ENVIRONMENTAL SOCIAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED INSTALLATION OF AN INCINERATOR ON PLOT NO GILGIL/GILGIL BLOCK 1/52264 & 52265 (KIKOPEY), GILGIL- SUB COUNTY

Site coordinates; Latitude -0.572307^{0}S, Longitude 36.272992^{0}E

This Environmental Impact Assessment (ESIA) Project Report is submitted to Kenya National Environmental Management Authority (NEMA) in conformity with the requirements of the Environmental Management and Coordination Act, Environment Management and Co-ordination (Amendment) Act, 2015 and the Environmental (Impact Assessment and Audit) Regulations, 2003.

SUBMITTED TO:
NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY
P.O BOX 14134-20100
NAIROBI

PROPONENT:
HAMAN KAGO KINYANJUI
P.O. BOX 20100
NAKURU

CERTIFICATION

I submit this Environmental Social Impact Assessment (ESIA) Project Report for the proposed installation of an incinerator at Gilgil/Gilgil Block 1/52264 and 52265, Gilgil Sub County. I/We certify to the best of my/our knowledge that the information contained in this report is accurate and truthful reflection of the anticipated Environmental Impacts associated with the proposal.

LEAD EXPERT

JOYCE WAIRIMU MWANGI ***Signature***.....

LEAD EXPERT NO.7660 ***Date***.....

ASSOCIATE EXPERT

MARTIN WANDIGU NGUGI ***Signature***.....

REG NO.11653 ***Date***.....

DECLARATION BY THE PROJECT PROPONENT

I certify to the best of my knowledge that the information contained in this report reflects are accurate and a truthful representation of all findings relating to the installation of an incinerator to the best of my knowledge.

Name..... **Designation**.....

Address: ..... **Date**.....

Signature..... **Contact**.....

EXECUTIVE SUMMARY

Industrialization in Kenya and the implementation of Environmental Management and Coordination (Waste Management) Regulations, 2006, has necessitated the need to develop a hazardous waste treatment facility that can cope with the increased demand from industrial waste and at the same time meet the ever demanding regulatory framework. The proponent is a private person, Kenyan citizen who intends to develop install an incinerator to facilitate waste management within Nakuru County and the Country at Large.

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

The installation of a new incineration facility at Gilgil in Nakuru County will increase the handling capacity of hazardous waste which will both assist the economic growth of industries and provide a proper treatment and disposal route that is affordable.

The purpose of this EIA report submission to the National Environment Management Authority (NEMA) is to grant the proponent an opportunity to install an incineration plant in the land which is currently left idle. The proposed site is approximately 8 km from Gilgil town and 200 meters from the Eburu road. . The area is well connected to road that will enable its operators to safely transport wastes by road from across the county for treatment. The incinerator is expected to handle 75kgs/hr during its pick operation.

Upon realization of the growing hazardous wastes challenges, the proponent is seeking to install a new facility to be able to provide a hazardous waste handling capacity to cater for the need of such waste disposal by ever increasing industrial establishments in the country.

For this reason the proponent has identified a parcel of land in Gilgil area approximately 8km from Gilgil Town and along the Eburu road to establish a designed yard for the collection, storage and incineration. The site will also take advantage of the existing road for safe delivery of waste from various parts of the county and the country at large.

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 from installation 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 installation of 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 estimated project cost is Kenya shillings **Two million two hundred thousand and four hundred shillings only** (***Ksh.* 2,200,400.00**).

The proposed plant will be handling hazardous wastes through incineration. 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 to the west of the plant. 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 plant 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. Not all waste sources are capable of handling hazardous and toxic materials within the premises without compromising the health of their own workers or the neighboring communities. 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 proposed plant;

- 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 hazardous and toxic materials from the agricultural sector and particularly the agro-chemical manufacturers and dealers as well as major users such as to include expired chemicals, packaging materials and obsolete equipment.
- Provision for disposal of expired drugs and medicines from hospitals and health centers across the country, most of whom do not have a professional mode of the wastedisposal,

- ✦ The facility will provide a safe point for reducing the volumes of hazardous waste and toxic wastes before disposal into appropriate county's landfills, most of which currently is dumped into public garbage disposal sites with adverse implications to the ecology and human health.
- ✦ 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 both during the installation and operation,
- 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 neighbors 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
- Increased storm water/run off resulting from the roof catchments and as a result of decreased recharge areas, after pavement of most areas i.e. fore court and drive ways.
- 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 installation/construction phase.
- Suppressors or silencers on equipment or noise shields for instance corrugated iron sheet structures. Management strategies to reduce impacts including truck speed. Sensitize workers on the need to switch off engines whenever possible; ensure that the machineries are well maintained; ensure that the work is carried out during the recommended time.

