

# ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT FOR PROPOSED DISPOSAL SITE AT KAHURU, ENGINEER, NYANDARUA COUNTY

Latitude 0.56927 and Longitude 36.54334



PROPONENT	EIA EXPERT
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**FEBRUARY 2019**

**Certification.**

This environmental impact assessment (EIA) project report was prepared by a registered EIA/EA expert in accordance with environmental (impact assessment and Audit) regulation for submission to the national environmental management authority (NEMA). We the undersigned certify that all information contained in the report is accurate and truthful presentation of all findings relating to the proposed project.

Environmental consultant

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Registration 2147

Signature.....

Date.....

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Date.....

**Proponent**

Ministry of Health Nyandarua County

Name of contact person.....

Designation of contact person.....

Mobile number.....

Signature .....

Stamp.....


Kenya and the implementation of Environmental Management and Coordination (Waste Management) Regulations, 2006, has necessitated the need to develop a waste disposal facility that can cope with the increased demand from domestic waste and at the same time meet the ever demanding regulatory framework. The proponent is county government of Nyandarua, health department who intends to develop a dumpsite to facilitate waste management within Nyandarua County.

The availability of a waste disposal site is not only a critical environmental issue, but an essential economic factor for a country that aspires to grow its base. Most international companies expect

waste management program to be in place that is both economical and meets international standards, especially ISO 14000 considerations. Besides, without the means to dispose wastes, it is not possible to enforce the current environmental legislation.

The dump site at Kahuru in Nyandarua County will increase the handling capacity of domestic waste which will both assist improving hygiene and sanitation of the county

The purpose of this EIA report submission to the National Environment Management Authority (NEMA) is to grant the proponent an opportunity to install built a dump site in the land which is currently left idle. The proposed site is approximately 8 km from Engineer Town. The area is well connected to road that will enable its operators to safely transport wastes by road from across the county for disposal. The site is expected to handle domestic in Nyandarua south.

Upon realization of the growing wastes challenges, the proponent is seeking to build the facility to be able to provide a waste handling capacity to cater for the need of such waste disposal by ever increasing population in the county

In compliance to the Environmental Management and Coordination Act (EMCA), 1999 as well as the related regulations, the proponent has undertaken this EIA Study through a NEMA registered Lead EIA Expert for review and necessary approval purposes.

Our investigation examined the potential impacts of the project on the immediate surrounding with due regard to all the phases through to completing, operation and decommissioning. It encompasses all aspects pertaining to the physical, socio-cultural, health and safety conditions at the site and its environs during and after the project. During the screening exercise, issues identified as those that may be impacted upon by the project activities include: air quality, health and safety, and other environmental hazards and socio-economic welfare of the surrounding communities.

The proposed site will be handling domestic wastes through disposal. It is, therefore, expected that there will be potential emission of various gases and particulate matter into the atmosphere, depositions of particulate matter onto land and vegetation around the site. This scenario implies potential linkages with the surrounding environment and ecological setting that require to be addressed during the construction and upon commissioning. The following sections outline these linkages as well as proposed corrective measures.

## **ANTICIPATED IMPACTS**

### **Positive Impacts**

The disposal site has an overall positive implication to the country, and especially urban, agricultural and industrial sectors. The major threat to the environment and human health today is risks associated with waste management. The result of waste generators disposing wastes without appropriate equipment has been pollution of environmental resources and particularly water sources, air pollution, land contamination and even direct effects to human health. In this regard, therefore, the following are considered main benefits of the disposal site;

- ✦ The facility is a blue print of vision 2030 aimed at having a clean and healthy environment for all. It also encourages private investments in environmental conservation within the country.
- ✦ Cleaning up of domestic wastes from the Nyandarua county residents.
  
- ✦ The facility will provide a safe point for reducing the volumes of domestic waste.
- ✦ The facility will provide a multiple of direct and indirect employment opportunities within the county.

### **Negative Impacts**

The project is anticipated to create negative impacts as well. This will emanate from the construction and subsequent operation activities of the facility. They include the following:

- Air pollution: Emissions released to the atmosphere.
- Impact to soil (soil erosion and degradation) especially when laying the foundation and other earthworks.
- Potential contamination of soil and water; due to oil spills and other leakages/releases.
- The health and safety of workers and immediate residents and neighbours may be compromised due to accidents, pollution and disturbance.
- Impact (constraints/pressure) to the existing infrastructure i.e. water, power, surface drains, roads among others.
- Vegetation clearing
- Visual Intrusion; likely to occur during earthworks for the foundation of the project.
- Increased waste generation (both solid and liquid) during construction and operation phases.

### **Proposed mitigation measures**

To minimize the occurrence and magnitude of the negative impacts, mitigation measures have been proposed against each of the anticipated impact. Some measures have been integrated in the project designs with a view to ensuring compliance with applicable environmental laws and guidelines. The measures include the following:

- Erection of warning /informative signs (bill boards) at the site during the construction phase.
  
- Septic system should be properly designed (using approved materials), installed and regularly maintained to effectively drain effluent.
- Workers should be provided with appropriate personal protective equipment (PPE) to beef up their health and safety and they should be sensitized on EHS safety measures.
- The site should be fenced off during installations to keep off animals and the general public.
- Provision of sound waste management systems and procedures. This will involve provision of solid waste collection bins; segregation of waste at source, appointing a reputable garbage collector etc during operation phase. During the installation phase, the contractor should put in place effective and efficient waste disposal systems. Waste, including

excavated soil and debris should be properly disposed of by backfilling or dumping in approved grounds by the County Government.

- An adequately stocked “First Aid Box” will be provided and the employees at the site will be properly trained on how to administer first aid.
- Following the completion of the construction phase, measures will be undertaken to restore the affected biodiversity through landscaping; i.e. planting of trees and grasses to cover unpaved areas.
- The surface drainage system should direct all potentially contaminated surface waters from the area into waste interceptor. The drainage and interceptor maintenance will be carried out regularly, including cleaning the interceptors of foliage, rubbish and grit.
- Capacity building of the workers and staff; to create awareness towards potential risks and recommended preventive measures through training. This will ensure that health and safety measures are followed. Conduction of regular drills on fire prevention and control will be encouraged to ensure proper preparedness for fire control.
- Formal procedures will be put in place for energy and water saving to optimize their use. A comprehensive firefighting equipment should be provided after completion of the project. This should be installed or provided at strategic points. The fire extinguishers should be serviced accordingly i.e. after every six months to ensure effective and efficient performance when required.
- The contractor and the proponent will implement the proposed mitigation and monitoring plan in order to protect the environment from any negative impacts.
- During the operation phase, conduct annual environment audit, health/Safety and Fire audits.
- Realization of cordial relations among various community, economic, social and cultural groups as well as between the local community and the contractor,
- Soil compaction and watering of loose soils on all unpaved access areas, construction materials at the construction sites to minimize air pollution and erosion by the agents of soil erosion i.e. water and wind.

## **Conclusion**

The proponent should take note that apart from the positive impacts created, the project has negative impacts which should be closely monitored and evaluated. This will ensure that the environment is always safeguarded. It is important that the proponent conducts regular site assessments to provide early indication of leaks or releases of waste into the ground and other potential risks. Considering the proposed project, mitigation measures that will be put in place and the project’s contribution to the environment and economy, its implementation is considered important and beneficial. The key effort should be geared towards safeguarding the environment. This can be effectively overcome through close following and implementation of the recommended Environmental Management Plan (EMP), consequently attaining sustainable development.

It is concluded that the project is important for economic development of the county and has a balanced environmental considerations and benefits. This report gives adequate measures to mitigate the negative impacts and a management plan. The proponent is committed the proposed

measures during the construction, operation and decommissioning phase of the project. Accordingly, as per part 11 section 10 (2) of the Legal Notice No. 101 on The Environmental (Impact Assessment and Audit) Regulations, 2003, we recommend that the project is granted an EIA license.

## ACRONYMS

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EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EMP	Environmental Management Plan
GOK	Government of Kenya
IEA	Initial Environmental Audit
KWS	Kenya Wildlife Services
LPG	Liquefied Petroleum Gas
MENR	Ministry of Environment and Natural Resources
MOH	Ministry of Health
NEC	National Environment Council
Km	Kilometers
NEMA	National Environment Management Authority
NGOs	Non- Governmental Organizations
NPEP	National Poverty Eradication Plan
PPE	Personal Protective Equipment
PCs	Private Companies
SWM	Solid Waste Management
SDP	Spatial Draft Plan
TOR	Terms of Reference
UNEP	United Nations Environmental Programme
AIDS	Acquired Immune Deficiency Syndrome
EIA	Environmental Impact Assessment
ERC	Energy Regulatory Commission
ERP	Emergency Response Plans
MDG's	Millennium Development Goals
WRMA	Water Resources Management Authority
OSHA	Occupation Safety and Health Act
WCC	Waste Collection Centre



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## CHAPTER ONE: BACKGROUND AND RATIONALE FOR THE EIA

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### 1.1. Introduction

*NATURE CONSORTIUM* is registered as a business name in Kenya. It is a business operated by Mr. James Muchemi and Mr. Patrick Muchemi and they have a keen interest in investing in waste management sector in the Kenyan market. Upon realization of the growing domestic wastes challenges, the Company is seeking to conduct an EIA to enable waste handling capacity with enhanced safety and health and without compromising environment and public health. For this reason the proponent has identified and purchased a parcel of land in Kahuru area, Nyandarua County for the sole purpose of establishing a designed work area for disposal.

