), the building being an upcoming project, requires an EIA study which will provide baseline information upon which subsequent environmental control assessment and management shall be based upon. The main purpose of the EIA study was to assist the proponent, stakeholders and the NEMA in understanding the potential environmental consequences of the proposed project and thus provide a basis for making informed decisions on the proposed project. The report addresses mitigation options for any potential impacts and residual effects relevant to operational activities of the proposed project, which would assist the management in decision-making regarding this project.

1.4 Objectives of the EIA

The following are the main objectives:

- To comply with EMCA, CAP 387;
- To examine, evaluate and assess the likely environmental impacts that would arise with the implementation of the proposed project; and
- To establish a benchmark for an appropriate environmental management that aims at sustainability of the Environment.

1.5 Terms of Reference for the EIA

This study was guided by the following ToR:

- To describe the project and location.
- To establish legal and regulatory framework;

- To assess the potential impacts that may occur in all phases of the proposed project;
- To identify the impacts imposed on existing infrastructure and the demand put on natural resources;
- To describe the potential effects of the development on both the natural and human environment taking into account health and safety matters;
- To propose suitable mitigation measures for identified negative impacts; ➢ To develop a comprehensive environmental management and monitoring plan; and ➢ To provide a decommissioning/rehabilitation plan.

1.6 Scope of the EIA

In order to accomplish the above TOR the following steps were undertaken:

- Description of the project area to generate baseline information;
- Description of the establishment and operational activities to be undertaken and the environmental changes that will occur;
- Conducting public participation through a public consultation process to obtain views and comments from interested and affected parties;
- Identifying both positive and negative impacts that may arise as a result of the development; Identifying areas of possible conflicts and suggesting amicable and practical solutions; and
- Developing an EMP for effective management of and future monitoring.

1.7 Assessment methodology

This assessment was carried out in accordance with the procedures in the Legal Notice No. 101, Environmental (Impact Assessment and Audit Regulations, 2003). The assessment involved:

a. Site visit to physically inspect and document existing features at the proposed site and natural and socio-economic features of importance.
b. Structured Interviews with affected and interested parties.
c. Environmental screening to determine the necessity and level of the EIA process.
d. Environmental scoping to help narrow down to the most significant issues.
e. Desktop studies for documentary review on the nature of the activities of the proposed project; proposed project related documents, plans and designs; policy and legislative frameworks as well as the environmental setting of the area amongst other things and proposing mitigation measures.

1.8 Limitations

Some of the information in this report was compiled based on responses of the community members and other development partners. There are difficulties in verification of some of this kind of information. The consultant has attempted to evaluate information obtained within the limits of the established scope of work.

CHAPTER TWO: PROPOSED PROJECT DESCRIPTIONS

2.1 Groundwater Survey

Before the commencement of borehole drilling and development works the proponent conducted a hydrological survey to establish the most suitable point for drilling. This was in compliance with the provisions of the Water Act 2002. The report was submitted to Water Resources Management Authority seeking an authority to drill the proposed borehole. The hydro geologist recommended that the proponent should sink the borehole at the proposed site to a minimum depth of 130m bgl and a maximum of 150m at the location of VES 1.

2.2 Nature and Description of Project The proposed project entails the following:

I. Erection of a standard bill board using metallic support and maintain it throughout the construction period and beyond

II. Site office construction using Timber and Galvanized iron sheets and any other locally available material III. Drilling Of the Borehole

- Drilling within overburden, to an average depth of ten (10") meters or basement rock is reached using 10 " bit.
- Drilling within the consolidated /rock formation to an average depth of 140 meters until fresh/ bedrock is reached using 8 " bit.
- Drilling below 150m using 8" Bit

IV. Installation of pump and Accessories

- installation of a hybrid submersible borehole pumping system comprising of the below items: Pump Controller of at least 3kW with capability of solar power and mains (Granados or Lorentz),Submersible water pump capable of delivering at least $3m^3/hr$ at a head of 180 meters,

V. Fencing Works

- Fixing pre-casted Reinforced Concrete squire fencing columns size 150x150x3000mm at a spacing of 2m apart.
- Fixing high tensile plain wire rolls and fix Ø 6mm of nine strands and fastened using stainless binding wires
- Fixing triple twisted hexagonal shaped galvanized chain link gauges 26 of six meters high embedded into mass concrete at the base and fasten using stainless binding wire.
- Fabricate and fix in place metallic double flapped gate overall size three meters wide with appropriate anchor blocks at the center complete with a pad lock.

VI. Concrete Tower Platform -Curst the following concrete using 42.5mps (high strength) cement & mixed with water proof additives for stability and including all formwork

- Concrete grade 15/20 for blinding and reinforced foundation footing and base grade 20/20 to receive concrete columns.
- Reinforced concrete 20/20 in Y16 vertical bars for concrete columns 5m high to receive concrete platform in 42.5 mps cement concentration
- Reinforced concrete 20/20 in Y12 for all ground and suspended beams to receive concrete platform.
- Reinforced concrete 20/20 in Y12 for Suspended slab that holds PVC tanks and allow 50mm dia. holes to receive guardrails.
- Installation of 50mm round galvanized water pipes as guardrails spaced 200mm apart within the holes provided for in the suspended slab.
- Installation of Two PVC tanks 10,000 lts. each and connecting the two using 75mm Ø long nipple with approved back nut complete with rubber washers.

VII. Axillary Structures

- Construction of Cattle watering concrete basin to serve separately the Cattle and the sheep and goat using masonry works and steel trowel finish.

- Construction of a Cattle watering reinforced concrete basin size 1.0x10.0x0.8m high to serve cattle and large stocks separately complete with murram compacted around the watering point
- Construction of Cattle watering concrete basin size 1x10x0.4 to serve separately the sheep, goats and small stocks.
- Wash rooms
- Construction of a VIP toilet attached to a bathroom together in one block

2.3. Borehole development

The proposed borehole will be developed and designed to maximize the yield by repairing any damage done to the formation by the drilling so that natural hydraulic properties are restored. Development enhances basic characteristics of the aquifer near the borehole so that water flows more freely to the well. The undisturbed part of the aquifers just outside the damaged zone may be reworked physically during development to improve its natural hydraulic properties. The borehole will be developed to achieve the following objectives;

a) To reduce the compaction and intermixing of grain sizes produced during drilling by removing fine materials from the pore space.

b) To increase the natural porosity and permeability of the previously undisturbed formation near the borehole by selectively removing the finer fraction of aquifer materials.

c) To remove the filter cake or drilling fluid film that coats the borehole, and remove much or all of the drilling fluid and natural formation solids that have invaded the formations so that the well will yield sand-free water.

On completion of the drilling works, the borehole will be developed using any or a combination of the following methods; over pumping, backwashing, mechanical surging, air development, high-velocity air or water jetting, and a combination of high-velocity water jetting and simultaneous pumping. The over pumping method results in water flows only in one direction, towards the screen, and some sand grains may be left in a bridged condition, resulting in a formation that is only partly stabilized.

Application of mechanical surging forces the water to flow in and out of a screen by operating a plunger up and down in the casing, similar to a piston in a cylinder. Surge blocks sometimes produce unsatisfactory results in certain formations with clay streaks or mica.

The best development results will be obtained by a combination of over pumping, followed successively by mechanical surging and simultaneous water jetting/air – lift pumping. One of the best methods used to clean rock holes is the water jetting/air-lift pumping method in which inflatable packers are used to isolate the zones that supply water to the well.

2.3.1 Test pumping

Test pumping will be conducted to determine the performance characteristics of the proposed well, the hydraulic parameters of the aquifer and the specific yield of a particular aquifer or

several aquifers during the course of drilling. The test pumping will be conducted for a continuous period of 24 to 72 hours, depending on the type of aquifer. Continuing the test for 24hours for a confined aquifer and 72 hours for an unconfined aquifer during constant rate tests level for the borehole must be recorded as well as the intake and the pumping water, levels of the pump during water abstraction.

2.3.3 Material Input

The proposed borehole will consume considerable amounts of both temporal and permanent materials. Temporal materials will include water and drilling form. The foam is primarily used to enhance the rate of cuttings removal by preventing them from aggregating so that they can be lifted more easily to the surface.

Permanent materials will include casings, screens, gravel pack, bentonite, cement, pipes, inert material, and a dipper line. Below is the proposed design:

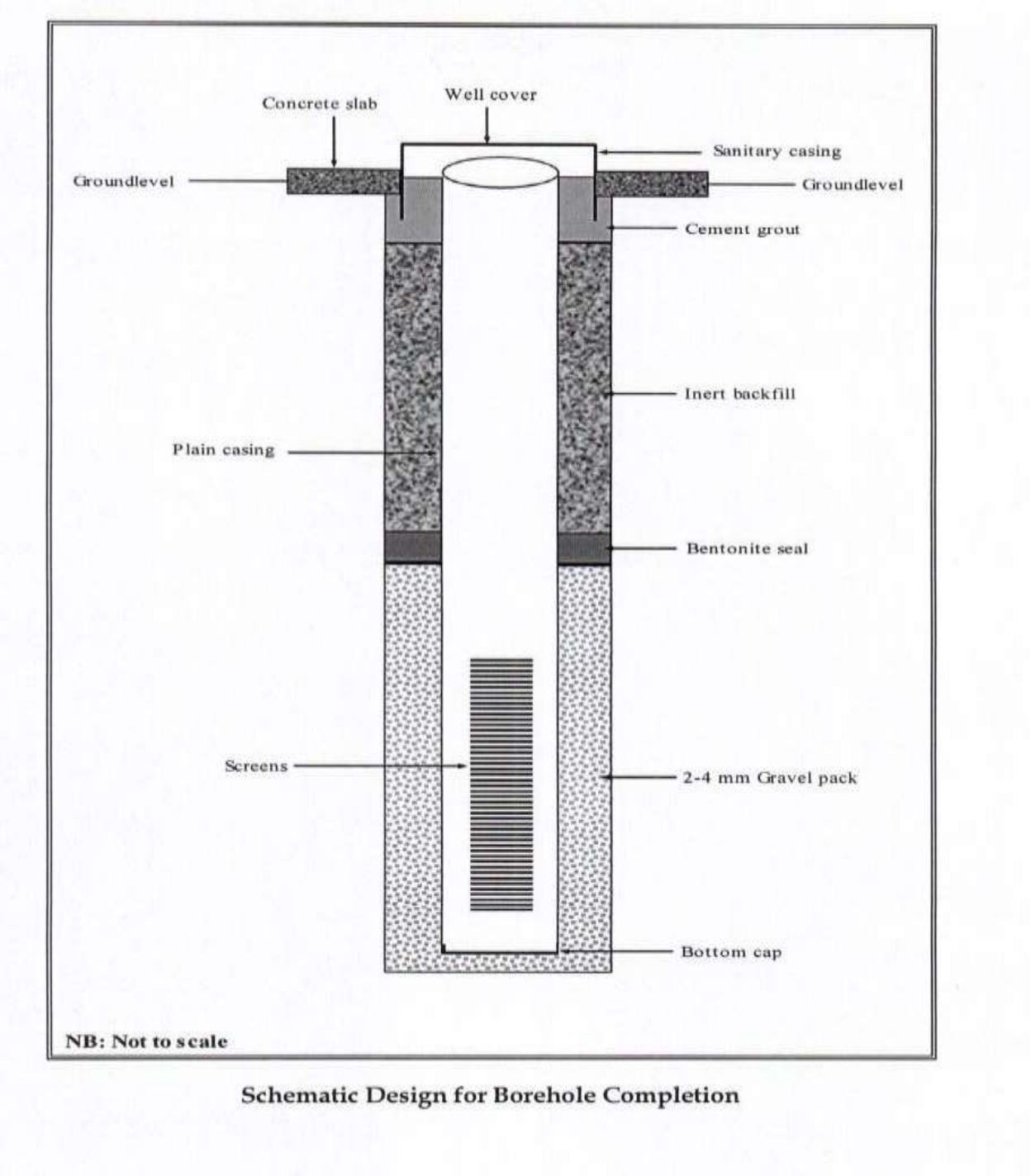

Figure 2:1 Schematic Design for Borehole completion (Source Hydrological Survey Report)

2.3.4 Proposed project outputs

The main products from the proposed project will include: a well-developed borehole fitted with an electric pump, a master meter and increased water drawing activities within the proposed project site

2.4 Cost of the project

The project will cost **Ksh.8,398,000**

CHAPTER THREE: BASELINE INFORMATION.

This chapter describes the environmental setting of the project site including the physical, social and biological environment composition of the site. It addresses the project area in terms of natural resources, land use patterns, socio-economic activities, population, topography, climate, and geology among other information that are potentially viable in affecting the proposed site for development/usage/construction.

3.1 Geography and Site Location

Kisumu County stretches from the Nandi escarpment in the East to the Kano Plains in the middle all the way to the hills of the West. The Kano Plain is perhaps its most famous feature, sporting black cotton soil that is very fertile.

