REPUBLIC OF KENYA

MINISTRY OF TRANSPORT, INFRASTRUCTURE, HOUSING AND URBAN DEVELOPMENT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PROJECT REPORT (ESIA)

ESIA for the Proposed Improvement of Access Road to the Proposed Mitubiri Sanitary Landfill Facility

Project Ref No.EHS-5240-522708-41

Date: November 14, 2017
CERTIFICATION

SGS Kenya Limited was commissioned by The Ministry of Lands, Housing and Urban Development to prepare this Project Report for the Proposed Construction of Access Road to Mitubiri Sanitary Landfill Site, Murang’a County. The Report has been prepared in accordance with the Environmental Management and Coordination Act no. 8 of 1999 and The Environmental (Impact Assessment and Audit) Regulations, 2003 for submission to the National Environmental Management Authority (NEMA).

SGS Kenya Limited submits this Environmental Impact Assessment Project Report, to NEMA Kenya. To the best of our knowledge, all the information in this report is true and correct.

Proponent: Ministry of Transport, Infrastructure, Housing and Urban Development

Name of Officer .................................................. Designation ..................................................

..................................................
Signature / Date / Official Stamp

Submitted by:
Firm of Experts: SGS Kenya Limited Reg. No. 0280

Official Stamp
Approved by:

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Signature .................................................. Date ..................................................

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ESIA/EA Lead Expert
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<tr>
<td>°C</td>
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<tr>
<td>BS</td>
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<td>SPM</td>
<td>Suspended Particulate Matter</td>
</tr>
<tr>
<td>SVOC</td>
<td>Semi Volatile Organic Compounds</td>
</tr>
<tr>
<td>SWM</td>
<td>Solid Waste Management</td>
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<tr>
<td>VOC</td>
<td>Volatile Organic Compounds</td>
</tr>
<tr>
<td>WB</td>
<td>World Bank</td>
</tr>
<tr>
<td>WRMA</td>
<td>Water Resource Management Authority</td>
</tr>
</tbody>
</table>
EXECUTIVE SUMMARY

Background
The Directorate of Nairobi Metropolitan Development hereinafter referred to as the Proponent proposes to improve the access road from Kabati to Mitubiri Sanitary Landfill Site in Gikono Area. The proposed improvement of the access road to the proposed Landfill Site covers a distance of approximately 11.5 Km. The road originates from Kabati and meanders up to the proposed landfill project site. The improvement of the access road project aims to improve the road to bitumen standards from the present condition which is part bitumen and part murram which gets aggravated whenever it rains heavily. In compliance with ESIA/EA Regulations and World Bank safeguard policies, the Proponent appointed SGS Kenya Limited to undertake environmental impact assessment of the proposed project and submit the report to NEMA. The report provides detailed description of the project, methodology employed in carrying out the assessment, potential impacts of the project, legal and legislative framework, analysis of alternatives and proposed mitigation measures for anticipated adverse environmental impacts.

Project Objectives
The objective of this road improvement project is to construct a bitumen standard access road to Mitubiri Sanitary Landfill Site as a transport logistics measure to ease the transportation of wastes to the Landfill. The road will be upgraded to service the Sanitary Landfill in all seasons to a standard that enables easy passage of trucks carrying waste to the site.

Project Description
The project road starts at the railway line and meanders to for a distance of 11.5 Km to Mitubiri Sanitary Landfill Site. During construction, existing road alignment will as far as possible be maintained so as not to interfere with private land. The present condition of the riding surface is part bitumen and part murram standard with some sections thinning as a result of erosion and undercutting from quarrying activities such as at Km 2+300 (from the railway level crossing) on the Right Hand Side. The road crosses a bridge of River Nginye at Km 2+600 and may impact the access of river temporarily during construction. The carriageway runs closely to private property boundaries of live fences (Kei Apple, Cactus and Euphorbia sp) at Km 1+900 and 2+800. Other institutions next to the road include Peter Kariuki Primary and Secondary School at Km 0+300, Gikono Dispensary and Solo Plant at Km 4+000 on both sides of the road. There also exists a barrier at Gikono Administration Police Post at Km 4+100 and next to it is a sales shop for Mitubiri Community Borehole. These institutions will ultimately benefit after construction due to reduced dust level. The main activities involved in the project will entail site clearance, topsoil and sub soil removal, earthwork, provision of culverts, drains, carpeting via tarmac
and road furniture. These activities will have positive and negative impacts on the environment as they involve soil excavations, compaction, scarifying and filling.

**Baseline Description**

The proposed project site is located in Murang’a County which is largely an agricultural area. Various maize plantations sit next to the road corridor and flower farms such as the Hippo Farm and Solo Plant. The major water resource in the area includes River Nginye that cuts the proposed road at Km 2+600. Some flower farms have dammed the river to allow abstraction to the required quantities. Locals in the area also fetch water from a community borehole at Km 4+100 for domestic use and others rely on water kiosks. The economy also revolves around stone quarrying such as the abandoned Mutito Quarry at Km 2+300 that has actually eaten into the road.

Mitubiri’s climate is classified as warm and temperate. The average annual temperature is 19.8 °C in Maragua while the average annual rainfall is 1164 mm. The least amount of rainfall occurs in July at an average of 18 mm. The greatest amount of precipitation occurs in April, with an average of 298 mm and may affect earthworks during the road construction. The temperatures are highest on average in November, at around 21.5 °C. The lowest average temperatures in the year occur in July, when it is around 17.9 °C. The ambient noise level at the site is typical of a rural setting. The results of the noise level measured indicated that the levels within WB/IFC group standards for diurnal period. The levels are expected to increase and may be exceed WB/IFC standards during project implementation.

**Project Cost**

The total project cost is Kshs. **824,818,943** and the total estimated ESMMP cost is Kshs. **18,505,000**.

**Policy, Legal and Administrative / Institutional Framework**

The ESIA Study, was conducted in accordance with the legal requirement stipulated in the Environmental Management and coordination Act (EMCA) of 2015 and its subsequent supplements: the Environmental (Impact Assessment and Audit) Regulation, 2003; EMCA (Waste Management) Regulations, 2006 and EMCA (Water Quality) Regulations, 2006; EMCA (Controlled Substance) Regulations, 2007; EMCA (Noise and Vibration Control) Regulations, 2009; EMCA (Emissions Control) Regulations, 2006; EMCA (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009; the Land Acts, Water Act among other pertinent legal and institutional framework regulating roads development including the World Bank Safeguard Policies. The WB safeguard policies taken into consideration during project impact evaluation are Operation Policy (OP)/Bank Procedure (BP) for Environmental Assessment (4.01); OP/BP for Natural Habitats (4.04);
OP/BP for Forests (4.36); OP/BP for Pest Management (4.09); OP/BP for Indigenous People (4.10); OP/BP for Physical Cultural Resources (4.11); OP/BP for Involuntary Resettlement (4.12); OP/BP for Projects on International Water Ways (7.50), and OP/BP for Public Disclosure 17.50. During the screenings and site visits, it was established that the project triggers OP4.01 only.

**Anticipated Impacts from the Project**

**Positive Impacts**

The objective of this road improvement project is to construct to bitumen standard an access road to Mitubiri Sanitary Landfill Site as a transport logistics measure to ease the transportation of wastes to the Landfill. The road will be upgraded to service the Landfill in all seasons to a standard that enables easy passage of trucks carrying waste to the site. Anticipated impacts from the proposed upgrading of the road are both positive and negative. The construction works will contribute towards poverty reduction in the Maragua areas through increased disposable incomes realized from employment of skilled and unskilled local labour, spending by the road contractor(s) as well as road users on purchase of supplies (consumables and road construction materials, e.g. gravel, etc.) and accommodation services. There will be reduced transportation costs of people and goods especially cash crops such as flowers to the airport. Accidents along the road will reduce and even dust pollution from unpaved surfaces. Owing to the terrain of the road, there is an opportunity to improve its drainage during construction. Trucks carrying wastes will benefit from reduced fuel consumption, which translates into economic savings for vehicle owners.

**Negative Impacts**

Given that the road is already in use, significant adverse impacts are likely during the construction phase of the project. Habitat destruction during site clearance will have some impact on flora and fauna particularly the wetland of River Nginye at Km 2+600 that is home to some birdlife such as the cattle egret. Boundaries close to the road may be affected which include Ficus tree species, shrubs, Kei Apple, Cactus and Euphorbia Sp along the road corridor. Some sections of the terrain have soils somehow sensitive to erosion that could increase sediment loads in River Nginye that cuts the project road. There will be dust emissions, and increased noise levels from construction equipment and workers plying the borrow pits and associated diversions. These traffic diversions may also temporarily affect small businesses and livelihoods along the existing route. Noise, generation of dust and ground vibration may impact negatively especially owing to closeness of homesteads and near sensitive institutions such as Peter Kariuki Primary and Secondary Schools, Gikono Dispensary, and the ACC & S Worship Center during the construction phase. Solid waste disposal, effluents from camps and possible oil spills during construction and increased litter from road users may be a source of environmental
concerns. Upon completion, there can be possibility of frequent road accidents associated with speeding on smooth roads. Haulage of waste on the road by uncovered trucks may spill wastes on the road thereby blocking drainage structures necessitating frequent repairs by the client. The table below shows the key environmental impact linkage/concerns. Their proposed management measures are in the Environmental Management Plan in chapter nine.

**Environmental Impact Linkage**

<table>
<thead>
<tr>
<th>No.</th>
<th>Focal Areas</th>
<th>Linkages/Environmental Concerns</th>
</tr>
</thead>
</table>
| 1.  | Natural Resources (wildlife, forests, vegetation/plant species, water sources, land, air, wetlands, etc.) | • Interference with the wildlife habitats i.e. frogs, papyrus reeds and birdlife *(Cattle Egret)* and also fragmentation of their roosting and feeding grounds at River Nginye  
• Excavations associated with deep foundations for the bridge at Nginye River may result to soil loosening during construction phase. Too much disturbance of the soil must be avoided at the bridge and banks of the river to reduce turbidity.  
• Water quality degradation by oil, grease, paint and asphalt from road construction and associated pollutants  
• Permanent and temporary destruction of vegetation cover along the haulage routes, diversions and material sites,  
• Emissions into the air (dust and smoke/hydrocarbons) during construction and increased traffic flow after commissioning |
| 2.  | Physical Environment (Topography, land forms, geology, hydrology, climate, etc.) | • Changes in micro-topographic pattern of the road after upgrading to bitumen standard  
• Effects on the drainage systems and hydrological regimes, particularly with increased magnitude in surface runoff from higher to lower elevations,  
• Creation of open quarries materials borrow site, effectively changes land forms in certain areas (applies to all material sites),  
• Effects on sub-surface geological formations as a result of earth moving and rock breaking activities,  
• Interference with of sensitive features such as Nginye River that forms a basin for watering livestock |
| 3.  | Social and economic Environment trends, land use and infrastructure. | • Increased moral decay in the neighbourhood during construction although this will be limited as most labourers will operate from their homes  
• Accessibility and efficiency in transport of wastes to the Sanitary Landfill Site, flowers to the airport, people and their goods, |
| 4.  | Health, Safety and Security aspects (construction safety measures, road safety and security upon commissioning, etc.) | • Safety of the construction equipment to the workers, public and the wildlife, (construction areas, material sites and work areas)  
• Interaction with the construction workers may lead to increased HIV/AIDS cases,  
• Noise to the residents and institutions such as Peter Kariuki |
<table>
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<tr>
<th>No.</th>
<th>Focal Areas</th>
<th>Linkages/Environmental Concerns</th>
</tr>
</thead>
</table>
|     | Primary and Secondary Schools, Gikono Dispensary and ACC&S Church          | • Risk to safety of road users during construction, especially at night,  
• Increased traffic flow upon commissioning implying higher risks of road accidents to the people and livestock  
• Risks to health from sensitive locations (material sites and associated dust emissions) |

**Mitigation Measures**

The following mitigation measures will be implemented to avert environmental degradation and social conflict during the project cycle;

- Movement of construction vehicles potentially impacting on urban infrastructure should be mitigated through the use of appropriate warning signs, and not entering or leaving the site during peak traffic hours.
- Topsoil shall be protected from any contaminant that might impact on vegetation.
- All relevant national legislation, including the OSHA 2007 and related regulations, shall be adhered to ensure that health and safety of proximate communities and the public at large are not threatened during construction and operational phases of the Project.
- The Proponent shall rollout and implement a documented emergency response plan at the completed footprint.
- The Proponent shall develop rehabilitation and decommissioning plan in conjunction with relevant stakeholders at least one year before the end of facility’s operations.
- The Contractor shall respect the property and rights of neighbouring landowners and occupiers at all times and shall treat all persons with deliberate courtesy.
- The contractor shall prevent littering and the random discard of any solid waste on or around the construction site.
- The contractor shall manage hazardous waste.
- The Contractor shall comply with all applicable laws, regulations, permit and approval conditions and requirements relevant to the storage, use, and proper disposal of hazardous materials.

**Environmental and Social Management and Monitoring Plan**

An Environmental and Social Management & Monitoring Plan has been developed as part of this ESIA. The ESMMP implementation can greatly improve the overall net effect of the project. This Report observes that the possible adverse impacts will manifest mainly at the Construction stage, therefore the mitigation effort will be strongly concentrated on the
contract for construction. Moreover, this report requires that the ESMMP is integrated into the Design Report with appropriate allocation of funds in the Bills of Quantities. The contract for construction should bear clauses binding the contractor to implement impact mitigation as part of the civil works. The NaMSIP’s Project Coordination Team (PCT) will settle internal monitoring to evaluate environmental and social sensitivity at all stages of the project development. The total ESMMP costs are estimated at Kshs. 18,505,000.

**Analysis of alternatives**
The alternatives considered for the proposed project were: site location and layout and no-go option. On the basis of these considerations, the Firm of Experts concludes that potential benefits of constructing to bitumen standard an access road to the Proposed Mitubiri Sanitary Landfill Site as a transport logistics measure to ease the transportation of wastes to the Landfill outweigh potential negative impacts. Furthermore the ‘No-go option’ does not compete with the benefits of proceeding with the project.

**Public Consultation**
Participation of Project Affected Persons (PAPs) is an important component in the efforts of identifying impacts and designing of the mitigation measures. The public consultation for the project was carried out in the month of January 2017 with the PAPs, key Stakeholders, NGOs and public representatives in the project area especially in identifying the impact categories. Care was taken to allow for greater participation of the marginalized and vulnerable groups among the PAPs. The consultants in collaboration with the respective leaders organized and facilitated PAPs consultation. During the consultations forum, local leaders, faith based organizations and PAPs participated in the discussions.

**Conclusions and Recommendations**

**Conclusions**
The improvement works of the access road to the proposed Sanitary Landfill Site will in no doubt contribute to promoting economic development in the study area. In addition, socio-economic benefits, such as improved access to Gikono Health Centre and better transport between the flower farms that exists along the road corridor and the airport are also expected. As the project road already exists and no major realignment will occur, the natural environment has already been considerably altered, therefore any major impacts have already occurred and additional disturbances due to construction works will be relatively minor.

The proposed upgrading of the road will reverse most of the negative socio-economic impacts that have been occasioned by the poor condition of the road. Briefly, the momentum of growth in the agricultural sector will be accelerated through better producer prices, and timely acquisition of inputs. The improved road could lead to stronger trade links within the region. Other sectors whose performance could improve include transport,
trade and commerce and the service sector. Notable adverse impacts are enhanced run-off and subsequent soil erosion with possible further impacts downstream of Nginye River. Activities at the borrow pits will also lead to land degradation. Most of these impacts can be mitigated effectively through prudent construction works, rehabilitation of cleared sites and borrow pits. To mitigate possible socio-cultural impacts, the locals should be considered for unskilled labour during construction, and adequate information on negative impacts associated with construction should be disseminated to the general public.

**Recommendations**

Following on the above observations, the conclusions/recommendations below were arrived at:

i. Involvement of the stakeholders and public during the project implementation, and particularly during the construction and early stages of the road use would be necessary to ensure minimized social impacts.

ii. The Contractor(s) will be expected to develop construction Environmental, Social, Health and Safety (ESHS) Management Plan in line with the ESMMP developed under this report for purposes of supervision and continuous monitoring as well as a Code of Conduct in line with World Bank requirements.

iii. All material sites will have comprehensive ESIA undertaken and management plans developed such as to include extraction practices, haulage and materials management rehabilitation plans.

iv. Appropriate safety audit should be undertaken for the road to guide on the implementation and usage of the road thereafter.

v. Continuous engagement of the waste truck drivers and community members on safety will be necessary on the long term management of the road section.

vi. The Directorate of Nairobi Metropolitan Development should ensure that the contractor comply with the applicable gender principles; labour laws encouraging the contractor to employ women and youth in road construction and maintenance; providing safe working conditions for both women and men workers; and ensuring that all civil work contractors engaged under the project, participate in HIV prevention and road safety programmes and; that information reaches the local communities (women, men, the youth and vulnerable groups) living and working along the road corridor.
CHAPTER ONE

1 INTRODUCTION

1.1 Project Background

The proposed improvement of the access road to the proposed Sanitary Landfill Site within the Murang’a South Sub County featured in this report covers a distance of approximately 11.5 Km. It originates from Kabati and meanders up to the proposed landfill project site. The improvement of the access road project aims to construct the road to bitumen standard, whose situation gets aggravated whenever it rains heavily. Already, the safety of the road for human and waste transport by trucks from Murang’a County Government is severely compromised as the road bears sharp bends with no road signage in addition to encroachment in some sections of the road reserves by quarrying activities, thus endangering the lives of road users. The construction of the road shall involve the excavation of earth materials, soils, rock debris and/or sediments that currently form an existing compact land mass and these soils being removed or added from the road sections may destroy the environment, if not handled well. This is why prior to such an undertaking, the Environmental Impact Assessment as envisaged, in the Environmental Management and Co-ordination Act, 2015, where an Environmental License is required before commencement of the excavation, rolling, mixing, compaction ,burning and application of the tar-allied chemicals.

In compliance with ESIA/EA Regulations and World Bank safeguard policies, the Proponent appointed SGS Kenya Limited to undertake environmental impact assessment of the proposed project and submit the report to NEMA. The report provides detail description of the project; methodology employed in carry out the assessment; potential impacts of the project; legal and legislative framework; analysis of alternatives and proposed mitigation measures for anticipated adverse environmental impacts.

1.2 Purpose of this Report

This report addresses the requirement for preparation of project report in accordance with ESIA/EA Regulations, 2003 and in compliance with World Bank safeguard policies. The report presents an overview of the proposed project and the environmental regulatory framework from which it operates. It identifies and assesses the significance of the impacts of the project as well as mitigation measures necessary to reduce or prevent impacts from occurring.

1.3 Scope of work

The Firm of Experts undertook comprehensive evaluation and determined environmental character of the project area in relation to the proposed road development and potential impacts identified. Subsequently, the Firm of Experts proposed recommendations for ensuring compliance with the relevant HSE legislations and preserving or restoring
ecological balance following implementation of the proposed road upgrading. In addition the Proponent required the consultant to prepare a project report in accordance with the ESIA/EA Regulations of 2003 and in compliance to World Bank safeguard policies which included undertaking the following:

i. Describing the proposed project components and activities to be carried out in each phase including Pre-construction. Construction, operation and decommission phase including location, project design, the technology, procedures and processes, materials to be used, project cost, the products, by-products and waste generated project;

ii. Describing the Policy, legal and Institutional framework that is relevant to the environmental management and to the proposed project.

iii. Gathering baseline information/existing environment data and any other relevant information related to the project area including physical, biological and socio economic conditions.

iv. Identifying and assessing the potentially affected environment including the Physical, Biological, Social economic and social cultural environments.

v. Identifying and assessing environment and social impacts that may result from the activities of the project including the direct, indirect, cumulative, irreversible, short-term and long-term anticipated impacts.

vi. Describing different project alternatives that were examined during project planning including project site, design, technologies and reasons for preferring the proposed site, design and technologies.

vii. To prepare an Environment and Social Management Plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment. The EMP must specify responsibilities for implementing mitigation measures, costs involved and time schedules.

viii. Preparing an action plan for the prevention and management of foreseeable accidents and hazardous activities in the cause of carrying out project activities.

ix. Identifying and consulting all the relevant stakeholders in order to obtain their views regarding the proposed project.

x. Compiling a project report in accordance with the provisions of EMCA Environmental Impact Assessment and Audit regulations of 2003 for submission to NEMA.

xi. Compiling a project report in accordance with the provisions of Bank safeguard policies

1.4 Study Approach

Both positive and negative implications of the proposed road improvement project were identified and appropriate measures to abate any adverse effects that may emanate from the road works. Environmental and Social Impact Assessment (ESIA) was designed to
ascertain the relationship between the road project and natural environment & social fabric. The study linked the project with key environmental and socioeconomic aspects and related linkages for ease of integration in the implementation of the project from the inception stage through construction, commissioning, periodic maintenance, and eventually long term use. The methodology used for this study involved a review of the existing environmental conditions of the Relief, Geology, Soils, Climate, Hydrology, and Biological resources (flora and fauna, etc.).

A review of the existing socio-economic environment was undertaken and included fieldwork coupled with collection of existing data alongside interviews with a wide spectrum of members of the society, business community, professionals and selected institutions. The socio-economic study was handled as a discrete activity using a combination of recognized tools for assessing socio-economic impacts of such projects and situation analysis on which the relationship between construction and operation of the road against human dimensions was examined.

Finally, identification of appropriate mitigation measures and/or design changes to eliminate or reduce the potentially adverse impacts, and formulation of an environmental management, mitigation and monitoring plans was undertaken. Fieldwork for the environmental and social impact assessment study was conducted in the month of January 2017. Data on topographical surveys, hydrology and drainage, soils and condition surveys of the project road alignment were collected and analyzed.

1.5 Detailed Study Methodology

This study was carried out through desk and field investigations including public consultations. The consultant conducted extensive literature review pertaining to the road improvement project. During the field investigation, reconnaissance survey was conducted to gather information on biophysical and socio economic aspects of the area and its environs. In order to address these issues the study team adopted a participatory approach where the immediate surrounding communities were consulted in addition to reviews and references to sources of information including legal statutes, design and relevant project documents. Among the key activities undertaken during the assessment are:

1.5.1 Documentary Review

The road improvement project documents are among key documents being reviewed. Relevant documents were reviewed to obtain information on the baseline information in general but specifically along the main route corridor. This documentary review provided further understanding of the terms of reference, national and local micro-environmental conditions, data on demographic trends, land use practices, development strategies and plans (local and national) as well as the policy and legal documents among others. Other documents included the World Bank social and environment safeguards.
1.5.2 Field Investigation

Preliminary site visit of the project road was carried out with specific focus on land use patterns, biodiversity, natural resources, hydrology, climatic variations, and current environmental status with respect to physical, biological and socio-cultural perspectives through the route. The objective of Field investigation was to access the exact physical environmental features to be affected within the proximity of the road route and identifying the potential positive and negative impacts of the proposed project road on surrounding environment.

1.5.3 Impact Assessment

Anticipated impacts that may arise from the road project was analyzed against the baseline conditions and was fully established during the detailed fieldwork and information obtained from the documentary reviews. Effects of the project to the environment and social well-being was evaluated against issues such as vegetation cover, land and soil, environmental pollution, health and safety, cultural integration and overview of benefits to the Maragua residents.

1.5.4 Public Consultation

Public consultations were undertaken through a public baraza, and interviews. The consultations were meant to create understanding about the project among the stakeholders and to learn how these external parties view the project and its attendant risks, impacts, opportunities, and mitigation measures. The consultations addressed the following:

- Inform the neighbours and stakeholders of the proposed construction and operations of the proposed road improvement project and its objectives;
- Establish if the neighbours and the stakeholders of the proposed project foresee any positive or negative environmental effects from it; and
- Seek views, concerns and opinions of the neighbours of the proposed project and the stakeholders about the project.

Information gathered was used for integration in project design and formulating mitigation measures and environmental management plan.

1.6 Structure of the ESIA Project Report

The structure of the report is based on that proposed in the NEMA ESIA Guidelines (2003), and is indicated in Table 1-1 below.