### 1.2 Project overview and justification

Industrialization in Kenya and the implementation of Environmental Management and Coordination (Waste Management) Regulations, 2006, has necessitated the need to develop a domestic waste disposal facility that can cope with the increased demand from growth of population and at the same time meet the ever demanding regulatory framework. The proponent is Nyandarua county government.

Nyandarua county coupled with population area means that domestic waste production is on the great rise. The area is also characterized by lack of centralized domestic waste disposal

The availability of a disposal domestic waste facility is not only a critical environmental issue, but also an essential economic factor for a country that aspires to grow its economic base. Most international companies expect a domestic waste management program to be in place that is both economical and meets international standards, especially ISO 14000 considerations. Besides, without the means to dispose hazardous wastes, it is not possible to enforce the current environmental legislation.

The management of disposal of domestic wastes in Kenya is regulated under the Environmental Management and Co-ordination Act (EMCA, 1999), EMCA (Waste Management) Regulations (2006). These regulations establish an order of preference for the management of domestic wastes to be: minimization, recycling, treatment, and land filling. The disposal of the domestic waste at Mbuyu area will both assist the economic growth and provide a proper treatment and disposal route that is affordable.

### 1.3 Scope, Objective and Criteria of the Environmental Impact Assessment (EIA)

#### 1.3.1 Scope of the Report

The EIA exercise has been conducted to evaluate the impacts of the proposed domestic disposal site on the environment and proposals have been given on how to eliminate or minimize any

undesirable effects resulting from its implementations (construction, installation and future operations). This report includes an assessment of impacts of the disposal site and operations on the following:

- Physical environment;
- Flora and fauna;
- Land use;
- Socio-economic aspects;
- Health issues;
- Fire response preparedness;
- Spill/leak containment;

The report has assessed the impacts of the proposed Site on the environment in accordance with the EMCA, 1999 guidelines and EIA/EA regulations. The scope of the EIA study covered:

- A review of the policy, legal and administrative framework
- Description of the proposed project
- Baseline information
- Provisions of the relevant environmental laws
- Assessment of the potential environmental impacts on the project area
- Development of the mitigation measures and future monitoring plans

### **1.3.2 Project Objectives**

The purpose of this EIA is to ensure adequate identification of potentially negative environmental impacts. Secondly to propose workable mitigation measures and thirdly to formulate an environmental management plan (EMP) articulating envisaged impacts.

The overall objective of the study on the other hand is to ensure that all environmental concerns are integrated in all the project development processes with an aim of managing domestic waste without compromising the natural environment and the ecology of the area.

Specific objectives include:

- ✦ To identify possible environmental impacts, both positive and negative
- ✦ To assess the significance of the impacts
- ✦ To assess the relative importance of the impacts of relative plan designs, and sites
- ✦ To propose preventive mitigation and compensative measures for the significant negative impacts of the project on the environment.
- ✦ Generate baseline data for monitoring and evaluating how well the mitigation measures are being implemented during the project cycle.
- ✦ To present information on impact of alternatives
- ✦ To present the results of the EIA that can guide informed decision making and safe operation of the disposal site.

### **1.3.3 Terms of Reference (TOR) for the EIA Process**

The TOR for the EIA included but not limited to the following:

- The proposed location of the project
- A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project.
- The objectives of the project.
- The technology, procedures and processes to be used, in the implementation of the project.
- The materials to be used in the construction and implementation of the project.
- The products, by-products and waste to be generated by the project.
- A description of the potentially affected environment.
- The environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated.
- Recommend a specific environmentally sound and affordable waste management system.
- Analysis of alternatives including project site, design and technologies.
- An environmental management plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, timeframe and responsibility to implement the measures.
- Provide an action plan for the prevention and management of the foreseeable accidents and activities in the cause of carrying out development activities.
- Propose measures to prevent health hazards and to ensure security in the working environment for the employees, residents and for the management in case of emergencies.
- An economic and social analysis of the project.
- Such other matters as the Authority may require.

(A copy of the approved terms of reference is hereby attached as annex 1)

### **1.3.4 Data Collection Procedures**

First, the Consultants undertook collection of data, which was carried out through questionnaires/standard interview schedules, use of checklists, observations and photography, site visits, desk top environmental studies and scientific tests, where necessary in the manner specified in Part V (section 31-41) of the Environmental (Impact Assessment and Audit) Regulations, 2003. Then data collected underwent environmental screening and scoping to avoid unnecessary data.

### **1.3.5 EIA Organization and Structure**

The EIA was carried out to full completion within a period of twenty-four (24) days from the date of undertaking. The Consultant (Lead Expert) coordinated the day-to-day functions and any related institutional support matters. The team undertaking the study was charged with responsibilities under the leadership of the team leader for a successful EIA process.

### **1.3.6 Reporting and Documentation**

The Environmental Impacts Assessment Project Report from the findings was compiled in accordance with the guidelines issued by NEMA for such works and was prepared and submitted for consideration and approval. The Consultant ensured constant briefing of the client during the exercise.

### **1.3.7 Responsibilities and Undertaking**

The Consultant undertook to meet all logistical costs relating to the assignment, including those of production of the report and any other relevant material. The consultant arranged for own transport and travels during the exercise. On the site of the proposed project, the proponent provided a contact person(s) to provide information required by the Consultant. The proponent provided details of raw materials, Project cost breakdown, proposed process outline and anticipated by-products, future development plans, operation permits and conditions, land-ownership documents and site history.

The output from the consultants includes the following:

- An Environmental Impact Assessment report comprising of an executive summary, assessment approach, baseline conditions, anticipated impacts and proposed mitigation measures,
- An Environmental Management Plan outline, which also forms part of the report recommendations.

### **1.3.8 Methodology Outline**

Since the proposed site is located within an area with no rich natural resources whose total effect to the surroundings could not be adverse. It also noted that the proposed development and use of facility on completion will greatly promote waste management which is a big issue of concern not only in Nyandarua County but in the Country at large. The general steps followed during the assessment were as follows:

- Environment screening, in which the project was identified as among those requiring environmental impact assessment under schedule 2 of EMCA, 1999
- Environmental scoping that provided the key environmental issues
- Desk Stop studies and interviews
- Physical inspection of the site and surrounding areas
- Reporting

#### **1.3.8.1 Environmental Screening**

This step was applied to determine whether an environmental impact assessment was required and what level of assessment was necessary. This was done in reference to requirements of the EMCA,

1999, and specifically the second schedule. Issues considered included the physical location, sensitive issues and nature of anticipated impacts.

### **1.3.8.2 Environmental Scoping**

The Scoping process helped narrow down onto the most critical issues requiring attention during the assessment. Environmental issues were categorized into physical, natural/ecological and social, economic and cultural aspects.

### **1.3.8.3 Desktop Study**

This included documentary review on the nature of the proposed activities, project documents, designs policy and legislative framework as well as the environmental setting of the area among others. It also included discussions with managers and design engineers as well as interviews with neighbours.

### **1.3.8.4 Site Assessment**

Field visits were meant for physical inspections of the site characteristics and the environmental status of the surrounding areas to determine the anticipated impacts. It also included further interviews with neighbours.

### **1.3.8.5 Reporting**

In addition to constant briefing of the client, this environmental impact assessment project report was prepared. The contents were presented for submission to NEMA as required by law.

## **CHAPTER TWO: PROJECT DESCRIPTION, DESIGN AND CONSTRUCTION**

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### **2.1 Nature of the project**

The proponent intends to develop a waste handling facility by identifying a disposal site at Kahuru located approximately 8km from Engineer. This is necessitated by the increased demand for proper waste handling facility by the increasing population within the county and the desire for maintenance of a clean environment.

### **2.2 Site Location and Ownership**

The proposed project site is located in Kahuru, Engineer. The proposed site is approximately 8km from Engineer in nyandarua south sub county, Nyandarua County. The site is within Kinangop constituency. The site borders Raitha primary school and Raitha secondary school. The proposed site is on coordinates latitude 0.56927 and Longitude 36.54334.

## 2.3 Site characteristics and neighbourhood

During the site assessment the entire piece of land was found idle. The site was seen to have limited vegetation cover including grass. No development was seen within the site. There are very few neighbours. The immediate neighbour is a local resident. The other neighbors are homesteads for persons and the nearest is about 50 meters to the south of the site. This is a sparsely populated area and most of the land is utilized for farming.

The land had been purchased by a land buying company which subdivided the land to its members. Some of these members have further sold or subdivided the land into smaller plots.



The domestic wastes will be collected from residential homes and businesses and within the town central business district and transported to the dumpsite by trucks. The trucks will be offloaded mechanically by tippers or using spades and fork jembes.