The proposed project is located within Nyakach Sub-County about 32Km from Kisumu city on Kendu Bay Road, approximately 2.8 km South West of Pap Onditi Market Centre and 2.4 km off the Awach- Kendu Bay road. The proposed site is a community land of approximate 0.09Ha within Kaloo Community, Kolal upper Village, Nyabola area, North Kabodho Sub- Location, Central Nyakach ward on plot No. Ksm/ Kabodho West/160/84/1/019.

The site lies at an elevation estimated at 1212.0 meters above sea level with its defining coordinates as ***LAT S O^0 20'6'63612'' - & LON E 34^{0}55'31.82952"*** It is bordered by residential homes, agricultural lands and institutions such as schools and Health Centre.

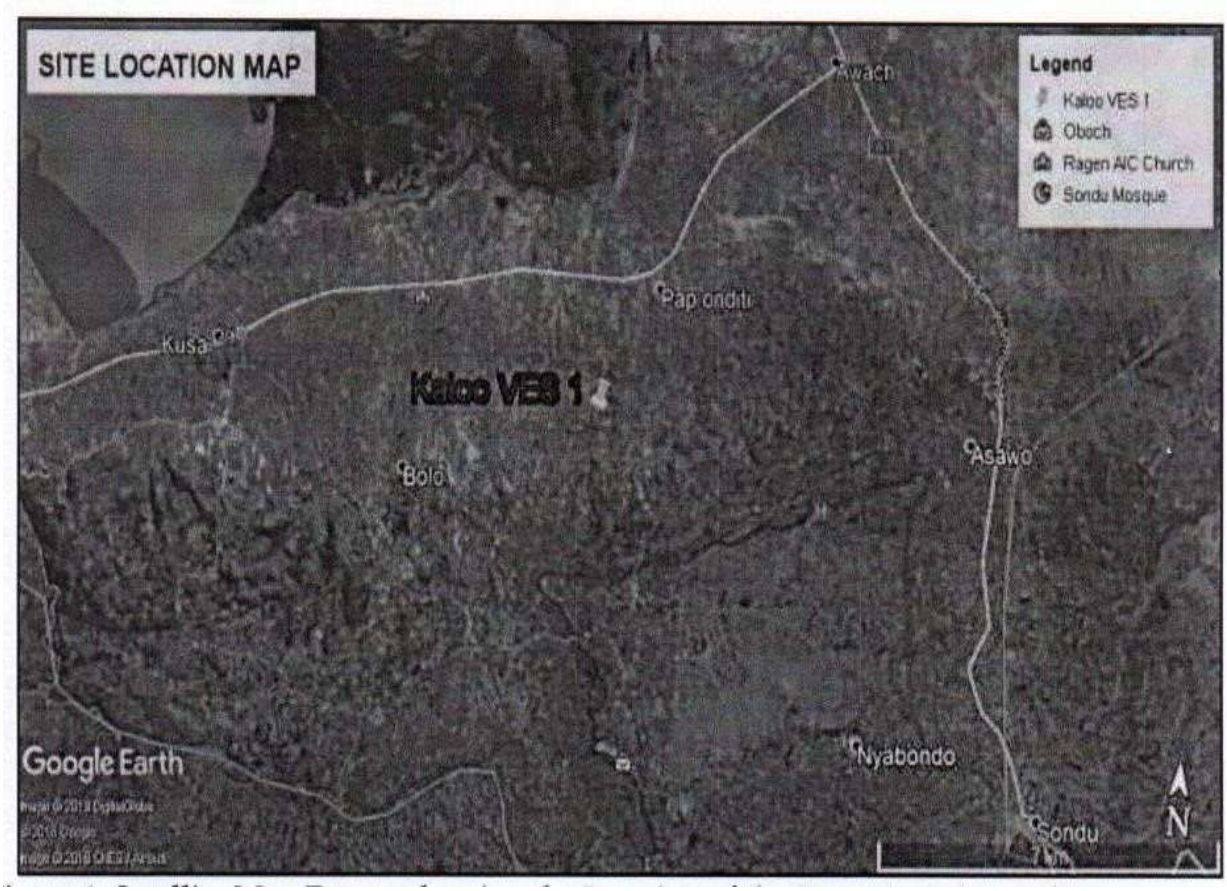

Figure 3.1: Satellite Map Extract showing the location of the proposed site (Google Earth)

3.2 Roads and Accessibility.

The proposed site is located in Nyakach Central ward, in Kolal Upper Village, approximately 32 Km from Kisumu City and accessed through Kendu Bay Road, on reaching Pap Onditi Center, the site is linked to the main road through Pap Onditi Nyabola Road. The site is easily accessible through the murram roads.

Fig 3.2 (a) Proposed Project Site & (b) Access path to the site

3.3 Population and Settlement Patterns

Kisumu County is relatively densely populated compared to the rest of Kenya. According to 2009 census, the county has a population of 968, 909 persons. The county has a population of 460 persons per square kilometer with seven constituencies namely Kisumu West, Kisumu Central, Nyando, Muhoroni, Nyakach, Seme and Kisumu East with a total of 35 wards.

3.4 Climate and Hydrology

Generally the climate of the whole county is modified by the presence of the lake. The annual relief rainfall that ranges between 1200mm – 1300mm. the rain mainly falls in two seasons. Kisumu is warm thought the year with mean annual temperature averaging at 23°C, Mean annual maximum temperatures in the area ranges between 27˚C and 30˚C, while mean annual minimum temperature ranges between 11˚C to 18˚C.

Temperature and rainfall data from the Kisumu Meteorological Station, which is the one closest to the project site, is given in table 1(a) and 1(b) below.

Table 2: Average Climatic Characteristic for Kisumu Metrological Station (Temperature and Rainfall)

The data for this site are considered to be representative of the Project area.

(a). Temperature data (^{0}C)

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Mean max.	30.2	30.1	29.7	28.3	27.9	27.5	27.3	27.9	28.9	29.9	29.9	29.4	28.9
Mean temp.	23.9	23.9	23.9	23.2	22.8	22.2	22.2	22.0	22.8	23.7	23.4	23.1	23.1
Mean min.	17.5	17.7	18.1	18.1	17.6	16.9	16.6	16.5	16.7	17.4	17.6	17.4	17.3
Absolute min	11.0	11.7	11.1	11.7	13.9	12.7	11.9	12.1	12.2	11.1	12.8	12.0	11.0

Source: Farm Management Handbook of Kenya – Vol. IIA, West Kenya. (1982), Jaetzold (b): Rainfall data (mm).

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Rainfall(mm	56	99	148	236	174	73	64	88	87	88	143	98	1353

Source: Farm Management Handbook of Kenya – Vol. IIA, West Kenya. (1982), Jaetzold

3.5 Soils and Land Use

Kisumu County has a wide range of soil types with wet soils being predominant. In the Kano plains, clay soils that are more associated with wetlands are more common though on elevated grounds are piedmont plans and planosols and its complexes. On the other hand, upland areas have cambisols and luvisols which are of volcanic origins and which have normally low fertility. Further, the soils can be described to consist predominantly of lake sediments, which are sandy clay soils. Dark cotton soils also constitute 70% of the soils in the district.

The area lies in the LM3 (Lower Midland Cotton Zone) of the Agro Ecological Zones (AEZ) of Kenya. The soils in the relatively higher areas of the region are of variable fertility and are shallow, well drained, dark reddish brown to dark red, friable sandy clay loam to clay, in many places rocky, bouldery and stony and in places with acid humid topsoil. The lower areas consists of lakeside beach ridge soils which are imperfectly drained, very deep, dark brown to greyish brown, friable, sandy loam to sandy clay of varying salinity and sodicity; with inclusions of loose sands to loamy sand soils (SOLOCHAKS, undifferentiated; with ARENOSOLS undifferentiated)

3.6 Flora and fauna

To a large degree the vegetation type of an area is usually influenced by the prevailing climatic conditions and soil type. The project site lies within Kisumu County which has mainly covered with herbaceous and woody vegetation. The vegetation mainly falls in the two major zones that divide the county. The two zones include the midland areas in the west and the Kano plains in the east. Escarpments also fall in the east, north, and south of Kisumu. Flora and fauna found

in the area is the indigenous vegetation cover mostly of grass, shrubs and very scattered acacia trees which has been tampered with to give way to subsistence cultivation. Majority of the locals practiced subsistence farming of maize, beans, horticulture among others. They also rear cattle, poultry, sheep and goats in small scale. The area though is relatively dry and with irrigation, the level of farming in the likely to increase.

There are no effects of natural flora and fauna that can be attributed to negative effects in the proposed site area and the environs; neither to the development of the area or the activities and livelihood of people occupying the area. In a collective, there are no diverse or noticeable effects of Flora and Fauna in the area proposed for the project.

Fig 3.3 (a) & (b) Vegetation within the project site

Sensitive ecosystems or places of cultural importance

The proposed site has no sensitive ecosystem or places of cultural importance in the environs.

3.7 Surface Drainage

Based on the observation made during site visits, the area seems to be poorly drained as evident by numerous gully erosions and water pans. The area is drained by River Nyalunya which flows Northwards towards Lake Victoria approximately 500mto the West of the proposed site. The proponent and the contractor are therefore advised to ensure the designs will be able to handle run-off/ storm water from the site throughout the project period.

3.8 Water Sources

Kisumu County is generally water abundant both in terms of surface and ground water and largely depends on piped water from the Lake Victoria through Dunga Water Treatment works; this is then supplied by the KIWASCO to residents. Ground water resources are also exploited along the lake line through shallow wells and boreholes but diminish as one move inland.

However, the project site has not been connected to the KIWASCO water services; hence the need for the project. Currently the community gets water from a seasonal river- River Olwalo, rain and water pans which are non-reliable

3.8 Waste Management

Statistics have it that within Kisumu County Refuse collection and efficiency in the county is at 30%. However, the project proponent and the contractor will develop modalities to ensure safe disposal of the generated solid waste. The adoption of integrated solid waste management system will be encouraged during the project cycle.

3.9 Energy

The neighborhood of the area is fully connected to the power line from Kenya Power grid lines, meaning that electricity supply will not be a problem in the project site. The project though will largely depend on solar energy as provided on the design.

3.10 Communication

The area is well covered by communication facilities landline and mobile telephony services being adequately covered by the four main mobile phone telephone service providers: Safaricom, Airtel and Orange.

3.11 Urban Transport

Transport in Kisumu can be divided into five categories: private vehicles, matatus (minibuses), Tuk tuks, motorcycles and taxis. Sometimes ignored, but equally important are the non-motorized forms of transport, such as walking and cycling.

3.12 Health Services

Majority of Kisumu residents are not able to access quality health care facilities. The county has established Health Management Committee with membership also drawn from the stakeholders to manage the county health centers. In addition, a HIV/AIDs project has been launched with the support of UN-HABITAT, Kenya Medical Research Institute (KEMRI) and the US Centres for Disease Control and prevention (CDC) where the stakeholders have formed committees in the neighborhood to sensitize the public on HIV/AIDs and educate the affected on practices and programmers that may help prolong their health.

The main health facility in the region is the Nyabola Health Dispensary. Other major health facilities located within the county include; Ahero Sub County hospital, Port Florence Hospital, Avenue Hospital, Aga Khan Hospital, Kisumu District Hospital, Ojola Sub County hospital and the Chulaimbo Hospital but referrals are done to Jaramogi Oginga Odinga Referral Hospital e.t.c.

3.13 Markets and Schools

The City is endowed with adequate markets and schools located strategically across the neighborhoods to adequately provide services to residents. The biggest known market in the area is the Pap Onditi Market center which is approximately 2.4Km away from the proposed site. Some of the known schools in the area and the closest one to the proposed site are Nyabola Primary and Secondary schools.

CHAPTER: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

4.1 Overview of the Policy Framework

4.1.1 National Water Policy

The National Policy of Water which was promulgated in April 1999 as Sessional Paper No. 1 of 1999 calls for decentralization of operational activities from the central government to other sectors, including local authorities, the private sector and increased involvement of

communities in order to improve efficiency in service delivery. It also tackles issues pertaining to water supply and sanitation facilities development, institutional framework and financing of the sector. According to the policy, in order to enable sustainable water supply and sanitation services, there is need to apply alternative management options that are participatory through enhanced involvement of others in the provision of these services but particularly the private sector.

The overall objective of the National Water Policy is to lay the foundation for the rational and efficient framework for meeting the water needs for national economic development, poverty alleviation, environmental protection and social wellbeing of the people through sustainable water resource management.

4.1.2 Water Catchments Management Policies

The policy on water catchments management has been shaped over time by two Sessional Papers as listed below:

a. Sessional paper No. 1 of 1968; and
b. Kenya Forest Development Policy Sessional paper No. 9 of May 2005.

Sessional Paper No. 9 encourages the involvement of the private sector, communities and other stakeholders' participation in forest management in order to conserve water catchments areas and reduce poverty.