Table 1-1: Structure of the ESIA Report

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<th>Chapter</th>
<th>Title</th>
<th>Content</th>
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<td>Chapter</td>
<td>Title</td>
<td>Description</td>
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<td>-----------------------------------------------------------------------------</td>
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<td>Chapter 2</td>
<td>Project Description</td>
<td>The technology and processes to be used in the implementation of the project; workforce requirements; the materials to be used in the construction and implementation of the project; the products, by-products and waste generated by the project.</td>
</tr>
<tr>
<td>Chapter 3</td>
<td>Baseline Information</td>
<td>Description of the potentially affected environment within the framework of the proposed ESIA; assessment of existing (pre project) impacts and potential (project and residual) impacts.</td>
</tr>
<tr>
<td>Chapter 4</td>
<td>Policy, Legal and Regulatory Framework</td>
<td>A concise description of the national environmental, legislative and regulatory framework, and international best practices.</td>
</tr>
<tr>
<td>Chapter 5</td>
<td>Analysis of Project Alternatives</td>
<td>Information provided about the key project alternatives considered, and the levels that were analyzed in the ESIA process.</td>
</tr>
<tr>
<td>Chapter 6</td>
<td>Identification of environmental and social impacts</td>
<td>Environmental effects of the project including the social, economic and cultural effects and the direct, indirect, cumulative irreversible, short term and long-term effects anticipated</td>
</tr>
<tr>
<td>Chapter 7</td>
<td>Environmental Mitigation Measures and Environmental Management Plan</td>
<td>Environmental Mitigation Measures proposing ways of eliminating, minimizing or mitigating adverse impacts on the environment,</td>
</tr>
<tr>
<td>Chapter 8</td>
<td>Public Stakeholder Consultation</td>
<td>Identified stakeholders and methods used in obtaining both primary and secondary data. It has issues raised and how they were addressed</td>
</tr>
<tr>
<td>Chapter 9</td>
<td>Environmental Mitigation Measures and Environmental management Plan</td>
<td>Provision of an action plan for the prevention and management of foreseeable accidents and hazardous activities in the course of carrying out road construction activities; measures to prevent health hazards and to ensure security in the working environment for the employees and for the management of emergencies.</td>
</tr>
<tr>
<td>Chapter 10</td>
<td>Conclusions and Recommendations</td>
<td>Summary of the conclusions and key recommendations from the ESIA Project Report.</td>
</tr>
<tr>
<td>Reference</td>
<td>References</td>
<td>List of references and websites referred to in the text.</td>
</tr>
<tr>
<td>Appendices</td>
<td>Appendices</td>
<td>Attached documents</td>
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</tbody>
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CHAPTER TWO

2 DESCRIPTION OF THE PROPOSED PROJECT

2.1 Project Location

The project road starts at the railway line and meanders to a distance of 11.5 Km to Mitubiri Sanitary Landfill Site in Murang’a County. The proposed site falls within Murang’a South Sub County and in Maragua Location. The project road lies between 37°08′ 30.0″E to 37°11′23.2″E longitude and 01° 00′ 04.3″S to 01°00′00.6″S latitude. The present condition of the riding surface is of murram standard with some sections thinning as a result of erosion and undercutting from quarrying activities. The carriageway runs closely to private property boundaries of live fences (Kei Apple and Euphorbia sp) which may be impacted upon by construction activities. Other institutions neighboring on both sides of the road include the Gikono Dispensary and Solo Plant. There also exists a road barrier at Gikono Administration Police Post. Figure 2-1 below is a satellite imagery of a section of the proposed access road to the proposed Sanitary Landfill Site showing the location of the proposed project site.
Figure 2-1: Location of Proposed Access Road to Proposed Mitubiri Sanitary Landfill Site
(Source: Google Earth 2017)
2.1.1 Linkage of the access road with the proposed sanitary landfill

The improvement of the access road is guided by World Bank’s Sanitary Landfill Design and Siting Criteria (Guidance Published in May 1996 by the World Bank’s an Urban Infrastructure Note, updated November 2004) which require that the Landfill be “Accessible from a competent paved public road which has an adequate width, slope, visibility and construction to accommodate the projected truck traffic. To minimize landfill development costs, the requirement for new access road construction generally should be less than 10 km for large landfills serving metropolitan areas and less than 3 km for small landfills serving secondary cities.” The Access Road Improvement and the Landfill Projects have been treated as separate projects requiring independent ESIA processes and reports, because the landfill, owing to its complexity and environmental and social impacts is a Category A project whilst the access road, being a normal upgrade of the earth/murram road to bitumen standards strictly is Category B and its necessary rehabilitation and improvement was agreed upon after the landfill facility design and ESIA compilation and it was agreed that review and evaluation of the landfill ESIA proceeds without its being unduly held by the access road ESIA. The ESIA report for the proposed development of Mitubiri Landfill has been prepared and sent to World Bank for review.

2.2 Existing Status

Description of the road project is meant to provide a physical understanding of the nature of the road and related characteristics. The access road is basically of murram surface running from the Railway Line and meanders all the way to the proposed Sanitary Landfill Site. The start point forms an X-Junction with the railway line. The present condition of the carriageway surface is of murram standard with some sections thinning as a result of erosion and undercutting from quarrying activities such as at Km 2+300 on the Right Hand Side. The road crosses a bridge of River Nginye at Km 2+600 and may have significant ecological implications. The carriageway runs closely to private property boundaries of live fences (Kei Apple, Cactus and Euphorbia sp). The stretch of the road also borders maize farms and homesteads. Other institutions next to the road include the AAA Growers Farm at Km 3+200, Gikono Dispensary, and Solo Plant at Km 4+000 on both sides of the road. There also exists a barrier at Gikono Administration Police Post at Km 4+100. All these facilities will not be relocated nor displaced by the access road rehabilitation and improvement as
the alignment and design are such as not to have any displacements or relocations.

Plate 2-1: The start of the road at the railway line and the end point at Mitubiri Sanitary Landfill Site

The road traverses through a sparsely populated area with greenhouse along the road. At some point it narrows down at the chief’s office area otherwise it remains an open road with clustered red roofed houses visible far off the road towards the landfill. Far off the road but close to the landfill is permanent house settlement. The project will involve the clearance of the currently available 15m wide road corridor. The design has been structured such that the proposed road alignment will not lead to relocation of any facilities or assets or displacement of persons to pave way for the road construction.

2.2.1 Alignment Condition

The proposed alignment follows the existing road alignment as much as possible so as not to interfere with private land. Already, the safety of the road for human and waste transport by trucks from Murang’a County Government is severely compromised as the road bears sharp bends with no road signage, thus endangering the lives of road users. The project will involve the clearance of the currently available 15m wide road corridor. The entire rehabilitated road width will be 12m comprising of 7m carriageway, 1m road shoulder on both sides of carriageway and 1.5m side ditch on both sides of the carriageway.
Plate 2-2: (a) Sharp bend at Km 3+000 and (b) view of quarrying activities eating into the road reserve

2.2.2 Drainage
River Nginye forms the major drainage basin along the road at Km 2+600. The topography of the road section is such that it slopes towards the river forming a valley that almost dissects the proposed road section into half. Owing to the terrain of the project area, erosion features were evident in some sections next to the road. There is therefore the opportunity to improve the road drainage during construction.

Plate 2-3: (a) view of the bridge at Km 2+600 and (b) erosion features due to poor drainage of the road

2.2.3 Settlements
The alignment passes close to various settlements like Bethsaida Shops at Km 1+500, AAA Growers Farm at Km 3+200 and the Gikono Dispensary at Km 4+000. The Solo plant also owns some greenhouses next to the road at Km
4+000. It is important for the contractor who will be appointed to sensitize the neighboring institutions on the impacts of the road construction activities.

The road narrows down at the chief’s office area. Clustered red roofed houses are visible far off the road towards the landfill. Far off the road but close to the landfill is Chosen Green City permanent house settlement. The project will involve the clearance of the currently available 15m wide road corridor. The design and alignment has been structured such that the proposed road alignment will not lead to relocation of any facilities or assets or displacement of persons.

Plate 2-4: (a) Solo Plant greenhouses and (b) Gikono Dispensary at Km 4+000 situated close to the road but will not be displaced or relocated

2.2.4 Key Features on Existing Access Road to Mitubiri Sanitary Landfill Site
The road corridor is characterized by significant transitions between different human economic activities, and social settings through its length. The key features along the road corridor could be described as follows;

- The first 3km from the railway line is notably dominated by maize farms and homesteads. Apart from the Bethsaida trading center at Km 1+500, other economic activities include quarrying particularly the Mutito Quarry at Km 2+200. This area may experience temporary disturbance.

- There is a change in land use to flower farming from chainage Km 3+200 where Solo Plant has several green houses. Gikono Dispensary is found within this stretch and the Administration Police Barrier at Km 4+000
- There exists ACC&S Gikono Church at Km 4+800 approximately 50m off road. There is no major feature after the church that may be impacted by the activities of the road construction.

Plate 2-5: Some trees and community welfare facilities such as the Mitubiri Community borehole in the vicinity of the proposed road but will be unaffected and will not be relocated

2.2.5 Current Road Usage

The access road to the proposed Sanitary Landfill Site is dominantly utilized by trucks ferrying flowers and staff from the flower farms. The road section has very limited traffic of public transport ("matatus") serving local communities living in the settlement locations along the route. Other notable road users include Murang’a County waste trucks carrying waste to an existing dumpsite and also trucks carrying quarry stones from the Mutito Quarry. Road users accessing the quarry may experience temporary disturbance or inconvenience during project execution.

Plate 2-6: View of vehicles common along the road corridor and other road users
2.3 Project Cost

The estimated project cost for all the proposed Mitubiri Access Road Improvement is **Kshs. 824,818,943.19** as shown in the table below.

**Table 2-1: Bill of Quantities**

<table>
<thead>
<tr>
<th>Bill No.</th>
<th>Description</th>
<th>Amount (Kshs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General</td>
<td>92,874,556.90</td>
</tr>
<tr>
<td>4</td>
<td>Site Clearance</td>
<td>9,378,600.00</td>
</tr>
<tr>
<td>5</td>
<td>Earth Works</td>
<td>54,114,000.00</td>
</tr>
<tr>
<td>8</td>
<td>Culverts And Drainage Works</td>
<td>105,636,000.00</td>
</tr>
<tr>
<td>9</td>
<td>Passage Of Traffic</td>
<td>3,452,000.00</td>
</tr>
<tr>
<td>11</td>
<td>Walkways</td>
<td>24,882,000.00</td>
</tr>
<tr>
<td>12</td>
<td>Natural Material For Sub-base And Base</td>
<td>106,992,600.00</td>
</tr>
<tr>
<td>14</td>
<td>Cement And Lime Treatment</td>
<td>59,299,200.00</td>
</tr>
<tr>
<td>15</td>
<td>Bituminous Surface Treatment And Surface Dressing</td>
<td>32,132,000.00</td>
</tr>
<tr>
<td>16</td>
<td>Bituminous Mix Bases, Binder Courses And Wearing Courses</td>
<td>239,105,000.00</td>
</tr>
<tr>
<td>20</td>
<td>Road Furniture</td>
<td>20,963,086.00</td>
</tr>
<tr>
<td></td>
<td>Sub - Total 1</td>
<td>748,829,042.90</td>
</tr>
<tr>
<td></td>
<td>Total For Day Works</td>
<td>1,006,360.00</td>
</tr>
<tr>
<td></td>
<td>Specified Provisional Sums Included in Sub Total of Bills</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Total of Bills Plus Provisional Sums (A+B+C)</td>
<td>749,835,402.90</td>
</tr>
<tr>
<td></td>
<td>Add 10% For Variation Of Price and Contingencies To Be Expended As Directed By The Engineer</td>
<td>74,983,540.29</td>
</tr>
<tr>
<td></td>
<td>Bid Price (D+E)</td>
<td>824,818,943.19</td>
</tr>
</tbody>
</table>

2.4 Project Components and Requirements during Construction

The major project components and resource requirements are described below:
2.4.1 Mobilization and Preliminary Works
This stage of the project shall essentially involve the preparatory activities such as surveying and leveling. It shall also involve the maintaining of passage for traffic and the provision of temporary signs to show the commencement of works.

2.4.2 Site Clearance and Top Soil Removal
This will be done so as to remove the encroaching vegetation from the road reserves. This stage will essentially enable the construction of the roads to take place without obstructions and allow for the meeting of specified widths and shoulder lengths. The resultant debris from the demolished structures will be disposed off in appropriate ways as specified in the Environmental Management Plan.

After clearing the site, the top soil will then be stripped off from the proposed roads. The top soil is essentially removed so as to enable the construction of a good base of the proposed roads. The top soil removal shall include the stripping off of any unsuitable material encountered in the existing or newly constructed drains, drainage channels and accesses.

2.4.3 Earthworks
This involves the road formation and filling using both soft and hard material. The processes under this section involve excavations, compaction, scarifying, and filling and cutting of benches. Excavations will be both vertical and perpendicular to the direction of travel and at respective steps. The earthworks will also involve the provision of gravel finish, stabilization of base with gravel and cement, preparation of first and second seals, stone dust application and the creation of shoulders to form pavements.

2.4.4 Compaction
This will involve the provision of suitable thickness of compacted lateritic gravel to the required specifications. The compaction shall be done to ensure that the required density is achieved.

2.4.5 Provision of Culverts
This would be of suitable diameter. The culverts shall ensure an improved drainage in the road proposed for improvement. On the other hand, the existing culverts may be extended to be compatible with increased road width and accesses.
In addition, the existing box culvert across River Nginye (seasonal river) is structurally sound and additional twin box culverts of 1200mm diameter across the river will be constructed to handle excess surface run off during rainy season based on a flood period of five years. In other words, the existing box culvert will be maintained but the road will be constructed to handle the expected heavy loading. In addition to this will be road safety works i.e. construction of guard rails and approach road construction works for the bridge.

2.4.6 Drainage
The current drainage of the proposed project road is poor and most of the storm waters from the high lying areas flow down to the Nginye River that is relatively low lying. Abandoned quarry pits such as Mutito Quarry receive the storm water during the rainy season that at times flood the road surface essentially due to lack of appropriate drainage provisions. However, the proposed improvement designs incorporate culverts and drainage channels so as to improve the drainage situation.

2.4.7 Material Sources and Transportation
The sourcing of materials for the proposed road construction will be solely the contractor’s duty, but must be done in an environmentally friendly way. As regards, it is noteworthy to mention that the area hosts appropriate quarries to which the contractor could source construction material from. The contractor will be required to prepare and submit for approval all the quarries that will be identified. In case new quarries will be identified the contractor is expected to carry out ESIA study to identify impacts that will be associated with extraction from the new quarries. He will then be required to adhere to the rehabilitation and restoration plans for all materials sites used for the project (quarry sites, borrow pits and spoil dumping areas). Mobilization of materials will be the main activities such as to include aggregate from the quarry sites, gravel from borrow areas and water from sources. Materials haulage, storage, batching and applications are major activities of the project.
Construction materials will be sourced from the existing and new sites. This will depend on the specification of the material and the amount that is required by the contractor versus the existing reserve in the site.

2.4.8 Non-Motorized Facilities Road
In the proposed road improvement design report, non-motorized facilities such as walkways should be provided on one side of the road for convenience and safety
of users. This is in accordance with the guidelines given in "Guidelines for Pedestrian and Bicycle Traffic in African Cities" prepared under the World Bank Sub-Saharan Africa Transport Program (January 2001).

2.4.9 Project Implementation Components
The project implementation shall consist of several components, which include in addition to the road construction activities:

- Identification of camp site for construction team
- Identification of sources/ disposal sites for wastes that may be produced during implementation
- Identification of sources of construction material
- Identification of sources of water to be used for construction
- Recruitment of labourers
- Development and implementation of applicable environmental conservation and management plan.

2.4.10 Machinery and Equipment
It is expected that the contractor will have his own machinery and equipment which will be used in the proposed road improvement. The machineries and equipment to be used include; bulldozers, generators, rollers, wheel loader, tippers, water bowsers, bitumen distributors, grinders, mixers, compactors and crushers and drills.

2.4.11 Construction Camp / Storage Area
The contractor will establish a camp site for the storage of construction materials, equipment and machinery, particularly for the project. Camp sites would also be necessary for activities such as the burning of bitumen for use in the road construction. Once the site has been identified, a stand-alone Environmental and Social Impact Assessment is proposed in order to identify potential environmental risks associated with the campsite, outlining the establishment and operation of the camp site, including contractors’ code of conduct. The construction campsites and storage area and their establishments are a responsibility of the contractor and no land will be acquired by NaMSIP for this purpose.

2.4.12 Solid Waste and Waste Water Management
The contractor shall dispose of all the solid wastes to an approved dumping site (approved by the County Environmental Officer) and ensure the free flow of waste water in the road drains.
2.4.13 Landscaping

To improve the aesthetic value or visual quality of the site once construction ceases, the proponent will be required to carry out landscaping. This will include the establishment of roadside grass and trees; as well as the backfilling and vegetating of disused quarry sites with indigenous tree species prior to closure of the contract.

2.5 Major Project Components during Operation

2.5.1 Improved Accessibility to Mitubiri Sanitary Landfill Site and Other Areas

The objective of this road improvement project is to construct to bitumen standard an access road to the proposed Mitubiri Sanitary Landfill Site as a transport logistics measure to ease the transportation of wastes. The road will be upgraded to service the proposed Landfill facility in all seasons to a standard that enables easy passage of trucks carrying waste.

The stretch of the road also border maize farms and homesteads. Other institutions next to the road include Peter Kariuki Primary and Secondary School (Km 0+300), AAA Growers Farm at Km 3+200, Gikono Dispensary, and Solo Plant at Km 4+000 on both sides of the road. These flower farms depend on the road for delivery of the flowers to the airport. As such, the proposed road will have far reaching socio economic impacts to the locals.

2.5.2 Enhanced Standard of Living

The project will have a positive impact on the development of Gikono area. People will have good businesses, as well as good health care due to improved road network to Gikono Dispensary and absence of stagnant polluted waters; this largely being resultant from improved systems drainage. The net effect of this will be improved living standards as lesser money will be spent on, for example water related diseases.

2.5.3 General Repairs and Maintenance

Periodic maintenance of the road will also be undertaken once construction is complete and this will include clearing of road side vegetation, landscaping maintenance, and fixing of damaged sections of the road, amongst others.

2.6 Description of the Project Decommissioning Activities

2.6.1 Demolition Works

There will be no major demolitions that will take place after the construction except for the campsite. However, any structures and signs that will have been
put up in the proposed roads will be removed and disposed of in approved dump sites or sold to some re-users.

2.6.2 Site Restoration

Once all the waste resulting from demolition and dismantling works is removed from the site, the area will be restored through replenishment of the topsoil and by re-vegetation using indigenous plant species or developed according to the development trend of the time.

2.6.3 Construction Materials and Energy Used

The main sources of energy required for use in the decommissioning of the project will include electricity and fossil fuels (especially diesel). Electricity will be used for welding, metal cutting/grinding. On the other hand, diesel will run transport vehicles and demolition equipment/machinery such as bulldozers and scrappers.

2.6.4 Solid Waste Generated

Large amounts of solid waste may be generated during the decommissioning of the project and these may amongst others, include excavated materials and spoils. As regards, the proponent is advised to take appropriate steps to minimize the generation of such waste and to ensure proper disposal procedures or recycling/ generated wastes.

2.7 Construction Waste and Emission Inventories

2.7.1 Construction and Commissioning Waste Management

The Table below presents indicative characteristics of wastes that will be generated by the Proposed Project.

Table 2-2: Characteristics of Potential Project Wastes

<table>
<thead>
<tr>
<th>SOLIDS</th>
<th>METALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bituminous material</td>
<td>Welding Rods</td>
</tr>
<tr>
<td>Cement (Dust)</td>
<td>Isolated Steel Piles Wasted Lengths</td>
</tr>
<tr>
<td>Paper and Cards</td>
<td>Copper (Electrical Wires etc.)</td>
</tr>
<tr>
<td>Plastic bottles, cans, drums &amp; packaging bags</td>
<td>Reinforcement steel</td>
</tr>
<tr>
<td>Aggregates</td>
<td>SLUDGES</td>
</tr>
<tr>
<td>Vehicle parts</td>
<td>Grease</td>
</tr>
<tr>
<td>Glass</td>
<td>Paint</td>
</tr>
<tr>
<td>Rags and Oil Adsorbents</td>
<td>Oil</td>
</tr>
<tr>
<td>Light bulbs and tubes</td>
<td>LIQUIDS</td>
</tr>
<tr>
<td>Paint cans and brushes</td>
<td>Wash down water and drum water</td>
</tr>
<tr>
<td>Stone and Rocks</td>
<td>Oily water</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>SOLIDS</th>
<th>METALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tyres</td>
<td>DOMESTIC</td>
</tr>
<tr>
<td>Cleared Trees &amp; Branches</td>
<td>Food</td>
</tr>
<tr>
<td>Cleared undergrowth, shrubs etc.</td>
<td></td>
</tr>
<tr>
<td>Waste Timber</td>
<td></td>
</tr>
<tr>
<td>Concrete Shuttering</td>
<td></td>
</tr>
</tbody>
</table>

It is expected that the special specifications will obligate the contractor to dispose of different categories of waste appropriately. For example, steel wasted lengths may easily be taken by the Jua Kali Industry. **The contractor is required to develop construction specific Waste Management Plans prior to the start of construction work.** Such plan should be consistent with the World Bank Group Environment, Health and Safety guidelines\(^1\). At the start of the construction contract, the contractor will undertake a waste minimization/treatment/disposal study, guided by the project waste management strategy. The study will identify and quantify the expected wastes and describe:-

- Proposals for reduction, treatment processing
- Third parties to whom waste will be transferred for re-use
- Liaisons with the Murang’a County Government to identify and document suitable County disposal sites ground, landfill and incineration facilities.
- Other locations of landfills or waste storage sites to be adopted if County facilities are inadequate.
- On site incineration facilities to be adopted if County facilities are inadequate.

The findings of the study will be used in the development of the construction waste management plans. At a minimum, these plans will include:-

- A consolidated summary of the applicable regulations and restrictions governing the generation, handling, treatment and disposal of wastes generated during the construction/commissioning phases of the Project.
- Any permitting requirements for waste treatment or disposal.
- Detailed method statement for each element of the waste management handling, treatment and disposal process
- Any third party agreements for waste handling, transfer or disposal

\(^1\) WBG EHS Guidelines:

https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final+-+General+EHS+Guidelines.pdf?MOD=AJPERES
After construction of the road, the waste handling/disposal facilities established by the contractor under the construction program will be closed. If a waste handling/disposal facility procured by the contractor is closed, the contractors will be required to ensure that it is appropriately de-commissioned (i.e. including capping of any landfills) and the surface will be re-instated according to the Project Reinstatement Strategy. If the facility is retained, it will be transferred to the proponent.

### 2.7.2 Release to the Atmosphere

Atmospheric emissions will be generated by the proposed roads project activities principally during construction of road works. It is anticipated that the most significant components of such emissions will be combustion gases, specifically:-

- Nitrogen Oxides (NOx)
- Carbon monoxide (CO)
- Sulphur Dioxide (SO2)
- Particulate matter (PM)
- Volatile Organic Compounds
- Aldehydes
- Secondary pollutants

### 2.7.3 General Wastewater Disposal

Wastewater includes all water flows from the temporary site office, work sites and subsidiary operations such as vehicle and equipment washing. Wastewater from camp and temporary site office should be treated in a septic tank and related soak-aways. Wastewater from the works will generally be from the roadside drains and during curing of concrete works. These wastewaters are not hazardous but should be monitored to ensure that they do not cause adverse effects. Roadside drains should be lined to mitigate against erosion.

### 2.8 Atmospheric Emissions during Normal Operations

During operation atmospheric emissions will come from vehicular traffic. Emission of pollutants by vehicles has a global impact. The emissions will vary from time to time depending on the traffic volume, traffic composition, speed of traffic, dispersion dynamics, vehicle emission levels and the road surface.
CHAPTER THREE

3 Baseline Information

This section presents baseline information of the proposed project site in terms of bio-physical and socio economic characteristics.

3.1 Physical Environment

3.1.1 Climatic conditions

The climatic conditions of Gikono area of Murang’a South Sub County is influenced by the Aberdare Ranges. The project area experiences an equatorial type of climate and tropical weather dominated by seasonal monsoons. This climatic condition corresponds to agro-ecological zones 1 and 2 (high potential).

The area has two rainy seasons: April-May (long rains); and October-November (short rains). During the intervening dry seasons monsoonal systems bring rather dry air masses. From December to March the persistent North easterly monsoon brings clear sunny weather with only occasional showers. This forms the perfect period for earthworks during road construction. During the period of South easterly monsoon from June to October the weather is duller and cooler with occasional drizzle which is more persistent at higher elevations. The areas receive an average annual rainfall of between 1400mm and 1600mm. The rainfall is reliable and well distributed throughout the year and is adequate for cultivation as well as rearing livestock.

The maximum annual temperature range between 26 and 30 degrees Celsius while the mean minimum annual temperature range between 14 and 18 degrees Celsius. In the colder areas, the mean minimum annual temperatures can be as low as 6 degrees Celsius or less. Below 1,500 metres the mean daily duration of bright sunshine ranges from 4 hours during July and August to 9 hours during the Northern Monsoon season with an annual mean of 6.8 hours. Sunshine decreases with altitude, with an annual mean of 5 hours at 2,500 metres.

3.1.2 Topography

The project area covers the north eastern limits of the greater Athi Kapiti Plains extending westwards to Thika and beyond. These plains are found at the southern slopes of the Aberdare Mountains. The Aberdare Mountains to the north, Kilimambogo (Ndonyo Sabuk) Hill to the south and Kakuzi Hills to the east are the only important physiographical features. The area has a poor drainage system and water logging during the rainy seasons is common.
Drainage system west of Kenol Market is towards Makindi stream tributary of Thika River, while east of Kenol Market drainage system is towards Maragua River several kilometres away.

The topography in project area is both an asset and liability to development. The terrain is dissected creating the risks of gulley erosion. The road design is such that it will prevent soil erosion. The path of the proposed road has taken into consideration the terrain of the area. Therefore only one bridge at Km 2+600 will be constructed.