The workforce of the dumpsite will comprise county workers who will monitor the operations at the dumpsite.

### 2.4.1 Waste Reception

It is intended that waste will be delivered to the site by road from around Nyandarua South Sub County. Delivery by road will be in compliance with regulations. The waste reception will comprise of;

- The proponent will procure a track and obtain waste transportation license from the National Environment Management Authority.



### **2.4.2 Waste Sorting**

Waste sorting will be done before loading into the tracks. Necessary safety and environmental protection provisions will be provided.

### **2.4.4 Waste Disposal**

The process does not use any water and therefore water will only be used for sanitary and washings within the site. Trenches will be dredged in the site. The domestic waste will be offloaded to the trenches. After they get filled up they will be covered by soil and compressed by a roller

### **2.4.6 Air Quality**

As indicated in the report the area is inhabited and therefore the air quality need to be enhanced by constructing concrete perimeter wall and planting of trees within the region.

### **2.4.7 Support services**

The site will not be complete until support facilities are put into place. These will include;

- (i) Perimeter wall
- (ii) Sanitation facilities (toilets, wastewater drains.
- (iii) Health and safety provisions (signage, exits, first Aid points etc.,)
- (iv)(iv) Security arrangements.

## **2.6 Project Approval**

The project will be developed on land that the proponent already owns.

Acquisition of NEMA approval should be done before commencement of the project.

After the pre-requisites are met the proponent will then commission the development as is planned.

## **2.7 Project Specifications**

The following are specific descriptions of the project;

- a) The project is located in Kahuru village near Raitha primary school, occupy Land reference title No: NYANDARUA/KAHURU/7242
- b) The area has no public sewer line hence the residents rely mainly on septic tanks or the pit latrines.
- c) The solid wastes will be collected by county government trucks

## **2.8 Project work.**

Excavation of the site to a level that will create a platform for dredging of trenches.

## 2.7 Project Activities

### 2.7.1 Pre-Construction stage

#### Project Approvals

The project has been submitted for/ approved by Lead Agencies for implementation as follows:

**Table 2: Approval Lead Agencies**

<u>APPROVING AUTHORITY/CONSULTANT</u>	<u>ACT</u>	<u>STATUS</u>	<u>REMARKS</u>
Physical planning	Physical Panning act, Cap. 286	The Change of use has been submitted to the county Government of Nyandarua	Advertisements have been made in the local newspaper and no objection was made. Waiting for the approvals.
NEMA	EMCA 1999	This report	To review the report for approval and licensing.

### 2.5.3 Operations

Once the development is completed, the proponent will use the facility to dispose domestic waste collected from Nyandarua county. Maintenance activities will include routine checks and other necessary repairs. Workers will be fully employed on site including the truck drivers who will be transporting the waste for disposal.

### **Solid waste management;**

The project proponent will provide facilities for handling hazardous waste. These will include dustbins/skips for temporarily holding hazardous waste within the premises before final disposal at the designated dumping site by NEMA approved hazardous waste handling company.

considered:

#### **Demolition works**

Upon decommissioning, refilling will be done using soil and compaction done. Trees will be planted

#### **Site restoration**

The site will be restored through replenishment of the topsoil and re-vegetation using indigenous plant species.

## **CHAPTER THREE: METHODOLOGY AND BASELINE INFORMATION**

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### **3.1 Methodology**

The preparation of an Environmental Impact Assessment report is a multi-disciplinary process that requires use of various approaches and data collection methods. In this particular survey, public participation and consultation was widely used and the bottom-top approach of participation applied. Both scientific and social data collection methods were used and they included the following:

#### **3.1.1 Questionnaires**

Questionnaires were administered to the neighboring developments randomly to seek their opinion on the proposed development. The questions to the respondents, contained in the questionnaire, were asked and responses recorded by the interviewer. (*Attached annex 4*)

#### **3.1.2 Observations**

Field observations formed an integral part of the report as the experts gathered considerable information through observations. This involved site visits and recording the situation on the ground. Observations were also used as a tool for verifying the facts that were gathered through interviews and questionnaires.

#### **3.1.3 Photography**

Photos were taken to show the actual site of the proposed development, resources on site and neighboring development.

### **3.1.4 Secondary data**

1. Various literatures were used in aiding the successful completion of the report. They include: The Kenya Gazettes Supplement Acts 2000, Environmental Management and Coordination Act No.8 of 1999. Kenya Gazette Supplements Acts, Physical Planning Act-Cap 286 of 2009. Kenya Gazette Supplement No. 56, Environmental Impact Assessment Audit regulations 2003. Environmental Management and Coordination (Waste Management) regulations, 2006 Legal Notice No.12, the Public Health Act, (Cap 242), the factories and other places of work Act and Water Act 2002, draft of the Wetlands Policy 2008 among others.

### **3.2 Background Information of the Project Area**

Nyandarua County is a County in the former Central Province of Kenya. Its capital and largest town is Ol Kalou. Formerly the capital was Nyahururu, which is now part of the Laikipia County. It neighbours Laikipia, Nakuru and Murang'a Counties.

#### **Geographical conditions**

The County's total area is of 3,304 km<sup>2</sup>a total population density of 596,268 as per the year 2009 National population census. It has five constituencies: Kinangop, Kipipiri, Ol Joro Orok, Ndaragwa Ol Kalou.

### **3.4 Climate and physical features**

There are several geographic features in the Nyandarua County, namely Lake Olbolosat and Aberdare ranges. These features have an adverse effect on the climatic and weather patterns experienced in the county however climate change and global warming also affects the weather components in the region. The average altitude of Engineer town is approximately 2373 metres above the sea level and this explains the temperature regimes experienced in the county.

The average temperatures range between 10 degrees Celsius and 20 degrees Celsius, the cold season is experienced in July and August while the hot season is experienced in January and March. The rains are received in two seasons whereby the long rains are experienced in April, May and August while the short rains are experienced between October and December. The average annual rainfall is approximated to be 850mm per year and this enables the farmers in Nyandarua County to practice crop farming.

The predominant soil type is loam and contains all the plant nutrients required for plant growth. Due to the good soil cover in the region, soil erosion is not major problem here.

## **CHAPTER FOUR: ENVIRONMENTAL LEGISLATIVE AND REGULATORY FRAMEWORK**

- The Environment (Impact Assessment and Audit) Regulations, 2003
- The Environment Management and Co-ordination Act-1999

- Environmental Management and Coordination (Waste Management) Regulations, 2006 Legal Notice No.121
- Government of Kenya Energy Policy and Plan of Action
- Energy Act, 2006
- The Water Act, 2002
- Water Quality Regulation
- The Physical Planning Act Cap 286
- The County Government Act No. 17 of 2012
- Public Health Act, Cap 242
- The Way Leaves Act
- The Occupational Safety and Health Act, 2007
- Policy Guidelines on Environment and Development (Sessional paper No.6 of 1999)
- National Policy on Water Resources Management and Development
- Penal Code Act (cap.63)
- Compliance of Solid Waste Management Legal Notice No. 121
- The Noise and Excessive Vibrations Act, 2009
- Work injury benefits Act-Act No.13 of 2007
- Kenya's Vision 2030
- National Environmental Action Plan (NEAP)
- The Land planning act (Cap 303)
- The Land Registration Act, No.5 of 2012

#### **4.2 The Constitution of Kenya**

This is the principal guiding law in the country from which all the subsidiary laws are drawn from. **Article 42** of the Bill of Rights of the Constitution grants every person has the right to a clean and healthy environment and thus forming a basis for this report.

#### **4.3 The Environment (Impact Assessment and Audit) Regulations, 2003**

On June 13<sup>th</sup> 2003, the Minister of Environment, Natural Resources and Wildlife promulgated the Environment (Impact Assessment and Audit) regulations 2003 (EIA/EA Regulations) under section 147 of the EMCA. These regulations provide the framework for carrying out EIAs and EAs in Kenya.

#### **4.4 The Environmental Management and Coordination Act (EMCA)-1999**

This is an Act of parliament to provide for the establishment of an appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto. Part VII on Environmental Audit and Monitoring section 58 specifically detail the need to undertake Environmental Impact Assessment of all projects likely to cause negative impacts to the environment as listed in the second schedule of the act. Further, part V of the Environmental Impact Assessment and therefore mandatory that an Environment Impact Assessment process. It is therefore mandatory that an Environmental Impact Assessment

must be undertaken by all ongoing projects to ensure that the activities at their premises comply with all legal and institutional frameworks that are in place to safeguard the environment, health and safety of the workers.

#### **4.5 Environmental Management and Co-ordination (Waste Management) Regulations, 2006 Legal Notice No.121**

**1)** No person shall dispose off any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle.

**2)** A waste generator shall collect, segregate and dispose such waste in the manner provided for under these regulations.