4.1.3 Policy on Environment and Development

This is presented as the Sessional paper No. 6 of 1999 on Environment and Development. The overall goal is to integrate environmental concerns into the national planning and management process and provide guidelines for environmentally sustainable development.

Under section 4.3 of the document, Provision of potable water and water for sanitation is viewed as being central to satisfying basic human needs. It is indicated that the current water development programmes focus almost entirely on water delivery with little concern for demand management and conservation. Water resources have an extremely high value and effective mechanisms for managing and conserving water could result unto economic benefits as well as sustainable use of this vital resource.

Some of the key objectives of the policy are:

- To protect water catchments;
- To ensure all development policies, programmes and projects take environmental considerations into accounts, and
- To enhance, review regularly, harmonize, implement and enforce laws for the management, sustainable utilization and conservation of natural resources.

Under this policy, broad categories of development issues have been covered that require sustainable approach. The policy recommends the need for enhanced re-use/recycling of residues including water and wastewater as well as increased public awareness raising and

appreciation of clean environment. It also enhances participation of stakeholders in the management of natural resources within their respective localities.

4.2 Overview of the Legislative Framework

4.2.1 The Constitution of Kenya

The Constitution is the supreme law of the Republic and binds all persons and all State organs at all levels of government.

The Constitution of Kenya, 2010 provides the broad framework regulating all existence and development aspects of interest to the people of Kenya, and along which all national and sectoral legislative documents are drawn.

In relation to the environment, article 42 of chapter four, The Bill Of Rights, confers to every person the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislative measures, particularly those contemplated in Article 69, and to have obligations relating to the environment fulfilled under Article 70.

Chapter 5 of the document provides the main pillars on which the 77 environmental statutes are hinged.

Part 1 of the chapter dwells on land, outlining the principles informing land policy, land classification as well as land use and property.

The second part of this chapter directs focus on the environment and natural resources. It provides a clear outline of the state's obligation with respect to the environment, thus;

"The state shall:

- Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;
- Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya;
- Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities;
- Encourage public participation in the management, protection and conservation of the environment;
- Protect genetic resources and biological diversity;
- Establish systems of environmental impact assessment, environmental audit and monitoring of the environment;
- Eliminate processes and activities that are likely to endanger the environment; and
- Utilize the environment and natural resources for the benefit of the people of Kenya."

There are further provisions on enforcement of environmental rights as well as establishment of legislation relating to the environment in accordance to the guidelines provided in this chapter.

In conformity with the Constitution of Kenya, every activity or project undertaken within the republic must be in tandem with the state's vision for the national environment as well as adherence to the right of every individual to a clean and healthy environment. The proposed project is a central development activity that utilizes sensitive components of the physical and natural environment hence need for a clearly spelt out environmental management plan to curb probable adverse effects to the environment.

4.2.2 The Environmental Management and Co-ordination Act (EMCA), CAP 387

This Act of Parliament, also known as EMCA, is the parent Act of Parliament that provides for the establishment of appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto.

EMCA, in its 13 interrelated parts, provides regulatory provisions for all levels of environmental conservation and management. The first four parts provide legislative guidelines on administrative and planning components of environmental management. They include:

(i) General Principles;

(ii) Administration;

(iii) Environmental planning;

(iv) Protection and Conservation of the Environment. Parts five to seven focus on on-field management of the environment as an integral component of actual or proposed projects;

(v) Environmental impact assessments (EIA), audits and monitoring;

(vi) Environmental audit and monitoring; and (vii) Environmental quality standards.

The last five parts of the Act regulate on enforcement of provisions outlined in the Act and recognition of international agreements along which the EMCA has been established. They are; Environmental Restoration orders, Environmental Easements, Inspection, analysis and records, Inspection Analysis and Records, International Treaties, Conventions and Agreements, National Environment Tribunal, Environmental Offences.

All the chapters 1 to 13 apply to the proposed project at one stage or the other and therefore the project proponent is required to understand and conform with the Act accordingly. One such area is Environmental Impact Assessment. This is expressly stated in section 58(2) of the Act. "The proponent of a project shall undertake or cause to be undertaken at his own expense an Environmental Impact Assessment study and prepare a report thereof where the authority, being satisfied, after studying the project report under sub-section (1), that the intended project may or is likely to have or will have a significant impact on the environment, so directs."

EMCA has set out several regulations for managing the environment which include the following:

(a) The Environmental (Impact Assessment and Audit) Regulations, 2003

This is a supplementary legislation to the EMCA. It gives additional "punch" by providing guidelines for conducting Environmental Impact Assessments and Audits. It offers guidance on the fundamental aspects on which emphasis must be laid during field study and outlines the nature and structure of Environmental Impact Assessments and Audit reports. The legislation further explains the legal consequences of partial or non-compliance to the provisions of the Act.

Relevance

The borehole construction as an activity is listed in the second schedule of EMCA as among projects that require an Environmental Impact Assessments before commencement. The project implementation cannot commence before the license is granted, upon conducting the EIA. For this reason, this report provides the legal requirements for the project approval.

Impacts of the borehole, involves major elements of the environment, including land, water and human health and safety. Therefore there is need to evaluate these impacts and establish the most sustainable approach to benefit both the current and the future generations and mitigate projected negative impacts to people and the environment through conducting Environmental Impact Assessment and subsequent audit

(b) The Environmental Management and Coordination (Water Quality) Regulations, 2006

Described in Legal Notice No. 120 of the Kenya Gazette Supplement No. 68 of September 2006, these regulations apply to drinking water, water used for industrial purposes, agricultural purposes, recreational purposes fisheries and wildlife and any other purposes. It stipulates quality standards for sources and discharge of water to any environmental receptors within an activity area.

The Regulations outline various water quality standards in relation to use and discharge. Such aspects provided for are:

- Quality standards for sources of domestic water;
- Quality 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.

Relevance

The proposed project will impound and abstract significant quantity of groundwater. It is thus fundamental to regularly analyze water quality and check for conformity to stipulated legal standards in this supplementary legislation.

Moreover, the quality of water discharges into any environmental receptor must be ascertained for safety and if not, treated.

(c) Environmental Management and Co-ordination (Waste Management) Regulations, 2006

Regulations guiding waste management are described in Legal Notice No. 121 of the Kenya Gazette Supplement No. 69 of September 2006. They offer legal provisions on handling of a variety of wastes emanating from various projects and activities. The waste categories covered by the regulations include:

- Industrial wastes;
- Hazardous and toxic wastes;
- Pesticides and toxic substances; Biomedical wastes; and Radio-active substances.

These Regulations outline requirements for handling, storing, transporting, and treatment / disposal of all waste categories as provided therein.

Relevance

The proposed project, during construction phase may involve the use of materials that release hazardous waste i.e. cement, oil spillage from vehicles, hence the need for all project actors to abide by these regulations in dealing with such wastes, especially the provisions of industrial, hazardous and toxic wastes which may be handled in the course of the project life.

(d) Environmental Management and Coordination (Fossil Fuel Emission Control) Regulations 2006

These regulations are described in Legal Notice No. 131 of the Kenya Gazette Supplement No. 74 of October 2006 and will apply to all internal combustion engine emission standards, emission inspections, the power of emission inspectors, fuel catalysts, licensing to treat fuel, cost of clearing pollution and partnerships to control fossil fuel emissions.

Relevance

The fossil fuels considered are petrol, engine oil and diesel. This will be applicable to equipment and, machinery used in the project during construction phases of the project.

(e) Environmental Management and Coordination (Noise and Excessive Vibration Pollution) Control Regulations, 2009

These Regulations 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.

Relevance

Under the regulation the Contractor is prohibited from producing excessive noise and vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment or excessive vibrations which exceed 0.5 decimetres per second beyond any source property boundary or 30 meters from any moving source. Under the regulation the Contractor will be required to undertake daily monitoring of the noise levels within the project area during construction period to maintain compliance.

4.2.3 Water Act, 2002

Water in Kenya is owned by the National Government, subject to any right of the user, legally acquired. However; this Act regulates conservation and management of all water resources within the republic, and related purposes.

In section 3 of part II, it states that every water resource is vested in the State, subject to any rights of user granted by or under this Act or any other written law. The Act also provides for establishment of a Water Resource Management Authority, whose aim is to manage and coordinate conservation and utilization of water resources at national scale.

(a) The Water Resources Management Rules, 2007

As a subsidiary to the Act, a legislative supplement, The Water Resources Management Rules, 2007 was gazetted to guide all policies, plans, programmes and activities that are subject to the Water Act, 2002. The Water Resources Management Rules empower Water Resources Management Authority (WRMA) to impose management controls on land use falling under riparian land.

Relevance

Water demand is the sole driving factor in the drilling of the proposed borehole. In the proposed project, groundwater will be the main source of water whose abstraction must comply with the provisions and legal procedures in this Act. The Act will thus play a central role in guiding the exploitation of the ground water resource throughout the project life.

4.2.4 Occupational Health and Safety Act, 2007

The Act provides for the safety, health and welfare of workers and all persons lawfully present at work place, as well as the establishment of the National Council for Occupational Safety and Health and for connected purposes.

Section 3(1) and (2) of the Act explains that it applies in all workplaces where any person is at work, either temporarily or permanently. It expounds on the purpose, which is to secure the safety, health and welfare of persons at work as well as protecting persons other than persons at work against risks resulting from, or connected to, activities at workplace.

Further, sections 43 and 44 of part V give regulations on registration of work places.

Relevance

The project will require significant manpower during drilling and will thus result in employment of quite a number of people. Thus, compliance with the relevant provisions in this Act will be vital in ensuring that workers operate in safe healthy environment, and that their welfare shall be catered for. There will also be need for establishment of contractor's health and safety plan in line with this Act. There are a number of supplementary legislative rules to the OSHA. The most relevant are;

(a) The Factory and Other Places of Work (Medical Examination) Rules, 2005

This supplementary legislation covers workers who are exposed to specific occupational hazards for the purpose of preventing or controlling occurrence of occupational diseases.

In the first schedule of the legislation, works involving risks to healthcare are listed and recommended examinations and their respective intervals are indicated for adherence by employers or company directors. Sample requisite certifications are also provided for employers.

Relevance

All persons employed will be required to undergo pre-employment and periodic medical examinations to ascertain their fitness and also to maintain their health and safety at the workplace. Examinations certificates will be required on regular basis, hence the need for adherence.

(b) The Factory and Other Places of Work (Noise Prevention and Control) Rules, 2005

Sections 1-4 of the legislation detail the permissible levels of noise in a workplace. Sections 5 and 6 elaborate on the recommended noise prevention programme as well as measurement and records to be undertaken by the contracted company during construction and even operational phases of the project.

Relevance

The construction phase of this project will involve use of heavy and noisy machines and equipment. This legislation will thus guide against health risks of excessive noise to workers at the work places, hence the relevance.

2.2.5 The Public Health Act (Cap 242)

This Act makes provision for securing and maintaining health. Part III and IV of the Act focuses on notification, prevention and suppression of infectious diseases, including inspection, disinfection and provision of medical aid to affected parties in case of outbreaks of infectious diseases. Part IX regulates on sanitation and housing, granting health authorities powers to prevent or remedy any dangers to health arising from poor handling of sanitation issues as well as improper housing and nuisances arising there from. Besides, regulations governing prevention and destruction of mosquitoes, encompassing due maintenance of yards, premises, wells, cesspits and identification and destruction of breeding places are entailed in part XII.

Relevance

Sanitation, housing, disease outbreaks and communal resource sharing are obvious issues in construction projects. The Public Health Act provides the necessary legal guidelines regulating measures aimed at effective control and management of the said issues.

4.2.6 The Kenya Roads Board Act, 1999

This is the one of the legal instrument that governs management of road network in the country.

Relevance

Of relevance with the proposed project is the need for consultative cooperation with the Roads authorities since pipeline routing may be laid within the road reserves.

4.2.7. Laws on Property and Land Rights in Kenya

The Constitution of Kenya (CoK), 2010 currently in force, replaced the 1969 constitution. It was approved by 67% of Kenyan voters and was promulgated on 27 August 2010.

The new Kenya Constitution has a comprehensive Bill of Rights in Chapter Four (4) and a well elaborated Chapter Five (5) on Land and Environment. These two chapters provide constitutional basis for land ownership, expropriation and protection of rights to land. Land in Kenya is classified as public, community or private. Prior to the new Constitution, there were over 70 pieces of legislations, Acts and subsidiary law governing land and land matters. Under the new Constitution they are being consolidated and rationalised to four pieces of legislation as follows:

- National Land Act, 2012 – discusses Land issues in general and establishes mechanisms for Land acquisition;
- Land and Environmental Court – this establishes a court to deal with all disputes; Land Registration Act, 2012; and The Community Land Act.

Article 60 (1) states that that "Land in Kenya shall be held, used and managed in a manner that is equitable, efficient, productive and sustainable, and in accordance to the following principles:

a) Equitable access to land;

b) Security of land rights;

c) Sustainable and productive management of land resources;

d) Transparent and cost effective administration of land;

e) Sound conservation and protection of ecological sensitive areas;

f) Elimination of gender discrimination in law, customs and practices related to land and property in land; and

g) Encouragement of communities to settle land disputes through the recognized local community initiatives consistent with this Constitution.

