NATIONAL URBAN TRANSPORT IMPROVEMENT PROJECT (NUTRIP)

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) OF THE PROPOSED: CONSTRUCTION OF ADDITIONAL LANES ON JKIA – LIKONI – JAMES GICHURU - RIRONI ROAD (A104); DUALLING OF AIRPORT SOUTH ROAD; ACCESS TO JKIA WIDENING; CONSTRUCTION OF ACCESS ROAD PROPOSED BARABARA PLAZA; AND IMPROVEMENT OF ACCESS TO INLAND CONTAINER DEPOT

APRIL 2012

Report prepared and submitted by:

Norken (I) Ltd.
Engineering and Management Consultants
Norfolk Towers, Block G
P.O. Box 9882-00100
Nairobi, Kenya
Tel. 254 20 2248762
Fax 254 20 2248900
Email: info@norken.co.ke

Proponent: Kenya National Highway Authority (KENHA)
Name and Address of Firm of Experts:
Norken International Limited
P. O. Box 9882 - 00100
Nairobi, Kenya
Tel. 254 020 2248762
Registration No. of Firm of Exerts: 0181

Signed: _____________________________  Date: ________________
For: Norken (I) Ltd
Haroub Ahmed
LEAD EIA/AUDIT EXPERT

Name and Address of Proponent:
The Kenya National Highway Authority (KENHA)
P. O. Box 49712 - 00100,
NAIROBI, KENYA

Signed: ___________________________     Date: _____________________
For: Director General
Eng., Denis Odeck
Manager Special Projects
Kenya National Highway Authority (KENHA)

Disclaimer:
This ESIA Project Report is strictly confidential to the Proponent and any use of the materials thereof should be strictly in accordance with agreement between the Proponent and the ESIA Expert (Norken International Limited). It is, however, subject to conditions in the Environmental (Impact Assessment and Audit) Regulations, 2003 under the Kenya Gazette Supplement No. 56 of 13th June 2003.
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Acronyms and Abbreviations

AIDS  Acquired Immune deficiency Syndrome
ARAP  Abbreviated Resettlement Action Plan
CBD  Central Business District
CCPB  Community Consultative Public Baraza
DDP  District Development Plan
EA  Environment Audit
EIA  Environment Impact Assessment
EMCA  Environment Management and Coordination Act
ERS  Economic Recovery Strategy
ESIA  Environment and Social Impact Assessment
ESMP  Environment and Social Management Plan
FG  Focus Groups
GOK  Government of Kenya
HIV  Human Immunodeficiency Virus
ILO  International Labour Organisation
KCPE  Kenya Certificate of Primary Education
KeNHA  Kenya National Highways Authority
KeRRA  Kenya Rural Roads Authority
KI  Key Informants
KURA  Kenya Urban Roads Authority
KWFT  Kenya Women Finance Trust
KWS  Kenya Wildlife Services
LIRP  Livelihood and Income Restoration Programme
LSK  Law Society of Kenya
MDG  Millennium Development Goals
MFI  Micro-finance Institutes
NCC  Nairobi City Council
NEAP  National Environment Action Plan
NEMA  National Environment Management Authority
NGO  Non-governmental Organisation
NMK  National Museums of Kenya
PAP  Project Affected Persons
PPE  Personal Protection Equipment
RAP  Resettlement Action Plan
RTI  Respiratory Tract infections
## Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>STI</td>
<td>Sexually Transmitted Infections</td>
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<tr>
<td>TOR</td>
<td>Terms of Reference</td>
</tr>
<tr>
<td>VCT</td>
<td>Voluntary Counseling and testing</td>
</tr>
<tr>
<td>WB</td>
<td>World Bank</td>
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<td>WHO</td>
<td>World Health Organisation</td>
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<tr>
<td>WMS</td>
<td>Welfare Monitoring Survey</td>
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<td>WRMA</td>
<td>Water Resources Management Authority</td>
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</tbody>
</table>
Introduction

The Government of Kenya (GOK) has a commitment to improve the lives of its people through the development of infrastructure and specifically, the road network. As implied in Vision 2030 the Government aspires for a country firmly interconnected through a network of roads, railways, ports, airports, water and sanitation facilities and telecommunications. It is further envisioned by the year 2030, it will become impossible to refer to any region of the country as remote. To achieve this it is the Government’s obligations to ensure that investment in the nation’s infrastructure is given the highest priority it deserves. The proposed National Urban Transport Improvement Project (NUTRIP) is one of the milestones that will enable the government to reach its goal and is being carried out by the Kenya National Highways Authority (KeNHA).

KeNHA is therefore planning to construct additional lanes on JKIA-Likoni-James Gichuru-Rironi road (A104) (approximately 42 km), dual Airport South Road (approximately 3km), create access to JKIA widening (approximately 2km), construct a bitumen road to the proposed Barabara Plaza (approximately 2km) and construct an access road to container depot (approximately 2km).

Norken (I) Ltd has therefore been contracted by KeNHA to conduct an environmental and social impact assessment study (ESIA) for the above works. The objective of this assignment is to ensure that the potentially adverse environmental and social impacts can be minimized and the positive impacts enhanced.

This report provides the background to the proposed projects as well as an assessment of their likely environmental and social impacts, both beneficial and adverse. Proposed enhancement and mitigation measures are outlined where necessary together with an initial assessment of costs and responsibilities for their implementation.

ESIA Study Objectives

The objectives of the study are to:

- Identify and assess all potential environmental and social impacts of the proposed project;
- Identify all potential significant adverse environmental and social impacts of the project and recommend measures for mitigation;
- Verify compliance with the environmental regulations and relevant standards;
- Identify problems (non-conformity) and recommend measures to improve the environmental management system;
- Generate baseline data that will be used to monitor and evaluate the mitigation measures implemented during the project cycle;
- Recommend cost effective measures to be used to mitigate against the anticipated negative impacts;
- Provide guidelines to stakeholders participating in the mitigation of adverse social impacts of the project.
- Verify the adherence and compliance of the World Bank’s safeguard policies.
ESIA Approach

The approach to this exercise was structured such as to cover the requirements under the EMCA 1999, the EIA Regulations as stipulated under the Gazette Notice No. 56 of 13th June 2003, and the World Bank Safeguard Policies. It involved largely an understanding of the project background, the preliminary designs and the implementation plan as well as commissioning. In addition, baseline information was obtained through physical investigation of the site areas, public consultations with members of the community in the project areas, survey, photography, and discussions with the Proponent.

ESIA Methodology

Environmental Screening:
In screening the Consultant set out to confirm whether or not this project falls within a category that requires an EIA prior to commencement. In addition, other considerations during the screening process included a preliminary assessment of the environmental sensitivity of the areas along the proposed project route; this comprised of a desk study involving the analysis of project maps and proposed project road, as well as literature review of previous studies on the proposed project.

It was therefore determined that infrastructure development activities (such as the development of the proposed project roads) are listed under Schedule 2 of EMCA, 1999 among projects requiring an EIA study. The Proponent has therefore commissioned this study in line with the provisions of EMCA, 1999.

Environmental Scoping:
This exercise helps to narrow down the most critical environmental and social issues requiring detailed evaluation. Below are the key activities that were undertaken during the study:

- Consultations with the Proponent and regarding the proposed project details, the site planning and implementation plan;
- Desk review of available documentation on the project;
- Thorough field investigations along the proposed route, photography, surveys, informal and discussions with people from the immediate neighbourhood;
- In-depth interviews with Provincial Administration, NGOs, CBOs and Faith Based Organisations;
- Evaluation of the project setting and baseline conditions;
- Analysis of the potential impacts of the proposed project on the biophysical and socio-cultural/economic environment;
- Formulation of appropriate mitigation measures and development of an environmental and social management plan, monitoring plan, and guidelines for capacity building in environmental and social management; and
- Preparation and submission of an ESIA Project Report to NEMA.

Final ESIA Report:
A detailed analysis of the potential impact and the corresponding recommendations on mitigation measures was undertaken during the preparation of the final Environmental and Social Impact Assessment Study. This study takes into account all of the findings of the previous assessments undertaken, to include all the consultations that have been carried out with Key Stakeholders.

ESIA Study Team
As required by the Environmental Regulations (2003), this ESIA study was conducted by a NEMA-registered Firm of Experts Norken (I) Ltd. NEMA Reg. No. 0181. The team had the following professionals:

- Lead EIA Experts (Environmental Scientists), Haroub Ahmed and Wanjiku Githinji,
ANTICIPATED IMPACTS AND PROPOSED MITIGATION MEASURES

The following table presents the anticipated impacts and proposed mitigation measures:
<table>
<thead>
<tr>
<th>Potential environmental and social impacts</th>
<th>Mitigation Measures</th>
<th>Responsibilities for implementing the mitigation measures</th>
<th>Responsibilities for monitoring the mitigation measures</th>
<th>Time horizon</th>
<th>Capacity building and training needs</th>
<th>Related cost estimates (KSh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrestrial Habitat Alteration Terrestrial Habitat Alteration</td>
<td>Re-vegetation of disturbed areas with native plant species; Use human labour as opposed to heavy machinery Vegetation management should not eradicate all vegetation; excessive vegetation maintenance may increase likelihood of the establishment of invasive species.</td>
<td>Contractor Supervising Engineer</td>
<td>Supervising Engineer</td>
<td>construction</td>
<td></td>
<td>Re-vegetation approx. 100 per sq m. Manual labour 200-500 per day</td>
</tr>
<tr>
<td>Soil erosion</td>
<td>Soils excavated for the erection of towers should be used for re-filling and should not be left exposed to wind or water for long periods Riverine vegetation should be minimally disturbed during the construction phase to reduce soil erosion and safeguard riverbank protection Re-plant degraded areas with local species to improve ground cover.</td>
<td>Contractor</td>
<td>Supervising Engineer</td>
<td>construction</td>
<td></td>
<td>watering soil heaps: 1000 per 1000 litres</td>
</tr>
<tr>
<td>Air Pollution (dust, fuel emissions)</td>
<td>Control speed of construction vehicles Prohibit idling of vehicles</td>
<td>Contractor</td>
<td>Contractor</td>
<td>construction</td>
<td>Occupational safety and health</td>
<td>Training: 5000 per person per day</td>
</tr>
<tr>
<td>Environmental and Social Impacts</td>
<td>Responsibilities for implementing the mitigation measures</td>
<td>Responsibilities for monitoring the mitigation measures</td>
<td>Time horizon</td>
<td>Capacity building and training needs</td>
<td>Related cost estimates (KSh)</td>
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<tr>
<td>Water should be sprayed during the construction phase on excavated areas</td>
<td>Contractor</td>
<td>Supervising Engineer</td>
<td>construction</td>
<td>Watering soil heaps: 1000 per 1000 litres</td>
<td></td>
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<tr>
<td>Regular maintenance of plant and equipment.</td>
<td>Contractor</td>
<td>Supervising Engineer</td>
<td>construction</td>
<td>Vehicle service @ 3,000-10,000</td>
<td></td>
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<tr>
<td>Provision of dust masks for use when working in dusty conditions</td>
<td>Contractor</td>
<td>Supervising Engineer</td>
<td>construction and operations</td>
<td>Respiratory protection @ 100</td>
<td></td>
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<tr>
<td>Hazardous substances</td>
<td>Contractor</td>
<td>Supervising Engineer</td>
<td>construction</td>
<td>Environmental management</td>
<td></td>
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<tr>
<td>Use of designated areas for repair and maintenance of vehicles and powered machinery to avoid oil spills</td>
<td>Contractor</td>
<td>Supervising Engineer</td>
<td>environmental management</td>
<td>Training in EM: 5000 per person per day</td>
<td></td>
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</tr>
<tr>
<td>Management of Solid Waste</td>
<td>Contractor, Supervising Engineer</td>
<td>Environment Unit</td>
<td>construction and operation</td>
<td>Environmental management</td>
<td>Waste bin @ 1000</td>
<td></td>
</tr>
<tr>
<td>provide solid waste collection facility (disposal container) for the temporary storage of waste prior to disposal at an appropriate and designated location</td>
<td>Contractor, Supervising Engineer</td>
<td>Environment Unit</td>
<td>construction and operation</td>
<td></td>
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<td></td>
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<tr>
<td>The storage yards should also be provided for the disposal of large mounds of waste rock and other earth material</td>
<td>Contractor, Supervising Engineer</td>
<td>Environment Unit</td>
<td>construction and operation</td>
<td></td>
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<tr>
<td>Noise pollution</td>
<td>Contractor</td>
<td>Environment Unit</td>
<td>occupational safety and health</td>
<td>Noise protection devices @100; Training on OSH: 5,000 per person per day</td>
<td></td>
<td></td>
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<tr>
<td>Environmental and social impacts</td>
<td>Responsibilities for implementing the mitigation measures</td>
<td>Responsibilities for monitoring the mitigation measures</td>
<td>Time horizon</td>
<td>Capacity building and training needs</td>
<td>Related cost estimates (KSh)</td>
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<tr>
<td>The right-of-way or way leave must be strictly adhered to mitigate the effects of the unwanted noise</td>
<td>Contractor</td>
<td>Supervising Engineer</td>
<td></td>
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<tr>
<td>Working at heights</td>
<td>Testing structures for integrity prior to undertaking work; Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures; Inspection, maintenance, and replacement of fall protection equipment; Use of helmets and other protective devices will mitigate against scratches, bruises, punctures, lacerations and head injuries due to dropping objects.</td>
<td>Maintenance Mgr</td>
<td>Safety officer</td>
<td>operation</td>
<td>Tower climbing, fall protection, OHS</td>
<td>Training: 5000 per person per day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maintenance Mgr</td>
<td>Safety officer</td>
<td>operation</td>
<td></td>
<td>Initial integrity tests 10,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maintenance Mgr</td>
<td>Safety officer</td>
<td>operation</td>
<td></td>
<td>Climbing equipment @ 25,000 ; PPE 10,000</td>
</tr>
<tr>
<td>Physical Hazards</td>
<td>Appropriate hand and foot protection (PPE) during the manual clearing of vegetation Adopting ergonomic work flow designs that fit physical tasks to employees and not vice versa while maintaining a balance with productivity</td>
<td>Contractor</td>
<td>Contractor</td>
<td>construction</td>
<td></td>
<td>Training OHS: 5000 per person per day</td>
</tr>
<tr>
<td>Environmental and Social Impacts</td>
<td>Responsibilities for Implementing the Mitigation Measures</td>
<td>Responsibilities for Monitoring the Mitigation Measures</td>
<td>Time Horizon</td>
<td>Capacity Building and Training Needs</td>
<td>Related Cost Estimates (KSh)</td>
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<td>Spread of Diseases</td>
<td>Contractor</td>
<td>Safety Officer</td>
<td>construction</td>
<td>HIV/AIDS Awareness</td>
<td>Medical screening approx. 1,000; Education approx. 2,000 per person per session Condoms @5/-</td>
<td></td>
</tr>
<tr>
<td>Education, guidance and counselling on HIV/AIDS and other STDs</td>
<td>Supervising Engineer</td>
<td></td>
<td>construction</td>
<td></td>
<td></td>
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<tr>
<td>Avail condoms to construction staff</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Sites of cultural heritage</td>
<td>Socio-economist</td>
<td>Socio-economist</td>
<td>construction</td>
<td></td>
<td>Survey: 20,000</td>
<td></td>
</tr>
<tr>
<td>Conduct a cultural heritage impact assessment survey in the project area. In the event of chance finds of physical cultural resources, notify the National Museums of Kenya immediately - the resource must be protected from any interference or manipulation of any kind.</td>
<td>Contractor, Supervising Engineer</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land acquisition and Resettlement</td>
<td>KeNHA, Environment Unit</td>
<td></td>
<td>construction</td>
<td></td>
<td>Approx. 114 M for land acquisition</td>
<td></td>
</tr>
<tr>
<td>Environmental and Social Impacts</td>
<td>Responsibilities for Implementing the Mitigation Measures</td>
<td>Responsibilities for Monitoring the Mitigation Measures</td>
<td>Time Horizon</td>
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<td>Related Cost Estimates (KSh)</td>
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<td>- offered support after displacement, for a transition period, based on a reasonable estimate of the time likely to be needed to restore their livelihood and standards of living; - provided with development assistance in addition to compensation measures;</td>
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CONCLUSION AND RECOMMENDATION

The proposed project is expected to have impacts on various aspects of the environment as well as the socio-cultural/economic status of the project affected parties. These anticipated impacts are discussed in Chapter 5.

Mitigation of potential impacts (environmental and social) as described in Chapter 6, and implementation of the ESMP presented in Chapter 7 of this report, will help to prevent or avert negative impacts, and enhance the positive outcomes of the project. This will help to achieve project sustainability.

The responsibility for the incorporation of mitigation measures as stated in ESMP of this report for the project implementation lies with the Supervising Engineer, who must ensure that the Contractor implements all specified mitigation measures.

The World Bank’s OP 4.12 on Involuntary Resettlement and Government of Kenya guidelines will be followed and used complementarily where applicable to avoid conflict.

Community participation in planning and implementing resettlement will be encouraged;

A Compensation and Resettlement Action Plan that has been developed addressing land, housing, crops, and other compensation to be provided to the adversely affected population. Details of this are available in the RAP report.

A monitoring and evaluation mechanism for resettlement activities should be carried out as stated in the ESMP and RAP.

The ESMP and RAP must be used as a crucial tool for compliance and evaluation of the project during all phases.

There are socially vulnerable groups including widowed, handicapped etc. Such group are provided with assistances. Details are discussed in RAP.

Diligence on the part of the contractor and proper supervision by the Supervising Engineer during construction and the initial operation period is crucial for mitigating impacts. However all mitigation measures stated in the ESMP need to be specified in tender and contract documents, and must be included in the Engineering Drawings, Specifications and Bills of Quantities.

The old PC house at the junction of Kenyatta Avenue and Uhuru highway has been identified as an important monument and the project design will not affect it however extra caution should be taken during construction to preserve it
1.1 BACKGROUND

The Government of Kenya (GOK) has a commitment to improve lives of its people through the development of infrastructure and specifically, the roads networks. As implied in the Vision 2030, ‘the Government aspires for a country firmly interconnected through a network of roads, railways, ports, airports, water and sanitation facilities and telecommunications’. It is further envisioned by the year 2030, “it will become impossible to refer to any region of the country as “remote”. To achieve this it is Government’s obligations to ensure that investment in the nation’s infrastructure is given the highest priority it deserves.

The Kenya National Highways Authority (KeNHA) was given the mandate by the Government to manage, develop, maintain and rehabilitate approximately 14,000 Km of the class A, B, and C, roads, which covers approximately 22% of the country’s road network.

KeNHA, in order to partly fulfil this mandate plan to see to the:

- Construction of additional lanes on JKIA-Likoni-James Gichuru-Rironi road (A104) (approximately 42 km);
- Dualling of Airport South Road (approximately 3km);
- Access to JKIA widening (approximately 2km);
- Construction of access bitumen road to the proposed Barabara Plaza (approximately 2km) and;
- Construction of access road to container depot (approximately 2km)

The scope of additional lanes on JKIA-Likoni-James Gichuru-Rironi road (A104) will entail rehabilitation of existing carriageways and installing additional lanes as indicated below:

- Two lanes on either side from JKIA-Nyayo Stadium
- Elevated roadway with two lanes on either side from Nyayo stadium to Museum Hill roundabout
- Two lanes from Museum Hill roundabout to Uthiru
- One lane in either side from Uthiru-Rironi

This ESIA report has therefore been undertaken to ensure that the significant environmental and social impacts of the proposed projects at the preconstruction, construction, operation and decommissioning stages have been considered and assessed at the project planning phase.

This report provides the background to the proposed projects as well as an assessment of their likely environmental and social impacts, both beneficial and adverse. Proposed enhancement and mitigation measures are outlined where necessary together with an initial assessment of costs and responsibilities for their implementation.

1.2 ESIA STUDY

The Kenya Government policy on all new projects requires that an Environmental and Social Impact Assessment (ESIA) study be carried out at the project planning phase in order to ensure that significant impacts on the environment are taken into consideration at the construction and operations stages.
The goal of this assignment is to ensure that any potentially adverse environmental and social impacts can be minimized to the extent feasible, and the positive impacts can be enhanced.

The ESIA assignment has been implemented in accordance with the requirements or the Environment Management and Coordination Act (1999) of Kenya and the Environmental Impact Assessment and Audit Regulations of Kenya (2003). The study also incorporates The World Bank Safeguard Policy guidelines.

The Consultant shall seek to obtain approval of this ESIA Project Report from the National Environment Management Authority (NEMA).

1.2.1 Study Objectives
The broad objective of this assessment was to identify potential environment and social impacts of the project and formulate recommendations to ensure that the proposed development takes into consideration appropriate measures to mitigate/minimise any adverse impacts through all phases of its implementation.

The assessment was undertaken in compliance with the Environmental Management and Coordination Act (EMCA) 1999 and also the Environmental (Impact Assessment and Audit) Regulations under the Kenya Gazette Supplement No. 56 of 13th June, 2003.

The objectives of this ESIA are to:

- Identify and assess all potential environmental and social impacts of the proposed project;
- Identify all potential significant adverse environmental and social impacts of the project and recommend measures for mitigation;
- Verify compliance with the environmental regulations and relevant standards;
- Identify problems (non-conformity) and recommend measures to improve the environmental management system;
- Generate baseline data that will be used to monitor and evaluate the mitigation measures implemented during the project cycle;
- Recommend cost effective measures to be used to mitigate against the anticipated negative impacts;
- Identify and quantify different categories of project affected people (PAPs) who would require some form of assistance, compensation, rehabilitation or relocation.
- Provide guidelines to stakeholders participating in the mitigation of adverse social impacts of the project.
- Verify the adherence and compliance of the World Bank safeguard policies.

1.2.2 Scope of the Study
The ESIA was carried out in compliance with the Government of Kenya's Environmental Management & Co-ordination Act of 1999 and the Environmental (Impact Assessment & Audit) Regulations, June 2003, among other relevant laws, regulations, and guidelines standards.

The scope of services included:
Description of the baseline environment.
- Physical environment (topography, landforms, geology, soils, climate and meteorology, air quality, hydrology, etc.)
- Biological environment (i.e., flora and fauna types and diversity, endangered species, sensitive habitats, etc.)
- Social and cultural environment, including present and projected, where appropriate (i.e., population, land use, planned development activities, community structure, gender, employment and labour market, sources and distribution of income, cultural properties, etc).

Description of the Proposed Project, its geographic location, ecological, general layout of facilities including maps.

An outline of the pertinent regulations and standards governing the environmental quality, solid and liquid waste management, health and safety, protection of sensitive areas, land use control at the national and local levels and ecological and socio-economic issues.

Analysis and description of all significant changes expected due to the proposed project. These would encompass environmental, ecological and social impacts, both positive and negative, as a result of interaction between the proposed project and the environment that are likely to bring about changes in the baseline environmental and social conditions.

Analysis and description of all occupational health and safety concerns likely to arise as a result of construction and operations of the proposed facility.

Public participation and consultations on the positive and negative impacts of the project.

Proposed Mitigation Measures to the identified environmental and social impacts.

The study has been structured such as to cover the requirements under the EMCA 1999, the EIA Regulations as stipulated under the Gazette Notice No. 56 of 13th June 2003.

The study also takes into consideration the World Bank Safeguard Policies, specifically: OP 4.01 Environmental Assessment; OP 4.04 Natural Habitats; OP 4.10 Indigenous Peoples; OP 4.11 Physical Resources; OP 4.12 Involuntary Resettlements; OP 4.36 Forests; 4.09 pest management; OP 4.37 Safety of Dams; OP 7.50 International Waterways; and OP 7.60 Projects in Disputed Areas.

1.2.3 Study Approach

The approach to this exercise was structured such as to cover the requirements under the EMCA 1999, the EIA Regulations as stipulated under the Gazette Notice No. 56 of 13th June 2003, and the World Bank Safeguard Policies. It involved largely an understanding of the project background, the preliminary designs and the implementation plan as well as commissioning. In addition, baseline information was obtained through physical investigation of the site areas, public consultations with members of the community in the project areas, survey, photography, and discussions with the Proponent.

1.2.4 Study Methodology

Environmental Screening:
In screening the Consultant set out to confirm whether or not this project falls within a category that requires an EIA prior to commencement. In addition, other considerations during the screening process included a preliminary assessment of the environmental sensitivity of the areas along the proposed project.
Environmental Scoping:
This exercise helps to narrow down the most critical environmental and social issues requiring detailed evaluation. Below are the key activities that were undertaken during the study:

- Consultations with the Proponent and regarding the proposed project details, the site planning and implementation plan;
- Desk review of available documentation on the project;
- Thorough field investigations along the proposed route, photography, surveys, informal and discussions with people from the immediate neighbourhood;
- In-depth interviews with Provincial Administration, NGOs, CBOs and Faith Based Organisations;
- Evaluation of the project setting and baseline conditions;
- Analysis of the potential impacts of the proposed project on the biophysical and socio-cultural/economic environment;
- Formulation of appropriate mitigation measures and development of an environmental and social management plan, monitoring plan, and guidelines for capacity building in environmental and social management; and
- Preparation and submission of an ESIA Project Report to NEMA.

