ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PROJECT REPORT

LAKE VICTORIA NORTH WATER SERVICE BOARD

PROPOSED TABANI RC PRIMARY SCHOOL BOREHOLE PROJECT IN BUBGOMA COUNTY

L.R No: KIMININI/TABANI/76

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C/O LAKE VICTORIA NORTH WATER SERVICES BOARD
P.O BOX 673-50100,
KAKAMEGA

May, 2014
CERTIFICATION

AFFIRMATION BY LEAD EXPERT

I, Mr. Joshua Obiri (EIA/EA Lead Expert, Registration No. 2088) Mr. Felix Kasiti and Mr. Eugene Mwavali affirm that to the best of our knowledge, the contents of this report are a correct representation of the findings of the Environmental Impact Assessment (EIA) carried out for the proposed Tabani RC Primary school borehole project, located on LR. No. kiminini/…PI PLOT 76. In Kiminini Location, Tongareni Division, Bungoma North Sub-County, Bungoma County.

Lead Expert Signature: .........................

Date: ....................../2014

AFFIRMATION BY PROPOSPENT

I, Mr. ......................................................... on behalf of Lake Victoria North Water Services Board proponent of the proposed borehole project located at Tabani RC Primary School on LR. No. Kiminini /Tabani/76 in Kiminini Location, Tongareni Division, Bungoma North Sub-County, Bungoma County of P.O BOX 673-50100 Kakamega, acknowledge that to the best of my knowledge, the contents of this report are a correct representation of the findings of the Environmental Impact Assessment (EIA) carried out for the proposed project.

Proponent Signature: .........................

Date: .........................../2014
EXECUTIVE SUMMARY

Introduction

The purpose of Environmental Impact Assessment (EIA) is to identify potential positive and negative environmental impacts associated with proposed borehole development project as well as recommend appropriate mitigation measures. The borehole will be drilled on an individuals’ piece of land. The proposed development has the prime objective of enhancing access to sustainable, clean and safe water for domestic use by the community. The EIA expert carried out the assessment using a combination of methods including site inspection and consultation with the interested and affected parties. Existing literature on statutory and other requirements was also reviewed.

Project Description

The proposed borehole project is cited at Tabani RC Primary School in Bungoma North Sub-County in Bungoma County. The proponent intends to sink a borehole to ease the water shortage in the school and the community around. The current water source for the school is a stream that is about a kilometer from the school and this inconveniences the school activities as well as hinder performance since most of the time is lost fetching water. The community practice agriculture both large and small scale and animal keeping.

The Environmental Impact Assessment (EIA) identified specific areas of concern that could be affected by implementation of the proposed project in all the three phases; drilling and construction, operation and decommissioning and proposed mitigation measures.

Below is a summary of potential environmental impacts associated with the proposed project and a brief description of their mitigation measures:

<table>
<thead>
<tr>
<th>Area of concern</th>
<th>Proposed mitigation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adverse drilling activities</td>
<td>• Supervision of drilling personnel by a qualified consultant engineer taking into consideration general sources of pollution and drilling wastes</td>
</tr>
<tr>
<td>Soil Erosion</td>
<td>• Remove soil overburdens after drilling</td>
</tr>
<tr>
<td></td>
<td>• Limit earthworks</td>
</tr>
<tr>
<td>Solid waste management</td>
<td>• Disposal to be done by authorized refuse handlers</td>
</tr>
<tr>
<td></td>
<td>• Regular collection of wastes to avoid accumulation at the site</td>
</tr>
<tr>
<td>Adverse abstraction activities</td>
<td>• Explore alternative sources of water such rain water harvesting to supplement</td>
</tr>
<tr>
<td></td>
<td>• Install water meters to monitor usage</td>
</tr>
<tr>
<td></td>
<td>• Install auto-shut water taps to reduce water wastage</td>
</tr>
<tr>
<td>Water Quality</td>
<td>• The chemical and bacteriological quality tests to be done regularly</td>
</tr>
</tbody>
</table>
### Area of concern | Proposed mitigation measures
---|---
**Air quality** | - The water should be disinfected before use by the proponent  
  - Stockpiles of the earth should be watered if dry to minimize dust from blowing  
  - All fuel powered equipment will be regularly serviced and maintained in optimal working conditions to mitigate against exhaust emissions

**Noise** | - Provide ear muffs to her workers and have a few extra ones for visitors visiting the site  
  - Use well maintained and serviced machinery to minimize the noise that will be generated

**Runoff-water** | - An open drainage system to be constructed at the site to direct runoff water into valleys particularly during test-pumping

**Land subsidence** | - All areas degraded during drilling shall be rehabilitated to near their original state  
  - Temporary casings may be installed during drilling in case soil strata is weak to prevent borehole walls from collapsing

**Site and public safety** | - Develop a site safety action plan  
  - Provide workers with suitable protective gear  
  - Ensure equipment is periodically checked by qualified personnel as outlined in Occupational Health and Safety Act (OSHA) 2007  
  - Ensure that spills are immediately removed along with all contaminated material and disposed of at an approved hazardous landfill site  
  - Ensure that all diesel and oil drums are stored in a banded area with the respective tags like “Danger” or its pictorial representation  
  - Fence the site to prevent intruders and unauthorized personnel

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**Conclusions and recommendations**
The hydro-geological conditions underlying the proposed site are favorable for drilling a borehole. The recommendation of this study that the proposed project be allowed to proceed on strict condition that the environmental management plan is implemented and follow-up is made to ensure compliance as may be directed by NEMA.

The primary objective of the proposed project is to enhance access to a stable water supply for the proponent. The hydro-geological survey carried out revealed that the hydro-geological conditions within the proposed project site are favorable for the drilling of the borehole.
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# LIST OF TERMS, ABBREVIATIONS AND ACRONYMS

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<tr>
<th>Term</th>
<th>Description</th>
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<td>AEZ:</td>
<td>Agro – Ecological Zone</td>
</tr>
<tr>
<td>CBD:</td>
<td>Central Business District.</td>
</tr>
<tr>
<td>EA:</td>
<td>Environnemental Audit.</td>
</tr>
<tr>
<td>EIA:</td>
<td>Environmental Impact Assessment.</td>
</tr>
<tr>
<td>EMP:</td>
<td>Environmental Management Plan.</td>
</tr>
<tr>
<td>ESA:</td>
<td>Environmental Solutions – Africa.</td>
</tr>
<tr>
<td>LASDAP:</td>
<td>Local Authority service Delivery Action Plan.</td>
</tr>
<tr>
<td>LM1:</td>
<td>Lower Midlands 1.</td>
</tr>
<tr>
<td>LM2:</td>
<td>Lower Midlands 2.</td>
</tr>
<tr>
<td>MDP:</td>
<td>Market Development Project.</td>
</tr>
<tr>
<td>MENR:</td>
<td>Ministry Of Environment and Mineral Resources.</td>
</tr>
<tr>
<td>NEMA:</td>
<td>National Environment Management Authority.</td>
</tr>
<tr>
<td>NIC:</td>
<td>Newly Industrialized Country.</td>
</tr>
<tr>
<td>NFP:</td>
<td>National Food Policy.</td>
</tr>
<tr>
<td>ROA:</td>
<td>Return on Capital Employed.</td>
</tr>
<tr>
<td>RRT:</td>
<td>Renewable Resource Technologies.</td>
</tr>
<tr>
<td>C°:</td>
<td>Degrees Celsius</td>
</tr>
<tr>
<td>dBA:</td>
<td>Decibels (a unit of measuring sound)</td>
</tr>
<tr>
<td>L. R. No.:</td>
<td>Land Registration Number</td>
</tr>
</tbody>
</table>
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) 1999.

**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 the 1999.

**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 socio-economic 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
1.0 INTRODUCTION

1.1 Background of the proposed water project

The proposed water project is intended to cater for the needs of the school and the surrounding areas which lack a proper source of water and perennially suffers water shortages particularly during the dry spell. Currently the school relies on water from poorly constructed springs supplemented by roof-catchment while the larger population in the area fetches their water from nearby streams. These sources do not provide adequate water supply during the dry spell when the students and community members are forced to seek for other alternative sources which exposes them to great danger and other vices. The proponent intents to sink a borehole expected to meet a daily water demand approximated at about 20\(m^3\) for domestic purposes. This will be sufficient to meet the domestic demand of the school and the local population in the area whose estimated population is about 1000 people.

Due to the above reasons, the management of the school through the District Water Officer, Bungoma North in collaboration with Lake Victoria North Water Services Board, engaged the services of a hydro-geologist to carry out groundwater investigation in the school to find a suitable site for borehole drilling to provide about 20 cubic meters of water per day for domestic use. The proposed borehole project is one of the drought mitigation measures financed by a grant from the World Bank under the Kenya Water and Sanitation Services Improvement Project - Additional Financing (WaSSIP-AF).

LVNWSB is one of the eight number of water services board that was established under the Water Act 2002, through Gazette Notice No. 1717 of 12\(^{th}\) March 2004. The area coverage is the entire Western region Kakamega, Busia, Bungoma and Vihiga counties and parts of North Rift region (Trans Nzoia, Uasin Gishu, Nandi and Elgeyo Marakwet) counties.

Lake Victoria North Water Services Board (LVNWSB) is a state corporation whose mission is to ensure provision of quality and affordable water and sanitation services through effective management of resources and in turn promote socio-economic progress in the region; with a vision of being the leading Water Services Board in Kenya in the provision of adequate and quality water and sanitation service. LVNWSB has developed several water projects from both surface and groundwater sources with great success.

1.2 Purpose of the EIA

The proposed project, falls under the second schedule of section 58 (1), (5) in EMCA, 1999
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.

The acquisition of an Environmental Impact Assessment (EIA) license is a requisite under section 58 of the Environmental Management and Coordination Act (EMCA), 1999 which stipulates that a proponent must seek an Environmental Impact Assessment (EIA) license “notwithstanding any approval, permit or license granted under this Act or any other law in force in Kenya…” This requirement applies to all projects listed in the Second Schedule to the Act. This Environmental Impact Assessment (EIA) project report was prepared following a study by NEMA registered EIA/EA experts as a request by the proponent in accordance with the second schedule of the Environmental Management and Co-ordination Act (EMCA), 1999 which specifies projects or activities that must be subjected to Environmental Impact Assessments (EIAs) and Environmental Audits (EAs) and also in compliance with Environmental (Impact Assessment and Audit) Regulations 2003.

1.3 Objectives of the EIA

The following are the main objectives:

a) To comply with EMCA, 1999;
b) To examine, evaluate and assess the likely environmental impacts that would arise with the implementation of the proposed project; and
c) To establish a benchmark for an appropriate environmental management that aims at sustainability of the Environment.

1.4 Terms of Reference for the EIA

This study was guided by the following ToR:

a) To establish legal and regulatory framework;
b) To assess the potential impacts that may occur in all phases of the proposed project;

c) To identify the impacts imposed on existing infrastructure and the demand put on natural resources;

d) To describe the potential effects of the development on both the natural and human environment taking into account health and safety matters;

e) To propose suitable mitigation measures for identified negative impacts;

f) To develop a comprehensive environmental management and monitoring plan; and

g) To provide a decommissioning/rehabilitation plan.

1.5 Scope of the EIA

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

a) Description of the project area to generate baseline information;

b) Description of the establishment and operational activities to be undertaken and the environmental changes that will occur;

c) Conducting public participation through a public consultation process to obtain views and comments from interested and affected parties;

d) 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

e) Developing an EMP for effective management of and future monitoring.

