MINISTRY OF TRANSPORT, INFRASTRUCTURE, HOUSING AND URBAN DEVELOPMENT

STATE DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Nairobi Metropolitan Services Improvement Project – NaMSIP

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) REPORT
FOR THE PROPOSED NOONKOPIR TOWNSHIP PRIMARY SCHOOL BOREHOLE IN KITENGELA, KAJIADO COUNTY OF NAIROBI METROPOLITAN REGION

July 4, 2019

PROPOSENT
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LEAD EXPERT
SUBMISSION DETAILS

Certificate of Declaration and Document Authentication

This document has been prepared in accordance with the Environmental Management and Coordination Cap 387 and Environmental Impact Assessment and Audit Regulations, 2003 of the Kenya Gazette Supplement No.56 of 13th June 2003, Legal Notice No. 101 and World Bank Operational Procedures.

This report is prepared for and on behalf of:

<table>
<thead>
<tr>
<th>LEAD EXPERT</th>
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<tr>
<td>Juliana Tek, P. O. Box 248-00517, NAIROBI</td>
<td>The Senior Principal Superintending Engineer, Ministry of Transport, Infrastructure Housing and Urban Development, State department of Housing and Urban Development P. O. Box 30130-00100, NAIROBI</td>
</tr>
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</table>

Name……………………………………
Designation……………………………
NEMA Reg. Cert. No…………………
Signed ………………………………
Date……………………………………

DISCLAIMER:

This Environmental Impact Assessment Study Report is based on literature review and findings from field assessment and it’s strictly confidential to the Ministry of Transport, Infrastructure, Housing and Urban Development, State Department of Housing and Urban Development. It is however, subject to conditions in the Environmental Management and Coordination Act, Cap 387 and the World Bank Operational Procedures.
## FACT SHEET

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<thead>
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<th><strong>Program Name</strong></th>
<th>Nairobi Metropolitan Services Improvement Project (NaMSIP)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assignment Name</strong></td>
<td>Environmental and Social Impact Assessment (ESIA) Report for the Proposed Noonkopir Township Primary School Borehole in Kitengela, Kajiado County of Nairobi Metropolitan Region.</td>
</tr>
<tr>
<td><strong>Lead Implementing Agency</strong></td>
<td>The Ministry of Transport, Infrastructure, Housing and Urban Development, State Department of Housing and Urban Development.</td>
</tr>
<tr>
<td><strong>Funding Agencies</strong></td>
<td>World Bank</td>
</tr>
</tbody>
</table>
| **Project Components** | • Drilling of a 300m deep borehole estimated to yield $6m^3/hr$.  
• Casing and equipping the borehole.  
• Connecting the borehole to the national power grid.  
• Construction of a water kiosk to supply the neighbourhood with water.  
• Supply and installation of two plastic water tanks on an elevated steel tank tower. |
| **Project Location** | Noonkopir Township Primary School in Kitengela Town |
| **Lead Expert** | Juliana Tek  
Reg. No. 2084 |
# ABBREVIATIONS & ACRONYMS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>BOQS</td>
<td>Bill of Quantities</td>
</tr>
<tr>
<td>CPP</td>
<td>Consultation and Public Participation</td>
</tr>
<tr>
<td>EA</td>
<td>Environmental Audit</td>
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<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>EMCA</td>
<td>Environmental Management and Coordination Act</td>
</tr>
<tr>
<td>EMP</td>
<td>Environmental Management Plan</td>
</tr>
<tr>
<td>ESIA</td>
<td>Environmental and Social Impact Assessment</td>
</tr>
<tr>
<td>ESF</td>
<td>Environmental and Social Framework</td>
</tr>
<tr>
<td>ESMMMP</td>
<td>Environmental and Social Management and Monitoring Plan</td>
</tr>
<tr>
<td>ESMP</td>
<td>Environmental and Social Management Plan</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GOK</td>
<td>Government of Kenya</td>
</tr>
<tr>
<td>NEAP</td>
<td>National Environmental Action Plan</td>
</tr>
<tr>
<td>NECC</td>
<td>National Environmental Complaints Committee</td>
</tr>
<tr>
<td>NEMA</td>
<td>National Environmental Management Authority</td>
</tr>
<tr>
<td>NHIF</td>
<td>National Hospital Insurance Fund</td>
</tr>
<tr>
<td>OHS</td>
<td>Occupational Health and Safety</td>
</tr>
<tr>
<td>OP</td>
<td>Operational Procedures</td>
</tr>
<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
</tr>
<tr>
<td>SCAMP</td>
<td>Sub-catchment Management Plan</td>
</tr>
<tr>
<td>SERC</td>
<td>Standards and Enforcement Review Committee</td>
</tr>
<tr>
<td>WASREB</td>
<td>Water Services Regulatory Board</td>
</tr>
<tr>
<td>WRMA</td>
<td>Water Resources Management Authority</td>
</tr>
<tr>
<td>WSP</td>
<td>Water Service Provider</td>
</tr>
<tr>
<td>WSTF</td>
<td>Water Services Trust Fund</td>
</tr>
</tbody>
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EXECUTIVE SUMMARY

I. PROJECT DESCRIPTION

The proposed borehole will be in Noonkopir Township Primary School in Kitengela and its main purpose is to provide water for the pupils learning at the school and the neighbouring community. The school is a public school, not connected to any water supply system and is currently sourcing water from a neighbouring school at a high cost. This leads the school administration to purchase water to meet their basic needs such as drinking, cooking and washing the kitchenware. Other activities like hand washing, washing classrooms, cleaning toilets and watering of plants are undertaken when water supply is adequate. This makes the pupils susceptible to poor health especially cholera which is rampant in crowded places and places with poor sanitation.

The school has a capacity of 1,020 pupils and is currently having a population of 1,010 pupils and 39 staff members. The school is a government sponsored school therefore it’s likely to reach its capacity soon since pupils interested in joining cannot be turned away based on capacity. In addition, the school also has a facility for the children with special needs, which is in dire need of expansion and equipment.

The pupil’s population and the current source of water demonstrate the importance of drilling a borehole within the school. The proposed project will involve:

- Drilling of a 300m deep borehole estimated to yield 6m³/hr.
- Casing and equipping the borehole.
- Connecting the borehole to the national power grid and installation of a water pump.
- Construction of a water kiosk to supply the neighbourhood with water.
- Supply and installation of two plastic water tanks on an elevated steel tank tower.

The proposed project will be financed under the Nairobi Metropolitan Services Improvement Project (NaMSIP), which is a project, funded jointly by the World Bank and Government of Kenya. The Project lead implementing agency is the State Department of Housing and Urban Development under the Ministry of Transport, Infrastructure, Housing & Urban Development (MTIH&UD). The Project is financing investments in infrastructure and service delivery in the Nairobi Metropolitan Region, the main Project Development Objective (PDO) is to strengthen urban services and infrastructure in the Nairobi metropolitan area.

The Project once complete will supply safe, reliable and adequate water to the pupils at Noonkopir Township Primary School and the residents of the neighbouring area.

II. PROJECT LOCATION /OWNERSHIP

Noonkopir Township Primary School is located on public land and occupies five (5) acres. The property has adequate space to accommodate the proposed borehole with no Resettlement issues being triggered as described by World Bank OP 4.12 on involuntary resettlement.

III. POLICY AND LEGAL FRAMEWORK
The Report has presented the relevant policies, legislation and institutional frameworks that guide preparation of ESIA at both National and World Bank OPs and legal provisions included:

**Policies**
- Constitution of Kenya 2010,
- Kenya Vision 2030,
- National Environment Policy 2013,
- HIV and AIDS Policy 2009,
- National Land Policy 2009,
- Gender Policy 2011,
- Kenya National Youth Policy 2006,
- Sustainable Development Goals (SDGs),

**Acts and Regulations**
- EMCA Cap 387,
- Land Act 2012,
- Water Act 2016,
- Physical Planning Act 1996 (Cap 286),
- The Urban Areas and Cities Act 2011,
- Occupational Health and Safety Act 2007,
- HIV and AIDS Prevention and Control Act 2011,
- Sexual Offences Act 2006,
- Child Rights Act (Amendment Bill) 2014,
- Labour Relations Act 2012,
- National Gender and Equality Commission Act 2011,
- The Wildlife Conservation and Management Act CAP 376, 2013
- Water quality, Waste management, Air quality and Noise & excessive Vibration Regulations

The assessment has also referred to the World Bank Operational Procedures to comply with the international safeguards standards as shown below:

- OP 4.01 Environmental Assessment;
- OP 4.04 Natural Habitats;
- OP 4.09 Pest Management;
- OP 4.11 Physical Cultural Resources (PCR);
- OP 4.12 Involuntary Resettlement;
- OP 4.10 Indigenous People;
- OP 4.36 Forests;
- OP 4.37 Safety of Dams;
- OP 7.50 Projects on International Waterways;
- OP 7.60 Projects in Disputed Areas.

**IV. HIGHLIGHTS OF CONSULTATION**

The World Bank Group (WBG) Environmental Assessment OP 4.01 and the EMCA Cap 387, The Environmental (Impact, Audit and Strategic Assessment) Regulations, 2003 requires that project-affected groups and local non-governmental organizations (NGOs) be consulted during the impact assessments process about the project’s potential environmental and social impacts.

A summary of outcomes of stakeholder consultations undertaken during preparation of this ESIA is as presented below:
a) The school and community have challenges accessing water in Kitengela.
b) The pupils and community will have improved sanitation and health.
c) Priority for employment should be given to the residents.
d) The project should consider using solar energy to manage electricity bill from pumping.
e) The community should be notified earlier before commencement of project construction.
f) Construction should be undertaken during school holidays to mitigate noise and health and safety incidence/accidents.

The ESIA chapters 6 and 7 provide a detailed approach and methodology of inclusion of the stakeholder comments into the project implementation and operation operations.

V. PROJECT POSITIVE IMPACTS

The project is a Socially Uplifting Project (SUP) and it’s envisaged to have more positive impacts after completion of the civil works and commissioning. The main anticipated positive impacts associated with the project include:

1) Increased access to affordable clean water for the pupils and residents thus improving their hygiene and sanitation conditions resulting to reduced incidences of water-borne diseases.
2) Income generation for the school from selling water at the water kiosk and reduced expenditure for the school, since they will stop sourcing water from the neighbourhood.
3) Reduced distances and travel time spent in search for water. The beneficiaries (especially women and children) will use that energy and time on economically and socially viable activities for the families.
4) Promote the socio-economic development of the project areas; water-reliant businesses (i.e. such as hotels) will be opened to take advantage of the project.
5) Provide employment opportunities for the local community during the construction, operation and decommissioning phases of the project (e.g. masons, carpenters, cooks and indirect spins-off etc.);
6) The project will help develop the human capital in the Country through transfer of skills to young engineers, environmental specialists and plumbers among others.
7) The County government will benefit from an expanded source of local revenue from businesses and licenses directly or indirectly associated with the borehole.

Against the above positive benefits brought about by the project, there will be some negative impacts emanating from both the construction, operation and decommissioning activities of the proposed project. The proposed project triggers Bank OP 4.01 on Environmental Assessment.

The following is a summary of the possible negative impacts and the mitigation measures.
VII. NEGATIVE IMPACTS AND MITIGATION MEASURES DURING CONSTRUCTION PHASE

The project construction phase will involve the following activities; delivery of construction materials including casings, cement, drilling of the borehole and construction of the water kiosk. The activities discussed above have the potential of triggering negative environment and social impacts during Project Construction Phase.

The project impacts and mitigation measures are presented in the table 1 below.

**Table 1: Negative Impacts and Proposed Mitigation Measures during Construction**

<table>
<thead>
<tr>
<th>Associated Impacts</th>
<th>Management Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health &amp; Safety risks</td>
<td>• Provide notices, signage and information to the public for their safety at all locations.</td>
</tr>
<tr>
<td>Air pollution</td>
<td>• Install barriers at the site to restrict access to the works for public health &amp; safety.</td>
</tr>
<tr>
<td>Social nuisance</td>
<td>• Where there are potential for nuisance from dust generation, ensure earth moving is under dump conditions (consider watering where necessary.)</td>
</tr>
<tr>
<td></td>
<td>• Inform immediate communities or stakeholders of the activities.</td>
</tr>
</tbody>
</table>

| Vegetation Cover destruction | • Construction activities will be limited to the project site which has no/limited vegetation cover. |
| | • Re-vegetate the project site after completion of civil works. |

| Public safety risks | • Provide signage and safety information in all work areas. |
| Pupils & worker Occupational health & safety risks | • Ensure compliance by workers with safety safeguards including the OHS, provision of safety gear and enforcement of application. |

| Environmental and Safety risks | • Construction material sources should be environmentally sustainable (approved accordingly). |
| | • Delivery routes and modes of transport should be approved. |
| | • Material storage on site not to be internal or external nuisance. |
| | • Delivery trucks to be well covered to avoid dust blown pollution. |

| Risks of contaminating surface and underground water resources | • Construction wastes (residual earth, debris and scrap materials) to be removed for safe disposal |
| | • Encourage recycling where possible (concrete debris for access road surfacing). |
| | • Contaminated matter in the work areas to be isolated for safe disposal. |
| | • Material residuals to be disposed in accordance with established regulations |

<p>| Risks of Accidents, Injuries or death of workers, pupils &amp; the community | • Provide construction workers with personal protective gear (gloves, gum boots, overalls and helmets), |
| | • Use toilets provided at the school, |
| | • Provide onsite first aid kit accessible by the workers on need, |
| | • Isolate the site for access by the local pupils &amp; community during the |</p>
<table>
<thead>
<tr>
<th>Associated Impacts</th>
<th>Management Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>construction for their safety and health,</td>
<td>Contractor to provide a Healthy and Safety Plan prior to the commencement of works to be approved by the resident engineer.</td>
</tr>
<tr>
<td>• Contractor to provide a Healthy and Safety Plan prior to the commencement of</td>
<td>Contractor to follow provisions of Kenya Occupational Health and Safety Act 2007.</td>
</tr>
<tr>
<td>construction of works to be approved by the resident engineer.</td>
<td></td>
</tr>
<tr>
<td>• Hazards of fire outbreak, oil and chemical spills.</td>
<td>Follow specifications of the Occupational Health and Safety Act, EMCA Cap 387 and others in the development and operation of stores,</td>
</tr>
<tr>
<td></td>
<td>• Provide a 20cm sand or ballast medium at plant and equipment storage area and fuel tanks area, the sand and ballast will trap any oil / fuel leaks, this medium should be replaced when saturated and disposed appropriately.</td>
</tr>
<tr>
<td>• Risks associated with water borne diseases exposed to pupils, community and</td>
<td>The Contractor shall comply with all laws and any by-laws relating to public health and sanitation and provisions of Public Health Act Cap 242,</td>
</tr>
<tr>
<td>workers</td>
<td>• A wash basin with adequate clean water and soap shall be provided alongside each toilet. Staff shall be encouraged to wash their hands after use of the toilet, to minimize the spread of possible disease.</td>
</tr>
<tr>
<td>• Risk to health and safety of community and workers</td>
<td>The Contractor shall keep noise level within acceptable limits 60dB (A) at day time and 35dB(A) at night and construction activities shall, where possible, be confined to normal working hours in the residential areas,</td>
</tr>
<tr>
<td></td>
<td>• Pupils, Churches, Hospitals and other noise sensitive areas shall be notified by the Contractor at least 5 days before construction is due to commence in their vicinity,</td>
</tr>
<tr>
<td></td>
<td>• Any complaints received by the Contractor regarding noise will be recorded and communicated to the RE.</td>
</tr>
<tr>
<td>• Risks of Accidents, Injuries or death of workers or community member</td>
<td>Strict use of warning signage and tapes where the activities are present,</td>
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<tr>
<td></td>
<td>• Employ and train road safety Marshalls who will be responsible for management of traffic on site,</td>
</tr>
<tr>
<td></td>
<td>• Contractor to provide a traffic management plan during construction to be approved by the resident engineer.</td>
</tr>
<tr>
<td>• Air pollution causing respiratory disorders to human</td>
<td>Workers shall be trained on management of air pollution from vehicles and machinery. All construction machinery shall be maintained and serviced in accordance with the contractor’s specifications,</td>
</tr>
<tr>
<td></td>
<td>• The removal of vegetation shall be avoided until clearance is required and exposed surfaces shall be re-vegetated or stabilized as soon as practically possible,</td>
</tr>
<tr>
<td></td>
<td>• The contractor shall not carry out dust generating activities (excavation, handling and transport of materials) during times of strong winds.</td>
</tr>
<tr>
<td>• Associated risks of environmental degradation</td>
<td>The site is to be cleared of all construction materials, including litter prior to hand over,</td>
</tr>
<tr>
<td></td>
<td>• Fences, barriers and demarcations associated with the construction phase.</td>
</tr>
</tbody>
</table>
VIII. NEGATIVE IMPACTS AND MITIGATION MEASURES DURING OPERATION PHASE

The operation phase activities will involve pumping and distribution of water and maintenance of the water kiosk. Table 2 below presents a summary of potential negative impacts likely to be experienced during operation phase of the project.