![General terrain along the proposed road corridor](image)

**Plate 3-1: General terrain along the proposed road corridor**

### 3.1.3 Geology

The geology of the Mitubiri area consists of volcanic rocks of the Pleistocene age and basement system rock of Achaean type. Volcanic rocks occupy the western part of the county bordering the Aberdares while rocks of the basement system are in the eastern part. Porous beds and disconformities within the volcanic rock system form important aquifers, collecting and moving ground water, thus regulating water supply from wells and boreholes. Volcanic rocks exposed to tropical weathering generally decompose to give rise to thick profiles of clayey (normally red) residual soils. These clayey soils are typically of low density, moderate to low plasticity and generally more silty than clayey. The rock formation in the project area has made it possible for exploitation for the construction industry. The contractor also has the opportunity to utilize the quarry sites in the area for material sites.
3.1.4 Soils

The predominant soils in the project area are the deep and well-drained red/brown soils. They include well drained, extremely deep, dark reddish brown to dark brown, friable and slightly smeary clay loam to clay with acid humic top soil (ando-humic nitisols, and humic andisols). These soils are loose and combined with the hilly terrain are easily eroded and sometimes are responsible for the landslides which are common in the county. Sometimes pockets of black soils are found around wetlands but these are more common in the low lands where cotton is grown. Soil erosion is major environmental problem in the county. Most of the land in the area is hilly with sparse vegetation. Rill erosion is very common in cultivated land while gully erosion is found in unprotected drainage channels, footpaths and culvert outlets.
3.1.5 Hydrology

In terms of drainage, Nginye River that crosses the proposed road falls in Upper Tana River basin and Maragua River. In the project area, water is used for multiple purposes among them being domestic, livestock and agriculture. Water has been tapped from River Nginye, springs and streams using pipes by industries such as AAA Growers Farm at Km 3+200. Others practise roof harvesting while others source water from shallow wells. However, there are others who rely on water taken directly from the rivers and seasonal streams. The main source of water for use in this project will be from a borehole to be drilled under the contract. Cost for undertaking these drilling works has been provided for under Bill 1 of the Bill of Quantities. Water from Triple A dam will be an additional alternative source, if required.

Plate 3-4: Water from River Nginye is used for livestock and for domestic use by the local community

3.1.6 Air Quality

There were no previous air quality studies in the project area available for review. However, given the dominance of agricultural land use with no major industrial establishments, save from few small-scale flower farms, there are currently no concerns of air quality deterioration within the project area. Potential impacts on air quality will depend on how effective the contractor manages the suppression of dust during the construction phase. The potential impact of the proposed project on local air quality will be spread along the road corridor and will only pose a risk to immediate neighbor if not handled efficiently given the closeness of some homesteads to the road corridor.
3.1.7 Noise Levels
Given the predominantly rural character of the project area, existing noise levels are generally low and are not expected to pose any nuisance. Notable existing sources of artificial noise are limited to transport-oriented activities including irregular movements of vehicles and motor bikes (boda boda). Noise from these sources is perceivable from settlements which are mainly located along the road. Noise levels are however expected to rise once construction of the road commences.

3.2 Biological Environment

3.2.1 Flora and Fauna
Farmlands have significantly changed the vegetation types in the project area. Only small pockets of natural vegetation still exists in the project area. Some of the tree species notable within the project area are: Croton megalocarpus, Grevillea robusta, Eucalyptus spp and Ficus sycamores. Natural vegetation cover is savannah grasslands but most of it has been cleared to give way to cultivation of subsistent crops and exotic trees.

The following table summarizes the vegetation type found along the Mitubiri landfill access road. All the trees on the road corridor belong to the Murang’a County Government who together with the road Contractor will replant the trees and grass after the improved road has been completed as part of landscaping activities.

Table 3-1: Vegetation type along the access road

<table>
<thead>
<tr>
<th>Distance from Kabati Market off Thika – Nyeri highway (car odometer reading)</th>
<th>Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) 0Km -4.1km</td>
<td>There are no trees nor shrubs to be impacted on the way leave corridor</td>
</tr>
<tr>
<td>2) 4.5km</td>
<td>3 Ficus tree Species (2 young trees)</td>
</tr>
<tr>
<td></td>
<td>1 Acacia tree species</td>
</tr>
<tr>
<td>3) 4.6km</td>
<td>1 Acacia tree species</td>
</tr>
<tr>
<td></td>
<td>Shrubs</td>
</tr>
<tr>
<td>4) 4.6km</td>
<td>Seasonal shrubs</td>
</tr>
<tr>
<td>5) 4.7</td>
<td>1 Acacia tree species</td>
</tr>
<tr>
<td>6) 4.9km</td>
<td>2 grivellea tree species</td>
</tr>
<tr>
<td>7) 5.0 km -5.2km</td>
<td>Seasonal shrubs/Acacia shrubs</td>
</tr>
<tr>
<td>8) 5.3km -5.5</td>
<td>1 Ficus tree species</td>
</tr>
<tr>
<td></td>
<td>Distance Range</td>
</tr>
<tr>
<td>---</td>
<td>----------------</td>
</tr>
<tr>
<td>9)</td>
<td>5.6km – 5.7km</td>
</tr>
<tr>
<td>10)</td>
<td>6.6km-6.9km  (Nginye river area)</td>
</tr>
<tr>
<td>11)</td>
<td>7.1km</td>
</tr>
<tr>
<td>12)</td>
<td>7.3km</td>
</tr>
<tr>
<td>13)</td>
<td>7.4km</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>14)</td>
<td>8.1km</td>
</tr>
<tr>
<td>15)</td>
<td>8.2km</td>
</tr>
<tr>
<td>16)</td>
<td>8.3km</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>17)</td>
<td>8.3km -11.5km</td>
</tr>
</tbody>
</table>

Plate 3-5: Maize farms and exotic tree species dominate the project area

Wildlife animals are found in the forests, rivers and farmland. Vervet monkeys for example are very common in farm land. However, throughout the alignment no fauna of concern was observed. However, there are some bird species that exists at some few wetland patches and grazing fields along the project road. The Cattle Egret was spotted in River Nginye. An ecological study undertaken for the proposed Mitubiri Sanitary Landfill facility found the area rich in avifauna in terms of species and abundance. It identified a total of 36 species of avifauna in 21 families. Plate 3-6 below show some of the birds found in the project area.
3.3 Socio-Economic Baseline

3.3.1 Human Population

According to population census of 2009, total population of Murang’a County generated from the census statistics shows the county has a total of 912,843 people. Thus, population density in the county is estimated at 356 persons per km². The lowest population in sub location is 2,229 and highest is 15,440 (Fig. 4-14). Female population are relatively higher than males at constituency and county levels of consideration. Majority of population in Murang’a County hail from Kiharu (20%), Gatanga (19%) and Kandara (17%); Kangema constituency has only 8% of the county’s population (Fig. 4-14).

Population of Gatanga constituency, from which the proposed landfill project site is situated, is estimated at 350,000; this is distributed among the eight locations (Administrative units). The location, Mitubiri, at which the project is located, has

Plate 3-6: Some selected bird species at the proposed Mitubiri Landfill Site

Source: ESIA Report for the proposed Mitubiri Sanitary Landfill Site
an estimated population of 19,304. From this population, Nanga Sub location has about 5457, Thuthua 6247 and the Sub location where the project is base, Wemba, has about 7,600.

Figure 3-14: Spatial distribution of population (total) in Murang’a County at a resolution of sub location. Bottom left – distribution of male population. Bottom right – distribution of female population.

3.3.2 Education Status of the People

The national literacy rate stands at 71.4 per cent where as that of Murang’a County is 70.1 per cent. This implies that the literacy rate at the county is lower
than the national one. In the county, the literacy level for male is 73.9per cent while for the female is 66.7per cent. This shows that literacy rate for male is higher than female.

At the national level, the net Primary school enrolment rate stands at 92.9 per cent whereas the county net Primary school enrolment rate stands at 93.85 per cent. This shows that the net Primary school enrolment at the county level is higher than at the national level. Again, at the county, net set secondary school enrolment rate is 67.2 percent for both boys and girls.

The county gross enrolment rate in primary schools stands at 97.75 per cent while the gross enrolment rate in secondary schools is 71.04 per cent. At the same time, the county transition rate from primary to secondary school is 70.6 per cent. Additionally the primary school completion rate in the county is 97.13 per cent. This implies that 26.53 points of the primary school pupils who complete primary education do not proceed to secondary school education. This could be attributed to inadequate day secondary schools to cater for those who qualify to join secondary schools but they cannot afford boarding secondary schools.

The county has 989 pre-schools, 616 primary schools, 263 secondary schools, 48 youth polytechnics, one technical institute (Michuki Technical Institute), two colleges (Murang’a Teachers Training college and Kenya Medical Training College) and one University (Murang’a University College).

This implies most of the county population can make informed decisions on matters affecting their socio-economic livelihoods.

### 3.3.3 Housing

In Murang’a County, about 40 per cent of the households live in stone/brick walled houses, 24.3 per cent in mud/wood walled houses while 2.19per cent live in grass straw/tin walled houses. Most housing units in the county are roofed with corrugated iron sheets (94.38 per cent), while makuti and grass roof constitute 0.18per cent of the households. Most of these housing units have earth floor (60.04 per cent), followed by cement floor at 38.85per cent. The county has 1,924 Low Grade, 232 Middle Grade, and 184 High Grade government housing units which are not adequate for the government officers deployed in the county.

### 3.3.4 Gender Issues

Gender disparities are minimal in primary and secondary education where enrolments are 50per cent for both boys and girls. Women have been discriminated against when it comes to access to ownership of property and
finances. 80 per cent of women constitute the agricultural workforce but only a small percentage of them hold title deeds to land. This imposes a great constraint on their ability to make major land-related investment decisions including obtaining credit using title deeds as collateral.

3.3.5 Poverty

The county has high poverty levels which according to the 2005/2006 Kenya Integrated Household Budget Survey, about 36 per cent of the population live below the poverty line compared to 42 percent nationally. The poor are not able to access the basic necessities of life such as food, shelter and education. The food poor constitute 36 per cent of the population with the vulnerable groups that is hardest hit by poverty being women, the unemployed youth, widows and orphans, neglected retired old people, the street children and those living in the marginal areas of the county. Poverty in the county manifests itself in many ways including inaccessibility to health services, food insecurity, inadequate potable water, lack of good and proper clothing, inaccessibility to proper education and landlessness. The main causes of poverty in the county include the poor physical infrastructure that increases the cost of accessing and marketing of agricultural produce; and low returns from coffee, tea and milk which make it difficult for most of the agricultural community to meet their basic needs. Other causes include: lack of industries; stringent collateral requirements and high interest rates by banks; high prices of farm inputs resulting in low application by farmers; collapse of the major cooperative societies and exploitation of farmers by middlemen.

3.3.6 HIV and AIDS

HIV and AIDS pandemic poses a serious threat to the development of the county as the prevalence rate stands at 3.7 per cent compared to 5.7 percent (National) for adult in Kenya. The scourge is on the increase virtually in all the constituencies of the county. AIDS related deaths are common and those mainly affected are those within the productive age group of 15-49 years of age. Also, the number of HIV/AIDS orphans is on the increase. HIV/AIDS in the county is also linked to peer pressure and ignorance of the youth based on age and sex distribution and commercial sex due to economic hardships.

3.3.7 Socio Economic activities

The southern region of the County where the project road lies is a relatively dry rangeland with minimal rainfall and therefore farming is practiced mainly under
irrigation. Subsistence farming is also common with maize, beans, bananas, tubers and vegetables being grown under small holder farms. The county is also home to few industries, most of them doing only semi processing of raw materials from the farming and animal industries. The project area hosts flower farms including AAA Hippo Farm and Solo Plant all located along the road corridor.

3.3.8 Physical Infrastructure

Physical infrastructure is a basic foundation for national transformation as articulated in the national economic blueprint – Kenya Vision 2030. In 2013, Murang’a County had 2,934.95 Km of road. Of these, 387.5 Km are bituminized, 1313.1 Km are gravelled and 1234.3 Km is earth surface. The county has 65Km of railway line which is underutilized. There is no established air strip in the county; however plans are underway to construct an airstrip at Kambirwa in Kiharu constituency.

3.3.9 Average Farm Sizes

The average farm size for most of the county’s households is 1.4 acres. As a result of this, farmers are not able to produce large quantities of crops to warrant large storage facilities at household level. Nevertheless, the average large scale farm size is 16 acres which are commonly found in the lower parts of the county and in tea, coffee, pineapples, mango and flower estates.

3.3.10 Markets and Urban Centres

There are a total of 513 market centres in the county out of which three are classified as towns (Murang’a, Maragwa and Makuyu towns). The number of urban centres in the county are three (Kabati, Kangari and Kiriaini). There are 18,963 registered traders, both retail and wholesale. The wholesalers mostly deal with consumer and hardware products while retail traders, who are in both rural and urban areas, deal mainly with food products. The trade sub-sector assists in the strengthening of the county joint loans board, promotes training of traders as well as consumer protection through frequent impromptu inspection of traders. The industry subsector is involved with promotion of local investments, identification and development of new enterprises, as well as collection, analysis and dissemination of industrial information. Coffee and tea processing are the main industrial activities in the county while milk cooling plants are also coming.
3.3.11 Cooperative Societies
The County has 155 registered co-operatives societies of which 120 are active and 35 are dormant. These have a total membership of 332,420 and annual turnover of over Kshs.599 million.

3.3.12 Non-Governmental Organizations
There are 10 active NGOs operating in the county. Their activities are pegged on the improvement of social and economic wellbeing of the entire population of the county. The key NGOs operating in the county include: Vihda association, G.I.Z, Africa now and YARD, among others.

3.3.13 Self Help, Women & Youth Groups
The county has 1,832 registered self-help groups of which 676 are youth groups and 1,156 are women groups. These groups operate with a view to pooling their resources to uplift the economic and social welfare of the members.

3.3.14 Environmental degradation in the county
The main environmental pollutants in the county are identified as agrochemicals from agricultural activities and factories, vehicle exhausts, quarrying activities and emissions of Green House Gases (GHGs) into the atmosphere through natural causes and human induced activities and solid wastes from markets and towns. The GHGs disrupt atmospheric balance and global warming therefore heating the earth surface.

Solid wastes include: plastic, polythene papers, glass, human waste, animal waste, organic plant matter, synthetic material, rubber and medical waste. Dumping and management of solid waste to the environment remains a major challenge for the County. Human waste disposal is a challenge in the county as it is only Murang’a Town which is served by a sewerage treatment plant.

3.3.15 Water and Sanitation
Water Resources and Quality
Murang’a County’s water resources are rivers, shallow wells, springs, dams, boreholes and roof catchment. There are 10 permanent rivers, 400 shallow wells, 75 springs, 30 dams and 100 bore holes that supply water for domestic and agricultural use in the county. All these sources supply 60 per cent of the county population with clean and safe drinking water.
Along the acces road there is Nginye River and water Kiosk which provide water to the residence of the area.
Water supply schemes
The county has 27 water supply schemes and about 16 irrigation schemes. Water supply schemes are managed by three different entities. There are some which are managed by the water companies, the department of water and some others are managed by the community members through water project committee. The irrigation schemes, which are managed by the community members, got funding from community own initiatives as well as government and development partners’ support.

Sanitation
In Murang’a County, about 99.78 per cent of the households use toilet facilities. Out of these, 4.97 per cent use flush toilets, 3.97 per cent use VIP latrines and the others use ordinary pit latrines. The majority of people living in the market and trading centres use ordinary pit latrines.

3.3.16 Health access and nutrition

Health Access
The County has 272 health facilities serving a population of 959,701. It has three level five hospitals, three mission/private hospitals and three nursing homes. There are 21 health centers (public and private), 114 dispensaries (89 public and 25 mission/NGO) and 137 private clinics.

The County has 464 medical personnel working in government health facilities with 312 nurses, 23 doctors, 41 clinical officers, 50 public health officers and 38 laboratory technicians and technologists among others medical personnel and health facilities in the county are inadequate.

Gikono dispensary is one of the facilities found along the road improvement project.

3.3.17 Structures/Utilities in the vicinity of the road Access Road

There are no structures on the existing road corridor. Since there will be no additional land required for the road rehabilitation activities, no structures will be affected on privately owned land. However, there are several institutions such as Peter Kariuki Primary and Secondary Schools, Gikono Health centre, Hippo Out-growers farm, Triple A horticultural farm and Gikono AP camp in the vicinity of the road but away from the road corridor. These institutions will realize benefits such as easier transportation means and reduced dust level because of the road upgrade. The following table is a summary of structures and utilities within the vicinity of the road.
Table 3-2: Structures/utilities in the neighborhood of Mitubiri access road.

<table>
<thead>
<tr>
<th>Distance from Kabati Market off Thika – Nyeri highway (car odometer reading)</th>
<th>Structures/utilities neighboring the road corridor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) 0Km - 4.1km</td>
<td>Shops along the road. None on the road reserve. Bitumen standard road to improved (to accommodate large trucks)</td>
</tr>
<tr>
<td>2) 4.6km</td>
<td>Peter Kariuki primary school fence</td>
</tr>
<tr>
<td>3) 4.8km</td>
<td>Peter Kariuki secondary school gate</td>
</tr>
<tr>
<td>4) 5.5km</td>
<td>Live fence (euphorbia species)</td>
</tr>
<tr>
<td>5) 6.2km</td>
<td>Live fence (euphorbia species)</td>
</tr>
<tr>
<td>6) 6.6km</td>
<td>Abandoned quarry site</td>
</tr>
<tr>
<td>7) 6.6km - 6.9km (Nginye river area)</td>
<td>4 power line poles (Utility line)</td>
</tr>
<tr>
<td>8) 8.1km</td>
<td>Gikono dispensary fence and gate</td>
</tr>
<tr>
<td>9) 8.2km</td>
<td>Gikono AP barrier. Live fence. Barbed wire fence</td>
</tr>
</tbody>
</table>
4 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

This section of the report discusses the policy, applicable EHS legislations and institutional framework. The proposed project falls under the provisions of several policy, regulations, standards, national and international laws of which the project proponent and contractors need to comply with in the execution of the project. Implementations of major projects in Kenya are preceded by the Environmental and Social Impact Assessment studies. It is a requirement to undertake the Environmental and Social Impact assessment according to the regulations stipulated in The Environmental Management and Coordination (EMCA) Act 1999, amended in 2015 and the Environmental Impact Assessment and Audit Regulations 2003. General environmental challenges facing Kenya include:

i. Weak enforcement of existing laws and regulations, unrealistic penalties, inadequate human resources to monitor and enforce regulations, and cumbersome procedures,

ii. Absence of discharge standards and methods for measuring the quality and quantity of effluents,

iii. Inadequate incentives to encourage adoption of efficient waste management technologies,

iv. Insensitivity of industry to the legal requirements for health and safety in the workplace,

v. Low priority and status given to waste management and sanitation, and

vi. Inadequate training facilities for occupational health and safety services.

4.1 Environmental Policy Framework

In the recent past, policy and legislative developments have been substantially directed at redefining the role of the state with separation of policy and regulation (state responsibility) from implementation (private sector and/or statutory bodies). At the same time, there has also been movement to redefine the role of the state vis-à-vis the individual and/or community groups. The new constitution and policies such as the National Land Policy have considerably strengthened community rights. This is critically important as developments such as the proposed project components can create social conflicts with the affected communities or individuals effectively delaying the project. This implies a need to engage the affected communities from the earliest stages of project planning.
4.1.1 The Constitution of Kenya 2010

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

In relation to environment, Article 42 of Chapter 4, the Bill of Rights, confers to every person the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislative measures, particularly those contemplated in Article 69, and to have obligations relating to the environment fulfilled under Article 70. Chapter 5 of the Constitution provides the main pillars on which the 77 environmental statutes are hinged. Part 1 of the Chapter dwells on land, outlining the principles informing land policy, land classification as well as land use and property. The provisions of this Part will be important as some of the land to be acquired for the project is private land.

Part 2 of the Chapter directs focus on the environment and natural resources. It provides for a clear outline of the state’s obligation with respect to the environment, thus:

The State shall:

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 percent 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;

v. Protect genetic resources and biological diversity;

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

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

viii. Utilize the environment and natural resources for the benefit of the people of Kenya.
There are further provisions on enforcement of environmental rights as well as establishment of legislation relating to the environment in accordance to the guidelines provided in this Chapter. In conformity with the Constitution of Kenya 2010, every activity or project undertaken within the Republic of Kenya must be in tandem with the state’s vision for the national environment as well as adherence to the right of every individual to a clean and healthy environment. The proposed project is a development activity that will utilize sensitive components of the physical and natural resources hence need for a clearly spelt out environmental management plan to curb probable adverse effects to the environment.

4.1.2 National Environmental Policy 2012

This National Environment Policy aims to provide a holistic framework to guide the management of the environment and natural resources in Kenya. It further ensures that the linkage between the environment and poverty reduction is integrated in all government processes and institutions in order to facilitate and realize sustainable development at all levels. The vehicles that will be using the access road have the potential to pollute the atmospheric resources that sustains life through generation of atmospheric pollutants such as greenhouse gases and dust. Some of the pollutants expected to be emitted during operation of the project are, \( \text{CO}_2 \), \( \text{SO}_2 \), particulate matter among others as described in the impacts section of this report.

4.1.3 The Land Policy 2007

The land policy has a vision of “efficient, sustainable and equitable use of land”. It designates all land in Kenya as Public, Community or Private; “Community land” replaces the Trust Land category. It also recognizes and protects customary land rights. Recognition of community land (formally trust land under a County Council control) is provided under section 66(d)(ii) for restitution of illegally acquired as part of trust land to the affected communities and (v) for governing community land transactions using participatory processes. Some key relevant issues:

i. The exercise of (these) powers (compulsory acquisition and development control) should be based on rationalized land use plans and agreed upon public needs established through democratic processes (Section 43),

ii. Ensure that the exercise of development control takes into account local practices and community values on land use and environmental management (Section 51(f)),
iii. Ensure effective public participation in the exercise of development control (Section 51(g), and

iv. Strategies for sharing benefits should be developed taking into account the nature of the resources involved and the contribution that diverse actors make to the management of the resources (Section 98).

4.1.4 The National Biodiversity Strategy 2007
The National Biodiversity Strategy and Action Plan (NBSAP) is a national framework of action to ensure that the present rate of biodiversity loss is reversed and the present levels of biological resources are maintained at sustainable levels for posterity. The general objectives of the strategy are to conserve Kenya’s biodiversity to sustainably use its components; to fairly and equitably share the benefits arising from the utilization of biological resources among the stakeholders; and to enhance technical and scientific cooperation nationally and internationally, including the exchange of information in support of biological conservation. It is recommended that landscaping programmes of the road project should involve use of certified plant species to prevent them from affecting project area negatively in terms of invading wetlands, vegetation and even farmlands. No alien species that might colonize the project area should be introduced for such programmes.

4.1.5 National Policy on Water Resources Management and Development
The National Policy on Water Resources Management and Development (Sessional Paper No. 1 of 1999) was established with an objective to preserve, conserve and protect available water resources and allocate it in a sustainable rational and economic way.

While the policy enhances a systematic development of water facilities in all sectors for promotion of the country’s socio-economic progress, it also recognizes the by-products of this process as wastewater. It, therefore, calls for development of appropriate sanitation systems to protect people’s health and water resources from institutional pollution. Development projects, therefore, should be accompanied by corresponding waste management systems to handle the wastewater and other waste emanating there from. Road constructions often require large volumes of water that may not be drawn from the rivers. The contractor will sink a borehole in this contract in order to avert possible water conflicts with the locals in this road construction project and use the water from this sunk borehole.
4.1.6 Guidelines for Prevention and Control of Soil Erosion in Road Works, 2010

The main objective of the guideline is to benefit all persons engaged in the road works (engineers, consultants, constructors and supervisors) and are not informed on the extent of damages caused by uncontrolled run-off from the road corridor. It acknowledges that road works potentially result in environmental hazard through the spillage of carbon products, contaminating the surrounding land, dust and noise pollution, interference with the drainage pattern hence extensive soil erosion. The guidelines therefore focus to minimize the damages to the environment through the use of innovative construction methods and procedures which are less damaging to the environment in controlling soil erosion. The guidelines discuss several issues on the soil and water conservation principles which entail:

i. The design and construction of water ways and soil erosion control measures in road drainage systems,

ii. Soil erosion control measures needed in upper and lower catchment areas,

iii. Soil erosion and their mitigation measures against anticipated damages from the road drainage discharge,

iv. Use of vetiver grass to stabilize and heal erosion damages, and

v. Indicative cost of soil and water conservation measures for planning purposes.

4.1.7 Environmental Guidelines for Roads and Bridges, 2010

The guideline for roads and bridges provides detailed analysis of environmental issues arising from road works along with mitigation measures that have been used in the national and the international contexts. The main focus is on simply, fulfilling the law that requires assessing the state of environment before and after the road construction period hence achieving sound environmental management for the road transportation system. It also addresses environmental practices to be followed during the development stages starting from tender, feasibility, design, construction, operation and maintenance phase. The guidelines recommend:

i. Preparation of full ESIA study to be completed at feasibility and updated at the design stage,

ii. The certificate for environmental compliance should be issued prior to the issuance of certificate of road completion,
iii. The guidelines are expected to be used in conjunction with existing and future regulations and guidelines developed by the government in particular NEMA, and

iv. Emphasizes on the environmental sustainable guidelines that calls for health and Environmental quality objectives (ecosystem protection, clean air, avoiding mobility and mortality.

4.1.8 Codes, Specifications and Standards
The Standard Specifications for Road and Bridge construction has guidelines on environmental protection and mitigation. Standard Specification Clauses 116,117,125,135,137 address protection of the environment, with regard to water, health, safety and accidents, water supply, maintenance of the engineers’ staff houses, offices, laboratories, and attendance upon the engineer and his staff. The provisions of these laws, standards and codes must not be contravened during project implementation, thus the provisions are largely supportive of EMCA 1999; must form part of the legal basis for environmental mitigation, avoidance, prevention, compensation, restoration and enhancement.