The State is permitted to regulate the use of any land, or any interest in or right over any land in the interest of defence, public safety, public order, public morality, public health, or land use planning.

According to Article 61 (1), all land in Kenya belongs to the people of Kenya collectively as a nation, as communities and as individuals.

Land is classified as public land, community land or private land and each category is defined in the subsequent articles. Public land is defined to include all minerals and mineral oils; government forests, government game reserves, water catchment areas, national parks, government animal sanctuaries and specially protected areas, gazetted roads and thoroughfares, all rivers, lakes and other water bodies as defined by law; the territorial sea, continental shelf, exclusive economic zone and the sea bed, all land between the high and low water marks, any land not classified as community or private land under the

Constitution-such public land shall vest and be held in trust by the national government in trust for the people of Kenya and shall be administered by the National Land Commission.

Community land includes land that is "lawfully held, managed or used by specific communities as community forest, grazing areas or shrines," and "ancestral lands and lands traditionally occupied by hunter-gatherer communities." Rights are also held through traditional African systems, and rights that derive from the English system introduced and maintained through laws enacted by colonial and then the national parliament. The former is loosely known as customary tenure bound through traditional rules (customary law). The latter body of law is referred to as statutory tenure, secured and expressed through national law, in various Act of parliament e.g. Land Act 2012, Land Registration Act, 2012, Trust

Land Act (cap 288) of the Laws of Kenya.

The right to property is protected in Article 40 (1) Subject to Article 65; "every person has the right, either individually or in association with others, to acquire and own property of any description; and in any part of Kenya".

The following land tenure systems exist in Kenya.

(i) Customary Land Tenure

This refers to unwritten land ownership practices by certain communities under customary law. Kenya being a diverse country in terms of its ethnic composition has multiple customary tenure systems, which vary mainly due to different agricultural practices, climatic conditions and cultural practices. However most customary tenure systems exhibit a number of similar characteristics as follows: First, individuals or groups by virtue of their membership in some social unit of production or political community have guaranteed rights of access to land and

other natural resources. Individuals or families thus claim property rights by virtue of their affiliation to the group.

(ii) Freehold Tenure

This tenure confers the greatest interest in land called absolute right of ownership or possession of land for an indefinite period of time, or in perpetuity. Freehold land is governed by the Land Registration Act, 2012. The Act provides that the registration of a person as the proprietor of the land vests in that person the absolute ownership of that land together with all rights, privileges relating thereto. A freehold title generally has no restriction as to the use and occupation but in practice there are conditional freeholds, which restrict the use for say agricultural or ranching purposes only. Land individualization was demanded by the colonial settlers who required legal guarantee for the private ownership of land without which they were reluctant to invest.

(iii)Leasehold Tenure

Leasehold is an interest in land for a definite term of years and may be granted by a freeholder usually subject to the payment of a fee or rent and is subject also to certain conditions which must be observed e.g. relating to developments and usage. Leases are also granted by the government for government land, the local authorities for trust land and by individuals or organizations owning freehold land. The maximum term of government leases granted in Kenya is 99 years for agricultural land and urban plots. There are few cases of 33 years leases granted by government in respect of urban trust lands. The local authorities have granted leases for 50 and 30 years as appropriate.

(iv)Public Tenure

This is where land owned by the Government for its own purpose and which includes unutilized or un-alienated government land reserved for future use by the Government itself or may be available to the general public for various uses. The land is administered under the Land Act 2012. These lands were vested in the president and who has, normally exercised this power through the Commissioner of Lands, to allocate or make grants of any estates, interests or rights in or over un-alienated government land. However the new constitution grants those rights to the National Land Commission (NLC) which is governed by the National Land Commission Act, 2012 that specifies the role of NLC.

The Land Act 2012, Part III, Section 27 recognizes the capacity of a child as being capable of holding title to land. However this can only happen through a trustee and such a child shall be in the same position as an adult with regard to child's liability and obligation to the land.

4.2.8 Expropriation/Acquisition of Land and Compensation of Land and other Assets

4.2.8.1 The Constitution of Kenya, 2010

CoK protects the sanctity of private property rights and states that no property can be compulsorily acquired by the Government except in accordance with law. Article 40(3) states:

"The State shall not deprive a person of property of any description, or of any interest in, or right over, property of any description, unless the deprivation results from an acquisition of land or an interest in land or a conversion of an interest in land, or title to land, in accordance with Chapter Five; or is for a public purpose or in the public interest and is carried out in accordance with this Constitution and any Act of Parliament that:

(i) Requires prompt payment in full, of just compensation to the person; and

(ii) Allows any person who has an interest in or right over, that property a right of access to a court of law.

The Constitution empowers the state to exercise the authority of compulsory acquisition.

Land Act 2012 (LA) designates the National Land Commission (NLC) as the agency empowered to compulsorily acquire land. Article 40 of the Constitution provides that the state may deprive owners of property only if the deprivation is "for a public purpose or in the public interest," which includes public buildings, roads, wayleaves, drainage, irrigation canals among others. The state's exercise of this power is left at the discretion of National Land Commission, and requires the state to make full and prompt payment of "just compensation" and an opportunity for appeal to court.

Article 40 (3) (a) refers to acquisition and conversion of all kinds of land in Kenya (private, public, community land and foreign interests in land). The Constitution further provides that payment of compensation shall be made to "occupants in good faith" of land acquired by the state who do not hold title for such land [Article 40 (4)]. An occupant in good faith is a "bona fide" occupant. On the other hand, under the Constitution, those who have acquired land illegally are not regarded as deserving any compensation [Article 40 (6)].

4.2.8.2 The Land Act, 2012

The Land Act is the Kenya's framework legislation regulating compulsory acquisition of land

(i.e. land, houses, easements etc.). The Land Act was adopted on 2nd May 2012 and provides for sustainable administration and management of land and land based resources including compulsory acquisition.

Section 107 (1) provides for the power of entry to inspect land. Sub-section (1) states that whenever the national or county government is satisfied that it may be necessary to acquire some particular land under section 110, the respective Cabinet Secretary or the County Executive Committee Member shall submit a request for acquisition of public land to the Commission to acquire the land on its behalf. Sub-section (2) requires that the Commission prescribe a criteria and guidelines to be adhered to by the acquiring authorities in the acquisition of land.

Sub-section (5) stipulates that upon approval of a request under sub-section (1), the Commission shall publish a notice to that effect in the Gazette and the county Gazette, and shall deliver a copy of the notice to the Registrar and every person who appears to the Commission to be interested in the land.

Sub-section (8) states that all land to be compulsorily acquired shall be geo-referenced and authenticated by the office or authority responsible for survey at both the national and county government

Under Section 108 (1) The Commission may authorize, in writing, any person, to enter upon any land specified in a notice published under section 107 and inspect the land and to do all things that may be reasonably necessary to ascertain whether the land is suitable for the intended purpose.

Section 109 provides payment for damage for inspection. As soon as practicable after entry has been made under section 108, the Commission shall promptly pay in full, just compensation for any damage resulting from the entry.

Section 110 (1) stipulates that land may be acquired compulsorily under this Part if the

Commission certifies, in writing, that the land is required for public purposes or in the public interest as related to and necessary for fulfilment of the stated public purpose.

Section 111 (1) states that if land is acquired compulsorily under this Act, just compensation shall be paid promptly in full to all persons whose interests in the land have been determined. Under Subsection (2), The Commission shall make rules to regulate the assessment of just compensation.

Section 112 (1) requires that at least thirty days after publishing the notice of intention to acquire land, the Commission shall appoint a date for an inquiry to hear issues of propriety and claims for compensation by persons interested in the land, and shall

(a) Cause notice of the inquiry to be published in the Gazette or county Gazette at least fifteen days before the inquiry; and

(b) Serve a copy of the notice on every person who appears to the Commission to be interested or who claims to be interested in the land.

Section 113 (1) requires that upon the conclusion of the inquiry, the Commission shall prepare a written award, in which the Commission shall make a separate award of compensation for every person whom the Commission has determined to have an interest in the land. Every award shall be filed in the office of the Commission (Subsection 4).

Part III of the Land Act 2012, section 113 (2a) states that "the Commission shall determine the value of land with conclusive evidence of

(i) the size of land to be acquired;

(ii) the value, in the opinion of the Commission, of the land; (iii) the amount of compensation payable, whether the owners of land have or have not appeared at the inquiry."

Market value of the property, which is determined at the date of the publication of the acquisition notice, must be taken into account when determining compensation.

Determination of the value has to take into consideration the conditions of the title and the regulations that classify the land use e.g. agricultural, residential, commercial or industrial.

Increased market value is disregarded when:

- It is accrued by improvements made within two years before the date of the publication of the acquisition notice, unless it is proved that such improvement was made in good faith and not in contemplation of the proceedings for compulsory acquisition. It is accrued by land use contrary to the law or detrimental to the health of the occupiers of the premises or public health;
- Any damages sustained or likely to be sustained by reason of severing such land from other land owned by the claimant;
- Any damage sustained or likely to be sustained if the acquisition of the land had negative effects on other property owned by the claimant;
- Reasonable expenses, if as a consequence of the acquisition, the claimant was compelled to change his residence or place of business (i.e., compensation for disruption to the claimant's life); and
- Any damage from loss of profits over the land occurring between the date of the publication of the acquisition notice and the date the NLC takes possession of the land.

Section 114 (2) stipulates that upon acquisition of land, and prior to taking possession of the land, the Commission may agree with the person who owned that land that instead of receiving an award, the person shall receive a grant of land, not exceeding in value the amount of compensation which the Commission considers would have been awarded, and upon the conclusion of the agreement that person shall be deemed to have conclusively been awarded and to have received all the compensation to which that person is entitled in respect of the interest in that land.

Section 115 stipulates that upon the conclusion of the inquiry, and once the NLC has determined the amount of compensation, NLC will prepare and serve a written award of compensation to each legitimate claimant. NLC will publish these awards which will be considered "final and conclusive evidence" of the area of the land to be acquired, the value of the land and the amount payable as compensation. Land Act, Section 115 further stipulates that an award shall not be invalidated by reason only of a discrepancy between the area specified in the award and the actual area of the land. Compensation cannot include attorney's fees, costs of obtaining advice, and costs incurred in preparing and submitting written claims.

A notice of award and offer of compensation shall be served to each person by the Commission. Section 120 provides that "first offer compensation shall be paid promptly" to all persons interested in land. Section 119 provides a different condition and states that the

NLC "as soon as practicable" will pay such compensation. Where such amount is not paid on or before the taking of the land, the NLC must pay interest on the awarded amount at the market rate yearly, calculated from the date the State takes possession until the date of the payment.

In cases of dispute, the Commission may at any time pay the amount of the compensation into a special compensation account held by the Commission, notifying the owner of the land accordingly. If the amount of any compensation awarded is not paid, the Commission shall on or before the taking of possession of the land, open a special account into which the Commission shall pay interest on the amount awarded at the rate prevailing bank rates from the time of taking possession until the time of payment.

Once the first offer payment has been awarded, the NLC will serve notice to landowners on the property indicating the date the Government will take possession. Upon taking possession of land, the commission shall ensure payment of just compensation in full.

When this has been done, NLC removes the ownership of private land from the register of private ownership and the land is vested in the national or county Government as public land free from any encumbrances (Section 115 & 116).

On the other side, the Commission also has the power to obtain temporary occupation of land. However, the commission shall as soon as is practicable, before taking possession, pay full and just compensation to all persons interested in the land.

In cases of where there is an urgent necessity for the acquisition of land, and it would be contrary to the public interest for the acquisition to be delayed by following the normal procedures of compulsory acquisition under this Act, the Commission may take possession of uncultivated or pasture or arable land upon the expiration of fifteen days from the date of publication of the notice of intention to acquire. On the expiration of that time NLC shall, notwithstanding that no award has been made, take possession of that land. If the documents evidencing title to the land acquired have not been previously delivered, the Commission shall, in writing, require the person having possession of the documents of title to deliver them to the Registrar, and thereupon that person shall forthwith deliver the documents to the Registrar. On receipt of the documents of title, the Registrar shall — cancel the title documents if the whole of the land comprised in the documents has been acquired; if only part of the land comprised in the documents has been acquired, the

Registrar shall register the resultant parcels and cause to be issued, to the parties, title documents in respect of the resultant parcels. If the documents are not forthcoming, the Registrar will cause an entry to be made in the register recording the acquisition of the land under this Act.

Part IX of the Land Act provides for settlement programs. Under Section 134 (1), The Commission shall, on behalf of the national and county governments, implement settlement programmes to provide access to land for shelter and livelihood.

Subsection (2) stipulates that settlement programmes shall, include, but not be limited to provision of access to land to squatters, persons displaced by natural causes, development projects, conservation, internal conflicts or other such causes that may lead to movement and displacement.