1.6 Assessment methodology

This assessment was carried out in April, 2014 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.

1.7 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.
2.0 BASELINE INFORMATION OF THE PROPOSED PROJECT AREA

2.1 Introduction
The following baseline information details on environmental, socio-economic and biophysical characteristics of the proposed project area. It is expected that it will provide for a benchmark for continued monitoring and assessment of the impact of the proposed borehole project on the environment.

2.2 Proposed site location, conditions and neighbourhood
The proposed borehole site is located on a parcel of land that belongs to Tabani RC Primary School. The institution is a public school and has a total of 850 students and 15 teaching staff. The school plans to construct classrooms, laboratory and administration block. The school currently relies on water from a stream (Tabani stream) and a shallow well which dried up. This source of water seems unreliable since there is more time lost in walking distances in search of clean water. For school children these distances traveled seems to compete with study time and this affects their performance in class. These sources of water also possess a great risk on their health as the quality of the water may be in question and may lead to water borne diseases. Access to and use of water are fundamental to human survival, health, and productivity The indivisibility of these functions of water to support human well-being lies at the heart of a holistic view of the resource and the need to assure its sustainability and that of the environment dependent upon it, for all those living today and for future generations.

The ground at the proposed site has a permitting drainage. The area is served by energy from KPC. From assessment there were no ecosystems of historical/ecological/archeological importance that are threatened by the establishment and operation of the proposed borehole. The proposed project site blends well with the neighbourhood. There was no adverse land-use activities such waste disposal particularly solid and waste water in close proximity to the proposed borehole site. During assessment, there was no sensitive/endangered flora and fauna at the proposed borehole drilling site. No vegetation will be cleared to pave way for drilling of the proposed borehole. The drilling of the proposed borehole will not affect any cultural heritages such as temples, pagodas and known graveyards. The site is in line with local authority’s long-term land use.
Plate 2.1: The proposed borehole site

Figure 2.1: Map for the proposed project area

Figure 2.2: Sketch Map for the proposed project site

2.3 Development challenges

Major environmental concerns in the area include:
• Inadequate public water supply and sewerage systems
• Poor solid waste collection and disposal systems;
• The problems related to the increasing population which posses pressure on the existing resources for example water and land and energy

2.4 Socio-economic environment

2.4.1 Physical and social infrastructure

Electricity is supplied by the Kenya Power Company in the proposed project area. However, some people have installed back-up generators and solar panels to supplement the Kenya Power supply especially in times of power outages. Many households in Tabani do not have access to portable water from protected sources. There is no existing Sewerage System in Tabani community. Most of the homesteads are served by pit latrines. The main tarmac road in the project area connects Webuye town to Kitale town at Kiminini center. There are other feeder roads such as Elgon – Soy road, which connect rural areas to the major roads. However, these feeder roads are dry weather roads and most become impassable during the rainy seasons. Communication is excellent for mobile reception from Safaricom, Airtel, Orange, Telkom Wireless and Yu networks and for landline from Telkom Kenya.

2.4.2 Land-use patterns

Agriculture, mostly of cash crop nature, is the main land use in the proposed project area. The proposed site is classified for mixed land use, comprising of residential and agricultural. A major challenge to the management of land use patterns in the proposed project area is the lack of a master plan to guide development activities and dictate land use activities.
2.4.3 Population

The target beneficiaries of the proposed borehole include Tabani primary school and the neighboring community within a radius of 1 km. Tabani primary has a population of approximately 865 people. At least 60 households will directly benefit from the supply. Typical household size is 6 people.

2.4.4 Economic activities

Industrial activities in the proposed project area are dominated by the informal (jua kali) sector – metal fabrication, apiaries, posho mills, wood workshops, blacksmiths, and motor vehicle repairs.

Agriculture and Livestock are the main sources of livelihoods for rural populations. The three broad Agricultural production systems are Crop Cultivation, Livestock Rearing, and Fisheries. Each of the production system has the potential to significantly affect human and environmental health. Tabani is characterized by high level of unemployment, high living costs and low income.
2.5 Physical Environment

2.5.1 Climate and topography

Tabani receives high rainfall almost all year round. However, the rainfall is less in intensity between December and February. The annual rainfall ranges from 1,179–1345mm per year. The area has an almost uniform rainfall distribution. It has high temperatures all the year round. The mean maximum is about 29°C. The high temperatures and rainfall allow for crop development all year round, enabling farmers to have two cropping seasons.

![Rainfall Distribution Map](image)

Figure 2.4: Map showing rainfall distribution in the proposed project area

2.5.2 Air quality and noise

Air quality in proposed project area becomes deteriorated especially during the dry season due to the presence of dust particles in the air which are accelerated mainly by vehicles moving on dry and dusty roads.
2.5.3 Water resources

The proposed project area is in the Lake Victoria catchment zone with all the rivers draining into Lake Victoria. The existing Water Supply System comprises of a combination of surface water and groundwater systems. The area is blessed with major rivers and myriads of permanent streams flowing throughout the year. Most people fetch water from natural sources (springs), and use untreated water exposing themselves to water-borne diseases everyday of their lives. A number of aquifers are being or have been exploited for domestic and livestock water supply across the proposed project area.

2.5.4 Geology and Soils

The investigated area is underlain by intrusives consisting of biotite granites, gneissose granite and meta-dolerites. In general, rocks in this category are melanic in appearance, with black shining hornblende either in long-bladed. They weather to a mustard yellow or reddish-brown colour and because of their low resistance to erosion are poorly exposed to form areas of low ground in most cases. The project area is majorly characterised by interstratified (mixed) clayey soils with proportions of sands. The soils are deep (100cm—150 cm). They are generally poorly drained with medium acidity (pH 5.2).

Figure 2.1: Map showing geology in the proposed project area
2.6 Biological environment

The area has both exotic and indigenous vegetation. Trees are used mainly for shade, boundary demarcation, fencing, production of fruits, timber, and fuel-wood and for ornamental purposes. Common trees in the district include: *Eucalyptus spp*, *Markhamia lutea*, *Cupressus lusitanica*, *Bischovia javonica*, *Spathodea nilotica*, *Croton megalocarpus* and *Pinus* sp. Common fruit trees are *Psidium guajava*, *Persea americana*, *Syzygium guinii* and *Eryobotria japonica*. Shrubs include *lantana camara*, *Tethonia diversifolia* and *Solanum incanum*. Animals in the sub-county are mainly domestic animals such as cattle, sheep, goats, pigs and poultry. There are no animals or resources of wildlife and tourism importance.
3.0 LEGAL AND REGULATORY FRAMEWORK

3.1 General Overview
The law has made provisions for the establishment of the National Environmental Management Authority (NEMA), which has the statutory mandate to supervise and coordinate all environmental activities. The Environmental Management and Co-ordination Act (EMCA), 1999, and the Environmental (Impact Assessment and Audit) Regulations, 2003, are the legislation that governs Environmental Impact Assessment (EIA) studies.

The proposed borehole will make use of the Groundwater conservation area, and thus an EIA must first be done in accordance with Section 58 of EMCA, 1999. Policies and legislation highlighting the legal and regulatory requirements pertinent to this study are presented below.

3.2 The Environment Management and Coordination Act, 1999
The Environmental Management and Coordination Act, 1999 came into force 14th January 2000. Its overall objective is to provide for the establishment of an appropriate legal and institutional framework for the management of the environment. The Act provides framework legislation for over 75 statutes in Kenya, which contain environmental provisions, and has direct relevance to the existing development. Section 58 (1) stipulates the requirements for environmental impact assessment for a range of projects specified in Schedule II of the Act, which include management of hydrocarbons such as the storage of natural gas and combustible or explosive fuels. A further review was carried out on the legislation supplement in Legal Notice No. 101 of 2003, on environmental impact and audit regulations. In this relation, that is the reason the proponent is conducting the EIA.

3.3 National Environmental Action Plan (NEAP)
According to the Kenya National Environmental Action Plan (NEAP, 1994) the Government recognized the negative impacts on ecosystems emanating from industrial, economic and social development programmes that disregarded environmental sustainability. Established in 1990, the plan’s effort was to integrate environmental considerations into the country’s economic and social development. The integration process was to be achieved through a multi-sectoral approach to develop comprehensive framework to ensure that environmental management and the conservation of natural resources are an integral part of societal decision-making. Under the NEAP process EIA was introduced and among the key participants identified were the industrialists, business community and local authorities.

3.4 National Policy on Water Resources Management and Development
While the National Policy on Water Resources Management and Development (1999)
enhances a systematic development of water facilities in all sectors for the promotion of the country’s socio-economic progress, it also recognizes the by-products of this process as wastewater. It, therefore, calls for the development of appropriate sanitation systems to protect people’s health and water resources from institutional pollution. Industrial and business development activities, therefore, should be accompanied by corresponding waste management systems to handle the wastewater and other wastes emanating there from. The same policy requires that such projects should undergo comprehensive EIA’s that will provide suitable measures to be taken to ensure environmental resources and people’s health in the immediate neighborhood and further downstream is not negatively impacted by the effluents. As a follow-up to this, EMCA, 1999 requires annual environmental audits to ensure continuous improvements on the recommendations from the EIA’s.

In addition, the policy provides for charging levies on wastewater based on quantity and quality (similar to polluter-pays-principle) of effluent. Further, the policy requires those contaminating water to meet the appropriate cost on remediation, though the necessary mechanisms for the implementation of this principle have not been fully established under the relevant Acts. However, the policy provides for establishment of standards to protect water bodies receiving wastewater, a process that is ongoing.

3.5 Policy Guidelines on Environment and Development

- Among the key objectives of the Policy Paper on Environment and Development (Sessional Paper No. 6 of 1999) are:
  - To ensure that from the onset, all development policies, programmes and projects take environmental considerations into account,
  - To ensure that an immediate environmental impact assessment (EIA) report is prepared for any industrial venture or other development before implementation,
  - To come up with effluent treatment standards that will conform to acceptable health guidelines.

Under this paper, broad categories of development issues have been covered that require sustainable approach. These issues include the waste management and human settlement sectors. The policy recommends the need for enhanced re-use/recyclable of residues including wastewater, use of low non-waste technologies, increased public awareness raising and appreciation of clean environment. It also encourages participation of stakeholders in the management of wastes within their localities.

Regarding human settlement, the paper encourages better planning in both rural and urban areas and provision of basic needs such as water, drainage and waste disposal facilities
3.6 Legal Aspects
Environmental management issues are addressed differently in several legal statutes, but the main objective in all of them is sustainability. The key national laws that govern the management of environmental resources in the country have been briefly discussed in the following paragraphs. It is noted that wherever any of the laws contradict each other, the Environmental Management and Coordination Act, 1999 prevails.

3.7 The Environment (Impact Assessment and Audit) Regulations, 2003
On June 13th 2003, the Minister of Environment, Natural Resources and Wildlife promulgated the Environment (Impact Assessment and Audit) regulations 2003 (EIA/EA Regulations) under section 147 of the EMCA. These regulations provide the framework for carrying out EIAs and EAs in Kenya by NEMA licensed Experts and Firms of Experts. EIA experts have been consulted.

3.8 The Water Act, 2002
Part II, section 18, of the Water Act, 2002 provides for national monitoring and information systems on water resources. Following on this sub-section 3 allows the Water Resources Management Authority to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may require to be kept by a facility operator and the information thereof furnished to the authority.