Final ESIA Report:
A detailed analysis of the potential impact and the corresponding recommendations on mitigation measures was undertaken during the preparation of the final Environmental and Social Impact Assessment Study. This study takes into account all of the findings of the previous assessments undertaken, to include all the consultations that have been carried out with Key Stakeholders.

1.2.5 Study Team
As required by the Environmental Regulations (2003), this ESIA study was conducted by a NEMA-registered ‘Firm of Experts’ Norken Ltd. NEMA Reg. No. 0181. The Consultant’s team is comprised of scientists with experience in carrying out environmental studies in the energy sector, and are conversant with the legislative and regulatory requirements pertinent to this assignment. The team had the following professionals:

i. Lead EIA Experts (Environmental Scientists)
ii. Highway Engineer
iii. Occupational Health and Safety Expert
iv. Ecologist/Natural Resource Expert
v. Sociologist/Socio-Economist.
vi. Surveyor
The project description discussed here below is based upon information provided by the Proponent, specifically the Design Engineers.

2.1 GENERAL

The project concept is to construct additional lanes on JKIA-Likoni-James Gichuru-Rironi road (A104) (approximately 42 km), dual Airport South Road (approximately 3km), access to JKIA widening (approximately 2km), construct a bitumen road to the proposed Barabara Plaza (approximately 2km) and construct an access road to the container depot (approximately 2km)

The scope of additional lanes on JKIA-Likoni-James Gichuru-Rironi road (A104) will entail rehabilitation of existing carriageways and installing additional lanes as indicated below:

- Two lanes on either side from JKIA-Nyayo Stadium
- Elevated roadway with two lanes on either side from Nyayo stadium to Museum Hill roundabout
- Two lanes from Museum Hill roundabout to Uthiru
- One lane in either side from Uthiru-Rironi

Attainment of grade separation at major road intersections including:

i. Mombasa Road/Popo Road/Kapiti Road junction
ii. Mombasa Road/Langata Road/Lusaka Road junction
iii. Mombasa Road/Bunyala Road junction
iv. Uhuru Highway/Haile Sellassie Avenue junction
v. Uhuru Highway/Kenyatta Avenue junction
vi. Uhuru Highway/University Way junction
vii. Chiromo Road/Riverside Drive junction
viii. Waiyaki Way/Rhapta Road/Lower Kabete Road junction
ix. Waiyaki Way/James Gichuru Road junction

2.2 DETAILED SECTION DESCRIPTION WITH COST

2.2.1 Section 1 - KM 0 TO KM 2

This section includes the proposed Kapiti Road / Popo Road interchange at km1.2. The existing A104 carriageways will be retained, with the interchange bridge passing over them. Raft foundations on Black Cotton Soils are anticipated. Rehabilitation requirements are assumed to be 25% patching and 50mm asphalt overlay. A wide interchange appears possible with ramps close to NGL. It is assumed that a source of fill material will be located within 20km of the interchange, and that an existing quarry some 20km distant will provide stone for base course, surfacing and concrete.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION/MEASUREMENT</th>
<th>QTY</th>
<th>UNIT</th>
<th>RATE (US$)</th>
<th>AMOUNT (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Rehabilitate existing A104 pavements 2 x 10.5 x 2000 = 42000</td>
<td>42000</td>
<td>m²</td>
<td>20</td>
<td>840000</td>
</tr>
<tr>
<td>1.1A</td>
<td>Additional lane in both directions 2 x 3.5 x 2000</td>
<td>14000</td>
<td>m²</td>
<td>70</td>
<td>980000</td>
</tr>
</tbody>
</table>
NB. Although a 2 km section of the road expansion from JKIA to Nyayo stadium does run parallel to the Nairobi National Park, there is a buffer provided by an industrial estate between the road and the boundaries of the park. Therefore the roadworks will not impose additional stress on wildlife, though construction waste should be disposed of well outside the vicinity of the National park.

### Section 1 - km0 to km1

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION/MEASUREMENT</th>
<th>QTY</th>
<th>UNIT</th>
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<th>AMOUNT (US$)</th>
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<tr>
<td>1.2</td>
<td>New Popo/Kapiti road pavement</td>
<td>2 x 8.5 x 500 + 3.5 x 200 = 9200 m²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>Kerbs on Popo/Kapiti</td>
<td>4 x 500 = 2000 m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td>Footpaths on Popo/Kapiti</td>
<td>2 x 500 = 2000 m²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>Earthworks 500 x (2 + 8.5 + 2.5) x 7/2 = 45500 m³</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6</td>
<td>Interchange ramp pavements: 4 x 300 = 1200 m² 1200 x 6 = 7200 m²</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.7</td>
<td>Interchange ramp earthworks</td>
<td>1200 x 8 x 3.5 = 33600 m³</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.8</td>
<td>Earthworks</td>
<td>500 x 2(2 + 8.5 + 2.5) x 7/2 = 45500 m³</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.9</td>
<td>Interchange ramp pavements: 4 x 300 = 1200 m² 1200 x 6 = 7200 m²</td>
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<td></td>
<td></td>
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<tr>
<td>1.10</td>
<td>Over Bridge: 3 spans of 18-14-18, 26m wide Deck: (26 x 50) m²</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.11</td>
<td>Retaining walls: assume both approaches retained 4 x 250 = 1000 m²</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL FOR SECTION 1** 10592700

### Section 2 - km2 to km3

This section includes the existing Kiganjo Avenue overbridge and an indirect link forming an interchange. No significant improvements are anticipated at this time. Pavement rehabilitation needs are assumed to be as for Section 1. The additional works include an extra lane in both directions. It is unlikely that the existing Kiganjo Avenue overbridge can accommodate additional fourth lanes as well as BRT lanes.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION/MEASUREMENT</th>
<th>QTY</th>
<th>UNIT</th>
<th>RATE (US$)</th>
<th>AMOUNT (US$)</th>
</tr>
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<td>2.1</td>
<td>Rehabilitate existing A104 pavements 2 x 10.5 x 1000 = 21000 m²</td>
<td>21000</td>
<td>m²</td>
<td>20</td>
<td>420000</td>
</tr>
<tr>
<td>2.1A</td>
<td>Additional lane in both directions 2 x 3.5 x 1000 m²</td>
<td>7000</td>
<td>m²</td>
<td>70</td>
<td>490000</td>
</tr>
<tr>
<td>2.2</td>
<td>Drainage</td>
<td>LS</td>
<td></td>
<td></td>
<td>100000</td>
</tr>
<tr>
<td>2.3</td>
<td>Ancillary works: Signs, markings, road studs etc:</td>
<td>1000</td>
<td>m</td>
<td>15</td>
<td>15000</td>
</tr>
</tbody>
</table>

**TOTAL FOR SECTION 1** 10592700
2.2.3 Section 3 - km3 to km4.5

This section includes the Nyayo Stadium and Bunyala roundabouts. Full interchange will be provided at Nyayo Stadium, but only grade separation without interchange at Bunyala. Pavement rehabilitation as for Section 1 is assumed at this stage. Foundation conditions are expected to be Black Cotton Soils at Langata/Lusaka and rock at shallow depth at Lower Hill/ Bunyala. Aerodrome Road will be realigned to a T-junction on Lower Hill/ Bunyala. The additional works include the reconstruction of the northbound carriageway to make space for the viaduct extension, an extra lane in both directions and the portion of the viaduct extension that falls within this section. Appurtenant works under the viaduct include the BRT pavement, kerbs, footpaths and New Jersey barriers and widening of the Lower Hill Road railway bridge.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION/MEASUREMENT</th>
<th>QTY</th>
<th>UNIT</th>
<th>RATE (US$)</th>
<th>AMOUNT (US$)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>LANGATA/LUSAKA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Rehabilitate existing A104 pavements 2 x 10.5 x 1500 = 31500</td>
<td>31500</td>
<td>m²</td>
<td>20</td>
<td>630000</td>
</tr>
<tr>
<td>3.2</td>
<td>New A104 pavements 2 x 10.5 x 50 = 1050</td>
<td>1050</td>
<td>m²</td>
<td>70</td>
<td>73500</td>
</tr>
<tr>
<td>3.2A</td>
<td>Additional (fourth) lane in both directions: 2 x 3.5 x 1500</td>
<td>10500</td>
<td>m²</td>
<td>70</td>
<td>73500</td>
</tr>
<tr>
<td>3.3</td>
<td>New Langata/Lusaka road pavement (2 x 8.5 x 500) + (3.5 x 200) = 9200</td>
<td>9200</td>
<td>m²</td>
<td>70</td>
<td>644000</td>
</tr>
<tr>
<td>3.4</td>
<td>Kerbs on Langata/Lusaka 4 x 500</td>
<td>2000</td>
<td>m</td>
<td>5</td>
<td>10000</td>
</tr>
<tr>
<td>3.5</td>
<td>Footpaths on Langata/Lusaka 2 x 500 x 2.0</td>
<td>2000</td>
<td>m²</td>
<td>50</td>
<td>50000</td>
</tr>
<tr>
<td>3.6</td>
<td>Earthworks 500 x 2(2 + 8.5 + 2.5) x 7/2 =</td>
<td>45500</td>
<td>m³</td>
<td>15</td>
<td>682500</td>
</tr>
<tr>
<td>3.7</td>
<td>Interchange ramp pavements: 4 x 300 = 1200m 1200 x 6 =7200</td>
<td>7200</td>
<td>m²</td>
<td>70</td>
<td>504000</td>
</tr>
<tr>
<td>3.8</td>
<td>Interchange ramp earthworks 1200 x 8 x 3.5</td>
<td>33600</td>
<td>m³</td>
<td>15</td>
<td>504000</td>
</tr>
<tr>
<td>3.9</td>
<td>Drainage</td>
<td>LS</td>
<td>300000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.10</td>
<td>Ancillary works: Signs, markings, roadstuds etc: A104 Langata/Lusaka</td>
<td>1500</td>
<td>m</td>
<td>15</td>
<td>22500</td>
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<tr>
<td>3.11</td>
<td>Over Bridge: 3 spans of 18-14-18, 26m wide Deck: (26 x 50) Abuts: Closed (2 x 26 x 10) Founds: Raft</td>
<td>1300</td>
<td>m²</td>
<td>1600</td>
<td>2080000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>520</td>
<td>m²</td>
<td>600</td>
<td>312000</td>
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<tr>
<td></td>
<td></td>
<td>520</td>
<td>m²</td>
<td>500</td>
<td>260000</td>
</tr>
<tr>
<td>3.11A</td>
<td>Additional length of overpass: 2 x 3.5 x 26</td>
<td>182</td>
<td>m²</td>
<td>1600</td>
<td>291200</td>
</tr>
<tr>
<td>3.12</td>
<td>Retaining walls: assume all approaches retained 4 x 250 x 10/2</td>
<td>5000</td>
<td>m²</td>
<td>600</td>
<td>3000000</td>
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<tr>
<td>3.13</td>
<td>Widen Lower Hill railway bridge: 10 x 10</td>
<td>100</td>
<td>m²</td>
<td>1600</td>
<td>160000</td>
</tr>
<tr>
<td>3.14</td>
<td>Additional height and length of viaduct ramp RWs: (4 x 7 x 300) + (4 x 350 x 10/2)</td>
<td>15400</td>
<td>m²</td>
<td>600</td>
<td>9240000</td>
</tr>
<tr>
<td>3.15-3.20</td>
<td>Not used</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>ITEM</td>
<td>DESCRIPTION/MEASUREMENT</td>
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<td>UNIT</td>
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<td>-----</td>
<td>-------</td>
<td>------------</td>
<td>--------------</td>
</tr>
<tr>
<td>3.21</td>
<td>rehabilitate existing A104 pavements (included in Langata/Lusaka)</td>
<td>0</td>
<td>m²</td>
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<td>0</td>
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<tr>
<td>3.22</td>
<td>New A104 pavements 2 x 10.5 x 50 = 1050</td>
<td>1050</td>
<td>m²</td>
<td>70</td>
<td>73500</td>
</tr>
<tr>
<td>3.23</td>
<td>New Lower Hill/Bunyala road pavement (2 x 8.5 x 500) + (3.5 x 200) = 9200</td>
<td>9200</td>
<td>m²</td>
<td>70</td>
<td>644000</td>
</tr>
<tr>
<td>3.24</td>
<td>Kerbs on Lower Hill/Bunyala 4 x 500</td>
<td>2000</td>
<td>m</td>
<td>5</td>
<td>10000</td>
</tr>
<tr>
<td>3.25</td>
<td>Footpaths on Lower Hill/Bunyala 2 x 500 x 2.0</td>
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<td>m²</td>
<td>25</td>
<td>50000</td>
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<tr>
<td>3.26</td>
<td>Earthworks 500 x 2(2 + 8.5 + 2.5) x 7/2 =</td>
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<td>m³</td>
<td>15</td>
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<tr>
<td>3.27</td>
<td>Aerodrome Road pavement: 300 x 10 = 3000</td>
<td>3000</td>
<td>m³</td>
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<td>210000</td>
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<tr>
<td>3.28</td>
<td>Aerodrome Road earthworks 1200 x 8 x 3.5</td>
<td>33600</td>
<td>m³</td>
<td>15</td>
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<tr>
<td>3.29</td>
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<td></td>
<td>100000</td>
</tr>
<tr>
<td>3.30</td>
<td>Ancillary works: Signs, markings, roadstuds etc: A104 Lower Hill/Bunyala Aerodrome</td>
<td>1500</td>
<td>m</td>
<td>15</td>
<td>22500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500</td>
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<td>10</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>300</td>
<td>m</td>
<td>5</td>
<td>1500</td>
</tr>
<tr>
<td>3.31</td>
<td>Over Bridge: 3 spans of 18-14-18, 26m wide Deck: (26 x 50)</td>
<td>1300</td>
<td>m²</td>
<td>1600</td>
<td>2080000</td>
</tr>
<tr>
<td></td>
<td>Abuts: Closed (2 x 26 x 10)</td>
<td>520</td>
<td>m²</td>
<td>600</td>
<td>312000</td>
</tr>
<tr>
<td></td>
<td>Founds: Raft</td>
<td>520</td>
<td>m²</td>
<td>500</td>
<td>260000</td>
</tr>
<tr>
<td>3.32</td>
<td>Retaining walls: assume east side approach retained 2 x 250 x 10/2</td>
<td>2500</td>
<td>m³</td>
<td>600</td>
<td>1500000</td>
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<tr>
<td>3.33</td>
<td>Viaduct extension Main structure: 1250 x 22</td>
<td>27500</td>
<td>m²</td>
<td>2200</td>
<td>60500000</td>
</tr>
<tr>
<td>3.34</td>
<td>BRT pavement: CRCP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1500 x 8 = 12000</td>
<td>12000</td>
<td>m²</td>
<td>50</td>
<td>600000</td>
</tr>
<tr>
<td>3.35</td>
<td>Kerbs on BRT busway: 2 x 1500</td>
<td>3000</td>
<td>m</td>
<td>5</td>
<td>15000</td>
</tr>
<tr>
<td>3.36</td>
<td>Footpaths under Viaduct extension 2 x 1500 x 4.0</td>
<td>12000</td>
<td>m²</td>
<td>25</td>
<td>300000</td>
</tr>
<tr>
<td>3.37</td>
<td>Earthworks under Viaduct extension 1500 x 9 x 1.0 =</td>
<td>13500</td>
<td>m³</td>
<td>15</td>
<td>202500</td>
</tr>
<tr>
<td>3.38</td>
<td>Additional earthworks in approach ramps 2 x 10 x 1500 x 10 = 300000</td>
<td>300000</td>
<td>m³</td>
<td>15</td>
<td>4500000</td>
</tr>
<tr>
<td>3.39</td>
<td>New Jersey Barriers between A104 and busway:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.2.4 Section 4 - km4.5 to km6.5

This section includes the Haile Selassie, Kenyatta and University Way roundabouts. An elevated road (the Uhuru Viaduct) with dual 2-lane carriageways will be provided here. Median shoulders 0.5m wide to provide clearance to a 0.5m wide concrete median barrier and outer shoulders 2.5m wide will accommodate broken-down vehicles would result in a deck with an overall width of 21.5m, including the median barrier and 0.5m wide NJ parapets.

An 8 metre wide CRCP carriageway for BRT buses will be provided between pairs of pier columns. Columns will sit to the inner side of 4m wide islands with NJ Barriers on the outer sides to protect (and restrain) pedestrians. Pelican crossings of the outer roadways will be provided at bus stations, at approximately 500m c/c.

Dual 3-lane carriageways will be provided at ground level, by adding three lanes to the western side of the existing road and shifting the centreline by one-and-a-half lane widths westwards. The new pavement is assumed to comprise:

- 50mm AC surfacing
- 125mm DBM
- 150mm CRR base course
- 150mm CRS upper subbase
- 200mm G45 lower subbase
- 300mm selected subgrade
- roadbed preparation

The pavement is assumed to be in a box cut, with excavated material cut to spoil and hauled 20km. The old pavement will be excavated and reused in the adjacent pavement for the busway under the elevated roadway. That excavation will be refilled with selected subgrade material.

The existing southbound carriageway will be rehabilitated, and needs are assumed to be as for Section 1. BRT median lanes will continue straight under the elevated roadway, and thus the access ramps at either end will be uni-directional with the median in between. Transition sections of deck with varying widths will also be required at each end of the viaduct. Other works in this road section include the widening of the bridge over the railway and lengthening of existing drainage culverts.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION/MEASUREMENT</th>
<th>QTY</th>
<th>UNIT</th>
<th>RATE (US$)</th>
<th>AMOUNT (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Rehabilitate existing A104 pavements Southbound: 1 x 10.5 x 2000 = 21000</td>
<td>21000</td>
<td>m²</td>
<td>20</td>
<td>420000</td>
</tr>
<tr>
<td>4.2</td>
<td>New A104 pavements Northbound: 1 x 10.5 x 2000 = 1050</td>
<td>1050</td>
<td>m²</td>
<td>70</td>
<td>73500</td>
</tr>
<tr>
<td></td>
<td>Across Roundabouts: 3 x 50 x 10.5</td>
<td>1575</td>
<td>m²</td>
<td>70</td>
<td>110250</td>
</tr>
<tr>
<td>4.2A</td>
<td>Additional lane in both directions: 2 x 3.5 x 2000</td>
<td>14000</td>
<td>m²</td>
<td>70</td>
<td>980000</td>
</tr>
</tbody>
</table>
### 4.3A Kerbs for new A104 pavements:

<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
<th>Unit</th>
<th>Rate (US$)</th>
<th>Amount (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northbound: 2 x 2000</td>
<td>4000</td>
<td>m</td>
<td>5</td>
<td>20000</td>
</tr>
<tr>
<td>Across R'abouts: 3 x 50 x 4</td>
<td>4600</td>
<td></td>
<td>10</td>
<td>230000</td>
</tr>
<tr>
<td>Southbound: 2 x 2000</td>
<td>4000</td>
<td>m</td>
<td>5</td>
<td>20000</td>
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</tbody>
</table>

### 4.4 New footpaths on A104:

<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
<th>Unit</th>
<th>Rate (US$)</th>
<th>Amount (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 x 2000 x 2.5</td>
<td>10000</td>
<td>m²</td>
<td>25</td>
<td>250000</td>
</tr>
</tbody>
</table>

### 4.5 Cut to spoil under new A104 pavement:

<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
<th>Unit</th>
<th>Rate (US$)</th>
<th>Amount (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.5 x 2000 x 1.0</td>
<td>23000</td>
<td>m³</td>
<td>10</td>
<td>230000</td>
</tr>
<tr>
<td>11.5 x 2000 x 1.0</td>
<td>23000</td>
<td>m³</td>
<td>15</td>
<td>345000</td>
</tr>
</tbody>
</table>

### 4.6 Borrow to fill in old A104 pavement:

<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
<th>Unit</th>
<th>Rate (US$)</th>
<th>Amount (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>23000</td>
<td>23000</td>
<td>m³</td>
<td>70</td>
<td>1519000</td>
</tr>
</tbody>
</table>

### 4.7 New Haile Selassie/ Kenyatta/ University Way pavements:

<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
<th>Unit</th>
<th>Rate (US$)</th>
<th>Amount (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3(2x 14.0 x 250) + (3.5 x 200) = 21700</td>
<td>21700</td>
<td>m³</td>
<td>70</td>
<td>1519000</td>
</tr>
</tbody>
</table>

### 4.8 Kerbs on Haile Selassie/ Kenyatta/ University Way:

<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
<th>Unit</th>
<th>Rate (US$)</th>
<th>Amount (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 x 4 x 250</td>
<td>3000</td>
<td>m</td>
<td>5</td>
<td>15000</td>
</tr>
</tbody>
</table>

### 4.9 Footpaths and median paving on Haile Selassie/ Kenyatta/ University Way:

<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
<th>Unit</th>
<th>Rate (US$)</th>
<th>Amount (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3(3 x 250 x 2.0)</td>
<td>2000</td>
<td>m²</td>
<td>25</td>
<td>50000</td>
</tr>
</tbody>
</table>

### 4.10 Earthworks:

<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
<th>Unit</th>
<th>Rate (US$)</th>
<th>Amount (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 x 2(2 + 8.5 + 2.5) x 7/2 =</td>
<td>45500</td>
<td>m³</td>
<td>15</td>
<td>682500</td>
</tr>
</tbody>
</table>

### 4.11 Interchange ramp pavements:

<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
<th>Unit</th>
<th>Rate (US$)</th>
<th>Amount (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 x 300 = 1200m 1200 x 6 =7200</td>
<td>7200</td>
<td>m²</td>
<td>70</td>
<td>504000</td>
</tr>
</tbody>
</table>

### 4.12 Interchange ramp earthworks:

<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
<th>Unit</th>
<th>Rate (US$)</th>
<th>Amount (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1200 x 8 x 3.5</td>
<td>33600</td>
<td>m³</td>
<td>70</td>
<td>2352000</td>
</tr>
</tbody>
</table>

### 4.13 Drainage:

<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
<th>Unit</th>
<th>Rate (US$)</th>
<th>Amount (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS</td>
<td></td>
<td></td>
<td>400000</td>
<td></td>
</tr>
</tbody>
</table>

### 4.14 Ancillary works: Signs, markings, roadstuds etc:

<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
<th>Unit</th>
<th>Rate (US$)</th>
<th>Amount (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A104 Haile Selassie/ Kenyatta/ University Way</td>
<td>2000 m</td>
<td>15</td>
<td>30000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>500 m</td>
<td>15</td>
<td>7500</td>
<td></td>
</tr>
</tbody>
</table>

### 4.15 Widen existing railway bridge:

<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
<th>Unit</th>
<th>Rate (US$)</th>
<th>Amount (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deck: (14 x 50)</td>
<td>700 m²</td>
<td>1600</td>
<td>1120000</td>
<td></td>
</tr>
<tr>
<td>Abuts: Closed (2 x 14 x 10)</td>
<td>280 m²</td>
<td>600</td>
<td>168000</td>
<td></td>
</tr>
<tr>
<td>Founds: Spread footings (8 x 50)</td>
<td>280 m²</td>
<td>500</td>
<td>140000</td>
<td></td>
</tr>
<tr>
<td>Additional width (8 x 50)</td>
<td>400 m²</td>
<td>1600</td>
<td>640000</td>
<td></td>
</tr>
</tbody>
</table>

### 4.16 Additional retaining walls on RR boundary:

<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
<th>Unit</th>
<th>Rate (US$)</th>
<th>Amount (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14000 m²</td>
<td>600</td>
<td>840000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4.17 - 4.20 Not used

### SUB- TOTAL CARRIED FORWARD

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION/MEASUREMENT</th>
<th>QTY</th>
<th>UNIT</th>
<th>RATE (US$)</th>
<th>AMOUNT (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UHURU VIADUCT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.21</td>
<td>Uhuru Viaduct:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Main structure: 1400 x 22</td>
<td>30800 m²</td>
<td>2000</td>
<td>61600000</td>
<td>40000000</td>
</tr>
<tr>
<td></td>
<td>End transition decks: 2 x 40 x 25</td>
<td>2000 m²</td>
<td>2000</td>
<td>40000000</td>
<td></td>
</tr>
<tr>
<td>4.21A</td>
<td>Viaduct extension: 450 x 22</td>
<td>9900 m²</td>
<td>2200</td>
<td>21780000</td>
<td></td>
</tr>
<tr>
<td>4.22</td>
<td>Retaining walls: twin ramps, both ends of viaduct, both sides retained</td>
<td>14000 m²</td>
<td>600</td>
<td>8400000</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION/MEASUREMENT</th>
<th>QTY</th>
<th>UNIT</th>
<th>RATE (US$)</th>
<th>AMOUNT (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** The table above provides a detailed breakdown of the various construction items, their quantities, units, rates, and total amounts. This information is crucial for project cost estimation and budgeting.
4.23 BRT pavement, CRCP:
2000 m x 8 = 16000 m²