4.2.8.3 Valuers' Act, Chapter 532.

Under The Valuers' Act, Chapter 532, Compensation awards will be made by the National Land Commission based on land valuation determined by registered Valuers. Besides, the Valuers Act establishes the Valuers Registration Board, which regulates the activities and practice of registered Valuers. All Valuers must be registered with the Board to practice in Kenya. The Board shall keep and maintain the names of registered Valuers which shall include the date of entry in the register, the address of the person registered the qualification of the person and any other relevant particular that the Board may find necessary.

4.3 Institutional Framework

New project developments can have major impacts on the environment including soil degradation, altering landscapes and destroying natural habitats. Other problems associated with development and human activity include land use conflicts, human and animal conflicts, water management and environmental pollution. In addition to harming the environment, these impacts can and do have significant economic costs and negatively affect human health.

In cognizance of this, the Government of Kenya has established a number of institutional and administrative entities to ensure adequate management of associated concerns and eventualities.

The following are the main institutions that perform the regulatory role and are relevant to the project.

4.3.1 Ministry of Water and Irrigation

The mandate is formulation, review and implementation of policy on the water sector.

The functions include:

- Water harvesting and storage infrastructure for water conservation, which will help in mitigating droughts and famine;
- Catchments area conservation;
- Water resources management policy;
- Urban and rural water development and supply;
- Waste water treatment and control;
- National water conservation and Pipeline Corporation; and
- Flood preparedness and management to cope with and mitigate the impacts.
- Water quality and pollution control by adopting the 'Polluter Pays' principles in order to ensure water user responsibility.

Relevance

Storage and utilization of water is the main driving factor in the project. Abstraction from groundwater will be guided by the ministry through WRMA. It is thus paramount that the ministry is centrally involved in the planning and operational phases of the proposed project.

The following are the key institutions of relevance to this project:

(a) The Water Resource Management Authority (WRMA) The

Authority shall have the following powers and functions:

- To develop principles, guidelines and procedures for the allocation of water resources;
- To monitor, and from time to time reassess, the national water resources management strategy;
- To receive and determine applications for permits for water use;
- To monitor and enforce conditions attached to permits for water use;
- To regulate and protect water resources quality from adverse impacts;
- To manage and protect water catchments; in accordance with guidelines in the national water resources management strategy, to determine charges to be imposed for the use of water from any water resource;
- To gather and maintain information on water resources and from time to time publish forecasts, projections and information on water resources;
- To liaise with other bodies for the better regulation and management of water resources;
- To advise the Minister concerning any matter in connection with water resources.

(b) Water Service Boards (WSB)

The Boards have the following mandate:

- strengthen the institution and build its capacity;
- provide water and sanitation services in an efficient, effective, affordable and sustainable manner;
- increase access and availability of water and sanitation services;
- strengthen communication with stakeholders; and
- Mainstream good corporate governance, gender, and HIV/AIDS awareness campaign in all core activities.

4.3.2 Ministry of Environment and Natural Resources

This is the state office in charge of all issues affecting, and affected by, the environment and all its components.

The Ministry's core mandate includes the following:

- Environment and Natural Resources Policy formulation, analysis and review;
- Sustainable management of Mineral resources and conservation of environment;
- Continuous development of geo-database for integrated natural resources and environmental management systems;
- Conduct applied research and dissemination of research findings in land resources and geology;
- Carry out geological surveys, mineral exploration and regulation of mining and use of commercial explosives;

- Promote, monitor and coordinate environmental activities and enforce compliance of environmental regulations and guidelines; and Meteorological services.

Relevance

Water resources, land, flora and fauna and the air are core components of the natural environment. The proposed development project will utilize all these resources at one stage or another. Any extractive or depository uses of the resources are guided by the various programmes and regulations under the ministry and consistent consultative partnerships, including adherence to relevant legal provisions will be required in the entire course of the project.

(a) The National Environment Management Authority

The authority is mandated to carry out, among others, the following activities in the sector:

- Promote the integration of environmental considerations into development policies, plans, programmes and projects, with a view to ensuring the proper management and rational utilization of environmental resources, on sustainable yield basis, for the improvement of the quality of human life in Kenya;
- Undertake and coordinate research, investigation and surveys, collect, collate and disseminate information on the findings of such research, investigations or surveys;
- Identify projects and programmes for which environmental audit or environmental monitoring must be conducted under this Act;
- Initiate and evolve procedures and safeguards for the prevention of accidents, which may cause environmental degradation and evolve remedial measures where accidents occur e.g. floods, landslides and oil spills; and
- Undertake, in cooperation with relevant lead agencies, programmes intended to enhance environmental education and public awareness, about the need for sound environmental management, as well as for enlisting public support and encouraging the effort made by other entities in that regard; Render advice and technical support, where possible, to entities engaged in natural resources management and environmental protection, so as to enable them to carry out their responsibilities satisfactorily.

4.4 World Bank Operational Policies

4.4.1 Operational Policy (OP) 4.01: Environmental Assessment, 2001

Environmental Assessment is used in the World Bank to identify, avoid, and mitigate the potential negative environmental associated with Bank lending operations. The purpose of Environmental Assessment is to improve decision making, to ensure that project options under consideration are sound and sustainable and that potentially affected people have been properly consulted.

Table 4.1. OP/BP 4.01 Environmental Assessment (January 1999)

Objectives	**Operational Principles**

To help ensure the environmental and social soundness and sustainability of investment projects. Also referred to as scoping.	Apply the screening process for each proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment (EA) so that appropriate studies are Undertaken proportional to potential risks and to direct, and, as relevant, indirect, cumulative, and associated impacts. Use sectoral or regional environmental assessment when appropriate. Assess potential impacts of the proposed project on physical, biological, socio-economic and physical cultural resources, including trans-boundary and global concerns, and potential impacts on human health and safety. Assess the adequacy of the applicable legal and institutional framework, including applicable international environmental agreements, and confirm that they provide that the cooperating government does not finance project activities that would contravene such international obligations.
To support integration of environmental and social aspects of projects into the decision making process.	Provide for assessment of feasible investment, technical, and siting alternatives, including the "no action" alternative, potential impacts, feasibility of mitigating these impacts, their capital and recurrent costs, their suitability under local conditions, and their institutional, training and monitoring requirements associated with them. Where applicable to the type of project being supported, normally apply the World Bank Group Environmental Health and Safety Guidelines. Justify deviations when alternatives to measures set forth in the handbook are selected.

	Prevent, minimize, or compensate for adverse project impacts and enhance positive impacts through environmental management and planning that includes the proposed mitigation measures, monitoring, institutional capacity development and training measures, an implementation schedule, and cost estimates. Involve stakeholders, including project-affected groups and local non-governmental organizations, as early as possible, in the preparation process and ensure that their views and concerns are made known to decision makers and taken into account. Continue Consultations throughout project implementation as necessary to address EA-related issues that affects them. Use independent expertise in the preparation of EA where appropriate. Use independent advisory panels during preparation and implementation of projects that are highly risky or contentious or that involve serious and multi-dimensional environmental and/or social concerns. Provide measures to link the environmental assessment process and findings with studies of economic, financial, institutional, social and technical analyses of a proposed project. Provide for application of the principles in this Table to subprojects under investment and financial intermediary activities. Disclose draft EIA in a timely manner, before appraisal formally begins, in an accessible place and in a form and language understandable to key stakeholders.

The World Bank has well-established environmental assessment procedures, which apply to its lending activities and to the projects undertaken by borrowing countries, in order to ensure that development projects are sustainable and environmentally sound. Although its operational policies and requirements vary in certain respects, the World Bank follows a relatively standard procedure for the preparation and approval of an environmental assessment study, which:

a) Identifies and assesses potential risks and benefits based on proposed activities, relevant site features, consideration of natural/human environment, social and transboundary issues;

b) Compares environmental pros and cons of feasible alternatives;

c) Recommends measures to eliminate, offset, or reduce adverse environmental impacts to acceptable levels (sitting, design, technology offsets);

d) Proposes monitoring indicators to implement mitigation measures; and

e) Describes institutional framework for environmental management and proposes relevant capacity building needs.

The environmental assessment evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation.

The World Bank considers environmental and social impact assessment (ESIA) as one among a range of instruments for environmental assessment. Other instruments used by the World Bank include regional or sectoral environmental assessment, Strategic Environmental and Social Assessment (SESA), environmental audit, hazard or risk assessment, Environmental Management Plan (EMP) and Environmental and Social Management Framework (ESMF). Environmental assessment applies one or more of these instruments, or elements of them, as appropriate.

The procedure generally follows the stages outlined below:

i. Screening at project identification stage; ii. Scoping process

during pre-feasibility and feasibility studies; iii. Final

environmental assessment; and iv. Project completion Report;

The Bank undertakes environmental screening of each proposed project to determine the appropriate extent and type of environmental assessment. Proposed projects are classified into one of three categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts:

Category A: the proposed project is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. For a Category A project, the Proponent is responsible for preparing an ESIA report.

Category B: the proposed project has potential adverse environmental impacts on human populations or environmentally important areas such as wetlands, forests, grasslands, and other natural habitats - but these are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases, mitigation measures can be designed more readily than for Category A projects. Like Category A the environmental assessment examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. This project was assigned EA Category B.

Category C: the proposed project is likely to have minimal or no adverse environmental impacts. Beyond screening, no further environmental assessment action is required for a Category C project. However, an approval should be sought from NEMA on the project.

4.4.2 World Bank Policy OP 4.12 (Involuntary Resettlement)

The World Bank policy on involuntary resettlement emphasizes that any development project should avoid or minimize involuntary resettlement and where this is not feasible, it should compensate for lost assets at full replacement cost and assist the displaced persons in improving or at least restoring their livelihoods and standards of living in real terms relative to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.

The World Bank OP 4.12, Annex A (Paragraphs 17-31), describes the scope (level of detail) and the elements that a resettlement plan should include. WB OP 4.12.(6a) demands that the resettlement plan includes measures to ensure that displaced persons are

(i) informed about their options and rights,
(ii) (ii) consulted on, offered choices among others and provided with technically and economically feasible resettlement alternatives, and
(iii) (iii) provided prompt and effective compensation at full replacement costs;

WB OP 4.12 (8) requires that particular attention should be paid to the needs of vulnerable groups among those displaced such as those below the poverty line, landless, elderly; women and children and indigenous peoples and ethnic minorities;

WB OP4.12 (12a) states that for households depending on land for their livelihoods preference should be given to land based solutions; however, payment of cash compensation for lost assets may be appropriate where livelihoods are land-based but the land taken for the project is a small fraction (less than 20%) of the affected asset and the residual is economically viable;

WB OP4.12 Para (6 b & c) state that in case of physical relocation, displaced persons should be

(i) Provided with assistance (such as moving allowances) during relocation; and

(ii) Provided with residential housing, or housing sites, or, as required, agricultural sites for which a combination of productive potential, location advantages, and other factors is at least equivalent to the advantages of the old site.

Land acquisition in relation to the WB policy

Land for the proposed project belongs to the community which voluntarily donated it for the drilling of the proposed borehole. The land measures 0.09 Ha. This policy therefore will not be triggered.

4.4.3 OP 4.04: Natural Habitats

The policy is designed to promote environmentally sustainable development by supporting the protection, conservation, maintenance and rehabilitation of natural habitats and their functions. The policy seeks to ensure that World Bank-supported infrastructure and other development projects take into account the conservation of biodiversity, as well as the numerous environmental services and products that natural habitats provide to human society. The policy strictly limits the circumstances under which any Bank-supported project can damage natural habitats (land and water area where most of the native plant and animal species are still present). This project has no significant interaction with natural habitats. This policy is, therefore, not triggered.

4.4.4 OP 4.11: Physical Cultural Resources

This policy is meant to assist in preserving physical cultural resources including the movable or immovable (above or below ground, or under water) objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance including sites and unique natural values. Physical cultural resources are important as sources of valuable scientific and historical information, as assets for economic and social development, and as integral parts of a people's cultural identity and practices. The objective of this policy is to avoid or mitigate adverse impacts on physical cultural resources from development projects. No cultural resources and sites were identified in the area and therefore this policy is not triggered.

4.4.5 OP 4.36: Forests

The policy on forest safeguards seeks to realize the potential of forests to reduce poverty in sustainable manner, integrate forests effectively into sustainable economic development and protect the vital local and global environmental services and values of forests. Among the principles is to screen as early as possible for potential impacts on forest health and quality and on the rights and welfare of the people who depend on them. The project area isfully habited with intensive social and economic activities. The policy is, therefore, not triggered.

4.4.6 OP 4.10: Indigenous Peoples

This policy contributes to the Bank's mission of poverty and sustainable development by ensuring that the development process fully respects the dignity, human rights, economies and cultures of indigenous peoples. For all projects that are proposed for Bank financing and affect indigenous peoples, the Bank requires the borrower to engage in a process of free, prior, and informed consultation. There are no indigenous peoples identified in this project area.