<table>
<thead>
<tr>
<th>Activity and Associated Impacts</th>
<th>Management Actions</th>
</tr>
</thead>
</table>
| • Risk of water vectors          | - Wastewater drainage channel be constructed to lead water away from the pump pad;  
|                                  | - The waste water may be used for small gardening initiatives by the school or directed to soak pits;  
|                                  | - Observe the Water Act 2002 and associated Water Rules;  
|                                  | - Conduct continuous maintenance of the borehole, pipework, tanks and water kiosk;  
|                                  | - Conduct water sampling at least every 3 months for water monitoring record. |
| • Lowering the water table       | - The borehole will be installed with a master meter and an Airline/Piezometer to monitor ground water abstractions and to facilitate regular measurements of the static water level in the borehole, respectively;  
|                                  | - The maximum ground water abstraction permitted from the borehole is limited to the authorized volume/day for the domestic use only subject to availability from 60% of the tested yield for a maximum abstraction period not exceeding ten (10) hours per day;  
|                                  | - The school management shall ensure no over pumping and adhere to the permit class issued by WRMA;  
|                                  | - Install auto-shut water taps to reduce water wastage;  
|                                  | - Educate and create awareness to the Community on the value of water resources for enhanced conservation;  
|                                  | - Ensure optimum maintenance of the water supply system components including pipelines, valves and consumer taps. |

IX. NEGATIVE IMPACTS AND MITIGATION MEASURES DURING PROJECT DECOMMISSIONING PHASE

The decommissioning phase activities will mainly involve removal of the pump and tanks, demolition of the water kiosk and their disposal. Site restoration/ rehabilitation is the next important activity. Table 3 below presents a summary of potential negative impacts likely to be experienced during decommissioning of the project.
Table 3: Negative Impacts and Proposed Mitigation Measures during Decommissioning

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Management Actions</th>
</tr>
</thead>
</table>
| Health and safety risk on pupils, workers and the community | • Adhere to the Occupational Health and Safety Act, 2007;  
• Ensure workers are provided with personal protective equipment and first aid kit;  
• Ensure all equipment are inspected before use for appropriate safeguards and that the machine operators are trained on machine safety;  
• Ensure the working hours are controlled;  
• Appoint a traffic marshal to control the traffic;  
• Ensure appropriate road safety signage are strategically placed and drivers adhere to the requirements of such signage in addition to training them on defensive driving;  
• Provide appropriate barriers and security at the site. All demolition activities shall be isolated from the public. This will be achieved through hoarding and fixing appropriate safety signage and information; and Involve the community. |
| Waste Generation                                      | • Recycle and reuse waste that can be recovered and all the other wastes are managed by a NEMA licensed company;  
• Demolition team to be encouraged to dump their personal wastes in designated bins;  
• Use the sanitary facilities provided by the school; and  
• Maintain and keep the site clean and orderly. |
| Noise Pollution                                       | • Ditto                                                                                                                                           |

X. CONCLUSION

The assessment reached the following conclusions:

i) The project will be constructed within existing school land and no additional land will be acquired.

ii) The World Bank OP 4.12 is not triggered since the proposed site is on the school land.

iii) The Environmental and Social Screening undertaken for the project revealed that the investment will result in low impact on both social and biophysical environment; therefore, this project is categorized as a category B project. The level of ESIA assessment required is at project report stage, which should be approved by Kajiado Nema office.

iv) Provisional Budget of KShs. 0.35 million is required for implementation of mitigation measures of potential negative environmental impacts identified in the report.

XI. RECOMMENDATIONS

This assessment recommends the following provisions:
• The proponent needs to support the implementation of environmental and social management and plan (including mitigation plan and monitoring) to protect the environment of the project area from the negative impacts of project implementation.
• Priority for employment should be given to the local community including women and youth. This will enhance social economic and capacity building.
• The proponent should adopt a participatory and collaborative approach during all the phases of the project. This will ensure active participation of all key stakeholders towards success and sustainability of the project.
CHAPTER ONE: INTRODUCTION

1.1 General background

The proposed borehole will be in Noonkopir Township Primary School in Kitengela and its main purpose is to provide water for the pupils learning at the school and the neighbouring community. The school is not connected to any water supply system and is currently sourcing water from a neighbouring school at a high cost. This leads the school administration to purchase water to meet their basic needs such as drinking, cooking and washing the kitchenware. Other activities like hand washing, washing classrooms, cleaning toilets and watering of plants are undertaken when water supply is adequate. This makes the pupils susceptible to poor health especially cholera which is rampant in crowded places and places with poor sanitation.

The school has a capacity of 1,020 pupils and is currently having a population of 1,010 pupils and 39 staff members. The school is a government sponsored school therefore it’s likely to reach its capacity soon since pupils interested in joining cannot be turned away based on capacity. In addition, the school also has a facility for the children with special needs, which is in dire need of expansion and equipment.

The pupil’s population and the current source of water demonstrate the importance of drilling a borehole within the school. The proposed project will involve:

- Drilling of a 300m deep borehole estimated to yield 6m³/hr.
- Casing and equipping the borehole.
- Connecting the borehole to the national power grid and installation of a water pump.
- Construction of a water kiosk to supply the neighbourhood with water.
- Supply and installation of two plastic water tanks on an elevated steel tank tower.

The proposed project will be financed under the Nairobi Metropolitan Services Improvement Project (NaMSIP), which is a project, funded jointly by the World Bank and Government of Kenya. The Project lead implementing agency is the State Department of Housing and Urban Development under the Ministry of Ministry of Transport, Infrastructure, Housing & Urban Development (MTIH&UD). The Project is financing investments in infrastructure and service delivery in the Nairobi Metropolitan Region, the main Project Development Objective (PDO) is to strengthen urban services and infrastructure in the Nairobi metropolitan area.

The Project once complete will supply safe, reliable and adequate water to the pupils at Noonkopir Township Primary School and the residents of the neighbouring area.

1.2 Project description

The proposed borehole project lies in Kajiado County in Kajiado East Constituency. The project involves drilling of a borehole in Noonkopir Township Primary School in Kitengela. This will provide water for the pupils and the wider community around the school. The borehole will be
located specifically eastwards of the school compound at latitude and longitude 010 28’ 01.4’’South and 0360 56’ 58.8’’East. The proposed project will involve:

- Drilling of a 300m deep borehole estimated to yield 6m³/hr.
- Casing and equipping the borehole.
- Connecting the borehole to the national power grid and installation of a water pump.
- Construction of a water kiosk to supply the neighbourhood with water.
- Supply and installation of two plastic water tanks on an elevated steel tank tower.

The Project once complete will supply safe, affordable, reliable and adequate water to pupils and the community around Noonkopir Township Primary School which has a total population of 1,010 pupils.

This ESIA report presents environment and social impacts to human and natural environment associated with implementation of the proposed project. Appropriate mitigation measures have also been recommended in chapter 7 and 8 of this report.

1.3 Objectives of the project
The general framework and objective of Noonkopir Township Primary School Borehole Project is to supply affordable water currently being provided by a neighbouring Secondary School. The proposed project will also provide key quality water to the pupils and surrounding communities that will enable them to embrace sustainable, accessible quality water and sanitation services.

1.4 Significance of the project
The project will contribute towards solving the inadequacy of water supply to the school and the surrounding community. This will have positive impacts to the pupil’s and community’s economy and health by reducing cases of water-borne diseases.

1.5 Project justification
Water supply to Noonkopir Township Primary School is costly for the school and hence not sustainable with 1,010 pupils enrolled in the school. The school currently buys water from the neighbouring Noonkopir Secondary School, however the water cannot meet the needs of the Primary section due to the number of pupils. Besides the secondary school borehole is at 198m which is acceptable but may be vulnerable to drying up in the future while the primary school will drill at 300m to reduce chances of over-exploitation.

1.6 Objectives of ESIA assessment

1.6.1 General Objective
The purpose of an environmental and social impact assessment (ESIA) is to improve decision-making and to ensure that the project under consideration is environmentally and socially sound and sustainable.
This ESIA has been conducted in compliance with the Environmental Impact Assessment Regulation as outlined under the Gazette Notice No. 56 of 2003 established under the Environmental Management and Coordination Act (EMCA), Cap 387 of Kenya and the World Bank OPs.

1.6.2 Specific Objectives of ESIA investigations
This Environmental & Social Impact Assessment (ESIA) is expected to achieve the following objectives:

i) To present existing environmental, social and cultural setting of the target project area.

ii) A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project.

iii) To identify potential environmental and social impacts (direct and indirect), including opportunities for enhancement; this includes the cumulative impact of the proposed project and other developments which are anticipated.

iv) The technology, procedures and processes to be used, in the implementation of the project.

v) To generate feasible alternative investments, sites, technologies, and designs.

vi) The products, by-products and waste generated by the project.

vii) To provide preventive, mitigating, and compensatory measures.

viii) To provide detailed results of the public consultation and disclosure program and

ix) To prepare an Environmental and Social Management and monitoring Plan to mitigate the identified impacts to ensure sustainability of the proposed Projects.

x) To recommend cost-effective measures to mitigate against the expected impacts.

xi) The measures to prevent health hazards and to ensure security in the working environment for employees and for the management of emergencies.

xii) An identification of gaps in knowledge and uncertainties, which were encouraged in compiling the information.

xiii) An economic and social analysis of the project.

1.7 ESIA Approach and Methodology
The systematic investigative and reporting methodology specified for conduct of Project Report Studies (Legal Notice 101 of EMCA) was adopted in this Study. Baseline data on project design was generated through discussion with the client and review of project documentation. Opinions formed were revalidated through field work entailing site investigations and interviews with potentially affected people and secondary stakeholders.

To identify, predict, analyse and evaluate potential impacts that may emanate from the project, diverse study methods and tools including use of checklists, matrices, expert opinions and
observations were employed. An Environmental Management and Monitoring Plan comprising of an impact mitigation plan and modalities for monitoring and evaluation were then developed to guide environmental management during all phases of project development.

Once approved by the Ministry of Transport, Infrastructure, Housing and Urban Development, NEMA and the World Bank, the Project Report will be disclosed as required.

Consequently, this report provides the following:

- The location of the project including the physical environment that may be affected by the project’s activities.
- The activities that shall be undertaken during the project design, construction, operation and decommissioning of the project.
- The materials to be used, products and by-products including waste to be generated by the project and the methods of disposal.
- The potential environmental and social impacts of the project and mitigation measures to be taken during and after the implementation of the road construction project.
- An action plan for prevention and management of possible accidents during the project cycle.
- A plan to ensure the health and safety of the workers and the neighbouring communities.
- The project cost is – Kshs. **8,838,852**.
- Any other information that the proponent may be requested to provide by NEMA.

This report also seeks to ensure that all the potential environmental and social impacts are identified and that workable mitigation measures are adopted. The report also seeks to ensure compliance with the provisions of the EMCA Cap 387, Environmental (Impact Assessment and Audit) Regulations 2003 as well as other regulations and the World Bank safeguards policies. Finally, a comprehensive Environmental and Social Management and Monitoring Plan (ESMMP) is mandatory for a project of this nature to ensure monitoring and mitigation of negative environmental and social impacts during the different phases of the project.

### 1.8 Project cost

The estimated costs of the project components are summarized in table 4 below:

**Table 4: Drilling and Equipping of a Borehole at Kitengela Noonkopir Township Primary School**

<table>
<thead>
<tr>
<th>ITEM</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>NOONKOPIR BOREHOLE DRILLING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Allow for mobilization and demobilization of plant, equipment and personnel to and from site.</td>
<td>L/sum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>By use of rotary drilling, drill a borehole with finished internal diameter of 150mm and to the required depth.</td>
<td>M</td>
<td>300</td>
<td>5,000.00</td>
<td>1,500,000.00</td>
</tr>
<tr>
<td>1.3</td>
<td>Allow for reaming and install 203mm diameter surface casing as directed (provisional)</td>
<td>M</td>
<td>30</td>
<td>8,000.00</td>
<td>240,000.00</td>
</tr>
<tr>
<td>1.4</td>
<td>Supply and install in the borehole 150mm diameter plain and slotted steel casings as directed</td>
<td>M</td>
<td>300</td>
<td>4,000.00</td>
<td>1,200,000.00</td>
</tr>
<tr>
<td>1.5</td>
<td>Supply and install 2mm-4mm gravel pack material</td>
<td>Ton</td>
<td>8</td>
<td>8,000.00</td>
<td>64,000.00</td>
</tr>
</tbody>
</table>
### ESIA Report for the Proposed Noonkopir Township Primary School Borehole in Kajiado County of the Nairobi Metropolitan Region

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.6</td>
<td>Allow for test pumping and recovery measurement including installation and removal of test pumping equipment</td>
<td>L/sum</td>
<td></td>
<td>100,000.00</td>
</tr>
<tr>
<td>1.7</td>
<td>Supply all materials and prepare a mass concrete well head</td>
<td>L/sum</td>
<td></td>
<td>20,000.00</td>
</tr>
<tr>
<td>1.8</td>
<td>Supply and install 150mm diameter borehole cap</td>
<td>No 1</td>
<td>6,000.00</td>
<td>6,000.00</td>
</tr>
<tr>
<td>1.9</td>
<td>Collect water sample and carry out chemical and bacteriological analysis</td>
<td>item</td>
<td></td>
<td>20,000.00</td>
</tr>
</tbody>
</table>