4.24 Kerbs on BRT busway:
2 x 2000 = 4000 m

4.25 Footpaths under Uhuru Viaduct
2 x 2000 x 4.0 = 16000 m²

4.26 Earthworks under Uhuru Viaduct
2000 m x 9 x 1.0 = 18000 m³
Earthworks in approach ramps
4 x 10 m x 2000 m x 10/2 = 400000 m³

4.27 New Jersey Barriers between A104 and busway:
2000 m x 2 = 4000 m

4.28 Aerodrome Road earthworks:
12000 x 8 x 3.5 = 33600 m³

4.29 Drainage

4.30 Ancillary works: Signs, markings, roadstuds etc:
A104 Uhuru Viaduct
2000 m x 1400 m

SUB-TOTAL UHURU VIADUCT

TOTAL FOR SECTION 4

2.2.5 Section 5 - km6.5 to km7.5

This section includes the new Museum Hill interchange and only pavement rehabilitation and possibly some minor widening works are expected to be necessary. However, Riverside Drive will be diverted and extended by 1000m to align with Museum Hill road at the new interchange.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION/MEASUREMENT</th>
<th>QTY</th>
<th>UNIT</th>
<th>RATE (US$)</th>
<th>AMOUNT (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UHURU HIGHWAY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 5.1  | Rehabilitate existing A104 pavements
|      | 2 x 10.5 x 1000 = 21000 m²  | 21000 | m²   | 20         | 420000       |
| 5.2  | Kerbs for new A104 pavements:
|      | 4 x 1000 = 4000 m  | 4000 | m    | 5          | 20000        |
| 5.3  | New footpaths on A104
|      | 2 x 1000 x 2.5  | 5000 | m    | 25         | 125000       |
| 5.4  | New Riverside Drive pavement:
|      | 2 x 1000 x 9 = 18000 m²  | 18000 | m²   | 70         | 1260000      |
| 5.5  | Kerbs on Riverside Drive
|      | 4 x 1000  | 4000 | m    | 5          | 20000        |
| 5.6  | Footpaths and median paving on Riverside Drive
|      | 2 x 1000 x 2.0
|      | 1 x 1000 x 5.0  | 9000 | m²   | 25         | 225000       |
| 5.7  | Riverside Drive Earthworks
|      | 1000 m x 27 x 0.5 = 13500 m³  | 13500 | m³   | 15         | 202500       |
| 5.8  | Interchange ramp pavements: 2 x 300 = 600 m²
|      | 600 m x 6 = 3600  | 3600 | m²   | 70         | 252000       |
| 5.9  | Side road pavements
|      | 2 x 250  | 500  | m²   | 70         | 35000        |
### 5.10 Side road kerbs

2 x 2 x 250 m

- W2 = 5000

### 5.11 Interchange ramp and side road earthworks

1100 x 8 x 3.5

- V2 = 33600 m$^3$

- PM = 15

- T2 = 504000

### 5.12 Drainage

LS

- W2 = 200000

### 5.13 Ancillary works: Signs, markings, roadstuds etc:

- Riverside Drive
- Interchange ramps and side roads

- W2 = 2000 m

- F2 = 5000 m

- PM = 5

- T2 = 20000

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION/MEASUREMENT</th>
<th>QTY</th>
<th>UNIT</th>
<th>RATE (US$)</th>
<th>AMOUNT (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>Rehabilitate existing A104 pavements 1 x 10.5 x 1500 = 42000</td>
<td>15750</td>
<td>m$^2$</td>
<td>20</td>
<td>315000</td>
</tr>
<tr>
<td>6.2</td>
<td>New A104 road pavement (3 x 10.5 x 1500) =</td>
<td>45750</td>
<td>m$^2$</td>
<td>70</td>
<td>3202500</td>
</tr>
<tr>
<td>6.3</td>
<td>Kerbs on A104 4 x 3000</td>
<td>12000</td>
<td>m</td>
<td>5</td>
<td>60000</td>
</tr>
<tr>
<td>6.4</td>
<td>Footpaths on A104 2 x 3000 x 2.0</td>
<td>12000</td>
<td>m$^2$</td>
<td>25</td>
<td>300000</td>
</tr>
<tr>
<td>6.5</td>
<td>Earthworks - Cut in rock: 1500 x 42 x 4 = 252000 1500 x 21 x 4 = 126000</td>
<td>252000 126000</td>
<td>m$^3$</td>
<td>25 25</td>
<td>6300000 3150000</td>
</tr>
<tr>
<td>6.6</td>
<td>Interchange ramp pavements: 4 x 300 x 8 = 9600m</td>
<td>9600</td>
<td>m$^2$</td>
<td>70</td>
<td>672000</td>
</tr>
<tr>
<td>6.7</td>
<td>Interchange ramp earthworks</td>
<td>9600</td>
<td>m$^2$</td>
<td>15</td>
<td>504000</td>
</tr>
</tbody>
</table>

#### 2.2.6 Section 6 - km7.5 to km10.5

This section includes the Riverside Drive, Rhapta Road and Parklands Road intersections. Riverside Drive will be diverted around the eastern side of the university campus to connect into the Museum Hill interchange (diversion included in Section 5 above).

In view of the very restricted space and intense development along side roads in this section the A104 will be lowered so that interchange bridges and side roads can remain at ground level. The cutting will start near the existing intersection of A104 and Riverside Drive and will extend through to Karuna Close, a distance of some 1500m.

A split diamond type of interchange will be provided at Parklands/Raphta Roads. At the southern end, the existing roundabout will be retained, with two bridges spanning the depressed A104. At the northern end, David Osieli Road will be bridged across the A104 cutting to connect to the service road. The existing southbound carriageway of A104 will be retained as a two-way service/ connector road. A pair of west-facing ramps will be added, with retained embankments.

The existing footbridge adjacent to David Osieli Road will be redundant and will be removed to a new location where ramps will be added for cyclists and the disabled. At Brookside Grove/Muguga Green/Mvuli Road, the higher carriageway will be lowered and the A104 bridged to connect the local street networks north and south of the main road. The portions of the A104 carriageways that remain will be rehabilitated as for Section 1.
2.2.7 Section 7 - km10.5 to km12

This section includes the James Gichuru Road intersection. The A104 has only dual 2-lane carriageways in a 32m reserve, and it has not yet been established whether additional lanes should be built now, which would require an additional width of road reserve to be expropriated. At this stage therefore, only rehabilitation is envisaged.

James Gichuru Road will be extended northwards for about 950m along the Westlands-Redhill Road Link to join Kyuna Road to improve the effectiveness of the interchange. Further extension should be planned to better establish it as a minor arterial. James Gichuru Road is already quite steep on the approach to A104, which will mean that it must pass under the main road. Excavation is expected to be in rock.
the stagger between the alignments of James Gichuru Road and possibly allow the connection of service roads. Twin bridge structures will carry the BRT roadway and a station in the A104 median. It is intended that one grade separated cross road over A104 to connect local neighbourhoods and reduce through traffic at the adjacent interchange will be provided although a suitable location has not been identified at this stage. The existing footbridge will be relocated and ramps will be added for cyclists and the disabled. The extra works include an additional traffic lane in both directions.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION/MEASUREMENT</th>
<th>QTY</th>
<th>UNIT</th>
<th>RATE (US$)</th>
<th>AMOUNT (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1</td>
<td>Rehabilitate existing A104 pavement</td>
<td>21000</td>
<td>m²</td>
<td>20</td>
<td>420000</td>
</tr>
<tr>
<td>7.2</td>
<td>New A104 road pavement</td>
<td>5250</td>
<td>m²</td>
<td>70</td>
<td>367500</td>
</tr>
<tr>
<td>7.2A</td>
<td>Additional lanes : 1500 x 7</td>
<td>10500</td>
<td>m²</td>
<td>70</td>
<td>7350000</td>
</tr>
<tr>
<td>7.3</td>
<td>Kerbs on A104</td>
<td>6000</td>
<td>m</td>
<td>5</td>
<td>30000</td>
</tr>
<tr>
<td>7.4</td>
<td>Footpaths on A104</td>
<td>6000</td>
<td>m²</td>
<td>25</td>
<td>150000</td>
</tr>
<tr>
<td>7.5</td>
<td>James Gichuri /Westland -Redhill link earthworks - Cut in rock:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.6</td>
<td>James Gichuri /Westland -Redhill link pavement</td>
<td>20000</td>
<td>m²</td>
<td>70</td>
<td>1400000</td>
</tr>
<tr>
<td>7.7</td>
<td>Roundabout pavement</td>
<td>4200</td>
<td>m²</td>
<td>70</td>
<td>294000</td>
</tr>
<tr>
<td>7.8</td>
<td>Interchange ramp pavements:</td>
<td>7200</td>
<td>m²</td>
<td>70</td>
<td>504000</td>
</tr>
<tr>
<td>7.9</td>
<td>Interchange ramp earthworks- Cut in rock:</td>
<td>33600</td>
<td>m³</td>
<td>25</td>
<td>840000</td>
</tr>
<tr>
<td>7.10</td>
<td>Ancillary works: Signs, markings, roadstuds etc:</td>
<td>1500</td>
<td>m</td>
<td>15</td>
<td>22500</td>
</tr>
<tr>
<td></td>
<td>A104</td>
<td>1000</td>
<td>m</td>
<td>10</td>
<td>10000</td>
</tr>
<tr>
<td></td>
<td>James Gichuri - Westlands- Redhill Rams</td>
<td>1400</td>
<td>m</td>
<td>5</td>
<td>7000</td>
</tr>
<tr>
<td>7.11</td>
<td>Kerbs on ramps</td>
<td>2800</td>
<td>m</td>
<td>5</td>
<td>14000</td>
</tr>
<tr>
<td>7.12</td>
<td>Kerbs on JG-WR</td>
<td>2000</td>
<td>m</td>
<td>5</td>
<td>10000</td>
</tr>
<tr>
<td>7.13</td>
<td>Under Bridges:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2No. 3 spans of 18-14-18, 15m wide</td>
<td>1500</td>
<td>m²</td>
<td>1600</td>
<td>2400000</td>
</tr>
<tr>
<td></td>
<td>Decks (curved, 20m inside radius: 2(15 x 50)</td>
<td>600</td>
<td>m²</td>
<td>600</td>
<td>360000</td>
</tr>
<tr>
<td></td>
<td>Abuts: Closed (4 x 15 x 10)</td>
<td>400</td>
<td>m²</td>
<td>500</td>
<td>200000</td>
</tr>
<tr>
<td></td>
<td>Founds: Spread 4 x 20 x 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cross bridge: 1No. 3 spans of 18-14-18, 24m wide</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deck: 2(24 x 50)</td>
<td>1200</td>
<td>m²</td>
<td>1600</td>
<td>1920000</td>
</tr>
<tr>
<td></td>
<td>Abuts: Closed 2(2 x 24 x 10)</td>
<td>480</td>
<td>m²</td>
<td>600</td>
<td>288000</td>
</tr>
<tr>
<td></td>
<td>Founds: Spread 2(2 x 20 x 5)</td>
<td>200</td>
<td>m²</td>
<td>500</td>
<td>100000</td>
</tr>
<tr>
<td>7.14</td>
<td>Drainage</td>
<td>LS</td>
<td></td>
<td></td>
<td>200000</td>
</tr>
<tr>
<td>7.15</td>
<td>Move existing footbridge</td>
<td>LS</td>
<td></td>
<td></td>
<td>25000</td>
</tr>
</tbody>
</table>

**TOTAL FOR** 21112000
2.2.1 Summary of project cost

SUMMARY

<table>
<thead>
<tr>
<th>SECTION</th>
<th>QTY</th>
<th>RATE (US$)</th>
<th>AMOUNT (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SECTION 1</td>
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<td>10592700</td>
<td></td>
</tr>
<tr>
<td>SECTION 2</td>
<td></td>
<td>1025000</td>
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</tr>
<tr>
<td>SECTION 3</td>
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<td>93021200</td>
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</tr>
<tr>
<td>SECTION 4</td>
<td></td>
<td>122504750</td>
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</tr>
<tr>
<td>SECTION 5</td>
<td></td>
<td>3291000</td>
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</tr>
<tr>
<td>SECTION 6</td>
<td></td>
<td>26351200</td>
<td></td>
</tr>
<tr>
<td>SECTION 7</td>
<td></td>
<td>21112000</td>
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</tr>
<tr>
<td>SUB-TOTAL OF SECTIONS</td>
<td></td>
<td>277897850</td>
<td></td>
</tr>
</tbody>
</table>

ADD:

- Preliminary and General Items: 10% 27777785
- Service relocations: LS 2000000
- Street Lighting: LS 714000

GRAND TOTAL 314695635
3.1 ENVIRONMENTAL PROTECTION AND MANAGEMENT AT THE NATIONAL LEVEL

According to the Kenya National Environment Action Plan (NEAP, 1994) the Government recognised the negative impacts on ecosystems emanating from economic and social development programmes that disregarded environmental sustainability. Following on this, establishment of appropriate policies and legal guidelines as well as harmonisation of the existing ones have been accomplished or is in the process of development. The NEAP process introduced environmental assessments in the country culminating into the enactment of the Policy on Environment and Development under the Sessional Paper No. 6 of 1999.

An EIA is a legal requirement in Kenya for all development projects. The Environmental Management and Co-ordination Act 1999, is the legislation that governs EIA studies. This project falls under the Second Schedule that lists the type of projects that are required to undergo EIA studies in accordance with section 58 (1-4) of the Act. Projects under the Second Schedule comprise those considered to pose potentially negative environmental impacts.

Kenyan law has made provisions for the establishment of the National Environment Management Authority (NEMA), which has the statutory mandate to supervise and co-ordinate all environmental activities. Policies and legislation highlighting the legal and administrative requirements pertinent to this study are presented in section 3.2 below.

3.2 POLICY PROVISIONS

3.2.1 The National Environment Action Plan Framework 2009 - 2013

The Kenya National Environment Action Plan (NEAP, 2009-2013) highlights priority themes and activities for the Country towards achieving sustainable development. The NEAP aims at providing a broad framework for the coordination of environmental activities by all actors (i.e., both the private and public sector) to guide the course of development actions. Under the NEAP 1994 process, EIA was introduced and among the key participants identified were the District Development Committees.

3.2.2 Sessional Paper No. 6 of 1999 on Environment and Sustainable Development

Among the key objectives of the Sessional Paper No. 6 of 1999 on Environment and Sustainable Development (1993) are:

- To ensure that from the onset, all development policies, programmes and projects take environmental considerations into account,
- To ensure that an independent environmental impact assessment (EIA) report is prepared for any development before implementation,

Under this paper, broad categories of development issues have been covered that require sustainable approaches. These issues include the waste management and human settlement sectors. The policy recommends the need for enhanced re-use/recycling of residues including wastewater and increased public awareness raising and appreciation of clean environment as well as the participation of stakeholders in the management of wastes within their localities. Regarding human settlement, the paper
3.2.3 Sessional Paper No. 3 of 1975 (The Wildlife Policy)

The key elements of this policy may be summarized as follows:
(a). It identifies the primary goal of wildlife conservation as the optimization of returns from wildlife defined broadly to include aesthetic, cultural, scientific and economic gains, taking into account the income from other land uses;
(b). It points out the need to identify and implement compatible land uses and fair distribution of benefits derived from wildlife including from both non-consumptive and consumptive uses of wildlife;
(c). It underscores the need for an integrated approach to wildlife conservation and management in order to minimize human-wildlife conflicts; and
(d). The government assumes the responsibility of paying compensation for damages caused by wildlife.

3.2.4 Economic Recovery Strategy

The Economy Recovery Strategy (ERS) is equivalent to Poverty Reduction Strategy Paper in Kenya. As such it states overall government priorities and is the principal guide to economic policy. The ERS states that it will achieve its objectives without compromising the health of the environment.

3.3 KENYA ROADS POLICIES

The objectives of Kenya Road Policies are based on the following criteria:
- Integration: Ensuring that all roads decisions are taken in the context of a coherent, integrated transport policy covering all modes;
- Accessibility: Making it easy to reach the places we wish to get to;
- Safety: Making travel safer; and
- Economy: Getting good value for money and supporting sustainable economic activity in appropriate locations.

3.3.1 Environmental Impact and Road Policy

The road policy further emphasises on the following environment relevant issues:
- All road improvements need to be sustainable. Consequently, short-run gains from road infrastructure should not obscure wider or long-run damage that may be associated with it;
- The aim is to limit and where possible reduce damage at local, regional and global levels, taking account of all relevant environmental policies such as those on climate change, local air quality and biodiversity. It is also important to acknowledge positive environmental benefits that the trunk road system can bring;
- Bypasses have their positive and negative sides. They can take noisy, polluting traffic out of towns and villages and allow the implementation of traffic calming and other measures to improve the urban environment. They can also reduce accidents. On the other hand, bypasses intrude on the countryside; and
- Road improvements have a mixed effect on emissions. By easing congestion they could help reduce emission of some pollutants, but they increase emission of others.

3.3.2 Environmental Guidelines for Roads and Bridges, 2010
and bridges provide detailed analysis of environmental issues and mitigation measures that have been used successfully in national and international contexts. The guidelines identify the direct and indirect effects from road works on the biophysical environment – land, water, air, vegetation, etc as well as the socio-economic and cultural environments for instance, public health, welfare and safety and valued traditions from the present and past.

The guidelines underscore the importance of public consultations and participation in all aspects of road-transportation development, thereby ensuring accountability, fairness and sustainability.

However, the guidelines do not address environmental impacts from road transport, including:

- Vehicle emissions that degrade air quality, e.g. carbon dioxide, ozone, nitrous oxides etc;
- Road safety issues that arise from unsafe road designs, failure to correct black spots, etc;
- Vehicle inspections that require repairs to ensure road-worthiness for all transport modes;
- Passenger safety viz use of seat belts; and
- Vehicle overloading.

Environmental guidelines for roads and bridges, 2010 cover the following guidelines for activities that can affect the water quality:

- Contractor Camp Guidelines;
- Site Preparation Guidelines;
- Earthworks Guidelines;
- Drainage Guidelines;
- Borrow Pit Guidelines;
- Rock Quarries Guidelines;
- Sand Sources Guidelines;
- Water Sources Guidelines;
- Bitumen Processes Guidelines;
- Culverts Guidelines; and
- Bridges Guidelines.

In addition, it contains the following guidelines:

- Air Quality Guidelines;
- Noise and Ground Vibrations
- Land Use Including:
- Material Site Guidelines;
- Debris Disposal Guidelines;
- Road-Induced Changes in Resource Management Guidelines.
- Community Health Including:
- STDs and HIV/AIDS Guidelines;
- Vectorborne Diseases Guidelines;
- Fugitive Dust Guidelines;
- Noise Guidelines; and
- Ground Vibration Guidelines.
- Community Welfare which includes Job Opportunities Guidelines; and
- Cultural and Natural Heritage Guidelines which include Landscape and Visual Intrusion Guidelines.

3.4 NATIONAL LEGAL FRAMEWORK
Applications on environmental conservation suggest that the Proponent has a legal duty and social responsibility to ensure that the proposed development is carried out without compromising the status of the environment, natural resources, public health and safety. This position enhances the importance of this environmental impact assessment for the proposed site to provide a benchmark for its sustainable operation.

Kenya has approximately 77 statutes that relate to environmental concerns. Most of these statutes are sector specific, covering issues such as public health; soil erosion; protected areas; endangered species; water rights and water quality; air quality, noise and vibration; cultural, historical, scientific and archaeological sites; land use; resettlement; etc. Previously, environmental management activities were implemented through a variety of instruments such as policy statements and sectoral laws, and also through permits and licences. For example, the Physical Planning Act of 1996 empowers local authorities to request existing facilities to conduct environmental assessments, while under the Local Government Act of 1998, it is an offence to emit smoke, fumes or dust which may be a source of danger, discomfort or annoyance.

3.4.1 Administrative Framework

In the year 2001, the Kenya Government established the administrative structures meant to implement EMCA. The main administrative structures include the following:

The National Environmental Council

NEC is responsible for policy formulation and directions for the purposes of the Act. It also sets national goals and objectives, and determines policies and priorities for the protection of the environment.

The National Environment Management Authority (NEMA)

The responsibility of NEMA is to exercise general supervision and co-ordination over all matters relating to the environment and be the principal instrument of government in the implementation of all policies relating to the environment.

The Standards and Enforcement Review Committee

The EMCA provides for the establishment and enforcement of environmental quality standards to be set by a technical committee of NEMA. This is known as the Standards and Enforcement Review Committee (SERC).

The Provincial and District Environment Committee

These mainly contribute to decentralization of environmental management and enable the participation of local communities. These committees comprise of:

- Representatives from all the ministries
- Representatives from local authorities within the province or the district
- Two farmers / pastoral representatives
- Two representatives for the NGOs involved in Environmental Management in the province or district
- A representative of each regional development authority in the province / district
The Public Complaints Committee

EMCA also established a Public Complaints Committee, which provides the administrative mechanism for addressing environmental harm. This committee has the mandate to investigate complaints relating to environmental damage and degradation. Its members include:

- Representatives from the Law Society of Kenya (LSK)
- Representatives from NGOs involved in environmental management
- Representatives from the business community.

3.5 REVIEW OF RELEVANT STATUTES

The key national laws that govern the management of environmental resources in the country have been briefly discussed below.

3.5.1 The Environmental Management and Co-ordination Act, 1999

The Environmental Management and Co-ordination Act (EMCA) of 1999 provides for the establishment of a National Environment Management Authority (NEMA), as the supreme regulatory and advisory body on environmental management in Kenya under EMCA 1999. NEMA is charged with the responsibility of coordinating and supervising the various environmental management activities being undertaken by other statutory organs. NEMA also ensures that environmental management is integrated into development policies, programmes, plans and projects.

Under Part II (General Principles), sub section (1), the Act entitles every person in Kenya to a clean and healthy environment, but also confers responsibility on them to safeguard and enhance the environment. Some other key principles that should guide environmental management and decision making include: public participation, the polluter pays principle and the precautionary principle.

Section 58 of EMCA makes it mandatory for any proponent undertaking any development activity in the second schedule of the Act to carry out Environmental impact Assessment and get it approved by NEMA before being licensed to commence implementation. The Act also states that EIA shall be conducted in accordance with the environmental impact regulations, guidelines and procedures issued under the Act.

Sections 68 sub section (3), confer responsibility on the proponent for any project for which an EIA was done to keep accurate records and make annual reports describing how far the project is conforming to the statements made in the EIA report. Sub section (4) gives responsibility to the proponent to ensure that all reasonable measures to mitigate undesired effects not contemplated in the EIA are implemented. He/She will also prepare and submit audit reports on those measures annually to the Authority or as the Authority shall require.

Part VIII section 72 of the Act prohibits discharging or applying poisonous, toxic, noxious or obstructing matter, radioactive or any other pollutants into the environment.

Section 87 Sub-section 1 states that no person shall discharge or dispose of any wastes, whether generated within or outside Kenya, in such a manner as to cause pollution to the environment or ill health to any person. Sections 90 through 100 outline more regulations on management of hazardous and toxic substances including oils, chemicals and pesticides.

Finally, section 148 of EMCA provides for conflict resolution between different statutes, giving EMCA supremacy over any existing law in the country in case of any such conflict.
3.5.2 The Environment (Impact Assessment and Audit) Regulations, 2003

The regulations provide for the detailed procedure of carrying the EIA and audit process in Kenya. They also provide explicitly for public consultation and mechanisms for doing it. The regulations also indicate "Issues to be Considered in Environmental Impact Assessment" in the second schedule of the regulations and "General Guidelines for Carrying out an Environmental Impact Assessment Study” in the third schedule to the regulations.

3.5.3 Building Code By-Laws

The By-law of Building Code 3 (1) states ‘A person who erects a building or develops land or changes the use of a building or land, or who owes or occupies a building or land shall comply with requirements of these by-laws’. By-law 5 states that a person who intends to erect a building or materially change the use of a building or part of a building shall furnish the council in the manner provided in Part A of the First Schedule to these By-laws.

3.5.4 The Occupational Safety and Health Act, 2007 and Regulations

The Factories Act (Cap 514) was repealed and replaced with the Occupation Safety and Health Act (2007) which is an Act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, and provides for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The Act has the following functions among others:

- Secures safety and health for people legally in all workplaces
- Prevents employment of children in workplaces where their safety and health is at risk.
- Encourages entrepreneurs to set achievable safety targets for their enterprises.
- Promotes reporting of workplace accidents, dangerous occurrences and ill health with a view to finding out their causes and preventing similar occurrences in future.
- Promotes creation of a safety culture at workplaces through education and training in occupational safety and health.