- 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 Council.
- An emergency power control switch will be strategically installed in order to facilitate general power cut of the entire workplace in case of emergency.
- An adequately stocked "First Aid Box" will be provided and the employees at the incinerator 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 incinerator 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.The staff will be encouraged to turn off unnecessary lights and not to leave water taps running.
- Comprehensive firefighting equipments 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.

The proposed project's estimated cost is Kshs. 2,600,*400*.00 (Two million two hundred thousand and four hundred Kenyan shillings only). The proponent will therefore pay Kshs. 10,000.00 (Ten Thousand Kenya Shillings only) as EIA processing fees which is 0.1% of the total project cost

ACRONYMS

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
MOH	Ministry of Health
NEC	National Environment Council
Km	Kilometers
NEMA	National Environment Management
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
KPRL	Kenya Petroleum Refineries
KPC	Kenya Pipeline Company
ERC	Energy Regulatory Commission
ERP	Emergency Response Plans
KPLC	Kenya Power and Lighting
Company	
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

1.1. Introduction

The proponent Mr. Haman Kago is a private investor who has a keen interest in investing in waste management sector in the Kenyan market today. Upon realization of the growing hazardous wastes challenges, the proponent is seeking to install a new incineration plant 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 Gilgil area, Nakuru County for the sole purpose of establishing a designed work area for the collection, storage and incineration of waste.

The project has also included consultation of the public and review of all the necessary documentations to ensure approvals are obtained from the relevant Authorities.

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 hazardous waste treatment facility that can cope with the increased demand from industry and at the same time meet the ever demanding regulatory framework. The proponent is a Kenyan citizen and an investor. The installation of the incinerator was conceptualized by the proponent due to the fact that he offers cleaning services to various institutions, hotels and individuals. Consequently, the proponent intends to develop the facility to provide local industry and the public sector with the technical infrastructural capacity to manage hazardous wastes.

Gilgil area coupled with the different flower farms, rapid human development and other agricultural activity in the area means that hazardous waste production is on the great rise. The area and Nakuru County at large is also characterized ISO 14001 companies that require a national waste disposal infrastructure that can enable them to account for their chemical wastes and other hazardous wastes. This incineration services is hence a necessity within Gilgil area and Nakuru County at Large.

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

The management of hazardous wastes in Kenya is regulated under the Environmental

Management and Co-ordination Act (EMCA, 1999), EMCA (Waste Management) Regulations (2006) and other related regulations controlling the disposal of Pesticides, Pharmaceutical wastes and Hazardous and Nuclear wastes. These regulations establish an order of preference for the management of hazardous wastes to be: minimization, recycling, treatment, and landfilling. The installation of the incineration plant at Gilgil area will both assist the economic growth of industries 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 incinerator installation 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 installations 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 facility on the environment in accordancewith 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 hazardous 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 EIAS that can guide informed decision making and safe operation of the incineration plant

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 installation, 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 hazardous 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.

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 hazardous waste management which is a big issue of concern not only in Nakuru 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 neighbors.

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

2.1 Nature of the project

The proponent intends to develop a waste handling facility by installing an incineration plant at Gilgil Sub County located approximately 8km from Gilgil town along Eburu road. This is necessitated by the increased demand for proper waste handling facility by the increasing industrialization within the country and the desire for maintenance of a clean environment.

When complete, the project will have an incineration plant, waste handling and sorting yardand waste holding point. The specification of the incinerator is listed below;

Feeding doors

- Steel plate finish worktop
- 450mm high content feeding opening
- High fire resistant

Burning chamber

- Burner jet just below the feeding door
- Burner feed taps wit 4'' diameter fuel feed for burning the content
- 112.5mm fire brick walling
- 1200mm high circular fire bricks wall bonded with fire clay and high alumina cement
- 6mm thick steel plate with a 6mm steal ms plate base
- Steel fabricated hood to elevate beyond roof
- Cast iron fire bars that's connects to the ash chamber

Ash chamber

- 112.5mm thick fire bricks walling/lining to internal faces of the ash chamber
- 6mm steel plate
- Fabricated steel tray/trolley pulled from the cooler side to remove ash

Chimney stack

- 200mm diameter steel flue
- Flue top cover
- Steel fabricated flue to convey fumes

- 10 metre high
- An inductor fan is fitted to ensure the diluting of air inside the chimney and exit velocity of the air meets the required standards.