#### 2 Equipping and other civil works (All Provisional).

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Supply and install a standard submersible pump set to deliver 6m³/hr at a head of 180m.</td>
<td>No 1</td>
<td>500,000.00</td>
<td>500,000.00</td>
</tr>
<tr>
<td>2.2</td>
<td>Supply and install 6mm² * 4 core underground cable</td>
<td>M 10</td>
<td>1,200.00</td>
<td>12,000.00</td>
</tr>
<tr>
<td>2.3</td>
<td>- Ditto- but 1.5mm² * 2 core underground cable</td>
<td>M 10</td>
<td>200.00</td>
<td>2,000.00</td>
</tr>
<tr>
<td>2.4</td>
<td>Supply and install 6mm² ** 4 core submersible cable. Rate to include all jointing materials.</td>
<td>M 250</td>
<td>900.00</td>
<td>225,000.00</td>
</tr>
<tr>
<td>2.5</td>
<td>Supply and install 1.5mm² twin water level cables complete with a pair of pencil electrodes. Rate to include all jointing materials.</td>
<td>M 500</td>
<td>100.00</td>
<td>50,000.00</td>
</tr>
<tr>
<td>2.6</td>
<td>Supply and install a standard junction box. Rate to include all jointing materials.</td>
<td>No 1</td>
<td>3,000.00</td>
<td>3,000.00</td>
</tr>
<tr>
<td>2.7</td>
<td>Supply and install 1&quot; Upv air pipes (piezometer).</td>
<td>M 300</td>
<td>100.00</td>
<td>30,000.00</td>
</tr>
<tr>
<td>2.8</td>
<td>Supply and install 50mm diameter steel draw pipes complete with heavy duty sockets</td>
<td>M 250</td>
<td>1,500.00</td>
<td>375,000.00</td>
</tr>
<tr>
<td>2.9</td>
<td>Allow for borehole equipping sundries</td>
<td>L/sum</td>
<td></td>
<td>100,000.00</td>
</tr>
<tr>
<td>3</td>
<td>Allow for a PC sum of Kshs. 400,000.00 for electric power supply (provisional)</td>
<td>Sum</td>
<td></td>
<td>400,000.00</td>
</tr>
<tr>
<td>3.1</td>
<td>Supply all materials and construct a 2.5m*2.5m masonry power house complete with reinforced concrete roof slab and burglar proof door. The power house to be used as water kiosk.</td>
<td>No 1</td>
<td>480,000.00</td>
<td>480,000.00</td>
</tr>
<tr>
<td>3.2</td>
<td>Supply and install a standard control panel for the above pump. Rate to include all the wiring.</td>
<td>No 1</td>
<td>100,000.00</td>
<td>100,000.00</td>
</tr>
<tr>
<td>3.3</td>
<td>Supply and install electricity main switch. Rate to include all wiring and jointing materials.</td>
<td>No 1</td>
<td>40,000.00</td>
<td>40,000.00</td>
</tr>
<tr>
<td>3.4</td>
<td>Supply and install 3 phase power meter box complete with all piping and wiring.</td>
<td>No 1</td>
<td>25,000.00</td>
<td>25,000.00</td>
</tr>
<tr>
<td>3.5</td>
<td>Supply all materials and construct a 6m high twin steel tower to accommodate 2No of 10m³ plastic water storage tanks. Rate to include all civil works.</td>
<td>No 1</td>
<td>300,000.00</td>
<td>300,000.00</td>
</tr>
<tr>
<td>3.6</td>
<td>Supply and install 10m³ plastic water tanks. Rate to include all plumbing works.</td>
<td>No 2</td>
<td>120,000.00</td>
<td>240,000.00</td>
</tr>
<tr>
<td>3.7</td>
<td>Supply all materials and construct a standard water kiosk. Rate to include all valves, prepaid meters and all plumbing works.</td>
<td>No</td>
<td>500,000.00</td>
<td></td>
</tr>
<tr>
<td>3.8</td>
<td>Supply all materials and construct a 50mm diameter PPR pipeline from the storage tank to the water kiosk. Rate to include all excavations and backfilling (provisional)</td>
<td>M 100</td>
<td>500.00</td>
<td>50,000.00</td>
</tr>
<tr>
<td>3.9</td>
<td>Allow a PC sum of Ksh 245,000.00 for supervision of the works</td>
<td>Sum</td>
<td></td>
<td>245,000.00</td>
</tr>
<tr>
<td>4</td>
<td>Allow contingencies @ 10%</td>
<td>Item</td>
<td>6,927,000.00</td>
<td>692,700.00</td>
</tr>
</tbody>
</table>

**Sub-total** | **7,619,700.00**

Add 16% VAT | 1,219,152.00

**TOTAL** | **8,838,852.00**
CHAPTER TWO: PROJECT DESCRIPTION

2.1 Overview

The proposed borehole project lies in Kajiado County in Kajiado East Constituency. The project involves drilling of a borehole in Noonkopir Township Primary School in Kitengela. This will provide water for the pupils and the wider community around the school. The borehole will be located specifically eastwards of the school compound at latitude and longitude 010 28’ 01.4’’ South and 0360 56’ 58.8’’ East.

Pupils sitting outside their classroom

Pupils moving around the school compound

Figure 1: Noonkopir Township Primary School

Residential flat opposite the School

Residential and commercial structures

Figure 2: Neighbourhood of Noonkopir Township School
2.2 Existing water sources

Kitengela town has several boreholes, which supplies water to the community. Noonkopir Township Primary School has been purchasing water from various suppliers until recently when the school got connected to the water supply from Noonkopir Secondary School which is an immediate neighbour. The increasing number of pupils plus the cost of water limits the school from purchasing adequate water for all their uses, therefore the school focusses on buying water for cooking mainly. At times, they don’t even have drinking water which implies that their health and sanitation is at stake.

2.3 Project process description

The proposed project has various components which include:
- Drilling of a 300m deep borehole estimated to yield 6m³/hr.
- Casing and equipping the borehole.
- Connecting the borehole to the national power grid.
- Construction of a water kiosk to supply the neighbourhood with water.
- Supply and installation of two plastic water tanks on an elevated steel tank tower.

Drilling of the borehole, casing and equipping the borehole are the major components of the project. This will require approval from NEMA and WARMA before commencing. Connecting the borehole to electricity will require an approval from Kenya Power and Lighting Corporation. Then construction of the water kiosk and installation of the water tanks can follow before the project is commissioned.

The borehole drilling process follows four main steps outlined in table 5 below;

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro-geological Survey to locate drilling site.</td>
<td>Drilling, casing and well development</td>
<td>Test Pumping to determine output discharge capacity</td>
<td>Pump installation electrical works and borehole commissioning</td>
</tr>
</tbody>
</table>

2.3.1 Drilling

Drilling should be carried out with an appropriate tool. A percussion or rotary drilling machine will be suitable, though the latter is considerably faster. Geological rock samples should be collected at 2 metres intervals. Water struck and water rest levels and if possible estimates of the yield of individual aquifers encountered, should also be noted.

1. Well Design

The design of well should ensure that screens are placed against the optimum aquifer zones. The final design should be made by an experienced hydrogeologist.

2. Casing and Screens
The well should be screened with good quality screens considering the depth of the borehole; it is recommended that stainless steel casing and screens of 6” diameter be used. Slots should be of maximum 2mm in size. It’s not recommended to use of torch-lit steel casing for screens. In general, its use will reduce well efficiency (which leads to lower yields) increase pumping costs through greater draw down, increased maintenance’s cost, and eventually reduction of the potential effective life of the well.

3. Gravel pack
The use of gravel pack is recommended within the aquifer zone, because the aquifer could contain sands or silts which are finer than the screen slot size. An 8 1/2 diameter borehole screened at 6”, which should be sufficient. Should the slot size chosen be too large, the well will pump sand, thus damaging the plant and leading to gradual siltation of the well. The grain size of the gravel pack should be an average 2-4mm.

4. Well Construction
Once the design has been agreed, construction can be proceeded. In installing screen and casing, centralizers at 6 metre intervals should be used to ensure centrality within the borehole. This is particularly important to insert the artificial gravel pack all around the screen. If installed gravel packed sections should be sealed off, top and bottom with clay(2m), the remaining annular space should be backfilled with an inert material and the top five metres grouted with cement to ensure that no surface water at the well-head can enter the well and thus prevent contamination.

5. Well Development
Once screen, pack, seals and backfill have been installed, the well should be developed. Development aims at repairing the damage done to the aquifer while drilling by removing clays and other additives from borehole wall. Secondly, it alters the physical characteristics of the aquifer around the screen and removes fine particles. The use of over pumping as a means of development is not recommended since it only increases permeability in zones, which are already permeable. Instead, its recommended that the use of air or water jetting or the use of the mechanical plunger, which physically agitates the gravel pack and adjacent aquifer material. This is an extremely efficient method of development and cleaning wells. Wells development is an expensive element in the completion of a well, but is usually justified in longer well-life, greater efficiencies, lower operational and maintenance costs and a more constant yield.

6. Well Testing
After development and preliminary tests, a long duration well test should be carried out. Well tests have to be carried out on all newly-completed wells because not only does this give an indication of the success of the drilling, design and development, but it also yields information on aquifer parameters which are vital to a hydro geologist. A well test consists of pumping a well from measured start (SWL) at a known or measured yield and recording the rate and pattern by which the water level within the well changes. Once as dynamic water level (DWL) is reached, rate of inflow to the well equals the rate of pumping. The duration of the test should be 24 hours with a
further 24 hours for a recovery test or less depending on the rate of recovery during which the rate
discovery to SWL is recorded. The results of the test will enable a hydro geologist to calculate the
test recorded. The results of the test pumping rate, the installation depth and the drawdown for a
given discharge rate.

It is nowadays-common practice to carry out a so-called step draw down test, in which the yield
during testing increases stepwise. Each step is continued until hydraulic equilibrium is reached
after which the yield is increased with 50 to 100% towards the end of the test a water sample of 2
litres should be collected for chemical analysis.

7. Pump Installation

After testing and analysis of the results the pump can be selected and installed. It is important to
select the right type of pump, which matches the characteristic of the well. It should have the right
capacity to lift the water directly to the storage tank. The pump should never be installed in the
slotted section, but at least 2 meters above or below the screened section. The electric submersible
pump should be protected with a cut-off switch 2 meters above the pump inlet level.
2.3.2 Structure of the complete borehole

On completion, the borehole will look like the figure 3 below;

![Diagram of a complete borehole]

Figure 3: Structure of a complete borehole

2.3.3 Materials for drilling the borehole

Both temporary and permanent materials will be used in drilling. Temporary materials are those materials, which get used up, in the drilling process, while permanent materials are those installations that remain in place after completion of the drilling. Table 6, outlines the materials, the purpose and expected impact on the environment.
### Table 6: Materials input of the project and their anticipated impact on the environment

<table>
<thead>
<tr>
<th>Materials</th>
<th>Purpose</th>
<th>Anticipated Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1) Temporary Materials</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Water</td>
<td>Cooling of drill bit and uplifting of drill cuttings.</td>
<td>Drilling water not expected to have any impact on the environment.</td>
</tr>
<tr>
<td>b) Drill Form</td>
<td>Uplifting of drill cuttings, cooling and reduction of friction.</td>
<td>Not expected to have any impact. It is biodegradable and will be flushed out during the development process.</td>
</tr>
<tr>
<td>c) Lubricants, oils and diesel</td>
<td>For lubricating and running of machinery.</td>
<td>Spillages can adversely affect the environment, both flora and fauna.</td>
</tr>
<tr>
<td><strong>2) Permanent Materials</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Casing and Screens</td>
<td>Provide support to borehole wall and avoid caving in.</td>
<td>Corrosion of metal casings from reaction with water may contaminate water. Casings and screens should be installed upon water quality analysis.</td>
</tr>
<tr>
<td>b) Gravel pack</td>
<td>Annular filling between the casings and the borehole.</td>
<td>Gravel pack is generally inert as it is composed of quartz. It should be washed to remove the fines, which may lead to clogging in the submersible pump.</td>
</tr>
<tr>
<td>c) Bentonite</td>
<td>Sealing off the upper part of the borehole for sanitary purposes.</td>
<td>None</td>
</tr>
<tr>
<td>d) Cement</td>
<td>Construction of a concrete slab around the borehole.</td>
<td>None</td>
</tr>
<tr>
<td>e) Dipper line</td>
<td>Plastic PVC 2mm pipe for monitoring of the water level in the borehole.</td>
<td>None</td>
</tr>
<tr>
<td>f) Submersible Pump</td>
<td>Pumping water from the borehole.</td>
<td>None</td>
</tr>
<tr>
<td>g) GI pipes</td>
<td>For lifting of water from the borehole.</td>
<td>Corrosion of metal pipes may result if water is reactive, thus contaminating water. Type of Pipes to be installed based on water quality analysis</td>
</tr>
<tr>
<td>h) Water Monitoring Meter</td>
<td>Monitor abstraction level</td>
<td>None</td>
</tr>
</tbody>
</table>

### 2.3.4 Well Site Requirements

*Drill Area* - The designated drill site, which will cover about 10m x 10m area, will be cleared for the drill rig and associated equipment. A small drain channel will be constructed to control surface runoff from the drill site.
Access Track - An access track will be required to allow access of the drill rig to the site. The site is easily accessible without any difficulty.

Water - About 15,000 litres of water will be required for the drilling operations. As there is no reliable source of water in the area, the contractor will be required to truck in his own water.

Toilet Facilities - The drill crew will use toilets facilities that are used by the Institution.

2.3.5 Electric pump
A submersible electric pump will be used for pumping of water from the borehole site to the elevated tank. There is 3 phase electricity at Noonkopir Township Primary School approximately 500m away. This will be extended to the site. The electric pump is normally quite durable. In terms of maintenance the pump requires well trained personnel. The disadvantages of using electricity is that it can be expensive especially during drought. There are also power outages from time to time.

2.3.6 Storage tanks
Water from the borehole will be pumped directly to an elevated storage tank on a 10m tower at the school and directed to 2 additional plastic tanks for storage and distribution by gravity to the pupils and consumers. The tank will provide storage required to even out fluctuations in demand and supply and to provide emergency storage when there is a breakdown in pumping equipment. It will also act as a balancing tank to reduce peak flows in the rising main and as a discharge point for the pumping system. The Practice Manual for Water Supply Services in Kenya recommends a storage size for ½ day demand. However, the storage will be sized according to the borehole yield.

2.3.7 Pump house
A new pump/control house will be constructed.

2.3.8 Water Kiosk
The design will be of an appropriate and low-cost technology for ease of construction, operation and management. The water kiosk will be provided with a gate valve and a water meter in valve chamber. Multiple stainless-steel water taps will be provided at the kiosk, with all fittings made of galvanized iron.
CHAPTER 3: ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS
This section provides a brief description of the project environment and is based on a review of the existing information, site visits undertaken by the project team and discussions with the public/stakeholders. The study area is Kitengela, Kajiado County.

3.1 Project Location
Kajiado County is one of the fourteen counties in the Rift Valley region of the Republic of Kenya. It is bordered to the North by Kiambu, Nakuru and Nairobi, to the South by Taita Taveta and Tanzania, to the Narok and to the East by Makueni and Machakos Counties. It lies between Longitudes 360 5” and 370 5” East and between Latitudes 10 0” and 30 0” South. Kajiado County occupies a total area of 21,900.9 Km2. The County lies between 5000 m above sea level (A SL) at Lake Magadi to 2,500 m above sea level (ASL) at the Ngong Hills. Valley is a low depression on the western side of the county running from north to south. It is made up of steep faults giving rise to plateau, scarps and structural plains. The rivers are mainly seasonal with upper parts of Tsavo River being perennial. Its main tributaries Nolturesh, Magoine and Rombo, flow from the eastern slopes of Mt. Kilimanjaro. Other rivers in the County include River Mbagathi, River Kandisi and River Kajiado and they to join Athi River. The County is divided into five constituencies; Kajiado East, Kajiado West, Kajiado Central, Kajiado North and Kajiado South.