Section 73 of the Act allows a person with license (licensee) to supply water to make regulations for purposes of protecting against degradation of water sources. Section 75 and sub-section 1 allows the licensee (MUNICIPAL) to construct and maintain drains, sewers and other works for intercepting, treating or disposing of any foul water arising or flowing upon land for preventing pollution of water sources within his/her jurisdiction. A letter of authority has to be obtained from Water Resources Management Authority before commencement of the borehole drilling. An authority to this effect has been issued.

3.9 The Public Health Act, Cap. 242
Part IX, section 115, of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires Local Authorities to take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be injurious or dangerous to human health.

Such nuisance or condition are defined under section 118 as waste pipes, sewers, drains or
refuse pits in such a state, situated or constructed as in the opinion of the medical officer of health to be offensive or injurious to health. On the responsibility of local authorities, Part XI, section 129, of the Act states in part “It shall be the duty of every local authority to take all lawful, necessary and reasonably practicable measures for preventing any pollution dangerous to health of any supply of water which the public within its district has a right to use and does use for drinking or domestic purposes....” The quality of water will have to be verified before it is put to use.

3.10 The Local Government Act, Cap.265
Section 160 helps local authorities ensure effective utilization of the sewerage systems. It states in part that municipal authorities have powers to establish and maintain sanitary services for the removal and destruction of, or otherwise deal with all kinds of refuse and effluent and where such service is established, compel its use by persons to whom the service is available. However, to protect against illegal connections, section 173 states that any person who, without prior consent in writing from the council, erects a building on; excavate or opens up; injures or destroys sewers, drains or pipes shall be guilty of an offence. Any demolitions and repairs thereof shall be carried out at the expense of the offender. A letter of no objection has been obtained from Municipal Council before commencement of the borehole drilling.

3.11 The Physical Planning Act, 1999
The Local Authorities are empowered under section 29 of the Act to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same section, therefore, allows for the prohibition or control of the use and development of land and buildings in the interest of proper and orderly development of an area. Finally, section 36 states that if in connection with a development application, local authority is of the opinion that the proposed development activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an environmental impact assessment (EIA) report. EMCA, 1999 echoes the same by requiring that such an EIA is approved by the National Environmental Management Authority (NEMA) and should be followed by annual environmental audits. A hydrogeological Report has already been conducted for the proposed borehole drilling.

3.12 The Environmental Management and (Water Quality) Regulations, 2006
These regulations set the standards of domestic water and wastewater. The regulations are meant for pollution control and prevention and provides for protection of water sources. The proposed project has no chance of significantly affecting this. Testing and monitoring the
quality of the water will be paramount and the proponent will adhere to these requirements

3.13 **Land Planning Act (Cap 303).**
The Act ensures that all development plans within local authorities to be submitted to the Ministry for approval, this is intended to reduce potential conflicts between the interests of the authorities and those of landowners in respect of settlement, social and economic activities. The project area covers land legally granted under the Registrar of Titles Act (Cap281).

3.14 **Environmental (Water Quality) Regulations and Standards**

3.14.1 **Treated Water Supply**
In order to protect treated water supplies, no person shall:

- Abstract drinking water from a source that is not approved by the Authority;
- Use water treatment chemicals, processes and facilities that are not approved by the Authority in consultation with lead agency;
- Operate water treatment facilities without observing necessary health and safety measures as stipulated in the Public Health Act and Occupational, Health and Safety Act;
- Convey water in a manner likely to change the water quality;
- Transmit or distribute water in materials not approved by the Authority in consultation with Kenya Bureau of Standards, and as prescribed in the design manual for water supplies in Kenya;
- Work in the water treatment works without the necessary training approved by the Authority in consultation with the lead agency;
- Tamper with treated water conveyance pipes or systems without the consent of the water service provider.

3.14.2 **Water Quality Monitoring**
For the protection of drinking water sources, the Ministry responsible for the water affairs, in consultation with the Authority, shall maintain regular water quality monitoring twice a year, once during low flow, and once during high flow period, as stipulated in the Water Act, 2002, Part III Section 18, schedule 17. Table (b) below shows the parameters and results to be looked at when monitoring the water quality for drinking water sources.

**Table 3.1: Water Quality Monitoring for Drinking Water Sources**
### Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standard Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6.7-8.5</td>
</tr>
<tr>
<td>Suspended solids</td>
<td>30 (mg/L)</td>
</tr>
<tr>
<td>Nitrate – NO₃</td>
<td>10 (mg/L)</td>
</tr>
<tr>
<td>Ammonia – N</td>
<td>0.5 (mg/L)</td>
</tr>
<tr>
<td>Nitrate – NO₂</td>
<td>3 (mg/L)</td>
</tr>
<tr>
<td>Total Dissolved Solids</td>
<td>1200 (mg/L)</td>
</tr>
<tr>
<td>E-Coli</td>
<td>50/100ml</td>
</tr>
<tr>
<td>Fluoride</td>
<td>1.5 (mg/L)</td>
</tr>
<tr>
<td>Phenols</td>
<td>Nil (mg/L)</td>
</tr>
<tr>
<td>Arsenic</td>
<td>0.01 (mg/L)</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0.01 (mg/L)</td>
</tr>
<tr>
<td>Lead</td>
<td>0.05 (mg/L)</td>
</tr>
<tr>
<td>Selenium</td>
<td>0.01 (mg/L)</td>
</tr>
<tr>
<td>Copper</td>
<td>0.05 (mg/L)</td>
</tr>
<tr>
<td>Zinc</td>
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</tr>
<tr>
<td>Alkyl benzyl sulphonates</td>
<td>0.5 (mg/L)</td>
</tr>
<tr>
<td>Permanganate Value</td>
<td>1.0 (mg/L)</td>
</tr>
</tbody>
</table>

### 3.15 World Bank’s Safeguard Policies

The objective of the World Bank's environmental and social safeguard policies is to prevent and mitigate undue harm to people and their environment in the development process. These policies provide guidelines for bank and borrower staffs in the identification, preparation, and implementation of programs and projects. Safeguard policies have often provided a platform for the participation of stakeholders in project design, and have been an important instrument for building ownership among local populations. (World Bank, 1999-2006)

#### 3.15.1 World Bank Safeguard Policy 4.01-Environmental Assessment

The environmental assessment process provides insights to ascertain the applicability of other WB safeguard policies to specific projects. This is especially the case for the policies on natural habitats, pest management, and physical cultural resources that are typically considered within the EA process. The policy describes an environmental assessment (EA) process for the proposed project. The breadth, depth, and type of analysis of the EA process depend on the nature, scale, and potential environmental impact of the proposed project. The policy favours preventive measures over mitigatory or compensatory measures, whenever feasible. The operational principles of the policy require the environmental assessment process to undertake the following

a. Evaluate adequacy of existing legal and institution framework including applicable international environmental agreements. This policy aims to ensure that projects contravening the agreements are not financed.

b. Stakeholder consultation before and during project implementation
c. Engage service of independent experts to undertake the environmental assessment

d. Provide measures to link the environmental process and findings with studies of economics, financial, institutional, social and technical analysis of the proposed project.

e. Develop programmes for strengthening of institutional capacity in environmental management.

The requirements of the policy are similar to those of EMCA which aims to ensure sustainable project implementation. Most of the requirements of this safeguard policy have been responded to in this report by evaluating the impact of the project, its alternatives, existing legislative framework and public consultation.

3.15.2 Bank Safeguard Policy 4.12-Involuntary Resettlement

The policy mitigates against impoverishment risks associated with Involuntary Resettlement and the restoration or improvement of income-earning capacity of the Project Affected People (PAP). The policy requires full public participation in resettlement planning and implementation and describes the conditions that borrowers are obliged to meet in operations involving involuntary resettlement.

The proposed project do NOT require resettlement and relocation in the project area of community members.
4.0 PROJECT DESIGN, WORKS AND ACTIVITIES

4.1 Groundwater Survey
In compliance with the provisions of the Water Act 2002, a hydro-geologist conducted a ground water survey. The survey indicated that there is sufficient underground water to meet the desired water requirements by the proponent. The report was submitted to Water Resources Management Authority seeking an authority to drill the proposed borehole. A copy of the report has been submitted to NEMA along with the EIA report.

4.2 Drilling
The borehole will be circular in shape. The maximum recommended depths by the hydro geologist are 150 metres. It is important that the proposed diameter be not more than 230 mm since there is no great advantage derived by increasing the diameter.

From the Dupuit equation for steady flow and holding all other factors remaining constant, increasing the well diameter enhances the yield only marginally i.e. about 10%. The diameter should therefore be in the range of 203 – 230 mm. The logging data must be collected successively throughout the drilling process for analysis.

4.3 Water Well Design
For the purposes of monitoring of groundwater abstraction and the static water level measurements, a water meter and an airline respectively must be installed. An airline consists of an open tube or several pipes. These pipes are connected together and are normally attached to the pump’s drop pipes.

A water meter and the airline are required for the purpose of determining the relationship between the rate of groundwater abstraction and the static or dynamic water level in the borehole at any given time.

4.4 Casing
The two main purposes of a well casing are to support the borehole and to help protect the aquifer from contamination. The casing serves as a housing for the pumping equipment and as vertical conduit for water flowing upward from the aquifer to the pump intake.

The proposed project should have two casings of say 30.5 and 20-cm used in the well. The 30.5 and 20-cm casings will be cut off with the latter casing slightly below the outer casing. The 30.5 –cm pipe will serve as the protective casing, and will have a locking cap installed. The well will be flush-mounted at the ground surface, with a relief above existing grades and will have a minimum of 60cm stick-up in order to readily find it as well as prevent temporary flooding from making it inaccessible.
An open borehole provides an avenue where vertical migration of contaminants may occur from contaminated fracture zones to clean fractures. To prevent this potential migration and cross-contamination, and still maintain the preliminary borehole a plug will be installed in the borehole.

Selection of casing material is based on water quality, well depth, cost, borehole diameter, and the drilling procedure. Steel is used most commonly, but thermoplastic materials can be used especially in areas where groundwater is highly corrosive and the depth of the well is less than 300 metres.

Corrosion resistance, lightweight, relatively low cost, easy installation, and resistance to acid treatment make plastic (PVC) casings desirable for many installations where high strength is not required. Plastic must be centered in the borehole before backfilling or filter packing is completed. Any voids in the backfill or filter pack material may lead to sudden collapse of formation materials against the casing, causing it to break.

Caution is required in selecting materials for any well deeper than 90 meters, especially for large diameter wells. Plastic casings exhibit one or other characteristics that may present a hazard to drinking water quality in areas where groundwater contamination has occurred. If volatile organic chemicals exist in groundwater near a borehole, but above the intake section of the well, some of these chemicals still might move into the discharge by passing through the wall of the casing. It appears that plastic casing can be permeable in the presence of certain chemicals.

4.5 Grouting
Grouting is the act of injecting certain substances into the void of earth materials to reduce or eliminate their permeability, consolidate them, or increase their strength. Though it is not always a part of a well, gravel packing is often used in addition to the well screen. Grouting or cementing well casing involves filling the annular space between the casing and the drilled hole with suitable slurry of cement or clay. The length of the borehole section to be grouted depends on the water well codes, aquifer structure and water quality.

4.6 Plumpness and Alignment
Water well should be both straight and plumb, although in practice any borehole of substantial depth may not be perfectly straight or perfectly plumb. A well bore may be straight but not plumb. A deviation from plumpness of two-thirds the well’s inside diameter per 30 meters is reasonable, considering the difficulties of drilling in earth materials. Straightness of the well bore is important, because it determines whether or not the casings
and a properly sized pump can be installed in the well to the desired depth.