Particulate removers

- The incinerator is fitted with a cyclone separator.
- The kilns are designed with provisions of flue gas trapping, smoke interception and stacks fitted with scrubbers (for gases) and filters for particulate matter removal

2.2 Site Location and Ownership

The proposed project site is located along the Eburu road approximately 8 km from Gilgil town, Nakuru County and is within a low densely populated area with the nearest neigbours being about 300 metres to the north. To the East is a vacant land bordering the Eburu road and Kirima kia nugu hills across the road. The parcel of land is on plot Gilgil/Gilgil Block 1/52264 & 52265 (Kikopey) in Gilgil, Nakuru County and belongs to Mr. Haman Kago Kinyanjui. The proposed site is on coordinates Latitude -0.572307^{0}S, Longitude 36.272992^{0}E.

The land title deeds are hereby attached as annex 2.

2.3 Site characteristics and neighborhood

During the site assessment the entire piece of land was found idle. The site was seen to have limited vegetation cover including grass. The site had a temporary fence, site house and a few building materials. There are very few neighbors. The immediate neighboring lands are all vacant covered with vegetation. The other neighbors are residential houses and the nearest is about 300 meters to the north of the site. This is a sparsely populated area and most of the land has been left idol.

2.4 Proposed development components

Despite the fact that the general solid wastes management is being addressed through local authorities (direct services, out-sourcing, partnerships and privatizations) handling of hazardous wastes still remains a great challenge to the authorities as well as environmental and public Health fields since this sub-sector of waste management requires specialized handling. Among the options available for the management of hazardous wastes include incineration in accordance to the guidelines in the Environment Management and Coordination Act (Waste Management regulations), Gazette Notice No. 121 of September 2006). The integrated waste management facility is being designed to facilitate handling of hazardous wastes and will accommodate the following basic components;

A go-down will be constructed at a site. The go-down will be of dimensions 70 feet by 40 feet and will be divided into two – the machine area and the temporary waste storage area. There will be a separate office and sanitary facilities.

2.4.1 Waste Reception

It is intended that waste will be delivered to the site by road from around Nakuru County and other parts of the Country. 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.
- A container offloading bay will be provided at the site that will also be installed with safety measures environmental protection provisions. The bay will also receive wastes from delivery trucks

2.4.1 Waste Sorting

Waste sorting will be done before loading into the tracks. Minor sorting bay will therefore, be provided in the holding area fitted with appropriate quantification facilities, documentation and holding zones. Necessary safety and environmental protection provisions will be provided.

2.4.2 Waste Storage

The proposed go-down will consist of two main areas, the machine area and the temporary storage area. It is uneconomical to start the incineration process without enough waste, because of the heating process. Therefore, the temporary holding area will be enough to hold a day's capacity i.e. approximately 600 kilograms.

2.4.3 Incineration facility description

The proponent anticipates installing an incinerator at his newly acquired plot in Gilgil area. The design, acquisition and final installation has been done and will be in conformity to the Waste Management Regulation, 2006, guidelines, criteria, procedures for installing/operating incinerators. In addition, it has been proposed that the proponent regularly subject its operation to air quality measurements to ensure sound environmental management in its operation.

The incineration plant will be fitted with constant air emission monitors that will provide a CEM including a draw sample system that will monitor O2, CO, HCl, hydrogen fluoride, sulphur dioxide, NOx, particulate, and HC. This will eventually regulate particulate matter to the atmosphere reducing air pollution.

The incinerator will be installed and operated by competent persons at all times to ensure efficiency and environmental conservation.

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. Waste water emanating from operation areas will not be allowed into the natural drainage system. Due to the potential residuals of hazardous pollutants, the wastewater will be collected and channeled into a septic system designed for used at the premises.