The project site lies within Kajiado East constituency which has a total population of 137,254 and five County Assembly Wards (CAW). The project site lies within Oloosirkon/Sholinke CAW in Kitengela Town (figure 4 below) with an urban population of 58,167 which forms its entire population, according to the census conducted in 2009.
Noonkopir Township Primary School and its environs

Project Site at the Noonkopir Township Primary School

*Figure 4: Project Location*
3.2 Physical environment

3.2.1 Climate
The mean annual rainfall in Kitengela ranges from 300mm to 800 mm. The rainfall is bimodal, with short rains occurring from October to December and long rains from March to May. Distribution of rainfall between the two seasons changes gradually from east to west across Kajiado County. More rainfall occurs during the "short rains" in eastern Kajiado than during the "long rains". In western Kajiado the majority of rainfall occurs during the "long rains". The annual rainfall is influenced by altitude.

The mean daily temperature ranges between 12 and 30°C. It is usually dry and cold between July and August, but hot and dry in January and February (CBS 2003). The mean monthly relative humidity varies between 36 and 55 per cent. The mean daily sunshine hours varies between 3.4 and 9.5 hours (CBS 2003). The cloudiest part of the year is just after the first rainy season, when, until September, conditions are usually overcast with drizzle.

3.2.2 Geology and Soils
The proposed site area is generally a highland volcanic plain and plateau standing above the lower Athi plains to the east and the Rift Valley System to the west. East of Kajiado area is predominantly covered by black cotton soil which is underlain by volcanic rocks, mainly agglomerates, tuffs and phonolites. The area has several faults running in a north-south direction. There are also small to medium sized caves found in some of the outcrops of the volcanic rocks spread out in the area.

The project area is overlain by relatively shallow mainly black cotton soils which in some areas grade into more grayish colored loamy soils. These soils are products of weathering of the underlying volcanic rocks – the Oldoinyo Narok Agglomerates and Kerichwa Valley tuffs. There are scattered outcrops of agglomerates and welded tuffs which mean there is no soil cover. Between the black cotton soil and bedrock is a layer of lateritic soil that is grayish-brown in color and often contains rounded gravel. The project area lies in the Ol Doinyo Narok plateau which ranges between 1850 and 2035m above mean sea level. The area has numerous faults running north-south and is associated with the Rift Valley system that has a similar trend. The geology of the area is characterized by Athi series rocks, Kapiti phonolites and basement system rocks.

3.2.3 Topography
The general topography of Kajiado County is characterized by plains and occasional volcanic hills. The land rises from about 500 meters above sea level around Lake Magadi to about 2,500 meters above sea level in the Ngong Hills area. The County can be divided into four topographic areas: The Rift Valley, Athi Kapiti Plains, Central Broken Ground and the Amboseli Plains. The Rift Valley is a low depression on the west side of the County which runs from north to south. The depression has important features such as Mount Suswa and Lakes Magadi and Natron. Both lakes have substantial deposits of soda ash but commercial exploitation is going on in Magadi only. On the far western Nguruman Escarpment, there are three main rivers namely, Oloibortot, Entasopia and Sampu which support significant irrigation agriculture.
The Athi Kapiti Plains consist mostly of open rolling land. The area also includes the Ngong Hills with an altitude of 2,500 meters above the sea level and is the source of Athi River. The river is fed by its major tributaries Mbagathi and Kiserian both of which are permanent rivers. The Central Broken Ground comprises a 20 to 70 kilometer wide stretch from the North-eastern border across the County to the south west. There are permanent water sources draining this area. This area is also crisscrossed by many dry river beds which are important sources of sand for building and construction industry in Nairobi and the County itself. The Amboseli Plains are characterized by gently undulating plains with deep reddish brown clay loamy soils and flat sedimentary plains with poorly drained cotton soils.

3.2.4 Hydrology and hydrogeology

The key water resources in the area are:

- Rainwater harvesting;
- Sub surface water (shallow wells, water pans);
- Ground water;
- Running water (rivers, springs)

Water is used for multiple purposes among them being domestic, livestock, and agriculture. The area faces an acute water shortage due to low and unreliable rainfall, limited permanent water resources and pollution of water sources. On average, women travel between 5 and 10 kilometers to access water and are not included when water management decisions are made. Kitengela Town has scarce permanent natural sources of surface water with the main one being Athi River and Kasuitu river which is a seasonal river. Generally, Kajiado County experiences severe shortage of water due to lack of surface waters mostly in rivers and streams due to their seasonality. There is low precipitation in most parts of the area and frequent drought experienced in nearly all parts of the County.

A survey of the water resources revealed existence of substantial water resources within the County that serve during dry seasons in the area. The seasonal river has dry beds during dry seasons but has “wells” on the beds that contain waters during dry season. Some of these can serve local community water requirements, livestock and wildlife drinking waters throughout the year. However, most of the valleys are very rugged to be accessed by people and livestock. There are few existing developed water resources in the area mainly constructed by the Ministry of Water and local initiatives. These are more reliable sources of water but are located far away from most people in the area. Through individual initiatives small water-pans are constructed however their lifespan is uncertain in dry seasons. Kitengela Town has several boreholes at various points for the communities to access water. This implies that people have to walk to the water point, fetch the water and carry it to their homes. Some other commercial premises have their own borehole to serve their needs.
3.3 Biological Environment

3.3.1 Flora and Fauna

The common vegetation types predominant in Kajiado County are open grasslands, wooded and bushed grassland, bush and woodland, and forests. Among these types, bushes and woodland occupy a larger area of the county. The proposed project area is characterized by unique vegetation covers comprising of open grassland dominated by the *Vachellia drepanolobium* species and trees mainly acacia *xanthophloea*.

Two conspicuous herbivores observed in the project area include Zebras and Thompson Gazelles. During the dry season the number of species and population observed were few compared to the wet season. Herpetofauna such as snakes, geckos on tree bark and on rocks and frogs in wells and seasonal streams were observed during the transect surveys although these groups were not easy to spot.

*Figure 5: Vegetation in the project area*
3.4 Social set up

3.4.1 Cultural Heritage

This community is made up of two major clans and several sub clans who are culturally similar. The two major clans are Odonongi and Orok’kiteng. Odonongi is made up of Ilmolelian, Ilmokesen, and Irkerinkishu sub clans while Orok’kiteng is made up of Ilukumae and Ilaiser sub clans.

The community has an age set system of social organization. The first age group according to a key informant was Iltalala. This is the age group that migrated from Kerio valley and settled in Kinangop. Ilpeles was the next age group and the one that continued the journey from Kinangop to settle in their present location in Kajiado. Other subsequent age groups are Ituati, Iltraenkolong, Ilmishuki, Iloshoron, Ilmaridani, Ihnyangusi (the key informant’s age group), Iseuri, Irkitoip and Ilkeshiro in that order. There is an interval of approximately twenty years between age groups.

The Maasai are traditionally polygamous but this tradition is slowly dying out as it has become increasingly difficult to maintain a large number of wives and children. Most of the younger men now have one wife and send all their children to school, in contrast to older men who still selectively send only the male children to school. This then results in girls getting married at a very young age as soon as they are initiated. The younger the age at which the girls get married, the higher the likelihood of having many children, and there are records of women having as many as 12 children. In the past it was easy for a man to marry several wives because it was also easy to maintain large herds of cows, but the number of animals kept by each family has reduced drastically in recent years. This is due to several factors, mainly, a rise in population and a shortage of pasture for the animals. The Maasai keep cows, goats, sheep and donkeys with the latter being the least. The large numbers of animals required by the Maasai to maintain their livelihood, the effects of climate change and their displacement from the Northern grazing lands have all contributed to a change in their subsistence to a certain extent. The private ownership of land and fencing off what was once accessible grazing lands have restricted the movement of the Maasai in search of pasture for their animals, with the result that they lose nearly all their animals during droughts. Their diet now no longer consists of milk, meat and blood, and they have to rely on other Kenyan staple foods such as ugali and beans.

3.4.2 Economic Profile

Kitengela is one of the most urbanised towns in the County and serve as a commercial, industrial and residential area for the working population in Kitengela and Nairobi. It’s growing faster compared to other urban areas due to it’s proximity to Nairobi. Trading is a major activity in this town including a large population working in the industries within the area.

3.4.3 Employment level and labour force

A large number of the workforce work in either in the Economic Processing Zone or various factories within the area. Portland cement and Savanna cement factory within the proximity of the project site. The monthly income is mainly generated from salaries, wages or profits earned in
business. The population in Kitengela mainly participates in the industrial activities, with few in mainstream employment and business. Majority of the school going children attend school including children with special needs.

3.4.4 Housing
The area is diversified in terms of the type of the common building materials used in the construction of the houses but what stands out is that the modern bungalows, maisonettes and apartments with tiled roof or corrugated iron sheets roof. Most of the houses neighbouring the project area are owned, self-constructed and stone houses/structures.

3.4.5 Utilities and Services
Most of the population residing in the project area has limited access to water in the form of household water inside their dwellings. However it was observed that the construction of water tanks and rain-water harvesting is on the rise. There is increasing privatization of water use from private boreholes. Community boreholes also exist at various points to increase access to water being built. Sanitation levels are low with pit laterines being utilized with limited water for handwashing. Electricity is available in the area with charcoal, gas and firewood being used for cooking.

3.4.6 Transportation services
According to observations and interviews, the predominant mode of travel which individuals use to travel to work and school is by foot and/or public transport. This is followed by travel using a private vehicle. The time taken for local travel on foot is a large burden especially on women and men and also on school going children. The distances covered are large per day. Travel to commercial centres involves having passengers in a public or private vehicles. Motobikes “boda bodas” are also a common within the Town and are mostly used to access remote areas or areas that public transport is not available.

3.4.7 Administrative and Political Unit
a) Road and telecommunication
The area is accessible via the Nairobi-Namanga highway which is a tarmac road. The access roads are mainly earth road with a few being upgraded to different standards. The mobile telecommunication facilities in the area include: Safaricom, Airtel and Telkom.

b) Energy sources
The main energy sources in the county are electricity, firewood, charcoal, solar and petroleum products. Out of 173,464 households across Kajiado County, only 69,098 households are connected to electricity accounting for 39.8 percent of the households, with highest number of households being in the urban areas. Other sources of energy underexploited include wind, solar and geothermal.

c) Land and land use
Land is mainly used for Industrial, commercial and residential use. Mining activities like quarrying and sand harvesting are also common in the area. Trade at the core of the community with markets, shopping malls, hotels, banks among others dominating the area.

### 3.4.8 Population size and distribution

The human population within Kitengela area has more than doubled in the last 10 years, from 6548 in 1889 to 17,347 in 1999 to 58,167 in 2009. The actual and projected population of Kitengela Town is as shown in the following table.

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kitengela</td>
<td>30088</td>
<td>28079</td>
<td>58167</td>
<td>39325</td>
<td>36699</td>
<td>76024</td>
<td>43778</td>
<td>40835</td>
<td>84633</td>
</tr>
</tbody>
</table>

Kitengela town holds more of the urban population than any other town in the county with 41 percent of the total. The male urban population (50.4 percent) is more compared to Female urban population (49.6 percent).

### 3.4.9 HIV and AIDS, Malaria and other diseases

HIV and AIDS are considered a threat to the development of Kenya. The prevalence rate stands at 3.7 per cent. AIDS related deaths are common and those mainly affected are within the productive age group of 15-49 years of age. It was also noted that the number of HIV/AIDS orphans is on the increase. Poverty is viewed as a major cause of HIV/AIDS. Poverty increases vulnerability of people with HIV, hence there is need to redirect resources towards support services to poor households.

The situation is further aggravated by the fact that HIV/AIDS mostly affects people in the productive age leaving minors and the elderly people to take care of households. Progressive gains on poverty reduction may be reversed if concerted efforts are not urgently put in place to bring the HIV/AIDS pandemic under control. Implementation of the project thus needs to create comprehensive HIV/AIDS awareness among the workers along the project area.
CHAPTER FOUR: ANALYSIS OF PROJECT ALTERNATIVES

4.1 Introduction
Regulation 18(1) of Legal Notice 101 specifies the basic content of an Environmental Impact Assessment Study / Project Report after which, subsection (i) requires an analysis of alternatives. Analysis of project alternatives requires comparison of feasible alternatives for the proposed project in terms of: project site, project technology, potential environmental and social impacts, capital and recurrent costs, suitability under local conditions, and acceptability by neighbouring land users.

This chapter describes and examines the various alternatives considered during the design of the project. The consideration of alternatives is one of the proactive sides of environmental and social assessment required to enhance project design. This is achieved through examining options instead of only focusing on the more defensive task of reducing adverse impacts of a single design option. The alternative that was considered for the project was focused on: -

i) “No-action” Alternative
ii) Water Sources Alternatives
iii) Distribution Alternatives
iv) Management Alternatives
v) Implementation of the Proposal as per the ESIA Report

4.2 “No action” Alternative
The “no project” alternative would mean further problems in spending more time and money in accessing water for domestic use. This project provides hope for the school children and the community who spend time and money to access water from boreholes within the neighbourhood. Dangers of waterborne diseases such as cholera will prevail with this alternative. Furthermore, the sanitation situations will deteriorate with negative ramifications on the environment. A ‘no project’ alternative is therefore, a continuation of the current status quo and quite undesirable. The No Project Option is the least preferred from the socio-economic and environmental perspective due to the following factors: -

a. Increased problems associated with limited access to clean and affordable water supply.
b. The economic status of the local people would remain unchanged.
c. No employment opportunities will be created for locals who will work at the proposed project
d. Discouragement for investors planning to invest in water infrastructure
e. Development of infrastructural facilities such as health facilities, electrical etc. will not be undertaken

From the above analysis, it becomes apparent that the No Project alternative is not feasible.
4.3 Water Sources Alternatives
The community should consider roof catchments of rainwater to supplement water supply from the borehole. Harvesting of rainwater will reduce pressure on the grounds and will provide plenty of water for use particularly for the community. The proponent should also install water storage tanks for storing harvested rainwater. This alternative is not feasible currently, since there is a cost is attached to the proposal which is also dependent on unpredictable weather patterns, hence no guarantees of water supply throughout the year.

4.4 Distribution Alternatives
The proposed project should be implemented using technologies that shall have minimum negative impacts to the environment. The project implementation should consider using a solar pump and gravity-based system as opposed to a pumping system that will be fossil fuel based or will involve incorporation of several other components that might lead to environmental degradation such as generation of Green House Gases (GHG) among other air pollutants. In addition to the gravity, based system the project shall involve developing standby electric pump to be used only during solar pump failures. This alternative is feasible in the future when more funds are available but currently not feasible.

4.5 Management Alternatives
The water project upon commissioning will be handed to the School management. The School will oversee the day-to-day running of the water facility. Alternatively, the School head teacher may contract a company to take charge of the water supply and pay dues as per agreement.

4.6 Implementation of the Proposal as per the ESIA
Upon completion of the construction works, the water project will be handed over to the School management. The proposed water supply project is considered as a school and community water project and may benefit as indicated below:

i. **Prime locality for access of water:** Noonkopir Township Primary School is strategically located, currently the pupils and the community source water from neighbouring boreholes at a cost that’s not sustainable.

ii. **Land Acquisition and Resettlement:** Noonkopir Township Primary School borehole Project is located on the school’s piece of land which implies that there is no need for land acquisition. Any land issues that may occur during project implementation will be dealt.
CHAPTER FIVE: POLICY AND LEGAL FRAMEWORK AND INSTITUTIONAL FRAMEWORK

5.1 Introduction

Noonkopir Township Primary School borehole project will be administered and implemented in accordance with the provisions of the Kenyan policy, administrative and legal framework and in conformance with international best practices. The legislative and legal framework applicable to the implementation of the proposed project is outlined in the following sections.