4.7 Screens
The choice of material used to fabricate screens depends on the water quality, potential presence of iron bacteria and strength requirements. Water quality analysis show whether groundwater is corrosive or incrusting or both. It is therefore important to use a well screen fabricated from corrosion-resistant material. Incrusting water deposits minerals on the screen surface and in the pores of the formation just outside the screen. These deposits plug both the screen openings and the formation.

Iron bacteria causes plugging of pores in water-bearing formations and openings in well screens but has no effect on our health. Iron produces accumulations of slimy material of gel-like consistency, and oxidize and precipitating minerals can plug a well almost completely within a short time.

The design of water well supplying potable water should include those features that continuous sanitary protection. Contaminated water from the surface drainage or low-quality water encountered in the well can move downward through the annulars between the casing and borehole wall. Thus, the annulus around the casing must be sealed off with a cement or bentonite grout.

4.8 Borehole development
All drilling methods cause some plugging of fractures or crevices in rocks. Borehole development is designed to maximize the well yield by repairing damage done to the formation by the drilling so that natural hydraulic properties are restored. Development also alters the basic characteristics of the aquifer near the borehole so that water will flow more freely to a well. These objectives are accomplished by applying some form of energy to the screen and formation.

Well development is confined to a zone immediately adjacent to the well, where the formation materials have been distributed by the well construction procedures or adversely affected by the drilling fluid. The undisturbed part of the aquifers just outside the damaged zone may be reworked physically during development to improve its natural hydraulic properties.

All new wells should be developed so as to achieve sand-free water at the highest possible specific capacity.

Development procedures have the following beneficial purposes:
a) Reduce the compaction and intermixing of grain sizes produced during drilling by removing fine materials from the pore space.

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

c) 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.

4.8.1 Development Methods
Borehole development methods include over pumping, backwashing, mechanical surging, air development, high-velocity air or water jetting, and a combination of high-velocity water jetting and simultaneous pumping.

4.8.2 Over pumping
This is the simplest method of removing fines from water-bearing formations. Over pumping itself seldom produces an efficient well or full stabilization of the aquifer, particularly in unconsolidated formations because most of the development action takes place in the most permeable zones closest to the top of the screen. In this method, 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.

4.8.3 Mechanical Surging
Water is forced 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, especially when the aquifer contains many clay streaks or mica, because the action of the block can cause clay or mica to plug the formation.

4.8.3.1 Other Methods
The best development results are obtained by a combination of over pumping, followed successively by mechanical surging and simultaneous water jetting/air—lift pumping. Over pumping is the least effective of the three methods. 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.

Blasting and bailing techniques are used in an attempt to reduce sand pumping and enhance yields from wells after other development methods have been applied. If a rock is massive, with few joints or faults, the volume of water available is often inadequate. Aquifer simulation is done when the aquifer does not yield enough water after development.
procedures have been applied. It can also increase the yields far beyond those obtained through typical well development.

Explosives are sometimes used in an attempt to develop greater specific capacity. Good results can be obtained if blasting procedures are appropriate for the rock type and the size and depth of the well.

4.8.3.1.2 Pumping test data
Pumping tests are conducted to determine the performance characteristics of a well, the hydraulic parameters of the aquifer and the specific yield of a particular aquifer or several aquifers during the course of drilling.

4.8.3.1.3 Multiple wells.
There are two types of aquifer tests: constant-rate test and step-draw down test. In the constant-rate test, the well is pumped for a significant length of time at one rate. In the step draw down test, the well is pumped at successively greater discharges for relatively short periods.

The results from properly conducted tests are the most important tool in groundwater investigations. Measurements of water levels after the pump is stopped (recovery) are extremely valuable in verifying the aquifer coefficients calculated during the pumping phase of the test.

- The pumping test should be conducted for a continuous period of 24 to 72 hours, depending on the type of aquifer. The accuracy of a draw down data taken during a pumping test depends on the following: - Maintaining a constant yield during the test. Measuring the draw down carefully in the pumping well and in one or two properly placed observation wells.
- Taking draw down readings at appropriate time intervals.
- Determining changes in barometric pressures; stream levels affect the draw down data.
- Comparing recovery data with draw down data taken during the pumping portion of the test.
- Continuing the test for 24 hours 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.
4.9 Material Input

The materials to be used fall into two categories: temporary and permanent.

Temporary Materials - materials will include the materials, which will be used to facilitate the drilling work.

4.9.1 Temporary materials

4.9.1.1 Water
Drilling water should not come from wetlands or seasonal swamps in the environs of the proposed borehole site. This is because these water supplies is likely to harbor pathogenic and iron bacteria and their subsequent growth in the borehole can cause severe problems both on human health and installed equipment in the hole. Water for drilling activities should be clean and of good quality.

4.9.1.2 Drilling foam
Foam drilling is associated with the introduction, into air, of a surfactant mixed with water. An ionic soap mainly comprising sodium alkyl ether will be used. 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. The advantages of the foam are:

- Higher solids carrying capacity
- Ability to lift large volumes of water
- Reduced air volume requirements
- Reduced erosion of poorly consolidated formations
- Effective dust suppression
- Increased borehole stability

The foams used are slightly viscous amber colored fluid with a Biological oxygen demand/Chemical oxygen demand (BOD/COD) ration greater than 0.1 which is readily biodegradable. 1m3 of the injection fluid is required per 1m3 of ground removed.

Lubricants and Diesel will be used to run the engines of the drilling machine, mud pump and generator just within the period of implementing the project.

4.9.2 Permanent Materials

Permanent materials include the items, which will be installed after completing the drilling of the hole. These include:

4.9.2.1 Casings and Screens
These will be mild steel pipes. They will be installed in the drilled hole. They are not corrosive hence least likely to affect the water quality.
4.9.2.2 Gravel Pack
The grain size should be in the range of 2 to 5 mm, rounded to well granules, which should be 95% siliceous. The material is locally available where sand deposition has taken place such as at banks of rivers. The gravel pack shall be installed in the annular space (1”round space between the borehole wall and the casings) of the borehole. The activity is conducted to ensure the infiltration of sediment and silt free groundwater to the borehole. Any fines in the gravel should be removed by washing or sieving.

4.9.2.3 Bentonite
The material is mixed with water and will be used in the construction of the borehole in sealing some sections of the annular space for sanitary purposes.

4.9.2.4 Cement
Cement grout in the annular space and slab on the surface will be used as for sanitary purposes.

4.9.2.5 One meter (1m) steel casing
This is used for the borehole cap to avoid entry of surface water into the borehole. It will then be fitted with a cap at its top to prevent anybody from throwing foreign material into the hole.

4.9.2.6 Pipes
These will be class ‘C’ steel rising main to be connected to the submersible pump and class C steel pipes to connect water supply to the storage tank.

4.9.2.7 Inert material
The drilled material will be reused by filling a section of the annual space during the borehole construction.

4.9.2.8 Dipper line
It is legal requirement under the Water Act, 2002 that every borehole sunk should be fitted with a dipper line (I.e. a 25 mm diameter u PVC air line attached to the rising main) in order to monitor the water level using a water deeper around seasons and whenever such need arises. This is a long term exercise and is vital because the owner or any stakeholder can assess the performance of a borehole by observing the pumped water level and static water level after the safe recommended yield is pumped for the recommended length of time.

4.10 Proposed project products
The main products from the proposed project will include: the a well constructed borehole
fitted with a hand pump, a master meter and increased water drawing activities within the proposed project site. Possible mitigation measures and enhancements to the adverse and beneficial impacts respectively associated with the project establishment and operation are as discussed in chapter five.
5.0 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The environmental baseline information collected and the project description discussed form the basis for impact identification and evaluation. The impacts that are expected to arise from the project could either be termed as positive or negative, direct or indirect, short-term or long-term, temporary or permanent depending on their nature, area of coverage and their duration in the environment and have been identified in all the phases of the proposed project cycle namely; construction, operational and decommissioning.

5.1 Soil compaction

5.2.1 Assessment

As machines and people move on ground the soil is compacted. Compaction has the undesired effect of hindering air and water penetration beneath the soil surface and thus limiting aerobic activities of soil dwelling organisms. This may have negative consequences on soil productivity on a localized scale. Compaction also enhances run-off during the rainy season resulting into soil erosion.

5.2.2 Mitigation

a) Strictly control construction vehicles to ensure that they operate judiciously and over designated areas to reduce soil compaction.

b) Rip off any compacted areas after construction to allow aeration of soil and ease infiltration of water into the soil.

5.2 Groundwater pollution

5.2.1 Assessment

Water, especially for domestic use should be of high quality and wholesome. Poor water quality could be of great concern to human and animal health. The water that seeps into the ground may be contaminated to some degree and eventually affects the quality of the groundwater and indeed, borehole water. Percolation of water from sanitary systems i.e. toilets and refuse disposal sites poses a serious threat to the preservation of groundwater quality.

Protection of groundwater quality depends on the well design and the methods and materials used to construct the well. Some of the deficiencies in well construction are:

a) Insufficient or substandard well casing

b) Inadequate seal between the well casing and the borehole

c) Poor welding of casing joints
d) Lack of sanitary protection at wellhead.

e) Use of well pits.

Causes of Pollution of Groundwater

Groundwater can be polluted by poisonous or pathogenic substances or by other detrimental changes in its quality especially through:

a) Poisonous substances such as compounds of lead, cadmium, chromium cyanide, fluoride or mercury.

b) Chemicals for plant protection, herbicides, pesticides and plant growth regulators.

c) Sewerage, refuse or garbage

d) Detergents, fats, petroleum products

e) Colouring agents such as dyes, paints and aromatic substances

f) Metabolic and decomposition products of micro organisms and fertilizers Acids, alcalis and salts.

Sources of Danger

A borehole should certainly be located as far away as possible from all the sources of dangers such as:

a) Plants and installations, especially those that release radioactive substances or those that can impair the quality of water, sewerage waste, gaseous and particulate emissions etc.

b) Manufacture, transportation, usage, storage and deposition of substances, which can impair the quality of water.

c) Transportation, utilization, storage and deposition of garbage, refuse or scrap metals.

d) Hospitals, sanatoriums, hotels and cemeteries

e) Sewage seepage into the ground through septic tanks, injection of sewerage or other dissolved and undissolved substances into the ground surface water.

f) Pipelines for substances which can impair the quality of water

g) Polluted water bodies

h) Parking and washing of motor vehicles

i) Washing and leachates from the soil, organic fertilizers (liquid manure, barnyard manure, sludge, garbage compost) and mineral fertilizers.

j) Use of chemical substances of plant protection, herbicides, pesticides and growth regulators.
5.2.2 Mitigation measures

a) Groundwater quality must be safeguarded by a correct territorial planning and protection of surface waters since these are strictly linked to ground water resources.

b) 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.

c) The proponent will 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. This helps to reduce wastage and misuse of this resource.

d) Use water based drilling fluid

e) Case the well as it passes through the water table

f) 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.

5.3 Groundwater depletion

5.3.1 Assessment

This may result from excessive abstraction of the water from the borehole i.e. beyond the permitted limit.

5.3.2 Mitigation measures

On completion of the drilling and other related works;

a) 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.

b) 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.

c) Install auto-shut water taps to reduce water wastage.