5 (1) A waste generator shall minimize the waste generated by adopting the following cleaner production methods:

a) Improvement of production process through

i) Conserving raw materials and energy ii)

Eliminating the use of toxic raw materials; and

iii) Reducing toxic emissions and waste

b) Monitoring the products cycle from beginning to end by-

i) Identifying and eliminating potential negative impacts of the product; ii)

Enabling the recovery and re-use of the product where possible; and iii)

Reclamation and recycling; and

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

#### **4.6 The Water Act, 2002**

Part II, section 18, of the water Act 2002 provides for national monitoring and information systems on water resources. Following on this, sub-section 3 allows the water Resources Management Authority to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may require to be kept by a facility operator and the information thereof furnished to the authority. Section 73 of the act allows a person with license (licensee) to supply water to make regulations for purposes of protecting against degradation of water sources. Section 75 and sub-section 1 allows the licensee to construct and maintain drains, sewers and other works for intercepting, treating or disposing of any foul water arising or flowing upon land for preventing pollution of water sources within his/her jurisdiction. The proponent intends build a septic system for use within the premises.

#### **4.7 Water Quality Regulation Part II**

Every person shall refrain from any act which directly or indirectly causes or may cause immediate or subsequent water pollution and it shall be immaterial whether or not the water resource was polluted before the enactment of the act.

2. No person shall throw or cause to flow into or near a water resource, liquid, solid or gaseous substance or deposit any such substance in or near, as to cause pollution.

No person shall:

- a) Discharge, any effluent from sewerage treatment works industry or other point source into aquatic environment without a valid effluent discharge license issued in accordance with the provisions of the act.
- b) Abstract ground water or carry out any activity near any lakes, rivers, stream, springs and wells that is likely to have any adverse impact on the quantity and quality of the water without an Environment Impact Assessment license issued in accordance with the provisions of the Act;  
Or
- c) Cultivate or undertake and development activity within a minimum of six meters and a maximum of thirty meters from the highest ever recorded flood level, on either side of a river or stream, and as may be determined by the authority from time to time. The proponent intends to use septic system to mitigate against pollution of any neighboring water resources. Karoroha river is approximately 5 km from the project site so the proposed project shall not interfere with this resource. Measures will be put in place to ensure this no waste is transported to the river including properly covering tracks transporting waste.

#### **4.8 The Physical Planning Act Cap 286**

Section 29 states that each County authority shall have powers to control the use and development of land and buildings in the interest of proper and orderly development of its area. This includes prohibition or control of subdivision of land or plots into smaller units. The section also empowers the County authority to formulate by-laws to regulate zoning in respect to use and density of development.

#### **4.9 The County Government Act No. 17 of 2012**

Under the new constitution of Kenya, County Governments have taken over what used to be previously the functions of County authorities. The act has given power to the County government to control or prohibit all developments, businesses, factories and other activities. This include any proposed project which, by reason of smoke, fumes, gases, dust, noise or other cause may be or become a source of danger, discomfort or annoyance to the neighborhood, and to prescribe conditions subject to which such business, factories, yards etc shall be carried. The new constitution grants county governments the powers to grant or to renew business licenses or to refuse the same.

To ensure implementation of the provisions of the new constitution, the county governments are 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. This includes construction and maintenance of water supply, sewage and solid waste management systems.

The proponent has applied for approvals from the Nakuru county Government to commence the development.

#### **4.10 Public Health Act (Revised 1986)**

Under this Act, every County authority or health authority is mandated to take all lawful, necessary and reasonable practicable measures to prevent all injurious conditions in premises, construction condition or manner of use of any trade premises. Nuisances under this act include any noxious matter or waste water, flowing or discharged from any premises wherever situated, into any public street, or into the gutter or side channel of any street or water course, or any accumulation or deposit of refuse or other offensive matter. Every council and every urban area council may make by-laws as to buildings and sanitation. The proponent has made arrangements for the discharge of waste water into the septic system which is to be developed.

#### **4.12 Occupational Safety and Health Act, 2007)**

The Act makes provision for the health, safety and welfare of persons employed in workplaces. The provisions require that all practicable measures be taken to protect persons employed in a workplace from dust, fumes or impurities originating from any process within the facility. The provisions of the Act are also relevant to the management of hazardous and non-hazardous wastes, which may arise at a project site.

For developments such as construction projects, the Act is important as it requires project proponents to have adequate management procedures of occupational safety and health at the work places. In particular, the project should be implemented during construction in accordance with the requirements of the Building and Works of Engineering Construction Rules, which is a subsidiary legislation of the Occupational Safety and Health Act, 2007. For safe construction works, the contractor and project managers should ensure the following:

- Provision of Personal Protective Equipments (PPEs), fire safety, electrical safety, and other precautions essential for safe construction work.
- Provision of Physical barriers and solid separators (dust barriers, hazard barriers, temporary walkways, among others as explained in the project Environmental Management Plan.)
- Inspection of construction equipment to ensure that they are in good working condition before beginning a job. In addition, the proponent will ensure that regular inspections and maintenance of the equipment are conducted accordingly.
- Provision of a First Aid Kit stocked in accordance with the First Aid Rules, 1977 and also ensures availability of a trained First Aider at all working times.

#### **4.13 Policy Guidelines on Environment and Development (Sessional paper No.6 of 1999)**

Among the key objectives of the policy paper on Environment and Development (Sessional paper No.6 of 1999) are to ensure that from the onset, all development policies, programmes and projects take environmental considerations into account and to ensure that an immediate environmental impact assessment (EIA) report is prepared for all kinds of developments before implementation.



Under this paper, broad categories of development issues among them the human settlement sector, have been covered that require sustainable approach. The policy recommends the need for enhanced re-use/recycle of residues including wastewater, use of low non-waste technologies, increased public awareness and appreciation of clean environment. It also encourages participation of stakeholders in the management of wastes within their localities. Regarding human settlement, the paper encourages better planning in both rural and urban areas and provision of basic needs such as water, drainage and waste disposal facilities among others. The proponent intends to adhere to these provisions.

#### **4.14 National Policy on Water Resources Management and Development**

While the National Policy on Water Resources Management and development (1999) enhances a systematic development of water facilities in all sectors for the promotion of the country's socio-economic progress, it also recognizes the by-products of these processes as waste water. It, therefore, calls for the development of appropriate sanitation systems to protect people's health and water resources from pollution. Projects therefore, should be accompanied by corresponding waste management systems to handle the waste water and other wastes emanating there from. The same policy requires such projects should undergo comprehensive Environmental Impact Assessment. The proponent has addressed all these and this report forms the basis.

#### **4.18 Penal Code Act (cap.63)**

Section 191 of the penal codes states that any person or institution that voluntarily corrupts or viols water for public springs or reservoirs, rendering it less fit for its ordinary use its guilty for an offence. Section 192 of the same act says a person who makes or vitiates the atmosphere to make it noxious to health of person/institution is dwelling on business premises in the neighborhoods or those passing along public way, commits an offence. The proponent should implement the EMP in this report to address any issue that may arise.

#### **4.19 Compliance of Solid Waste Management Legal Notice No. 121**

The environment management and coordination Legal Notice No. 121 on (Waste Management) provides for the responsibility of waste generation, cleaner production methods, segregation of waste by generator, waste transportation license responsibility of waste transporter, transportation of waste by licensed transporters, license for disposal facility, waste treatment by operators of disposal sites, requirement of environmental audit and reuse and recycling plant. The legal notice provides mitigation measures to industrial waste and their treatment. The hazardous and toxic wastes have been specified by the legal notice that also provides for various requirements of EIA. Details on how toxic and hazardous waste should be handled, stored, treated, transported and even provision of permits. This has to apply to pesticides and toxic substances, biomedical waste, and radioactive waste whereby collection, transportation, storage, treatment and disposal of them have been specified. The legal notice further specifies offence, penalties and operation of regulation that have to be followed when dealing with any type of waste. The proponent will have to adhere to legal notice No 121 in its project cycle that is from construction, operational and decommissioning of the incinerator.

*The proponent is environmental management company characterized by presence of environmental experts. The proponent will fully adhere to the legal notice No. 121 in its project cycle that is from construction, operational and decommissioning of the incinerator. The proponent is also intends to apply for waste transportation license from the Authority.*

#### **4.20 Noise and Excessive Vibrations Act, 2009**

Under this Act, except as otherwise provided in these regulations, 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.

*The proponent will adhere to this provision installing modern machinery which are silenced and environmentally friendly.*

#### **4.21 Work injury benefits Act-Act No.13 of 2007.**

It is an act of Parliament to provide for compensation to workers for injuries suffered in the course of their employment. It outlines the following:

- Employer's liability for compensation for death or incapacity resulting from accident;
- Compensation in fatal cases;
- Compensation in case of permanent partial incapacity;
- Compensation in case of temporary incapacity;
- Persons entitled to compensation and methods of calculating the earnings;
- No compensation shall be payable under this Act in respect of any incapacity or death resulting from a deliberate self-injury;
- Notice of an accident, causing injury to a workman, of such a nature as would entitle him for compensation shall be given in the prescribed form to the director.

*The contractor will need to abide by all the provisions of WIBA. During the operation the occupier must also ensure that this legal provision is complied with.*

#### **4.22 Kenya's Vision 2030.**

Efficient waste management infrastructure for transport and treatment of solid waste is imperative for the desired Kenya's socio-economic transformation and has been identified as a central pillar in Vision 2030. Clean environment has likewise been identified as one of the infrastructural enablers of economic, social and political pillars of Kenya's Vision 2030.