5.2 Policy provisions

5.2.1 Constitution of Kenya

Article 42 of Bill of Rights of the Kenyan Constitution provides that every Kenyan has a right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislation and other measures. Part II of Chapter 5 of the Constitution (Environment and Natural Resources), (I) the State clearly undertakes to carry out the following: -

i. Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;

ii. Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya;

iii. Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities;

iv. Encourage public participation in the management, protection and conservation of the environment; Protect genetic resources and biological diversity;

v. Establish systems of environmental impact assessment, environmental audit and monitoring of the environment;

vi. Eliminate processes and activities that are likely to endanger the environment; and

Part (II) “Every person has a duty to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources. Chapter 5 on Land and Environment emphasizes on the following: -

i. Land use and management shall by law benefit local communities

ii. Community land is protected from encroachment by State.

iii. Law shall protect Rivers, forests and water bodies.

iv. Equitable access to land.

v. All lawful land rights are secured; only someone who has stolen land needs to worry.

vi. County governments will manage land in trust of the people in accordance with the Constitution.

Relevance
The Constitution of Kenya provides for sound management and sustainable development of all of Kenya’s Projects, both public and private investments. It also calls for the duty given to the Project proponent to cooperate with State organs and other persons to protect and conserve the environment as mentioned in Part II.

5.2.2 Kenya Vision 2030

Kenya Vision 2030 is the current national development blueprint for period 2008 to 2030 and was developed following on the successful implementation of the Economic Recovery Strategy of Wealth and Employment Creation which saw the country’s economy back on the path to rapid growth since 2002. GDP growth rose from 0.6% to 7% in 2007 but dropped between 1.7% and 1.8% in 2008 and 2009 respectively. The objective of the vision 2030 is to “transform Kenya into a middle-income country with a consistent annual growth of 10% by the year 2030”. One of its aims is to make Kenya to be a nation that has a clean, secure and sustainable environment by 2030. This will be achieved through promoting environmental conservation to better support the economic pillar.

Developing and improving basic infrastructure and services namely will achieve Kenya’s transformation into a middle-income country: roads, streetlights, storm water drains, footpaths, and water and sanitation facilities among others.

Relevance

This project aims at increasing access to water to the pupils and the community, which improves the economy, health, and sanitation of the entire community. The project will offer an opportunity for the local community to empower themselves economically through securing employment and service provision.

5.2.3 National Environment Policy (NEP), 2013

Sessional Paper No. 6 of 1999 on Environment and Development since adoption by parliament in 1999 has been in use and influenced the formation of EMCA in 1999 with 2015 amendments but has since been surpassed by time and is therefore under revision to comprehensively cover areas that were previously left out to augment it.

The revised draft of the National Environmental Policy, dated April 2012, sets out important provisions relating to the management of ecosystems and the sustainable use of natural resources, and recognizes that natural systems are under intense pressure from human activities particularly for critical ecosystems including forests, grasslands and arid and semi-arid lands. The objectives of the Policy include developing an integrated approach to Environmental management, strengthening the legal and institutional framework for effective coordination, promoting environmental management tools.

Relevance

The project shall implement the Environmental and Social Management and Monitoring Plan (ESMMP) to mitigate the impacts of the resulting impacts during the construction and operational phases of the project; this will ensure that the sensitive ecosystems are not
destabilized by the subsequent Project activities.

5.2.4 National Land Policy, 2009
Chapter 2 of the policy is linked to constitutional reforms; regulation of property rights is vested in the government by the Constitution with powers to regulate how private land is used to protect the public interest. The Government exercises these powers through compulsory acquisition and development control. Compulsory acquisition is the power of the State to take over land owned privately for a public purpose. However, the Government must make prompt payment of compensation.

Chapter 4 of the land policy under Environmental Management Principles, the policy provides actions for addressing the environmental problems such as the degradation of natural resources, soil erosion, and pollution.

For the management of the urban environment it provides guidelines to prohibit the discharge of untreated waste into water sources by industries and local authorities; it also recommends for appropriate waste management systems and procedures, including waste and waste water treatment, reuse and recycling. This project aims at improving access to water in the Project area.

The policy goes further to advocate for environmental assessment and audit as a land management tool to ensure environmental impact assessments and audits are carried out on all land developments that may degrade the environment and take appropriate actions to correct the situation. Public participation has been indicated as key in the monitoring and protection of the environment.

Chapter 4 further advocates for the Implementation of the polluter pays principle which ensures that polluters meet the cost of cleaning up the pollution they cause and encourage industries to use cleaner production technologies.

5.2.5 HIV and AIDS Policy, 2009
The proposed project is to be implemented in the rural area, this area has high freelance cases of HIV and Aids. This policy shall provide a framework to both the project proponent and contractor to address issues related to HIV and Aids. In summary, the policy provides a mechanism for:

- Setting Minimum Internal Requirements (MIR) for managing HIV and AIDS
- Establishing and promoting programmes to ensure non-discrimination and non-stigmatization of the infected;
- Contributing to national efforts to minimize the spread and mitigate against the impact of HIV and AIDS;
- Ensuring adequate allocation of resources to HIV and AIDS interventions;
- Guiding human resource managers and employees on their rights and obligations regarding HIV and AIDS.

Relevance
The Policy will be complied with during implementation of the project; the contractor will in cooperate in tender document and implement HIV awareness initiatives during construction of the project.

5.2.6 Gender Policy, 2011
The overall goal of this Policy Framework is to mainstream gender concerns in the national development process to improve the social, legal/civic, economic and cultural conditions of women, men, girls and boys in Kenya. The policy provides direction for setting priorities. An important priority is to ensure that all ministerial strategies and their performance frameworks integrate gender equality objectives and indicators and identify actions for tackling inequality. In addition, each program will develop integrated gender equality strategies at the initiative level in priority areas. Within selected interventions, the policy will also scale-up specific initiatives to advance gender equality

Relevance
This policy will be referred to during project implementation especially during hiring of workers to be involved in the project, procuring of suppliers and sub-consultants and sub-contractors to the project.

5.2.7 The Sustainable Development Goals (SDGs)
The 2030 Agenda comprises 17 new Sustainable Development Goals (SDGs), or Global Goals, which will guide policy and funding for the next 15 years, beginning with a historic pledge to end poverty.
The concept of the SDGs was born at the United Nations Conference on Sustainable Development, Rio+20, in 2012. The objective was to produce a set of universally applicable goals that balances the three dimensions of sustainable development: environmental, social, and economic.
The Global Goals replace the Millennium Development Goals (MDGs), which in September 2000 assembled the world around a common 15-year agenda to tackle the indignity of poverty. Sustainable Development Goal (6) which is the new 2030 agenda and expands Millennium Development Goal as guided by resolutions of Rio+20 conference. The goal focuses more on investment in adequate infrastructure in water sanitation, hygiene, water quality, wastewater management, water scarcity and use efficiency, integrated water resource management and protection of water related ecosystems. The Noonkopir Township Primary School borehole will directly contribute towards achieving this goal.

5.3 Kenyan Legislations
5.3.1 The Environmental Management and Coordination Act (EMCA Cap 387)
The Act provides for the establishment of a legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto. Just
as in the New Constitution, Part II of EMCA confers to every person the right to a clean and healthy environment and to its judicial enforcement. The new Constitution and EMCA therefore obligates the project’s executing agency and Contractor to work in a clean environment and not to contravene the right of any person within its zone of influence, to this entitlement. EMCA has provided for the development of several subsidiary legislations and guidelines which govern environmental management and are relevant to the project implementation. These include:

i. The Environmental (Impact Assessment and Audit) Regulations, 2009 Legal Notice No. 101;
ii. The Environmental Management and Coordination (Waste Management) Regulations, 2006 Legal Notice No. 121;
iii. The Environmental Management and Coordination (Water Quality) Regulations, 2006 Legal Notice No. 120;
iv. The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009 Legal Notice No. 61;
v. The Environmental Management and Coordination (Air Quality Regulations 2014)
vi. The Environmental Management and Coordination (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006 Legal Notice No. 160;
viii. The Environmental Management and Coordination (Controlled Substances) Regulations, 2007 Legal Notice No. 73.

Relevance to the Project
EMCA Cap 387 and above listed regulations will form the main statutory instruments which will guide the implementation of the project so that any likely adverse impacts that could be caused by the project are promptly mitigated as recommended in this study.

5.3.2 Water Act 2016.
The Water Act 2002 was amended in the year 2016 to align to the Kenyan Constitution 2010, the Act vest the responsibility of developing water and Sanitation infrastructure (sewerage and water supply) to the water service boards and ownership and management to the WSP that acts as the agent for the board. Section 73 of the Water Act allows a person with a license to supply water (licensee) to make regulations for purposes of protecting against degradation of sources of water which he is authorized to take. Under the Act, the licensee could be a local authority, a private Trust or an individual and the law will apply accordingly under the supervision of the Regulatory Board. Section 75 and sub-section 1 of the Water Act allows a licensee for water supply 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 water belonging to the licensee or which he is authorized to take for supply from being polluted. However, if the proposed works will affect or is likely to affect any body of water in the catchment, the licensee shall obtain consent from the Water Resources Management Authority.

Section 76 states that no person shall discharge any trade effluent from any trade premises into sewers of a licensee without the consent of the licensee upon application indicating the nature and composition of the effluent, maximum quantity anticipated, flow rate of the effluent and any other information deemed necessary. The consent shall be issued on conditions including the payment rates for the discharge as may be provided under section 77 of the same Act.

**Relevance to the Project**
This Act will be relevant during construction of the project whereby the contractor will be required from time to time ensure that project activities do not pollute water resources in the project area.

The Contractor will also be required to comply with the effluent discharge requirements during construction of the project which will require that the contractor obtain relevant permits from Water Resource Authority (WRMA) on case by case basis when required.

### 5.3.3 County Government Act No. 17 of 2012
Part II of the Act empowers the county government to oversee function described in Article 186 of the constitution, (county roads, water and Sanitation, Health), Part XI of the Act vest the responsibility of planning and development facilitation to the county government with collaboration with national government, this arrangement has been adopted for interventions in order not to conflict with provisions of the Kenyan Constitution.

**Relevance to the Project**
The project once commissioned by NAMSIP will be handed over to Noonkopir Township Primary School which will be licensed by Kajiado Government to operation and maintenance the borehole.

### 5.3.4 Physical Planning Act 1996 (Cap 286)
Section 29 of the said Act empowers the local Authorities (now county governments) to reserve and maintain all land planned for open spaces, parks, urban forests and green belts as well as land assigned for public social amenities.

The same section allows for prohibition or control of the use and development of an area.

Section 30 states that any person who carries out development without development permission will be required to restore the land to its original condition. It also states that no other licensing authority shall grant license for commercial or industrial use or occupation of any building without a development permission granted by the respective local Authority.

**Relevance to the Project**
Thus, the Act directs, regulates and harmonizes development and use of land over the Country, the entire project has been designed within the land of the school. Any issues that may be encountered will be dealt with in a case by case bases.

5.3.5 Occupational Health and Safety Act (OSHA 2007)
This legislation provides for protection of workers during construction and operation phases. It is tailored at implementation of the EHS plan in compliance with the relevant sections of this Act. The ESMMP prepared under this assessment has provided for specific health and safety aspects to be complied with during implementation of the project.

**Relevance to the Project**
The Act provides EHS guidelines which shall be followed by both the contractor and supervising consultant during implementation of the project to avoid injuries and even loss of life to pupils, workers and neighbouring community.

5.3.6 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 for injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 and include nuisances caused by accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbour rats or other vermin.

**Relevance to the Project**
The Act provides guideline to the contractor on how he shall manage all wastes (Liquid and Solid Wastes) emanating from the project in a way not to cause nuisance to the community, this Act during construction shall be read alongside the waste management regulations of EMCA Cap 387 for utmost compliance.

5.3.7 Work Injury Benefits Act, (WIBA 2007)
This is an Act of Parliament to provide for compensation to employees for work related injuries and diseases contracted during their employment and for connected purposes. An employee is a person who has been employed for wages or a salary under a contract and includes apprentice or indentured learner.

_The proposed project will adhere to the provisions of this act throughout the construction period of the project._

5.4 Institutional Structure of the Water Sector
The Water Act 2002 was repealed and replaced by Water Act 2016, this Act now aligns Water Services Management to the Kenyan Constitution 2010.
The Ministry of water and sanitation is responsible for policy development, sector co-ordination, monitoring and supervision to ensure effective Water and Sewerage Services in the Country, sustainability of Water Resources and development of Water resources for irrigation, commercial, industrial, power generation and other uses. The Ministry executes its mandate through the following sector institutions:
5.4.1 **Water Services Regulatory Board (WASREB)**

Section 70 of the Water Act 2016 provides for establishment of Water Services Regulatory Board; this assessment assumes that the current Water Services Regulatory Authority (WASREB) will assume the roles proposed in the Water Act 2016. The regulatory Board is responsible for the regulation of the water and sewerage services in partnership with the people of Kenya. The mandate of the regulator covers the following key areas:

i. Regulating the provision of water and sewerage services including licensing, quality assurance, and issuance of guidelines for tariffs, prices and disputes resolution.

ii. Overseeing the implementation of policies and strategies relating to provision of water services licensing of Water Services Boards and approving their appointed Water Services Providers,

iii. Monitoring the performance of the Water Services Boards and Water Services Providers,

iv. Establish the procedure of customer complaints,

v. Inform the public on the sector performance,

vi. Gives advice to the Minister in charge of water affairs.

5.4.2 **Water Resources and Management Authority (WRMA)**

Section 11 of the Water Act 2016 provides for establishment of Water Resources Management Authority; this assessment assumes that the current Water Resources Authority (WRA) will assume the roles proposed in the Water Act 2016. The authority is responsible for sustainable management of the Nation's Water Resources:

i. Implementation of policies and strategies relating to management of water resources, Develop principles, guidelines and procedures for the allocation of water,

ii. Development of Catchments level management strategies including appointment of catchments area advisory committees,

iii. Regulate and protect water resources quality from adverse impact

iv. Classify, monitor and allocate water resources.

5.4.3 **Water Services Boards (WSBs)**

Section 65 of the Water Act 2016 provides for establishment of Water Works Development Agencies; this assessment assumes that the current Water Services Boards (WSB) will assume the roles proposed in the Water Act 2016. The WSBs are responsible for planning and development of water and sewerage services infrastructure in their areas of jurisdiction. In Kajiado County the relevant Water Services Board is the Athi Water Services Board, this Board is mandated to

i. Develop the facilities, prepare business plans and performance targets

ii. Planning for efficient and economical provision of Water and sewerage services within their areas of jurisdiction;
5.4.4 Water Services Providers
The Kenyan Constitution Article 186 and 187 and corresponding further schedule item 11(b) mandates the county government to oversee Water and Sanitation in their respective counties. The County Government Act of 2012 part II provides more elaborate interpretation of the function.
They have vested this mandate to Water Service Providers which are utilities or water companies. They are County Government owned but have been commercialized to improve performance and run like business within a context of efficiency, operational and financial autonomy, accountability and strategic, but minor investment.
In Kajiado County there are one WSP mandated to provide water and sanitation services in different areas of jurisdiction.

5.5 NEMA Compliance
The government established the National Environmental Management Authority (NEMA) as the supreme regulatory and advisory bodies on environmental management in Kenya under EMCA Cap 387. NEMA is charged with the responsibility of coordinating and supervising the various environmental management activities being undertaken by other statutory organs. NEMA also ensures that environmental management is integrated into development policies, programmes, plans and projects.