5.4 Noise and vibrations

5.4.1 Assessment

Noise is unavoidable during the construction period. The drilling works will most likely be a noisy operation due to the machines (driller), incoming vehicles to deliver drilling and
construction materials and communication among workers. The noise generated during any construction is at best described as part of a normal occupational hazard that workers in the construction industry face. Noise levels in construction works are usually below the threshold limit (90 dBA) that workers can be exposed in an 8 hours working day and is consequently not of any major concern. Operations and people in the neighbourhood are likely to be affected since noise beyond 85 dBA (can be transmitted up to 30 metres away) is itself a nuisance. The significance of noise impacts depends on whether the project would increase noise levels above the existing ambient levels by introducing new sources of noise. Noise and vibration impacts would be considered significant if the project would result in: a substantial permanent increase in ambient noise levels of more than 90 dBA (can be transmitted to over 30 metres away) in the project vicinity; exposure of persons to or generation of excessive ground-borne vibration or noise levels and a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project. The effects of noise include:

a) Noise interferes with communication and can lead to tinnitus (ringing in the ears);

b) Nuisance;

c) Fatigue and tiredness, reduced efficiency, low morale and severe and permanent loss of hearing which may persist for several hours due to prolonged exposure to noise;

d) Deterioration of the environment within the project site and the surrounding areas through vibrations produced by heavy construction machinery;

e) Weakening of adjacent buildings resulting into cracking of their walls by vibrations.

5.4.2 Mitigation

a) 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”.

b) Minimize noise at the site and in the surrounding areas through:

i. Properly servicing and maintaining and tuning drilling machinery such as generators and other heavy duty equipment to reduce noise generation; and

ii. Placing noisy equipment in sound proof rooms or in enclosures to minimize ambient noise levels.
c) Minimize the impacts of temporary drilling noise and vibration by:
   i. Planning the drilling work to take place only during the day when the
      neighbours are also at work.
   ii. Maintaining reasonable working hours so as to reduce the number of
       complaints concerning noise from the workers and neighbours.
   iii. Operating shorter shift periods for workers who come in direct contact with
        high concentrations of noise or other hazards.
   iv. Posting notices at the construction site informing the public of the construction
       activities, time and day.
   v. Providing ear protective devices to prevent high frequency noise emitted by
      the high frequency machines during construction phase.

5.5 Hazardous wastes
5.5.1 Assessment

Accidental oil and diesel spills would be caused by leaking of drums holding the diesel and
oil that are stored on the site. The machines being used at the site could also cause oil spill
especially if they are not well maintained or during regular maintenance. However, the
occurrence of these wastes is expected to be minimal. Seepage of hydrocarbon products such
as oils, grease and fuel if not carefully handled will result into contamination of water thus
rendering it not go for both domestic and animal use. During the dry season spilled fuel, oils
and lubricants could result into fire risks.

5.5.2 Mitigation

The following mitigation measures should be adopted to limit the impact of hazardous
substances on-site;

i. Ensure that the drilling crew is aware of the procedures to be followed for dealing
   with spills and leaks;
ii. Ensure that spills are immediately removed along with all contaminated material and
    disposed of at an approved hazardous landfill site;
iii. Ensure that all contaminated material is stored in a banded area before being disposed
    of;
iv. Ensure that a suitable spill kit is available on site, to be applied to all contaminated
    areas that will absorb / breakdown the spills. The quantity of such materials shall be
    able to handle the total volume of the hydrocarbon stored on site; and
v. Ensure that all diesel and oil drums are stored in a banded area with the respective
tags like “Danger” or its pictorial representation.
vi. Caution to be observed when transporting diesel and oil to, from and within the site. It is recommended that if possible, this be done using qualified oil transporters

vii. Repairing and maintenance and greasing of vehicles and construction plants must be carried out off the site (petrol station or garage) to avoid fuels and lubricants spills at the project site and contamination of the water

5.6 Air Quality

5.6.1 Assessment

The drilling process is expected to cause a lot of dust emissions due to vehicles and trucks driving to and from the site along the rough road leading to the site. Limited dust would be generated by the actual drilling activities. Stock piles arising from the drilled area could also cause dust emissions if blown away by wind. Smoke will be generated from the vehicles and the drilling equipment. The magnitude will however depend on the condition of the machines and the vehicles during the drilling period.

5.6.2 Mitigation

The following mitigation measures can be adopted to reduce degradation of the air quality by the drilling activities.

i. Provide dust masks to people visiting the site and have extra ones for site visitors

ii. Stockpiles of the earth should be watered if dry to minimize dust from blowing

iii. All fuel powered equipment including the generator will be serviced and maintained in optimal working conditions to mitigate against exhaust emissions.

iv. Workers and any other people at the site should wear face masks at all times to avoid carbon monoxide poisoning

5.7 Geological risks

5.7.1 Assessment

The ubiquitous drilling and digging of the ground soil for water, weakens the soil surface with an enhanced porosity as its ultimate result. With such vulnerability and lesser soil cohesion, the ephemeral soil might trigger erosion in the underground. Due to this, boreholes have may cause negative environmental effects on ground water with high tendency of land subsidence (collapse) which may affect structures and infrastructure. Boreholes could lead to potential landmines, earthquakes or tremor.
5.7.2 Mitigation

The following mitigation options should be adopted:

i. The proponent will be advised to carry out a hydrogeologist survey to determine the suitability of the area for the drilling of a borehole

ii. 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

iii. Drilling be done in the presence and supervision of a hydro-geologist

5.8 Solid Wastes

5.8.1 Assessment

The major solid waste will be the drilled cuttings. There will be some solid containers such as cement, bentonite and gravel bags and other packets with materials and equipment to be used during implementation of the project. Other solid waste will be generated from the composite housing of the drilling crew. At the time of assessment the church had not secured a solid waste collection point.

5.8.2 Mitigation

The following mitigation options can be adopted:

i. Any remaining waste (paper or polythene containers, cement, bentonine and gravel bags, excavation debris, remaining gravel pack e.t.c. should be burned and/or disposed in sanitary dumpsite before the project is commissioned.

ii. 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.

iii. Drilling crew to be encouraged to dump their personal wastes in designated covered dustbins

iv. Do not secure a solid waste disposal site within a radius of 50M of the proposed borehole site.

5.9 Transition phase from construction to operation

During the transition phase from the completion of the development to the start of operations, the following will be done:

i. Remove any wastes from the site;
ii. Rehabilitate any areas adversely affected by the construction through spillages of pollutants: liquids, chemicals, cement and paint among others at the site and any other areas disturbed as a result of the construction outside the site.

iii. Plant grasses and ornamental trees at the site.

iv. Put up fencing around the site for protection from intruders and unauthorized persons and ensure privacy.

5.10 Social Economic Aspects

Implementation of the proposed borehole project will ease the water problems in the target community. This is because the consumers will have enough water that will be used for domestic use after the implementation of the project, there will be no vacation of people, any rerouting of any infrastructure such as road, underground power, telephone or water supply lines or relocation or closing down of social of social amenities. No social conflicts are expected to arise as a result of the implementation of the project. All activities related to the project will be carried out within a land agreed upon between the proponent and the community members. The project will thus improve social-economic aspects of the potential consumers.

5.11 Decommissioning Phase

This involves demolition of the borehole and its abandonment after a certain period. There are varied reasons for the abandonment of a borehole; these include inadequate water or drying up of the aquifer due to activities uphill, poor water quality, defective construction and legal implications.

During the abandonment period, a lot of caution needs to be observed so that the materials can be reused on another project and to avoid contamination of the remaining water in the aquifer. Effective abandonment of a borehole depends on knowledge of the construction carried out at the source, geology and hydrogeology of the area. The importance of a full characterization increases as the complexity of the borehole yield, site geology and the risk of aquifer contamination.

Proper records should be maintained during project implementation and later filed with the Water Resources Management Authority (WRMA) as required. Water level and any obstruction around the vicinity of the project need to be identified. Obstructions such as pumps, pipes, wiring must be pulled out and be used in alternative project. Scrap metal such as Iron sheets can be sold to metal scrap for safe disposal.
5.12 Public participation

Public consultation is crucial in any development agenda. EMCA, 1999 treats the environment as one entity as opposed to the previous situation where each segment of the environment had its own laws. This section has been based upon the principle that local communities have a right to participate in making decisions on matters that have significant effect on the environment. The information obtained from both field visits and public consultations formed the basis for incorporation of public views into this report. In this public participation, questionnaires were administered randomly to the immediate neighbours of the facility. To avoid bias, the respondents were picked at random. 10 No. of people were consulted about the proposed borehole project. The issues that were raised during the public participation were captured on the questionnaires annexed on this document. The table below summarizes the issues that arose during the public consultation process.

<table>
<thead>
<tr>
<th>Name of Respondent</th>
<th>Phone No.</th>
<th>Area of concern</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patrick Masinde</td>
<td>07261358756</td>
<td>• Clean water</td>
<td>• Establish a management committee</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reduced distance</td>
<td></td>
</tr>
<tr>
<td>Sella Wafukho</td>
<td>0728379698</td>
<td>• Water for the school and community</td>
<td>• Involve the community</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Noise during drilling</td>
<td></td>
</tr>
<tr>
<td>Mark Kwoma</td>
<td>0725334805</td>
<td>• Provision of clean water</td>
<td>• Reduce noise generation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Noise during drilling</td>
<td></td>
</tr>
<tr>
<td>Julias Wekesa</td>
<td>0702945730</td>
<td>• Clean water supply for the community and the school</td>
<td>• Minimize noise generating activities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Noise</td>
<td></td>
</tr>
<tr>
<td>Queen Brown</td>
<td>0706788230</td>
<td>• Clean water for the community and school</td>
<td>• Minimize noise generating activities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Noise</td>
<td></td>
</tr>
<tr>
<td>Erick Wamami</td>
<td>0725697506</td>
<td>• Clean water supply</td>
<td>• The project to continue</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Noise</td>
<td></td>
</tr>
<tr>
<td>Cocepta Lutomia</td>
<td>0729890049</td>
<td>• Clean water supply</td>
<td>• The project to continue</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Noise during drilling</td>
<td></td>
</tr>
<tr>
<td>Samuel Wamukoya</td>
<td>0727781330</td>
<td>• Clean and accessible water to the community</td>
<td>• Minimize noise generating activities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Noise during drilling</td>
<td></td>
</tr>
</tbody>
</table>

5.13 Record keeping and documentation and environmental policy

In accordance with the EMCA (1999), records of environmental issues, relevant licenses and permits need to be kept and availed to NEMA officers when necessary to prove compliance. These include: water abstraction permits; accident registers and a list of all hazardous materials on site. In addition, inspection records, environmental records, discharge-
monitoring reports, relevant project licenses, amongst others are to be documented and kept safely. For efficient management of the borehole and to facilitate further assessments in compliance with the law, it is recommended that the following records be kept always in addition to those mentioned above:

Records in environmental issues and periodic review notes;
Records of violations and notification of authorities’ correspondence in relation to the environment; and Situational reports made to NEMA in accordance with Section 68(3) of the EMCA, 1999.
6.0 ANALYSES OF PROPOSED PROJECT ALTERNATIVES

6.1 Introduction

This section examines feasible alternatives to the proposed borehole project. The benefits of the proposed project have been considered against any potential environmental cost. The general principle involved in identifying alternative option(s) to a proposed development was to ensure that the option chosen would result in optimal social, environmental and capital benefits not only for the developer, but also for the environment in the area. This section is a requirement by NEMA and is critical in consideration of the ideal development with minimal environmental disturbance. This section has explored three alternatives namely; No-action alternative, Relocation alternative and the proposed development as described in this EIA report.