As per the manufacturers guidelines out of 100 kgs of waste, 4kgs of ash will be generated. The ash is considered clean and will be disposed off on site to an ash pit to be constructed.

2.4.5 Water supply

There is no surface water source within the vicinity of the proposed site. This leaves sources options as rain water harvesting and groundwater for a project as well as water vendors in the area.

2.4.6 Support services

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

(i) Offices,
(ii) Sanitation facilities (toilets, bathrooms, hydrants, wastewater drains,
(iii) Health and safety provisions (fire extinguishers, hydrants, signage, exits, first Aid points etc.,
(iv) Security arrangements.

2.7 Project Approval

The project will be developed on land that the proponent already owns. The building plan has been submitted to the relevant County offices for approvals.
For full implementation of the project, the following pre-requisites will be met:

1) Approval designs by the County Government of Nakuru.
2) Appointment of established competent and capable contractors and consultants to undertake the development.
3) Acquisition of NEMA approval.

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

2.8 Project Specifications

The following are specific descriptions of the project;

a) The project is located along Old Gilgil road, occupy Land Reference No. plot no. Gilgil/Gilgil Block 1/52264 & 52265 (Kikopey) in Gilgil area, Nakuru County**.**

b) The area has no public sewer line hence the residents rely mainly on septic tanks or the pit latrines.

c) A competent architect has made the final design of the project and the constructions will follow details as given by the project consultants.

d) A competent engineer will facilitate the installation and management of the

incinerator according to the manufactures specification.

e) The structures will be founded on solid ground using reinforced concrete strips laid on concrete blinding. The laying of the foundation will follow details as given by the structural engineers on site.

f) The solid wastes will be collected by a private companies contracted for their environmentally sound and friendly waste disposal strategy

2.9 Project Construction

The proposed incinerator will comprise of the following:

i) Excavation of the site to a level that will create a platform upon which the structure/building will be constructed.

ii) The incinerator will be installed inside the building constructed.

iii) Sanitation facility including septic system will be constructed for use at the facility.

iii) The proponent will procure and obtained license for covered truck used to transport waste.

2.10 Project Activities

2.10.1 Pre-Construction stage <u>Project Approvals</u>

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

Table 2: Approval Lead Agencies

APPROVING AUTHORITY/CONSULTANT	**ACT**	**STATUS**	**REMARKS**
Physical planning	Physical Panning act, Cap. 286	The Change of use has been submitted to the county government of Nakuru, Gilgil office	Advertisements have been made in the local newspaper and no objection was made. Waiting for the approvals.
Architectural Drawings Physical Planning Department, Nakuru County Council	Physical Panning act, Cap. 286 County Government Act, Cap 265	To be Submitted for Approval	Architect to Supervise implementation
NEMA	EMCA 1999	This report	To review the report For approval and licensing.

The pre-construction has also involved getting to collaborative agreements with key

stakeholders including project manager, architects, quantity surveyors, engineers / contractors (structural, mechanical, electrical), material suppliers, landscapers, and financiers). A programme has been set and an agreement made between the proponent and the project consultants.

2.10.2 Installation and Civil Works Stage

The project will be constructed based on applicable standards of Kenya and any other standards which may be incorporated. The constructions will as well incorporate environmental guidelines, health and safety measures. The project inputs will include the following;

- Construction raw materials will include sand, cement, stones, gravel, ballast, metals, among others. All these will be obtained from licensed dealers and especially those that have complied with the environmental management guidelines and policies.
- Construction machines will include machinery such as trucks, concrete mixers and other relevant construction equipment. These will be used for the transportation of materials, clearing of the vegetation and resulting construction debris. Most of the machinery will use petroleum products to provide energy.
- A construction labor force of both skilled and non-skilled workers will be required.

In addition, the proponent has hired qualified and registered consultants. During the construction phase of the project, the project's sign board must be erected to make the public aware of the proposed development and to keep away intruders, which will indicate the following:

- A pictorial impression of the proposed building
- The developer's name and address
- The County authority approval number
- The project architect's details
- The project engineers' details
- The project's quantity surveyors
- NEMA approval number
- The project Environmental Consultants
- Environment Consulting Company
- Other professionals involved in the project.