4.2 International Policy Guidelines
The following international Guidelines and Safeguards Policies will have significant bearing on the project, particularly when there will be need for financial partnerships with the World Bank (WB).

4.2.1 World Bank Environmental and Social Safeguard Policies
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 Operational Procedures (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
mitigation measures can be designed more readily than for Category A projects. This particular road 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 environmental assessment 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 road project.

The proposed development of the access road to Mitubiri Sanitary Landfill Site by the Ministry of Land, Housing and Urban Development, and Nairobi Metropolitan Development under the NaMSIP is also subject to World Bank requirements for impact assessment. As such, this ESIA Report study has been formulated to address and cater for both Kenyan and World Bank requirements for environmental impact assessment. World Bank projects and activities are governed by Operational Policies, which are clearly spelt out in the Bank's Operational Manual. The World Bank's safeguard policies are designed to ensure that projects proposed for Bank financing are environmentally and socially sustainable, and thus improve decision-making. These operational policies include:

- OP 4.01 Environmental Assessment;
- OP 4.04 Natural Habitats;
- OP 4.09 Pest Management;
- OP 4.11 Physical Cultural Resources;
- 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.

The table below shows the applicability of World Bank Operational Policies to the proposed Mitubiri access road improvement project.
**Table 4-1: Analysis of potential triggers to World Bank Safeguards Policies**

<table>
<thead>
<tr>
<th>OP</th>
<th>Title</th>
<th>Comments/Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.01</td>
<td>Environmental Assessment</td>
<td>Applicable. As a result of environmental and social screening, the project was identified as a Category B project because the road is not new and the upgrading will follow the existing alignment as closely as possible with no resettlements or land acquisition.</td>
</tr>
<tr>
<td>4.04</td>
<td>Natural Habitats</td>
<td>Not applicable - there are no natural habitats at the project site.</td>
</tr>
<tr>
<td>4.09</td>
<td>Pest Management</td>
<td>Not applicable - the project will not involve any pest management.</td>
</tr>
<tr>
<td>4.10</td>
<td>Indigenous Peoples</td>
<td>Not applicable - there are no indigenous people at the site or project area.</td>
</tr>
<tr>
<td>4.11</td>
<td>Physical Cultural Resources</td>
<td>Not applicable. Site inspections and literature searches have not indicated the presence of any cultural (historical, archaeological) sites in the construction area. However, “Sample Chance Finds Procedures” have been included in this report to guide in the event there are chance finds of cultural resources in order to safeguard them.</td>
</tr>
<tr>
<td>4.12</td>
<td>Involuntary Resettlement</td>
<td>Not applicable The alignment and design of the road to be constructed is such that there will be no relocation of any facilities or assets or displacement of persons. No RAP or ARAP is required for this project as it does not trigger Involuntary Resettlement Safeguard, OP 4.12. As such, there will be no compensation required. The project therefore does not trigger this safeguard.</td>
</tr>
<tr>
<td>4.36</td>
<td>Forests</td>
<td>Not applicable - there is no forest at the site.</td>
</tr>
<tr>
<td>4.37</td>
<td>Safety of Dams</td>
<td>Not applicable because the project will not involve construction of dams.</td>
</tr>
<tr>
<td>7.50</td>
<td>Projects on International Waters (OP 7.50)</td>
<td>Not applicable - the site does not affect international waters.</td>
</tr>
<tr>
<td>7.60</td>
<td>Projects in Disputed Areas</td>
<td>The site is not classified as a disputed area.</td>
</tr>
</tbody>
</table>

In addition, during the project implementation the contractor should refer to World Bank Group Environment, Health and Safety Guidelines as these provide a set of internationally accepted good practices to improve sustainability of construction activities.
4.3 Legal Framework

4.3.1 The Environment Management and Coordination Act No 8, 1999 and the relative Amendment Act No 5, 2015

The Environment Management and Co-ordination (Amendment) Act 2015 No 5 of 2015 was effective on the 17th June 2015 to amend some sections of the Principal Act (Environmental Management and Co-ordination Act 1999). The Act has aligned EMCA Act 1999 with the Constitution of Kenya (2010) to include new structures that the Constitution of Kenya 2012 created particularly entrenchment of county government in environment and natural resource management. The EMCA is an act of Parliament that provides for the establishment of an appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto.

The Act further aims to improve the legal and administrative co-ordination of the diverse sectoral initiatives in the field of environment so as to enhance the national capacity for its effective management. In addition Act seeks to harmonize all the 77 sector specific legislation touching on the environment in a manner designed to ensure protection of the environment.

As the principal environmental legislation in Kenya, EMCA sets the legal framework for environmental management basically as follows:-

Part II of the Act states that every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment. In order to ensure the achievement, part VI of the same Act directs that any proponent of a new project, activity or operation should undertake an Environmental Impact Assessment (ESIA) and a report prepared for submission to the National Environmental Management Authority (NEMA), who in turn may issue a license as appropriate; while projects already in place will undertake annual Environmental Audits (EA).

Section 58 of the Environmental Law requires that notwithstanding any approval, permit or license under this Act or any other law in force in Kenya, any person being a proponent of a project, shall before financing, commencing proceeding with carrying out, executing or conducting or causing to be financed, commenced, proceed carried out, executed or conducted by another person for any undertaking specified in the second schedule to this Act, submit a project report to the Authority in the prescribed form, giving the prescribed information and shall be accompanied by the prescribed fee.

Section 68 and 69 of EMCA requires all on-going projects to conduct an EA with a view to finding out if the processes and activities have any negative impacts on
the environment and to propose any mitigation measures to counter such impacts.

EA are further expounded in Regulation 35 (1) and (2) of Legal Notice 101 of June 2003. Under EMCA 2015, NEMA has gazetted legal tools that govern how ESIs are conducted and general environmental protection. These guidelines are captured in the Contracts for Construction to ensure that contractors are legally bound to undertake mitigation alongside general construction work. Under EMCA, NEMA has gazetted legal tools that govern conduct of ESIs and general environmental protection. The Proposed project by the NaMSIP has been screened against these tools with results that (table below) five of the tools will be triggered.

**Table 4-2: Analysis of the Project triggers to the EMCA and its tools.**

<table>
<thead>
<tr>
<th>Legal Tool</th>
<th>Status</th>
<th>Trigger mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESIA and Audit regulations</td>
<td>Triggered</td>
<td>ESIA Study has to conform to these rules</td>
</tr>
<tr>
<td>Waste Management Rules</td>
<td>Triggered</td>
<td>Construction likely to generate solid waste</td>
</tr>
<tr>
<td>Water Quality rules</td>
<td>Triggered</td>
<td>The main source of water for use in this project will be from a borehole to be drilled under the contract. Triple A dam will be an additional alternative source, if required. There will also be work over the river when constructing the twin box culverts</td>
</tr>
<tr>
<td>Conservation of Biodiversity regulations</td>
<td>Not triggered</td>
<td>These regulations focus more on benefit sharing in biodiversity conservation.</td>
</tr>
<tr>
<td>National Sand Harvesting Rules</td>
<td>Triggered</td>
<td>Road works will require concrete mixture which shall include sand</td>
</tr>
<tr>
<td>Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009 Legal Notice No. 61:</td>
<td>Triggered</td>
<td>Both construction activity and construction crew likely to generate noise</td>
</tr>
<tr>
<td>Air Quality Regulation</td>
<td>Triggered</td>
<td>Both construction activity and</td>
</tr>
</tbody>
</table>
In particular, specifications of these guidelines would require to be captured in the Contracts for Construction to ensure that contractors are legally bound to undertake mitigation alongside general construction work. The EMCA Tools likely to be triggered by the proposed construction of the road sections are briefly reviewed below.

4.3.2 Environmental Impact Assessment and Audit Regulations, 2003

Environmental impact Assessment (ESIA) is a tool for environmental conservation and has been identified as a key component in new project implementation. At the national level, Kenya has put into place necessary legislation that requires ESIA be carried out on every new project, activity or programme (EMCA), and a report submitted to the National Environmental Management Authority (NEMA) for approval and issuance of relevant certificates. These Regulations provide procedures for conducting an ESIA study and detail the parameters to be evaluated during the study. It also provides guidelines on the payment of the ESIA license fees, conducting environmental audits and development of project monitoring plans.

In particular, specifications of these guidelines indicate that no proponent should implement a project which can have a negative environmental impact.

This ESIA report has been undertaken in accordance with the Environment (Impact Assessment and Audit) regulation 2003, which operationalizes the Environment Management & Coordination Act (EMCA) 1999 and its subsequent amendment, the Environmental Management and Coordination Act (Amendment), 2015. The report is prepared in conformity with the requirements stipulated in the Act and its amendment and the Environmental Impact Assessment and Audit regulations 2003 regulation7 (1) and the second schedule.

4.3.3 Environmental Management and Coordination Act (Waste Management) Regulations, 2006

The regulations provide details on management (handling, storage, transportation, treatment and disposal) of various waste streams including:

- Domestic waste
- Industrial waste,
- Hazardous and toxic waste
• Pesticides and toxic substances
• Biomedical wastes
• Radioactive waste

Regulation No.4 (1) makes it an offence for any person to dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle.

Regulation 5 (1) provides categories of cleaner production methods that should be adopted by waste generators in order to minimize the amount of waste generated and they include:

i) Improvement of production process through:
   • Conserving raw materials and energy
   • Eliminating the use of toxic raw materials and waste
   • Reducing toxic emissions and wastes

ii) Monitoring the product cycle from beginning to end by:
   • Identifying and eliminating potential negative impacts of the product
   • Enabling the recovery and re-use of the product where possible
   • Reclamation and recycling

iii) Incorporating environmental concerns in the design and disposal of a product.

The Proponent shall ensure that the main contractor adopts and implements all possible cleaner production methods during the construction phase of the project.

Regulation 6 requires waste generators to segregate waste by separating hazardous waste from non-hazardous waste for appropriate disposal.

Regulation 14 (1) requires every trade or industrial undertaking to install anti-pollution equipment for the treatment of waste emanating from such trade or industrial undertaking.

Regulation 15 prohibits any industry from discharging or disposing of any untreated waste in any state into the environment.

Regulation 17 (1) makes it an offence for any person to engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment license issued by NEMA.

Regulation 18 requires all generators of hazardous waste to ensure that every container or package for storing such waste is fixed with a label containing the following information:

   • The identity of the hazardous waste
The name and address of the generator of waste
The net contents
The normal storage stability and methods of storage
The name and percentage of weight of active ingredients and names and percentages of weights of other ingredients or half-life of radioactive material
Warning or caution statements which may include any of the following as appropriate.
- the words "WARNING" or "CAUTION";
- the word "POISON" (marked indelibly in red on a contrasting background);
- The words “DANGER! KEEP AWAY / NO ENTRY FOR UNAUTHORIZED PERSONS”;
- A pictogram of skull and crossbones.

Regulation 19 (1) requires every person who generates toxic or hazardous waste to treat or cause to be treated such hazardous waste. During the construction phase of the project, the Proponent shall ensure that the main contractor implements the above mentioned measures as necessary to enhance sound environmental management of waste.

4.3.4 Environmental Management and Coordination Act (water quality) Regulation 2006

The Regulations provides for sustainable management of water resources including prevention of water pollution and protection of water sources (lakes, rivers, streams, springs, wells and other water sources).

It is an offence under Regulation No.4 (2), for any person to throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, as to cause pollution.

Regulation No. 11 further makes it an offence for any person to discharge or apply any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or permit the dumping or discharge of such matter into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards for effluent discharge into the environment. The contractor therefore has the duty to protect River Nginye against such pollution.

Regulation No. 14 (1) requires every licensed person generating and discharging effluent into the environment to carry out daily effluent discharge quality and
quantity monitoring and to submit quarterly records of such monitoring to the Authority or its designated representatives.

The proponent will have to abide by the Legal Notice No. 120 of the Environmental Management and Co-Ordination (Water Quality) Regulations, 2006 throughout the project cycle to ensure that appropriate measures to prevent pollution of underground and surface water sources implemented.

The table below indicates the allowable discharge limit of different parameters into the environment according to EMCA Water Quality Regulation 2006.

**Table 4-3: Standards for Discharge into Environment (Water body)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1,1-trichloroethane (mg/l)</td>
<td>3</td>
</tr>
<tr>
<td>1,1,2-trichloroethane (mg/l)</td>
<td>0.06</td>
</tr>
<tr>
<td>1,1-dichloroethylene</td>
<td>0.2</td>
</tr>
<tr>
<td>1,2-dichloroethylene</td>
<td>0.04</td>
</tr>
<tr>
<td>1,3-dichloropropene (mg/l)</td>
<td>0.02</td>
</tr>
<tr>
<td>Alkyl Mercury compounds</td>
<td>Nd</td>
</tr>
<tr>
<td>Ammonia, ammonium compounds, NO3 compounds and NO2 compounds (Sum total</td>
<td>100</td>
</tr>
<tr>
<td>of ammonia-N times 4 plus nitrate-N and Nitrite-N) (mg/l)</td>
<td></td>
</tr>
<tr>
<td>Arsenic (mg/l)</td>
<td>0.02</td>
</tr>
<tr>
<td>Arsenic and its compounds (mg/l)</td>
<td>0.1</td>
</tr>
<tr>
<td>Benzene (mg/l)</td>
<td>0.1</td>
</tr>
<tr>
<td>Biochemical Oxygen Demand (BOD 5days at 20 oC) (mg/l)</td>
<td>30</td>
</tr>
<tr>
<td>Boron (mg/l)</td>
<td>1.0</td>
</tr>
<tr>
<td>Boron and its compounds – non marine (mg/l)</td>
<td>10</td>
</tr>
<tr>
<td>Boron and its compounds – marine (mg/l)</td>
<td>30</td>
</tr>
<tr>
<td>Cadmium (mg/l)</td>
<td>0.01</td>
</tr>
<tr>
<td>Cadmium and its compounds (mg/l)</td>
<td>0.1</td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td>0.02</td>
</tr>
<tr>
<td>Chemical Oxygen Demand (COD (mg/l)</td>
<td>50</td>
</tr>
<tr>
<td>Chromium VI (mg/l)</td>
<td>0.05</td>
</tr>
<tr>
<td>Chloride (mg/l)</td>
<td>250</td>
</tr>
<tr>
<td>Chlorine free residue</td>
<td>0.10</td>
</tr>
<tr>
<td>Chromium total</td>
<td>2</td>
</tr>
<tr>
<td>cis –1,2- dichloro ethylene</td>
<td>0.4</td>
</tr>
<tr>
<td>Copper (mg/l)</td>
<td>1.0</td>
</tr>
<tr>
<td>Dichloromethane (mg/l)</td>
<td>0.2</td>
</tr>
<tr>
<td>Dissolved iron (mg/l)</td>
<td>10</td>
</tr>
<tr>
<td>Dissolved Manganese(mg/l)</td>
<td>10</td>
</tr>
<tr>
<td>E.coli (Counts / 100 ml)</td>
<td>Nil</td>
</tr>
<tr>
<td>Fluoride (mg/l)</td>
<td>1.5</td>
</tr>
<tr>
<td>Fluoride and its compounds (marine and non-marine) (mg/l)</td>
<td>8</td>
</tr>
<tr>
<td>Lead (mg/l)</td>
<td>0.01</td>
</tr>
<tr>
<td>Chemical</td>
<td>Concentration (mg/l)</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Lead and its compounds</td>
<td>0.1</td>
</tr>
<tr>
<td>n-Hexane extracts (animal and vegetable fats)</td>
<td>30</td>
</tr>
<tr>
<td>n-Hexane extracts (mineral oil)</td>
<td>5</td>
</tr>
<tr>
<td>Oil and grease</td>
<td>Nil</td>
</tr>
<tr>
<td>Organo-Phosphorus compounds</td>
<td>1.0</td>
</tr>
<tr>
<td>Polychlorinated biphenyls, PCBs</td>
<td>0.003</td>
</tr>
<tr>
<td>pH (Hydrogen ion activity------marine)</td>
<td>5.0-9.0</td>
</tr>
<tr>
<td>pH (Hydrogen ion activity--non marine)</td>
<td>6.5-8.5</td>
</tr>
<tr>
<td>Phenols</td>
<td>0.001</td>
</tr>
<tr>
<td>Selenium</td>
<td>0.01</td>
</tr>
<tr>
<td>Hexavalent Chromium VI compounds</td>
<td>0.1</td>
</tr>
<tr>
<td>Sulphide</td>
<td>0.1</td>
</tr>
<tr>
<td>Simazine</td>
<td>0.03</td>
</tr>
<tr>
<td>Total Suspended Solids,</td>
<td>30</td>
</tr>
<tr>
<td>Tetrachloroethylene</td>
<td>0.1</td>
</tr>
<tr>
<td>Thiobencarb</td>
<td>0.1</td>
</tr>
<tr>
<td>Temperature (in degrees celious)</td>
<td>±3</td>
</tr>
<tr>
<td>Thiram</td>
<td>0.06</td>
</tr>
<tr>
<td>Total coliforms (counts/100 ml)</td>
<td>30</td>
</tr>
<tr>
<td>Total Cyanogen</td>
<td>N.d.</td>
</tr>
<tr>
<td>Total Nickel</td>
<td>0.3</td>
</tr>
<tr>
<td>Total Dissolved solids</td>
<td>1200</td>
</tr>
<tr>
<td>Colour in Hazen Units (H.U)</td>
<td>15</td>
</tr>
<tr>
<td>Detergents</td>
<td>Nil</td>
</tr>
<tr>
<td>Total mercury</td>
<td>0.005</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>0.3</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.5</td>
</tr>
<tr>
<td>Whole effluent toxicity</td>
<td></td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>2 Guideline</td>
</tr>
<tr>
<td>Total Nitrogen</td>
<td>2 Guideline</td>
</tr>
</tbody>
</table>

Sources: EMC (Water Quality) Regulations, 2006.

4.3.5 The Environmental Management and Coordination (Air Quality) Regulation, 2014

The objective of these regulations is to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air.

It provides for the establishment of emission standards for various sources, including as mobile sources (e.g. motor vehicles) and stationary sources (e.g. industries) as outlined in the Environmental Management and Coordination Act, 1999. It also covers any other air pollution source as may be determined by the Minister in consultation with the Authority. Emission limits for various areas and facilities have been set.

The Regulations prohibits the Proponent from:
✓ Acting in a way that directly or indirectly cause or may cause air pollution to exceed levels set out in the second Schedule to the Regulations

✓ Allowing particulates emissions into the atmosphere from any source not listed in the six schedule of the Regulations

✓ Causing ambient air quality in controlled areas (listed in Schedule Thirteen) to exceed those stipulated under second Schedule.

✓ Allowing (during construction and demolition) emission of particulate matter above the limits stipulated in second Schedule

✓ Causing or allowing stockpiling or storage of material in a manner likely to cause air pollution

✓ Causing or allowing emissions of oxides of nitrogen in excess of those stipulated in the eleventh Schedule of the Regulation

The Proponent shall observe policy and regulatory requirements and implement the mitigation measures proposed in this document in an effort to comply with the provisions of these Regulations on abatement of air pollution.

4.3.6 **Environmental Management and Coordination Act (Noise and Excessive Vibrations Pollution Control) Regulations, 2009**

The regulations define noise as any undesirable sound that is intrinsically objectionable or that may cause adverse effects on human health or the environment. The regulations prohibit any person from making or causing to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.

Article 13 2(d) of the regulations allows for construction work at night for public utility construction, construction of public works, projects exclusively relating to roads, bridges, airports, public schools and sidewalks, provided noise generated is not caused within a residential building or across a residential real property boundary where such noise interferes with the comfort, repose, or safety of the members of the public. The second Schedule of the Regulations provides for the maximum permissible level of noise at construction sites.
Table 4-4: Maximum permissible noise levels for construction sites
(measurement taken within the facility)

<table>
<thead>
<tr>
<th>Facility</th>
<th>Maximum Noise level permitted (leq) in dB (A)</th>
<th>Day (6.01am-6.00pm)</th>
<th>Night (6.01 pm-6.00am)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Health facilities, educational institutions, homes for disabled and residential areas</td>
<td>60</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>(ii) Residential</td>
<td>60</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>(iii) Areas other than those prescribed in (i) and (ii)</td>
<td>75</td>
<td>65</td>
<td></td>
</tr>
</tbody>
</table>

Under section 15, the Regulations require the Proponent during ESIA studies to:

- Identify natural resources, land uses or activities which may be affected by noise or excessive vibrations from construction or demolition;
- Determine the measures which are needed in the plans and specifications to minimize or eliminate adverse construction or demolition noise or vibration impacts;
- Incorporate the needed abatement measures in the plans and specifications.

It is anticipated that the proposed road improvement project will generate noise and/or vibration during the construction phase, that will originate from the construction equipment, vehicles and the workers since the access road neighbours homesteads and institutions in some sections and it is therefore recommended that the construction team develops mitigations to reduce noise propagation in the project area.

4.3.7 National Sand Harvesting Guidelines, 2007

These Guidelines apply to all sand harvesting activities in Kenya to ensure sustainable utilization of the sand resource and proper management of the environment. Among key features, the guidelines empower respective DECs to regulate sand harvesting within areas of jurisdiction implying that, sand should only be sourced from approved sites and by approved dealers. The project will require extraction of sand for construction period and therefore sand must be scooped from Nema licensed quarries in fulfillment of the guidelines.

4.3.8 The Water Act 2002

This Act of parliament was enacted to provide for the management, conservation, use and control of water resources.
Section 25 of the Act requires a permit to be obtained for among others any use of water from a water resource, discharge of a pollutant into any water resource. The Water Act established the Water Resources Management Authority (WRMA), a parastatal body under the Ministry of Environment, Water and Natural Resources, with the responsibility of being the Lead Agency in managing water resources and catchment areas in Kenya.

WRMA, on behalf of the National Government, is undertaking the Water Resources regulation and management functions, issued by the Constitution of Kenya in 2010. The contractor/proponent is therefore advised to obtain relevant water permit from WRMA or consult with the Murang’a South Water and Sewerage Company.

4.3.9 Occupational Safety and Health Act OSHA, 2007

The Occupational Safety and Health Act, 2007, is an Act of Parliament to provide for the safety, health and welfare of all workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The Act applies to all workplaces and workers associated with it; whether temporary or permanent. The main aim of the Act is to safeguard the safety, health and welfare of workers and non-workers. Part 9 states that the occupier or employer shall establish a health and safety committee where twenty or more people are employed and such an employee shall prepare a written statement of his general policy with respect to the safety and health at the workplace. Further, the occupier shall prepare annual safety and health audits by a qualified person.

It is thus recommended that all Sections of the Act related to this project, such as observing safety guidelines, provision of protective clothing, clean water, and insurance cover are observed so as to protect all from work related injuries or other health hazards.

4.3.10 The Public Health Act (Cap. 242)

The Public Health Act provides for the protection of human health through prevention and guarding against introduction of infectious diseases into Kenya from outside, to promote public health and the prevention, limitation or suppression of infectious, communicable or preventable diseases within Kenya, to advice and direct local authorities in regard to matters affecting the public health to promote or carry out research and investigations in connection with the prevention or treatment of human diseases. This Act provides the impetus for a
healthy environment and gives regulations to waste management, pollution and human health.

The operations and activities of the proposed project can be detrimental to human and environmental health and safety in the absence of appropriate measures. For example waste, dust, noise and air emission generated from activities and process of the proposed project can directly or indirectly have adverse impacts on human and environment. The Act prohibits the Proponent from engaging in activities that cause environmental nuisance or those that cause danger, discomfort or annoyance to inhabitants or is hazardous to human and environmental health and safety. The proponent will therefore observe the public Health act to mitigate on the negative environmental health and safety to the public.

4.3.11 The Physical Planning Act (Cap. 286)

Cap 286 provides for the preparation and implementation of physical development plans for connected purposes. It establishes the responsibility for the physical planning at various levels of government mainly the District Level. The Act provides for a hierarchy of plans in which guidelines are laid down for the future physical development of areas referred to in the specific plan. The intention is that the three-tier order plans, the national development plan, regional development plan, and the local physical development plan should concentrate on broad policy issues. The Act also promotes public participation in the preparation of plans and requires that in preparation of plans proper consideration be given to the potential for economic and social development. The proponent has prepared plans and design that have been submitted to the Ministry of Lands and Physical Planning in accordance to the law.

4.3.12 Public Procurement and Disposal Act 2005:

The purpose of this Act is to establish procedures for procurement and the disposal of unserviceable, obsolete or surplus stores and equipment by public entities to achieve the following objectives -

a) to maximize economy and efficiency;

b) to promote competition and ensure that competitors are treated fairly;

c) to promote the integrity and fairness of those procedures;

d) to increase transparency and accountability in those procedures; and

e) to increase public confidence in those procedures;
f) To facilitate the promotion of local industry and economic development.

4.3.13 Way Leave Act Cap 292

Section 3 of the Act states that the Government may carry any sewer, drain or pipeline through, over or under any land whatsoever, but may not in doing so interfere with any existing building. Notice, however, should be given one month before carrying out any such works (section 4) with full description of the intended works and targeted place for inspection.

Any damages caused by the works would then be compensated to the owner as per Section 8 of the Act that states that any person whom without consent causes any building to be newly erected on a way leave, or cause hindrance along the way leave shall be guilty of an offence and any alterations will be done at his/her costs. The proponent is therefore advised to observe this Way leave Act when developing drainage system during the project period.