Kenya aims to be a nation that has a clean, secure and sustainable environment by 2030. The goals for 2012 are:

- (i) to increase forest cover from less than 3% at present to 4%; and (ii)  
to lessen by half all environment-related diseases.

Specific strategies will involve promoting environmental conservation in order to provide better support to the economic pillar flagship projects and for the purposes of achieving the Millennium Development Goals (MDGs); improving pollution and waste management through the design and

application of economic incentives; and the commissioning of public-private partnerships (PPPs) for improved efficiency in water and sanitation delivery. Kenya will also enhance disaster preparedness in all disaster-prone areas and improve the capacity for adaptation to global climatic change. In addition, the country will harmonize environment related laws for better environmental planning and governance.

*The proponent is hence committed to promoting the vision by installing the proposed incinerator. The proponent's intervention is based on realization that effective and reliable waste management infrastructure is critical in promoting the country's ability to manage solid hazardous wastes produced in different industrial and farm setup.*

#### **4.23 National Environmental Action Plan (NEAP)**

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

#### **4.25 The Land planning act (Cap 303)**

Section 9 of the subsidiary legislation (the development and use of land Regulations 1961) under which it requires that before the local Authority to submit any plans to then minister for approval, steps should be taken as may be necessary to acquire the owners of any land affected by such plans. Particulars of comments and objections made by the landowners should be submitted, which intends to reduce conflict of interest with other socio economic activities.

*The proponent has initiated the process of submitting all the plans and other relevant document to the Nakuru County Council to ensure all the approvals are obtained.*

#### **4.26 The Land Registration Act, No.5 of 2012**

An Act of Parliament to revise, consolidate and rationalize the registration of titles to land, to give effect to the principles and objects of devolved government in land registration, and for connected purposes. The Act has repealed the following land related laws:

- i. *The Indian Transfer of Property Act 1882*
- ii. *The Government Lands Act, (Cap 280)*
- iii. *The Registration of Titles Act, (Cap 281)*
- iv. *The Land Titles Act, (Chapter 282)*
- v. *The Registered Land Act, (Cap. 300)*

Section 26 of the Act states that Certificate of title to be held as conclusive evidence of proprietorship, except:

- a. on the ground of fraud or misrepresentation to which the person is proved to be a party; or
- b. Where the certificate of title has been acquired illegally, unprocedurally or through a corrupt scheme.

*The project proponent has legally acquired this piece of land in possession of title deed.*

## **CHAPTER FIVE: ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES**

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### **5.1 Anticipated Impacts**

Impacts can be positive and negative, direct or indirect. Environmental impacts for the project are determined by breaking down the project into its activity components and examining the tasks in each component. Once the environmental impacts have been identified, mitigating measures are then prescribed and subsequently, an Environmental Management Plan (EMP) is formulated for the project. The Environmental Impacts of the project and the mitigation measures of the negative impacts are listed in the below:

#### **5.1.1 Loss of Biodiversity**

The site has vegetation cover including the grass and shrubs. The proponent intends to clear part of the land to create room for developing the proposed disposal site. On completion of the development it is recommended that the proponent should plant trees on the unoccupied land to attain aesthetic beauty.

#### **Mitigation:**

- After completion of the project the proponent should rehabilitate the land by planting trees and ornamental flowers on the disturbed and undisturbed areas.
- Project implementation should disturb as little area as possible in order to minimize potential impacts to biodiversity.

#### **5.1.2 Air Quality/Particulate Matter (Dust)**

Vehicular/ equipment engine exhaust emissions will be minor and temporary during construction. Air quality impacts will be temporary during construction. The project will not generate significant vehicle trips to the area. Vehicular and equipment exhaust emissions during project operations will, thus, have a minor incremental/cumulative impact locally and regionally. Particulate matter (dust) would be generated by grading, excavation and the movement of construction vehicles.

During the operations major potential point sources of particulate matter (chemical residuals, smoke and dust) and gaseous emissions in and around the proposed premises are expected to be as follows;

- Holding areas for the disposal waste materials as received will likely be sources of dust, particularly from the transfer process. The wastes are obtained from a wide range of background with varying components and hence quality of related particulate matter discharged into the air. Particulate matter could contain chemical pollutants, organic pollutants, bacterial contaminants all of hazardous/toxic characteristics,

Impacts associated with the above air pollution would include;

- Health effects mainly bronchial infections, skin problems, visibility, etc. are likely effects from uncontrolled air pollution. This could affect the employees and the immediate residents and communities
- Soil quality degradation that may result from deposition of pollutants from the plant operations or carried to other areas through surface runoff,
- Pollution of water sources through direct deposition, surface runoff and/or infiltration into groundwater aquifers,

**Mitigation:**

- Vehicle speeds in the construction area will be limited to minimize dust in the area.
- Discourage idling of vehicles i.e. vehicle and equipment will be turned off when not in direct use to reduce exhaust emissions.
- Regular maintenance of construction plants and equipments.
- The management will sensitize the employees on sound environmental management
- Provide personal protective equipment such as, nose masks, goggles to the workers on site
- The construction contractor will water the site with exposed soil surfaces twice each day during dry weather.
- Domestic wastes holding site require to be kept moist at all times to prevent dust emission into the atmosphere and the windward side of the site during deliveries, inhouse movement or just in storage,

**5.1.3 Effluent disposal**

Developers who construct projects without planning on how effluent will be disposed appropriately, channel their run off (raw sewage) to water bodies, or dispose carelessly to the environment.

The project area is not served with a sewer line hence the proponent should build and utilize septic system to cater for runoff during rainy season . The proponent should ensure that the septic systems are regularly maintained and kept very clean.

### ***Operation phase.***

Discharging runoff water into open drainage system around the premises would subsequently be carried into public water sources through surface runoff. Pollutants in this case include waste residuals, suspended solids, oils and lubricant residuals as well as mixture of contaminants brought along the waste materials. This has potential impacts on people's health and the aquatic life. The proponent will hence be expected to direct the effluent from the facility to the septic system.

*The effluent is mainly from surface run off.*

### **Mitigation measures**

The following are basic aspects for inclusion in the site design and the wastewater handled in accordance with waste regulations Legal Notice No. 120 of September 2006;

- Construct a concrete slab for holding of the scrap metals coming from the field. The waste slab should also be fitted with surface runoff traps from which the leachate should be handled as waste water.
- Surface runoff and spills from the area should be collected and channeled into an interception chamber, stabilization/ sedimentation tank and a treatment facility before discharge.
- Maintain appropriate records on wastewater quality for compliance evaluation and comparison with NEMA/KEBS recommended standards on a continuous basis.

### **5.1.4 Occupational Health and safety**

During construction, there will be increased dust, noise and air pollution. The immediate neighbors and workforce involved would be more subjected to these environmental hazards. Food for the construction workforce is usually provided by mobile individuals who usually operate without licenses. This can compromise health of the workers especially if foodstuffs are prepared in unhygienic conditions

### ***Operation phase.***

Health risks are found in the management of the waste holding areas, the transfer routes and preparation procedures. The risks including exposing the workers to a wide range of chemical poisoning, toxicity or long term health complications. The neighbourhood could also be affected through wind or surface runoff transferring contaminants from the scrap holding areas to the external environment,

### **Mitigation measure:**

- All workers should be provided with protective gear. These include working safety boots, overalls, helmets, goggles, earmuffs, respirators/masks and gloves.
- Construction crew at the site will be sensitized on social issues such as drugs, alcohol, diseases.
- A first aid kit should be provided within the site. This should be fully equipped at all times and should be managed by qualified person.

- The contractor should have workmen's compensation cover. It should comply with workmen's compensation Act, as well as ordinances, regulations and union agreements.
- Adequate sanitary facilities should be provided and standard cleanliness maintained.
- Food handlers preparing food for the workers at the site should be controlled and monitored to ensure that food is hygienically prepared
- – Regular maintenance of machinery on site.
- Workers should be provided with evacuation procedures in case of fire.
- Safe operation procedures/ clear instruction provided to the workers to ensure that safety is maintained.
- Conducting risk assessments before the work commences to ensure that hazards are identified and eliminated before the work commences.

### **5.1.5 Soil Erosion**

In this particular project, soil erosion might be an environmental issue of concern although this will not be more pronounced if on excavation, leveling of the soil to be done. There will be some soil disturbance which would expose and set the soils loose to the agents of soil erosion water.

#### **Mitigation Measures**

- Avoid unnecessary movement of soil materials from the site.
- Provide soil conservation structures on the areas prone to soil erosion mostly to reduce impact by the run-off.
- Control construction activities especially during rainy conditions
- Re-surface open areas after completion of the project and introduce appropriate vegetation.
- Provide suitable storm water drainage channels to effectively discharge water to safe areas. Channels need to be regularly maintained and repaired to avoid point discharge incase of breakages or blockages.
- Conduct landscaping after the project completion to maximally control any possible chance of soil movement.