4.5 Environmental, Health and Safety Guidelines

The IFC EHS guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP) as defined in IFC's Performance Standard 3: Resource Efficiency and Pollution Prevention. The guidelines are inclusive of various aspects such as:

- Environment
- Occupational health and safety;

- Community health and safety; and
- Construction and decommissioning

All of these are relevant to this project. The ESMP has summarized all the anticipated impacts according to the various phases of the project. In determining these impacts, public consultations were also conducted to get the views of the various stakeholders and the key impacts that will arise with the implementation of the project.

The General EHS Guidelines contain information on cross-cutting environmental, health, and safety issues potentially applicable to all industry sectors. The relevant Industry Sector Guideline(s) is the Water and Sanitation guidelines. The EHS Guidelines for Water and Sanitation include information relevant to the operation and maintenance of

(i) potable water treatment and distribution systems, and

(ii) (ii) Collection of sewage in centralized systems (such as piped sewer collection networks) or decentralized systems (such as septic tanks subsequently serviced by pump trucks) and treatment of collected sewage at centralized facilities. Information on potable water treatment and distribution systems is therefore relevant to the proposed project.

CHAPTER 5: PUBLIC CONSULTATION AND PARTICIPATION

5.1 Introduction

This chapter outlines the key issues raised by the public on the proposed project. The findings indicate that all the community members support the project as long as they are involved and fully sensitized on the same.

5.2 Objectives of Public Consultation

Section 58 of the amended EMCA, CAP 387 and subsequent EIA/EA Regulations of 2003 requires any project to carry out environmental impact assessments for development proposals. According to EIA /EA Regulations, 2003 such studies have to incorporate consultation and public participation (CPP) process. Consultation and Public participation is conducted to:

- Disseminate and correctly inform the stakeholders about the project, its key components, location and expected impacts;
- Awareness creation on the need for EIA;
- Gather comments, concerns and suggestions of the interested and affected parties;
- Ensure that the concerns of the stakeholders were known to the decision-makers early enough; and
- Incorporate the information collected into the ESIA study

The purpose for such a process was to identify the positive and negative impacts and subsequently promote and mitigate them respectively. It also helped in identifying any other miscellaneous issues which may bring conflicts in case project implementation proceeded as planned.

5.3 Public Participation Process

Stakeholder consultation was structured in different approaches during the EIA process;

First, the team reviewed the previous consultations done during project inception, socio Economic Survey, Community Consultations and validation of Project Priorities as well as during development of Conceptual Designs.

Second the EIA team conducted public participation on 6th of September, 2019. This was conducted through a baraza in the community whereas the team held consultative meetings with them (community members) about the proposed project in order to give them a platform of expressing their environmental and social concerns. The notice about the public participation had earlier been circulated by the area chief and the group's chairman

The team also visited the proposed project site for further assessment. The minutes of the meeting are annexed at the end of the report. Consultations were done through the use of questionnaires and have been annexed in the EIA report. Attendance list have also been annexed at the end of this report.

Fig 5.1 (a) & (b) EIA experts and Nyamodel members during site visitation

5.4 Public Consultation Approach

5.4.1 Consultation with Interested and Affected Parties

The consultation process included to a large extent public consultation through barazas with the local people and interested and affected parties. Questionnaires were administered and filled as annexed at the end of the EIA report.

Fig 5.2 (a),b,c,& d) Public Participation Baraza on going at the project site

5.4.2The Content of the Questionnaire

The content of the questionnaire included:

a. Awareness about the proposed drilling of the bore hole.

b. Whether the proposed project will cause negative impacts on the following.

- ✓ Local residents
- ✓ Natural ecology of the area
- ✓ The human environment
- ✓ Public health and safety
- ✓ Effect on water resources and quality
- ✓ The soil Quality in the local area
- ✓ The areas of scenic beauty
- ✓ Drainage of the area

5.4.3 The Results of the Consultation

The result of the consultation is that most of the respondents were aware of the proposed development and welcomed this development. The overall conclusion from the interviews and analysis of the questionnaire led to determination of the following:

- ➢ The proposed project is accepted by the interested and the affected parties (i.e. almost all of the respondents)
- ➢ The proposed project will benefit the general population of by providing the muchneeded water for both domestic and agricultural use.
- ➢ Provide jobs to community members and in the long run reduce dependency and poverty.
- ➢ Improvement of the standards of living through the minimisation of waterborne diseases following the provision of clean water to the public.

Summary Outcome of Stakeholder and Public Consultations

5.5.1Concerns and Fears

Participants consulted raised several issues regarding the proposed drilling of the Borehole. Below is a summary of repeatedly social issues raised during the meeting and recommendations:

i. Increased rise in social vices including prostitution, crime and spread of HIV/AIDS leading to conflicts, early pregnancies and broken families as well as abuse of girl child. It is therefore important to ensure involvement of civil societies and government agencies in mobilizing and educating people before start of actual work while at the same time conducting more consultations at the village level.

ii. Increased insecurity within the region as a result of influx of people during drilling and construction process, increased traffic and socioeconomic crime like drug abuse/prostitution, insecurity and risk during construction phase. There is therefore need to consider a security personnel.

iii. Fear of management conflicts during the operational stage of the project. Members of the Nyamodel group feel that the project is their initiative hence they should be allowed to manage it whereas, community members present had the opinion that the project being community's, its management should not be left under the hands of a just one group. There is there need for the community to be sensitized on the structure of management of such project to avoid conflicts.

iv. On labour and employment, there were fears that the contractor may come with casual labourers from outside the area and thereby deprive the inhabitants of incomes from the proposed project.

5.5.6. Suggestions and Recommendations

Some of the recommendations to the concerns made during the meeting included the following-:

i. Strategies adopted in the project should address issues of community involvement in the project to enhance community ownership and therefore sustainability. This should be done in a manner that is acceptable to both the community and Nyamodel group.

ii. Accessibility to the borehole should be provided during and after completion of the project. The design should include two gates ie entrance and exit to ease on movement to and from the borehole site.

iii. Piping should be done for distribution of water to as many homes as possible

iv. Concerning HIV, a series of awareness-creation initiative and public events to educate community on spread of HIV/AIDS and supply of condoms to workers during construction.

v. Youth have problems when it comes to employments; contractor comes with imported labour from other areas. There is need to establish procedures to ensure locals get casual jobs

vi. The contractor should prioritize to employ Women and subcontract local CBOs and SHGs in job opportunities. He should pay fair wages for local casual workers.

vii. Also the local people should be given opportunities to benefit with skills from job opportunities during the construction**.**

Conclusion

The project should be implemented owing to the enormous benefits accruing from the proposed borehole including- improving the standards of living through access to clean water, income generation through irrigation support farming and livestock keeping, creation of employment opportunities both in the unskilled and skilled sector and development of viable enterprises for local economic development. In addition, the project has unanimous approval from all cross sections of the village as it was considered to be viable, valuable and needs to have been started. As such, implementation of the project should observe set timelines since keeping the project time frame is critical to managing expectations of the community members who are in dire need of sustainable supply of water pending the current scarcity of this precious commodity in the entire village.

CHAPTER SIX: ANALYSIS OF PROJECT ALTERNATIVES

6.1 Introduction

The consideration of alternatives is one of the more proactive sides of environmental assessment enhancing the project design through examining options instead of only focusing on the more defensive task of reducing the adverse impacts associated with a single design.

The analysis of alternatives should yield a well-informed decision on the optimal project design, based on consultations with stakeholders and experts. This calls for the comparison of feasible alternatives for the proposed project site, technology, and/or operational alternatives. Alternatives may been compared in terms of their potential environmental impacts, capital and recurrent costs, suitability under local conditions, acceptability by neighbouring land users, among other pertinent factors.

6.2 Alternative Location

Alternative location is one of the options considered for this project. In this case, the proponent will have to move the project to another site instead of implementing it on the proposed site. This is not however a feasible option considering that:

- Groundwater reserve analysis established that the boreholes which have been drilled are very sparsely distributed and are far from the sit. This means that drilling this borehole will not adversely affect the aquifer characteristics of the area and will open up the project area for future groundwater development.
- The proposed site was chosen by the community after considering all other alternatives sites;
- The land where the proposed project is to be developed is a community land hence available for the said project. Finding and acquiring another land to accommodate the scale, type and size of the project and completing official transaction may take longer and delay the project;
- Even if the land was to be obtained, there is no guarantee that such land would be suitable in terms of environmental, health and safety requirements; accessibility and zoning based on land use; and
- Even if the land was to be obtained, the proponent will spend some more time and resources on hydro-geological investigations and other project planning activities to adjust to new site conditions, this will not be cost friendly to the proponent.

6.3 The No Project Alternative

The other best alternative to address the significant impacts is the No project alternative.

This alternative will ensure that things remain unchanged. The environment therefore will not be tampered with. This option is not feasible too. This is due to:

- It results in losses to the project proponent and other stakeholders, society and the Government;

- The project would not be constructed and there would be no water supply;
- The land will remain literally idle;
- Lack of creation of employment, hence, effect on socio-economic empowerment of the society;
- Local skills would remain under-utilized; and
- The community will still travel long distances to access water.

6.4 Alternatives water sources

The community should consider roof catchments of rainwater to augment water supply from the borehole. Harvesting of rainwater will reduce pressure on the grounds and will provide plenty of water for use particularly for the community.

6.5 Alternative design and technology

The proponent would also have opted to adopt alternative design and technology. This option too is not feasible since the adopted technology in this project is a brain child of various professionals including engineers, and surveyors and environmental consultants who have vast experience in the hydrogeology regulations and standards both locally and internationally and they settled for the best as a way of fostering best practice within the industry.

The proposed borehole will use a submersible water pump powered by solar which is economical and easy to run. Other power source like electricity and diesel are not viable due to its prohibitive cost for operations & maintenance.

6.6 Input Alternatives

The choice of materials and inputs selected for the project was based on the stipulated laws, standards and specifications as commonly applied in a project of such nature. The selection of materials takes into account design specifications and end user consideration.

CHAPTER SEVEN: ANTICIPATED POTENTIAL ENVIRONMENTAL IMPACTS

7.1 Introduction

This Chapter identifies and discusses both positive and negative impacts associated with the proposed borehole water project. Impacts to the environment could be positive or negative, direct or indirect, reversible or irreversible. The extent of environmental impact is determined by its significance, adversity, temporary or permanent, long-term or short-term, localized or widespread. Some impact mitigation has already been proactively addressed in the design while others would be undertaken through considered incorporation in the implementation of the project and guided by the Environmental and Social Management Plan (ESMP) presented in this report.

The anticipated impacts are discussed in three phases namely: construction, operational and decommissioning phases. **7.2 Construction Phase**

7.2.1 Positive impacts

7.2.1.1 Creation of Employment and Business Opportunities

During the construction period, new employment opportunities will be created in the form of skilled and unskilled labour. The majority of unskilled labour will be sourced from the communities around the project sites .Business and Employment Opportunities will also be created for Suppliers, Sub-Contractors and other small businesses such as food kiosks that may be setup near the contractor's camps Based on the Scope of Works for the drilling of borehole and construction of elevated tanks.

Job creation will help reduce the problem of unemployment with attendant improvement in income for the workers' household and revenue. Employment opportunities have both economic and social benefit.

7.2.2 Negative Impacts

7.2.2.1Loss of Vegetation Cover and Biodiversity

Before the drilling and installation of the boreholes, pipeline works and construction of water kiosk and elevated steel tank, clearing of part of the existing vegetation cover will be done.

Direct impact from such disturbance may cause changes in the natural community ecosystem or lead to invasion by non-native plant species. Loss of plant communities may also result in soil erosion and/or compaction. The loose soil material may also be washed down into the lower areas (streams and valleys).

Mitigation

- Ensure proper demarcation and delineation of the project area to be affected by construction works;
- Site Clearance and Construction activities will be limited to the area set out for construction.

- It is recommended that indigenous trees or other fast growing trees be planted in strategic locations where the vegetation cover will be cleared as part of landscaping initiatives;
- Project implementation plans will be developed such that section excavated are worked on and completed before moving to other areas;
- Re-vegetation of exposed areas around the site will be carried out rapidly in order to mitigate against erosion of soil through surface water runoff and wind erosion; and
- Identify and restrict movement of vehicles to areas of disturbance
- Reinstatement of the project sites to their original state to be carried out once construction works are completed to allow growth of vegetation.

7.2.2.2Alteration or Destruction of Wildlife Habitat

Drilling of borehole, laying of water pipeline and construction of water kiosk may have immediate impact on wildlife habitat. Alteration, fragmentation, or destruction of wildlife habitat can result in the direct loss or displacement of species and the ability of the ecosystem to support other biological resources such as the plant communities upon which the wildlife rely on for survival. The level of habitat destruction in this project is minimal as the core impact areas are quite small. There were also no observed counts of endangered animal species in the proposed construction sites.