4.3.14 The Building Code 2009

This code was formulated to provide rules and guideline to be observed during construction it requires the proponent to adhere to the set rules and guidelines in the code. The code requires building plans to be approved by county government. It also prohibits;

- Erection, or causing or permitting erection of temporary buildings (e.g. a site office, store, builder’s shed etc.) to which the Regulations apply without a permit granted under Regulations and
- Knowingly occupying a temporary building which is erected in contravention to the regulations

The proponent is committed to developing the proposed project in accordance to the building codes, the national standards and other international building standards and guidelines e.g. as KS 04 general installation of electrical equipment, British standards 8110 structural concrete, NFPA 14 on installation of standpipes and hose systems among others

4.3.15 Public Roads and Roads of Access Act (Cap 399)

Sections 8 and 9 of the Act provides for the dedication, conservation or alignment of public travel lines including construction of access roads adjacent to lands from the nearest part of a public road.
Sections 10 and 11 allows for notices to be served on the adjacent land owners seeking permission to construct the respective roads. Therefore the proponent is required to issue notices to land owners adjacent to the project area before construction works begins.

4.3.16 Nairobi Metro 2030

Nairobi Metro 2030 was developed in the year 2008 to provide a guide for the NMR play its role in the National growth strategies under the Kenya Vision 2030. It is a transitional document that brings into focus challenges faced under urban growth and development. The document provides forum to achieve sustained rates of economic growth necessary for successful economic and social development. The Metro 2030 provides links with the Central Government through Kenya Vision 2030 and other development plans as well as seeking to strengthen the Local Authorities as part of the devolution of power and recognizing need for ensuring efficient and effective management of resources at the grassroots.

Nairobi Metro 2030 carries the vision for Nairobi Metropolitan Region to be a World Class African Metropolis supportive to the overall national agenda under the Kenya Vision 2030. The agenda to achieve this vision is the need to enhance mechanisms for economic growth, employment creation, improved lifestyles and improved infrastructure. Therefore proposed improvement of access road project will contributes to the Nairobi Metro 2030 by providing an efficient transportation alternative.

4.3.17 HIV/AIDS Prevention and control Act (Act No. 14 of 2006)

Part 11, Section 7 of the Act requires that HIV and AIDS education be carried out at the work-place. The government is expected to ensure the provision of basic information and instruction on HIV and Aids prevention and control to:

(I) Employees of all government ministries, departments, Authorities, and other agencies and employees of private and informal sectors.

(ii) The information on HIV/AIDS is expected to be treated with confidentiality at the work place and positive attitude towards infected employees.

In allocating contractors to the proposed project, the proponent should ensure that the contractor offers such training to the worker as provided by law.

4.3.18 The County Governments Act 2012

The County Governments Act 2012, defines the functions of county governments which include inter alia running of the sub-counties (former districts), wards,
municipals and townships in their area of jurisdiction. Sections 48 and 49 give the structure of the decentralized units and urban areas and cities structures. The Act mandates the county governments, among others, to:

i. the development of policies and plans,
ii. service delivery,
iii. developmental activities to empower the community,
iv. the provision and maintenance of infrastructure and facilities of public services;
v. the county public service, and
vi. Facilitation and coordination of citizen participation in the development of policies and plans and delivery of services.

4.3.19 The Kenya Roads Act 2007

Kenya Rural Roads Authority (KeRRA) is one of the established road authorities which is a corporate body with perpetual succession and common seal. The authority has a role of management, development, rehabilitation and the maintenance of the rural roads. Part II section 4 of the Act shows the functions of the authority which includes:

i. Constructing, upgrading, rehabilitating and maintaining roads under its control,
ii. Controlling the rural roads and road reserves and access to the road side development,
iii. Implementing of the road policies in relation to the rural roads,
iv. Ensuring adherence to the roles and guidelines on the axle load control prescribed under the traffic act (Cap 403) and under any regulations under these act ensuring roads quality as prescribed by the minister,
v. Monitoring and evaluating the use of rural roads, and
vi. Liaising and coordinating with other road authorities in planning and operation with respect to roads.

Although the proposed road is not an initiative of KeRRA, the proponent will have to ensure conformity with the specifications spelt out in its guidelines.

4.3.20 The Public Roads and Roads Access Act (Cap. 22)

Section 8 and 9 of the Act provides for the dedication, conversion or alignment of public travel lines including construction of access roads adjacent lands from the nearest part of a public road. Section 10 and 11 allows for notices to be served on the adjacent landowners seeking permission to construct the respective roads.
Already public meetings were held during public consultations and notifications to effect this.

4.3.21 The Work Injury Benefits Act, 2007

The Work Injury Benefits Act (WIBA) provides for compensation to employees for work related injuries and diseases contracted in the course of their employment and for connected purposes.

Section 7(a) of the Act, on the obligations of the employer, requires an employer to obtain and maintain an insurance policy with an insurer approved by the State in respect of any liability that the employer may incur under this Act to any of his employees.

Section 10(1) States that an employee who is involved in an accident resulting in the employee’s disablement or death is subject to the provision of this Act, and entitled to the benefits provided for under this Act. It also states expressly that an employer is liable to pay compensation in accordance with the provisions of this Act to an employee injured while at work.

On First Aid covered in section 45(1), an employer is supposed to provide and maintain such appliances and services for the rendering of first aid to his employees in case of any accident as may be prescribed in any other written law in respect of the trade or business in which the employer is engaged.

This Act is triggered by the proposed project and it is thus recommended that all workers contracted during the project implementation phase have the required insurance covers so that they can be compensated in case of injuries while working.

4.3.22 The Mining Act, Cap. 306

Section 26 of the Act requires that if a mining operation causes disturbance, nuisance and/or damage to land occupiers, land, crop, plants, buildings, installations, etc., it shall be the responsibility of the miner to pay any related compensations. Following on this, section 57 requires treatment and/or removal of any tailings on land and/or grass left after the mining activities. Regarding health and safety section 69 states that a mining inspector may identify any mine, matter, thing or practice that is dangerous or a threat to bodily injury of any person or stock and will notify the miner for removal of the said danger. Other related sections of the Act are 72, 73, 75 and 76.

During material sourcing, the contractor must not use explosives near residential homes while in addition all haul routes must be sprinkled with water to suppress dust. Extraction of materials must be done by persons provided with PPE and underage persons must not be allowed during construction phase of the project.
5 ANALYSIS OF PROJECT ALTERNATIVES

This Chapter analyses the proposed Project’s alternatives in terms of site and technology. It describes the relocation alternative, no Project alternative and the proposed development alternative. It also analyses the alternative construction materials and technology.

The Environmental and Social Impact Assessment Study should identify and assess alternatives to the proposed development/project. Only the best alternative (one with the least adverse impacts) should be selected based on less negative impacts and cost-benefit analysis. An important alternative to be analyzed always is the “no project”. This is a very important analysis because it helps the proponents measure the impacts from the project against those which would have taken place without the project. The access road to Mitubiri Sanitary Landfill Site is located in Gikono area of Murang’a South Sub County and stretches to an approximate distance of 11.5km. This region of Murang’a County is not currently well developed and thus economic activities are on lower side which is a key factor for growth and development of any area. The infrastructure facilities in the area are poor with no bitumen surfaced roads. The proposed access road is an important link to Thika and Nairobi areas for both goods and services. This section analyses the project alternatives in terms of site, technology and waste management options.

5.1 No project alternative

The no-project alternative is often defined by the baseline information and is crucial in the assessment of impact because other alternatives are weighed with reference to it. From the qualitative analysis and the summary of the proposed site for the project, there will not be any significant negative effect on either the bio-physical or the socio-cultural environment of the proposed project. Without the project, the environmental situation will neither improve nor can we say that it will necessarily deteriorate. The no-project option will however lead to the following (general) major negative and long term impacts:

- Roads are drivers of economic growth and therefore the economic status of residents of Gikono area would remain unchanged.
- The opportunity to improve its drainage and road signage would be foregone.
- No employment and business opportunities will be created for thousands of Kenyans local citizens who will work in the project area.
• Discouragement for investors particularly the flower farms in the area
• There is also the possibility of waste spillage during haulage due to the rugged nature of the road.
• Likely Levels of Poverty will increase or remain the same

The No Project alternative is therefore not a viable alternative as the proposed access road to Mitubiri Sanitary Landfill Site will relieve the Murang’a County residents transport problems and the Nairobi Metropolitan Region in general. However, the anticipated environmental impacts associated with the proposed project will also not be experienced.

5.2 Proposed Construction Alternative

This alignment is the only existing route to travel to the Mitubiri Sanitary Landfill Site. The objective of this road improvement project is to construct to bitumen standard an access road to Mitubiri Sanitary Landfill Site as a transport logistics measure to ease the transportation of wastes. The road will be upgraded to service the proposed Sanitary Landfill facility in all seasons to a standard that enables easy passage of trucks carrying waste to the facility. Some of the stretches in this section are damaged which requires improvement for better riding quality while other sections are badly damaged by undercutting from quarrying activities and poses danger to even trucks hauling waste. Vehicles are thus forced to move in low gear due to bad condition of road. This has far reaching environmental damages in as far as emission of greenhouse gases is concerned and therefore the need to improve the access road to bitumen standard. Although the proposed project will generate environmental impacts already discussed in Chapter six of this report, most of the impacts are concentrated during construction phase which will be temporary and their significance will reduce further with implementation of the proposed mitigation measures.

5.3 Analysis of Alternative Construction Materials and Technology

The road will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental as well as aesthetic requirements. Equipment and systems that save resources including energy and water conservation will be given first priority without compromising on cost or availability factors. Rainwater shall when available be harvested and be used in construction activities. Heavy use of timber and wood during construction for fencing or other purposes shall be discouraged to minimize destruction of natural resources. Asphalt mixers, crushers and other construction equipment and machineries shall as
appropriate be fitted with pollution control devices, like dust arrestors/precipitators, and emission controllers, as well as noise abatement desulphurization devices. The equipment and vehicles shall be maintained at the highest levels of combustion efficiency, and be capable of using cleaner fuels like bio-diesel. In all these, safety features of the equipment and machinery shall always be enhanced.

5.4 Solid Waste Management Alternatives

A lot of solid wastes will be generated from the proposed Project and as such an integrated solid waste management system is recommendable. The Proponent should first, give priority to reducing waste at source. This option will demand a pertinent solid waste management awareness program for the management, workers and the residents.

Secondly, recycling, reuse and composting of the waste will be the second alternative in terms of priority. This will call for a source separation program to be put in place. Some of the line wastes such as soil, gravel and debris can be used to reinstate quarries and in landscaping. Other wastes such as temporary signs made of metal can be reused for other purposes or sold to other contractors. Any other solid wastes that might be generated as a result of the project shall be disposed-off in the most appropriate and environmentally friendly manner.

5.5 Water source alternative

The project considered three water sources which are

- River Nginye
- Drilling a borehole
- Triple A Dam

After consideration, the project settled on two water sources which are

- Drilling a borehole
- Triple A Dam

The main source of water for use in this project will be from the borehole to be drilled under the contract. Triple A dam will be an additional alternative source if required. The borehole will be drilled for use by the project but will be handed to the management of Peter Kariuki Secondary after completion of the project.

Conclusion

On the basis of the above considerations, the “Proposed Project Alternative” has far reaching positive impacts as compared to the ‘No Project Alternative’ which does not compete with the benefits of proceeding with the project. Upgrading the road to bitumen standards has been assessed as the most viable option for the project.
CHAPTER SIX

6 PUBLIC STAKEHOLDER CONSULTATION

Public participation is an essential and legislative requirement for environmental authorization. The firm of experts undertook the public stakeholder consultation (PSC) for the proposed project in accordance with the requirements for an ESIA Study stipulated in the EMCA, 2015 and ESIA/EA Regulations 2003 and World Bank safeguard policies. Public consultation was undertaken to disseminate information to interested and affected parties (stakeholders), solicit their views and consult on sensitive issues. The output is incorporated in the development of mitigation measures. The participation process involved consultations with different stakeholders to inform them about the proposed project and obtain preliminary views on the acceptability of the project.

6.1 Objective of Public Stakeholder Consultation

The objectives of public participation in an ESIA are to provide sufficient and accessible information to Interested and Affected Parties (I&APs) in an objective manner to assist them to identify issues of concern, and provide suggestions for enhanced benefits and alternatives. The specific objectives of the consultation process were:

- Fulfill the legal requirements of the ESIA regulations
- Inform stakeholders about the proposed access road improvement Project and identify its potential impacts on their lives
- Provide opportunities and time for people to voice their concerns
- Ensure response to the concerns and ideas raised
- Ensure the building of trust and addressing of suspicions or fears by documenting consultations and discussions
- Ensure accountability and transparency in the process

Two key stakeholders were identified for this purpose:

1. Primary stakeholders: Those who are the beneficiaries of a development intervention or those directly affected (positively or negatively) by the project, commonly referred to as Project Affected Parties (PAPs)
2. Secondary stakeholders: Those who influence a development or are indirectly affected by the project. These include the implementing agency, relevant government departments and local administration among others.
6.2 Approach used in carrying out the PSC

The Firm of Experts organized a baraza through the area Chief on the 25th January 2017. The Chief mobilized stakeholders within the area including farmers, residents and any other interested party. The meeting was also attended by the proponent representatives. During the meeting, minutes were taken and every participant recorded their name, contact and signature.

Plate 6-1: Stakeholder Consultation Forum along the project road

6.3 Summary of Issues and Responses from the Stakeholders

Generally, all the participants consulted had no objection to the establishment of proposed project. They observed that the proposed project will generate employment opportunities, contribute to growth of agro businesses in the area and will encourage economic growth, hence this will raise the locals living standards. Summary of observations and comments obtained from the stakeholders are presented in the table below while minutes of the Public Baraza held on 25th January 2017 are appended at the end of the report (see Attachment 2).

Table 6-1: Summary of Issues and Responses from the Stakeholders

<table>
<thead>
<tr>
<th>ISSUE</th>
<th>RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise Nuisance</td>
<td>Locals indicated that they were worried that after the tarmac road</td>
</tr>
<tr>
<td></td>
<td>construction and the movement of large trucks to and from the sanitary</td>
</tr>
<tr>
<td></td>
<td>landfill, their peace would be disturbed. The officials advised that this</td>
</tr>
<tr>
<td></td>
<td>was a small price to pay</td>
</tr>
</tbody>
</table>
against the positive impact the tarmac road was to unveil such as convenience in movement and also economic benefits such as appreciation in land values.

<p>| Scarcity in water resource | Locals inquired from the officials of where they were to get water from to facilitate road construction as the area was quite arid. The officials declared that the Contractor would drill a borehole under the contract for provision of water for the road construction. |
| Deterioration of the existing tarmac road | Locals were worried that the said large trucks would damage the existing tarmac road as it wasn’t designed to carry such heavy loads. Officials advised that re-carpeting would be done to ensure the existing tarmac road wouldn’t deteriorate. |
| Youth Employment | Locals insisted that the youth around the area needed to be employed and not side lined in execution of the works. Officials confirmed that that would definitely be implemented and only specialised labour would be imported. |
| Safety Issues | Locals declared their worry that the tarmac road would lead to consequential accidents. Officials proclaimed that safety issues would be addressed in the design stage such as the provision of pumps etc. |
| Air Pollution | Locals questioned if the proposed Sanitary Landfill would release smoke into the atmosphere like the existing one. Officials advised that the proposed Sanitary Landfill was highly specialised and was a complete system that needed not burning of garbage and smoke wasn’t a concern. Then again, the existing one would be abandoned and closed. |
| Leachate Release-Foul Smell | Locals inquired of how leachate release would be managed and the consequential foul smell. Officials responded by insisting that the system was designed to collect the leachate and lead it through pipes to a collector chamber where treatment would take place. |
| Energy Harvesting | Locals questioned of how the tapped energy would be beneficial to the area. Officials responded by claiming that the methane energy would be converted into electricity which would of course impart locals positively. |
| Community | Locals insisted that there was need for community |</p>
<table>
<thead>
<tr>
<th><strong>Representation</strong></th>
<th>Representation during decision making from the preliminary stage to commissioning stage. Officials agreed to the request and promised to have two locals involved in decision making.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Public Awareness</strong></td>
<td>Members agreed to have the Sanitary Landfill design drawings shared publicly in form of signage or rather a signage to ensure all and sundry is informed and aware of the works to be executed.</td>
</tr>
<tr>
<td><strong>Conclusions</strong></td>
<td>After all queries were settled, a unanimous decision was arrived upon and it was noted that the locals were FOR the project.</td>
</tr>
</tbody>
</table>
CHAPTER SEVEN

7 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

This Chapter identifies and discusses both positive and negative impacts associated with the proposed project. On-site and off-site impacts can occur due to project location, and during construction, operation and decommissioning phases of the Project. Identification and assessment of impacts depend on the nature and magnitude of the activity being undertaken and also on the type of pollution control measures that are envisaged as part of the Project proposal. The impacts are identified according to phases namely: Impacts during construction, operation and decommissioning phases.

7.1 Positive Impacts during Construction Phase

7.1.1 Creation of Employment Opportunities

Unemployment is currently high in the area and country at large. Several employment opportunities will be created for road construction workers during the Construction Phase of the project.

7.1.2 Provision of Market for Supply of Materials

The project will require supply of large quantities of materials, some of which will be sourced locally at the local hardware shops and in the pertinent supply points of Nairobi as well as in the surrounding areas of Kabati and Kenol. This project thus provides a unique and ready market for material suppliers such as quarrying companies, hardware shops, and vehicle, equipment/ machinery spare part shops, amongst others. Elite Concrete Pavers situated at Km 3+700 may be contracted to supply precast concrete.

7.1.3 Reduction of Costs of Road Maintenance

Use of gravel to rehabilitate the project road is considered very expensive due to the unsustainability of the built structure related to the rate of wear and tear of the constituent materials; this being due to their susceptibility to the effects of wind, usage, and rain, amongst other factors. On the same note, it is worthy to note that sections of the Mitubiri access road was only graveled sometime back by Murang'a County Government, and hence full tarmacking of the same will help reduce the cost of maintenance of the current structure and thereby enabling the government to use the tax payers’ money on reasonably longer-term projects.
7.1.4 Improved Drainage and Road Safety

If the road is constructed to the required engineering standards and specifications, the drainage and road safety issues presently being faced by the residents shall considerably reduce. This is because of the fact that poor drainage and road safety are currently two of the major problems facing the proposed road project as culverts, wall extensions, and sharp bends at Km 0+300, 2+800, 4+000. The meandering nature of the road also presents major safety concerns and the designs must include of road signage to indicate appropriate speed limits, warning signs, etc.

Plate 7-1: Sharp bends with no signage exists on various sections of the project road

The proposed road improvement intervention is thus seen as a positive mechanism towards the reduction of drainage and road safety menace, which among others has led to reduced business income to the commercial populace.

7.1.5 Increased Business Opportunities

The road network will improve the social and economic status of the area by opening up the area to services and goods, especially so for the produce from the farming areas flower farms along the road corridor. The project will also lead to the spurring economic and social development by providing vital links between centers of production and markets for agricultural products. It will enhance people’s access to employment, and provide a wide range of social services including health, education, recreation and others.

There shall also be an increase in food supply and security and a corresponding reduction in related losses as the resultant good transport network will facilitate the flow of goods and services from the surplus zones to the deficit ones and thereby enhance an equitable distribution of goods and services which will in effect reduce, stabilize and level -up the prices.
7.2 Negative Environmental Impacts of Construction Activities

7.2.1 Extraction and Use of Materials

Road construction materials such as hard core, sand, ballast, rough stone, gravel and water will be required for the construction activities, and these will be respectively obtained from quarries and drilled borehole. Since substantial quantities of these materials will be required for construction of the road, the availability and sustainability of say, such construction resources at the extraction sites will be negatively affected, as these are essentially not renewable. Extraction of sand, mainly from river beds could lead to destruction and degradation of river beds (some that are seasonal), valleys and certain land surfaces. The contractor must refer to the National Sand Harvesting Guidelines (2007). In addition to this, the sites from which the materials will be extracted may be significantly affected in several ways, including by way of landscape changes, habitat destruction, loss of vegetation, poor visual quality and opening-up of depressions on the surface and thus leading to destruction of agricultural crops, as well as several human and animal health impacts.

7.2.2 Dust Emissions

During construction, the project will generate substantial quantities of dust at the construction site, diversions, material site and its surrounding. The sources of dust emissions will include excavation, construction, and leveling works, as well as, to a small extent, the delivering of materials and personnel by transport vehicles. Emission of large quantities of dust may thus lead to significant impacts on the construction workers and the local residents; this becoming more pronounced during dry weather conditions. The following table shows the sensitive receptors indentify that would be impacted by dust during the road construction.

<table>
<thead>
<tr>
<th>Chainage (Car Odometer)</th>
<th>Name of Site</th>
<th>Description of susceptible feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Km 0+300</td>
<td>Peter Kariuki Primary and Secondary Schools</td>
<td>Road next to school boundary. Students likely to be affected by both dust and noise during construction</td>
</tr>
<tr>
<td>Km 1+500</td>
<td>Bethsaida Shops</td>
<td>Dust could impact business outlets close to</td>
</tr>
</tbody>
</table>

Table 7-1: Receptors Susceptible to dust

https://www.nema.go.ke/images/others/NATIONAL_SAND_HARVESTING_GUIDELINES.pdf
7.2.3 Exhaust Emissions

The trucks used to transport various building materials from their sources to the project site will contribute to increases in emissions of CO₂, NO₂ and fine exhaust particulates along the various haul routes with particular emphasis on borrow sites as a result of diesel combustion. Such emissions can lead to several environmental impacts, including global warming and health complications. Because large quantities of materials are required, some of which shall be sourced outside the project area, emissions released can be enormous and may affect a wider geographical area. The impacts of such emissions is expected to be greater in virgin borrow sites. There also exist human settlements on either side along the route and due care must be taken prior to sourcing. Such may include speed limits and avoiding haulage during worship days. At the construction site, running of vehicle engines, and the frequent vehicle movement in the loading and offloading areas may also result to increase in particulate matter in the air.

7.2.4 Noise and Vibration

The construction works, delivery of materials by heavy trucks and the use of machinery/equipment including bulldozers, generators, grinders, mixers, compactors, crushers and drills will contribute to high levels of noise and vibration within the construction site and the surrounding areas. The elevated noise and vibration levels within the site can varyly affect the project workers and the residents, passers-by, and domestic animals, within the vicinity. All these disturb the natural surroundings and create unfavorable conditions for the living creatures. On the other hand, significant vibrations may also affect the nearby structures. Institutions such as Gikono Dispensary (Km 4+000), ACC&S Gikono Church (Km 4+800) and Gikono Administration Police Post at (Km 4+100) may

<table>
<thead>
<tr>
<th>Chainage (Car Odometer)</th>
<th>Name of Site</th>
<th>Description of susceptible feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Km 3+200</td>
<td>Green houses within AAA Hippo Farm</td>
<td>Workers in could be impacted by dust noise from trucks can interfere with the green houses</td>
</tr>
<tr>
<td>Km 4+000</td>
<td>Gikono Dispensary Solo Plant</td>
<td>Patients and workers could be impacted by dust from road construction and disruption of the activities at the health facility</td>
</tr>
<tr>
<td>Km 4+800</td>
<td>ACC &amp; S Gikono Church</td>
<td>Impact of dust and noise during construction</td>
</tr>
</tbody>
</table>
need special reduced hours schedule especially during worship days for the church. The mitigation measures put in place in the subsequent Chapter and the EMP developed must thus be adhered to in order to curb the adverse effects of noise and vibrations. The following table summarizes the identified noise and vibration receptors

**Table 7-2: Receptors Susceptible to Noise and Vibration**

<table>
<thead>
<tr>
<th>Chainage (Car Odometer)</th>
<th>Name of Site</th>
<th>Description of susceptible feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Km 0+300</td>
<td>Peter Kariuki Primary (1737 pupils) and Secondary Schools (183 students)</td>
<td>Road next to school boundary. Pupils and students likely to be impacted by noise and vibration during construction</td>
</tr>
<tr>
<td>Km 1+500</td>
<td>Bethsaida Shops</td>
<td>Business outlets close to the road may be impacted by noise and vibration during construction</td>
</tr>
<tr>
<td>Km 3+200</td>
<td>Green houses within AAA Hippo Farm</td>
<td>Workers may experience interference from noise or vibration especially where they are working close to the road boundary</td>
</tr>
<tr>
<td>Km 4+000</td>
<td>Gikono Dispensary Solo Plant</td>
<td>The health facility may be impacted by noise and vibration during construction</td>
</tr>
<tr>
<td>Km 4+800</td>
<td>ACC &amp; S Gikono Church</td>
<td>Impact of noise during construction</td>
</tr>
</tbody>
</table>

**7.2.5 Risks of Accidents and Injuries to Workers and General Public**

Given the intensive engineering and construction activities including grinding and cutting, as well as masonry works, construction workers will be exposed to risks of accidents and injuries. Such injuries may result from accidental falls, hand tools and construction equipment; cuts from sharp edges, and failure or collapse of structures/machines. Open borrow pits, ditches, unfinished works and improper storage of materials can also lead to accidents to both the workers and members of public.

Proper road signage will also be a prerequisite during construction given the meandering nature of the road. Sharp bends exists in such areas as Km 0+300 and slopes at Km 2+400 as you access Nginye River. Attention must also be paid to the various centers such as Bethsaida at Km 1+500 where shops are close to the road. During the planning and construction stage of the project, the contractor, Kenya Rural Roads Authority (KERRA) and the County Government shall discuss the issue of road signs and use of speed bumps so that necessary precautions are taken into consideration for better road usage.
7.2.6 Migration of workers

Although the scale of the project is not significant, and not many migrant workers are expected to be at the site, the proposed project will still attract workers from outside the project area; both skilled and unskilled, which may result in unhealthy social behaviors (considering the influence of money). This may potentially lead to gender based violence and abuse of minors. By the end of the road construction period, a trail of HIV/AIDS infected persons may be left resulting in loss of life, joblessness, underdevelopment and poverty.