Even though the Factories and Other Places of Works Act (Cap 514) was repealed, there are regulations which were enacted under the Act which are still operational under OSHA and are relevant to this Project. These are:

- The Factories (Wood Working Machinery) Rules 1959;
- The Factories (Eye Protection) Rules 1978;
- The Factories (Electric Power) (Special) Rules 1978;
- The Factories and Other Places of Work (Health & Safety Committees) Rules 2004;
- The Factories and Other Places of Work (Medical Examination) Rules 2005;
- The Factories and Other Places of Work (Noise Prevention and Control) Rules 2005; and

a) Building Operations and Works of Engineering Construction Rules

The building operations and engineering construction works are contained in the Abstract of the Act for Building Operations, and Works of Engineering Construction Rules. These are summarised below:
### Legal Requirements

<table>
<thead>
<tr>
<th>Legal Requirements</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Requirements</strong></td>
<td><em>Give notice of particular operations or works:</em> Notice should be sent in writing to the Occupational Health and Safety Officer, not later than seven days after commencement of construction and building works except where the construction works will be complete in less than six weeks or notice had already been given to the Occupational Health and Safety Officer (Section 60 of the Act).</td>
</tr>
<tr>
<td><strong>General Register:</strong></td>
<td>A general register of every person undertaking building operations or construction works be kept in adherence to the prescribed form L.D.B.C.R.2. This register is kept at the site of operations or at the office of the person undertaking the operations or works.</td>
</tr>
<tr>
<td></td>
<td>The register should contain:</td>
</tr>
<tr>
<td></td>
<td>▪ The certificate of registration of the workplace;</td>
</tr>
<tr>
<td></td>
<td>▪ Every other certificate issued by the Chief Inspector under this Act;</td>
</tr>
<tr>
<td></td>
<td>▪ The prescribed particulars as to the finishing (washing, white washing, colour washing, painting or varnishing) of the facility;</td>
</tr>
<tr>
<td></td>
<td>▪ The prescribed particulars as to every accident and case of occupational disease occurring in the workplace of which a notice is required to be sent to a labour officer under the provisions of any law for the time being in force;</td>
</tr>
<tr>
<td></td>
<td>▪ All reports and particulars required by any other provision of this Act to be entered in or attached to the general register;</td>
</tr>
<tr>
<td></td>
<td>▪ Such other matters as may be prescribed (Section 62 of the Factories and Other Places of Work Act) and OSHA.</td>
</tr>
<tr>
<td><strong>Special rules and welfare:</strong></td>
<td>Printed copies or prescribed abstracts of the Factories and Other Places of Work Act must be kept posted at the site of operations or works (Section 61 of the Factories and Other Places of Work Act) and OSHA.</td>
</tr>
<tr>
<td><strong>Safety Requirements</strong></td>
<td><em>Air receivers:</em> These should be of sound construction and be properly maintained. They should be thoroughly examined by a competent person at intervals of 24 months and the reports of such examinations attached to the General Register (Section 39 of the Factories and other Places of Work Act) and OSHA.</td>
</tr>
<tr>
<td></td>
<td><em>Cylinders for compressed, liquefied and dissolved gases:</em> Such cylinders should be of good construction, sound material, adequate strength and free from patent defect. The cylinders should conform to standards specified under the Standards Act or to a prescribed standard specification, approved in writing, by the Director, Kenya Bureau of Standards. They should be thoroughly examined by a competent person at regular intervals and a maintenance register kept (Section 39A of the amendment of the Factories and Other Places of Work Act) and OSHA.</td>
</tr>
</tbody>
</table>
Legal Requirements

**Notification of accidents:** The particulars of an accident causing death or disablement of a worker for more than three days from earning full wages at the workplace where he was employed must be sent in the prescribed form (L.D.B.C.R 6) to the Occupational Health and Safety Officer and entered in the General Register. Certain dangerous occurrences must also be reported whether or not they cause disablement (Section 62 of the Factories and Other Places of Work Act) and OSHA.

<table>
<thead>
<tr>
<th>Health Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sanitary accommodation:</strong></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Miscellaneous Requirements</th>
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</thead>
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<tr>
<td><strong>Prohibition of deduction from wages:</strong></td>
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<tr>
<td><strong>Duties of persons employed:</strong></td>
</tr>
<tr>
<td><strong>Inspection:</strong></td>
</tr>
</tbody>
</table>

**b) Health and Safety Committee Rules**

The Health and Safety Committee Rules are described in Legal Notice No. 31 of the Kenya Gazette Supplement No. 25 of 14th May 2004 and apply to all factories and other workplaces that regularly employ twenty or more employees. Among other items, the rules state that:

- The occupier of every factory or other workplace shall establish a Health and Safety Committee;
- The Committee shall consist of safety representatives from the management and the workers;
- The factory occupier shall appoint a competent person from the management staff to be responsible for safety, health and welfare in the factory or workplace; and the person appointed shall be secretary to the committee;
- Every member of the Health and Safety Committee shall undertake a prescribed basic training course in occupational health and safety within a period of six months from the date of appointment or election, and thereafter further training from time to time; and
The occupier of every factory or workplace shall cause a health and safety audit of the workplace every period of twelve months by a registered health and safety adviser.

The above legal notice also describes the functions and duties of the Health and Safety Committees meetings and minutes, and roles in the Committee. It further describes the duties of the occupier and those of the Health and safety Adviser.

c) Noise Prevention and Control Rules

These rules are described in Legal Notice No. 25 of the Kenya Gazette Supplement No. 22 of April 2005 and apply to every plant, premises, place, process and operations to which the provision of the factories applies. These Rules describe the following:

- Permissible noise levels;
- Noise prevention programme;
- Noise measurements and records;
- Information on noise and training of workers;
- Noise measuring equipment;
- Engineering Controls;
- Installation and maintenance of machinery or plant;
- Means of communication;
- Hearing protection;
- Noise hazard areas;
- Workers responsibility in noise hazard areas;
- Duties of the occupier;
- Medical examination and hearing tests;
- Compensation and notification of occupational hearing impairment;
- Noise programme review; and
- Offences and penalties.

3.5.5 Water Act, 2002

Section 25 of the Act requires a permit to be obtained for among others any use of water from a water resource, and discharge of a pollutant into any water resource. According to section 29 of the same Act, application for such a permit shall be subject to public consultation as well as an environmental impact assessment as per the Environmental Management and Coordination Act, 1999.

Section 73 of the Act allows a person with a license to supply water (licensee) to make regulations for purposes of protecting against degradation of sources of water which he is authorised to take. Under the Act, the licensee could be a local authority, a private Trust or an individual and the law will apply accordingly under the supervision of the Regulatory Board.

Section 76 states that no person shall discharge any trade effluent from any trade premises into sewers of a licensee without the consent of the licensee upon application indicating the nature and composition of the effluent, maximum quantity anticipated, flow rate of the effluent and any other information deemed necessary. The consent shall be issued on conditions including the payment rates for the discharge as may be provided under section 77 of the same Act.
3.5.6 Water Quality Regulations, 2006 (Legal Notice 121)

The Water Quality Regulations (2006) are contained in the Kenya Gazette Supplement No 68, Legal Notice No 120. Of immediate relevance to the proposed facility for the purposes of this Scoping Report is Part II, Sections 4 - 5, as well as Part V Section 24.

Part II Section 4 states that “Every person shall refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution.”

Part V Section 24 states that “No person shall discharge or apply any poison, toxic, noxious or obstructing matter, radioactive wastes, or other pollutants or permit any person to dump or discharge any such matter into water meant for fisheries, wildlife, recreational purposes of any other uses.”


In addition to the Water Act 2002, the main document outlining the regulations is the Water Resource Management Rules 2007. The rules set out the procedures for obtaining water use permits and the conditions placed on permit holders. Sections 54 to 69 of the Water Resources Management Rules 2007 impose certain statutory requirements on dam owners and users in regard. These provisions address:

- Technical design report in respect of the water use permit;
- Operational information to be lodged with WRMA;
- Dam safety measures and requirements for inspections;
- Requirements for procedures to notify downstream communities in the event of unexpected releases.

Section 104 of the Water Resource Management Rules requires certain water permit holders to pay water use charges. The intention of the water use charges was to:

- Raise revenue for water resource management;
- Raise revenue for catchment conservation activities;
- Improve efficiency of water resource abstraction;
- Provide a system of data collection on water resource usage.

The rules also provide for catchment conservation activities which should involve the stakeholders in each catchment.

3.5.8 The Local Government Act (Cap 265)

Part XI section 168 provides that every municipal council, town council or urban council may establish and maintain sewerage and drainage works within or without its area of jurisdiction. For purposes of the land required for such development, section 144 states in part “A local authority may, subject to the approval of the Minister, apply to the government or any other authority having power to acquire land required for purposes of any of its functions, to be acquired compulsorily for and on behalf of, and at the expense of the local authority.” The Act, however, does not indicate the repercussions of impacts on landowners.

Section 160 helps local authorities ensure effective utilisation of the sewerage systems. It states in part that municipal authorities have powers to establish and maintain sanitary services for the removal and destruction of, or otherwise deal with all kinds of refuse and effluent and where such service is established, compel its use by persons to whom the service is available. However, to protect against illegal connections, section 173 states that any person who, without prior consent in writing from the council, erects a building on; excavate or opens-up; or injures or destroys a sewers, drains or pipes shall be guilty of an offence. Any demolitions and repairs thereof shall be carried out at the expense of the offender.
to prohibit all business, which may be or become a source of their noxious nature through smoke, fumes, dust, noise, or vibrations. Section 165 allows the local authority to refuse to grant or renew any license which is empowered in this act or any other written law on the grounds that the activity does not conform to the requirements of any by-laws in force in the area of such local authority the granting of the license would be contrary to the public interest.

Section 170, allows the right of access to private property at all times by local authorities, its officers and servants for purposes of inspection, maintenance and alteration or repairs. In addition, the municipal Council may establish and maintain sewage farms or disposal works, and dispose of the effluent therefrom, but shall not be liable for any nuisance or damage as a consequence of proper and ordinary conduct of the sewage farms or disposal works (section 171). To ensure sustainability in this regard, the local authority is empowered to make by-laws in respect of all such matters as are necessary or desirable for the maintenance of health, safety and wellbeing of the inhabitants of its area as provided for under section 201 of the Act.

The Act under section 176 gives power to the local authority to regulate sewerage and drainage, fix charges for use of sewers and drains and require connecting premises to meet the related costs. According to section 174, any charges so collected shall be deemed to be charges for sanitary services and will be recoverable from the premise owner connected to the facility. Section 264 also requires that all charges due for sewerage, sanitary and refuse removal shall be recovered jointly and severally from the owner and occupier of the premises in respect of which the services were rendered. This in part allows for application of the "polluter-pays-principle".

3.5.9 The Public Health Act (Cap, 242)

Part IX section 115 of the Act states that no person/institution shall cause a nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires Local Authorities to take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable for injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 and include nuisances caused by accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbour rats or other vermin.

3.5.10 Physical Planning Act (Cap 286)

Section 24 of the Physical Planning Act gives provision for the development of local physical development plan for guiding and coordinating development of infrastructure facilities and services within the area of authority of a county, municipal or town council and for specific control of the use and development of land.

Section 29 of physical Planning Act gives county councils power to prohibit and control the use of land, building, and subdivision of land, in the interest of proper and orderly development of its area. The same section also allows them to approve all development applications and grant development permissions as well as to ensure the proper execution and implications of approved physical development plans. On zoning, the act empowers them to formulate by-laws in respect of use and density of development.

Section 30 states that any person who carries out development within an area of a local authority without development permission shall be guilty of an offence and the development shall be invalid. The Act also gives the local authority power to compel the developer to restore the land on which such development has taken place to its original conditions within a period of ninety days. If no action is taken, then the council will restore the land and recover the cost incurred thereto from the developer. In addition, the same section also states that no person shall carry out development within the area of a local authority without development permission granted by the local authority. At the same time, sub-section 5, re-
Section 36 states that if in connection with development application a local authority is of the opinion that, the proposed activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an Environmental Impact Assessment report. The environmental impact assessment report must be approved by the National Environmental Management Authority (NEMA) and followed by annual environmental audits as spelled out by EMCA 1999.

Section 38 states that if the local authority finds out that the development activity is not complying to all laid down regulations, the local authority may serve an enforcement notice specifying the conditions of the development permissions alleged to have been contravened and compel the developer to restore the land to it's original conditions.

3.5.11 Land Planning Act, Cap 303
Section 9 of the subsidiary legislation (The development and use of land regulations 1961) requires that before the local authorities submit any plans to the Minister for approval, steps should be taken as may be necessary to acquaint the owners of any land affected by such plans. Particulars of comments and objections made by the landowners should also be submitted. This is intended to reduce conflict with other interests such as settlement and other social and economic activities.

3.5.12 The Penal Code (Cap 63)
Section 191 of the Penal Code states that any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence. Section 192 of the same Act says a person who makes or vitiates the atmosphere in any place to make it noxious to health of persons/institution in dwellings or business premises in the neighbourhood or those passing along public way, commit an offence.

3.5.13 Occupiers Liability Act (Cap. 34)
Section 3 requires that an occupier of premises owe the "common duty of care" to all visitors and workers. Rules of Common Law regulates the duty which an occupier of premises owes to his visitors in respect of danger and risk due to the state of the premises or to things omitted or attributes an affliction on his/her health to a toxic materials in the premises.

3.5.14 Waste Management Regulations, 2006 (Legal Notice 121)
The Waste Management Regulations (2006) are contained in the Kenya Gazette Supplement No 69, Legal Notice No 121. Of immediate relevance to proposed development for the purposes of this scoping report is Part II, Sections 4(1-2), 5 and 6.

Section 4 (1) states that "No person shall dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle"

Sections 4 (2) and 6 explain that the waste generator must collect, segregate (hazardous waste from non-hazardous) and dispose waste in such a facility that shall be provided by the relevant local authority.

Section 5 provides methods of cleaner production (so as to minimize waste generation) which includes the improvement of production processes through: conserving raw materials and energy.
Pollution Control Regulations, 2009

states that: no person shall make or cause 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 and section 3(2) states that in determining whether noise is loud, unreasonable, unnecessary or unusual, the following factors may be considered:

- Time of the day;
- Proximity to residential area;
- Whether the noise is recurrent, intermittent or constant;
- The level and intensity of the noise;
- Whether the noise has been enhanced in level or range by any type of electronic or mechanical means; and,
- Whether the noise can be controlled without much effort or expense to the person making the noise.

Part II Section 4 states that: except as otherwise provided in these Regulations, no person shall (a) make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or (b) cause to be made excessive vibrations which exceed 0.5 centimeters per second beyond any source property boundary or 30 metres from any moving source.

Part III, Section 11(1) states that any person wishing to (a) operate or repair any machinery, motor vehicle, construction equipment or other equipment, pump, fan, air-conditioning apparatus or similar mechanical device; or (b) engage in any commercial or industrial activity, which is likely to emit noise or excessive vibrations shall carry out the activity or activities within the relevant levels prescribed in the First Schedule to these Regulations. Any person who contravenes this Regulation commits an offence.

Section 13(1) states that except for the purposes specified in sub-Regulation (2) hereunder, no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations. These purposes include emergencies, those of a domestic nature and /or public utility construction.

Section 14 relates to noise, excessive vibrations from construction, demolition, mining or quarrying sites, and states that: where defined work of construction, demolition, mining or quarrying is to be carried out in an area, the Authority may impose requirements on how the work is to be carried out including but not limited to requirements regarding (a) machinery that may be used, and (b) the permitted levels of noise as stipulated in the Second and Third Schedules to these Regulations.

It further states that the relevant lead agency shall ensure that mines and quarries where explosives and machinery used are located in designated areas and not less than two kilometers away from human settlements and any person carrying out construction, demolition, mining or quarrying work shall ensure that the vibration levels do not exceed 0.5 centimeters per second beyond any source property boundary or 30 metres from any moving source.

3.5.16 The Land Acquisition Act (Cap 295) Laws of Kenya

The Act provides for the compulsory or otherwise acquisition of land from private ownership for the benefit of the general public. Section 3 states that when the Minister is satisfied on the need for acquisition, notice will be issued through the Kenya Gazette and copies delivered to all the persons affected. Full compensation for any damage resulting from the entry onto land to do things such as survey upon necessary authorisation will be undertaken in accordance with section 5 of the Act. Likewise where land is acquired compulsorily, full compensation shall be paid promptly to all persons affected in accordance to sections 8 and 10 along the following parameters:

- Area of land acquired,
• Damages sustained from the severance of the land parcel from the land,
• Damages to other property in the process of acquiring the said land parcel,
• Consequences of changing residence or place of business by the land owners,
• Damages from diminution of profits of the land acquired.

Part II of the Act allows for the temporary acquisition of the land for utilisation in promotion of the public good for periods not exceeding 5 years. At the expiry of the period, the Commissioner of Land shall vacate the land and undertake to restore the land to the conditions it was before. Any damages or reduction of value shall be compensated to the landowners. A resettlement action plan (RAP) has been prepared for this project in a separate volume.

3.5.17 The Traffic Act (Cap 403) Laws of Kenya
This Act consolidates the law relating to traffic on all public roads. The Act also prohibits encroachment on and damage to roads including land reserved for roads. The project is under the provision of the Act.

3.5.18 The Wayleaves Act (Cap 292) Laws of Kenya
Section 3 of the Act states that the government may carry any works through, over or under any land whatsoever provided it shall not interfere with any existing building or structures of an ongoing activity. Notice, however, will 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 this section. Finally section 8 states that any person 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 alteration will be done at his/her costs.

3.5.19 The Roads Act, 2007
This is an Act of Parliament to provide for the establishment of the Kenya National Highways Authority (KeNHA), the Kenya Urban Roads Authority (KURA) and the Kenya Rural Roads Authority (KeRRA), to provide for the powers and functions of the authorities and for connected purposes.

3.5.20 Fossil Fuel Emission Control Regulation, 2006
Section 4. (Sub-section 1), states that any person who operates or owns an internal combustion engine (in this case vehicles) and permits it to be operated upon any road, street, public highway or any premises, which emits smoke or other air contaminants in excess of emission standards set out in the First Schedule commits an offence. The vehicles employed by the proponent for the purposes of implementing this project should be regularly serviced and inspected for faults so as not to contravene this Act.

3.5.21 Wildlife Conservation and Management Act, Cap. 376
This is an Act of Parliament that is meant to consolidate and amend the laws relating to the protection, conservation and management of wildlife in Kenya.

3.5.22 Conservation of Biological Diversity Regulations, 2006
Part II of this regulation states that a person may not engage in any activity that may have an adverse impact in the environment without conducting an Environmental Impact Assessment.
3.6 SECTORAL INTEGRATION
This integration encourages provision of sustainable development and a healthy environment to all Kenyans. The key functions of NEMA through the NEC include policy direction, setting national goals and objectives and determining policies and priorities for the protection of the environment, promotion of cooperation among public departments, local authorities, private sector, non-governmental organizations and such other organizations engaged in environmental protection programmes and performing such other functions as contained in the Act.

3.7 THE MINISTRY OF ROADS
The Ministry of Roads is charged with the responsibility of providing basic infrastructure facilities to the public. These include development, maintenance and rehabilitation of road networks in the country.

The Specific responsibilities are:-
- National Roads Development Policy;
- Development, standardization and maintenance of roads;
- Materials testing and advise on usage;
- Co-ordination of the activities undertaken by the Parastatals / Authorities namely:-
  - Kenya Roads Board;
  - Kenya National Highways Authority;
  - Kenya Urban Roads Authority; and
  - Kenya Rural Roads Authority.
- Research and Training on Highways construction and Building technology;
- Standardization of Vehicles, Plant and Equipment;
- Vehicles, Plant and Equipment Inventory;
- Registration of Engineers;
- Registration of Road Contractors; and
- Maintenance of Security Roads.

3.8 THE KENYA NATIONAL HIGHWAYS AUTHORITY (KENHA)
The Kenya National Highways Authority (the Proponent) is a State Corporation under the Ministry of Roads established by the Kenya Roads Act, 2007 and is responsible for the management, development, rehabilitation and maintenance of international trunk roads linking centres of international importance and crossing international boundaries or terminating at international ports (Class A road), national trunk roads linking internationally important centres (Class B roads), and primarily roads linking provincially important centres to each other or two higher-class roads (Class C roads).

3.9 INTERNATIONAL CONVENTIONS AND TREATIES
Kenya has ratified numerous International Treaties and Conventions. Relevant international treaties and guidelines for the proposed road construction project include:
- Vienna Convention on Road Traffic;
- Convention on Biological Diversity (CBD);
- Convention on the Conservation of Migratory Species of Wildlife Animals;
- The African Convention on the Conservation of Nature and Natural Resources;
- Montreal Protocol on Substances that Deplete the Ozone Layer;
- Vienna Convention for the Protection of the Ozone Layer; and
- Kyoto Protocol in pursuant to the objectives of the United Nations Framework Convention on Climate Change.

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

### 3.10.1 Safeguard Policies Triggered by the Proposed Road Project

**OP/BP 4.01 - Environmental Assessment**

The World Bank's environmental assessment policy and recommended processing are described in Operational Policy (OP)/Bank Procedure (BP) 4.01: Environmental Assessment. Its purpose is to improve decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted.

Environmental Assessment is one of the 10 environmental, social, and legal Safeguard Policies of the World Bank. Environmental Assessment is used in the World Bank to identify, avoid, and mitigate the potential negative environmental impacts associated with Bank lending operations. This policy is considered to be the umbrella policy for the Bank's environmental 'safeguard policies'.

#### Table 3: OP/BP 4.01 Environmental Assessment (January 1999)

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Operational Principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>To help ensure the environmental and social soundness and sustainability of investment projects.</td>
<td>1. Use a screening process for each proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment (EA) so that appropriate studies are undertaken proportional to potential risks and to direct, and, as relevant, indirect, cumulative, and associated impacts. Use sectoral or regional environmental assessment when appropriate.</td>
</tr>
<tr>
<td>To support integration of environmental and social aspects of projects into the decision making process.</td>
<td>2. Assess potential impacts of the proposed project on physical, biological, socio-economic and physical cultural resources, including transboundary and global concerns, and potential impacts on human health and safety.</td>
</tr>
<tr>
<td></td>
<td>3. Assess the adequacy of the applicable legal and institutional framework, including applicable international environmental agreements, and confirm that they provide that the cooperating government does not finance project activities that would contravene such international obligations.</td>
</tr>
<tr>
<td></td>
<td>4. Provide for assessment of feasible investment, technical, and siting alternatives, including the &quot;no action&quot; alternative, potential impacts, feasibility of mitigating these impacts, their capital and recurrent costs, their suitability under local conditions, and their institutional, training and monitoring requirements associated with them.</td>
</tr>
<tr>
<td></td>
<td>5. Where applicable to the type of project being supported, normally apply the Pollution Prevention and Abatement Handbook (PPAH). Justify deviations when alternatives to measures set forth in the PPAH are selected.</td>
</tr>
<tr>
<td></td>
<td>6. Prevent and, where not possible to prevent, at least minimize, or compensate for adverse project impacts and enhance positive impacts through environmental management and planning that includes the proposed mitigation measures, monitoring, institutional capacity development and training measures, an implementation schedule, and cost estimates.</td>
</tr>
</tbody>
</table>
The proposed project triggers this policy because although there is justification of the proposed road improvement (as well as its associated infrastructure), there are environmental and social issues associated with the construction and operation of the proposed project as discussed in chapter 5 of this report. OP 4.01 requires an environmental assessment (EA) of projects proposed for WB financing to ensure that they are environmentally sound and sustainable, and thus to improve decision making. In this regard, a comprehensive environmental and social impact assessment study with an exhaustive public participation process is being undertaken by the Proponent to establish a detailed environmental management plan that will provide a guideline for the entire project cycle (construction through to decommissioning).

**OP 4.12 - Involuntary Resettlement**

This policy is triggered in situations involving involuntary taking of land and involuntary restrictions of access to legally designated parks and protected areas. The policy aims to avoid involuntary resettlement to the extent feasible, or to minimize and mitigate its adverse social and economic impacts. It promotes participation of displaced people in resettlement planning and implementation, and its key economic objective is to assist displaced persons in their efforts to improve or at least restore their incomes and standards of living after displacement. The policy prescribes compensation and other resettlement measures to achieve its objectives and requires that borrowers prepare adequate resettlement planning instruments prior to Bank appraisal of proposed projects. A RAP study was carried out for this project and the report is in a separate volume.

**Table 4: OP/BP 4.12 Involuntary Resettlement (December 2001)**

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Operational Principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>To avoid or minimize involuntary resettlement and, where this is not feasible, to assist displaced persons in improving or at least restoring their livelihoods and standards of living in real terms relative to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.</td>
<td>1. Assess all viable alternative project designs to avoid, where feasible, or minimize involuntary resettlement.</td>
</tr>
<tr>
<td></td>
<td>2. Through census and socio-economic surveys of the affected population, identify, assess, and address the potential economic and social impacts of the project that are caused by involuntary taking of land (e.g., relocation or loss of shelter, loss of assets or access to assets, loss of income sources or means of livelihood, whether or not the affected person must move to another location) or involuntary restriction of access to legally designated parks and protected areas.</td>
</tr>
<tr>
<td></td>
<td>3. Identify and address impacts also if they result from other activities that are (a) directly and significantly related to the proposed project, (b)</td>
</tr>
</tbody>
</table>
Objectives

Operational Principles

5. Inform displaced persons of their rights, consult them on options, and provide them with technically and economically feasible resettlement alternatives and needed assistance, including (a) prompt compensation at full replacement cost for loss of assets attributable to the project; (b) if there is relocation, assistance during relocation, and residential housing, or housing sites, or agricultural sites of equivalent productive potential, as required; (c) transitional support and development assistance, such as land preparation, credit facilities, training or job opportunities as required, in addition to compensation measures; (d) cash compensation for land when the impact of land acquisition on livelihoods is minor; and (e) provision of civic infrastructure and community services as required.