6.2 “No-action” alternative

6.2.1 Assessment

The selection of the “No-action” alternative would mean the discontinuation of the proposed project. Thus, the site is retained in its existing form. If this alternative is selected, the site is unlikely to undergo any changes from its present condition. This option may be based on the principles that the proposed:

a. Site is environmentally sensitive such as having one or more threatened, rare, endangered, endemic or key stone plant or animal species or any other flora or fauna that is considered for preservation under an Act of Parliament;

b. Site is found in an archaeological or historical site or is found to have a historically or archaeologically, or culturally important material; and/or

c. Project will have severe implications on the environment if implemented.

6.2.2 Findings

a) The proposed development will not be an impediment to any other development in the area since there are other similar projects within the proposed project area

b) The products of the proposed project will not have serious implications on the environment; instead it will improve health and sanitation among the potential beneficiaries.

c) There are no physical, biological, cultural and socio-economic features of concern at/or near the proposed site.
6.2.3 Implications

a) The owner would be at a loss in terms of financial commitments already made in designing and planning for the project, professional fees to the project managers, geologists, quantity surveyors, EIA lead experts, public health officers and physical planners and application for EIA approval and licensing from NEMA at 0.1% of total project cost.

b) The local and central government will not gain from the tax income that the project would generate if implemented.

c) There would be loss of income opportunities that the project is envisioned to create.

d) It would discourage the proponent and any other local and international investors from investing in such a project in the area resulting in a zero development.

6.3 Relocation Alternative

6.3.1 Assessment

This option would mean transfer of the proposed development to another site. If this option is selected the proponent is required to look for an alternative site either within or outside the zone. This option may be based on the principles that the proposed development:

a) Is a hindrance to an existing development;

b) Is not compatible with other developments in the area; and

c) As in the „no-development option the project site is ecologically sensitive area.

6.3.2 Findings

a. The proposed development will not be an impediment to any other development in the area since there are other similar projects within the proposed project area.

b. The products of the proposed project will not have serious implications on the environment.

c. There are no physical, biological, cultural and socio-economic features of concern at/or near the proposed site.

6.4 The Proposed Development as Described in the EIA Report

The impacts and mitigation measures for this alternative are discussed in detail throughout this report. The positive impacts have also been identified. The Merits of this alternative are as follows:
• Access to water supply for domestic use will be improved
• Completion of the project will have social and economic benefits to the community.
• The potential for expanded income that is currently limited by inadequate water supply will be realized.

Most potential negative impacts would be easily mitigated by the measures proposed in the EMP of this report.
7.0 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

This section provides a concise structure of actions with specific priority level of action for the management of the environment across different phases of the proposed borehole project. Environmental management will best be achieved by implementation of an Environmental Management and Monitoring Plan (EMP). The plan identifies potential environmental impacts and proposes mitigation across all phases of the proposed project cycle. It also assigns responsibility for implementation of the mitigation measures. Mitigation cost estimates have been proposed and may change in time and space. As project commencement and scheduling plans are developed and changed, components of the EMP might require amending. The EMP is generally prepared to ensure that the components of proposed project are operated in accordance with the design. The EMP presented below has been proposed for this project.
### Table 7.1 Environmental Management Plan for the proposed borehole project

<table>
<thead>
<tr>
<th>Area of Concern</th>
<th>Anticipated Impacts</th>
<th>Standards/ Guidelines</th>
<th>Mitigation Measures</th>
<th>Monitoring Indicators</th>
<th>Responsible Person</th>
<th>Duration</th>
<th>Cost (Kshs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Quality</td>
<td>Dust emissions</td>
<td>EMCA, 1999</td>
<td>Reduce speed for vehicles visiting the site</td>
<td>Presence of dust on plants around the site and access roads</td>
<td>Contractor</td>
<td>Construction phase</td>
<td>20,000</td>
</tr>
<tr>
<td></td>
<td>Smoke emissions</td>
<td>Public Health Act</td>
<td>Provide dust masks to people at the site</td>
<td>Public complains</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Obnoxious gases: SOx, NOx, CH4, CO2</td>
<td>OSHA, 2007</td>
<td>Continuously water the site during the drilling process</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Use well maintained machinery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Use well serviced vehicles</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sensitize neighbours to shut their windows throughout the drilling period</td>
<td></td>
<td>Contractor</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Presence of dust on plants around the site and access roads</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Public complains</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil Erosion</td>
<td>Siltation of water sources</td>
<td>EMCA, 1999</td>
<td>Remove soil overburdens after drilling</td>
<td>Stockpiled soil overburdens</td>
<td>Contractor</td>
<td>Construction phase of drilling</td>
<td>5,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Limit earthworks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ensure excavated material do no end up in - water sources</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise &amp; Vibration Management</td>
<td>Interferes with communication</td>
<td>EMCA, 1999</td>
<td>Avoid hooting especially when passing through noise sensitive areas such as religious areas, hospitals and schools;</td>
<td>Public complains</td>
<td>Contractor</td>
<td>During construction phase of drilling</td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td>Health effects such as tinnitus &amp; fatigue</td>
<td>OSHA, 2007</td>
<td>Properly service and maintain drilling machinery such as generators and other heavy duty equipment to reduce noise generation; and</td>
<td>Presence of PPE (particularly ear muffs)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Public nuisance</td>
<td></td>
<td>Provide ear muffs to all people being exposed to noise for a duration of more than 8 hrs;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Excessive vibration</td>
<td>EMCA, 1999</td>
<td>Maintaining reasonable working hours so as to reduce the number of complaints concerning noise from the workers and neighbours.</td>
<td></td>
<td>Contractor</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>OSHA, 2007</td>
<td>Operating shorter shift periods for workers who come in direct contact with high concentrations of noise or other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


### Area of Concern: Ecosystem disturbance
- **Anticipated Impacts:**
  - Extinction of indigenous species of vegetation
  - Changes in natural habitats

<table>
<thead>
<tr>
<th>Standards/Guidelines</th>
<th>Mitigation Measures</th>
<th>Monitoring Indicators</th>
<th>Responsible Person</th>
<th>Duration</th>
<th>Cost (Kshs)</th>
</tr>
</thead>
</table>
  - Re-establishing vegetation in whole or part of the disturbed areas through implementation of a well-designed landscaping programme. | Extinction of local vegetation | Contractor | Construction phase | 5,000 |
| LVNWSB | - Avoid encroachment into ecologically sensitive areas.  
  - Plant vegetation with water conservation/purification traits around the borehole. | Extinction of local vegetation | LVNWSB | Construction and operation phase | 10,000 |

### Area of Concern: Water Quality
- **Anticipated Impacts:**
  - Poor/fluctuating water quality
  - Health complications associated with contaminated water

<table>
<thead>
<tr>
<th>Standards/Guidelines</th>
<th>Mitigation Measures</th>
<th>Monitoring Indicators</th>
<th>Responsible Person</th>
<th>Duration</th>
<th>Cost (Kshs)</th>
</tr>
</thead>
</table>
  - 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 |
| LVNWSB | - Groundwater quality must be safeguarded by a correct territorial planning and protection of surface waters since these are strictly linked to ground water resources.  
  - Establish a database on water quality monitoring records  
  - Ensure regular disinfection of the water. | Water quality records  
  Availability of water disinfection agents | Community  
  LVNWSB | Construction and operation phases | 20,000 |
## Area of Concern | Anticipated Impacts | Standards/Guidelines | Mitigation Measures | Monitoring Indicators | Responsible Person | Duration | Cost (Kshs)
--- | --- | --- | --- | --- | --- | --- | ---
### Hazardous waste management
- Accidental oil spills
- Contamination of water
- Fire hazards

- EMCA, 1999
- 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 on site. Spillages of chemical will be cleaned up immediately

- Spillages of hazardous substances around the site
- Reports of contamination
- Bunded areas for storage of hazardous substance

- Contractor
- Construction phase of the project
- 10,000

### Ground water management
- Over-abstraction
- Conflicting water demands
- Contamination of water

- EMCA, 1999
- 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
- The maximum ground water abstraction permitted from the borehole is limited to

- Yield from the borehole
- A master meter at the borehole
- Water use conflicts

- LVNWSB
- Community
- Construction & operation phases
- 10,000

---

42
<table>
<thead>
<tr>
<th>Area of Concern</th>
<th>Anticipated Impacts</th>
<th>Standards/ Guidelines</th>
<th>Mitigation Measures</th>
<th>Monitoring Indicators</th>
<th>Responsible Person</th>
<th>Duration</th>
<th>Cost (Kshs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction waste pollution management</td>
<td>• Creation of habitats for pathogens and rodents&lt;br&gt;• Blockage of drainage canals from the spring</td>
<td>• EMCA, 1999&lt;br&gt;• Solid Waste Regulations, 2006&lt;br&gt;• EMCA, 1999&lt;br&gt;• Public Health Act</td>
<td>• Secure a centralized solid waste collection point away from the borehole site;&lt;br&gt;• Practice source separation of wastes into biodegradable and non-biodegradable&lt;br&gt;• Encourage re-use, recycling and waste reduction&lt;br&gt;• Any open air incineration of solid wastes must be done in an area far away from any combustible materials;&lt;br&gt;• Avoid accumulation of solid wastes to uncontrolled levels&lt;br&gt;• Ensure the collection and disposal of the wastes is done regularly and appropriately.</td>
<td>Solid waste collection point(s)&lt;br&gt;Public complains</td>
<td>Contractor</td>
<td>Construction phase of the project</td>
<td>10,000</td>
</tr>
<tr>
<td>Geologic risks</td>
<td>• Land subsidence&lt;br&gt;• Environmental degradation&lt;br&gt;• Loss of property and life</td>
<td>• EMCA, 1999&lt;br&gt;• Public Health Act</td>
<td>• 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&lt;br&gt;• Sinking of ground around the proposed borehole site&lt;br&gt;Hydrological survey</td>
<td>Sinking of ground around the proposed borehole site&lt;br&gt;Hydrological survey</td>
<td>Contractor</td>
<td>During construction phase of the borehole</td>
<td>10,000</td>
</tr>
</tbody>
</table>
### Area of Concern

<table>
<thead>
<tr>
<th><strong>Area of Concern</strong></th>
<th><strong>Anticipated Impacts</strong></th>
<th><strong>Standards/Guidelines</strong></th>
<th><strong>Mitigation Measures</strong></th>
<th><strong>Monitoring Indicators</strong></th>
<th><strong>Responsible Person</strong></th>
<th><strong>Duration</strong></th>
<th><strong>Cost (Kshs)</strong></th>
</tr>
</thead>
</table>
| Occupational Safety and Health              | • Occupational accidents • Exposure to occupational hazards | • OSHA, 2007             | 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 spring site  
• Carry out a hydrogeologic survey to determine the suitability of the area for 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 | Hydrological survey report | LVNWSB | Before drilling | 50,000 |
| 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 | • Proponent  
• Beneficiaries | Throughout the project phases | 10,000 |
Table 7.2: Environmental Management Plan During Decommissioning Phase

<table>
<thead>
<tr>
<th>Project Activities</th>
<th>Impacts</th>
<th>Mitigation Measures</th>
<th>Cost of Mitigation</th>
<th>Actors</th>
<th>Frequency/Expected Completion Time</th>
<th>Variable Monitoring Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifespan expired</td>
<td>Efficiency highly reduced</td>
<td>Rehabilitate the borehole. Relocate the borehole.</td>
<td>Cost of constructing a new one</td>
<td>LVNWSB</td>
<td>After 20-30 years</td>
<td>Presence of large material and frequent malfunctioning</td>
</tr>
<tr>
<td>Obsolete equipment</td>
<td>No longer in operation</td>
<td>1. Buy new equipment</td>
<td>Depends on the equipment</td>
<td>LVNWSB Community</td>
<td>Depending on the equipment</td>
<td>No longer in operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Disposal of the old will depend on the type of equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Recommendations
The hydro-geological conditions underlying the proposed site are favorable for drilling a borehole. The recommendation of this study that the proposed project be allowed to proceed on strict condition that the environmental management plan is implemented and follow-up is made to ensure compliance as may be directed by NEMA. Recommendations for the prevention and mitigation of adverse impacts are as follows:

1. The proposed borehole should have a minimum finished diameter of 8”. The borehole shall then be lined with appropriate 6” steel casings and screens following the design recommended by the supervising hydro-geologist.
2. The borehole should be properly gravel packed and sealed to avoid any contamination from shallow sub-surface water, taking particular note of the guidelines given in the accompanying addendum on borehole drilling, design and construction from the supervising hydro-geologist.
3. The borehole should be fitted with a master water meter to monitor groundwater abstraction, and an airline for monitoring of the water levels.
4. The drilling, construction and test pumping of the borehole should be supervised by a qualified hydro-geologist.
5. On completion of drilling works, a water sample should be referred to a competent laboratory for physical, chemical and bacteriological analysis before water is availed for use.
6. The supervising Hydro-geologist should ensure that the contractor collects all solid waste and construction debris from the site and disposes into the approved dumpsites.
7. Follow all recommendations made in the authorization letter from Water Resources Management Authority.
8. Diligence on the part of the contractor and proper supervision by the Supervising Hydro-geologist is crucial for mitigation impacts.
9. The use of an environmental checklist would also ensure that measures are implemented throughout the implementation and operation phases in order to prevent or avert any negative impacts.

8.2 Conclusion
The hydro-geological survey carried out revealed that the hydro-geological conditions within the proposed project site are favorable for the drilling of the borehole. The proposed borehole
will be drilled to a depth of 150 meters so as to penetrate fully into the water bearing series; to generate the authorized volume per day in order to meet the demand.

Expected positive impacts as a result of the implementation of this project include availability of reliable and safe water for domestic use, improved efficiency, and enhanced biological diversity and reduced dependency on other sources water. It is expected that the positive impacts emanating from such activities shall be maximized as much as possible. Groundwater from the proposed borehole is expected to be fresh.

The proponent of the proposed project shall be committed to putting in place several measures to mitigate the negative environmental, safety, health and social impacts associated with the life cycle of the project. It is recommended that in addition to this commitment, the proponent shall focus on implementing the measures outlined in the EMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects. It is expected that these measures will go a long way in ensuring the best possible environmental compliance and performance standards towards the goal of achieving sustainable development.

On the basis of the above and taking cognizance of the fact that ground water survey has been conducted and an application for Authorization to construct works for the use of water submitted to Water Resources Management Authority (Lake Victoria North Catchment Area), it is our recommendation that the project be allowed to go on provided the mitigation measures outlined in the report are adhered to, Environmental Management Plan (EMP) is implemented and the developer adhere to the conditions in the issued permit by Water Resources Management Authority.
REFERENCES

Kenya Gazette Supplement Acts, Land Planning Act (Cap. 303), Government Printer, Nairobi Republic of Kenya (2005);
Kenya Gazette Supplement Acts, Land Titles Act (Cap 282), Government Printer, Nairobi Republic of Kenya (2005);
Kenya Gazette Supplement Acts, Public Health Act (Cap. 242), Government Printer, Nairobi Republic of Kenya (2005);
Kenya Gazette Supplement Acts, Registration of Titles Act (Cap 281), Government Printer, Nairobi Republic of Kenya (2005);
APPENDICES

Copy of:

1. Land ownership document
2. Bills of Quantities
3. EIA public participation comment sheets
# TABANI PRIMARY SCHOOL/COMMUNITY WATER PROJECT

## COST ESTIMATE FOR A 150M DEEP BOREHOLE

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>QTY</th>
<th>RATE Kshs</th>
<th>AMOUNT Kshs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carry out hydrogeological/geophysical survey to determine the best point to drill the borehole</td>
<td>Lump sum</td>
<td>1</td>
<td>100,000.00</td>
<td>100,000.00</td>
</tr>
<tr>
<td>2</td>
<td>MOBILIZATION AND CONSTRUCTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Mobilization, set up and demobilization. Allow for personal, drilling unit pumping unit and all other necessary materials for carrying out and completing the works and for the removal from site.</td>
<td>Lump sum</td>
<td>0</td>
<td>300,000.00</td>
<td>300,000.00</td>
</tr>
<tr>
<td>3</td>
<td>BOREHOLE CONSTRUCTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Drilling of Borehole to depth of 150m, with sufficient diameter to provide for finished cased diameter of 200mm.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3.2</td>
<td>a) 0-100 m</td>
<td>m</td>
<td>100</td>
<td>3,500.00</td>
<td>350,000.00</td>
</tr>
<tr>
<td>3.3</td>
<td>b) Over 100m</td>
<td>m</td>
<td>50</td>
<td>4,000.00</td>
<td>200,000.00</td>
</tr>
<tr>
<td>3.4</td>
<td>Supply and install 200 mm plain steel casing, Class B</td>
<td>m</td>
<td>100</td>
<td>3,500.00</td>
<td>350,000.00</td>
</tr>
<tr>
<td>3.5</td>
<td>Supply and install 200 mm slotted steel casing class B</td>
<td>m</td>
<td>50</td>
<td>3,800.00</td>
<td>190,000.00</td>
</tr>
<tr>
<td>3.6</td>
<td>Supply and install gravel pack with average size 2mm</td>
<td>Ton</td>
<td>10</td>
<td>8,000.00</td>
<td>80,000.00</td>
</tr>
<tr>
<td>3.7</td>
<td>Well development using air or jetting as recommended by the Hydro geologist or by WHH Technical Officer/Engineer.</td>
<td>Hr</td>
<td>6</td>
<td>1,850.00</td>
<td>11,100.00</td>
</tr>
<tr>
<td>3.8</td>
<td>Test pumping</td>
<td>Hr</td>
<td>24</td>
<td>6,000.00</td>
<td>144,000.00</td>
</tr>
<tr>
<td>3.9</td>
<td>Recovery test</td>
<td>Hr</td>
<td>6</td>
<td>3,200.00</td>
<td>19,200.00</td>
</tr>
<tr>
<td>3.11</td>
<td>Supply and construct borehole gantry and overhead chamber, include sanitary seal, well cap, cement grouting pantry and drainage system.</td>
<td>Lump sum</td>
<td>1</td>
<td>75,000.00</td>
<td>75,000.00</td>
</tr>
<tr>
<td>3.11</td>
<td>Chemical analysis of water</td>
<td>Lump sum</td>
<td>1</td>
<td>10,000.00</td>
<td>10,000.00</td>
</tr>
<tr>
<td>4</td>
<td>PUMPING EQUIPMENT</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4.1</td>
<td>Supply and Instal a hand pump, together with all the accessories</td>
<td>Lump sum</td>
<td>1</td>
<td>100,000.00</td>
<td>100,000.00</td>
</tr>
<tr>
<td>4.2</td>
<td>Supply all materials and erect protective fence around the water facility.</td>
<td>m</td>
<td>50</td>
<td>350.00</td>
<td>17,500.00</td>
</tr>
<tr>
<td>5</td>
<td>LANDSCAPE AND CLEAN-UP</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>5.1</td>
<td>Landscape and clean-up the site to make good the environmental conditions to the satisfaction of the WHH Technical Officer/Engineer.</td>
<td>Lump sum</td>
<td>1</td>
<td>10,000.00</td>
<td>10,000.00</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
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<td><strong>1,956,800</strong></td>
</tr>
</tbody>
</table>
A Typical schematic design illustration of a completed borehole
Site Photos
To Whom It May Concern

REF: TABANI RC PRIMARY SCHOOL
- MDE CODE 035/528
- SCHOOL CODE 90-31-04-035
- IPRD CODE 0047-861-4812

This is a Public Primary School established 1958. It is owned and managed by the community. It is situated on Plot 76 in Rimiini Settlement Scheme on four acres of land. Our major challenge is the lack of clean water. Thus, we strive to drill a bore hole for the school and community. It is very much needed.

Thank you and God bless you abundantly

Samuel Wamukoto
HEADTEACHER
THE CEO
LAKE VICTORIA NORTH S.B.
P.O. Box 673
KAKAMEGA

Dear Sir/Madam,

REF: LETTER OF NO OBJECTION

This is to notify you that the school has no objection for a community borehole to be drilled in their school. The borehole will be a very big saver since they are always using contaminated water from a seasonal stream around.

Please this gesture is warmly welcome.

Thank you and God bless.

Sammy Samuel Wanyuka
HEADTEACHER

0727781330
0721553335
RE: TABANI RC PRIMARY SCHOOL

This is to confirm

the above mentioned School

within this area of Jurisdiction

its in a DI plot that the

Management Committee is in

process to get Little Clear

document. Since its a Commu

School, there’s need for getting

a Permanent Water Source.

Kindly accord them the

needful.

John E. Githensimbi

Chief Location Officer

Kisumu Division

0725 333 163

Kisumu, May 17, 2014
THE CEO
L. VICTORIAN NORTH WATER SERVICES, BEARD,
P.O. BOX 673
KAKAMBA.

Dear Sir/Madam,

Ref. Drilling Borehole in Tabani RC PR School,
Registration No. 90-31-04-085

This School was established in 1955 and is situated on a PI Plot No. 76 in Kiminini Settlement on four acres. This plot has no dispute with the local community. Any public facility established on this plot is going to greatly benefit the community around. Our main source of water currently is a small stream which dries up during the dry season.

Your gesture for sinking a borehole in this school is welcome as it will save the community.

Thank you, God bless you.

Yours faithfully,

Samuel Wamukota
0727283330
0721533335

HEADTEACHER...
# ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PUBLIC PARTICIPATION QUESTIONNAIRE

Members of the public are supposed to participate and get involved in development projects because the projects may affect them in one way or another. Reference is made to section 58 (Environmental Impact Assessment) of the Environmental Management and Coordination Act (EMCA), 1999 and section 17 of the Environmental (Impact Assessment and Audit) Regulations, 2003, where a proponent of a proposed project has to, in consultation with the National Environment Management Authority (NEMA), seek the views of persons who may be affected by the project. The role of public consultation and involvement in EIA process is to assure the quality, comprehensiveness and effectiveness of the assessment and ensure that the public views are adequately taken into consideration in decision making process. In view of this, we request you as a member of the community to give your comments on expected socio-economic, cultural and environmental impacts of the named proposed project.

<table>
<thead>
<tr>
<th>Name of proposed project:</th>
<th>Mapera Primary School Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner:</td>
<td>P.O. Box 123, 23456, Kenya</td>
</tr>
<tr>
<td>Location and/or Plot No.:</td>
<td>Plot 76, Kericho</td>
</tr>
</tbody>
</table>

1. **What is the distance between your home/premises and the proposed project site?**
   - Less than 100 M ( )
   - Between 100 M and 1,000 M / 1Km ( )
   - More than 1 Km ( )

2. **What positive (good) socio-economic, cultural and environmental impacts do you anticipate during the project construction, operational and decommissioning phases?**
   - [ ]
   - [ ]
   - [ ]

3. **What are the negative (bad) socio-economic, cultural and environmental impacts do you anticipate during the project construction, operational and decommissioning phases?**
   - [ ]
   - [ ]
   - [ ]

   What measures do you think the developer needs to put in place during the project construction, operational and decommissioning phases?
   - [ ]
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4. **What is your general opinion on the proposed project?**
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ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PUBLIC PARTICIPATION QUESTIONNAIRE

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Name of proposed project: MADERA COMMUNITY WASTE PROJECT

Owner: P.O. Box 673-50102

Location and/or Plot No.: PLOT 76 KAMIRINJ SCHEME

1. What is the distance between your home/premises and the proposed project site?
   - Less than 100 M ( )
   - Between 100 M and 1,000 M / 1Km ( )
   - More than 1 Km ( )

2. What positive (good) socio-economic, cultural and environmental impacts do you anticipate during the project construction, operational and decommissioning phases?