5.6 Sectoral Integration
This integration encourages provision of sustainable development and a healthy environment to all Kenyans. The key functions of NEMA through the NEC include policy direction, setting national goals and objectives and determining policies and priorities for the protection of the environment, promotion of cooperation among public departments, local authorities, private sector, non-governmental organizations and such other organizations engaged in environmental protection programmes and performing such other functions as contained in the act.

5.7 Project Implementation Institutional Structure
NAMSIP has an established implementation system that has clear provisions for environmental and social integration through the Environmental Division. An ideal project management structure proposed for the organization in this project has the following components:

5.7.1 The Contractor
The contractor will be required to establish an environmental office to continuously advise on environmental components of the project implementation. Elements in the environmental and social management plan are expected to be integrated in the project with appropriate consultations with NAMSIP S through the supervising environmental expert. The environmental officer of the contractor is also expected to fully understand the engineering and management aspects of the project for effective coordination of relevant issues.

5.7.2 The Supervisor
The supervisor will be engaged by NAMSIP (as the project proponent) to ensure effective implementation of the environmental management plan. It is expected that supervisor engages the services of an environmental expert who should in return understand the details of the
recommendations on environment management and especially the proposed action plans, timeframes and expected targets of the management plan. The environmental supervisor expert should also be the liaison person between the contractor and the management of the school on the implementation of environmental concerns as well as issues of social nature associated with the Project.

5.8 International guidelines

5.8.1 World Bank Environmental and Social Safeguards Standards

Like in any project financed by, or with financial participation of, the World Bank, the environmental and social safeguards as defined in the Bank's OPs will be respected for the purposes of this project implementation. WB classifies its projects into four Environmental Assessment categories according to the likely impacts on the environment they will have. This classification is as follows (only main conditions mentioned):

(a) Category A: A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts.

(b) Category B: A proposed project is classified as Category B if it’s potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects. This NaMSIP sub-project has been categorized as B.

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

(d) Category FI: A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts; this case, in any way, is not applicable to the NaMSIP project.

Most of the proposed specific projects are in the areas of water supply, storm water drainage and sewerage, with road upgrading and floodlighting in some of the settlements and improvement of roads in key urban areas of the metropolitan region. All of them will have significant positive effects on the environment and on the living conditions of the residents in these areas. Adverse effects, if any, will be limited (some minor and temporarily limited noise and dust during construction). Only where drainage and sewage are concerned, measures will be taken to prevent indirect adverse effects; such effects could be outside of the project sites, i.e. the selected settlements, in the downstream area, to which drainage water and sewage will flow. Such effects can clearly be identified during the screening process and mitigated as described in ESMMP.
The table below shows the applicability of World Bank Safeguards Operational Procedures as it applies to this borehole construction project in Kajiado County of the Nairobi Metropolitan Region.

**Table 7: Applicability of WB OPs**

<table>
<thead>
<tr>
<th>OP</th>
<th>Title</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.01</td>
<td>Environmental Assessment</td>
<td>Triggered. This project falls under category B as per the World Bank OP 4.01 and an environmental and social impact assessment has been undertaken as part of the project preparation to ensure the design, construction, operation and decommissioning phase mitigate the significant adverse environmental and social impacts.</td>
</tr>
<tr>
<td>4.04</td>
<td>Natural Habitats</td>
<td>Not applicable. There are no significant natural habitats on the site of the proposed project.</td>
</tr>
<tr>
<td>4.09</td>
<td>Pest Management</td>
<td>Not applicable. There is no pest at the proposed project site.</td>
</tr>
<tr>
<td>4.10</td>
<td>Indigenous Peoples</td>
<td>Not applicable. There are no known indigenous people living at the proposed project site – it’s a cosmopolitan area with urban population.</td>
</tr>
<tr>
<td>4.11</td>
<td>Physical Cultural Resources</td>
<td>Not applicable. Site visits and inventories have not indicated the presence of any cultural (historical, archaeological) sites in the sample settlements. However, to manage “chance finds” an appropriate procedure is included in this report. Such procedure to be followed by contractors during the construction phase.</td>
</tr>
<tr>
<td>4.12</td>
<td>Involuntary Resettlement</td>
<td>Not applicable. The proposed project is on the school property hence no resettlement is triggered.</td>
</tr>
<tr>
<td>4.36</td>
<td>Forests</td>
<td>Not applicable. The proposed project site has no forest.</td>
</tr>
<tr>
<td>4.37</td>
<td>Safety of Dams</td>
<td>Not applicable. The project does not involve construction of dams.</td>
</tr>
<tr>
<td>7.50</td>
<td>Projects on International Waterways</td>
<td>Not applicable. The proposed project is not on any waterway.</td>
</tr>
<tr>
<td>7.60</td>
<td>Projects in Disputed Areas</td>
<td>Not applicable. The proposed project Site is located within the school property.</td>
</tr>
</tbody>
</table>

5.8.2 Harmonization of both WB and GOK requirements for Social and Environmental Sustainability

The World Bank (WB) and Government of Kenya (GoK) require that Projects of such nature are subjected to environmental and social impact assessment as stipulated under EMCA Cap 387 and its tools; the same process simultaneously fully resolves requirements of OP 4.01 generally, both requirements are aligned in principle and objective in that:
• Both require Environmental Assessment before project implementation leading to development of comprehensive Environmental and social Management plans to guide resolution of social and environmental impacts as anticipated.

• While OP 4.01 of World Bank stipulates different scales of Project Report for different category of projects, EMCA requires Project Report for all sizes of projects, which are required to be scoped as relevant,

• Where EMCA requires consultation of Lead Agencies comprising of relevant sectors with legal mandate under GoK laws, the WB has equivalent safeguards for specific interests.

• The Bank requires that stakeholder consultations be undertaken during planning, implementation and operation phases of the project, which is equivalent to the statutory annual environmental audits at the operation phase of projects in Kenya.

• The understanding of this Project Report study is that, pursuit of an in-depth Project Report process as stipulated by EMCA Cap 387 is adequate to address all World Bank requirements in the OP. This is a major guiding principle in this study.

Therefore, in keeping with this trend, public consultation has been done to the stakeholders, and their comments have been incorporated in the final Environmental Assessment and final design of the project. In addition, the Environmental Assessment report will be made publicly available to all stakeholders through disclosure at the project’s proponent website, NEMA, and WB website, as well as copy of the report available at the project site.
SIX: PUBLIC PARTICIPATION AND CONSULTATION

6.1 Overview
The need for public involvement in project development is enshrined in the Constitution of Kenya, 2010. This requirement is also provided for in the EMCA Cap 387, the Environmental (Impact and Audit) Regulations, 2003, and is one of the guiding principles of the National Environment Policy, 2013.
Public participation ensures that communities and stakeholders are part and parcel of the proposed development(s). It presupposes that the public has access to timely and accurate information on the environment and the proposed development(s), and therefore assures that the developments are sustainable, and resources are also used sustainably. It has also been demonstrated successfully that projects that go through this process acquire a high level of acceptance and accrue benefits to a wider section of society.
Public consultation also forms a useful component for gathering, understanding and establishing likely impacts of projects, determining community and individual preferences and selecting alternatives.

6.2 Benefits of public consultation

6.2.1 Benefits to the developer
- The developer is likely to benefit from local knowledge
- Costs may be saved as key issues are identified by the public and studies are focused on key issues as opposed to a broad range of issues;
- Measures to reduce adverse impacts and enhance benefits will be identified with stakeholders;
- Relations with the communities near the development are likely to be improved;
- Delays in decision making may be reduced because of good participation early in the process;
- The public are unlikely to raise objections to the project; and
- The developer’s image and reputation are likely to be enhanced

6.2.2 Benefits to the public
- Capacity is built through people playing an active role during the process. The skills learnt can be used in other community projects;
- Public rights are exercised and protected in participating; and
- Inputs are likely to influence the form and nature of the development and is likely to lead to better development that takes society’s needs into account.

6.2.3 Benefits to decision makers
- Public participation is likely to improve decisions since there is access to a broader range of perspectives and opinion on the proposed rehabilitation/augmentation;
The development is likely to be more sustainable as it takes people’s needs and views into account; and
- The legitimacy of project commencement and implementation is likely to be improved.

6.3 Approach to public Participation and consultation
The Public consultation process involved visiting the project area and its environs. Project stakeholders were identified and consulted with the aim of informing them about the proposed project, collect their views on anticipated positive and/or negative impacts, get recommendations on how the adverse impacts can be mitigated or avoided, and gather local knowledge that would be useful to the proposed project.

6.3.1 Objectives
The main objectives of the public consultation process were as follows:
- To inform stakeholders about the proposed project;
- To share with stakeholders, the impacts (positive and/or negative) that they should expect from the proposed project during construction and operation; and
- To collect stakeholders’ views, comments, concerns and local knowledge regarding the proposed project.

6.3.2 Engagement methodology
To complete the public consultation exercise, a systematic approach was implemented that consisted of a reconnaissance visit to the project area, review of relevant documentation, conducting interviews, administration of questionnaires to the project stakeholders and holding stakeholders’ meetings. The Public consultation exercise was conducted in the month of March.

6.3.3 Reconnaissance visit
Project site visits were carried out in March 2019 to familiarize with the project area and scope. During these visits, would-be project stakeholders covering government institutions, individual households and the neighbouring communities were identified.

6.3.4 Literature review
A review of relevant information including the project’s design report was done to provide a background on the project and area, and a basis for collection of additional information to fill identified gaps.

6.3.5 Stakeholders identification and analysis
Like in all civil works projects, the core stakeholders comprise people to be directly served by the project once implemented. This is the group that is likely to benefit or be affected by the proposed development hence the primary stakeholders. This study also identified a second category of stakeholders comprised of GoK officers, County government heads and institutions in charge of diverse sectors (Ministry of Health among others). This category was also consulted as key informants on sectoral policy and to advise this ESIA study on mitigation measures to be put in
place to minimize adverse impacts in respective sectors. Each category of stakeholders called for a different approach to consultation. Outcome of community consultation

Questionnaires being administered to the School and Community representatives

Discussions with government official and representatives form the school & community

Figure 6: Public Consultation and Participation

Forms of consultation

Interviews and stakeholder engagements were carried out in the form of a public meeting where attendance sheets were filled, and the questionnaires were administered. This involved filling of questionnaires to solicit views regarding this project from these persons. The status of the project as well as its design was disclosed to the stakeholders at this point. The questionnaire initially gave introduction and created awareness to these stakeholders of the proposed project. Afterwards, the ESIA team enquired on the acceptance of the project and whether the project would cause any negative impacts on the following; a) Residents and their businesses; b) Ecology of the area; c) Public health and safety; d) Effect on water resources and quality; and; e) Waste disposal. The said parameters were directly mentioned to foresee which could have intense negative impact.

6.3.6 Issues Raised

The issues raised in the public meeting included the following:

1. How long the project would take?
2. Will the water abstraction affect aquifers of the neighbouring boreholes?
3. How will the pupils be protected as the project undergoes construction?
4. Can solar energy be considered as part of the project to minimize the electricity bill?
5. How will the waste from the drilling activity be disposed and where?
6. Will noise and dust be mitigated when drilling?

The stakeholders welcomed the proposed project as they are in dire need of water and it will result in improved the health and sanitation for the pupils and the community at large. Further issues are as reflected in the questionnaires in the Annexure. The attendance sheets are also part of the annexure.
CHAPTER SEVEN: ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT & MITIGATION MEASURES

7.1 Introduction

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

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

7.2 Construction Phase

7.2.1 Positive Impacts

7.2.1.1 Creation of Employment and Business Opportunities

During the construction phase, new employment opportunities will be created in the form of skilled and unskilled labour. Majority of the unskilled labour will be sourced from the project area and the gender rule should also be maintained. Business opportunities will also be created for suppliers, sub-contractors and other small businesses such as food kiosk that may set-up near the school. The proposed borehole project will need workers to provide security and undertake all activities related to drilling of the borehole hence employment and business opportunities will have both economic and social benefits to the community.

7.2.2 Negative Impacts

7.2.2.1 Loss of Vegetation Cover and Biodiversity

Construction activities including laying of the pipeline works, construction of the water kiosk and installation of the elevated steel tank have the potential to clear vegetation and loosen soils which is likely to be washed away to the lower areas, especially considering that the school is a high elevation compared to surrounding. The project area has sparse vegetation cover thus impact on them will be minimal.

**Mitigation**

- Ensure proper demarcation and delineation of the project area to be affected by construction works;
- Project implementation plans will be developed such that section excavated are worked on and completed before moving to other areas;
- Identify and restrict movement of vehicles to areas of disturbance;
- Excavated materials should be reused as much as possible in backfilling the trenches or
for land filling activities. Those to be used later should be stored appropriately to protect against elements of weather such as storm water runoff.

- Excavation materials for disposal should be disposed in designated sites so as to reduce risks of being washed away by elements of weather and spillover effects to neighbouring lands or water bodies;
- Proper channels for wastewater drainage should be developed within the project site to reduce washing away of soils and other loose materials;
- Re-vegetation of exposed areas around the site should be carried out rapidly in order to mitigate against erosion of soil through surface water runoff and wind erosion;
- It is recommended that indigenous trees be planted in strategic locations where the vegetation cover will be cleared as part of landscaping initiatives; and
- Develop programs for enhancing vegetation cover the project area.

7.2.2.2 Waste Generation

The construction works involves activities which may lead to generation of both solid waste and waste water. These will include rejected casing materials, excavated materials and cleared vegetation among others. There will also be some solid containers such as cement bags, bentonite residuals and cement bags and other packets with materials and equipment to be used during implementation of the project. The workers at the site will also generate human wastes which needs proper handling to prevent diseases, such as cholera, typhoid and diarrhoea outbreak. This impact is likely to have a significant impact on community and the environment.

Mitigation

- Use an integrated waste management system which includes reduction at source, recycling, re-use, incineration, and dumpsites;
- Any remaining waste (paper or polythene containers, cement bags, bentonite, construction debris, etc. shall be safely disposed in designated waste disposal areas before the project is commissioned;
- Some of the drilled materials will be used in the borehole construction by back filling the annular space. All excavated material from the draining channel will be used to refill it;
- Construction team to be encouraged to dump their personal wastes in designated bins;
- Use the sanitary facilities provided by the school; and
- Maintain and keep the site clean and orderly.

7.2.2.3 Dust Emission

During site clearing, excavation and drilling is likely to generate dust and emissions leading to pollution. Particulate matter in the air and emissions from the equipment may affect the health of the workers and the surrounding community. Drilling should have no visible dust nor exhaust from any equipment to last for more than 10 seconds. The potential impact on air quality will be minimal.
Mitigation

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

7.2.2.4 Noise Pollution

The construction works will generate noise due to moving parts of machines (drilling rig, pipeline excavation works and communicating workers) and trucks that carry the equipment to the site. The site workers and community are likely to be affected by noise levels beyond the acceptable limits. Noise levels in construction works are usually below the threshold limit (90dBA) that workers can be exposed in an 8-hour working day and is consequently not of any major concern. However, this project is generally a low noise activity where noise is confined with the excavation equipment and support vehicular traffic. The noise emitted from these equipment, however, will be minimum and within the ambient noise levels. The works will be undertaken during the day time and hence noise impacts at night associated with the construction equipment.

Mitigation

- Adhere to the Kenya Noise Prevention and Control rule passed in 1996 under legal notice No. 296 as a subsidiary legislation to the Occupational Health and Safety Act (OSHA) of 2007 which requires putting in place measures that will mitigate noise pollution.
- Enforce a rule that, “No worker shall be exposed to noise level in excess of the continuous equivalent of 90 dBA for more than 8 hours within any 24 hours duration”;
- The drill rig must be fitted with appropriate noise suppression equipment such as mufflers;
- Proper maintenance of the construction equipment;
- The workers will be supplied with on ear mask where applicable to control excessive noise;
- No works during the night to prevent disruption of the neighbouring community; and
- Sensitize vehicle drivers and machine operators to switch off engines of vehicles or generators when not in use and to avoid hooting.