6. Give preference to land-based resettlement strategies for displaced persons whose livelihoods are land-based.

7. For those without formal legal rights to lands or claims to such land that could be recognized under the laws of the country, provide resettlement assistance in lieu of compensation for land to help improve or at least restore their livelihoods.

8. Disclose draft resettlement plans, including documentation of the consultation process, in a timely manner, before appraisal formally begins, in an accessible place and in a form and language that are understandable to key stakeholders.

9. Apply the principles described in the involuntary resettlement section of this Table, as applicable and relevant, to subprojects requiring land acquisition.

10. Design, document, and disclose before appraisal of projects involving involuntary restriction of access to legally designated parks and protected areas, a participatory process for: (a) preparing and implementing project components; (b) establishing eligibility criteria; (c) agreeing on mitigation measures that help improve or restore livelihoods in a manner that maintains the sustainability of the park or protected area; (d) resolving conflicts; and (e) monitoring implementation.

11. Implement all relevant resettlement plans before project completion and provide resettlement entitlements before displacement or restriction of access. For projects involving restrictions of access, impose the restrictions in accordance with the timetable in the plan of actions.

12. Assess whether the objectives of the resettlement instrument have been achieved, upon completion of the project, taking account of the baseline
The project triggers this policy in that it shall require [involuntary] acquisition of land and restrictions of access to legally protected areas within the road corridor.

**OP 4.11 – Physical Cultural Resources**

The policy will be triggered, given the fact that construction is in proximity to the museum (PC’s House) and the Nairobi Hebrew Congregation synagogue.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Operational Principles</th>
</tr>
</thead>
</table>
| Avoid or mitigate adverse impacts of development projects on physical cultural resources. The impacts on physical cultural resources resulting from project activities, including mitigating measures, may not contravene either the borrower’s national legislation, or its obligations under relevant international environmental treaties and agreements. | • Assess the project’s potential impacts on physical cultural resources as an integral component of the Environmental Assessment (EA). The process steps for the physical cultural resources component of the EA are the same for Category A and B projects.  
• Include the physical cultural resources into the EA provides for (i) an assessment of physical cultural resources likely to be affected by the project; (ii) documentation of the characteristics and significance of the these resources; and, (ii) an assessment of the nature and extent of potential direct and indirect impacts on these resources.  
• Where the EA predicts adverse impacts on physical cultural resources, the cultural resources component of the EA includes a physical cultural resources management plan that includes: (i) actions to mitigate adverse impacts; (ii) provisions for the treatment of physical cultural resources discovered during project implementation and operation (hereafter referred to as ‘chance finds’); (iii) any necessary measures for strengthening institutional capacity to implement the management plan; and, (iv) a monitoring system to track progress of these activities. The management plan is consistent with the country’s overall policy framework and national legislation and take into account institutional capabilities with regard to physical cultural resources. |

(Please refer to Appendix IX for more information on a summary of the World Bank Safeguard Policies)
4.1 PROJECT SETTING

See the Appendix I for Earth Satellite Map showing project area.

4.2 SUMMARY DESCRIPTION OF BIOPHYSICAL ENVIRONMENT

4.2.1 Climate
The climate of the Nairobi is predominantly controlled by its equatorial position, the continent’s large scale pressure systems and the Indian Ocean. Topography, however, strongly influences the magnitude of the climatic elements and to a lesser extent their seasonal distribution. The seasonal distribution of rainfall is dominated by the movement of the Inter Tropical Convergence Zone (ITCZ) which separates the North eastern and south eastern trade wind systems and the belt of maximum rainfall follows the position of the overhead sun with a time lag of about 4 to 6 weeks. The two rainy seasons are therefore centered on April-May (Long Rains) and October-November (Short Rains). The highest annual rainfall totals of over 2,600 mm.

Table 5: General overview of the Nairobi Weather

<table>
<thead>
<tr>
<th>Month</th>
<th>Temperature</th>
<th>Relative Humidity</th>
<th>Monthly Mean Rainfall (mm)</th>
<th>Nos. of Raindays (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily Maximum (Degree)</td>
<td>Daily Minimum (Degree)</td>
<td>Daily Maximum (%)</td>
<td>Daily Minimum (%)</td>
</tr>
<tr>
<td>Jan</td>
<td>26.2</td>
<td>12.9</td>
<td>73</td>
<td>40</td>
</tr>
<tr>
<td>Feb</td>
<td>27.1</td>
<td>13.3</td>
<td>72</td>
<td>39</td>
</tr>
<tr>
<td>Mar</td>
<td>27.1</td>
<td>14.4</td>
<td>79</td>
<td>41</td>
</tr>
<tr>
<td>Apr</td>
<td>25.4</td>
<td>13.0</td>
<td>86</td>
<td>53</td>
</tr>
<tr>
<td>May</td>
<td>23.8</td>
<td>14.0</td>
<td>86</td>
<td>58</td>
</tr>
<tr>
<td>Jun</td>
<td>22.6</td>
<td>12.0</td>
<td>85</td>
<td>56</td>
</tr>
<tr>
<td>Jul</td>
<td>22.0</td>
<td>11.3</td>
<td>84</td>
<td>54</td>
</tr>
<tr>
<td>Aug</td>
<td>22.7</td>
<td>11.3</td>
<td>84</td>
<td>51</td>
</tr>
<tr>
<td>Sep</td>
<td>25.2</td>
<td>11.8</td>
<td>80</td>
<td>41</td>
</tr>
<tr>
<td>Oct</td>
<td>26.2</td>
<td>13.6</td>
<td>77</td>
<td>40</td>
</tr>
<tr>
<td>Nov</td>
<td>24.5</td>
<td>14.3</td>
<td>83</td>
<td>53</td>
</tr>
<tr>
<td>Dec</td>
<td>24.8</td>
<td>13.8</td>
<td>78</td>
<td>46</td>
</tr>
<tr>
<td>Total</td>
<td>257.8</td>
<td>157.7</td>
<td>967</td>
<td>472</td>
</tr>
<tr>
<td>Max.</td>
<td>27.1</td>
<td>115.0</td>
<td>86</td>
<td>58</td>
</tr>
<tr>
<td>Min.</td>
<td>22.0</td>
<td>11.3</td>
<td>72</td>
<td>36</td>
</tr>
<tr>
<td>Ave.</td>
<td>24.8</td>
<td>13.1</td>
<td>80</td>
<td>47</td>
</tr>
</tbody>
</table>

Source: Station No.: 9136130; Station Name: Nairobi Wilson Airport Met. Station Location: Latitude 1 19 S; Longitude: 36 49 E; Altitude: 1683 m
Typically the annual average diurnal range at elevations of 1,500 metres is 13°C to 25°C whilst at lower elevations to 80% or more above 2,500 metres. Humidity is greatest at dawn and lowest in the early afternoon when the temperature reaches the diurnal maximum.

Impact on Project

The climate in the project areas as described above is not expected to create adverse impacts during the construction phase, or on the performance of the project upon commissioning. Construction should however be limited to when the weather is drier to ensure the project is not delayed during the wet seasons.

4.2.2 Latitude, Longitude, and Elevation

Nairobi, Kenya is located at -1.28333 latitude, 36.8167 longitude and at an elevation/altitude of meters. The average elevation of Nairobi, Kenya is 1724 meters.

4.2.3 Soils and Geology

The proposed project area is overlain with an ancient core of crystalline rocks of the basement complex which underlies the greater part of the plateau areas of Africa. These have been affected by the extensive faulting, displacement and volcanic activity associated with the Rift Valley System. The eroded surface of the pre-Cambrian basement rocks outcrops only on the southern and eastern margins of the area.

Elsewhere it is overlain by a variable thickness of volcanic and pyroclastic rocks of Tertiary age. The Tertiary succession comprises various lava flows, pyroclastic rocks or their weathered derivatives, and also paleosols, developed intervening periods sub-aerial weathering. Uplifting and concentration of volcanic activity at the margins of Rift Valley has resulted in a general alignment of lava flows and associated surface deposits in a south easterly direction. The character of the volcanic events both in space and time has dictated the lateral and vertical variability.

4.2.4 Air Quality

Baseline air quality was carried out at six locations along the project road. The assessment of air quality on the section between Jomo Kenyatta International Airport and Zambezi was carried out 10th April 2012.

The assessment was carried out at the following sites, please refer to the project map for location reference:
- JKIA I - JKIA intersection joining Mombasa Road
- JKIA II - Main highway into Nairobi 100m from Embakasi Flyover
- Nyayo I - Nyayo Stadium / Lusaka Rd Roundabout
- Nyayo II - Nyayo Stadium / Bunyala Rd roundabout
- Zambezi I - Opposite Wida Hotel
- Zambezi II - At end of the flyover

The aim of the assessment was to assess the quality of air along the road with respect to nitrous oxides (NOx), sulphur oxides (SOx), hydrocarbons (HC), carbon monoxide (CO), carbon dioxide (CO2), hydrogen sulphide (H2S) gases and particulate matter. Please refer to Appendix X for the complete report. The table in the next page shows the results;
Table 6: Air Quality Results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>Tolerant Values (mg/Nm³)</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen Sulphide (H₂S), mg/m³</td>
<td>642 1012 1380 1451 440 712</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Sulphur dioxide (SO₂), mg/m³</td>
<td>147 211 352 405 89 107</td>
<td>125</td>
<td>WHO standard 20-125 daily) 500 (10 min.)</td>
</tr>
<tr>
<td>Sulphur Trioxide (SO₃), mg/Nm³</td>
<td>&lt; 0.01 &lt; 0.01 &lt; 0.01 &lt; 0.01 &lt; 0.01</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Nitrogen dioxide (NO₂), μg/Nm³</td>
<td>102 111 174 207 69 83</td>
<td>200</td>
<td>Yearly 40 (guideline) Hourly 200 (guideline)</td>
</tr>
<tr>
<td>Nitrogen Trioxide (NO₃), mg/m³</td>
<td>&lt; 0.01 &lt; 0.01 &lt; 0.01 &lt; 0.01 &lt; 0.01</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Hydrocarbons (HCs), mg/m³</td>
<td>3600 5208 7714 8206 530 616</td>
<td>500</td>
<td>kenya police department traffic act</td>
</tr>
<tr>
<td>Particulate Matter mg/m³</td>
<td>17.7 19.7 28.3 31.6 11.3 12.5</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>
4.2.5 Biodiversity
The project area is mainly built up therefore there will minimal or negative animal species that will be displaced; however there is evidence of small mammals around the JKIA area.

4.2.6 Vegetation
The area has been divided into several sections
- JIKA to Nyayo Stadium
  The Stretch between JKIA and the Nyayo Stadium is about 12 kms long. The Flora in the area is mainly open grassland with scattered Acacia drepanolobium trees. There are small areas with some wetland vegetation. The area is progressively built up as one heads towards Nyayo Stadium from JKIA. It was noted that there was an open sewage channel approximately 11kms from the JKIA roundabout.

- Nyayo Stadium to Museum Hill
  This stretch is about 4 kms long and is built up area. Around the Nyayo stadium are many Acacia xanthophlea that are the roosting places of the Marabou Storks Leptoptilus crumenifrus. There are planted exotic plants such as the palms and Ficus sp along the road especially in the Central Business District area.
Figure 2: Acacia xanthophlea at the Nyayo Stadium
The figure above shows the Acacia xanthophlea that is an important roosting place for the marabou storks found around Nyayo Stadium. There will be need to plant other trees if these will be cut down in order to put another road on top of the current one.

- Museum Hill to Uthiru to Rironi

At the Museum hill interchange adjacent to the University of Nairobi is the tributary of Nairobi river and the riverside bridge which are located approximately 16.8km from the JKIA roundabout. The land starts to rise gently and along the road the area is built up. The tree species are mainly the Ficus as well as the Croton species. Some areas have Grevillea robusta planted along the road.

Figure 3: Project area at Westlands
The photo above shows the project area at Westlands. This is an urban area with more space and several trees have been planted. Kangemi area (24km) is past the westland roundabout. There is a constructed dam next to the Kenya Sugar Authority headquarters and the Waterfront Gardens Estate. From Uthiru the area is less built up and has more open grass lands with soft kikuyu grass.
Remnants of a wetland that was drained and is known as lake view. This is approximately 500 meters from the project site.

Figure 4: Grevilliea bushes around the Kangemi Area
The photo above shows the Grevillia bushes along the Kangemi area.

Figure 5: Ecologically Sensitive Areas source Google maps.
The Figure above shows the ecologically sensitive areas along the project site. These are
1. The Wetland at lakeview Zambezi
2. The Nairobi River flowing underneath the Museum Hill interchange.
3. Nairobi River tributary that is located close to the Nyayo stadium and within south C
4.3 DESCRIPTION OF SOCIO-CULTURAL/ECONOMIC ENVIRONMENT

4.3.1 Background

The name Nairobi is derived from the Maasai phrase Ṣenkare Nairobi which means Ṣen place of cold waters. Originally, this place was for wildlife and livestock grazing and watering, with no human settlements at all. However, when the construction of the Kenya-Uganda Railway from Mombasa reached Nairobi in June 1899, it became a settled area and, by July of the same year, it had become the headquarters of the Kenya-Uganda Railway (Mitullah, 2003). By 1900, Nairobi had become a large and flourishing place with settlements consisting of railway buildings and separate areas for Europeans and Indians. While the former comprised of colonialists and employees of British Africa Company that was responsible for building the railway, the latter comprised of labours that had been brought from India to build the railway. Nairobi, as an urban centre was officially defined in 1900 under the Nairobi Municipal Community Regulations and it became the capital of Kenya in 1907 (CCN, 2006).

4.3.2 Location

Nairobi is located in the south-eastern part of the country at 1° 9’S and 36° 4’E, 37° 10’E and at an altitude varying between 1,600 and 1,850 metres above sea level. It occupies an area of about 696 km² (CBS, 2001).

4.3.3 The People

Nairobi is a culturally diverse city. All the major Kenyan ethnic groups are represented in the city. These include the Kikuyu, Luo, Luoia, Kalenjin, Kisii, and Kamba. While it is difficult to know the exact percentage of the ethnic makeup of Nairobi, there are probably more Kikuyu living in the city than any other group. This is because the Kikuyu make up around 20 percent of the Kenyan population, and their home area borders Nairobi. In addition to the Kenyan African ethnic groups, there is a sizeable population of Asians (people who trace their origins to India and Pakistan), Europeans, and Somalis. Nairobi is also home to a sizeable expatriate (people who have left their homeland) community as numerous embassies and international organizations have offices in the city.

4.3.4 Stakeholders in the Project Area

The stakeholders identified within the project area ranged from businessmen, drivers, farmers, bankers, among others. Motorists frequenting this road will be most affected by the proposed road. School going children will also be affected. As per census conducted by the RAP team in the project area and with a cut-off date of March 2, 2012. There are 344 Vendors in the project area and the total number of PAPs is 1,322. Below is a table of summary of location, structures and PAPs affected by the project as presented in the RAP report.
Table 7: Summary of location, structures, and PAPs affected by the project

<table>
<thead>
<tr>
<th>Division</th>
<th>PAPs</th>
<th>Total PAPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makerere</td>
<td>46</td>
<td>76</td>
</tr>
<tr>
<td>Kangemi Bridge</td>
<td>330</td>
<td>816</td>
</tr>
<tr>
<td>Uthiru Junction (Uthiru-Nakasha Road Junction)</td>
<td>22</td>
<td>43</td>
</tr>
<tr>
<td>Uthiru Corporation near Footbridge</td>
<td>41</td>
<td>96</td>
</tr>
<tr>
<td>87 Junction</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Stage 57</td>
<td>14</td>
<td>29</td>
</tr>
<tr>
<td>Kinoo</td>
<td>93</td>
<td>189</td>
</tr>
<tr>
<td>Gitaru</td>
<td>16</td>
<td>30</td>
</tr>
<tr>
<td>Airport South Road at junction with North Airport Road</td>
<td>13</td>
<td>31</td>
</tr>
<tr>
<td>Nyayo Stadium</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 8: Divisions and subdivisions of Nairobi

<table>
<thead>
<tr>
<th>Division</th>
<th>Subdivisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>Huruma, Kariokor, Mathare, Ngara, Starehe, Dagoretti Kawangware, Kenyatta Golf Club, Mutuini, Riruta, Uthiru/Ruthmitu and Waitaha</td>
</tr>
</tbody>
</table>
4.3.6 Population

Nairobi is currently home to more than three million people and represents about a quarter of Kenya’s urban population. A growing economy and population numbers from both in-migration and natural growth are continually increasing the city’s size. A significant number of commuters from satellite towns such as Thika, Naivasha, Ngong, and Machakos come into Nairobi daily to work or bring goods and supplies. Daily commuters from such satellite towns contribute an approximated additional half-million people to the city’s population.

Nairobi’s large and growing population is one of the main forces driving the city’s overwhelming environmental challenges. Ongoing rural to urban migration, high natural birth rates, and poor or inappropriate city planning continue to degrade the city’s water and air quality. In turn, environmental degradation has impacts on human health and the economy.

Table 9: Population Trends (1906-2005)

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
<th>Percentage Increase</th>
<th>Area (Km²)</th>
<th>Density (persons per km²)</th>
<th>Kenya Population</th>
<th>Nairobi as % of Kenya Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1906</td>
<td>11,512</td>
<td>-</td>
<td>18.13</td>
<td>635</td>
<td>n.a</td>
<td>-</td>
</tr>
<tr>
<td>1928</td>
<td>29,864</td>
<td>159.4</td>
<td>25.37</td>
<td>1,177</td>
<td>n.a</td>
<td>-</td>
</tr>
<tr>
<td>1931</td>
<td>47,919</td>
<td>60.5</td>
<td>25.37</td>
<td>1,889</td>
<td>3,073,947</td>
<td>1.6</td>
</tr>
<tr>
<td>1936</td>
<td>49,600</td>
<td>3.5</td>
<td>25.37</td>
<td>1,955</td>
<td>n.a</td>
<td>-</td>
</tr>
<tr>
<td>1944</td>
<td>108,900</td>
<td>119.6</td>
<td>25.37</td>
<td>4,292</td>
<td>n.a</td>
<td>-</td>
</tr>
<tr>
<td>1962</td>
<td>343,500</td>
<td>124.2</td>
<td>684</td>
<td>390</td>
<td>8,636,263</td>
<td>3.1</td>
</tr>
<tr>
<td>1969</td>
<td>509,286</td>
<td>90.9</td>
<td>684</td>
<td>745</td>
<td>10,942,705</td>
<td>4.7</td>
</tr>
<tr>
<td>1979</td>
<td>827,775</td>
<td>62.5</td>
<td>684</td>
<td>1,210</td>
<td>15,327,000</td>
<td>5.4</td>
</tr>
<tr>
<td>1989</td>
<td>1,324,570</td>
<td>60.0</td>
<td>684</td>
<td>1,937</td>
<td>21,445,000</td>
<td>6.2</td>
</tr>
<tr>
<td>1999</td>
<td>2,143,254</td>
<td>61.8</td>
<td>696</td>
<td>3,079</td>
<td>28,686,607</td>
<td>7.5</td>
</tr>
<tr>
<td>2000</td>
<td>2,290,049</td>
<td>6.8</td>
<td>696</td>
<td>3,290</td>
<td>30,208,365</td>
<td>7.6</td>
</tr>
<tr>
<td>2001</td>
<td>2,379,741</td>
<td>3.9</td>
<td>696</td>
<td>3,419</td>
<td>30,864,544</td>
<td>7.7</td>
</tr>
<tr>
<td>2002</td>
<td>2,470,850</td>
<td>3.8</td>
<td>696</td>
<td>3,550</td>
<td>31,517,142</td>
<td>7.8</td>
</tr>
<tr>
<td>2003</td>
<td>2,563,297</td>
<td>3.7</td>
<td>696</td>
<td>3,683</td>
<td>32,165,328</td>
<td>8.0</td>
</tr>
<tr>
<td>2004</td>
<td>2,656,997</td>
<td>3.7</td>
<td>696</td>
<td>3,818</td>
<td>32,808,269</td>
<td>8.1</td>
</tr>
<tr>
<td>2005</td>
<td>2,751,860</td>
<td>3.6</td>
<td>696</td>
<td>3,954</td>
<td>33,445,119</td>
<td>8.2</td>
</tr>
</tbody>
</table>

Source: CCN, 2006

In 2009, the population was estimated at 3, 138,369. The growth rate of Nairobi is currently 4.1%. It is estimated that Nairobi’s population will reach 4 million in 2015 and 5 million in 2025.
4.3.7 Population Distribution

The city’s overall population density was 3,079 per square kilometer (CBS, 2001). It however, varies significantly across administrative divisions. For instance Central Division is the most densely populated division of Nairobi with 22,164 persons per square km while Kibera is the least densely populated with 1,284 persons per square kilometer (CBS, 2001). There are variations even within these divisions, with slum areas, such as Kibera slum, having extremely high population densities.

4.3.8 Settlement Patterns and Housing

Nairobi is generally a densely populated town with a majority of the residents living within the Nairobi Central Business District or its environs. The slum areas are however heavily congested, increasing pressure on the available resources such as land, water and energy. A majority of the structures are made of Stone and concrete while in the slums, and shanties, one can find housing structures made of iron sheets and wood.

Most of the Nairobi residents are tenants as opposed to home owners. This is mainly attributed to the lack of land to set up these houses and the high cost of living.

4.3.9 Cultural Properties

Nairobi is a cosmopolitan and multicultural city. Since its foundation, Nairobi has maintained a strong British presence, and a lasting legacy from colonial rule. This is highlighted by the number of English-named suburbs, including Hurlingham, Lavington, Karen and Parklands.

By the mid twentieth century, many foreigners settled in Nairobi from other British colonies, primarily India and parts of, what is now, Pakistan. These immigrants were workers who arrived to construct the Kenya-Uganda Railway, settling in Nairobi after its completion, and merchants from Gujarat. Nairobi also has established communities from Somalia and Sudan.

Nairobi has a diverse and multicultural composition; there are a number of churches, mosques, temples and gurdwaras within the city. Prominent places of worship in Nairobi include the Cathedral Basilica of the Holy Family, All Saints Cathedral, Ismaili Jamat Khana and Jamia Mosque.

Nairobi has two informal nicknames. The first is "The Green City in the Sun", which is derived from the city's foliage and warm climate. The second is the "Safari Capital of the World", which is used due to Nairobi's prominence as a hub for safari tourism.

With reference to World Bank OP 4.11, this refers to physical cultural resources, which are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below ground, or under water. Their cultural interest may be at the local, provincial or national level, or within the international community. Physical cultural resources are important as sources of valuable scientific and historical information, as assets for economic and social development, and as integral parts of a people’s cultural identity and practices. Located very close to the project in the heart of Nairobi City next to Nyayo House is the Nairobi Gallery. Buit in 1913, this Old PC's office building was fondly referred to by the settler community as 'Hatches, Matches and Dispatches' name because of the births, marriages and deaths that were recorded here. This museum holds temporary exhibitions that continuously rotate to give it spice and life. The project will not affect this museum. This was clarified in the stakeholder consultation forum held at KICC. Please refer to stakeholder's comments and response in the annexes.
4.3.11 Land Ownership and Use
Commercial buildings cover almost 80% of the Nairobi Metropolitan area. Small scale farming can however be found within individual homes. Land is bought and a title deed is issued to the land owner. The land owner constructs these structures mainly for lease to individuals or businesses. A Resettlement action plan was carried out as a separate study for this project and is presented in a separate volume.

4.3.12 Education
Illiteracy within the project area is relatively low. A majority of residents and visitors are literate having acquired at least primary education. With the growth of population however, demand for these educational facilities grows. This has led to the emergence of cheaper private schools even within the slums. Some of these schools are however operating illegally without the relevant syllabus taught.

4.3.13 Insecurity and Conflict
Crime levels in Nairobi have since time immemorial been on the rise with crimes ranging from petty thievery to murder, to rape, to assault, to robbery with violence. Currently these crimes are still on the rise as population. Illicit drugs and lack of income are attributed to the rise of these crimes.

4.3.14 Tourism, Forests and Wildlife
National Museums of Kenya and Nairobi National Park are some of the Worlds renowned tourist attractions in Kenya, both of which are based in Kenya. National museums of Kenya is responsible for identifying and documenting all species, monuments and artefacts found in Kenya. They display some of these artefacts and monuments for local and foreign tourists. Some of these are displayed in public open grounds such as the Uhuru Garden, while others are displayed within closed doors, such as the National Archives and within the NMK office.