Construction activities include the following:

- A temporary site office and a sanitation facility for use by the construction workers.
- Procurement of construction material from approved dealers
- Storage of the construction materials.
- Transportation, storage of construction materials and disposal of the resulting construction wastes/debris using light machinery. All debris and excavated

materials will be dumped on sites approved by the council engineer.

- All required kinds of works will be done by registered experts such as:
  - Masonry, concrete work and related activities,
  - Structural steel works,
  - Roofing and sheet metal works,
  - Electrical work and,
  - Landscaping etc.

The project begins after the National Environmental Management Authority (NEMA) issues the Environmental Impact Assessment (EIA) license.

2.10.3 Operations

Once the development is completed, the proponent will use the facility to conduct incineration for various clients. Maintenance activities will include facility cleaning, routine checks and other necessary repairs. Workers will be fully employed onsite including the truck drivers who will be transporting the waste for incineration.

Solid waste management;

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

Effluent and waste water management;

The area is not served by sewer system. The proponent hence intends to use septic system for efficient effluent management. Inorganic waste generated from the premise such as oil and fuel should however be treated before release to the system.

Cleaning;

The proponent will be responsible for ensuring regular washing and cleaning of the pavement of the entire facility. Cleaning operations will involve the use of substantial amounts of water, disinfectants, detergents e.t.c.

2.10.4 De-commissioning stage

The commissioning of the project will take the duration agreed as per the Conveyance document between the proponent and the concerned authorities. Later on, should there be need for decommissioning the project; the following will have to be considered:

- **Demolition works**

Upon decommissioning, the project components including buildings, pavements, drainage systems, parking areas and perimeter fence will be demolished. This will produce a lot of

solid waste, which will be reused for other construction works or not reusable, disposed of appropriately by a licensed waste disposal company.

- **Dismantling of equipment and fixtures**

All equipment including the incinerator, electrical installations, furniture, finishing fixtures partitions, pipe-work and sinks among others will be dismantled and removed from the site on decommissioning of the project. Priority will be given to reuse of these equipments in other projects. This will be achieved through resale of the equipments to other building owners or contractors or donation of these equipments to schools, churches and charitable institutions.

- **Site restoration**

Once all the waste resulting from demolition and dismantling works is removed from the site, the site will be restored through replenishment of the topsoil and re-vegetation using indigenous plant species.

CHAPTER THREE: METHODOLOGY AND BASELINE INFORMATION

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

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. Government printer, Kenya Gazette Supplements Acts, Physical Planning Act-Cap 286 of 2009. Government printers, Kenya Gazette Supplement No.56, Environmental Impact Assessment Audit regulations 2003. Government printer, Nakuru County Development plan, 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

The proposed project site is to the West of Gilgil town. It is at the foot of the ridge that extends North-South direction. From the top of the ridge, there is a steep descend with notable valleys.

Gilgil, Kenya, is a town in Nakuru County, Kenya. The town is located between Naivasha and Nakuru and along the Nairobi – Nakuru highway. It is to the west of the Gilgil River, which flows south to feed Lake Naivasha. There is also Gilgil Country golf club course to the East of the town.

3.3 Geographical conditions

The geology of Gilgil area including the project area is the outcome of volcanic and tectonic activities of the rift valley. The volcanic activity of the rift preceded and accompanied the rift tectonic activities. Gilgil area is dominated by quaternary volcanic ash and diatomaceous silts in the plain areas and some volcanic tuff, lava flow and diatomite deposits in the higher escarpments. Alkaline volcanism composed of pumiceous pyroclastics ashes, trachytes, ignimbrites, phonolites and phonolitic trachytes, tuffs, agglomerates and acid lava dominate Gilgil area. Also, volcanic soil and diatomite deposits dominate the area with trona impregnated silts bordering Lake Elmenteita. The area is also characterized by repeated volcanicity followed by movement. The eruptives in each episode start with basalt.

The southern part of Gilgil is within the Olkaria volcanic complex. Craters, fumaroles, hot springs and steam vents are found in several places within the Olkaria and Eburru area. The earlier tectonic geology is reflected in the step-faults of Satima and Kinangop generating Kinangop plateau. Grid faulting generated Gilgil plateau while the Mau escarpment is as a result of fault flexures. The major fault escarpments influence topography of the rift floor that influence the drainage flow pattern. The dominant type of soil in the area is black loamy soil, which is quite fertile and good for agricultural purposes. In other parts there is clay, silt and dry sandy soils. Dominantly the soils are quite good for agricultural purposes.