7.2.2.5 Soil and Water Contamination from spillages and other sources

The drilling machine contains movable parts which will require oiling and greasing to minimize wear and tear. Likewise, the truck for carrying the drilling rig, pipes and other construction materials to site may require oil and other lubricants change. Possibilities of oil spillage contaminating the soil and water within the project areas are real. Borehole construction activities have the potential to introduce contaminants into ground water reservoirs creating a great concern to human and animal health. Alteration of water quality during the drilling may occur following one or more of the following deficiencies: Insufficient or substandard well casing hence drawing
contamination from the sub-surface or perched water, inadequate seal between the well casing and the borehole, poor welding of casing joint and lack of sanitary protection at the wellhead. The impacts of the drilling process are covered in this ESIA. Water quality during the water abstraction and distribution may be altered in the pump installation process or due to the heavy application of agrochemicals in the area among others.

**Mitigation**

- Safety procedures will be enforced to minimise cases of oil spillage. Such procedures may include maintaining the machinery in specific designated areas designed for such purposes;
- Ensure that contaminated materials including used/spilled oils/grease as well as other contaminated materials are stored in a banded area before disposal.
- Ensure that oil/grease spills and other oils and associated materials (filters, rags and cans) are immediately removed along with all contaminated material and disposed through a NEMA licensed waste handler;
- Ensure that all potential sources of contamination are eliminated;
- The proponent will adhere to the regulations set by WRMA 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 as well as ensuring equity in ground water abstractions;
- Avoid improper land use activities within the proximity of the borehole wellhead; and
- Undertake an audit on the integrity of the borehole abstraction piping and associated casings.

7.2.2.6 Health and Safety risks on the pupils, workers and the community

During construction, the workers are exposed to occupational health hazards from handling equipment and hazardous substances like cement, oil and grease. The pupils and members of the community are at risk from the traffic in and out of the site and open trenches. In addition, the curiosity of the pupils may lead them to the project site to see or experiment with what they find. This exacerbates the risks of accidents and injuries. Such injuries can result from loading and unloading truck mounted drill rig, transportation of the drill rig, hand tools and cuts from sharp objects, slips and fall hazards among others.

**Mitigation**

- Adhere to the Occupational Health and Safety Act, 2007;
- Ensure workers are provided with personal protective equipment and first aid kit;
- Ensure all equipment are inspected before use for appropriate safeguards and that the machine operators are trained on machine safety;
- Ensure the working hours are controlled and that employees are not allowed to extend the working hours;
• Appoint a traffic marshal to control the traffic;
• Ensure appropriate road safety signage are strategically placed and drivers adhere to the requirements of such signage in addition to training them on defensive driving;
• Provide adequate manual labour to meet the requirements of the tasks to avoid multi-tasking;
• Provide appropriate barriers and security at the site. All construction activities shall be isolated from the public. This will be achieved through hoarding and fixing appropriate safety signage and information;
• Involve the local people for enhanced ownership and management; and
• Upon completion and commissioning of the works, public safety in regard to water quality will be important. Security to be ensured for the borehole and storage tanks. Involvement of the local community will be inevitable in this regard.

7.2.2.7 Risks associated with exposure to HIV/AIDS

The project will attract new people to the project area and this can lead to several repercussions leading to the spread of the virus. Influx of new people to the project area especially construction workers can affect the number of new cases of HIV, because they often interfere with an otherwise stable situation, but the contrary can also happen where the newcomers find themselves at higher risk.

Mitigation

• Develop appropriate training and awareness materials for Information, Education and Communication (IEC) on HIV/AIDS; and
• Identify other stakeholders (local CBOs, NGOs, and government organizations) on HIV/AIDS for enhanced collaboration.
• Sensitization of the local community on HIV/AIDS and/or other sexually transmitted diseases (STDs);
• Review the construction activities to integrate with the HIV/AIDS campaigns;

7.3 Operation Phase

7.3.1 Positive Impacts

7.3.1.1 Access to affordable Water

The current water sources are boreholes from the neighbours who draw water from upper aquifers which are quite vulnerable to depletion. In addition, the recharge rate is low since clay soil is predominantly in the area and allows little percolation. This affects the cost of water in the area and the school which is a public school, is forced to purchase only what they can afford for their day-to-day activities. It is expected that the construction of the borehole will greatly improve access to affordable water for the pupils and the community.
7.3.1.2 Improved Health and Sanitation

The pupil’s and the proportion of the population currently relying on water from various boreholes will reduce significantly. These will have a direct impact on health and sanitation especially in relation to waterborne diseases such as diarrhoea and helminthic infections. Pupils will have ample drinking water and water for other uses like handwashing, cleaning their classes and even watering their plants. Families will be able to perform more duties like handwashing, cleaning laundry and flushing toilets due to proximity to a water source.

7.3.1.3 Relieving Children, the duty of looking for Water

The Pupils will have the opportunity to buy or even carry drinking water home. This will relieve them the duty of going to look for water once they get home. This will therefore give the children so much joy and allow them to participate in activities that are age appropriate like playing.

7.3.1.4 Improved quality of life due to reduced travel time to water points and Increased participation of women in socio-economic activities

Most families spend almost 30 min-1 hour in search for water. The boreholes available are few and only have one point for fetching water, which means that women queue for long before accessing water. After fetching the water, they also carry it on their backs, heads or even give to their children to carry to get it home. This is time-consuming and an infringement to the child rights. It is expected that the construction of the borehole will lead to significant time savings due to reduced distances to the water point. It is expected that same will improve the economic and social status of women and children since there will be more time for other activities for example for small-scale farming and engaging in business. The prevailing socio-cultural norms influencing household division of labour determine that looking after children, preparation of food and collecting water and firewood are tasks for the women. By constructing a borehole closer to the communities, the women will be able to spend their time in other productive activities thereby increasing their participation in socio-economic development.

7.3.1.5 Creation of Employment and Business Opportunities

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

7.3.2 Negative Impacts

7.3.2.1 Risk of Water Vectors

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

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

7.3.2.2 Lowering the Water Table

It is expected that the water from the borehole will be used by both the school and the community. Consequently, the risk of over abstraction is real. This may cause lowering of ground water table which may interfere with other existing boreholes.

Mitigation

- The borehole will be installed with a master meter and an Airline/Piezometer to monitor ground water abstractions and to facilitate regular measurements of the static water level in the borehole, respectively;
- The maximum ground water abstraction permitted from the borehole is limited to the authorized volume/day for the domestic use only subject to availability from 60% of the tested yield for a maximum abstraction period not exceeding ten (10) hours per day;
- The school management shall ensure that there is no over pumping and they will stick to the permit class issued by WRMA;
- Install auto-shut water taps to reduce water wastage;
- Educate and create awareness to the Community on the value of water and water resources for enhanced conservation; and
- Ensure optimum maintenance of the water supply system components including pipelines, valves and consumer taps.

7.4 Decommissioning Phase

Decommissioning refers to the final removal of the project and associated materials at the expiry of the project life span or when the borehole dry up or when the school and community gets a more reliable water source. During this project, the proponent will be expected to demolish the pump house, remove the casings, pump, water pipeline, water kiosk, elevated water tank and remediate the site.

7.4.1 Positive Impacts

7.4.1.1 Rehabilitation and restoration of the Site

Upon decommissioning of the proposed project, rehabilitation of the project site will be carried out to restore the site to its original status or to a better state than it was originally. This will include
replacement of topsoil and re-vegetation which will lead to improved visual quality of the area. This will also mean that alternative options can be utilized within the project site.

7.4.1.2 Creation of Employment and Business Opportunities

During decommissioning, workers will be needed at the site hence providing employment opportunities for both skilled and unskilled labour. The food kiosk and other businesses will also get to sell their products hence improved business opportunities.

7.4.2 Negative Impacts

7.4.2.1 Health and Safety Risks on the Pupils and the Community

Demolition works will inevitably expose workers, pupils and the public to occupational health and public safety risks especially when working with heavy equipment, handling and use of tools engender certain risks. The pupils and members of the community are at risk from the traffic in and out of the site. In addition, the curiosity of the pupils may lead them to the project site to see or experiment with what they find. This exacerbates the risks of accidents and injuries. Such injuries can result from loading truck with waste materials, hand tools and cuts from sharp objects, slips and fall hazards among others.

Mitigation

- Adhere to the Occupational Health and Safety Act, 2007;
- Ensure workers are provided with personal protective equipment and first aid kit;
- Ensure all equipment are inspected before use for appropriate safeguards and that the machine operators are trained on machine safety;
- Ensure the working hours are controlled and that employees are not allowed to extend the working hours;
- Appoint a traffic marshal to control the traffic;
- Ensure appropriate road safety signage are strategically placed and drivers adhere to the requirements of such signage in addition to training them on defensive driving;
- Provide adequate manual labour to meet the requirements of the tasks to avoid multi-tasking;
- Provide appropriate barriers and security at the site. All demolition activities shall be isolated from the public. This will be achieved through hoarding and fixing appropriate safety signage and information; and
- Involve the community.

7.4.2.2 Waste Generation

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

- Recycle and reuse waste that can be recovered and all the other wastes are managed by a NEMA licensed company;
- Demolition team to be encouraged to dump their personal wastes in designated bins;
- Use the sanitary facilities provided by the school; and
- Maintain and keep the site clean and orderly.

7.4.2.3 Noise Pollution

The decommissioning related activities such as demolition works will lead to significant deterioration of the audio environment within the project site and the surrounding areas. This will be result in noise and excessive vibration that will be experienced because of demolishing the proposed project structures.

- 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.
- Enforce a rule that, “No worker shall be exposed to noise level in excess of the continuous equivalent of 90 dBA for more than 8 hours within any 24 hours duration”;
- The equipment must be fitted with appropriate noise suppression equipment such as mufflers;
- Proper maintenance of the equipment;
- The workers will be supplied with on ear mask where applicable to control excessive noise;
- No works during the night to prevent disruption of the neighbouring community; and
- Sensitize vehicle drivers and machine operators to switch off engines of vehicles or generators when not in use and to avoid hooting.
8.1 Purpose and Objectives of ESMMP
The specific objectives of the ESMMP are to:

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

8.2 Auditing of ESMMP
The contractor shall conduct regular audits to the ESMMP to ensure that the system for implementation of the ESMMP is operating effectively. The audit shall check that a procedure is in place to ensure that:

- The ESMMP being used is the up to date version;
- Variations to the ESMMP and non-compliance and corrective action are documented;
- Appropriate environmental training of personnel is undertaken;
- Emergency procedures are in place and effectively communicated to personnel;
- A register of major incidents (spills, injuries, complaints) is in place and other documentation related to the ESMMP; and
- Ensure that appropriate corrective and preventive action is taken by the Contractor once instructions have been issued

8.3 Management Responsibility of ESMMP
To ensure the sound development and effective implementation of the ESMMP, it will be necessary to identify and define the responsibilities and authority of the various persons and Organizations which will be involved in the project. The following entities should be involved in the implementation of this ESMMP:

- NEMA;
- Contractor;
- Consultant;
- County Government of Kajiado
8.3.1 **National Environment Management Authority (NEMA)**
The responsibility of NEMA is to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of Government of Kenya in the implementation of all policies relating to the environment.

8.3.2 **The Contractor**
The persons/firms contracted to put up the proposed borehole will be required to comply with the requirements of the ESMMP within this report. To ensure strict compliance environmental specifications of this ESMMP should form part of the contract documents.

8.3.3 **Consultant**
The sourced consultant should ensure that the proposed ESMMP is up to date and is being used by the contractor. Periodic audits of the ESMMP should be done to ensure that its performance is as expected.

8.3.4 **County Government of Kajiado**
The relevant departmental officers in the above County government will be called upon where necessary during project implementation to provide the necessary permits and advisory services to the Project implementers. The Project once commissioned will be operated by the Noonkopir Township Primary School.

**Tables 9, 10 and 11** present the ESMMP for the proposed borehole project during the construction, operation and decommissioning phases respectively.

8.4 **Emergency procedure during construction and operation phase of the project**
An emergency means unforeseen happening resulting in serious or fatal injury to workers or the neighbouring communities. In the event of an emergency during construction and decommissioning, the workers shall: -

   i. Alert other persons exposed to danger;
   ii. Inform the OSHA coordinator;
   iii. Do a quick assessment on the nature of emergency;
   iv. Call for ambulance.

When emergency is over the OSHA coordinator shall notify the workers by putting a message: “ALL CLEAR”.

In the event of such an emergency during operation the workers shall:

   a. Alert other persons exposed to danger;
   b. Ring the nearest police station and ambulance services.

The proponent has already put measures to respond to emergencies in their premises like a fire assembly point. The proponent also has trained first aiders who can assist in case of emergencies.
### Table 8: Pre-Construction Phase: Environmental and Social Management and Monitoring Plan

<table>
<thead>
<tr>
<th>Activity</th>
<th>Associated Impacts</th>
<th>Impact Levels</th>
<th>Management Actions</th>
<th>Target Areas/ Responsibilities</th>
<th>Monitoring Indicator</th>
<th>Budget</th>
</tr>
</thead>
</table>
| • Seeking Approvals from WRMA for water abstraction  
• Seeking approvals from NEMA for ESIA         | Delay in implementation of the project due to objections and stop orders           | Low           | • The Contractor shall ensure that all pertinent permits, certificates and licenses have been obtained prior to any activities commencing on site and are strictly enforced/ adhered to;  
  • The Contractor shall maintain a database of all pertinent permits and licenses required for the contract and for pertinent activities for the duration of the contract. | All Project Components Responsibility Contractor/ NAMSIP |  
  o Degree of completion of set of required approvals / permits issued (%),  
  o Number and type of findings during any audits based on conditions of approvals | ~KShs 0.05M |
| • Environmental Training and Awareness         | Risks of Environmental degradation risks and occupational health and safety related accidents | High          | • The Contractor and sub-contractors shall be aware of the environmental requirements and constraints on construction activities contained in the provisions of the ESMMP  
  • The Contractor will be required to provide for the appropriate Environmental Training and Awareness as described in this ESMMP at his cost.  
  • An initial environmental awareness training session shall be held prior to any work commencing on site, with the target audience being all project affected persons. | All Pupils and Workers Responsibility Contractor(s) |  
  o Number of Trainings Held  
  o Availability of Training reports  
  o Attendance list of participants during the training sessions  
  o Minutes of the trainings | KShs 0.04M |
| • HIV/AIDS awareness and prevention campaign   | Risks of increased HIV & Aids transmission in the area                              |               | • The Contractor shall institute HIV/AIDS awareness and prevention campaign amongst his workers for the duration of the contract.  
  • contracting & implementing organisation, with preference for an organisation already working on this issue in the project area; | All Workers and selected workshops targeting communities Responsibility Contractor(s) |  
  o Number of Trainings Held  
  o Availability of Training reports  
  o Attendance list of participants during the training sessions  
  o Minutes of the trainings | KShs 0.04M |
| • Local Labour / Employment                    | Delay in project implementation due to opposition from                              | High          | • Wherever possible, the Contractor shall use local labour, and women must be encouraged to be involved.                                                                                                              | All the Project components Responsibility |  
  o Number of workforce employed from the local community | No direct costs associated |