The Nairobi National Park, on the other hand gives tourists the opportunity of viewing both plant and animal species in their natural habitats. Another tourist attraction within Nairobi city is the Nairobi Arboretum, which displays different kinds of plant species available in Kenya.

4.3.15 The Transport Sector
The Kenyan transport system is made up of five transportation mode: roads, rail, air, maritime transport and pipeline. In the recent past, the sectors contribution to GDP at constant factor cost has been, on the average, 11% per year, and has been growing at an average rate of 14.7% annually.

4.3.16 Road Transport
The Kenyan road network consists of 114,500 km2 of unclassified roads. About 14% of the classified road network (ie 9,100km) is paved, the rest being of gravel or earth surface. Road transport is the predominant mode of transport in Kenya, accounting for about 85% of the total domestic transportation.
Roads constitute a major transportation link in Kenya, moving large numbers of passengers and high volumes of domestic freight throughout the country. To satisfy road demand, a substantial portion of Kenya’s annual budget is expended on building, expanding and maintaining roads that have underpinned economic development.

But in the past, environmental and socio-economic costs that accompany these transportation advances have been fully addressed in a manner that ensures sustainable development. As a consequence, these costs have accumulated to improvish the environment upon which we all depend. Making certain that environmental costs do not outweigh economic benefits enjoyed from improved road transportation is a challenge Kenya faces today. By anticipating and reducing or even avoiding negative socio-economic impacts to the environment brought about by building and maintaining road infrastructure, Kenya meets the challenge by containing and reversing harmful costs to socio-economic and cultural environments.

4.3.17 Urbanization and Motorization

Urban centres in Kenya have experienced rapid population growth with statistics indicating that urban population had increased from 8.166 million in 1995 to 14.263 million in 2006 resulting in about 42% of the population living in urban centres. The urbanization trend coupled with explosive growth in motorization and a disorganized public transport system has resulted in chronic traffic congestion particularly in Nairobi and Mombasa due to heavy flows during peak hours and competition and conflict for limited road space by road users.

4.3.18 Road Traffic Congestion in Nairobi Metropolitan Area

Daily traffic volumes along most of major arterial roads in and out of the city have exceeded their design capacity necessitating major improvements. The Nairobi Metropolitan Area Urban Transport Master Plan Study financed by JICA in 2006, highlighted the urgent need to increase the urban transport supply through construction of missing links, improvement of major urban corridors, and a gradual shift to mass transit systems such as Bus Rapid Transit and Light Rail Transit in order to address the current crisis and cope with future developments.

4.3.19 Public Transportation System

Public transportation in Nairobi Metropolitan Area is dominated by conventional bus service and mini bus services (Matatus) with commuter rail playing a very limited role. More than 80% of public transport consists of small matatus, which is not an efficient use of limited urban infrastructure and causes traffic congestion and traffic accidents. There is an urgent need to improve the public transportation system in Nairobi by introducing other modes of public transport with high carrying capacity such as LRT and BRT. This action should be complemented by strengthening mode interchange, and introducing shuttle buses in the CBD. In addition strong consideration should be given for improving the institutional and regulatory framework for management and operation of public transport system.

4.3.20 HIV/AIDS

According to UNAIDS, the infection rate of HIV/AIDS in Nairobi has reduced from 10% annually to 7% annually. Those orphaned by HIV/AIDS increased from 9% to 11%. HIV/AIDS awareness however increased since currently four out of five persons is aware of the ways in which HIV/AIDS infection can be transmitted.
5.0 POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION MEASURES

5.1 INTRODUCTION

This chapter focuses on the impacts likely to occur as a result of the proposed construction works on the proposed road. For ease of reference, the impacts due to or affecting certain elements during construction and operation are presented in matrix form in the Environmental and Social Management and Monitoring Plan (See Section 8.0).

5.1.1 Potential Positive Impacts

Some of the identified positive impacts include:

- Ease traffic along the Mombasa Road.
  Mombasa Road is currently considered one of the busiest roads in Kenya. It connects not only the different parts of Nairobi (the eastern and Western Sections) but it also connects the coastal and southern parts of Kenya to the Western and Northern Parts of Kenya. Light commercial vehicles and heavy commercial vehicles use this road in transportation of both goods and persons. Widening this road will ease the traffic congestion, reducing the amount of time road users are on this road.

- Improve tourism
  Nairobi being the Capital city of Kenya is basically the country. The busiest airport in Kenya, the Jomo Kenyatta International Airport, is the choice airport for tourists leaving or coming into Kenya. The conditions of the road, is also an attraction for these tourists encouraging them to choose JKIA as opposed to other airports in the Country.

- Encourage business in other Parts of the country
  Mombasa Road connects other parts of the country such as Nairobi-Athi river-Machakos, Machakos-Athi River-Nairobi-Limuru etc. Widening this road will encourage business men living in Limuru to Invest in Athi River or Machakos and vice versa. This will encourage the exchange of goods acquired from one side of Nairobi for others on the other side. It will also widen Nairobi and reduce competition for such goods and services in the main Nairobi CBD.

Other positive impacts of the proposed project include:

- Improved traffic flow into and out of the city;
- Time saving resulting and increasing economic productivity
- Improved access to social and economic centres, such as markets, schools, health facilities, government offices
- Reduced transportation costs for people and goods between Nairobi and its outlying suburbs, as well as western, southern and eastern Kenya, Uganda, Rwanda, Tanzania.
- Reduced number of accidents along the road
- Reduction of fuel consumption, which translates into economic savings for vehicle owners
1.4.2. Negative Impacts

Various negative socio-economic impacts can be predicted from this project. These include:

a) Changes in the social dynamic, leading to encouraging social activities such as prostitution, with the associated risks of spreading STIs/HIV/AIDS;
b) The need for the contractor to ensure participation by women and youth during project construction;
c) The disruption of infrastructure and services as water pipes, electricity cables, telephone cables, drains and access roads;
d) Dust emissions during the dry season;
e) Mud during the wet season;
f) Increased noise levels from construction equipment and workers;
g) Temporary disruptions caused by diversion of traffic during construction may affect businesses and livelihoods along the existing route.

Other positive impacts of the proposed project include:

- Conflict of interests/land use conflicts
- Conflict of interests/land use conflicts
- Loss of land and property
- Displacement of people
- Disruption of infrastructure and services such as water pipes, electricity cables, telephone cables, drains and access roads;
- Changes in the social dynamics, leading to encouraging social activities such as prostitution, with the associated risks of spreading STIs/HIV/AIDS.
- Marginalization of the women and youth
- Dust emissions
- Increased noise levels from construction equipment and workers
- Increased noise levels from construction equipment and workers
- Temporary disruptions caused by diversion of traffic during construction may affect businesses and livelihoods along the existing route
- Temporary blockage of access to businesses

5.2 POTENTIALLY ADVERSE IMPACTS ON THE BIOPHYSICAL ENVIRONMENT

5.2.1 Terrestrial Habitat Alteration

Construction and Operation

The construction of proposed road rights-of-way, will result in alteration and disruption to terrestrial habitat through vegetation clearing. Right-of-way construction activities will transform habitats, depending on the characteristics of existing built environment vegetation, and topographic features. Built environment will be destroyed, undulating topography will be levelled, and vegetation will be cut down. The operation phase will however not has any adverse impact on this environment.
To mitigate on these impacts, vegetation clearing will be done manually by use of pangas and slashers. Where there are big trees, portable power saw mills (petrol powered) will be used. This could further be reduced by using existing access roads/tracks to the erection sites.

Other measures include:

- Re-vegetation of disturbed areas with native plant species;
- Use human labour as opposed to heavy machinery to avoid herbaceous layer destruction and exposure of the soil to wind and water erosion;
- Vegetation management should not eradicate all vegetation; excessive vegetation maintenance may remove unnecessary amounts of vegetation resulting in the continual replacement of species and an increased likelihood of the establishment of invasive species;
- The owners of property that will be destroyed should be given prior notification before the actual acquisition of the identified property and pieces of land are identified;
- Adequate consultation with the relevant stakeholders should be done in order to avoid conflicts and ensure that the affected parties are duly compensated prior to construction;

5.2.2 Soil

Construction

During the construction phase, the contractor is expected to loosen the soil along the wayleave for the road which may lead to soil erosion. Similarly, the wayleave will serve temporarily as a road to transport material between construction sites. The exposed soil will be prone to wind and water erosion during the construction phase. Occasionally, temporary access roads to construction sites will have to be created where they did not exist before and this will result in displacement of top soil in the affected sections.

Mitigation

- Soils excavated should be used for re-filling and should not be left exposed to wind or water for long periods;
- The contractor should avoid steep terrain during the transportation of construction material by using alternative routes or use light vehicles where appropriate;
- Re-plant degraded areas with local species common in the area to complement natural vegetation regeneration to improve ground cover.
- In cases where mature trees will be cut down, the Borrower should liaise with KFS on tree planting and monitoring of planted trees to replace those trees that will be lost.

5.2.3 Air

Construction

During the construction phase, the main sources of air pollution will be excavation and quarrying for materials, which will raise dust; exhaust from construction machineries and other vehicles; and dust from grinding of material such as ballast that will be used in the road works. The dust and smog from the exhaust, will settle on plants clogging their stoma (gaseous exchange sites) and thus choking them. The plants may eventually die, or have a stunted growth. Inhalation of this dust and exhaust
The fumes from machinery and vehicles are poisonous to the environment. SO\textsubscript{x} and NO\textsubscript{x} compounds react with Oxygen atoms to form other compounds. When they react with any form precipitation (rain, snow, sleet), they form acidic compounds that fall to the ground and corrode structures and vehicles. They may result in other forms of stomach and throat infections. Acidic precipitation will also burn and kill plants.

Ozone layer depletion also results from the reactions between radical ions and other atoms in the upper atmosphere. These reactions lead to further global ozone layer depletion.

**Mitigation:**
- The construction workers should have dust masks on, especially during working hours;
- The contractor should ensure that the workers are regularly checked for Respiratory Tract Infections (RTI). These should be done monthly to monitor progress, and mitigate the impacts early, to avoid any fatalities. This should not be at the construction workers cost but the contractors;
- Road worthy vehicles used for construction, that produce minimal exhaust fumes should be used;
- Machinery used should undergo routine inspection, to ensure that they are of good working condition, and;
- There should be watering of the dusty excavated areas during the drier seasons. This should be done three to five times a day, depending on the prevailing climatic factors.

**Operation**

Increase in the number of vehicles and the speed of driving will increase the amount of air and noise pollution within the project area.

**Mitigation:**

\begin{itemize}
  \item There should be strict regulation on the speed limit of the vehicles that use the road. Speed bumps and other speed control agents such as rumbles should be erected especially in areas of high population.
  \item Only road worthy vehicles should be allowed by the traffic Police to utilize the proposed road. Those that are not should be confiscated or fined in accordance to the Traffic Act.
\end{itemize}

**5.2.4 Material Sites**

**Operation**

Material quarries, if left open by the contractors, are a likely breeding ground for pests such as mosquitoes which spread the malaria bacteria. It is therefore likely that the cases of malaria reported in various health centers increase after construction is complete.

The open quarries are also a safety hazard for the community members and especially the children, who may opt to go to the quarries to play, oblivious of the danger the quarries pose.

The sites where the earth and other construction materials are dumped should also be decommissioned. If not, such sites may be rendered not useful for any other activity. Such sites are
and may also pose a safety risk to the community members

Mitigation:
All the material sites should be decommissioned by the contractors before the contract is signed off as complete. Open quarries can be used as water pans, for the community or may also be refilled by the non-toxic waste earth material and be made available for other viable land based activities such as construction of farming.

Before decommissioning commences, open quarries or waste dump sites should be cordoned off from the community members with clear warning signs as to the danger these sites pose. The workers subcontracted for the project who live within the project area should also be used as mouth pieces to inform the other community members of the same. The project sociologist should be tasked with informing the community members of such and other risks.

5.2.5 Right-of-Way Maintenance
Operation

Regular maintenance of vegetation within road rights-of-way is necessary to avoid interference with vehicle travel and road maintenance. Unchecked growth of trees and plants can cover signals and signs, restrict motorist visibility, and fall onto the road and overhead power lines.

Regular maintenance of rights-of-way to control vegetation may involve the use of mechanical methods (e.g. mowing), manual methods (e.g. hand pruning), and the use of herbicides. Vegetation maintenance beyond that which is necessary for safety may, by removing unnecessary amounts of vegetation, result in the continual replacement of successional species and an increased likelihood of the establishment of invasive species.

Mitigation:
Implementation of integrated vegetation management (IVM);

- From the edge of the road area to the boundary of the right-of-way, vegetation is structured with smaller plants near the road and larger trees further away to provide habitats for a wide variety of plants and animals;
- Planting of native species and removal of invasive plant species;
- Use of biological, mechanical, and thermal vegetation control measures where practical, and avoiding use of chemical herbicides;

5.2.6 Hazardous Substances
Construction and operation

Use of engines (construction vehicles) and other equipment on site has the potential to lead to spillage of petroleum products.

Mitigation
- All spills within the project area should be dealt with as soon as they occur. It should first be contained and then removed from the site to a designated waste disposal site such as dandora waste disposal site;
- Machinery should be duly inspected to check for leaks in their systems.
During the construction period, solid waste will be generated from the actual construction activities (excavated top soil and earth material, packaging materials, recovered materials, among other waste) and from the workforce itself (waste in the form of food, wrappers, bottles, containers, cartons, and other disposable or personal items).

Mitigation

The workforce on site at any given time is relatively small (approximately 20no.) however the accumulative impact of waste generation can create a significant problem if mitigation measures are not made available.

- The construction site should have solid waste collection facility (disposal container) for the temporary storage of waste prior to its disposal later at an appropriate and designated location (e.g. the nearest such as council dump site). Waste rocks, earth material
- The storage yards should also be provided with solid waste disposal facilities such as waste bins.

5.2.8 Camp Sites

Construction

The project is likely to have three categories of camp sites, namely workers camps, operation camp (offices, stores and workshops) and material site camps (materials preparation sites). The anticipated impacts to the environment would be as follows:

(i) Workers camps associated with domestic wastes (sewage and garbage) running into water sources and land. People’s health would be at risk,
(ii) Construction materials holding and preparation sites with waste oils, bitumen residuals, machine parts, etc. that could infiltrate into water sources, land and air. Effects are mainly people’s health and physical environmental degradation,
(iii) Uncontrolled disposal of office wastes could also be a nuisance to the local inhabitants and the environment,
(iv) Material sites (gravel, hard stones, sand and water) have risks to people’s safety, environmental pollution and degradation among other undesirable occurrences.

Mitigation:

- All the solid wastes (kitchen, human and office wastes) from the camps should be collected and disposed of away from the construction site. Dandora dump site should be considered for this. The garbage can be collected by a Waste disposal contractor duly registered and authorized by NEMA.
- Waste oil, bitumen residuals, machine parts, should be stored appropriately within the camps awaiting disposal. For instance, the waste oil and bitumen residuals should be stored in clearly labeled metallic drums with lids. The machine parts should be stored in lockable stores with concrete floored in an organized manner for easy access, and to avoid accidents and leakages into the soils.
- Material site camps, should be constructed a significant distance away from material pits and material heaps. The safest distance should be determined by the contractor and the local public health officer within the area. The material should not be dumped in areas other than the areas set aside to have these materials.
- Hydrology

Construction
During the demolition of structures and excavation of soils, existing surface drainages and tarmac roads, there is bound to be the disruption of Municipal water supply due to destruction of underground water pipes. This will mean that some residents’ water supply will be interrupted for the duration of the construction of this road.

Mitigation
- The Municipal council should seek alternative ways of supplying water to these residents during the duration of the project. This can be through delivering water to these residents routinely (daily or weekly) through water trucks, or temporarily diverting other piping systems into their piping system.
- The residents should be given prior notification of such a possibility to enable them acquire sufficient water storage containers for this period.

5.3 IMPACTS ON HEALTH AND SAFETY

5.3.1 Noise
Construction
There will be significant noise and vibrations generated during the construction phase. The noise impact during construction is expected to be negative and will last as long as the construction phase. The major receptors are expected to be the construction workers as well as any immediate neighbouring residential premises. Sources of noise will be trucks and the off-road vehicles in transit and use of compressor to break hard ground.

The noise from compressors will only be significant where hard ground breaking is carried out. Impacts of noise include noise-induced hearing loss for the project employees and nuisance for the affected settlements.

Operation

Increased number of vehicles operating on these roads will result in an increase in noise within the project area. This increase will however not be significant since the roads are already existing.

Mitigation
All unroad worthy vehicles should not be allowed to operate on the road. This should be done with the assistance of the Traffic police.

5.3.2 Physical Hazards

Construction and Operation

There will be major roadworks carried out during the construction of the proposed roads. This will involve major excavation works and use of heavy machinery. These can result in physical injuries to the workers and also to passers-by. Falling hazards, into pits or from tall machines, moving parts of machines, dropping hazards are all possibilities. Such falls will cause fractures that could lead to loss of ability to use limbs normally and in extreme cases fatalities. The manual digging for the foundations of the lattice structures is a highly physical and energy sapping activity. Prolonged digging and overexertion will lead to ergonomic issues relating to pains in the lower back and in the joints (of legs and hands/arms).
Given the possibility that these roads will still be used during the construction phase, road accidents are a high possibility in various sections of the road.

The use of compressors in the areas of hard will subject the project employees to whole-body vibrations that may impair functions of the chest, abdominal organs, and musculoskeletal systems, contribute to fatigue and decrease concentration.

**Mitigation**

- Appropriate hand and foot protection (PPE) during the manual clearing of vegetation;
- Adopting ergonomic work flow designs that fit physical tasks to employees and not vice versa while maintaining a balance with productivity;
- Training of workers on how to identify dangerous vibrations of the compressor;
- Erect warning signs in Swahili or English in hazard prone areas such as sharp corners or obstructed sections of the road;
- Construct alternative routes that motorists can still use during the construction of these roads;

5.4 **ANALYSIS OF IMPACTS**

Impacts to the environment could be positive or negative, direct or indirect, reversible or irreversible. The extent of environmental impact is determined by its significance, adversity, temporary or permanent, long-term or short-term, localised or widespread.

Some impact mitigation has already been proactively addressed in the design while others would be undertaken through considered incorporation in the implementation of the project and guided by the Environmental and Social Management Plan developed under this report.

The table below provides a snapshot view of the anticipated impacts (both positive and negative) of the proposed project:

**Table 10: Impact Assessment Matrix**

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<th>Aspect/Impact</th>
<th>Positive (+)</th>
<th>Negative (-)</th>
<th>Insignificant (i)</th>
<th>Direct (D)</th>
<th>Indirect (I)</th>
<th>Permanent (P)</th>
<th>Temporary (t)</th>
<th>Major (Mj)</th>
<th>Minor (m)</th>
<th>Occurrence</th>
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<td>Job creation</td>
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<td>Improved living standard/ reduce poverty</td>
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<td>Improved income generating activities / Industry growth</td>
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<td>Air pollution (dust, exhaust emissions)</td>
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<td>Aspect/Impact</td>
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<td>Maintenance of Rights-of-Way</td>
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<td>Spread of diseases</td>
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Identification and analysis of stakeholders

The following steps were taken to identify the stakeholders:

1) The assessor met KeNHA project engineers who made a presentation about the proposed project;

2) In the company of KeNHA project engineers, the assessor made a reconnaissance visit/drive to the proposed project area. The purpose was to familiarize with the project area and draw a list of all the businesses and properties found along the highway, from JKIA to Rironi;

3) From the reconnaissance visit, the project area was divided into four sections: JKIA to Nyayo Stadium; Nyayo Stadium to Museum Hill; Museum Hill to Uthiru and Uthiru to Rironi.

4) The initial list was analyzed to determine the properties and businesses that would be mostly affected by the project. The criteria used included:
   - proximity to the JKIA-Rironi highway;
   - proximity to the proposed interchanges;
   - type and size of businesses;
   - estimated area occupied by the business and property;
   - estimated number of people who would be affected; and
   - expected level of involvement and interest in the project.

5) For logistical reasons, the nature of participation and consultation was then determined according to the four sections (3) above, the criteria(4) above, location, scale of businesses and property, common interest and ease to mobilize and meet.

6) Stakeholders were then regrouped into four groups according the common characteristics and location. The four groups were:
   - Property and business owners found between Rironi to Uthiru;
   - Small scale businesses operating between Kangemi-Fly-over to Kabete Police Station;
   - Small scale businesses operating in Westlands;
   - Medium and large scale property and businesses owners found between JKIA and Uthiru.

Provincial Administration assisted in mobilizing stakeholder i, ii, and iii above which is why all the three consultative meetings were held at the chief's offices, at Zambezi, Kangemi and Westlands respectively. Stakeholders from JKIA to Uthiru received invitation letters and, attended a consultative meeting held at the Kenyatta International Conference Centre.

From the analysis, four groups of stakeholders were consulted. These were property and business owners found between Uthiru and Rironi; small businesses operating between Kangemi and Kabete Police Station; small businesses operating in Westlands; and medium and large property and businesses owners between JKIA and Uthiru.

4.2 Comments, Observations and Suggestions of Stakeholders

4.2.1 Property and business owners between Uthiru and Rironi

The group comprised property and business owners along the high way. The estimated number of these people is 200.
Consultative meeting at the Chief’s Office, Zambezi, Sigona

The group made the following observations:

a) Having witnessed the expansion of the Nairobi-Thika Highway into a super highway, most of the land and property owners are not surprised to learn that the JKIA-Rironi highway is also to be expanded;

b) There are not opposed to the proposed project. This is because such project is a sign of development of the country. They are going to cooperate with the Government regarding this project. All they want is the Government to respect their rights.

c) In the event the project proposes to add lanes on the road up to Rironi, then the Government would need to acquire some of their land or destroy some of their properties. Should that be the case, then the Government should be prepared to duly compensate them.

d) There are a few illegal structures and micro enterprises operating within the road reserve: at Zambezi and Gituru bus stops.

The landowners and property owners expressed the following concerns:

a) Road contractors usually raise the road level when they re-carpet the roads. This leaves entrances to business, properties and homes to hang. When this happens, business, customers and home owners usually experience difficulties in climbing down and up to their businesses and property and to the highway.

b) They want to know the time frame for project implantation. When will road construction and re-carpeting begin and end? They would like to know so that they can also plan their activities.

c) The micro-enterprises operating within the road reserve, especially around Zambezi bus stop and Gituru should be re-relocated. There are no official markets for these businesses in Sigona and Gituru. Where then should they be relocated? Ignoring them would mean the Government is not mindful of its relatively poor citizens.

d) Increasing accidents along the highway especially around Zambezi. Many pedestrians have lost their lives while trying to cross the highway.

e) Road drainage channels that are directed into their shambas or near their homes are not necessarily a good thing to landowners.

f) Where they could go in case they have complaints against the contractor or KeNHA.

g) Undertaking road works during foggy conditions in the area is likely to lead to many accidents.
consider providing facilities for non motorized users ignores that fact such users are more than motorized users in Kenya.

i) The shoddy work being undertaken by some road contractors. Roads hardly last. Potholes, cracks and grooves appear soon after the contractor has left. Why is KeNHA and other road development and management authorities in the country unable supervise contractors?

Suggestions/recommendations
The group suggested the following:

a) After re-carpeting the road, the constructor should consider levelling the entrances to businesses, property and homes;

b) Road design should provide facilities for non motorized road users. Foot bridge at the commercial centres (Zambezi and Gituru) should be provided;

c) After re-carpeting, the road should be clearly be marked. Because of the foggy conditions that exist in the area, cut eyes should be used to mark the road

d) Construction should not take place when the area is foggy.

e) The Government should timely for any property loss.

f) Water from the road should be channelled into the nearest streams or rivers.

4.2.2 Small-scale businesses between Kangemi- Kabate Police Station

The group comprised representatives of owners of small scale business selling vegetables, fruits, books, household provisions second cloths sellers, etc, as well as cobblers, shoe shiners and taxi drivers. The estimated number of people involved in these kind of micro-businesses in this area is 1,500.

Consultative meeting at the Chief’s Office, Kangemi

The group made the following comments:

a) There is no official market in Kangemi area. It also acknowledged that the place where they are operating their businesses is not officially designated as a market though the City Council of Nairobi collects money from them. It is a road reserve. This is why the place lacks toilets, water and waste disposal facilities.

b) The roadside market is a convenient site for the group members and their goods customers. Most of their customers are motorists along the highway and residents in the neighbourhoods, especially Kangemi.

c) The businesses the group members are carrying out at the market are the main source of their livelihoods. Without the market, their lives would be adversely affected.
d) Group members are not opposed to the proposed project because such project is not only a sign of development but needed and expected in the country.

e) It was acknowledged that implementation of the proposed project would adversely affect most group members.

f) There is no single organization representing all the micro-businesses. Instead there are several informal and formal groupings for specific business types, and those dealing with cross cutting issues.