Mitigation

- Clearance of vegetation should be done in necessary areas only; and
- Notify Kenya Wildlife Service (KWS) in case animals are encountered during construction activities.

7.2.2.3 Solid and Liquid Waste Generation

The construction works involves activities which may lead to generation of both solid and liquid wastes. These will include rejected casing materials, excavated materials and cleared vegetation among others. There will also be some solid containers such as cement bags, bentonite residuals and cement bags and other packets with materials and equipment to be used during implementation of the project. The workers at the site will also generate faecal wastes during their day to day operations. The generated waste needs proper handling to prevent diseases, such as cholera, typhoid and diarrhoea outbreak on the site. Unless this is addressed, it can prove to be an environmental/health hazard.

Mitigation

- Use an integrated solid and liquid waste management system which includes reduction at source, recycling, re-use and recommended disposal
- The proponent in collaboration with the local administration should organize for disposal of waste to a NEMA licensed dump site before commissioning the project.
- Some of the drilled materials will be used in the borehole construction by backfilling the annular space. All excavated material from the draining channel will be used to refill it.

- Drilling crew to be encouraged to dump their personal wastes in designated covered dustbins
- Do not secure a solid waste disposal site within a radius of 50M of the proposed borehole site.
- Any remaining waste (paper or polythene containers, cement bags, bentonite, construction debris, etc. shall be safely burned and/or disposed in designated waste disposal areas before the project is commissioned;
- Some of the drilled materials will be used in the borehole construction by back filling the annular space. All excavated material from the draining channel will be used to refill it;
- Construction crew to be encouraged to dump their personal wastes in designated covered dustbins; and
- Keep the site clean and orderly at all times.

7.2.2.4 Noise and Excessive Vibrations

The construction works will most likely be a noisy operation due to moving parts of machines (drilling rig, pipeline excavation works and communicating workers) and trucks that carry the equipment to the site. This impact poses a health and safety risk to both the communities living in the project area and construction workers.

The noise emitted from these equipment, however, will be minimum and within the ambient noise levels. The works will be undertaken during the day time and hence effects to night time noise will not be associated with the construction equipment.

Mitigation

- Adhere to the Kenya Noise Prevention and Control rule passed in 1996 under legal notice No. 296 as a subsidiary legislation to the Occupational Health and Safety Act (OSHA) of 2007 which requires putting in place measures that will mitigate noise pollution. Consider especially the rule, which states that, "No worker shall be exposed to noise level in excess of the continuous equivalent of 90 dBA for more than 8 hours within any 24 hours duration";
- The drill rig must be fitted with appropriate noise suppression equipment such as mufflers;
- Proper maintenance of the construction equipment;
- Workers to be supplied with an ear mask where applicable to control excessive noise;
- No works during the night to prevent disruption of the neighbouring community; and
- Sensitize vehicle drivers and machine operators to switch off engines of vehicles or generators when not in use and to avoid hooting.
- Hospitals and other noise sensitive areas such as schools shall be notified by the Contractor at least 5 days before construction is due to commence in their vicinity
- Any complaints received by the Contractor regarding noise will be recorded and communicated to the Supervising Engineer for appropriate action

7.2.2.5 Dust Emissions

Particulate matter pollution is likely to occur during site clearance, excavation works and drilling operations. There is possibility that generated dust may affect the workers and the surrounding community members' heath. The law requires that best management practices are adopted during drilling activities. Ideally, no visible dust should be created nor should exhaust from any equipment be visible for more than 10 seconds. However, the potential impact on air quality will be minimal.

Mitigation

- Ensure that the workers have proper PPEs like dust masks;
- Ensure strict enforcement of on-site speed limits; and
- The equipment used to drill water must be fitted with dust suppressors equipment (e.g. water sprays), and pre-start inspection of dust control equipment will be undertaken.

7.2.2.6 Risk of Accidents and Health and Safety Concerns

During construction activities, it is expected that the construction workers may encounter occupational health hazards as a result of coming into contact and handling hazardous waste e.g. engine oil and grease. Workers are also likely to be exposed to risk of accidents and injuries when setting up and operating the drilling machines. Some injuries can also be as a result of loading and offloading truck mounted drill rig, transportation of the drill rig, hand tools and cuts from sharp objects, slips and fall hazards among others.

Mitigation

- Ensure compliance with occupational health and safety act, 2007;
- Ensure workers are provided with personal protective equipment and first aid kit;
- Ensure all equipment are inspected before use for appropriate safeguards and that the machine operators are trained on machine safety;
- Ensure appropriate road safety signage are strategically placed and drivers adhere to the requirements of such signage;
- Provide appropriate barriers along the excavated trenches. All construction sites shall be isolated from the public and their livestock. This will be done through temporary fencing and fixing appropriate safety signage and information;

7.2.2.7 Risk of Oil Spillage

The drilling machine contains movable parts which will require oiling and greasing to minimize wear and tear. Likewise the truck for carrying the drilling rig, pipes and other construction materials to site may require oil and other lubricants change. There are Possibilities of oil spillage contaminating soil and water within the project area.

Mitigation

- Safety procedures such as maintaining the machinery in specific designated areas designed for such purposes will be enforced to minimise cases of oil spillage.

- Ensure that oil/grease spills and other oils and associated materials (filters, rags and cans) are immediately removed along with all contaminated material and disposed off appropriately
- Ensure that contaminated materials including used/spilled oils/grease as well as other contaminated materials are stored in a banded area before being disposed off.

7.2.2.8 Groundwater Pollution

Water, especially for domestic use should be of high quality and wholesome .Borehole construction activities have the potential to introduce contaminants into ground water reservoirs creating a great concern to human and animal health. Percolation of water from sanitary systems I.e. toilets and refuse disposal sites poses a serious threat to the preservation of groundwater quality. Groundwater quality pollution during drilling may occur following one or more of the following deficiencies:

i. Insufficient or substandard well casing hence drawing contamination from the subsurface or perched water,
ii. Inadequate seal between the well casing and the borehole
iii. Poor welding of casing joints
iv. Lack of sanitary protection at the wellhead

Mitigation

- Groundwater quality must be safeguarded by a correct territorial planning and protection of surface waters since these are strictly linked to ground water resources.
- Ensure that all potential sources of pollution are eliminated
- The proponent to adhere to the regulations and permits set by WRMA.
- Avoid improper land use activities within the proximity of the borehole wellhead; and
- Undertake an audit on the integrity of the borehole abstraction piping and associated casings.

7.2.2.9 HIV/AIDS

During construction, the project is likely to bring in a significant population of new people in the project area. With this, chances are high that social delinquency and STI rates will increase. This is due to the fact that the workers and traders will have money to spend and some may use it to attract women from the project area in a bid to solicit for sex, thereby creating avenues for spread of HIV/AIDS and STIs.

Mitigation

- Programs will be developed and integrated into the project implementation for sensitizing the local community and project workers on HIV/AIDS and/or other sexually transmitted diseases (STDs);
- Review the construction activities to integrate with the HIV/AIDS campaigns;
- Develop appropriate training and awareness materials for Information, Education and Communication (IEC) on HIV/AIDS; and

- Identify other players (local CBOs, NGOs, and government organizations) on HIV/AIDS for enhanced collaboration.

7.3 Operation Phase

7.3.1 Positive Impacts

7.3.1.1 Increased Access to Water

The current water sources rapidly deplete during the dry season. Consequently, the community members have to travel increasingly far distances in search for water. It is expected that the construction of boreholes will greatly improve access to water in the area.

7.3.1.2 Permanent Employment Opportunities

Permanent employment opportunities are one of the long-term major impacts of the project that will be realized during the operation and maintenance of the borehole. It is expected that some community members will be permanently employed as borehole attendants.

7.3.1.3 Improved Health and Sanitation

The proportion of the population currently relying on water from unprotected water sources such as rivers and shallow wells will reduce significantly. These will have a direct impact on health and sanitation especially in relation to waterborne diseases such as diarrheal and helminthic infections. Families that are unable to wash clothes or bathe will be able to do so due to close proximity to water sources.

7.3.1.4 Reduced Travel Times to Water Points

From our discussions with community members, most families spend almost 30 min-1 hour in search for water. It is expected that the construction of the borehole will lead to significant time savings due to reduced distances to water points. It is expected that same will improve the economic and social status of women and children since there will be more time for other activities for example for farming and studying.

7.3.1.5 Increased Participation of Women in Socio-economic Development

The prevailing socio-cultural norms influencing household division of labour determine that looking after children, preparation of food and collecting water and firewood are tasks for the women. By constructing borehole closer to the communities, the women will be able to spend their time in other productive activities thereby increasing their participation in socioeconomic development.

7.3.2 Negative Impacts

7.3.2.1Additional Financial Burden

Once done, the borehole will be the most common source of water in the project area. However, being a community project, the borehole stands a chance of being non-operational due to lack of proper community management framework for operation, repair and maintenance of the same. It is expected that construction of the borehole at the proposed site will impose additional financial burden to the community members who will have to dig from their own pockets to repair and/or maintenance.

Mitigation

- The project proponent will train the community members on proper operation, management and maintenance of the borehole to ensure sustainability; and
- The proponent will consult with the community on reasonable ways of getting funds for repairs and bills when need be

7.3.2.2Change in Settlement Patterns

The construction of borehole is likely to encourage permanent settlements leading to livestock and human concentration near the water points. Large concentration of domestic animals may result in heavy grazing and accompanying vegetation changes in the vicinity of the boreholes.

Mitigation

- Liaise with the County Government of Kisumu to control developments in the area and ensure provision of adequate services.

7.3.2.3 Risk of Water Vectors

Water spillage around the taps during operation may provide breeding ground for vectors of waterborne diseases such as worms, mosquitos and schistosomiasis. With increasing population and demand of water resources, more energy may be directed into enhancing water flow but forgetting the management of sanitation and wastewater. This scenario also leads to low attention to water quality and concentrating into increasing the volume.

Mitigation

- The waste water drainage channel be constructed to lead water away from the pump pad;
- The waste water may be used for small gardening initiatives by the communities or directed to soak pits;
- Observe the Water Act 2002 and associated Water Rules;
- Conduct continuous maintenance of the borehole, pipework, tank and water kiosk; and
- Conduct water sampling at least every 3 months for water monitoring record base on this facility

7.3.2.4 Lowering of Water Table

It is expected that the water from the borehole will be used for both human and animal consumption and in some cases irrigation purposes. This poses the risk of over abstraction. This may lead to lowering of ground water table which may interfere with other existing boreholes.

Mitigation

- The borehole will be installed with a master meter and an Airline/Piezometer to monitor ground water abstractions and to facilitate regular measurements of the static water level in the borehole, respectively;

- The committee managing the water source shall ensure that there is no over pumping and also they will stick to the permit class issued by WRMA;
- Install auto-shut water taps to reduce water wastage;
- Educate and create awareness to the Community on the value of water and water resources for enhanced conservation; and
- Ensure optimum maintenance of the water supply system components including pipelines, valves and consumer taps.

7.4 Decommissioning Phase

Decommissioning refers to the final disposal of the project and associated materials at the expiry of the project life span or when the borehole dries up or when the community gets a better source of water other than the proposed borehole. During this phase, the proponent will be expected to demolish the pump house, remove the casings, pump, water pipeline, water kiosk, elevated water tank and remediate the site.

7.4.1. Positive Impacts

7.4.1.1 Rehabilitation

Upon decommissioning of the proposed project, rehabilitation of the project site will be carried out to restore the site to its original status or to a better state than it was originally.

This will include replacement of topsoil and re-vegetation which will lead to improved visual quality of the area. This will also mean that alternative options can be utilized within the project site.

7.4.1.2 Employment Opportunity

For decommissioning to take place properly and in good time, several people will be involved. As a result several employment opportunities will be created for the demolition staff.

7.4.2. Negative Impacts

7.4.1.1 Solid Waste Generation

Demolition of project related infrastructure will result in large quantities of solid waste. The waste will include materials such as concrete, metal, wood, adhesives, sealants and fasteners. Although demolition waste is generally considered as less harmful to the environment since they are composed of inert materials, there is growing evidence that large quantities of such waste may lead to release of certain hazardous chemicals into the environment. We recommend that proper waste disposal mechanisms be observed.

7.4.2.2 Noise Pollution

The decommissioning related activities such as demolition works will lead to significant deterioration of the acoustic environment within the project site and the surrounding areas.

This will be as a result of the noise and vibration that will be experienced as a result of demolishing the proposed project structures.

7.4.2.3 Occupational Health Hazards

Demolition works will inevitably expose workers and the public to occupational health and public safety risks: in particular, working with heavy equipment, handling and use of tools engender certain risks. The construction workers are also likely to be exposed to risks such as accidents and injuries resulting from accidental falls, falling objects, injuries from hand tools and other equipment.

CHAPTER EIGHT: ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

In order to mitigate negative environmental and social impacts arising from the project, and to integrate environmental management into all stages of the project cycle, an environmental management plan is given below. The EMP also provides a framework for monitoring the mitigation of negative environmental impacts.