7.2.7 Clearance of Vegetation

The alignment of the project road may lead to vegetation clearance in the road reserve to give right of way in some areas. Vegetation along the road such as some trees and shrubs will be cleared to pave way for the construction of the road. Table 3-1 (Vegetation type along the access road) show the vegetation cover that may be affected during the road construction.

![Plate 7-2: Boundary markers on some sections of the road](image)

7.2.8 Increased Soil Erosion

The wearing away, detachment and transportation of soil from one place to another place and its deposition by moving water, blowing wind or other causes is called soil erosion. Some vegetation on the road reserve may have to be
removed for the purpose of road construction. Similarly, soil disturbances may also occur through various civil engineering constructions. Both of these will lead to the loosening of the soil structure and the exposure of the bare soil surfaces; ultimately resulting to the soil erosion of the opened up surfaces and siltation into the natural and artificial water courses during rain or in heavy wind situations. The runoff and wind-eroded soils will also be a nuisance to the local populace and developmental infrastructure; these too being added negative impacts of the Construction Phase.

7.2.9 Waste Generation
Large quantities of solid waste will be generated at the site during the construction of the road and related infrastructure. Such wastes may consist of excavated materials and cleared vegetation, rejected and surplus materials; surplus spoils; paper bags, empty cartons, waste oil, and waste bitumen, amongst others. Such solid waste materials can be injurious to the environment through the blockage of drainage systems, choking-up of water bodies and the realization of negative impacts on human and animal health. This may be emphasized by the fact that some of the waste materials contain hazardous substances such as waste oil, and solvents; while others including metal cuttings and plastic containers are not biodegradable and can have long-term and cumulative effects on the environment. Stored materials may also generate waste in form of oil spills form storage tanks, filling platforms and transfer tanks. The contractor will be expected to develop a Waste Management Plan prior to construction and strongly advised against setting up construction campsite near water bodies such as River Nginye.

7.2.10 Contamination of Soil and Water
Contamination of soil, water and air will definitely take place during the road construction process. In this respect, soil contamination may occur through aerial deposition and spills of road related pollutants, say asphalt residuals; and erosion by wind and storm water. These will lead to silting and development of gully’s and depressions. Air quality will also be reduced due to generation of dust; and hydrocarbon emissions through nitrogen oxide, sulphur oxide and particulate matter from machineries.
Water will potentially be contaminated due to siltation as a result of the loosening of the soil during excavation and stripping. Hydrocarbons levels at water sources may also increase due to spillage and deposition of oil residues from equipment/machineries as well as by water transportation tankers and other vehicles. The
engagement of water tanks or equipment/ machinery may lead to the damage of river banks at the points of water abstraction, and these will definitely lead to the transfer of hazardous materials into aquatic and human systems; ultimately leading to increased health risks. Areas observed to be susceptible are the watering points at the Nginye River at Km 2+600.

Plate 7-3: Areas susceptible to soil and water contamination

7.2.11 Increased Demand for Sanitary Facilities
Construction workers will require sanitary facilities while working in the field and other withdrawn areas and this will lead to the pollution of the environment, for example through the practice of some bad hygiene behaviors like open defecation.

7.2.12 Repair and Maintenance of Vehicles and Machinery
The project required a number of heavy machinery, vehicles and equipment, which will require repair and maintenance, including washing. Some of these may lead to the likelihood of oil spillage, say, during servicing and repairs. The generation of wastes like engine filters, greases and scrap materials, may lead to the pollution of among others, rivers and the larger terrestrial environments. The contractor is prohibited from undertaking these activities near rivers and streams.

7.2.13 Water Use
The construction activities will require large quantities of water that will be mainly sourced from a borehole that will be drilled under the project as the main source of water. Water from Triple A dam will be used as an alternative if required and permission will have to be obtained from the owners of this dam if used. As a consequence, the project will not impact water in River Nginye. As required for compliance, the contractor will be required to do an ESIA for the borehole and obtain permit from WRMA as stipulated in the Water Act 2002.
7.2.14 **Interference with Business and Daily Activities during road construction**

The alignment and design of the road to be constructed is such that there will be no relocation of any facilities or assets or displacement of persons. The project will not engage in any demolition works of any facility during construction phase. No RAP or ARAP is required for this project as it does not trigger Involuntary Resettlement Safeguard, OP 4.12. As such, there will be no compensation required.

7.2.15 **Camping Site Waste**

The camp sites will be a source of significant amounts of solid wastes during its operation. The bulk of the solid wastes generated at the camp during this period will consist of paper, plastic, glass, metal, textile and organic wastes. Such wastes can cause injuries to the environment through the blockage of drainage systems, choking of water bodies and negative impacts on animal health. Some of these waste materials, especially so the plastics/polythenes are not biodegradable and this may cause long-term injurious effects to the environment.

7.2.16 **Energy Consumption**

The project shall consume fossil fuels (mainly diesel) to run transport vehicles, generators and construction machinery. The generators will also be used to power the asphalt plant.

7.2.17 **Deviations / Diversions**

During the works, it will be necessary to have diversions in order to allow uninterrupted traffic flow. Although diversions should ideally remain within the road reserve, this is not always practical or possible and therefore traffic may have to be diverted temporarily across private land. A number of settlements in form of residential buildings, restaurants, shops and kiosks may be affected by dust as they fall within the vicinity of the proposed diversions. Diversions will be abandoned and plants allowed to re-vegetate after construction phase.

7.2.18 **Demolition of the Camp Site**

Demolition of the temporary project infrastructure including the access roads, camps, equipment and fixtures at contractor’s yard will result in large quantities of solid waste. The waste will contain the materials used in project construction and these include concrete, metal, cement, bitumen, oil, 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 hazard
gous chemicals into the environment. In addition to this, even the generally non-toxic chemicals such as compounds of chlorides, sodium, sulphates and ammonia, which may be released as a result of leaching of demolition waste, are known to lead to the degradation of ground water quality. On the other hand, large quantities of dust will be generated during demolition works and this may affect the health of demolition staff as well as the neighboring residents.

7.3 Positive Environmental Impacts of Operational Activities

7.3.1 Provision of Markets for local goods
During the construction stage workers will provide market for goods and services for the local traders. This will essentially be possible due to availability of good road network. Flower farms expected to reap from the proposed improvement include AAA Farm Growers, Solo Plant and Elite Concrete Pavers.

7.3.2 Efficient Delivery of Wastes to Mitubiri Sanitary Landfill Site
The objective of this road improvement project is to construct to bitumen standard an access road to the proposed Mitubiri Sanitary Landfill Site as a transport logistics measure to ease the transportation of wastes to the site. Once in operation, it will service the proposed Landfill facility in all seasons to a standard that enables easy passage of trucks carrying waste to the facility.

7.3.3 Revenue to National and Local Governments
Through payment of relevant taxes, rates and fees to the government and the local authority, the project, traders and businessmen will contribute towards the national and local revenue earnings thereby leading to national economic growth.

7.3.4 Reduction in Poverty
Poverty shall be reduced through improved economic performance i.e. by increased access to the market place and timely delivery of goods and services to the market centers due to the efficient road network.

7.3.5 Improved Security
Security of the area will be beefed up after the completion of the proposed project. This will be due to the fact that vegetation growing up to the middle of the roads as well as forming bushy structures will thence be cleared. These will thus enable the roads to be much accessible, clearer and safer to use even at night and therefore reducing on insecurity issues.
7.3.6 Increased Work-force

Good road network will attract a higher population thereby resulting into a higher work force/man-power. The availability of man-power comes about as a result of thriving businesses and increase in investments which are made possible due to good road infrastructure. An area with a high number of work-force is an advantage to the economy since projects that require man-power such as the flower farms in the area can be easily done.

7.4 Negative Impacts during Operation Phase

There are quite a few impacts that may arise during the Operation Phase of the project;

7.4.1 Accidents

The social behavior of the majority of the people who inhabit this area is quite different as the road is rarely busy. As such, users rarely observe road signs or traffic while using or crossing the road. As such, the improved road network may lead to an increase in accidents as the roads will be much accessible and smooth, thus tempting drivers to speed. The meandering nature of the road will aggravate this problem, unless community sensitization and road signage is established. During the operation phase of the project, the County Government of Murang’a shall enforce standards to ensure safe driving and adequate issuance of road signs so that necessary precautions are taken into consideration for better road usage.

7.4.2 Increased Population

Good road network may attract a high population into the area and this in turn may exert pressure on the existing resources including water, firewood, building materials and food resources, amongst others. However, this is expected to be minimal as the area is largely rural residential.
CHAPTER EIGHT

8 MITIGATION OF CONSTRUCTION RELATED IMPACTS

This chapter highlights the necessary mitigation measures that will be adopted to prevent or minimize significant negative environmental, social, health and safety impacts associated with the activities of the project during its construction, operation and decommissioning phases. This section presents the environmental mitigation measures and Environmental and Social Management Plan (ESMMP) for the proposed access road improvement project. The ESMMP covers information on the management and/or mitigation measures that will be taken into consideration to address impacts in respect of the following project phases: design, construction, operation and decommissioning.

Table 8-1 presents the range of approaches that the Proponent will be used to manage potential impacts of the proposed project.

Table 8-1: Approaches for managing potential impacts of the proposed projects

<table>
<thead>
<tr>
<th>Approach</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoidance</td>
<td>Avoiding activities that could result in adverse impacts and/or resources or areas considered sensitive</td>
</tr>
<tr>
<td>Prevention</td>
<td>Preventing the occurrence of negative environmental impacts and/or preventing such an occurrence having negative impacts.</td>
</tr>
<tr>
<td>Minimization</td>
<td>Limiting or reducing the degree, extent, magnitude or duration of adverse impacts through scaling down, relocating, redesigning and or realigning elements of the project</td>
</tr>
<tr>
<td>Mitigation</td>
<td>Measures taken to minimize adverse impacts on the environment</td>
</tr>
<tr>
<td>Enhancement</td>
<td>Magnifying and/or improving the positive effects or benefits of a project</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>Repairing affected resources</td>
</tr>
<tr>
<td>Restoration</td>
<td>Restoring affected resources to an earlier (possibly more stable and productive) state, typically “background or ‘pristine’ condition.</td>
</tr>
</tbody>
</table>

Table 8-2 will present the mitigation measures for the potential impacts of the proposed project and Table 8-3 the monitoring plan.
8.1.1 Minimization of Noise and Vibration

Noise and excessive vibration impacts are anticipated, as heavy earth moving machineries and equipment will be used. The proponent of the proposed project, through the contractor shall thus put in place several measures that will mitigate noise and vibration pollution expected to rise during the construction phase. As regards, the following noise and vibration suppression techniques will be employed to curb the possible menace:

- To minimize the night time noise and vibration impacts, suppressors/dampers will be used on construction equipment where feasible. High noise and vibration machinery should not be allowed to operate in the proximity of social places such as ACC & S Gikono Church and also from 22:00 to 7:00 hrs where there are residential homes nearby.
- Apply the above measures to minimize the day time noise and vibration impacts in area such as Peter Kariuki Primary and Secondary Schools (Km 0+300), and Gikono Dispensary (4+000)
- Use quiet and modern equipment (i.e. equipment designed with noise and vibration control elements – noise shielding screens or vibration dampers). These equipments must be kept at manufacturers’ specification.
- Limit trucks and other small equipment to minimum idling time and observe common-sense approach to vehicle use, as well as encourage workers to shut off vehicle engines whenever not in use.
- Construct mainly during the day.
- Loud noise and high vibration generating machinery like generators should be encased or dampened to reduce the noise and vibrations they may generate.
- Establish inspection and monitoring program for equipment

Recommended noise level guidelines are 55 dBA during daytime (07:00 till 22:00) and 45 dBA during night-time (22:00 till 07:00).

8.1.2 Dust Emissions and Air Quality

Controlling dust emissions that are likely to take place during the construction phase of the proposed project is useful in minimizing nuisance conditions. It is thus recommended that a standard set of feasible dust control measures be implemented for the project activities. As such, all personnel working on the project will be appropriately trained on methods for minimizing air quality impacts, such as the delimiting of dust emissions during construction, prior to starting
construction. Specific training may also be focused on minimizing dust and exhaust gas emission from machinery and heavy construction vehicles. Dust emissions will be controlled by the following measures:

- Watering of construction fields and major access and haul roads on a set schedule, particularly in the dry season. Construction materials storage areas and concrete mixing plants will be sited more than 100m away from residences and churches, and in a down wind direction. Similarly, asphalt mixing plants must be sited at least 300m away. All the mixing equipment will be closed systems with dust extractors.
- Sprinkling of water on the roads being worked on to settle dust. Centers such as Peter Kariuki Primary and Secondary Schools (Km 0+300), Bethsaida (Km 1+500), Matigari Hippo Farm (3+200), ACC&S Gikono Church (4+800), and Gikono Dispensary (4+000) all have unpaved access roads and dust during material haulage will affect their operations.
- Workers to be supplied with dust masks and transparent goggles and their wear enforced.
- Regular checks done on heavy machinery like excavators, etc. Construction vehicles emitting excessive smoke should be removed from site. They should be well maintained to ensure total fuel combustion.
- Delivery vehicle drivers and machine operators should be sensitized to switch off engines when not in use or whilst offloading materials.
- Cover all trucks hauling materials particularly sand.
- Limit the speed of the vehicles to 40 Kph or by placing speed bumps especially in busy areas.

8.1.3 Excavated Soil during Construction

The soil excavated during the construction of the proposed Project will be disposed - off appropriately and preferably reused. An example to this measure is the fact that the contractor should recognize the significance of biodiversity and plan to reinstate all the quarries from which the construction material will be obtained by using the topsoil and overburden that will be scrapped out of the road surfaces proposed for improvement.
8.1.4 Storm water Management and Control

Proper drainage channels shall be constructed within the construction site to allow for convenient and free flow of storm water so as to mitigate on the negative consequences of stagnant waters.

8.1.5 Minimization of increased Water Demand

The construction activities will require large quantities of water to be sourced from the borehole that will be drilled under this contract. Sinking this borehole will require a permit from WRMA and a NEMA license. Some of the mitigation measures that should be put in place in this water usage include the following, among others:

- Water handling equipment shall be appropriate to the intended usage to avoid leakages and unnecessary spills.
- Efficient use of water at the site by sensitizing construction staff to avoid irresponsible water use and encourage conservation.
- Rainwater collection at construction camp.
- Promotion of reuse of water in as much as possible.

8.1.6 Minimization of spilt oil and grease spills

The contractor shall ensure that no spilt oil is allowed on to the bare ground. As regards, used oils from trucks and plants shall be disposed of accordingly as in the ESMP. The contractor shall establish spill prevention procedures and response plans, which may, for example necessitate the need to procure a spill control kit or the design and use as appropriate. Solutions for preventing and reducing the spills include:

- Construction of a concrete pad sloped in such a way that water and fuel is directed to an oil-water separator or a sump.
- Construction of a concrete pad that contains spills or overfills.
- Construction and maintenance of an impermeable, hydrocarbon resistant, non-combustible barrier that contains spills or overfills.

8.1.7 Minimization of Accidents and Hazards during the Construction Phase

To reduce the worker accidents and hazards during the construction phase of the proposed Project, the proponent shall commit and adhere to the Site Occupational Health and Safety rules and regulations stipulated in the Occupational Health and Safety Act (Cap 514). In this regard, the contractor shall
provide appropriate Personal Protective Equipment, as well as ensure a safe and healthy environment for construction workers as outlined in the ESMP. In addition to these, safety education and training shall need to be emphasized at the on-set of construction activities.

Signage will also be applied to warn oncoming vehicles of the construction as well as use of diversions where necessary to avoid vehicle accidents.

8.1.8 Reduction of Impacts at Material Extraction Sites and Efficient Use of Raw Materials

The project may require use of available spoil/borrow pits for structural fill for access roads and embankments before borrow pits are excavated. Several material sites were observed along the road corridor such as Mutito quarry while new quarry sites will be procured. The Contractors of the proposed project must therefore source construction raw materials from registered quarry sites like whose projects have undergone satisfactory environmental impact assessment/audit and received NEMA approval. Such firms are expected to apply acceptable environmental performance standards; the negative impacts of their activities at the extraction sites will considerably be well mitigated.

Borrow pits should be centrally located wherever possible so they can serve more than one site. Topsoil from the borrow pits will be removed and set aside. When borrowing from the pit ceases, the areas will be reinstated accordingly to the project engineers’ approval. Agreements between the Contractor and owners of material and dumping sites should be brought to the attention of the Client representative/Project Engineers who shall ensure implementation of the Environmental Management Plan for these sites. All steep cuts will be benched accordingly. Special attention will be given to ensuring that watercourses are not blocked and material stockpiles will be designed so that runoff will not induce sedimentation of waterways. In areas of high swell shrink soils, solution would be removal of the soil. Alternative would be to raise the track with base built from the rock level of profile. Dug out quarries should be filled with soil and rehabilitated with grass and tree planting.

To reduce the negative impacts on availability and sustainability of the materials, the Contractor will only order for what will be required through accurate budgeting and estimation of actual construction requirements. This will ensure that materials are not extracted or purchased in excessive quantities. Moreover, the contractor
will ensure that wastage of materials at the construction site is kept minimal, as this would lead to additional demand for extraction or purchase of, materials.

8.1.9 Minimization of Solid Wastes during the Construction Phase

It is recommended that construction solid waste be recycled or reused as much as possible so as to ensure that materials that would otherwise be disposed of as waste are diverted for productive uses. In this regard, the contractor will ensure that construction materials left over during or at the end of construction will be used in project sections or other projects rather than being disposed of.

On the other hand, the contractor shall put in place measures to ensure that construction material requirements are carefully budgeted for to ensure that the amount of construction materials left on site after construction is kept minimal. An additional recommendation for minimization of solid wastes during the construction of the proposed Project is the use of durable, long-lasting materials that will not need to be replaced often; this thereby reducing the amount of construction waste generated over time.

Recycling will be critical to the proposed road improvement project and therefore, plans will be actualized to promote a reuse programme in solid waste management for those wastes that can be reused. To comply with the requirements of the solid waste management regulations, the Proponent shall in addition to the above-mentioned recommendations undertake to do the following:

1. Not to dispose any waste on the road, recreational area and public places;
2. Segregate waste and group them according to their similarity and nature, for example plastics, toxics, organics, etc.;
3. Ensure that all waste is deposited in designated dumping sites as approved by the local authority;
4. Ensure that all waste handlers engaged by the proponent are licensed by NEMA and possess all relevant waste handling equipment and documents such as waste transport license, tracking documents, license to operate a waste yard, insurance cover, and vehicle inspection documents, among others. Mitubiri Sanitary Landfill is currently not an option as it is not licensed.
5. Implement cleaner production principles of waste management, namely reduce, reuse and recycle;
6. Label all hazardous wastes as specified in section 24 (1-3) of the regulations.

8.1.10 Minimization of Vegetation Disturbance

The proposed project will result in insignificant vegetation disturbance because it is not a new road but will follow the existing alignment as closely as possible. For only a few areas where shrubs and trees are in the road reserve, especially along homes next to the road, will be cleared. Prudent demarcation of the affected areas would be of importance so as to avoid vegetation loss in a larger area than necessary.

Conduct continuous monitoring and enforcement of penalties to ensure that construction camps and borrow pits are located far from any forested area, and that water abstraction and disposal of construction waste is not undertaken within the forest area. This will be aimed at ensuring that any disturbance to flora and fauna is restricted to the actual project area and is kept to the minimum possible.

8.1.11 Soil Erosion Control

- During construction, any construction materials for use shall be screened or covered to prevent offsite movement; primarily windblown soil. On the other hand, the surplus materials shall be removed from site to an approved disposal site.
- Stripping of vegetation shall be minimized, unless very necessary; so as to avoid erosion.
- Stabilization/ stone pitching / berming of open trenches shall be done so as to prevent them from being washed away by run-off. Abandoned Mutito Quarry next to the road also needs to be filled and leveled with soil.

8.1.12 Increase in HIV/AIDS Infection Incidence

The Proponent through the Contractor shall provide voluntary counseling and testing for HIV/AIDS to incoming construction personnel. He will also strengthen advocacy through awareness training in HIV/AIDS and other STIs; encourage the use of preventive measures like condoms by availing condom dispensers to construction staff.

8.1.13 Potential Pedestrian access risks to the Chief’s and dispensary:

a) The road access to the Chief’s camp and to the Dispensary is too narrow and would need to be expanded. The Chief’s Camp and the local dispensary are relatively high pedestrian traffic areas on a daily basis. Increased road traffic of
trucks during construction and also during operations would increase risks to many residents accessing these important services. This will require provision of alternative routes to access these services

b) There would also be need to ensure pedestrian walk ways are constructed in areas where residential estates and businesses are built into the main road. These would serve the same purpose of reducing access risks to pedestrians using these residential estates and entering businesses.

8.1.14 Interference with Business and Daily Activities during Demolition

During construction where interference is intended, businessmen should be served notices and allowed enough time. Alternative arrangements for access should be discussed and implemented before the demolition activities start. The proponent should consider employment of locals and considerations in job allocations especially for activities requiring unskilled labour. Where interference would impact on part of the existing infrastructure e.g. Gikono dispensary, Peter Kariuki Primary & Secondary School, Triple A and Hippo farm access gates, the contractor should inform/give notice to these institutions because improvement of access to the property by widening the radius of the access near the gate may temporarily result to disruption. This also applies to entrance to homesteads where access should be improved by widening the radius to allow smooth entry and exit (road design provision).

8.1.15 Employment of local youths as agreed during consultations

The proponent should allocate employment opportunities to locals as part of the community stakeholder agreements during the public consultations. Especially for unskilled labour, the locals requested and it was agreed that they would organize the youths who could participate in employment opportunities during the construction of the road. Where local employment skills and expertise are unavailable, then employment would be sourced from outside.

8.1.16 Sourcing of materials available locally as agreed during consultations

It was the opinion of the locals that construction materials could be sourced locally. The business communities from the area should be given priority. Women were particularly keen to deliver materials especially foodstuffs available locally and should be given opportunities. Services including vehicles repairs, stationeries, sand, and other locally available materials should be sources to some extent from local suppliers.
8.1.17 Community Health and Safety Issues

The proponent should observe community health and safety. The public consultation was categorical about the role of community health and safety during construction and operations. In this regard, the proponent should be committed to:

- Inform community members along project route on project schedule and activities
- Reflective signage should be installed for safety of road users, keep public away from material sites
- Initiative should be taken to conduct public awareness and sensitization campaign on safety aspects related to the road project.
- Train and develop capacity especially for inexperienced labourers/workers or newly purchased equipment's,
- Compensate for losses and injuries,

8.1.18 Grievance Redress Mechanisms

Operational Safety rules be agreed with the community and implemented within a grievance mechanism that facilitates a comprehensive fair, effective and efficient grievance system. The project involves risks associated with increased road traffic including during operations and should be established an effective and clear grievance mechanism (GM), through which communities and stakeholders would be able to present their grievances that would be attended to fairly, effectively and efficiently, with an option for scaling further.

8.1.19 Minimization of conflicts with immigrant workers

Increased immigration into the project area will lead to increase in population. This will result in strained relationships which sometimes degenerate into open conflicts between the residents and the users of the road. The community and proponent should therefore develop programmes to enhance cohesion between project employees and the local community. Where possible, first consideration should be given to local communities in allocation of unskilled jobs.

8.1.20 Non-interference with Wetlands

Under no circumstances should the contractor interfere with any wetlands without seeking NEMA approval for guidance and in compliance with NEMA requirements in this regard.
8.2 Mitigation of Operation Phase Impacts

The negative impacts associated with the Project during the operation phase will be mitigated as discussed below:

8.2.1 Accidents

Good road networks may become a hot spot for losing lives; and based on the meandering nature of the road, the contractor through the KeRRA office shall continuously review the project design as necessary in order to ensure that speed bumps are created and sited, where appropriate especially near centers and churches. During the planning and construction stage of the project, the contractor, KeRRA and the County Government shall discuss the issue of road signs so that necessary precautions are taken into consideration for better road usage. This is because of the fact that, if appropriate speed regulating infrastructure and signage are not used on the road; and road ethics and adherence not enforced, then increased accidents will be witnessed within the area and this shall also affect the domestic animals and poultry roaming the area.

8.2.2 Maintenance

To minimize the likely maintenance costs during the operation of the proposed Project, the Proponent shall positively consider some primary measures, which may include, amongst others the approval and use of durable and sustainable materials for long term project gains.

8.2.3 Flooding and Surface Run off

Poorly designed drainage systems may trigger flooding which may in turn be a health problem to the communities along the road corridor. Well-designed drainage system and re-vegetation of road embankments to stabilize slopes will minimize such impacts.