The provincial administration pointed out that the proposed project is a Government Project which needed the support of the group. Since the owners of small business were operating on the road reserve, they would be affected once construction of additional lanes starts. Unlike in the past, this time, the Government is consulting them before the project is implemented. This was an indication that times had changed in Kenya.
Concerns:

The group expressed the following concerns:

a) Past evictions of hawkers from the place never resulted in the Government implementing road expansion project. As a result, hawkers who had left to other places and new ones slowly came back. In view of this, the group was wondering whether this time the Government is serious.

b) Past evictions were cruel, forceful, and inhuman and did not consider alternative places where they could be moved. They felt they did not matter to the Government and Nairobi City Council. Now that this time they are being consulted, they would like to know if the Government and Nairobi City Council would consider moving them to alternative market site(s) before road expansion starts;

c) Should the Government and City of Nairobi consider re-locating them, their preference is a site that is not far away from the present market site. Otherwise, they would lose customers.

d) The group would like to know when road construction would commence so that they can also plan what to do next, either individually or as a group.

e) The lack of concern by the City of Nairobi and the Government about the disruptions of their businesses and their livelihoods.

f) The dust that would spread on their goods, including foods during construction.

The District Officer observed that a couple of years ago Provincial Administration was used to evict hawkers near the Kangemi Fly-over to give way to proposed expansion of the same road by the Kenya Highway Authority. But the project did not take-off and, KeNHA has never given an explanation. Since then, Provincial Administration has been at pains to explain to the people what had actually happened. As a result, the people, especially those who were evicted, were seeing Provincial Administration in bad light. He hoped that this time around, the same false should not happen.

Suggestions/recommendations

The group suggested that:

1) In the event the City Council of Nairobi re-locates it to a new site, its members should be allowed to construct their own kiosks according to City of Nairobi designs and specifications. From the group's own observations, if the Kiosks are constructed by the CCN, they would not only be too expensive for them but would end up in the hands of the rich.

2) At new site, the city council should only provide toilets, water and waste disposal facilities; and

3) Initiatives to assist it should target its members who already are carrying out businesses at the present site (from the Kangemi fly-over to Kabate Police Station).

The District Officer suggested, this time, KeNHA should be serious. Should there be any difficulties regarding implementation of the proposed project, his office should be told to avoid creating bad blood between it and the people.

4.2.3. Small businesses operating in Westlands

The group comprised representatives of car wash, hawkers and taxis operators operating in Westlands area. The estimated number of these people is 300.
Consultative meeting at the Asst Chief’s Office, Westlands

The group made the following comments:

a) Most of the car wash and taxi operators operating along Waiyaki Way would be directly affected when road construction starts. Over 20 youths who wash cars and approximately 60 taxi operators would be displaced and, their businesses and livelihoods would suffer during and after construction.

b) Their operations are their only source of livelihoods.

c) Although they are not opposed to the project, the Government should consider their inevitable plight.
Concerns

The group expressed the following concerns:

a) Traffic congestion around Westlands would intensify once road construction begins. Alternative routes that could accommodate diverted traffic would also suffer from the same problem. In view of this, how long would construction of the road take in this area?

b) Considering that there are few open places in Westlands, alternative site(s) where car wash and taxi operations could be re-relocated during the construction phase of the project would be a challenge.

c) The two City Council of Nairobi public toilets are in Westlands, at the Kangemi Matatu Park along Waiyaki Way and in the market. While the former is open to the public for 24 hrs, the latter only opens when the market is open. From the group observations, it is likely that the toilet at the matatu park itself would be demolished during the construction phase of the project because it is within the road reserve. What would be the alternatives for the public and taxi operator who need to use the toilet at night? Which site in Westlands would be used as a matatu park?

d) Car wash businesses use the spring water behind the matatu stage at no cost. This water source is likely to be disrupted when road construction begins. As a result, car washers would be forced to look for other sources of water, where they are likely to pay for water. This would make their business unattractive especially when they are not re-relocated elsewhere.

e) They wanted to know what would happen to them after construction is completed. They observed that, it was not going to be impossible for them to return to the same sites after road has been expanded.

f) Additional lanes on both sides of the road would leave little space for non motorized road users, roadside hawkers and shoppers in Westlands. What plans are there to decongest Westlands shopping area?

Suggestions/recommendations

The group offered the following suggestions:

a) Alternative sites for car wash and taxis operators be found preferably in Westlands even if it is on temporary basis.

b) Some youths should be considered for employment by road constructors during road construction; and

c) Government should consider car wash youths for vocational training;

4.2.4 Medium and large scale property and business owners between JKIA and Uthiru

The group comprised representatives of medium and large scale businesses and properties. They included corporations, private companies, government departments, local authority, university, religious institutions and residences. The estimated number of these organizations is 250 with many people directly and indirectly involved in them.
The group made the following comments:

a) Some of the by-passes so far constructed along the Nairobi-Thika super highway have poor visual appearances. It was observed that the same could happen with this project. The University of Nairobi Architectural Department offered to help in designing visually attractive by-passes.

b) Even if KeNHA indicated that road expansion would be confined within the road reserve, some participants felt that the authority would have to acquire some land especially at interchanges.

c) Allowing trucks on the highway was one of the main reasons for accidents and traffic congestion within the city. If the southern and northern by-passes were opened, there should be no need for the transit trucks to go through the city.

d) It takes so long for the relevant authorities to fix leaking sewage into the roads. This is not only a health hazard but also an eyesore that scares away potential customers to their businesses;

e) Some over-passes within Nairobi are rarely used by pedestrians. For instance, the over-passes at Nyayo, Joogo Road, and Kinoo areas are hardly used. This means that they are not user friendly at such locations and alternative facilities could have served pedestrians better.

f) It was necessary that the Chiromo Road should be widened. This is because the traffic from this road has been increasing and if not widened, it would be the cause of traffic congestion at the Chiromo Road/Riverside Drive Junction.

g) Road constructors have a tendency of leaving sloppy sides of the roads with loose soils, exposed. As a result, the road sides get eroded and drainage systems get blocked. The case cited was that the recently rehabilitated interchanges at Uthiru.

h) There is a serious need to cater for non-motorized traffic, especially pedestrian traffic in the highway. This means that KeNHA would somehow have to purchases land in some areas along the highway.

The meeting raised the following concerns:

i) Very often road constructions block accessibility to businesses and property. These does not only inconvenience businesses and property owners but also lead to their loss of businesses. Nairobi Synagogue pointed out that the expansion of the University Way has already blocked access to the Synagogue on its Eastern and southern sides and construction of an elevated highway would seal its western side. Mantrac Ltd was concerned that it had no direct access to the Mombasa Road despite its repeated requests to the City Council of Nairobi. Many businesses were concerned that the slip roads to their premises may be lost as a result of adding new lanes.
Security at Uhuru Highway-University Way Junction also known as 'God's Corner' due to the presence of St Paul's Church, University Chapel and Nairobi Synagogue. The Nairobi Synagogue was particularly concerned about its security. It was observed that a proposal to construct an elevated highway has inherent security risk to the synagogue.

KeNHA should be categorical that no buildings shall be demolished. Many property owners have spent millions of shillings and would like to be assured that their buildings would not be brought down as a result of implementing this project.

When the project would start and, how long it would take KeNHA to complete it. This information was necessary because business and property owners also wanted to plan their mitigations especially when the road is under construction.

Where to go in case of complaints and damages regarding shared utilities within the way leaves/road reserve. Safaricom observed that it was not clear which organization is in charge of such cases. Is it KeNHA, City Council of Nairobi or Kenya Urban Road Authority? Clarification on this matter was needed.

Some road contractors were doing shoddy work. Some roads by some constructors hardly last their intended life span. Why is KeNHA not concerned with such poor workmanship? What has KeNHA been doing about this? What is the guarantee that contracts to undertake the proposed project will not be given to such contractors?

It was unrealistic that most road designs do not cater for non-motorized road users in a developing country like Kenya. Because pedestrians, cyclists, carts etc are not catered for when building highways, they compete with vehicles in the use of the highway which results into increased accident cases.

On many occasions livestock enter into the city to graze along and to cross the highways especially during the dry season. This poses danger to high speed motorists and should not be allowed at all.

KeNHA was asked to confirm that there would be no land acquisitions. Landowners needed to be assured in no uncertain terms about this. In case their land would be acquired, they would like to know what to do and not to do with it.

The meeting observed that since KeNHA had not presented a detailed road design, it was difficult for property owners and businesses to establish the extent they would be affected by the project. For instance, it was not easy for property owners to know if their fences would be brought down; whether slip roads to their premises would be eaten away by additional lanes; whether or not more land would be needed at interchanges; and the designs recommendations at certain places such as between Liberty House and General Motors and stretch from St. Marks Church, Westlands up to Kianda School. They also wanted to know how the interchanges were designed. Therefore comprehensive comments were reserved until KeNHA availed detailed project designs.

There were many accidents due to lack of pedestrian crossings. For instance at Kianda School, between Nyayo Stadium and JKIA and the Uthiru and Kinoo areas.

It was observed that road designers and contractors have a tendency of draining water from the roads and directing it into people's shambas. This was not good because, it sometimes adversely affects the crops and vegetation in the shambas.

Kenya Agricultural Research Institute (KARI) expressed concern that it was going to lose some of its land as a result of implementing this project. Already some land been taken away as a result of a new road coming up on its eastern side. If the Waiyaki Way/James Gichuru Road junction would need an intersection, definitely some of its land, including the main gate may be taken away by this project.

Residents of Belleview Estate wanted to know how wide the expanded road was going to be. They observed that if road was going to be 66 metres wide, then they would not be greatly affected. However, it was going to be 88 metres wide, they were going to lose the fence and parts of some their houses.

National Museums of Kenya and Nyayo House observed that there was need for KeNHA to leave old buildings like Nairobi Gallery and Nairobi Synagogue (which is over 100 years old)
Such buildings were a national heritage that should not be demolished or interfered with. Nakumatt Supermarket wanted to know whether it was going to lose its parking which is adjacent to the highway. Intercontinental Hotel was concerned about the noise that would be produced when construction work is undertaken especially at night. This would disturb visitors to the hotel. The hotel also wanted to know the plans KeNHA and the contractor would put in place during road construction for those who will be inconvenienced when travelling to and from JKIA and what would happen to its perimeter fence which is next to the highway and protects its borehole.

It was observed that there was so far inadequate incorporation of local Kenyan expertise in the road design and construction of the highways.

The group made the following suggestions and recommendations:

a) Foot bridges or subways be constructed in places where pedestrians mostly cross the highway;

b) Service roads behind properties and businesses be improved or constructed prior to expansion construction of the highway

c) Where possible, Bicycle lanes be provided along the highway

d) A lane dedicated to use by the police, ambulances, fire engines and presidential escort be provided.

e) Consider parking bays for trucks that do not transit the city.

f) New acceleration lanes from Nyayo Stadium towards JKIA should be added

g) The proposal to construct an under-pass at the Mombasa Road/Langata Road/Lusaka Road junction with shopping facilities should bear in mind the security risks posed by football hooliganism.

h) Water drained from the roads should be channelled and directed towards nearby rivers /streams rather than in people’s shambas.

i) There is need for KeNHA to educate the public on how to use the highways.
7.0 ASSESSMENT OF ALTERNATIVES

7.1 GENERAL

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

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

Alternatives usually involve options regarding alignment, routing, construction methods, materials used, landscaping, and so forth, while the basic project concept remains constant. Frequently, two to three alternatives are chosen, and within these there may be several other alternative treatments for specific features, which may also be considered as separate alternatives.

7.1.1 The ‘No Action’ Alternative

The ‘No Action’ Alternative maintains the status quo; any social and economic development benefits from the proposed roads would be foregone. The potential adverse impacts associated with the project would however not occur.

7.1.2 The Proposed Option

KeNHA plans to construct additional lanes on JKIA-Likoni-James Gichuru-Rironi road (A104) (approximately 42 km), dualling of Airport South Road (approximately 3km), access to JKIA widening (approximately 2km), construction of access bitumen road to the proposed Barabara Plaza (approximately 2km) and construction of access road to container depot (approximately 2km).

The scope of additional lanes on JKIA-Likoni-James Gichuru-Rironi road (A104) will entail rehabilitation of existing carriageways and installing additional lanes as indicated below:

- Two lanes on either side from JKIA-Nyayo Stadium
- Elevated roadway with two lanes on either side from Nyayo stadium to Museum Hill roundabout
- Two lanes from Museum Hill roundabout to Uthiru
- One lane in either side from Uthiru-Rironi

Attainment of grade separation at major road intersections including:

- Mombasa Road/Popo Road/Kapiti Road junction
- Mombasa Road/Langata Road/Lusaka Road junction
- Mombasa Road/Bunyala Road junction
- Uhuru Highway/Haile Sellassie Avenue junction

7-11
This option was selected since it will result in the widening and improving of already existing roads. There will therefore be minimal destruction of buildings and other structures. Such destruction is however unavoidable given that the roads traverse the well-developed Nairobi Province.

7.1.3 Comparison of Alternatives

Table below presents an assessment of all the alternatives mentioned above and makes comparison between their merits and demerits.

Table 11: Comparison of Alternatives

<table>
<thead>
<tr>
<th></th>
<th>Merits</th>
<th>Demerits</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Action Alternative</td>
<td>There will be no project implementation and its associated impacts on</td>
<td>The objectives of the project and the expected socio-economic benefits that</td>
</tr>
<tr>
<td></td>
<td>the biophysical and socio-cultural/economic environment</td>
<td>would be achieved by the project implementation would be foregone.</td>
</tr>
<tr>
<td>Proposed Action</td>
<td>The proposed additional lanes for the road between JKIA – Uthiru have selected the best option of maximizing the available space between the two highway roads. The road from Uthiru – Rironi will only undergo rehabilitation and there will be no additional lanes. The Airport South Road has ample space for dualling with minimal displacement. The space for the access road to the proposed Barabara Plaza is also open; hence no displacement and similarly the rehabilitation of the access road to the Inland Container Depot will not affect any businesses or structures.</td>
<td>The proposed option has the potential to create undesirable environmental and social impacts as described in Chapter 5 of this report. The Proponent shall be required to incorporate various mitigation measures (Chapter 6) in order to minimize/prevent these impacts and ensure sustainable development.</td>
</tr>
</tbody>
</table>

7.1.4 Mitigation for the Proposed Action

In view of the fact that this study identifies environmental and social impacts associated with the project as proposed, mitigation measures, including best environmental management practices have been recommended in this Report. When diligently implemented will help to protect the environment of the affected project area. Commitments included in this Report, as well as the EIA license and other authorizations that would be issued, are designed to avoid environmental damage in accordance with the Environmental Management and Co-ordination Act, 1999 and the World Bank safeguard policies.
8.0 ENVIRONMENTAL & SOCIAL MANAGEMENT AND MONITORING

8.1 ENVIRONMENTAL AND SOCIAL MANAGEMENT

Following the desk studies, field investigations and public consultations undertaken in this study, an Environmental and Social Management Plan (ESMP) has subsequently been developed. The ESMP provides a general outlay of the environmental and social aspects, potential impacts, mitigation measures, performance indicators, monitoring means and frequency, responsibility for monitoring and associated [estimate] costs.

The responsibility for the incorporation of mitigation measures for the project implementation lies with the KeNHA Environment department, who must ensure that the Contractor implements all specified mitigation measures. In order for the Contractor to carry out environmental management activities during construction, the Contractor should draw up an environmental management plan of his own to show how he will address the mitigation measures during the construction period. The Supervising Engineer is responsible for assessing the Contractor's environmental management plan.

Functions

Planning and Environment Department is headed by the General Manager, Planning and Environment. Its functions include but are not limited to;

- Undertaking studies, designs and preparation of tender documentation for operations relating to planning, surveying, road reserve protection and socio-environmental management;
- Effectively supervising works and consultancies relating to road planning, surveying, road reserve protection and socio-environmental management and ensuring the works and services are executed in accordance with the standards and specifications;
- Administering and protecting road reserves;
- Liaison with Ministry for the time being responsible for road safety;
- Undertaking of road safety audits for road designs and implementation of road safety measures;
- Monitoring and evaluation of road projects;
- Carrying out traffic planning, collection and management of traffic data;

8.2 MONITORING ENVIRONMENTAL AND SOCIAL PERFORMANCE

Monitoring is a long-term process, which should begin the start of construction of the Road and should continue throughout the life of the project. Its purpose is to establish benchmarks so that the nature and magnitude of anticipated environmental and social impacts can be continually assessed. Monitoring involves the continuous or periodic review of construction, operation and maintenance activities to determine the effectiveness of recommended mitigation measures. Consequently, trends in environmental degradation or improvement can be established, and previously unforeseen impacts can be identified or pre-empted.
Simple monitoring systems should be set up during construction by the Environment Unit so that potentially environmentally problematic areas can be detected well in advance and the appropriate remedial action taken. This could simply be a checklist of items that need to be inspected as a matter of routine, or periodically, depending on the nature of the aspect. The types of parameters that can be monitored may include mitigation measures or design features, or actual impacts. In some cases, monitoring is fairly straightforward and can be done as part of routine or periodic maintenance. However, other parameters, particularly those related to socio-economic and ecological issues can only be effectively assessed over a more prolonged period of say 3 to 5 years.

8.2.1 Environmental and Social Management Plan Matrix

The Tables overleaf describe parameters that can be monitored, and suggests how monitoring should be done, how frequently, and who should be responsible for monitoring and action.
<table>
<thead>
<tr>
<th>Potential environmental and social impacts</th>
<th>Mitigation Measures</th>
<th>Responsibilities implementing the mitigation measures</th>
<th>Responsibilities monitoring the mitigation measures</th>
<th>Time horizon</th>
<th>Capacity building and training needs</th>
<th>Related cost estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrestrial Habitat Alteration</td>
<td>Re-vegetation of disturbed areas with native plant species;</td>
<td>Contractor</td>
<td>Supervising Engineer</td>
<td>construction</td>
<td></td>
<td>Re-vegetation approx. 100 per sq m.</td>
</tr>
<tr>
<td></td>
<td>Use human labour as opposed to heavy machinery</td>
<td>Contractor</td>
<td>Supervising Engineer</td>
<td>construction</td>
<td></td>
<td>Manual labour 200-500 per day</td>
</tr>
<tr>
<td></td>
<td>Vegetation management should not eradicate all vegetation; excessive vegetation maintenance may increase likelihood of the establishment of invasive species.</td>
<td>Supervising Engineer</td>
<td>Supervising Engineer</td>
<td>operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terrestrial Habitat Alteration</td>
<td>Soil erosion</td>
<td>Contractor</td>
<td>Supervising Engineer</td>
<td>construction</td>
<td></td>
<td>watering soil heaps: 1000 per 1000 litres</td>
</tr>
<tr>
<td></td>
<td>Soils excavated for the erection of towers should be used for re-filling and should not be left exposed to wind or water for long periods</td>
<td>Contractor</td>
<td>Supervising Engineer</td>
<td>construction</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Riverine vegetation should be minimally disturbed during the construction phase to reduce soil erosion and safeguard riverbank protection</td>
<td>Contractor</td>
<td>Environment Unit</td>
<td>construction</td>
<td></td>
<td>Re-vegetation approx. 100/- per sq m.</td>
</tr>
<tr>
<td></td>
<td>Re-plant degraded areas with local species to improve ground cover.</td>
<td>Contractor</td>
<td>Environment Unit</td>
<td>construction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Pollution (dust, fuel emissions)</td>
<td>Control speed of construction vehicles</td>
<td>Contractor</td>
<td>Contractor</td>
<td>construction</td>
<td>Occupational safety and health</td>
<td>Training: 5000 per person per day</td>
</tr>
<tr>
<td></td>
<td>Prohibit idling of vehicles</td>
<td>Contractor</td>
<td>Contractor</td>
<td>construction</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water should be sprayed during the construction phase on excavated areas</td>
<td>Contractor</td>
<td>Supervising Engineer</td>
<td>construction</td>
<td></td>
<td>Watering soil heaps: 1000 per 1000 litres</td>
</tr>
<tr>
<td>Environmental and social impacts</td>
<td>Responsibilities for implementing mitigation measures</td>
<td>Responsibilities for monitoring the mitigation measures</td>
<td>Time horizon</td>
<td>Capacity building and training needs</td>
<td>Related cost estimates (KSh)</td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------------------------------------------------------</td>
<td>------------------------------------------------------</td>
<td>--------------</td>
<td>-------------------------------------</td>
<td>----------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Regular maintenance of plant and equipment.</strong></td>
<td>Contractor</td>
<td>Supervising Engineer</td>
<td>construction</td>
<td></td>
<td>Vehicle service @ 3,000-10,000</td>
<td></td>
</tr>
<tr>
<td><strong>Provision of dust masks for use when working in dusty conditions</strong></td>
<td>Contractor</td>
<td>Supervising Engineer</td>
<td>construction and operations</td>
<td></td>
<td>Respiratory protection @ 100</td>
<td></td>
</tr>
<tr>
<td><strong>Use of designated areas for repair and maintenance of vehicles and powered machinery to avoid oil spills</strong></td>
<td>Contractor</td>
<td>Supervising Engineer</td>
<td>construction</td>
<td>environmental management</td>
<td>Training in EM: 5000 per person per day</td>
<td></td>
</tr>
<tr>
<td><strong>Provide solid waste collection facility (disposal container) for the temporary storage of waste prior to disposal at an appropriate and designated location.</strong></td>
<td>Contractor, Supervising Engineer</td>
<td>Environment Unit</td>
<td>construction and operation</td>
<td>environmental management</td>
<td>Waste bin @ 1000</td>
<td></td>
</tr>
<tr>
<td><strong>The storage yards should also be provided for the disposal of large mounds of waste rock and other earth material.</strong></td>
<td>Contractor, Supervising Engineer</td>
<td>Environment Unit</td>
<td>construction and operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Noise reduction / hearing protection devices when working with noisy equipment.</strong></td>
<td>Contractor</td>
<td>Environment Unit</td>
<td></td>
<td>occupational safety and health</td>
<td>Noise protection devices @900; Training on OSH: 5,000 per person per day</td>
<td></td>
</tr>
<tr>
<td><strong>The right-of-way or way leave must be strictly adhered to mitigate the effects of the unwanted noise.</strong></td>
<td>Contractor</td>
<td>Supervising Engineer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Testing structures for integrity prior to undertaking work; Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures;</strong></td>
<td>Maintenance Mgr</td>
<td>Safety officer</td>
<td>operation</td>
<td>Tower climbing, fall protection, OHS</td>
<td>Training: 5000 per person per day</td>
<td></td>
</tr>
</tbody>
</table>
## Potential environmental and social impacts

<table>
<thead>
<tr>
<th>Environmental and social impacts</th>
<th>Responsibilities for implementing mitigation measures</th>
<th>Responsibilities for monitoring the mitigation measures</th>
<th>Time horizon</th>
<th>Capacity building and training needs</th>
<th>Related cost estimates (KSh)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inspection, maintenance, and replacement of fall protection equipment:</strong> Use of helmets and other protective devices will mitigate against scratches, bruises, punctures, lacerations and head injuries due to dropping objects.</td>
<td>Maintenance Mgr</td>
<td>Safety officer</td>
<td>operation</td>
<td>Initial integrity tests 10,000</td>
<td>Climbing equipment @ 25,000 ; PPE 10,000</td>
</tr>
<tr>
<td><strong>Physical Hazards</strong> Appropriate hand and foot protection (PPE) during the manual clearing of vegetation. Adopting ergonomic work flow designs that fit physical tasks to employees and not vice versa while maintaining a balance with productivity.</td>
<td>Contractor</td>
<td>Contractor</td>
<td>construction</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintenance Mgr</td>
<td>Safety Officer</td>
<td>operation</td>
<td>OHS</td>
<td>Training OHS: 5000 per person per day</td>
</tr>
<tr>
<td><strong>Spread of Diseases</strong> Education, guidance and counselling on HIV/AIDS and other STDs to construction staff. Avail condoms to construction staff.</td>
<td>Contractor</td>
<td>Safety Officer</td>
<td>construction</td>
<td>HIV/AIDS Awareness</td>
<td>Medical screening approx. 1,000; Education approx. 2,000 per person per session</td>
</tr>
<tr>
<td></td>
<td>Supervising Engineer</td>
<td></td>
<td></td>
<td></td>
<td>Condoms @$5/-</td>
</tr>
<tr>
<td><strong>Sites of cultural heritage</strong> Conduct a cultural heritage impact assessment survey in the project area. In the event of chance finds of physical cultural resources, notify the National Museums of Kenya immediately - the resource must be protected from any interference or manipulation of any kind.</td>
<td>Socio-economist</td>
<td>Socio-economist</td>
<td>construction</td>
<td></td>
<td>Survey: 20,000</td>
</tr>
</tbody>
</table>
## Potential Environmental and Social Impacts

<table>
<thead>
<tr>
<th>Environmental and Social Impacts</th>
<th>Responsibilities Implementing Mitigation Measures</th>
<th>Responsibilities for Monitoring the Mitigation Measures</th>
<th>Time Horizon</th>
<th>Capacity Building and Training Needs</th>
<th>Related Cost Estimates (KSh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land acquisition and Resettlement</td>
<td>Ensure that the displaced persons are:</td>
<td></td>
<td></td>
<td></td>
<td>Approx. 114 M for land acquisition</td>
</tr>
<tr>
<td></td>
<td>- informed about their options and rights pertaining to resettlement;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- consulted on, offered choices among, and provided with alternatives;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- provided prompt and effective compensation at full replacement cost for losses of assets attributable directly to the project.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- offered support after displacement, for a transition period, based on a reasonable estimate of the time likely to be needed to restore their livelihood and standards of living;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- provided with development assistance in addition to compensation measures;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>KeNHA,</td>
<td>Environment Unit</td>
<td>construction</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 13: Environmental and Social Management Plan Matrix - Decommissioning

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Proposed Mitigation</th>
<th>Monitoring Means and frequency</th>
<th>Responsibility for Monitoring</th>
<th>Performance Indicator</th>
<th>Cost (KSh)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NOISE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicular</td>
<td>Control of speed</td>
<td>Random checks</td>
<td>Supervising Engineer</td>
<td>Number of Public complaints</td>
<td>Nil</td>
</tr>
<tr>
<td>Compressor</td>
<td>Provision of hearing protection devices</td>
<td>Regular inspection</td>
<td>Supervising Engineer</td>
<td>Number of Public complaints</td>
<td>@ 200</td>
</tr>
<tr>
<td><strong>PHYSICAL HAZARDS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Hazards</td>
<td>adopting ergonomic work flow designs that tend to fit the physical tasks to the workers and not vice-versa while maintaining a balance with expected productivity</td>
<td>Regular inspection and re-design of work flow</td>
<td>Supervising Engineer</td>
<td>Number of ergonomic-related complaints</td>
<td>Nil</td>
</tr>
<tr>
<td><strong>AIR POLLUTION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dust</td>
<td>Provide appropriate hand, respiratory and body protective devices</td>
<td>Periodic inventory of personal protective equipment</td>
<td>Supervising Engineer</td>
<td>Number and status of existing PPE</td>
<td>@600 @ 200 each for the hand, respiratory and body protection devices for each worker</td>
</tr>
<tr>
<td>Vehicular</td>
<td>Proper service of project vehicles</td>
<td>Service schedules e.g. every 5,000 km for off-road vehicles and every 3,000 km for truck</td>
<td>Supervising Engineer</td>
<td>Service tags</td>
<td>@ 5,000 and 10,000 for off-road vehicles and trucks respectively</td>
</tr>
</tbody>
</table>
The decommissioning phase also known as the “deconstruction,” is part of the (eventual/ultimate) reversal phase, which has the additional and often dominant risk factors associated with the materials processed/produced during the life of the project (e.g., toxic and/or explosive chemicals, etc), as well as the potentially decreased structural integrity due to renovations and/or wear and tear.