While specifying mitigation measures for negative environmental impacts, the EMP assigns responsibilities, gives cost estimates for mitigation options and gives monitoring indicators. The EMP also specifies timeframes within which mitigation measures are to be monitored. The Environmental Management Plan given below contains mitigation measures for project impacts at the construction, operation and decommissioning phases.

8.1 Purpose and Objectives of EMMP

The specific objectives of the EMMP are to:

- ✓ Serve as a commitment and reference for the contractor to implement the EMMP including conditions of approval from NEMA.
- ✓ Serve as a guiding document for the environmental and social monitoring activities for the supervising consultant, contractor and the client management including requisite progress reports.
- ✓ Provide detailed specifications for the management and mitigation of activities that have the potential to impact negatively on the environment.
- ✓ Provide instructions to relevant Project personnel regarding procedures for protecting the environment and minimizing environmental effects, thereby supporting the Project goal of minimal or zero incidents.
- ✓ Document environmental concerns and appropriate protection measures; while ensuring that corrective actions are completed in a timely manner.

8.2 Auditing of EMMP

- ✓ The contractor shall conduct regular audits to the EMMP to ensure that the system for implementation of the EMMP is operating effectively. The audit shall check that a procedure is in place to ensure that:
- ✓ The EMMP being used is the up to date version;
- ✓ Variations to the EMMP and non-compliance and corrective action are documented
- ✓ Appropriate environmental training of personnel is undertaken;
- ✓ Emergency procedures are in place and effectively communicated to personnel;
- ✓ A register of major incidents (spills, injuries, complaints) is in place and other documentation related to the ESMMP; and
- ✓ Ensure that appropriate corrective and preventive action is taken by the Contractor once instructions have been issued

Table 8.1 Environmental Management Plan for the proposed borehole project

Area of Concern	Anticipated Impacts	Standards/ Guidelines	Mitigation Measures	Monitoring Indicators	Responsible Person	Duration	Cost (Ks
Air Quality	- Dust emissions - Smoke emissions - Obnoxious gases: SOx, NOx, CH4, CO2	EMCA,CAP 387 Public Health Act OSHA, 2007	- Reduce speed for vehicles visiting the site - Provide dust masks to people at the site - Continuously water the site during the drilling process - Use well maintained machinery - Use well serviced vehicles	• Presence of dust on plants around the site and access roads • Public complains	Contractor	Construction phase	20,000
			- Sensitize neighbours to shut their windows throughout the drilling period	Public complains	Proponent	Construction phase	10,000
Soil Erosion	- Siltation of water sources	EMCA ,CAP 387	- Remove soil overburdens after drilling - Limit earthworks - Ensure excavated material do no end up in - water sources	Stockpiled soil overburdens	Contractor	Construction phase of drilling	5,000

Noise & Vibration Management	- Interferes with communication - Health effects such as tinnitus & fatigue - Public nuisance	EMCA,CAP 387 OSHA, 2007	- Avoid hooting especially when passing through noise sensitive areas such as religious areas, hospitals and schools; - Properly service and maintain drilling machinery such as generators and other heavy duty equipment to reduce noise generation; and - Provide ear muffs to all people	• Public complains • Presence of PPE (particularly ear muffs)	Contractor	construction phase of drilling	10,000
			being exposed to noise for a duration of more than 8 hrs;				
	- Excessive vibration	EMCA,CAP 387 OSHA, 2007	- Planning the construction work to take place only during the day when the neighbours are also at work.	Drilling at late hours of the evening	Proponent	Construction phase	
Ecosystem disturbance	- Extinction of indigenous species of vegetation - Changes in natural habitats	EMCA,CAP 387 OSHA, 2007	- Minimize clearance of existing natural vegetation at the at the site - Re-establishing vegetation in whole or part of the disturbed areas through implementation of a welldesigned landscaping programme	Extinction of local vegetation	Contractor	Construction phase	5,000
			- Avoid encroachment into ecologically sensitive areas - Plant vegetation with water conservation/purification traits around the borehole.	Extinction of local vegetation No. of trees planted to conserve the catchment	Proponent	Construction and operation phase	10,000

Water Quality	- Poor/fluctuating water quality - Health complications associated with contaminated water	EMCA,CAP 387 Water Act,2002 Public Health Act	- Use water based drilling fluid Case the well as it passes through the water table - Proper housekeeping within and around the rig will be observed before, during and after drilling, while proper clean up procedures will be undertaken in case of drilling fluid and oil spills	Water quality records Availability of water disinfection agents	Contractor	Construction phase of the project	10,000
			- Groundwater quality must be safeguarded by a correct territorial planning and protection of surface	Water quality records Availability of	Community Proponent	Construction and operation	20,000

			- waters since these are strictly linked to ground water resources. Establish - a database on water quality monitoring records - Ensure regular disinfection of the water. Regularly conduct water quality - analysis to ascertain quality of the water Ensure that all potential sources of pollution are eliminated for example by ensuring that the sewage disposal system are well - protected and does not leak even during exhaustion Properly gravel pack and seal the borehole to avoid any contamination from shallow sub surface water	water disinfectio n agents		phases	

Hazardous waste management	- Accidental oil spills - Contamination of water - Fire hazards	EMCA,CAP 387 OSHA, 2007 Water Act Public Health, Act	- Any oil and grease spills from machines to be contained for safe disposal - No bulk storage of hazardous substances or dangerous goods at any site/office within the scheme - Provide bunded and impervious storage areas for fuels and chemicals - Spill kit will be maintained on site when chemicals or fuels are stored	Spillages of hazardous substances around the site Reports of contamination Bunded areas for storage of	Contractor	Construction phase of the project	10,000
			on site. - Spillages of chemical will be cleaned up immediately	hazardous substance			
Ground water management	- Overabstraction - Conflicting water demands - Contamination of water	EMCA,CAP 387 Water Act,2002 Public Health, Act	Ensure withdrawals are reliable from groundwater resources especially during dry seasons Enhance accountability of water supplied by installing a master water meter to monitor quantities of water abstracted Borehole to be fitted with an airline for monitoring of the water levels	Yield from the Borehole A master meter at the borehole	Proponent	Construction & operation phases	10,000

	-		The maximum ground water abstraction permitted from the borehole is limited to the authorized volume per day for the domestic/industrial use only subject to availability from 60% of the tested yield for a maximum abstraction period not exceeding ten (10) hours per day Explore alternative sources of water such rain water harvesting Adhere to the regulations set by the ministry of water Resources, Management and development on the amounts to be extracted from a borehole and the number of pumping hours.	Water use conflicts Contaminated water No, of alternative sources of water	Community	Operation phases	10,000

Construction waste pollution management	Creation of habitats for pathogens and rodent Blockage of drainage canals from the borehole	Solid Waste Regulations, 2006	Secure a centralized solid waste collection point away from the borehole site Practice source separation of wastes into biodegradable and non-biodegradable Encourage re-use, recycling and waste reduction Any open air incineration of solid wastes must be done in an area far away from any combustible materials; Avoid accumulation of solid wastes to uncontrolled levels	Public complains	Contractor	Construction phase of the project	10000
			Ensure the collection and disposal of the wastes is done regularly and appropriately	Solid wastes at borehole site area	Community	Operation Phase	5000
Geologic risks	Land subsidence Environmental Degradation Loss of property and life	EMCA,CAP 387 Public Health Act	Temporary casings may also be installed during drilling in case they notice the soil strata is weak to prevent the borehole walls from collapsing which should be replaced by stronger casings Drilling be done in the presence and supervision of a hydro-geologist Avoid heavy compaction activities around the proposed borehole site	Sinking of ground around the proposed borehole site Hydrological survey report	Contractor	During construction phase of the borehole	10,000

			Carry out a hydrogeological survey to determine the suitability of the area for	Hydrological survey report	Proponent	Before drilling	50000
			the drilling of a borehole Ensure the borehole is drilled to a minimum finished diameter of 8". The borehole should then be lined with appropriate 6" casings				
Occupational Safety and Health	Occupational Accidents Exposure to occupational hazards	OSHA, 2007	Every person at the proposed project activities should take care of his/her safety. The proposed site should be properly secured by a fence to control access. Provide PPEs for use during construction of the borehole Provide first fully equipped first aid kit and services. Training all workers/employees at the various proposed project activities on how to operate different implements/equipments Ensure employee welfare including sick leaves/offs is catered for	Reports of work related accidents Availability of PPEs Availability of a first aid Kit	Contractor	During implementation and operation phases of the project	10,000

Record keeping and documentation	Lack of records on environmental performance by the facility	NEMA Regulations, Public Health Act	Develop procedures for documentation of records keeping of all environmental and health concerns	Routine recording	Community	Throughout the project phases	10,000

Table 8.2: Environmental Management Plan During Decommissioning Phase

Project Activities	Impacts	Mitigation Measures	Cost of Mitigation	Actors	Frequency/Expected Completion Time	Variable Monitoring Indicators
Lifespan expired	Efficiency highly reduced	Rehabilitate the borehole. Relocate the borehole	Cost of constructing a new on	Proponent	After 20-30 year	Presence of large and material frequent malfunctioning
Obsolete equipment	No longer in operation	1. Buy new equipment 2. Disposal of the old will depend on the type of equipment	Depends on the Equipment	Proponent Community	Depending on the equipment	No longer in operation

CHAPTER: CONCLUSION AND RECOMMENDATIONS

9.1 Conclusion

From this EIA process, the social and economic rating of this project is highly positive. The borehole project will include provision of clean, adequate, reliable and portable water close to the homes of the community members. The borehole will also promote the general health and sanitation standards of the local population and increase food production. Analysis of alternatives shows that the foregone options are limited and costly, hence the choice of the preferred project site, design and implementation technology. In addition, the EIA reveals that this project does not have serious negative environmental impacts, and for the impacts identified, adequate mitigation measures have been spelt out in the EMP.

9.2 Recommendations

From the detailed environmental and socio-economic analysis of the proposed project, the experts are of the opinion that this is a viable project, hence recommends that NEMA approves it and issues an EIA licence.

This EIA study also recommends future monitoring of water quality and water level monitoring in the borehole for environmental auditing.

It is further recommended that the Proponent and contractors implement the recommendations in the environmental management plan and those in the health, safety and accident prevention action plan. This is to ensure that the potentially affected environment is well managed and that accidents are prevented in the course of project implementation.

The Proponent is also expected to comply with the relevant legal and policy requirements with regard to project implementation.

REFERENCES

Government of Kenya (2008), Kenya vision 2030, government printer, Nairobi

Government of Kenya (1994), The National Environment Action Plan, government printer, Nairobi

Government of Kenya (1999), The National Shelter Strategy to the year 2000, government printer, Nairobi

Government of Kenya (2003), The National Poverty Reduction Strategy Paper, government printer, Nairobi

Kenya gazette supplement Acts 2000, Environmental Management and Coordination Act Number 8 of 1999. Government printer, Nairobi

Kenya gazette supplement Acts, Building Code 2000 by government printer, Nairobi

Kenya gazette supplement Acts, Land Planning Act (Cap. 303) government printer, Nairobi

Kenya gazette supplement Acts, Local Authority Act (Cap. 265) government printer, Nairobi

Kenya gazette supplement Acts, Penal Code Act (Cap.63) government printer, Nairobi

Kenya gazette supplement Acts, Physical Planning Act, 1999 government printer, Nairobi

Kenya gazette supplement Acts, Public Health Act (Cap. 242) government printer, Nairobi

Kenya gazette supplement Acts, Water Act, 2002 government printer, Nairobi

Kenya gazette supplement number 56, Environmental Impact Assessment and Audit Regulations 2003. Government printer, Nairobi

Kenya gazette supplement Acts, Occupational Safety and Health Act, 2007government printer, Nairobi

Kenya gazette supplement Acts, The Factories and Other Places of Work Act, (CAP 514) government printer, Nairobi

Kenya gazette supplement, Sessional Paper No. 6 on Environment and Development (1999) government printer, Nairobi

United Nations (1987), The Rio Declaration on Environment and Development

United Nations (2000), World Commission on Environment and Development

ANNEXES

Annex 1: Public Consultation Participants list

Annex 2: Completed Questionnaires

Annex 3: Certificate of Site Ownership/ Title Deed.

Annex 4: Hydrological Survey Report

Annex 5: Summary of Bill of Quantities

GRAND SUMMARY

ITEM DESCRIPTION	Amount
BILL NO 1: PRELIMINARIES & GENERAL	540,000.00

BILL NO 2: DRILLING WORKS	2,895,000.00
BILL No. 3 EQUIPPING WORKS	1,483,000.00
BILL No. 4 FENCING WORKS	1,030,000.00
BILL No. 5 CONCRETE TOWER PLATFORM	1,510,000.00
BILL No. 6 AUXILIARY STRUCTURES	540,000.00
BILL No.8 OTHERS	400,000.00
TOTAL	**8,398,000**