8.2.4 Emissions to Air

Waste trucks especially from local authorities are known to be old and therefore contributors to air pollution, especially if they are not regularly serviced. Diesel truck engines (especially those that use high sulphur diesel) are known to emit combustion products, including nitrogen oxides (NOX) and particulate matter (PM10), both of which contribute to public health problems, and carbon dioxide (CO2), a greenhouse gas. The Murang’a County Government is encouraged to acquire new and maintain their existing waste trucks to reduce atmospheric emissions.
8.2.5 **Decommissioning Phase**

Roads, under normal circumstances may not need to be decommissioned. They are mainly maintained and sometimes rehabilitated. During rehabilitation, a new ESIA can be instituted or an environmental and social management plan can be prepared depending on the degree of rehabilitation. The rehabilitation and decommission management plan shall include the following:

- **Planning for closure**
  - The Proponent shall develop rehabilitation and decommissioning plan in conjunction with relevant stakeholders at least one year before the end of facility’s operations.
  - The Proponent shall investigate practical options for closure of the facility at least one year before decommissioning and submit a report to relevant authorities NEMA included.
  - The Proponent to explore options of re-use and recycling of the facility’s components/structures.

- **Decommissioning**
  - The Proponent shall take into consideration the health and safety of personnel, contractors, neighbours and the public during the planning and implementation of the demolition process.
  - The Proponent shall undertake a further survey or environmental site assessment to identify any contaminated areas and remediate them accordingly.
  - The proponent shall submit a decommissioning plan 3 months prior to closure

- **Post Closure**
  The Proponent shall ensure that the facility’s site is free of impacts associated with the abandonment/closure. The Proponent shall develop, rollout and implement a monitoring plan that includes:
    - Monitoring of the rehabilitated site to confirm whether progress is satisfactory.
    - Outline of how land improvement and future land use will be affected by the past operation and decommissioning of the site.

8.3 **Monitoring**

The proposed programmes and plans will be subjected to monitoring. Monitoring will have two elements: routine monitoring against standards or performance criteria; and periodic review or evaluation. Monitoring will often focus on the effectiveness and impact of the programme or plan as a whole. During construction phase, the Proponent shall monitor the contractor’s activities in order to verify that the management measures/procedures/specifications are
implemented as contained in the EMP. Compliance will mean that the Contractor is fulfilling their contractual obligation. During operation phase, the Proponent will monitor facility’s operations to ensure compliance with management measures in the EMP and operation procedures. As part of this monitoring, the Proponent will undertake statutory initial environmental audit as required by the ESIA/EA Regulations, 2003 and subsequent annual self-environmental audits.

8.3.1 Programme Monitoring
The Proponent shall regularly monitor programme implementation. The process will include regular monitoring of:

- Erosion of soil resulting in the immediate surroundings of the facility caused by the presence of facility or impacting on structures associated with the facility
- Air quality and ambient emissions, including dust generated by construction activities
- Noise generation during construction phases
- Effluent discharge into the environment during operation phase;

8.3.2 Plan Monitoring
All of the management plans make provision for monitoring and evaluation. Special attention should be given to the monitoring arrangements relating to biophysical impacts, occupational health and safety, facility operational and emergency response.

During the construction phase of the project, the Contractor shall report all environmental impacts as well as accidents and incidents to the Proponent. The reported impacts and incidents will be captured on a database to ascertain trends and track progress in the implementation of preventive and corrective actions, and benchmarking against other, similar operations. Depending on the level of severity, accidents and incidents will be investigated by the Contractor. The table below provide mitigation and management measures for the potential impacts of the proposed project.
Table 8-2: Environmental and Social Management Plan

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Mitigating Measures</th>
<th>Phase</th>
<th>Responsibility</th>
</tr>
</thead>
</table>
| Noise and vibrations            | - Suppressors / dampers on construction equipment  
- Use of quiet and modern equipment  
- Minimize idling time and shut off vehicle engines when not in use  
- Construction during the day, school holidays and weekends  
- Inspection and monitoring program for equipment  
- Avoid unnecessary hooting  
(Special attention on mitigation measures near or next to Peter Kariuki Primary and Secondary Schools, Bethsaida Shops, Green houses within AAA Hippo Farm, Gikono Dispensary Solo Plant, ACC&S Gikono Church on worship times and Gikono Administration Police Post) | Construction / decommissioning | Contractor      |
| Dust emissions and air quality  | - Watering of construction fields and major access and haul roads particularly if in the dry season on a set schedule  
- Asphalt mixing plant sited at least 300m away from residential places and all mixing equipment to be closed systems with extractors  
- Sprinkling of water on the roads being worked on to settle dust – sprinkling to be always done near or next to | Construction / decommissioning | Contractor      |
<table>
<thead>
<tr>
<th>Impacts</th>
<th>Mitigating Measures</th>
<th>Phase</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>centers such as Peter Kariuki Primary and Secondary Schools, Bethsaida Shops, Matigari Hippo Farm, Green Houses within AAA Hippo Farm, ACC&amp;S Gikono Church and Gikono Dispensary and the roads next to them must have their dust controlled through water sprinkling especially during material haulage</td>
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</table>
| • Workers to be supplied with dust masks and transparent goggles and their wear enforced  
• Regular checks done on heavy machinery like excavators and construction vehicles emitting excessive smoke to be removed from site  
• Good maintenance of construction equipment  
• Delivery vehicle drivers and machine operators should be sensitized to switch off engines when not in use or whilst offloading materials  
• Cover all trucks hauling materials particularly sand  
• Limit speed of the vehicles to 40 Kph or by placing bumps at appropriate places and in busy areas – next to centers such as Peter Kariuki Primary and Secondary Schools, Bethsaida Shops, Matigari Hippo Farm, ACC&S Gikono Church and Gikono Dispensary |
| • Excavated soil  
• Dispose off appropriately | Construction / | Contractor      |
<table>
<thead>
<tr>
<th>Impacts</th>
<th>Mitigating Measures</th>
<th>Phase</th>
<th>Responsibility</th>
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<tbody>
<tr>
<td>• Reuse and use for filling Mutito Quarry next to the road</td>
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<td>decommissioning</td>
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</tr>
</tbody>
</table>
| • Storm-water, flooding, stagnant water and surface run-off | • Proper drainage channels along the road and provided with culverts across residences/private establishments for access – applies to centers such as Peter Kariuki Primary and Secondary Schools, Bethsaida Shops, Matigari Hippo Farm, ACC&S Gikono Church and Gikono Dispensary  
• Implement well designed drainage system and re-vegetation of road embankments to stabilize slopes – culvert bridge across River Nginye | Construction / operation   | Contractor        |
| • Water demand                              | • Equipment with no leaks  
• Efficient water use by sensitizing construction staff  
• Rainwater harvesting at the construction camp  
• Promotion of water reuse as much as possible | Construction / decommissioning | Contractor / WRMA |
| • Oil and grease spills                      | • Minimize any spills  
• Use of spill control kits  
• Construction of sloped concrete pad directing to an oil-water separator that contains spills or overfills  
• Construction and maintenance of an impermeable, hydrocarbon resistant non-combustible barrier that contains spills or overfills  
• Disposal of used oil using a licensed handler from any | Construction / decommissioning | Contractor        |
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<tr>
<th>Impacts</th>
<th>Mitigating Measures</th>
<th>Phase</th>
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<tbody>
<tr>
<td>garages or maintenance yards</td>
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<tr>
<td>• Accidents, injuries, hazards and incidents</td>
<td>• Adhere to site occupational health and safety rules and regulations – OSHA 2007</td>
<td>Construction / operation / decommissioning</td>
<td>Contractor / County Government</td>
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<tr>
<td>• Ensure a safe and healthy working environment</td>
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<td>• Safety education and training to all workers</td>
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<tr>
<td>• Provide and enforce use of PPE</td>
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<tr>
<td>• Signage to be applied to warn oncoming vehicles of the construction as well as use of diversions where necessary to avoid accidents – apply near centers such as Peter Kariuki Primary and Secondary Schools, Bethsaida Shops, Matigari Hippo Farm, ACC&amp;S Gikono Church, Gikono Dispensary and Mutito Quarry next to the project road</td>
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<tr>
<td>• Use of vehicle flaggers at Peter Kariuki Primary and Secondary Schools, Bethsaida Shops, Matigari Hippo Farm, ACC&amp;S Gikono Church, Gikono Dispensary and Gikono Administration and Police Post</td>
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<tr>
<td>• Use of vehicle flaggers and warning signage at the origin of the road project at the railway crossing</td>
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<td>Impacts</td>
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|                                     | • Erect speed bumps on the road at Gikono dispensary, Peter Kariuki Primary & Secondary School, Triple A and Hippo farm access gates and Bethsaida Shops  
• Warning signs to warn and sensitize drivers against speeding when crossing river Nginye bridge to avoid hitting livestock that goes to drink from the river  
• Put up warning signs and speed bumps on the road as it meanders towards Matigari shops  
• Control traffic and put up appropriate road signages on the turn-off to the sanitary landfill | Construction / decommissioning | Contractor             |
|                                     | • Materials extraction and use of raw materials  
• Source materials from registered quarry sites  
• Seek NEMA approval for new material sites  
• Dug out quarries to be rehabilitated with soil and trees and grass planted  
• Minimize wastes of materials | Construction / decommissioning | Contractor, Resident engineer |
|                                     | • Solid wastes  
• Implement cleaner production principles of Reduce, Recycle and Reuse as much as possible  
• Disposal using licensed handlers licensed by NEMA with no disposal on the road, recreational area or public places  
• Segregate waste at any campsite  
• Label all hazardous wastes as per the regulations | Construction / decommissioning | Contractor              |
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<tr>
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<tbody>
<tr>
<td></td>
<td>• Avoid dumping of wastes near Peter Kariuki Primary and Secondary Schools, Bethsaida Shops, Matigari Hippo Farm, ACC&amp;S Gikono Church, Gikono Dispensary and Gikono Administration and Police Post.</td>
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</tbody>
</table>
| • Vegetation disturbance        | • Minimum possible vegetation disturbance along alignment and restrict to the project area  
• Landscaping and tree planting to be ensured - mainly near Peter Kariuki Primary and Secondary Schools and the flower farm  
• Replant trees and landscaping after the road construction at the origin of the road project at the Railway crossing | Construction / decommissioning       | Contractor     |
| • Soil erosion                  | • Minimize stripping of vegetation  
• Stabilization/stone pitching / berming of open trenches to prevent wash away by run-off  
• Abandoned Mutito Quarry next to the road needs to be filled and leveled with soil | Construction / decommissioning       | Contractor     |
| • HIV / AIDS Infections         | • Voluntary counseling and testing to the staff  
• Sensitization and awareness creation  
• Condom dispensers to construction staff | Construction / decommissioning       | Contractor     |
<p>| • Potential pedestrian risks to the Chief's and Dispensary | • Expand road access as the Chief's and dispensary are high pedestrian traffic areas | Construction / decommissioning       | Contractor     |</p>
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<thead>
<tr>
<th>Impacts</th>
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<th>Phase</th>
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<tbody>
<tr>
<td></td>
<td>• Provide alternative routes to provide access to these services to pedestrians / residents</td>
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<td>• Construct pedestrian walk-ways in areas where residential estates and businesses are built into the main road</td>
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<td>• Interference with businesses and daily activities – mainly during excavations</td>
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<td></td>
<td>• Serve notices to businesses and allow enough time – Gikono dispensary, Peter Kariuki Primary &amp; Secondary School, Triple A and Hippo farm access gates and Bethesda shops</td>
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<tr>
<td></td>
<td>• Provide alternative arrangements for access</td>
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<td></td>
<td>• Employ locals and consider job allocations for activities requiring unskilled labour</td>
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<td></td>
<td>• Widen access to homesteads and private property close to the road to allow smooth entry and exit (road design provision)</td>
<td></td>
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<tr>
<td></td>
<td>• Conflicts with immigrant workers</td>
<td>Construction / decommissioning</td>
<td>Contractor / County Government</td>
</tr>
<tr>
<td></td>
<td>• Provide employment to locals especially on unskilled labour as a first consideration</td>
<td></td>
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<tr>
<td></td>
<td>• Develop programmes to enhance cohesion between project employees and local community</td>
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<tr>
<td></td>
<td>• Employ a Grievance Redress Mechanism to resolve grievances</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• Community health and safety issues</td>
<td></td>
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<tr>
<td></td>
<td>• Inform community members along project routes on</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Impacts** | **Mitigating Measures** | **Phase** | **Responsibility**
--- | --- | --- | ---
 | project schedule and activities | | |
 | • Keep public away from project and material sites | | |
 | • Reflective signage installed for safety of road users | | |
 | • Conduct public awareness and sensitization campaign on safety aspects related to the project | | |
 | • Train and develop capacity especially for inexperienced labourers/workers or newly purchased equipment | | |

- **Wetlands**
  - No interference with wetlands – River Nginye – without NEMA approval

- **Grievances**
  - Employ a Grievance Redress Mechanism to resolve grievances

---

**Table 8-3: Environmental and Social Monitoring Plan**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Project activities</th>
<th>Impacts</th>
<th>Indicators</th>
<th>Method of Monitoring</th>
<th>Time frame</th>
<th>Responsibility</th>
<th>Cost Estimate (Kshs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Vegetation clearance and route clearing</td>
<td>• Loss of vegetation cover and habitats&lt;br&gt;• Interference with breeding and roosting habitats for birdlife</td>
<td>• Changes in vegetation cover.&lt;br&gt;• Populations changes of target species&lt;br&gt;• Soil erosion&lt;br&gt;• Species composition and canopy structure of natural vegetation</td>
<td>Field assessment and sampling&lt;br&gt;Survey of trees affected</td>
<td>Construction/operation</td>
<td>Contractor/County Government</td>
<td>500,000</td>
</tr>
<tr>
<td>Phase</td>
<td>Project activities</td>
<td>Impacts</td>
<td>Indicators</td>
<td>Method of Monitoring</td>
<td>Time frame</td>
<td>Responsibility</td>
<td>Cost Estimate (Kshs)</td>
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</tr>
<tr>
<td>Excavations</td>
<td>• Soil erosion</td>
<td></td>
<td>• Erosion features (Rills, gullies, reduced soil depth, stunted crops)</td>
<td>Field surveys and Observations</td>
<td>Construction/operation</td>
<td>Contractor Resident engineer NEMA</td>
<td>2,000,000</td>
</tr>
<tr>
<td></td>
<td>• Noise</td>
<td></td>
<td>• Respiratory infections associated with dust and complaints</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Dust</td>
<td></td>
<td>• Public complaints</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Damage to utility cables</td>
<td></td>
<td>• Injuries on workers and complaints of falling livestock</td>
<td></td>
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<tr>
<td></td>
<td>• Accidents leading to injuries and may</td>
<td></td>
<td>• Waste not disposed properly</td>
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<tr>
<td></td>
<td>be deaths</td>
<td></td>
<td>• Water logging in open pits</td>
<td></td>
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<td></td>
<td>• Solid waste</td>
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<tr>
<td>Use of heavy machinery</td>
<td>• Oil spillage</td>
<td></td>
<td>• Contamination of soil and water bodies</td>
<td>Observation</td>
<td>Construction</td>
<td>Contractor Grievance Redress Committee</td>
<td>1,500,000</td>
</tr>
<tr>
<td>and equipment</td>
<td>• Dust</td>
<td></td>
<td>• Dust associated respiratory infections</td>
<td></td>
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<tr>
<td></td>
<td>• Noise</td>
<td></td>
<td>• Complaints</td>
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<tr>
<td></td>
<td>• Accidents</td>
<td></td>
<td>• Injuries and deaths</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• Health and Safety concerns</td>
<td></td>
<td>• Accelerated run off due to soil compaction</td>
<td></td>
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<tr>
<td>Transport and storage of</td>
<td>• Damage to ecosystem</td>
<td></td>
<td></td>
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<tr>
<td>raw materials</td>
<td>• Destruction of drainage systems</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Oil spills</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Damaged vegetation/disfigured landscape</td>
<td>Field Assessment</td>
<td>Construction</td>
<td>Contractor Resident engineer</td>
<td>3,000,000</td>
</tr>
<tr>
<td>Phase</td>
<td>Project activities</td>
<td>Impacts</td>
<td>Indicators</td>
<td>Method of Monitoring</td>
<td>Time frame</td>
<td>Responsibility</td>
<td>Cost Estimate (Kshs)</td>
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<tr>
<td>Water abstraction</td>
<td>Shortage in water supply, Oil spills in water bodies</td>
<td>Complaints/conflicts on the resource, Contaminated water sources, Bare grounds, Toxic elements in water, Sediment load in rivers, Reduced water table</td>
<td>Laboratory analysis and observation</td>
<td>Construction</td>
<td></td>
<td>Contractor, Resident engineer, Environmentalist, WRMA</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Crushing and</td>
<td>Noise and vibrations, Dust and air pollution, Accidents, Oil spills</td>
<td>Public complaints, Complaints and respiratory infections, Injured workers, Contaminated soils and water</td>
<td>Health and safety records, Observation</td>
<td>Construction</td>
<td></td>
<td>Contractor, Resident engineer, Grievance, Redress Committee</td>
<td>1,755,000</td>
</tr>
<tr>
<td>screening of materials</td>
<td>Damage to landscape, Hazardous open pits, Caving in of excavations, Noise and vibration, Dust and air pollution</td>
<td>Disfigured landscape, Presence of open pits, Caved in excavations/landslides, Complaints, Respiratory infections/complaints</td>
<td>Field assessment, Observation</td>
<td>Construction/operation</td>
<td></td>
<td>Contractor, Resident engineer, Environmentalist, County Government, Grievance, Redress Committee</td>
<td>1,500,000</td>
</tr>
<tr>
<td>Borrow pits</td>
<td>Dust and air pollution</td>
<td>Complaints from workers</td>
<td>Laboratory analysis and observation</td>
<td>Construction</td>
<td></td>
<td>Contractor</td>
<td>3,550,000</td>
</tr>
<tr>
<td>and material extraction</td>
<td>Development of new quarries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screening</td>
<td>Dust and air pollution</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Phase</td>
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<td>Responsibility</td>
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</tr>
</tbody>
</table>
| mixing and stockpiling of aggregates Heating of Bitumen and asphalt plant operation | • Visual intrusion  
• Soil contamination  
• Oil spills  
• Air pollutions  
• Accidents from heating activities | • Piles of materials  
• Contaminated soils  
• Contaminated soils and water bodies  
• Complaints/respiratory infections  
• Injuries on workers such as burns | analysis  
Field Observation | Resident engineer |  |
| Construction of drainage structures | • Water pollution  
• Erosion close to river banks | • Changes in water quality/quantity, oils spills and public complaints downstream  
• Erosion features  
• Increased sediment load in rivers/streams  
• Toxic elements in water body | Laboratory analysis  
Field Observation | Construction  
Contractor  
Resident engineer  
Environmentalist  
Design Engineer | 550,000 |
| Pavement construction | • Noise and vibration  
• Dust from diversions  
• Oils spills | • Complaints  
• Complaints/respiratory infections  
• Contaminated soils and water bodies | Noise measurements  
Impaired hearing by workers | Construction  
Contractor  
Resident engineer  
Environmentalist | 2,650,000 |
| Management | • Employ a grievance | • Number of complaints | Number of  
Continuous | Grievance | 500,000 |
<table>
<thead>
<tr>
<th>Phase</th>
<th>Project activities</th>
<th>Impacts</th>
<th>Indicators</th>
<th>Method of Monitoring</th>
<th>Time frame</th>
<th>Responsibility</th>
<th>Cost Estimate (Kshs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>of complaints and/or grievances</td>
<td>redress mechanism incorporating a negotiation and/or mediation team or party</td>
<td></td>
<td>complaints/grievances resolved against total grievances received</td>
<td>Time of resolution</td>
<td>Chairman / Committee (Steward by Resident Engineer)</td>
<td></td>
</tr>
<tr>
<td>APPROXIMATE TOTALES$MMP COST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Kshs. 18,505,000</td>
</tr>
</tbody>
</table>
| Operation | Immigration | • Population increase  
• Spread of HIV/AIDS and opportunistic infections  
• Changes in cultural set up  
• New ideas and development  
• Insecurity | • Increased settlements and growth of towns  
• Health records  
• Declined moral values  
• Business growth and other premises  
• Increased crime rates | High population density  
Growth of informal settlements | Operation | Contractor  
County Government  
Police  
Grievance Redress Committee | - |
## High traffic

- Accidents
- Police records

## Repair and maintenance of structures

- Erosion
- Blockage of drainages
- Waste
- Erosion features
- Blocked structures and overflows
- Waste piles, contaminated soils and water bodies

## Observation

- Police

## Operation

- KeRRA

## Contractor

- County Government

## Covered in the contract sum

## Decommissio ning

## Dismantling of structures and fittings

- Accidents
- Waste
- Income loss for site support businesses
- Injuries
- Scattered/piled waste of materials such as wood, metals
- Abandoned businesses

## Field Assessment

- KeRRA

## Covered in the contract sum

## Laying off workers

- Loss of employment hence loss of income and tax revenue for state
- Complaints and conflicts
- Increased crime
- High unemployment rates

## Emigration

- Increased crime rates

## Operation

- KeRRA

## Covered in the contract sum

## Sites withdrawal

- Abandoned premise may result to an eyesore after some time
- Interference with drainage
- Land degradation especially close to water points
- Public complaints
- Changes in flow
- Vegetation loss and bare grounds

## Open grounds

- Exposed stumps or roots

## Operation

- KeRRA

## Covered in the contract sum
8.4 Responsibility and Accountability

The Proponent (NaMSIP) will have the overall responsibility to make sure a competent contractor is available for the road construction. Resident Engineer appointed by the proponent will supervise the works according to the contractual agreement.

The ESMMP

The contractor will be responsible for implementation of the ESMMP. The contractor will ensure that there are personnel in charge of the Environmental Health and safety of the overall project. Environmental/Health and Safety Officer will also be responsible for social aspect of the project. The contractor will also have to provide his implementation plans and programmes as regards Environmental, Social, Health and Safety (ESHS) aspects of the project and sign a Code of Conduct, as per the Bank’s guidelines. This construction ESMP will be required from the Contractor to manage construction related impacts.

Safety officer

The contractor will ensure that there is a trained safety officer who will oversees safety services and counseling services for the workers.

Supervision of the project

The proponent will ensure that the project is supervised by a competent engineer

Inspections and Audits

The proponent will ensure that the project is inspected and audited on quarterly basis to check if the project progress is compliant with the existing laws mentioned in chapter four of this report.

Monitoring of the project

The proponent will ensure that the contractor carryout measurements of air and noise quality before, during and after construction work for the indentified sensitive receptors.

Grievance redress mechanism

The proponent and the contractor will be responsible in setting up a grievance redress committee to address issues raised by the local community in the area. It should appoint a competent person who is capable of dealing with complaints and issues raised by the locals.

Regulatory Compliance

The contractor will ensure that the project is compliance with all the legal compliance applicable for a road construction. The key institutions/authorities that will be inspecting the project or consulted is presented in the following table
Operation of the Landfill and the Improved Road
During operation of the landfill and the improved road, the responsibility lies with the County Government of Murang’a who will be the landfill operator with inclusion of the regulatory institutions as shown in the table below.