Similar impacts encountered during the construction phase will be experienced in much the same way when the reverse process is set in motion. The table below gives an analysis of the decommissioning impacts expected in the proposed National Urban Transport Improvement Project:

Table 14: Impact Analysis – Decommissioning Phase

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Health And Safety Impact</th>
<th>Significance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td>Reduced hearing due to high noise from decommissioning activities i.e., deconstruction such as vehicular noise and site remediation noises</td>
<td>Low</td>
</tr>
<tr>
<td>Air Pollutants</td>
<td>Acute/chronic respiratory disease caused by CO2, CO, NOx, and VOCs released by combustion engines during transportation and by obnoxious respirable particles released by speeding trucks during transportation of debris</td>
<td>Low</td>
</tr>
<tr>
<td>Water Pollutants</td>
<td>Public health problems as a result of consuming heavy metal contaminated drinking well water from oils, greases, hydrocarbons deposited on roads sides and leached into drinking water wells by rain water</td>
<td>Low</td>
</tr>
<tr>
<td>Water Pollutants</td>
<td>Public health problems due to decommissioning activities that pollute potential drinking water points</td>
<td>Low</td>
</tr>
<tr>
<td>Traffic Accidents</td>
<td>Traffic related mortality and morbidity from transportation activities</td>
<td>High</td>
</tr>
<tr>
<td>Physical Hazards</td>
<td>Injuries resulting from physical hazards such as slips, trips, and falls from a tall cabin, cabin ladder, or trailer; Injuries due to accidental bumping into unguarded rigid parts of truck or cargo; Injuries while performing field repair-work, tire change, unfastening tight bands and ropes, etc.</td>
<td>High</td>
</tr>
<tr>
<td>Physical Hazards</td>
<td>Injuries resulting from physical hazards encountered by truck drivers</td>
<td>Low</td>
</tr>
<tr>
<td>Physical Hazards</td>
<td>Injuries resulting from physical hazards encountered by truck drivers such as explosion of over-inflated tires or car battery</td>
<td>Low</td>
</tr>
<tr>
<td>Ergonomic Hazards</td>
<td>Injuries due to poor ergonomic considerations such as pains in the low back and in the joints caused by prolonged driving; Over-exertion while moving or otherwise handling bulky and heavy loads/equipment; visual discomfort and eye problems caused by inadequate illumination and eyestrain; development of lumbago due to poor vehicle suspension/uncomfortable seat, etc.</td>
<td>Low</td>
</tr>
</tbody>
</table>
8.4 CAPACITY BUILDING AND TRAINING

The effective implementation of the Environmental Management Plan of the project will require capacity and awareness building. While the Proponent must ensure that capacity and awareness building, mitigation measures and monitoring concerns are implemented, actual training activities should be the responsibility of the Supervising Engineer, who may have to commission external consultants to carry out the training component. This can be achieved by targeting specific groups for the necessary training.

Table 15: Target Groups for Capacity Building and Training

<table>
<thead>
<tr>
<th>Target Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>Road Workers: This group consists of Engineers (Resident, Provincial, Project,) Contractors, Supervisors, Site Agents, Site Managers and the Environmental unit in KeNHA. These should ideally comprise the top management staff concerned with the project road construction and maintenance.</td>
</tr>
<tr>
<td>Group B</td>
<td>Road Workers: Foremen, headmen, skilled and unskilled labourers.</td>
</tr>
<tr>
<td>Group C</td>
<td>Maintenance team: For this group of people, working on the road is their core activity.</td>
</tr>
<tr>
<td>Group D</td>
<td>Project Affected People (PAP): area residents, farmers, people who have businesses that can potentially be affected by the road, or they live close by the road route.</td>
</tr>
</tbody>
</table>

8.4.1 Training Objectives

Training will be based on modules aimed at:

- Developing awareness of the need to consider environmental issues during construction, operation and maintenance of the road
- Creating awareness and understanding of the environmental legal framework pertaining to road and transport
- Developing skills for identification and assessment of environmental, social, safety and health impacts of road project
- Incorporation of mitigation measures at all stages of development
- Reviewing EIA reports and incorporating measures into decision making.

Arrangements for training in environmental awareness should be initiated as soon as possible. KeNHA will either have to commission a consultant to carry out this training on site, at the Head Office, or personnel could undertake the environmental training and then in turn he/she trains other personnel.
9.1 GENERAL CONCLUSIONS

The proposed project is expected to have impacts on various aspects of the environment as well as the socio-cultural/economic status of the project affected parties. These anticipated impacts are discussed in Chapter 5.

Mitigation of potential impacts (environmental and social) as described in Chapter 6, and implementation of the ESMP presented in Chapter 7 of this report, will help to prevent or avert negative impacts, and enhance the positive outcomes of the project. This will help to achieve project sustainability.

The responsibility for the incorporation of mitigation measures as stated in ESMP of this report for the project implementation lies with the Supervising Engineer, who must ensure that the Contractor implements all specified mitigation measures.

The World Bank’s OP 4.12 on Involuntary Resettlement and Government of Kenya guidelines will be followed and used complementarily where applicable to avoid conflict.

Community participation in planning and implementing resettlement will be encouraged;

A Compensation and Resettlement Action Plan that has been developed addressing land, housing, crops, and other compensation to be provided to the adversely affected population. Details of this are available in the RAP report.

A monitoring and evaluation mechanism for resettlement activities should be carried out as stated in the ESMP and RAP.

The ESMP and RAP must be used as a crucial tool for compliance and evaluation of the project during all phases.

There are socially vulnerable groups including widowed, handicapped etc. Such group are provided with assistances. Details are discussed in RAP.

Diligence on the part of the contractor and proper supervision by the Supervising Engineer during construction and the initial operation period is crucial for mitigating impacts. However all mitigation measures stated in the ESMP need to be specified in tender and contract documents, and must be included in the Engineering Drawings, Specifications and Bills of Quantities.

The old PC house at the junction of Kenyatta Avenue and Uhuru highway has been identified as an important monument and the project design will not affect it however extra caution should be taken during construction to preserve it.

9.2 GENERAL RECOMMENDATIONS
Avoidance of negative environmental impacts should be the Proponent’s priority. Impacts can be avoided completely by a "no-project" alternative, but it should be recognized that even existing roads have impacts on their surrounding environment; these impacts can increase over time with economic growth and development, however their effect on the environment may be reduced by maintenance, rehabilitation, design and construction actions.

9.2.1 Mitigation

Mitigation is the lessening of negative environmental impacts through:

a) changes in the design, construction practices, maintenance, and operation of a project; and

b) additional actions taken to protect the biophysical and social environment, as well as individuals who have been impacted adversely by a project.

The extent and timing of mitigative actions should be based on the significance of the predicted impacts. Some aspects of impact mitigation can be incorporated into project design and can largely resolve the threat of impacts before construction commences.

However, many measures require an ongoing implementation plan to ensure that proposed actions are carried out at the correct times, that environmental measures such as planting and slope protection are maintained, and that prompt remedial actions are taken when the initial measures are not fully successful.

Some measures may not be the exclusive domain of the Proponent; Government departments, local authorities, neighbouring communities, businesses, non-governmental organizations, and the legal system may all be involved in their design and implementation of these mitigation measures. Clear definition of responsibilities, funding, and reporting requirements can help to ensure the success of such measures.

9.2.2 Compliance Monitoring

During construction, all mitigative measures designed to reduce the impact of the construction activities should be monitored and enforced by the environmental monitoring authorities. This requires:

- defining the proposed mitigative and compensatory measures;
- specifying who is responsible for the monitoring activity;
- including implementation of mitigative measures in contract specifications;
- making environmental competence one of the selection criteria for contractors; and briefing, educating, and training contractors in environmental protection methods.

Compliance monitoring should not be confined to the right-of-way, but should cover all sites affected by the project, including disposal sites, materials treatment areas, access roads, and work camps.

9.2.3 Effects Monitoring (Evaluation)

After mitigative measures are implemented, effects monitoring or evaluation can test the validity of hypotheses formulated in the environmental impact study; they can also determine if the mitigative measures have achieved their expected results. Evaluation is necessary not only for individual projects, but also to advance methodology, assist in designing future studies, and through lessons learned -contribute to the relevance and cost-effectiveness of environmental protection measures.
Responsibility for corrective action to be taken in the event of mitigation failure should be defined clearly within the Proponent’s organisation.
REFERENCES


EIA Regulations (Legal Notice No. 101 of 13th June 2003)

The Environmental Management and Coordination Act 1999

National State of Environment Report (2005),

Pollution prevention and abatement handbook (World Bank Group)

World Bank Safeguard Policies

Various Acts and Regulations

Available project documentation including the Feasibility Study of the proposed project

Personal Communications:


Appendix 1. Earth Satellite Maps showing Project Area
### Households by main type of lighting fuel

<table>
<thead>
<tr>
<th></th>
<th>electricity</th>
<th>Pressure lamp</th>
<th>Lantern</th>
<th>Tin lamp</th>
<th>Gas lamp</th>
<th>Fuel wood</th>
<th>solar</th>
<th>other</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya</td>
<td>1,716,388</td>
<td>28,639</td>
<td>822,774</td>
<td>755,533</td>
<td>21,841</td>
<td>16,367</td>
<td>23,861</td>
<td>21,217</td>
<td>3,406,620</td>
</tr>
<tr>
<td>Nairobi</td>
<td>712,859</td>
<td>10,324</td>
<td>128,173</td>
<td>123,551</td>
<td>1,251</td>
<td>622</td>
<td>992</td>
<td>7,244</td>
<td>985,016</td>
</tr>
<tr>
<td>Nairobi-West</td>
<td>141,173</td>
<td>1,761</td>
<td>28,616</td>
<td>38,924</td>
<td>278</td>
<td>160</td>
<td>205</td>
<td>1,178</td>
<td>212,295</td>
</tr>
<tr>
<td>Nairobi-East</td>
<td>264,200</td>
<td>4,508</td>
<td>54,288</td>
<td>42,268</td>
<td>521</td>
<td>233</td>
<td>491</td>
<td>3,357</td>
<td>369,866</td>
</tr>
<tr>
<td>Nairobi-North</td>
<td>247,903</td>
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<td>38,143</td>
<td>34,715</td>
<td>348</td>
<td>187</td>
<td>237</td>
<td>2,278</td>
<td>327,427</td>
</tr>
<tr>
<td>Westlands</td>
<td>59,583</td>
<td>438</td>
<td>7,126</td>
<td>7,644</td>
<td>104</td>
<td>42</td>
<td>59</td>
<td>431</td>
<td>75,427</td>
</tr>
</tbody>
</table>

*Source: NCBS, 2010*
Appendix 3. Nairobi: Households by main source of water

<table>
<thead>
<tr>
<th>Source</th>
<th>Pond/dam/dam</th>
<th>lake/s</th>
<th>Stream/stream</th>
<th>Spring/well/borehole</th>
<th>Piped/piped into dwelling</th>
<th>piped/Piped</th>
<th>Jabia/rain/harvested</th>
<th>Water vendor</th>
<th>other/other</th>
<th>Total/Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya</td>
<td>38,514</td>
<td>15,789</td>
<td>260,530</td>
<td>825,027</td>
<td>482,821</td>
<td>1,306,575</td>
<td>23,813</td>
<td>450,609</td>
<td>2,949</td>
<td>3,406,620</td>
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<td>Nairobi</td>
<td>2,761</td>
<td>99</td>
<td>1,345</td>
<td>70,729</td>
<td>230,704</td>
<td>514,943</td>
<td>1,691</td>
<td>162,057</td>
<td>687</td>
<td>985,016</td>
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<td>Nairobi-West</td>
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<td>12</td>
<td>497</td>
<td>46,808</td>
<td>32,006</td>
<td>89,738</td>
<td>489</td>
<td>42,082</td>
<td>91</td>
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<td>Nairobi-East</td>
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<td>8</td>
<td>196</td>
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<td>643</td>
<td>82,128</td>
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<tr>
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<td>461</td>
<td>3,946</td>
<td>86,615</td>
<td>203,948</td>
<td>406</td>
<td>30,728</td>
<td>194</td>
<td>327,427</td>
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<tr>
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<td>7</td>
<td>191</td>
<td>3,890</td>
<td>26,053</td>
<td>37,770</td>
<td>153</td>
<td>7,119</td>
<td>65</td>
<td>75,427</td>
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</table>

*Source: NCBS, 2010*
Appendix 4. Household by main type of roofing material for the

<table>
<thead>
<tr>
<th></th>
<th>Corrugated iron sheets</th>
<th>tiles</th>
<th>concrete</th>
<th>Asbestos sheets</th>
<th>Grass</th>
<th>Maku ti</th>
<th>Tin</th>
<th>Mud / dung</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya</td>
<td>6,389,622</td>
<td>193,792</td>
<td>311,379</td>
<td>197,217</td>
<td>1,194,210</td>
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<td>25,150</td>
<td>69,715</td>
<td>64,866</td>
<td>8,738,097</td>
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<tr>
<td>Nairobi</td>
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<td>95,617</td>
<td>208,148</td>
<td>30,463</td>
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<td>711</td>
<td>4,373</td>
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<td>212</td>
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<td>205</td>
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<td>61</td>
<td>88</td>
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<td>75,287</td>
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Source: NCBS, 2010
Population by Sex, Main type of Disability

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<thead>
<tr>
<th>Location</th>
<th>visual</th>
<th>hearing</th>
<th>speech</th>
<th>Physical/ self care</th>
<th>mental</th>
<th>other</th>
<th>none</th>
<th>total</th>
<th>Percent with disability</th>
</tr>
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<tbody>
<tr>
<td><strong>Kenya</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>153,783</td>
<td>99,978</td>
<td>86,783</td>
<td>198,071</td>
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<td>55,233</td>
<td>60,954</td>
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<tr>
<td>Female</td>
<td>177,811</td>
<td>182,818</td>
<td>161,803</td>
<td>413,698</td>
<td>136,093</td>
<td>99,306</td>
<td>136,093</td>
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<td>280,796</td>
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<td>611,769</td>
<td>211,232</td>
<td>154,539</td>
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<td></td>
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</tr>
<tr>
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<td></td>
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<td></td>
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</tr>
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</table>

Source: NCBS, 2010
Appendix 6. Public Consultation Minutes in the Project File
Appendix 7 – Signing sheets, written submissions and presentations
Appendix 8 – Photos
Air Quality Sampling at near JKIA

Photo 1-Project start point
Photo 2: Airport south road – the project proposes to dual this 3km stretch.

Photo 3: Mombasa road just before Nyayo stadium junction. The project proposes to do an overpass from this point to Museum hill round about.
Photo 4: James Gichuru junction. Another flyover is proposed at this point.

Photo 5: Uthiru area. There is little room for additional lanes here.
Photo 6: Rironi end of proposed project.

Photo 8: Kangemi area. Dense tree growth alongside the road as a result of Nairobi City Council tree planting programme.
Appendix 9 – Summary of WB Safeguard policies
<table>
<thead>
<tr>
<th>Environmental Assessment</th>
<th>The objective of this policy is to ensure that Bank-financed projects are environmentally sound and sustainable, and that decision-making is improved through appropriate analysis of actions and of their likely environmental impacts. This policy is triggered if a project is likely to have potential (adverse) environmental risks and impacts on its area of influence. OP 4.01 covers impacts on the natural environment (air, water and land); human health and safety; physical cultural resources; and Transboundary and global environment concerns. Depending on the project, and nature of impacts a range of instruments can be used: EIA, environmental audit, hazard or risk assessment and environmental management plan (EMP). When a project is likely to have sectoral or regional impacts, sectoral or regional EA is required. The Borrower is responsible for carrying out the EA.</th>
<th>Will be triggered by the project. This ESIA has been prepared to respond to this.</th>
</tr>
</thead>
<tbody>
<tr>
<td>OP/BP 4.04 Natural Habitats</td>
<td>This policy recognizes that the conservation of natural habitats is essential to safeguard their unique biodiversity and to maintain environmental services and products for human society and for long-term sustainable development. The Bank therefore supports the protection, management, and restoration of natural habitats in its project financing, as well as policy dialogue and economic and sector work. The Bank supports, and expects borrowers to apply, a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development. Natural habitats are land and water areas where most of the original native plant and animal species are still present. Natural habitats comprise many types of terrestrial, freshwater, coastal, and marine ecosystems. They include areas lightly modified by human activities, but retaining their ecological functions and most native species. This policy is triggered by any project (including any sub-project under a sector investment or financial intermediary) with the potential to cause significant conversion (loss) or degradation of natural habitats, whether directly (through construction) or indirectly (through human activities induced by the project).</td>
<td>Not triggered by the project.</td>
</tr>
<tr>
<td>OP/BP 4.36 Forests</td>
<td>The objective of this policy is to assist borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development and protect the vital local and global environmental services and values of forests. Where forest restoration and plantation</td>
<td>Not triggered by the project.</td>
</tr>
<tr>
<td>OP/BP 4.09 Pest Management</td>
<td>The objective of this policy is to (i) promote the use of biological or environmental control and reduce reliance on synthetic chemical pesticides; and (ii) strengthen the capacity of the country’s regulatory framework and institutions to promote and support safe, effective and environmentally sound pest management. More specifically, the policy aims to (a) Ascertain that pest management activities in Bank-financed operations are based on integrated approaches and seek to reduce reliance on synthetic chemical pesticides (Integrated Pest Management (IPM) in agricultural projects and Integrated Vector Management (IVM) in public health projects. (b) Ensure that health and environmental hazards associated with pest management, especially the use of pesticides are minimized and can be properly managed by the user. (c) As necessary, support policy reform and institutional capacity development to (i) enhance implementation of IPM-based pest management and (ii) regulate and monitor the distribution and use of pesticides.</td>
<td>The policy is triggered if : (i) procurement of pesticides or pesticide application equipment is envisaged (either directly through the project, or indirectly through on-lending, co-financing, or government counterpart funding); (ii) the project may affect pest management in a way that harm could be done, even though the project is not envisaged to procure pesticides. This includes projects that may (i) lead to substantially increased pesticide use and subsequent increase in health and environmental risk; (ii) maintain or expand present pest management practices that are unsustainable, not based on an IPM approach, and/or pose significant health or environmental risks.</td>
</tr>
<tr>
<td>OP/BP 4.11 Physical Cultural Resources</td>
<td>The objective of this policy is to assist countries to avoid or mitigate adverse impacts of development projects on physical cultural resources. For purposes of this policy, physical cultural resources are defined as movable or immovable objects, sites, structures, groups of structures, natural features and landscapes that have archaeological, paleontological, historical, architectural, interaction with forests; or (ii) aims to bring about changes in the management, protection or utilization of natural forests or plantations.</td>
<td>This policy applies to all projects requiring a Category A or B Environmental Assessment under OP 4.01, project located in, or in the vicinity of, recognized cultural heritage sites, and projects designed to support the management or</td>
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<td>OP/BP 4.10 Indigenous Peoples</td>
<td>The objective of this policy is to (i) ensure that the development process fosters full respect for the dignity, human rights, and cultural uniqueness of indigenous peoples; (ii) ensure that adverse effects during the development process are avoided, or if not feasible, ensure that these are minimized, mitigated or compensated; and (iii) ensure that indigenous peoples receive culturally appropriate and gender and intergenerationally inclusive social and economic benefits.</td>
<td>The policy is triggered when the project affects the indigenous peoples (with characteristics described in OP 4.10 para 4) in the project area.</td>
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<td>OP/BP 4.12 Involuntary Resettlement</td>
<td>The objective of this policy is to (i) avoid or minimize involuntary resettlement where feasible, exploring all viable alternative project designs; (ii) assist displaced persons in improving their former living standards, income earning capacity, and production levels, or at least in restoring them; (iii) encourage community participation in planning and implementing resettlement; and (iv) provide assistance to affected people regardless of the legality of land tenure.</td>
<td>This policy covers not only physical relocation, but any loss of land or other assets resulting in: (i) relocation or loss of shelter; (ii) loss of assets or access to assets; (iii) loss of income sources or means of livelihood, whether or not the affected people must move to another location. This policy also applies to the involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons.</td>
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<td>OP/BP 4.37 Safety of Dams</td>
<td>The objectives of this policy are as follows: For new dams, to ensure that experienced and competent professionals design and supervise construction; the borrower adopts and implements dam safety measures for the dam and associated works. For existing dams, to</td>
<td>This policy is triggered when the Bank finances: (i) a project involving construction of a large dam (15 m or higher) or a high hazard dam; and (ii) a project which is dependent on an</td>
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<td>OP 7.50 Projects in International Waters</td>
<td>The objective of this policy is to ensure that Bank-financed projects affecting international waterways would not affect: (i) relations between the Bank and its borrowers and between states (whether members of the Bank or not); and (ii) the efficient utilization and protection of international waterways. The policy applies to the following types of projects: (a) Hydroelectric, irrigation, flood control, navigation, drainage, water and sewerage, industrial and similar projects that involve the use or potential pollution of international waterways; and (b) Detailed design and engineering studies of projects under (a) above, include those carried out by the Bank as executing agency or in any other capacity.</td>
<td>This policy is triggered if (a) any river, canal, lake or similar body of water that forms a boundary between, or any river or body of surface water that flows through two or more states, whether Bank members or not; (b) any tributary or other body of surface water that is a component of any waterway described under (a); and (c) any bay, gulf strait, or channel bounded by two or more states, or if within one state recognized as a necessary channel of communication between the open sea and other states, and any river flowing into such waters.</td>
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<td>OP 7.60 Projects in Disputed Areas</td>
<td>The objective of this policy is to ensure that projects in disputed areas are dealt with at the earliest possible stage: (a) so as not to affect relations between the Bank and its member countries; (b) so as not to affect relations between the borrower and neighboring countries; and (c) so as not to prejudice the position of either the Bank or the countries concerned.</td>
<td>This policy is triggered if the proposed project will be in a disputed area. Questions to be answered include: Is the borrower involved in any disputes over an area with any of its neighbors. Is the project situated in a disputed area? Could any component financed or likely to be financed as part of the project be situated in a disputed area?</td>
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Appendix 10 – Air Quality Report