### **5.1.6 Surface drainage**

Good drainage system is used to prevent land near human settlement from becoming saturated with water which collects or accumulate/ flood after a downfall or from other sources. Poor drainage causes dampness to building structures as well as water stagnation. Dampness is influenced by poor drainage, in the presence of warmth and darkness, breeding grounds for malarial and other diseases can be directly traced from it. Drainage of the general property/premise comes in handy to enhance effective flow of the much anticipated surface run-off emanating from the roof catchments and other areas within the site. Drainage in the proposed project area is well

maintained, however, the County should make arrangements to improve the drainage system to be commensurate with the increase in population within the area.

### **Mitigation**

- During construction, the design of the drainage system should ensure that surface flow is drained suitably into the public drains provided to control flooding within the site.
- Drainage channels should be installed in all areas that generate or receive surface water such as car parking, drive ways and along the building block-edges of the roofs.
- Channels should be covered by approved materials to prevent occurrence of accidents and entry of dirt that would compromise flow of run-off.
- Drainage channels should ensure safe disposal of run-off/surface water and should be self-cleaning
- Paving of the sideways, driveways and other open area should be done using pervious materials to encourage recharge and thus reducing water runoff volume.

### **5.1.7 Solid Waste**

Waste collection within the area boundary is the responsibility of the Nyandarua County government, but since the County government is faced with many challenges, solid waste management being among them; private companies have come in to offer such services. Developers should comprehensively address the issues of waste in their planning before doing any construction to avoid creating illegal dumping sites within the area which pose a health risk to the residents.

### **5.1.8 Noise**

Like dust emissions, construction hand tools and transport trucks will be a major source of noise to the surrounding areas. It was noted that the immediate land has not been fully developed and hence effects of noise during construction/installation will not have any significant social implications.

#### ***Operation phase***

The proposed plant operations are likely to generate considerable noise levels from deliveries of domestic wastes, movement of waste materials from one point to another within the site. This situation is likely to have occupational health and safety implications as well effects to the workers. Currently, there are settlements in the immediate neighborhood, this imply that noise levels be maintained at the recommended levels of 45dBA at the residential areas during the night and 45dBA during the day with an occupational noise levels of 75dBA.

#### **Mitigation Measures:**

- Construction works should be carried out only during the specified time of 0800hrs to 1700hrs.
- Machinery should be maintained regularly to reduce noise resulting from friction



- There should not be unnecessary honking of the involved machinery
- Provision of billboards at the construction site notifying of the construction activity and timings

- Sensitize drivers of construction machinery on effects of noise
- Billboards will be suitably erected on the start of the project to psychologically prepare the people in the vicinity.
- Construction activities to be restricted to day time
- Workers in the vicinity of high-level noise to wear safety and protective gears
- Provide barriers such as walls around site boundaries to provide some buffer against noise propagation.

### **5.1.9 Soil Compaction**

The site preparation process will lead to the area at the site and area near the site to undergo some compaction.

#### **Mitigation Measure:**

- The proponent at the decommissioning phase will rehabilitate the land by loosening the soil which would be compacted by the project.
- The contractor will always use a predetermined route to the site.
- Unnecessary heavy machines will be avoided
- Use of cheap tools like jembes, forks and shovels will be encouraged to do the ground breaking
- Operations will be timed to take place during the dry season when the soil are dry to reduce the risk of soil compaction

### **5.2 Summary of the Mitigation Measures**

One of the objectives of the environmental assessment has been to identify measures to be taken by the proponent to mitigate environmental impacts. These will include:

- A code of practice to minimize construction noise, vibration dust and disturbance of the site.
- Planting of trees, and wild flowers to supplement the ground cover on the excavated area.
- Application of soil conservation measures to reduce surface runoff during wet seasons and especially during construction phase.
- Recovery of all debris generated and reuse of materials where possible e.g. the stone chippings which can be used as hardcore.
- Recycling and reuse of appropriate materials.

- - Provision of security measures to deter intruders and protect them from the risk of injury; and fitting of noise mufflers on generator exhausts.  
Installation of oil/diesel separators on site especially where there is storage of machinery or petroleum products e.t.c to keep oils from storm runoff.
  - Predetermined route to the site, oil spillages will be minimized by using right machinery that are regularly serviced and operators who are qualified following the operations instructions strictly.
  - The contractor will ensure management of excavation activities, if any- the activities will be controlled especially if construction will take place during rainy season.
  - After construction the proponent shall rehabilitate the land by removing any unnecessary materials that shall be covering the land and preventing natural biodiversity.
  - To minimize potential impacts to bio diversity, grass cover that does not interfere with the sitting of the project will be left intact,
  - Sensitize drivers of construction machinery on effects of noise; billboards will be suitably erected on the start of the project to psychologically prepare the people in the vicinity.
  - Signs must indicate and inform the public when the works start and when it will be completed, construction activities to be restricted to daytime to avoid accidents and possible harm to gears provide barriers such as walls around site boundaries to provide some buffer against noise propagation.
  - Vehicle speeds in the construction area will be limited to minimize dust in the area, discourage idling of vehicles i.e. vehicle and equipment engines will be turned off when not in direct use to reduce exhaust emissions.
  - Regular maintenance of construction plant and equipment, engage sensitive construction workers.
  - Provide personal protective Equipment such as nose masks to the workers on site, the construction contractor will water the site with exposed soil surface twice each day during dry weather.
  - All residual waste materials to be recycled sold or disposed in an environmentally friendly manner. Wastes will be properly segregated and separated to encourage recycling of some useful wastes; dustbins will be provided at the construction site.
  - A first aid kit will be provided within the site and it will be fully equipped at all times.
  - Sanitary facilities will be provided, local individuals preparing food for the workers at the site will be controlled to ensure that food is hygienically prepared
  - Construction crew at the site will be sensitized on social issues such as drugs, alcohol, diseases, ensuring proper solid waste disposal and collection facilities, ensure effective waste water management.

- - Provision of safe drinking water, contractor to take an insurance cover for workers in case of major accidents on site.  
Unauthorized persons will be restricted from site, enforce speed limits for construction vehicles especially along roads leading to the site, provide bill boards at the site/entrance to notify motorists about the development, put up warning signs like “speed limit 10kph”, “heavy vehicles” etc.
  - For the prevention of accidents, the contractor shall adhere to the guidelines under the factories and other places of work act.

## **CHAPTER SIX: ANALYSIS OF PROJECT ALTERNATIVES**

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This section analyses the projects alternatives in terms of site, technology scale and waste management options.

### **6.1 Relocation Option**

The proponent has full ownership of the parcel of land (*see attached title deed – annex 2*) in anticipation of putting up the proposed waste disposal site. Relocation options means that the proponent will look for a different plot to establish the proposed development, bearing in mind that the land owner does not have another site in the area. This means that he has to look for land elsewhere. Searching for land to accommodate the space and size of the project and completing official transaction it may take a long time although there is no guarantee that such land could be available in the area. The developer will spend another one year planning and pulling all the resources together. Project design and planning before the stage of implementation will cost the developer another large sum of money. Whatever has been done and paid up to this level will be counted as a loss to the developer.

Assuming the proposed project will be given a negative response by the relevant authorities including NEMA, the project will be delayed for about two year’s period before implementation. During this period the proponent will not utilize the land leaving it idle with no returns, a delay that the proponent can ill afford. This will also lead to a situation like no other project alternative option; the other consequences of this will be an environmental hazard in the county since there is no other disposal site.

### **6.2 No project Alternative**

The no project alternative option in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from the extreme environmental perspective as it ensures non-interference with the existing conditions. Under no project alternative, the proponent’s proposal would not receive the necessary approval from NEMA, proposed project would not be done and there would be no domestic waste disposal. This option will however, involve several losses both to the proponent and the Nyandarua county residents as a whole.

The no project option is the least preferred from the socio-economic and partly environmental perspective due to the following factors;

- Discouragement for environmentalist.
- Land will still remain idle
- No employment opportunities will be created for Kenyans bearing in mind that the proposed project will have employment opportunities both directly or indirectly during construction and operations phases and thus improve lifestyles and livelihoods
- Local skills would remain under utilized
- Development of infrastructural facilities (energy facilities, roads, electrical etc. will not be undertaken).
- Vision 2030 will be far from being achieved/ attained bearing in mind that this is one of sector which need infrastructural improvement to gear the nation towards realization of vision 2030.

From the analysis above, it becomes apparent that the No Project alternative is no alternative to the local people, and the government of Kenya.

### **6.3 Analyses of Alternative Construction Materials and Technology**

The proposed project will be done using modern, locally and internationally accepted standards to achieve public health safety, security and environmental aesthetic requirements. Equipments that save energy and water will be given first priority without compromising on cost or availability factors.

### **6.4 Waste Water (Effluent) Management alternatives**

**1. Use of stabilization ponds/lagoons:** This refers to the use of a series of ponds/lagoons which allow several biological processes to take place, before the water is released back to the river. The lagoons can be used for aquaculture purposes and irrigation. However, they occupy a lot of space but are less costly. No chemicals are used/heavy metals sink and decomposition processes take place. They are usually a nuisance to the public because of smell from the lagoons/ponds. This option is not preferable in the area because the required space is not only available, and the surrounding community is not likely to accept the option.