- **ESMMP**: Environmental Social Management and Monitoring Plan
- **KShs**: Kenyan Shillings
<table>
<thead>
<tr>
<th>Activity</th>
<th>Associated Impacts</th>
<th>Impact Levels</th>
<th>Management Actions</th>
<th>Target Areas/ Responsibilities</th>
<th>Monitoring Indicator</th>
<th>Budget</th>
</tr>
</thead>
</table>
| ESMMMP management records | aggrieved community members | Mediu m | • The contractor shall ensure compliance to the gender balance as required by the 2/3 gender rule. | Contractor | o Number of females employed  
| | Risks of associated with non-tracking of environment and social risks management initiatives. | | | | o Complaints from disgruntled work force | |
| Stakeholder Engagement | Risk of delays in project implementation due to disputes / grievances from Stakeholders | High | • The updated version of the ESMM should be kept on site.  
| | | | • Copies of all necessary permits and licenses should be kept on site.  
| | | | • All site-specific plans prepared as part of the updated ESMM.  
| | | | • All related environmental, social, health and safety management registers and correspondence, including any complaints.  
| | | | • A register of audit non-conformance reports and corrective actions. | All the Project Components  
| | | | | Responsibility Contractor | | |
| | | | | | o Available permits on site  
| | | | | | o Environment and Safety audit  
| | | | | | o Number of corrective measures adopted | No direct associated costs |

Sub Total 1 | | | | | | 0.13M |
### Table 9: Construction Phase: Environmental and Social Management and Monitoring Plan

<table>
<thead>
<tr>
<th>Activity</th>
<th>Associated Impacts</th>
<th>Impact Levels</th>
<th>Management Actions</th>
<th>Target Areas &amp; Responsibilities</th>
<th>Monitoring Indicator</th>
<th>Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth moving and excavations (site preparation)</td>
<td>• Health &amp; Safety risks</td>
<td>Medium</td>
<td>• Provide notices, signage and information to the public for their safety at all locations.</td>
<td>All work areas</td>
<td>• Accidents occurrence incidences</td>
<td>~KShs. 0.08M</td>
</tr>
<tr>
<td></td>
<td>• Air pollution</td>
<td></td>
<td>• Install barriers at the site to restrict access to the works for public health &amp; safety.</td>
<td></td>
<td>• Cases of respiratory complication at nearby health centre</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Social nuisance</td>
<td></td>
<td>• Where there are potential for nuisance from dust generation, ensure earth moving is under dump conditions (consider watering where necessary.)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Inform immediate communities or stakeholders of the activities.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• Vegetation Cover destruction</td>
<td>Low</td>
<td>• Construction activities will be limited to the project site which has no/limited vegetation cover.</td>
<td>All work areas</td>
<td>• Soil erosion extend and intensity on site</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Re-vegetate the project site after completion of civil works.</td>
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</tr>
<tr>
<td></td>
<td>• Public safety risks</td>
<td>Medium</td>
<td>• Provide signage and safety information in all work areas.</td>
<td>civil works areas</td>
<td>• Accidents occurrence incidences</td>
<td>Kshs. 0.05M</td>
</tr>
<tr>
<td></td>
<td>• Pupils &amp; worker Occupational health &amp; safety risks</td>
<td></td>
<td>• Ensure compliance by workers with safety safeguards including the OHS, provision of safety gear and enforcement of application.</td>
<td>Responsibility Contractor(s)</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Supervision</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Material sourcing, delivery and storage</td>
<td>• Environmental and Safety risks</td>
<td>High</td>
<td>• Construction material sources should be environmentally sustainable (approved accordingly).</td>
<td>Burrow Pits and Quarry Site</td>
<td>• Complains from the community on material transportatio</td>
<td>Costs included in contractors’ rates</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Delivery routes and modes of transport should be approved.</td>
<td>Responsibility Contractor(s)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Material storage on site not to be internal or external nuisance.</td>
<td>Supervision</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>• Delivery trucks to be well covered to avoid dust blown pollution.</td>
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<td></td>
</tr>
<tr>
<td>Activity</td>
<td>Associated Impacts</td>
<td>Impact Levels</td>
<td>Management Actions</td>
<td>Target Areas &amp; Responsibilities</td>
<td>Monitoring Indicator</td>
<td>Budget</td>
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</tr>
</tbody>
</table>
| Wastes removals and disposal                 | • Risks of contaminating surface and underground water resources                    | High          | • Construction wastes (residual earth, debris and scrap materials) to be removed for safe disposal  
• Encourage recycling where possible (concrete debris for access road surfacing).  
• Contaminated matter in the work areas to be isolated for safe disposal.  
• Material residuals to be disposed in accordance with established regulations | Construction areas  
Responsibility Contractor(s) Supervision | • Number of complaints from community not happy with waste management of the contractor                                      | KShs. 0.05M |
| Occupational Health and Safety               | • Risks of Accidents, Injuries or death of workers, pupils & the community          | High          | • Provide construction workers with personal protective gear (gloves, gum boots, overalls and helmets),  
• Use toilets provided at the school,  
• Provide onsite first aid kit accessible by the workers on need,  
• Isolate the site for access by the local pupils & community during the construction for their safety and health,  
• Contractor to provide a Healthy and Safety Plan prior to the commencement of works to be approved by the resident engineer.  
• Contractor to follow provisions of Kenya Occupational Health and Safety Act 2007  
• Contractor to follow provisions of The World Bank Group Environment Health and Safety General Guidelines and specific Guidelines on Water and Sanitation and the World Bank Environmental and Social Standard No. 4 on Community Health and Safety. | All work areas  
Responsibility Contractor(s) Supervision | • Accidents occurrence incidences recorded in the Incidence Book                       | KShs. 0.04M |
<table>
<thead>
<tr>
<th>Activity</th>
<th>Associated Impacts</th>
<th>Impact Levels</th>
<th>Management Actions</th>
<th>Target Areas &amp; Responsibilities</th>
<th>Monitoring Indicator</th>
<th>Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage of fuel oils, lubricants, chemicals and flammable materials</td>
<td>• Hazards of fire outbreak, oil and chemical spills.</td>
<td>High</td>
<td>• Follow specifications of the Occupational Health and Safety Act, EMCA Cap 387 and others in the development and operation of stores, • Provide a 20cm sand or ballast medium at plant and equipment storage area and fuel tanks area, the sand and ballast will trap any oil / fuel leaks, this medium should be replaced when saturated and disposed appropriately.</td>
<td>All work areas</td>
<td>• Incidence of reported cases of fuel leaks and fire incidences</td>
<td>(integrate d in the works costs)</td>
</tr>
<tr>
<td>Sanitation issues resulting from wastes on site.</td>
<td>• Risks associated with water borne diseases exposed to pupils, community and workforce</td>
<td>Medium</td>
<td>• The Contractor shall comply with all laws and any by-laws relating to public health and sanitation and provisions of Public Health Act Cap 242, • A wash basin with adequate clean water and soap shall be provided alongside each toilet. Staff shall be encouraged to wash their hands after use of the toilet, to minimize the spread of possible disease.</td>
<td>All work areas</td>
<td>• Incidence of reported cases of water related diseases</td>
<td>(integrate d in the works costs)</td>
</tr>
<tr>
<td>Noise and excessive Vibration control</td>
<td>• Risk to health and safety of community and workers</td>
<td>Medium</td>
<td>• The Contractor shall keep noise level within acceptable limits 60dB (A) at day time and 35dB(A) at night and construction activities shall, where possible, be confined to normal working hours in the residential areas, • Pupils, Churches, Hospitals and other noise sensitive areas shall be notified by the Contractor at least 5 days before construction is due to commence in their vicinity, • Any complaints received by the Contractor regarding noise will be recorded and communicated to the RE.</td>
<td>civil work areas</td>
<td>• Reported complaints from neighbour community and institutions</td>
<td>(integrate d in the works costs)</td>
</tr>
<tr>
<td>Traffic management on site</td>
<td>• Risks of Accidents, Injuries or death of workers or</td>
<td>high</td>
<td>• Strict use of warning signage and tapes where the activities are present, • Employ and train road safety Marshalls who will be responsible for management of traffic on site,</td>
<td>civil work areas</td>
<td>• Accidents occurrence incidences</td>
<td>(integrate d in the works costs)</td>
</tr>
<tr>
<td>Activity</td>
<td>Associated Impacts</td>
<td>Impact Levels</td>
<td>Management Actions</td>
<td>Target Areas &amp; Responsibilities</td>
<td>Monitoring Indicator</td>
<td>Budget</td>
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</tr>
<tr>
<td>Air Quality Control</td>
<td>• Air pollution causing respiratory disorders to human</td>
<td>High</td>
<td>• Workers shall be trained on management of air pollution from vehicles and machinery. All construction machinery shall be maintained and serviced in accordance with the contractor’s specifications, • The removal of vegetation shall be avoided until clearance is required and exposed surfaces shall be re-vegetated or stabilized as soon as practically possible, • The contractor shall not carry out dust generating activities (excavation, handling and transport of materials) during times of strong winds.</td>
<td>contractor(s) supervision engineer</td>
<td>All work areas  ///&lt;br&gt; Responsibility contractor(s) supervision</td>
<td>0.35 Million (integrated in the works costs)</td>
</tr>
<tr>
<td>Contractor de-mobilization and site reinstatement</td>
<td>• Associated risks of environmental degradation</td>
<td>High</td>
<td>• The site is to be cleared of all construction materials, including litter prior to hand over, • Fences, barriers and demarcations associated with the construction phase must be removed from the site, • Rehabilitation Activities of Environmental Cases identified must continue throughout the defect liability period.</td>
<td>contractor(s) supervision</td>
<td>All work areas  ///&lt;br&gt; Responsibility contractor(s) supervision</td>
<td>0.22 Million (integrated in the works costs)</td>
</tr>
<tr>
<td>Subtotal 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Closeout audit report findings</td>
<td>0.57 Million (total)</td>
</tr>
<tr>
<td>Total Estimated Cost for ESMMP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Kshs. 0.57 Million (total)</td>
</tr>
</tbody>
</table>
Table 10: Operational Phase: Environmental and Social Management and Monitoring Plan

<table>
<thead>
<tr>
<th>Activity and Associated Impacts</th>
<th>Management Actions</th>
<th>Target Areas &amp; Responsibilities</th>
<th>Monitoring Indicator</th>
<th>Costs Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Risk of water vectors</td>
<td>The waste water drainage channel be constructed to lead water away from the pump pad; The waste water may be used for small gardening initiatives by the school or directed to soak pits; Observe the Water Act 2002 and associated Water Rules; Conduct continuous maintenance of the borehole, pipework, tank and water kiosk; and Conduct water sampling at least every 3 months for water monitoring record base on this facility.</td>
<td>School management and the community</td>
<td>Visual observation • Complaints from pupils or community</td>
<td>Cost will be determined at this phase</td>
</tr>
<tr>
<td>• Lowering the water table</td>
<td>The borehole will be installed with a master meter and an Airline/Piezometer to monitor ground water abstractions and to facilitate regular measurements of the static water level in the borehole, respectively; The maximum ground water abstraction permitted from the borehole is limited to the authorized volume/day for the domestic use only subject to availability from 60% of the tested yield for a maximum abstraction period not exceeding ten (10) hours per day; The school management shall ensure that there is no over pumping and they will stick to the permit class issued by WRMA; Install auto-shut water taps to reduce water wastage; Educate and create awareness to the Community on the value of water and water resources for enhanced conservation; and Ensure optimum maintenance of the water supply system components including pipelines, valves and consumer taps.</td>
<td>School management and the community</td>
<td>Complaints from pupils or community</td>
<td>No direct costs</td>
</tr>
</tbody>
</table>
### Table 11: Decommissioning Phase: Environmental and Social Management and Monitoring Plan

<table>
<thead>
<tr>
<th>Activity and Associated Impacts</th>
<th>Management Actions</th>
<th>Target Areas &amp; Responsibilities</th>
<th>Monitoring Indicator</th>
<th>Costs Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Health and safety risk on pupils, workers and the community</td>
<td>• Adhere to the Occupational Health and Safety Act, 2007; Ensure workers are provided with personal protective equipment and first aid kit; Ensure all equipment are inspected before use for appropriate safeguards and that the machine operators are trained on machine safety; Ensure the working hours are controlled; Appoint a traffic marshal to control the traffic; Ensure appropriate road safety signage are strategically placed and drivers adhere to the requirements of such signage in addition to training them on defensive driving; Provide appropriate barriers and security at the site. All demolition activities shall be isolated from the public. This will be achieved through hoarding and fixing appropriate safety signage and information; and Involve the community.</td>
<td>All work areas Responsibility Contractor(s) Supervision</td>
<td>• No. of incidences/accidents Complaints from pupils or community</td>
<td>Cost will be determined at this phase</td>
</tr>
<tr>
<td>• Waste Generation</td>
<td>• Recycle and reuse waste that can be recovered and all the other wastes are managed by a NEMA licensed company; Demolition team to be encouraged to dump their personal wastes in designated bins; Use the sanitary facilities provided by the school; and Maintain and keep the site clean and orderly.</td>
<td>All work areas Responsibility Contractor(s) Supervision</td>
<td>Complaints from pupils or community Visual observation</td>
<td>Ditto</td>
</tr>
<tr>
<td>• Noise Pollution</td>
<td>• Ditto</td>
<td>All work areas Responsibility Contractor(s) Supervision</td>
<td>Complaints from pupils or community</td>
<td>Ditto</td>
</tr>
</tbody>
</table>
CHAPTER NINE: CONCLUSION AND RECOMMENDATION

9.1 Conclusion
Through the assessment and evaluation of all potential environmental and social impacts of the proposed borehole project, it is concluded that the Project will have net ecological, economic, social and health benefits to the pupils and the community in the project areas. The Project is expected to provide adequate affordable and reliable water to the target population. Project activities that are envisaged to have potential less significant negative impacts at different phases of the project have been assessed in detail in this report and appropriate mitigation measures proposed.

To mitigate the potential negative impacts and to make the project environmentally and socially sounder, an Environmental and Social Management and Monitoring Plan (ESMMP) has been prepared. It includes the Mitigation Plan, the Monitoring and Enforcement Requirements; and the Responsible Persons/Organizations. All the recommendations/mitigations mentioned in the assessment will be financed and incorporated in the construction and supervision contracts.

The main findings from the assessment described in the report are as follows:

i. The borehole project site will be within the school property with no vegetation cover hence the Environmental and Social Scoping undertaken for the project indicate that the investment will result in low impact on biological environment; however, the Project triggers World Bank OP 4.01 on Environmental Assessment.

ii. Provisional Budget of Kenya Shillings 0.35 Million is required for implementation of mitigation measures of potential negative environmental impacts identified in the report.

iii. The overall objective of project is to improve access to affordable and reliable water to the pupils and the community around Noonkopir Township Primary School and hence improved health and sanitation.

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

2. ESIA for the Proposed Drought Mitigation Boreholes for Lake Victoria South Water Services Board
3. ESIA for the Proposed Ndiriti Aguthi Water Project, Nyeri County
4. ESIA for the Proposed Thika Boreholes Development Project
| ANNEXES |
|------------------|-------------------------------------------------|
| **Annex 1: Public Consultation Questionnaires** | Annex 1 - Public Consultation Questionnaires.pdf |
| **Annex 3: Sample ‘Chance Find’ Procedures** | Annex 3 - Sample Chance Find Procedures.pdf |
| **Annex 4: Grievance Resolution Mechanism** | Annex 4 - Grievance Resolution Mechanism.pdf |
| **Annex 5: Land Ownership Document** | Letter of Allotment.jpg |
| **Letter of Allotment** | Letter of Allotment.jpg |