   PROVIDE WATER FOR THE COMMUNITY AND
   "School"

3. What are the negative (bad) socio-economic, cultural and environmental impacts do you anticipate during the project construction, operational and decommissioning phases?

   "Less noise and dust"

   What measures do you think the developer needs to put in place during the project construction, operational and decommissioning phases?

   "Community will be recognised"

4. What is your general opinion on the proposed project?
   "It’s a project that can be beneficial to the community"

Your name: SEILA NKWARUKHE

Passport/ID No: 16837789

Telephone/mobile phone No.: 0718399198

Postal address: 27/NKWARUKHE

Position/Occupation: BOM

Consultancy representative signature:

THANK YOU IN PARTICIPATING IN MAKING OUR ENVIRONMENT CLEAN

Date: 09/06/2014
ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PUBLIC PARTICIPATION
QUESTIONNAIRE

Members of the public are supposed to participate and get involved in development projects because the projects may affect them in one way or another. Reference is made to section 58 (Environmental Impact Assessment) of the Environmental Management and Coordination Act (EMCA), 1999 and section 17 of the Environmental (Impact Assessment and Audit) Regulations, 2003, where a proponent of a proposed project has to, in consultation with the National Environment Management Authority (NEMA), seek the views of persons who may be affected by the project. The role of public consultation and involvement in EIA process is to assure the quality, comprehensiveness and effectiveness of the assessment and ensure that the public views are adequately taken into consideration in decision making process. In view of this, we request you as a member of the community to give your comments on expected socio-economic, cultural and environmental impacts of the named proposed project.

Name of proposed project: MANDELA COMMUNITY CENTER PROJECT
Owner: P.O.Box 8
Location and/or Plot No.: PLOT KIUMU SCHEME

1. What is the distance between your home/premises and the proposed project site?
   Less than 100 M ( ) Between 100 M and 1,000 M / 1Km ( ) More than 1 Km ( )

2. What positive (good) socio-economic, cultural and environmental impacts do you anticipate during the project construction, operational and decommissioning phases?
   To provide the community with Clean Water

3. What are the negative (bad) socio-economic, cultural and environmental impacts do you anticipate during the project construction, operational and decommissioning phases?

What measures do you think the developer needs to put in place during the project construction, operational and decommissioning phases?

4. What is your general opinion on the proposed project?
   It is Good to have Clean Water and have Health people

Your name: [Signature] Passport/ID No: 951847
Telephone/mobile phone No: 0722334980 Postal address: 28 Nakuru
Position/Occupation: Chairman Date: 31/4/2014

Consultancy representative signature: [Signature]

THANK YOU IN PARTICIPATING IN MAKING OUR ENVIRONMENT CLEAN
ENVIROMENTAL IMPACT ASSESSMENT (EIA) PUBLIC PARTICIPATION QUESTIONNAIRE

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Name of proposed project: MATERA COMMUNITY WATER PROJECT

Owner: P.O. Box 6783-45782

Location and/or Plot No.: Plot 76, KIMINAWI SCHEME

1. What is the distance between your home/premises and the proposed project site?
   Less than 100 M () Between 100 M and 1,000 M / 1Km () More than 1Km ()

2. What positive (good) socio-economic, cultural and environmental impacts do you anticipate during the project construction, operational and decommissioning phases?
   Good clean water for community and the school

3. What are the negative (bad) socio-economic, cultural and environmental impacts do you anticipate during the project construction, operational and decommissioning phases?

   What measures do you think the developer needs to put in place during the project construction, operational and decommissioning phases?
   Reduce noise to the school when lessons are on

4. What is your general opinion on the proposed project?
   Community will feel recognized

Your name: [Signature]

Passport/ID No: 937,445,623

Telephone/mobile phone No: 07027945780

Postal address: BOX 20, Tabani

Position/Occupation: [Signature]

Date: 9/6/2014

Consultancy representative signature: [Signature]

THANK YOU IN PARTICIPATING IN MAKING OUR ENVIRONMENT CLEAN
ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PUBLIC PARTICIPATION 
QUESTIONNAIRE

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Name of proposed project: 

Owner: .................................................................... P. O. Box ........................

Location and/or Plot No: ............................................................... (KAMININ SCHEME)

1. What is the distance between your home/premises and the proposed project site?

   Less than 100 M () Between 100 M and 1,000 M / 1Km () More than 1Km ()

2. What positive (good) socio-economic, cultural and environmental impacts do you anticipate during the project construction, operational and decommissioning phases?

   Good clean water for community and the school

3. What are the negative (bad) socio-economic, cultural and environmental impacts do you anticipate during the project construction, operational and decommissioning phases?

   What measures do you think the developer needs to put in place during the project construction, operational and decommissioning phases?

   Lessons are on

4. What is your general opinion on the proposed project?

   Community well fed recognised

Your name: ................................................................. Passport/ID No: .............................

Telephone/mobile phone No.: .......................... Postal address: ..........................

Position/Occupation: .......................................................... Date: ..........................

Consultancy representative signature: ..................................

THANK YOU IN PARTICIPATING IN MAKING OUR ENVIRONMENT CLEAN
ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PUBLIC PARTICIPATION QUESTIONNAIRE

Members of the public are supposed to participate and get involved in development projects because the projects may affect them in one way or another. Reference is made to section 58 (Environmental Impact Assessment) of the Environmental Management and Coordination Act (EMCA), 1999 and section 17 of the Environmental (Impact Assessment and Audit) Regulations, 2003, where a proponent of a proposed project has to, in consultation with the National Environment Management Authority (NEMA), seek the views of persons who may be affected by the project. The role of public consultation and involvement in EIA process is to assure the quality, comprehensiveness and effectiveness of the assessment and ensure that the public views are adequately taken into consideration in decision making process. In view of this, we request you as a member of the community to give your comments on expected socio-economic, cultural and environmental impacts of the named proposed project.

Name of proposed project: MAPERA COMMUNITY WATER PROJECT
Owner: JUWISCO P.O. Box 673 7E0
Location and/or Plot No.: PL PLOT 16 KIWINIINI SCHEME

1. What is the distance between your home/premises and the proposed project site?
   Less than 100 M ( ) Between 100 M and 1,000 M / 1Km ( ) More than 1 Km ( )

2. What positive (good) socio-economic, cultural and environmental impacts do you anticipate during the project construction, operational and decommissioning phases?
   To provide clean and readily available water to the community and school in the area

3. What are the negative (bad) socio-economic, cultural and environmental impacts do you anticipate during the project construction, operational and decommissioning phases?
   I do not anticipate any negative socio-economic impact.

What measures do you think the developer needs to put in place during the phases?
   To develop the project at the most suitable location.

4. What is your general opinion on the proposed project?
   It is a project that can be beneficial to the society if commissioned.

Your name: ERIE WAMANI P.KURE. Passport/ID No: 23271914
Telephone/mobile phone No: 0726297676. Postal address: R.V. 32 NAKURU
Position/Occupation: TEACHER. Date: 09/09/2014
Consultancy representative signature: 

THANK YOU IN PARTICIPATING IN MAKING OUR ENVIRONMENT CLEAN.
# Environmental Impact Assessment (EIA) Public Participation Questionnaire

Members of the public are supposed to participate and get involved in development projects because the projects may affect them in one way or another. Reference is made to section 58 (Environmental Impact Assessment) of the Environmental Management and Coordination Act (EMCA), 1999 and section 17 of the Environmental Impact Assessment and Audit Regulations, 2003, where a proponent of a proposed project has to, in consultation with the National Environment Management Authority (NEMA), seek the views of persons who may be affected by the project. The role of public consultation and involvement in EIA process is to assure the quality, comprehensiveness and effectiveness of the assessment and ensure that the public views are adequately taken into consideration in decision making process. In view of this, we request you as a member of the community to give your comments on expected socio-economic, cultural and environmental impacts of the named proposed project.

### Name of proposed project: NABERA COMMUNITY WATER PROJECT

### Owner: D.I. PLOT 76 P.O. Box 37 NAIROBI

### Location and/or Plot No.: D.I. PLOT 76 (TIPANI SUB-LOCATION)

1. **What is the distance between your home/premises and the proposed project site?**
   - Less than 100 M ()
   - Between 100 M and 1,000 M /1Km ()
   - More than 1Km ()

2. **What positive (good) socio-economic, cultural and environmental impacts do you anticipate during the project construction, operational and decommissioning phases?**

   The Community will have clean water

3. **What are the negative (bad) socio-economic, cultural and environmental impacts do you anticipate during the project construction, operational and decommissioning phases?**

4. **What measures do you think the developer needs to put in place during the during the project construction, operational and decommissioning phases?**

   **Noise when the machines are on**

5. **What is your general opinion on the proposed project?**

   Welcome the project on the Community in big level

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Your name: Concetian Liimide Wanora Passport/ID No: A9967068

Telephone/mobile phone No: 07422980649 Postal address: Box 38 NHALLA

Position/Occupation: B.O.M Date: 9/07/2014

Consultancy representative signature: [Signature]

THANK YOU IN PARTICIPATING IN MAKING OUR ENVIRONMENT CLEAN
ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PUBLIC PARTICIPATION QUESTIONNAIRE

Members of the public are supposed to participate and get involved in development projects because the projects may affect them in one way or another. Reference is made to section 58 (Environmental Impact Assessment) of the Environmental Management and Coordination Act (EMCA), 1999 and section 17 of the Environmental (Impact Assessment and Audit) Regulations, 2003, where a proponent of a proposed project has to, in consultation with the National Environment Management Authority (NEMA), seek the views of persons who may be affected by the project. The role of public consultation and involvement in EIA process is to assure the quality, comprehensiveness and effectiveness of the assessment and ensure that the public views are adequately taken into consideration in decision-making process. In view of this, we request you as a member of the community to give your comments on expected socio-economic, cultural and environmental impacts of the named proposed project.

Name of proposed project: MADERA COMMUNITY WATER PROJECT

Owner: ...........................................................................................................
P. O. Box ...........................................................................................................
Location and/or Plot No.: ..............................................................................

1. What is the distance between your home/premises and the proposed project site?
   - Less than 100 M ()
   - Between 100 M and 1,000 M /1Km ()
   - More than 1 Km ()

2. What positive (good) socio-economic, cultural and environmental impacts do you anticipate during the project construction, operational and decommissioning phases?

3. What are the negative (bad) socio-economic, cultural and environmental impacts do you anticipate during the project construction, operational and decommissioning phases?

What measures do you think the developer needs to put in place during the project construction, operational and decommissioning phases?

4. What is your general opinion on the proposed project?

Your name: ...........................................................................................................
Telephone/mobile phone No.: .................................................................
Postal address: ..............................................................................................
Position/Occupation: ..................................................................................

Consultancy representative signature: ............................................................

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