**2. Use of Constructed/Artificial wetland:** This is one of the powerful tools/methods used in raising the quality of life and health standards of local communities in developing countries. Constructed wetland plants act as filters for toxins. The advantages of the system are the simple technology, low capital and maintenance costs required. However they require space and a longer time to function. Long-term studies on plant species on the site will also be required to avoid weed biological behavioral problems. Hence it is not the best alternative for this kind of project.

## 6.6 Comparison of alternatives

The proposed project is the best alternative since it will provide domestic waste management facility within Nyandarua County. In addition to this the facility will lead to revenue for the proponent and the government, improvement in service (domestic waste) delivery and will create employment opportunities for more people.

# CHAPTER SEVEN: PUBLIC PARTICIPATION

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## 7.1 Introduction

One of the key information sources used during the EIA exercise was the consultative public participation, through administration of standard questionnaires. This exercise was carried out on 18-19<sup>th</sup> Dec 2018 by qualified environmental experts via administration of pre-designed questionnaires and by interviewing neighbours surrounding the proposed project site. The positive and negative views regarding the project were sought from the project site neighbours and other stakeholders.

## 7.2 Objectives of the Consultation and Public Participation

The objective of the consultation and public participation was to:

- a) Disseminate and inform the stakeholders about the project with special reference to its key components and location.
- b) Gather comments, suggestions and concerns of the interested and affected parties.
- c) Incorporate the information collected in the EIA study.

In addition, the process enabled,

- a) The establishment of a communication channel between the general public and the team of consultants, the project proponents and the Government.
- b) The concerns of the stakeholders to be known to the decision-making bodies at an early phase of project development.

In general, the following steps were followed in carrying out the entire Public participation process:-

- Identification of individuals interested in the process- database of the interested and affected parties
- Administration of questionnaires to the different local community members neighbouring the proposed project Site

The purpose for such interviews was to identify the positive and negative impacts and subsequently promote and mitigate them respectively. It also helped in identifying any other miscellaneous issues which may bring conflicts in case project implementation proceeds as planned (*Attached see comments of the public Annex 4*).

### **7.3 Issues raised**

The stakeholders consulted gave both positive and negative views, as well as suggestions for the proponent to consider during construction/installation and operation phases of the incineration station. Their views are as discussed below:

#### **7.3.1 Positive Issues**

The following is a summary of the views of the local community interviewed:

- The project is positive for the improvement of standard of the area since it will help manage domestic waste in the area.
- The project will create job opportunities to the local Youth during construction phase.

#### **7.3.2 Negative Issues**

The public consulted also raised negative issues which they anticipate the project will create hence should be mitigated:

- Air pollution may occur during the operation phase.
- Noise pollution
- Insecurity in the area by garbage dwellers.
- Waste generation by the project which may lead to contamination of surrounding stream and surrounding wells
- Accidents and hazards during excavation, construction and Operation Phase =  
Employment issues during the construction.

#### **7.3.3 Suggestions by respondents**

- The Proponent should ensure proper environmental management practices are put in place.
- The proponent should consider employing casual workers from the local areas during construction and operation phase of the project.
- Noise and water pollution should be controlled.
- Ensure that the project area is protected during construction and enough security during the operation phase.
- The contractor/proponent should ensure that local leaders are involved during the entire project circle to ensure any issues that may arise are amicably addressed.

## CHAPTER EIGHT: ENVIRONMENTAL MANAGEMENT PLAN

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### 8.1 Introduction

The objectives of the Environmental Management Plan are:

- To guide the project implementers in project planning.
- To guide the project implementers on the likely impacts of the project and when they are likely to occur.
- To give an assessment of the capacity requirements for the implementation of the EMP.
- To guide the project implementers to allocate adequate resources for the implementation of the mitigation measures.

### 8.2 Costing

It will be noted from the plan, that some impact mitigation activities on which costing are not done. This is because costing for such activities may have been catered for, under another project component/phase for a similar or related activity. For instance, the cost of provision of dust coats and masks is entered once, as it is not expected that the contractor will have to buy this item again for all the purpose listed in the subsequent phases

### 8.3 Plan Period

The EMP provided here is to cover the first year of the project's operations. It is then expected that an Environmental Audit will be undertaken at the end of the year to evaluate conformity to the EMP as well as identify any gaps and recommend corrective adjustments to the plan. This is then addressed through a loop mechanism from construction phase to operational phase to identify the success of the project versus the failures. This should be analyzed through the environmental criteria of impact and mitigations.



### 8.4 Environmental Management Plan (EMP) - Planning and Construction phase

The table below gives a summary of the environmental health and safety impacts that the project has on the proposed site and the possible mitigation measures monitoring actions required ensuring minimal damage of the environment.

**Table 3: Environmental Management Plan (EMP) - Planning and Construction phase**

<i>Development Stage</i>	<i>Potential Impact</i>	<i>Recommended Mitigative Measure</i>	<i>Responsibility And Timeframe</i>	<i>Targets And Cost Estimates</i>	<i>Monitorable Indicators</i>
Construction/ Installation/dredging	Environmental Pollution	<ul style="list-style-type: none"> <li>• Ensure contractor undertaking on environmental considerations,</li> <li>• Monitor trends on health and safety of construction/installation workers and neighbourhood,</li> <li>• Contractor to maintain material balance records at all times</li> </ul>	Proponent and Contractor  Continuous throughout construction period	Sustainable construction  No direct cost involved	<ul style="list-style-type: none"> <li>• Complaints from neighbourhood,</li> <li>• Concerns from environmental authorities and local County Council.</li> </ul>
	Waste Management	<ul style="list-style-type: none"> <li>• Disposal of waste be done in accordance to waste regulations,</li> <li>• Contractor to undertake safe waste disposal,</li> <li>• Verify legality of waste disposal destination</li> </ul>	Proponent and Contractor  Continuous throughout construction period	Safe construction waste management	Compliance with waste management regulations
	Social Aspects	<ul style="list-style-type: none"> <li>• Address concerns of neighbouring land users as per this report,</li> <li>• Integrate public safety in the construction process,</li> <li>• Utilize local labor for construction to enhance social harmony.</li> </ul>	Proponent and Contractor  Initiate action with construction	Social harmony  No direct cost involved	Residents complaint  Public opinion
<i>Development Stage</i>	<i>Potential Impact</i>	<i>Recommended Mitigative Measure</i>	<i>Responsibility And Timeframe</i>	<i>Targets And Cost Estimates</i>	<i>Monitorable Indicators</i>

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Decommissioning		<ul style="list-style-type: none"> <li>Construction camp decommissioning on pre-planned schedule,</li> <li>File a completion report to NEMA for initial inspection</li> </ul>	Proponent  Upon operation commencement	Identifiable baseline status of the plan	Fulfillment of the mitigation measures recommended
Operation:	Environmental Pollution	<ul style="list-style-type: none"> <li>Equipment specifications to conform with environmental standards,</li> <li>Integrate environmental components in the site design (waste management, emission controls, etc.),</li> <li>Apply to the extent possible provisions of the waste management regulations, Nyandarua County government by-laws, Public Health Standards, etc.,</li> <li>Enhance in-house awareness and sensitization on environmental protection initiatives,</li> </ul>	The proponent  Immediately and continuous.	Integration of environmental components/idea in the site operations.  <b>KShs. 200,000/=</b> for initial investment	<ul style="list-style-type: none"> <li>Emissions into the air,</li> <li>Related health effects to the site operators, Public complaints.</li> </ul>
	Waste Management	<ul style="list-style-type: none"> <li>Maintain Isolation of surface storm water drains from those carrying oil/grease residuals,</li> <li>Enhance water recycling for conservation purposes,</li> <li>Compliance to waste management regulations (Legal Notice Nos. 120 and 121),</li> <li>In-house training on waste management options for managers and supervisors,</li> <li>Provide leadership in waste recycling and re-use.</li> </ul>	The proponent  Immediately and continuous.	Streamlined waste flow paths.  KShs. 200,000/= as initial capital	<ul style="list-style-type: none"> <li>Waste categories and separation,</li> <li>Mode of transfer</li> <li>Final destinations.</li> </ul>
<i>Development Stage</i>	<i>Potential Impact</i>	<i>Recommended Mitigative Measure</i>	<i>Responsibility And Timeframe</i>	<i>Targets And Cost Estimates</i>	<i>Monitorable Indicators</i>