Table 8-3: Regulatory Institutions and Responsibilities

<table>
<thead>
<tr>
<th>Item</th>
<th>Institution/Authority</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>WRMA (Water Resource Management Authority)</td>
<td>All matters related to water bodies e.g. Water abstraction, borehole drilling. The contractor should ensure that all requirements by this body are met by the project.</td>
</tr>
<tr>
<td>2)</td>
<td>KERRA</td>
<td>Maintenance of road, inspection of road</td>
</tr>
<tr>
<td>3)</td>
<td>NEMA (National Environmental Management Authority)</td>
<td>Inspection of all environmental aspect of the project. The contractor should ensure that all requirements by this body are met by the project.</td>
</tr>
<tr>
<td>4)</td>
<td>DOSHS (Director of Occupational Safety and Health Servicers)</td>
<td>Responsible for all matters related to workers’ employment in the project. The contractor should ensure that all requirements by this body are met by the project.</td>
</tr>
<tr>
<td>5)</td>
<td>County Government</td>
<td>The contractor should ensure that all requirements by county government are met by the project. Maintenance of the road during the operation phase</td>
</tr>
</tbody>
</table>

8.5 Sensitive Receptors Noted along the Haulage Road
Sensitive receptors constitute aspects of the environment likely to be affected by the proposed development in the course of its life cycle. Table 8-4 below lists various sensitive receptors that were noted along the proposed access road from the railway line to Mitubiri Sanitary Landfill Site approximately 11.5 Km.
<table>
<thead>
<tr>
<th>Chainage (Car Odometer)</th>
<th>Name of Site</th>
<th>Description of susceptible feature</th>
<th>Suggested Way Forward / Mitigations</th>
<th>Responsible Party</th>
<th>Estimated Cost Kshs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Km 0+000</td>
<td>Mitubiri</td>
<td>Road narrows with few vegetation on the right hand side</td>
<td>Railway not used and therefore only signage will be required to alert oncoming vehicles of the construction activities Replanting of trees and landscaping should be done after the road construction</td>
<td>Contractor during construction</td>
<td>380,000</td>
</tr>
<tr>
<td>Km 0+300</td>
<td>Peter Kariuki Primary and Secondary Schools</td>
<td>Road next to school boundary. Students likely to be affected by both dust and noise during construction</td>
<td>The contractor to erect speed bumps and wet surfaces during construction period. Where possible, construction activities to be concentrated during the day, school holidays and weekends when there are no classes Avoid unnecessary hooting Assign vehicles flaggers if construction is done during school times with strict speed control during times when students have left classes and are to use the road Use of quiet and modern equipment and minimize idling time and shut off vehicle engines when not in use Need to have inspection and monitoring program for equipment Use suppressors / dampers on construction equipment to manage noise Materials hauling trucks</td>
<td>Contractor during construction</td>
<td>500,000</td>
</tr>
<tr>
<td>Chainage (Car Odometer)</td>
<td>Name of Site</td>
<td>Description of susceptible feature</td>
<td>Suggested Way Forward / Mitigations</td>
<td>Responsible Party</td>
<td>Estimated Cost Kshs</td>
</tr>
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</tr>
<tr>
<td>Km 1+500</td>
<td>Bethsaida Shops</td>
<td>Gikono business outlets close to the road may experience nuisance dust</td>
<td>to be covered so as not to affect the schools and with limited speeds of 40Kph maximum Avoid unnecessary hooting near the schools Serve notices to the schools and allow enough time and provide alternative arrangements for access if required Replant trees and landscaping after the road construction at the area of the school Proper drainage channels along the road and provided with culverts across the school establishments for access Use of quiet and modern equipment with an inspection and monitoring program Minimization of idling time and shut off vehicle engines when not in use Construction during the day only from 6am to 6pm Erect speed bumps and sensitize truck against speeding that can cause accidents Wet the surfaces at the center to suppress dust Materials hauling trucks to be covered so as not to affect the shops and with limited speeds of</td>
<td>Contractor during construction</td>
<td>280,000</td>
</tr>
<tr>
<td>Chainage (Car Odometer)</td>
<td>Name of Site</td>
<td>Description of susceptible feature</td>
<td>Suggested Way Forward / Mitigations</td>
<td>Responsible Party</td>
<td>Estimated Cost Kshs</td>
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<tr>
<td>Km 1+600</td>
<td><em>Gravelia robusta</em> tree species used to mark boundary</td>
<td>The trees may be removed to give way for construction</td>
<td>40Kph maximum Avoid unnecessary hooting near the schools Serve notices to the shop owners and allow enough time and provide alternative arrangements for access if required Proper drainage channels along the road and provided with culverts across the shops for access</td>
<td>Contractor during and after construction – provided for under Bill 1 of the BoQ</td>
<td>330,000</td>
</tr>
<tr>
<td>Km 1+800</td>
<td>Entrance to homesteads / private property</td>
<td>Entrance to private property close to the road</td>
<td>Access to the property will be improved by widening the radius (up to 7 meter) to allow smooth entry and exit to the property (road design provision) Put signage to alert drivers during construction Provide diversion when working on the section of the road and provide alternative arrangements for access if required Proper drainage channels along the road and provided with culverts across the residences or private</td>
<td>Contractor during construction</td>
<td>1,500,000</td>
</tr>
<tr>
<td>Chainage (Car Odometer)</td>
<td>Name of Site</td>
<td>Description of susceptible feature</td>
<td>Suggested Way Forward / Mitigations</td>
<td>Responsible Party</td>
<td>Estimated Cost Kshs</td>
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<tr>
<td>Km 2+300</td>
<td>Mutito Quarry next to the road</td>
<td>Road section is thinning out and may not accommodate two trucks at a time.</td>
<td>The abandoned quarry to be filled and leveled with excavated and compacted soil. Put signage to alert drivers during construction.</td>
<td>Contractor during construction</td>
<td>620,000</td>
</tr>
<tr>
<td>Km 2+600</td>
<td>River Nginye</td>
<td>Livestock watering point just next to the road. Possible pollution by dust. Interference of wetland of Papyrus Reeds.</td>
<td>Sensitize drivers against speeding that can hit livestock when watering. To the extent possible, avoid interfering with the wetland without approval. Implement well designed drainage system and re-vegetation of road embankments to stabilize slopes on the culvert bridge across River Nginye.</td>
<td>Contractor during construction</td>
<td>150,000</td>
</tr>
<tr>
<td>Km 3+000</td>
<td>Sharp bends exists and road meanders up to Matigari Shops</td>
<td>If bends are left after construction proper signage must be clearly put.</td>
<td>Put up warning signages. Erect speed bumps and sensitize truck against speeding that can cause accidents. Wet the surfaces at the center to suppress dust.</td>
<td>Contractor during construction</td>
<td>260,000</td>
</tr>
<tr>
<td>Km 3+200</td>
<td>Green houses within AAA Hippo Farm</td>
<td>Dust from trucks can interfere with the green houses.</td>
<td>Erect speed bumps and sensitize truck against speeding that can cause dust to settle on the green houses. Water or sprinkle water on the roads being worked on next to the farm for dust abatement. Assign vehicle flaggers.</td>
<td>Contractor during construction</td>
<td>380,000</td>
</tr>
<tr>
<td>Chainage (Car Odometer)</td>
<td>Name of Site</td>
<td>Description of susceptible feature</td>
<td>Suggested Way Forward / Mitigations</td>
<td>Responsible Party</td>
<td>Estimated Cost Kshs</td>
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</tr>
<tr>
<td>Km 4+000</td>
<td>Gikono Dispensary Solo Plant</td>
<td>Dust from trucks and disruption of the activities at the health facility and potential pedestrians' accidents</td>
<td>Suppression and damping of construction equipment and use of quiet and modern equipment with an inspection and monitoring program, Minimization of idling time and shut off vehicle engines when not in use, Good maintenance of construction equipment with regular checks done on machinery to reduce excessive emission of smoke and non-compliant vehicles to be removed from site, Materials hauling trucks to be covered so as not to affect the green houses and with limited speeds of 40Kph maximum whilst passing the houses, Landscaping and tree planting to be ensured after construction, Serve notices to the farm owners and allow enough time and provide alternative arrangements for access if required. Proper drainage channels along the road and provided with culverts across the farms</td>
<td>Contractor during construction</td>
<td>180,000</td>
</tr>
<tr>
<td>Chainage (Car Odometer)</td>
<td>Name of Site</td>
<td>Description of susceptible feature</td>
<td>Suggested Way Forward / Mitigations</td>
<td>Responsible Party</td>
<td>Estimated Cost Kshs</td>
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<td>---------------------</td>
</tr>
<tr>
<td>Km 4+800</td>
<td>ACC &amp; S Gikono Church</td>
<td>Impact of noise during construction</td>
<td>Noise during construction must be kept to a minimum and avoided during worship days and/or times. Suppression and damping of construction equipment and use of quiet and modern equipment with an inspection and monitoring program. Minimization of idling time and shut off vehicle engines when not in use. Erect speed bumps and sensitize truck drivers against speeding that can cause accidents near the church. Avoid unnecessary hooting near the church. Sprinkling of water on the roads being worked on to settle dust next to the dispensary. Expand road access as this is a high pedestrian area. Proper drainage channels along the road and provided with culverts across the dispensary.</td>
<td>Contractor during construction</td>
<td>-</td>
</tr>
<tr>
<td>Chainage (Car Odometer)</td>
<td>Name of Site</td>
<td>Description of susceptible feature</td>
<td>Suggested Way Forward / Mitigations</td>
<td>Responsible Party</td>
<td>Estimated Cost Kshs</td>
</tr>
<tr>
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<td>-----------------------------------</td>
<td>------------------------------------</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>the roads being worked on to settle dust next to the church</td>
<td>Proper drainage channels along the road and provided with culverts across the church for access</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Km 5+100</td>
<td>Turn off to Mitubiri Sanitary Landfill Site</td>
<td>Traffic during waste haulage and dumping</td>
<td>Control traffic Put up appropriate road signages Proper drainage channels along the road and provided with culverts across to the sanitary landfill site for access</td>
<td>Contractor during construction</td>
<td>180,000</td>
</tr>
</tbody>
</table>
CHAPTER NINE

9 Conclusion and Recommendation

9.1 Conclusions

The improvement works of the access road to the Proposed Mitubiri Sanitary Landfill Site will in no doubt ease transportation of waste to the proposed Sanitary Landfill Facility as well as contribute to promoting economic development in the study area. In addition, socio-economic benefits, such as improved access to Gikono Health Centre and better transport between the flower farms that exists along the road corridor and the airport are also expected. As the project road already exist and no major realignment will occur, the natural environment has already been considerably altered, therefore any major impacts have already occurred and additional disturbances due to construction works will be relatively minor.

The proposed upgrading of the road will reverse most of the negative socio-economic impacts that have been occasioned by poor condition of the road. Briefly, the momentum of growth in the agricultural sector will be accelerated through better producer prices, and timely acquisition of inputs. The improved road could lead to stronger trade links within the region. Other sectors whose performance could improve include transport, trade and commerce and the service sector. Notable adverse impacts are enhanced run-off and subsequent soil erosion with possible further impacts downstream of Nginye River. Activities at the borrow pits will also lead to land degradation. Most of these impacts can be mitigated effectively through prudent construction works, rehabilitation of cleared sites and borrow pits. To mitigate possible socio-cultural impacts, the locals should be considered for unskilled labour during construction, and adequate information on negative impacts associated with construction should be disseminated to the general public.

9.2 Recommendations

Following on the above observations, the conclusions/recommendations below were arrived at:

i. The Contractor(s) will be expected to develop construction environment and social management plan in line with the one developed under this report for purposes of supervision and continuous monitoring.

ii. All material sites will have comprehensive ESIA undertaken and management plans developed such as to include extraction practices, haulage and materials management rehabilitation plans.
iii. Appropriate safety audit should be undertaken for the road to guide on the implementation and usage of the road thereafter.

iv. Continuous engagement of the waste truck drivers and community members on safety will be necessary on the long term management of the road section.

v. The Directorate of Nairobi Metropolitan Development should ensure that the contractor comply with the applicable gender principles; labour laws encouraging the contractor to employ women and youth in road construction and maintenance; providing safe working conditions for both women and men workers; and ensuring that all civil work contractors engaged under the project, participate in HIV prevention and road safety programmes and; that information reaches the local communities (women, men, the youth and vulnerable groups) living and working along the road corridor.
REFERENCES

a) Factories and Other Places of Work (Fire Risk Reduction) Rules, 2007 Legal Notice No.59
b) Factories and Other Places of Work (Hazardous Substances) Rules, 2007 Legal Notice No.60
c) Factories and Other Places of Work (Medical Examination) Rules, 2005 Legal Notice No.24
d) Factories and Other Places of Work (Noise Prevention and Control) Rules, 2005 Legal Notice No.25
e) Factories and Other Places of Work (Safety and Health Committee) Rules, 2004 Legal Notice No.31
f) International Finance Corporation (July 1, 1998) EHS guidelines
g) Kenya gazette supplement Acts Building Code 2000 by government printer, Nairobi
h) Kenya gazette supplement Acts Water Act, 2002 government printer, Nairobi
k) Ministry of Works Road Design Manuals Part I – Geometric Design of Rural Roads
n) Pollution prevention and abatement handbook – Part III, (September, 2001)
p) The Occupational Safety and Health Act, 2007
CONSTRUCTION OF MITUBIRI ROAD LEADING TO THE SANITARY LANDFILL
MINUTES OF THE STAKEHOLDERS MEETING HELD ON 25TH JANUARY 2017

Attendance

<table>
<thead>
<tr>
<th>No.</th>
<th>NAME</th>
<th>ORGANIZATION</th>
<th>DESIGNATION</th>
</tr>
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<tbody>
<tr>
<td>1.</td>
<td>Eng. Gabriel Kamau</td>
<td>Murang’a county</td>
<td>Chief Officer</td>
</tr>
<tr>
<td>2.</td>
<td>Ms Sarah Gichanga</td>
<td>Murang’a county</td>
<td>Physical planner</td>
</tr>
<tr>
<td>3.</td>
<td>Mr. Philip Abuor</td>
<td>SGS</td>
<td>Lead Expert</td>
</tr>
<tr>
<td>4.</td>
<td>Mr. Joel Omondi</td>
<td>SGS</td>
<td>Sociologist</td>
</tr>
<tr>
<td>5.</td>
<td>Ann Muthoni</td>
<td>Kenol</td>
<td>MCA representative</td>
</tr>
<tr>
<td>6.</td>
<td>Louise Njogu</td>
<td>Kangang’u sub-location</td>
<td>Assistant Chief</td>
</tr>
<tr>
<td>7.</td>
<td>Francis Kimani</td>
<td></td>
<td>Pastor</td>
</tr>
<tr>
<td>8.</td>
<td>Mbuti Ian</td>
<td>DoNMED</td>
<td>Intern Engineer</td>
</tr>
<tr>
<td>9.</td>
<td>Simon Karanja</td>
<td>Kangang’u sub-location</td>
<td>Chief</td>
</tr>
<tr>
<td>10.</td>
<td>Silvia Muturi</td>
<td>SGS Field Assistant</td>
<td>Interpretation, Pics &amp; minutes</td>
</tr>
</tbody>
</table>

Agenda

1. Introduction
2. Matters Arising
3. Conclusion
4. A.O.B
5. Adjournment

<table>
<thead>
<tr>
<th>MINUTE</th>
<th>ITEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/01/2017</td>
<td>Introduction</td>
</tr>
<tr>
<td></td>
<td>Members converged under a tree adjacent to Mitubiri road where the Assistant Chief, Louise Njogu started off the meeting at 1532hrs. Pastor Francis Kimani led members</td>
</tr>
</tbody>
</table>
through a word of prayer and then invited the area Chief, Simon Karanja (Kangang'u Sub-location & Gikono village) to address members. The Chief thanked members for attendance and later invited Ms Sarah Gichanga, Physical Planner-Murang’a County, to enlighten members of the proposed tarmac road construction, approximately 4km, leading to yet another proposed Sanitary Landfill. She notified members that the projects were to be funded by World Bank and the works were to be under Nairobi Metropolitan in conjunction with Murang’a County, then again the forum was only to tackle the apparent tarmac road construction. Engineer G.N Kamau, Chief Officer-Murang’a County, later addressed members and insisted that it was the public’s constitutional right to be consulted as part of stakeholders before commencement of works. Mr. Philip Abuor, Environmental Lead Expert-SGS, also addressed members briefly and later Mr. Joel Omondi, Sociologist, requested members to share their opinion on the project and perhaps iron out any issue the locals had.

<table>
<thead>
<tr>
<th>02/01/2017</th>
<th>Matters Arising</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. <strong>Noise Pollution</strong></td>
<td>Locals indicated that they were worried that after the tarmac road construction and the movement of large trucks to and fro the sanitary landfill, their peace would be disturbed. The officials advised that this was a small price to pay against the positive impact the tarmac road was to unveil such as convenience in movement and also economic benefits such as appreciation in land values.</td>
</tr>
<tr>
<td>ii. <strong>Scarcity in water resource</strong></td>
<td>Locals inquired from the officials of where they were to get water from to facilitate road construction as the area was quite arid. The officials said that the contractor will sink a borehole under the contract as the main source of water for the road construction.</td>
</tr>
<tr>
<td>iii. <strong>Deterioration of the existing tarmac road</strong></td>
<td>Locals were worried that the said large trucks would damage the existing tarmac road as it wasn’t designed to carry such heavy loads. Officials advised that re-carpeting would be done to ensure the existing tarmac road wouldn’t deteriorate.</td>
</tr>
<tr>
<td>iv. <strong>Youth Employment</strong></td>
<td>Locals insisted that the youth around the area needed to be employed and not side lined in execution of the works. Officials confirmed that that would</td>
</tr>
<tr>
<td>v. Safety Issues</td>
<td>Locals declared their worry that the tarmac road would lead to consequential accidents. Officials proclaimed that safety issues would be addressed in the design stage such as the provision of speed bumps etc.</td>
</tr>
<tr>
<td>vi. Air Pollution-Smoke</td>
<td>Locals questioned if the proposed Sanitary Landfill would release smoke into the atmosphere like the existing one. Officials advised that the proposed Sanitary Landfill was highly specialised and was a complete system that needed not burning of garbage and smoke wasn’t a concern. Then again, the existing one would be abandoned and closed.</td>
</tr>
<tr>
<td>vii. Leachate Release-Foul Smell</td>
<td>Locals inquired of how leachate release would be managed and the consequential foul smell. Officials responded by insisting that the system was designed to collect the leachate and lead it through pipes to a collector chamber where treatment would take place.</td>
</tr>
<tr>
<td>viii. Energy Harvesting</td>
<td>Locals questioned of how the tapped energy would be beneficial to the area. Officials responded by claiming that the methane energy would be converted into electricity which would of course impart locals positively.</td>
</tr>
<tr>
<td>ix. Community Representation</td>
<td>Locals insisted that there was need for community representation during decision making from the preliminary stage to commissioning stage. Officials agreed to the request and promised to have two locals involved in decision making.</td>
</tr>
<tr>
<td>x. Public Awareness</td>
<td>Members agreed to have the Sanitary Landfill design drawings shared publicly in form of signages or rather a signage to ensure all and sundry is informed and aware of the works to be executed.</td>
</tr>
</tbody>
</table>

**Conclusion**

i. After all queries were settled, a unanimous decision was arrived upon and it was noted that the locals were FOR the project.
<table>
<thead>
<tr>
<th>Date</th>
<th>A.O.B</th>
<th>Adjournment</th>
</tr>
</thead>
<tbody>
<tr>
<td>04/01/2017</td>
<td>i. Locals requested to have the tarmac road extended beyond the Sanitary Landfill to the adjacent lands.</td>
<td>There being no other business, the Assistant Chief thanked members for attending and the meeting was adjourned at 1641hrs.</td>
</tr>
<tr>
<td></td>
<td>ii. Locals requested if whether the contract could have a welfare provision where the Chief and the Police could be provided with decent camp sites.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii. Locals requested Officials to forward a proposition to the County Government so that boreholes could be dug to counter water scarcity in the area.</td>
<td></td>
</tr>
</tbody>
</table>
## Annex 2: List of Participants

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
<th>Organization</th>
<th>Mobile Telephone</th>
<th>E-mail Address</th>
<th>Signature</th>
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<tr>
<td>1</td>
<td>John Ng’eno</td>
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<tr>
<td>2</td>
<td>Daniel Kuma</td>
<td></td>
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<tr>
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<td>Simon Hanja</td>
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<td>4</td>
<td>Simon Wana</td>
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<td>5</td>
<td>Dick Gitau</td>
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<td>6</td>
<td>Nehemia Kaburu</td>
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<td>Peter Mwendo</td>
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<td>8</td>
<td>Paul K. Wamwera</td>
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<td>9</td>
<td>John Gitonga</td>
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<td>10</td>
<td>Hannata Mwihoko</td>
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<tr>
<td>11</td>
<td>Joyce Wanjiku</td>
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<td>12</td>
<td>Sarah Wawo</td>
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<td>Doreen Wanjiku</td>
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<td>Silas Nasi</td>
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<td>Agnes Mwiti</td>
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<td>41</td>
<td>MICHAEL KIAMA</td>
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<td>42</td>
<td>GEORGE KIMANI</td>
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<td>45</td>
<td>Francis Kimani</td>
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<tr>
<td>46</td>
<td>Philip Akello</td>
<td>0722410381</td>
<td><a href="mailto:philip.mweu@sgs.com">philip.mweu@sgs.com</a></td>
<td></td>
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<tr>
<td>47</td>
<td>Sarah Gichangi</td>
<td>0704151084</td>
<td><a href="mailto:sangi@sgs.com">sangi@sgs.com</a></td>
<td>Muungano County</td>
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<td>Donadi Wieni</td>
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<td>51</td>
<td>Mitu Ini</td>
<td>0705892769</td>
<td><a href="mailto:mitution@gmail.com">mitution@gmail.com</a></td>
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<td>Chirwa K Mwamba</td>
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<tr>
<td>54</td>
<td>Loule W. K Mbita</td>
<td>0721803387</td>
<td><a href="mailto:loule.mbita@gmail.com">loule.mbita@gmail.com</a></td>
<td>Assi Chief</td>
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<td>Peter Kiplaghi</td>
<td>0716929723</td>
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</table>
Annex 3: Photographs of stake holders during public consultations
Annex 4: Sample Chance Find Procedures

Chance find procedures are an integral part of the project EMMP and civil works contracts. The following is proposed in this regard:

If the Contractor discovers archaeological sites, historical sites, remains and objects, including graveyards and/or individual graves during excavation or construction, the Contractor shall:

- Stop the construction activities in the area of the chance find;
- Delineate the discovered site or area;
- Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities or the Ministry of State for National Heritage and Culture take over;
- Notify the supervisor, Project Environmental Officer and Project Engineer who in turn will notify the responsible local authorities and the Ministry of State for National Heritage and Culture immediately (within 24 hours or less);

Responsible local authorities and the Ministry of State for National Heritage and Culture would then be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by the archaeologists of the National Museums of Kenya. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage, namely the aesthetic, historic, scientific or research, social and economic values.

Decisions on how to handle the find shall be taken by the responsible authorities and the Ministry of State for National Heritage and Culture. This could include changes in the layout (such as when finding irremovable remains of cultural or archaeological importance) conservation, preservation, restoration and salvage. Implementation for the authority decision concerning the management of the finding shall be communicated in writing by relevant local authorities.

Construction work may resume only after permission is given from the responsible local authorities or the Ministry of State for National Heritage and Culture concerning safeguard of the heritage.
1. **Steps in dealing with grievances**
   1.1. Complaint received in writing from affected person
   1.2. Recording of grievance in standard form
   1.3. Reconnaissance site visit with the complainant.
   1.4. Submission of detailed complaint to Resident Engineer for resolution by negotiation.
   1.5. Submission of detailed complaint to the Grievance Committee for resolution by mediation.
   1.6. Submission of complaint to NaMSIP for resolution.

2. **Composition of grievance committee**

<table>
<thead>
<tr>
<th>Name</th>
<th>Designation</th>
<th>Organization</th>
<th>Position</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Resident Engineer</td>
<td>Murang'a County</td>
<td>Committee Secretary</td>
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<td>2</td>
<td>Assistant Resident Engineer</td>
<td></td>
<td>Committee Assistant Secretary</td>
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<td>Site Administrator</td>
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<td>Member</td>
</tr>
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<td>4</td>
<td>Chief</td>
<td></td>
<td>Community Representative</td>
</tr>
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<td></td>
<td>Community Representative</td>
</tr>
<tr>
<td>6</td>
<td>Community Member</td>
<td>Local Community</td>
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<tr>
<td>7</td>
<td>Business Member</td>
<td>Business members</td>
<td>Business Representative</td>
</tr>
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</table>
Annex 6: Grievance Resolution Procedure

Recording of grievance in standard forms

Receipt of Complaint from affected person

Reconnaissance site visit

Can the grievance be resolved by the Resident (Negotiation)

Yes – 3 days

Can the grievance be resolved by Grievance

Yes – 5 days

Submission of grievance to NaMSIP for resolution

Grievance resolved

STORAGE OF ALL

Yes
Annex 7: Copy of typical road cross section

TYPICAL ROAD CROSS SECTION
CH. 5+000 TO CH. 11+225
SCALE 1:50
**TYPICAL ROAD CROSS SECTION**

WITHIN SHOPPING CENTRES

SCALE 1:50
Annex 8: Mitubiri Access Road Field Report

Mitubiri Access Road Field Report

Date: 26th September, 2017
Location: Along Mitubiri access road
Participants
- Eng. T.R Karatai (NaMSIP) Tel: 0722 565782
- Eng. Stephen Mwaura (NaMSIP) Tel: 0729 377629
- Alex Mwendwa (SGS Kenya Limited) Tel: 0724 682382

The above participants (team comprising NaMSIP and SGS representatives) conducted a site visit of the Proposed Mitubiri Landfill Access Road to check if there are structures/properties on the construction corridor that should be relocated prior to construction of the road.

The team conducted measurements to confirm the width of the project road vis-a-vis the location of the structures. The visit was guided by Eng. T. R. Karatai who has knowledge of the road reserve allocated for the road.

The table, photographs and maps below present the location and view of the structures found along the road.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Structure/Location</th>
<th>Coordinates</th>
<th>Width Space between the structures with the road in the middle</th>
<th>Road Reserve</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Building opposite Hippo Out-growers gate</td>
<td>0°59’26.80”S 37° 9’14.35”E</td>
<td>15.5 metres</td>
<td>15 metres</td>
</tr>
<tr>
<td>2.</td>
<td>Gikono Dispensary Gate/perimeter wall and Triple A Out growers perimeter fence</td>
<td>0°59’34.92”S 37° 9’38.33”E</td>
<td>15.7 metres</td>
<td>15 metres</td>
</tr>
<tr>
<td>3.</td>
<td>Gikono Water Kiosk and Triple A Out growers perimeter fence</td>
<td>0°59’34.90”S 37° 9’39.42”E</td>
<td>22.5 metres</td>
<td>15 metres</td>
</tr>
<tr>
<td>4.</td>
<td>Temporary kiosks and Triple A Out growers perimeter fence</td>
<td>0°59’34.90”S 37° 9’39.42”E</td>
<td>19 metres</td>
<td>15 metres</td>
</tr>
<tr>
<td>5.</td>
<td>AP camp gate and Triple A Out growers perimeter fence</td>
<td>0°59’34.90”S 37° 9’40.00”</td>
<td>23 metres</td>
<td>15 metres</td>
</tr>
</tbody>
</table>
Map showing locations mentioned

Source Google earth 2017
Filed Pictures

Property by road side near Hippo Out-growers gate

Gikono dispensary to the right and Triple A farm to the left
Water Kiosk (Gikono)

Kiosk (Gikono)
Conclusion
From the measures conducted, it was confirmed that no structure along the road will require relocation to pave way for the construction of the access road. The premises and property near the road will benefit by the improvement of access to the property by widening the radius (up to 7 meter) to allow smooth entry and exit to the property - Gikono Dispensary access, Triple A farm access, Hippo Out-growers access, Peter Kariuki Secondary School access.