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Operations	Air Quality	<ul style="list-style-type: none"> <li>Dry materials shall be kept dump or covered at all time,</li> </ul>	Project Manager  Initial installation are design controlled	Reduced concentrations of pollutants KShs. 100,000 per year.	Public complaint  PM(50), SO x (500), NOx(750) As(0.1), Cd(0.05), Cu(0.05), Pb(0.5), Zn(1) – all in ppm.
	Vegetation cover	Introduction of vegetation (trees, shrubs and grass) on open spaces within and around the site. Indigenous species would be preferred.	The proponent  Upon commissioning	Greening the compound and Landscaping.  <b>KShs100,000</b> over 1 year period.	Number of trees planted.  This action will develop a vegetated landscape that will also help contain dust originating from the site.
	Social Aspects	<ul style="list-style-type: none"> <li>Draw of-site contracts to enhance socially acceptable procedures,</li> <li>Involve more independent interested parties (waste collectors) in establishing options for waste recycling,</li> </ul>	The proponent  Upon commissioning then continuous	Social acceptability and co-existence.	Health problems and degradation of environmental resources, The public opinion, Satisfaction to the relevant authority
	Occupational Health and Safety	<ul style="list-style-type: none"> <li>Constitute health and safety committee,</li> <li>Maintain safety</li> <li>Train on HS issues and provide PPEs and enforce applications,</li> <li>Install all machines and equipment with protective guard rails at the moving parts.</li> </ul>	The proponent.  Immediately	Quick and effective response to emergencies.  Annual budget Of <b>KShs. 200,000</b>	<ul style="list-style-type: none"> <li>The security and safety of the neighbouring premises,</li> <li>Safety cases over a period of time,</li> <li>Response period on safety and medical aspects.</li> </ul>
<b><i>Development Stage</i></b>	<b><i>Potential Impact</i></b>	<b><i>Recommended Mitigative Measure</i></b>	<b><i>Responsibility And Timeframe</i></b>	<b><i>Targets And Cost Estimates</i></b>	<b><i>Monitorable Indicators</i></b>

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Operation	Noise levels:	<ul style="list-style-type: none"> <li>Initiate a noise mapping programme and keep monitoring,</li> <li>Undertake a annual hearing survey of all the workers,</li> <li>Train, provide ear muffs/corks and enforce compliance,</li> </ul>	The Supervisors.  Upon commissioning and continuous.	Compliance  <b>KShs. 200,000</b> for equipment and professional guidance.	Occupational levels of 70dBA,  External receptors as defined under the EMCA regulations on noise and vibrations (2009)
	Compliance aspect	<ul style="list-style-type: none"> <li>Develop an environmental policy,</li> <li>Establish a legal register on critical relevant environmental laws,</li> <li>Annual environmental audits as required by law,</li> <li>Develop Standard Operation Procedures focusing on environment, health and safety.</li> </ul>	The proponent  Continuous	An all time compliance  <b>KShs. 200,000</b> per year	A facility to ensure compliance with laid down guidelines at all times
	Institution Framework	<ul style="list-style-type: none"> <li>Adapt environmental aspects in administrative framework,</li> <li>Review the contracting arrangement at all levels of the operations,</li> <li>Establish a monitoring and reporting protocol on environmental conservation,</li> <li>Engage a professional to oversee environmental management.</li> </ul>	The proponent  Continuous	Coordinated environmental management  No direct costs anticipated	To ensure that all actions on environment are integrated in the future corporate business plans
<i>Development Stage</i>	<i>Potential Impact</i>	<i>Recommended Mitigative Measure</i>	<i>Responsibility And Timeframe</i>	<i>Targets And Cost Estimates</i>	<i>Monitorable Indicators</i>

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Corporate Initiatives	Capacity Building (Documentation and human resources capacity)	<ul style="list-style-type: none"> <li>Establish an information resource point (for reference by the site operators),</li> <li>Document in-house guidelines and procedures on environmental management,</li> <li>Develop a training programme for workers on safety, health, and environment,</li> <li>Engage a qualified staff to oversee environment, health and safety.</li> </ul>	The proponent  Continuous.	Sustainability and sharing with others.	To provide necessary knowledge, tools and awareness to all workers for effective human resource capacity development.
	Physical infrastructural capacity	<ul style="list-style-type: none"> <li>Establish a waste collection, transfer and storage mechanisms,</li> <li>Characterize and identify all waste streams up to final destinations,</li> <li>Monitor the carrying capacity of the environmental infrastructure receiving the wastes,</li> <li>Install monitoring facilities along the waste pathways.</li> </ul>	The proponent  Continuous.	No direct costs involved.	This provide organized system for the workers with respect to environment, health and safety protection
	Collaboration:	Collaborate with other players on environmental protection, waste management programmes.	The proponent.	Sustained capacity building.	Kenya Institute of Waste Management is recommended.
<b><i>Development Stage</i></b>	<b><i>Potential Impact</i></b>	<b><i>Recommended Mitigative Measure</i></b>	<b><i>Responsibility And Timeframe</i></b>	<b><i>Targets And Cost Estimates</i></b>	<b><i>Monitorable Indicators</i></b>

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Decommissioning	Compost impacts	<ul style="list-style-type: none"> <li>• Notify NEMA and other relevant authorities on intension to stop operations at least 3 months in advance,</li> <li>• Carry out a decommissioning audit and submit report to NEMA for review six months in advance,</li> <li>• Close down and participate in the plan for site inspection,</li> <li>• Initiate removal following strictly recommendations of the decommissioning audit report.</li> <li>• Initiate a programme to rehabilitate the site to near its original state,</li> <li>• Monitor the site on related parameters for 1 year.</li> </ul>	<p>The proponent, NEMA, HQ/Nyandarua County and environmental expert.</p> <p>Process to take 2 years on a pre-agreed schedule</p>	<p>Rehabilitated site</p> <p>Costs to be Identified through the decommissioning audit repot</p>	<p>Air quality and soil status in the area.</p> <p>Social and economic implications in the area</p> <p>Destination of waste material disposal.</p>
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## CHAPTER NINE: CONCLUSION AND RECOMMENDATION

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### 9.1 Conclusion

The proposed project design has integrated mitigation measures with a view to ensuring compliance with all the applicable laws and procedures. The proposed project will be implemented to the approvals by among others physical planning department and NEMA. From the foregoing, it is concluded that the proposed domestic waste management site is in appropriate location in as far as land use and interactions with human social and economic setting is concerned. There are no extensive habitations in the neighbourhood, there is significant sensitive environmental features found within the vicinity (schools). However, there are certain social concerns that touch on general environmental pollution, groundwater contamination, health of the workers, attraction of human settlements in future and soil contamination. For this reason, appropriate preventive measures have been developed in this report

During the project construction phase, the proponent and contractor will avoid inadequate/inappropriate use of natural resources, conserve nature sensitively and guarantee a respectful and fair treatment of all people working on the project, general public at the vicinity and inhabitants of the project. In relation to the proposed project, mitigation measures that will be incorporated during construction phase, the development's input to the society and cognition that the project proponent is economically and environmentally sound, this development will be considered beneficial and important. It is our conclusion that the proposed development is a timely venture that will increase the nation's domestic waste management facility.

### 9.2 Recommendation

This report recommends that the project be allowed to go ahead provided the outlined mitigation measures are adhered to. Major concerns should nevertheless be focused towards minimizing the occurrence of impacts that would degrade the general environment. This will be achieved through close follow-up and implementation of the recommended Environmental Management and Monitoring plans (EMPs). We recommend these:

- The proponent should follow the guidelines as set by the relevant departments to safeguard and envisage environmental management principles during installation and operations of the proposed project.
- Ensure waste and wastewater management regulations are complied with through provision of appropriate facilities including wastewater treatment facility. Waste water will be gotten from surface run off which may contaminate surrounding wells and *muthungu* dam.
- It is important that warning or informative sign (bill boards) be erected at the site. These should indicate the operation hours and when works are likely to be started and completed. The signs should be positioned in a way to be easily viewed by the public and mostly motorists.
- During construction all loose soils should be compacted to prevent any erosion by water and wind.

- Once earthworks have been done, restoration of the worked areas should be carried out immediately by backfilling, landscaping/leveling and planting of suitable tree species.
- A fully equipped first aid kit should be provided within the site
- Workers should get food that is hygienically prepared. The source of such food should be legalized or closely controlled.
- The contractor should have workmen's compensation cover and is required to comply with workmen's compensation Act as well as other relevant ordinances, regulations and Union Agreements.
- The contractor should provide adequate security during the construction period.
- The above environmental management plan shall be adopted and applied as the basis for addressing environmental and social aspects throughout the project cycle with necessary amendments as may found appropriate. In this connection, it will be the guiding tool for future audits and monitoring exercises

## **REFERENCES**

- 1) Kenya gazette supplement Acts 2000, Environmental Management and Coordination Act Number 8 of 1999. Government printer, Nairobi
- 2) Kenya gazette supplement Acts Building Code 2000 by government printer, Nairobi
- 3) Kenya gazette supplement Acts Land Planning Act (Cap. 303) government printer, Nairobi
- 4) Kenya gazette supplement Acts Local Authority Act (Cap. 265) government printer, Nairobi
- 5) Kenya gazette supplement Acts Penal Code Act (Cap.63) government printer, Nairobi
- 6) Kenya gazette supplement Acts Physical Planning Act, 1999 government printer, Nairobi
- 7) Kenya gazette supplement Acts Public Health Act (Cap. 242) government printer, Nairobi
- 8) Kenya gazette supplement number 56. Environmental Impact Assessment and Audit Regulations
- 9) 2003. Government printer, Nairobi.



## **ANNEXUS**

1. Terms of reference
2. Title Deed

Public Consultations