3.4 Climate and physical features

Gilgil experiences varying climatic conditions from time to time. The area experiences cool and dry seasons. The long rains are usually experienced between March and May. The area also receives short rains between October and December. The rest of the months are usually dry. Proposed site lies in Gilgil area which is 2004m above sea level. The climate is warm and temperate. The cold months are rainy compared to the warm months which are characteristically dry. This climate is considered to be “cool dry-summer” according to the Köppen-Geiger climate classification. The temperature averages 16.5°C. The rainfall within Gilgil is one of the lowest in Nakuru County. The driest month is February. The greatest amount of precipitation occurs in November, with an average of 174 mm. The warmest month of the year is March, with an average temperature of 18.2°C. The lowest average temperatures in the year occur in July, when it is around 15.1°C. The difference in precipitation between the driest month and the wettest month is 138 mm. The variation in temperatures throughout the year is about 3.1°C.

3.5 Hydrology

It is noted that the rainfall on the forested high ground of the Mau and Bahati rises to 1270mm and more, while on the floor of the Rift Valley average readings vary between 635mm and

890mm per annum. The Rift Valley contains a system of internal drainage basins, with no outlet to the sea. The main basins in the Kenya Rift Valley are the Naivasha Basin, the Nakuru-Elmenteita Basin and Bogoria-Baringo-Turkana Basin. The watersheds are the Eburru Ridge and the Menengai-Njoro Ridge. The possibility of subterranean outlets between these basins must be considered. It is possible that there is an underground flow between Naivasha and Elmenteita, but not enough is known of the area between the two lakes to provide any evidence.

As regards surface hydrology within the project area, the little Gilgil River to the east of Gilgil town runs north south direction as it joins River Malewa that ultimately drains its waters into Lake Naivasha. The river has its origins above 2,500 metres, where rainfall is around 1,100mm annually. It has water year-round. The Gilgil has three main headwaters. The Morindati rises at 2,700m, the Kiriundu at 2,710m and the Little Gilgil at 2,400m.

3.6 Infrastructural Facilities

Gilgil town and the surrounding area is adequately served by various infrastructural networks that include the bitumen standard Nakuru – Nairobi road and Gilgil – Ol Kalou Road to the east. There is also the Naivasha – Nakuru Meter Guage Railway (MGR) that run through the town. Likewise, there is also Gilgil Airstrip within the town. Educational facilities are also available in Gilgil, offering national and international curricula. The area is well served with electricity from the Kenya Power that will also serve the proposed project site. This is also supplemented by alternative power sources like diesel generators and solar power source.

CHAPTER FOUR: ENVIRONMENTAL LEGISLATIVE AND REGULATORY FRAMEWORK

4.1 Introduction

The policy, legal and institutional frameworks on health, safety, environmental standards and sustainable use of natural resource related to the activities at the company include the following:

- The Constitution of Kenya
- The Environment (Impact Assessment and Audit) Regulations, 2003
- The Environment Management and Co-ordination Act-1999
- Environmental Management and Coordination (Waste Management) Regulations, 2006Legal Notice No.121
- Government of Kenya Energy Policy and Plan of Action
- Petroleum Act, Cap. 116
- Energy Act, 2006
- Weights and Measures Act, Cap. 513
- 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
- Electricity Power Act No. 11 of 1997
- Building Codes 1968
- 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 EIA and Audit Regulations 2003, Legal Notice No. 101 (Amendment) 2019

Regulation 24 – *EIA license* -Environmental Impact License shall be issued after the authority approves the project under regulations 23, and shall be issued in form. **Regulation 28** – *false or incorrect information* -Substantial changes or modification and when project poses an environmental threat that information or data given by the licensee were false, incorrect or intended to mislead.

Regulation 24 – *Annual Environmental Audit* -Annual environmental auditing after presentation of an EIA study report shall be undertaken by the licensee to ensure the implementation of environmental management plan is audited on regular basis, an audit report submitted to NEMA annually and ensuring that the criteria to audit is based on environmental management plan developed during the EIA process or after the initial audit

Regulation 40 - *Monitoring changes after project implementation*

Monitoring by NEMA and Lead Agencies shall be done to establish any possible changes in the environment and their possible impacts, immediate and long-term effects of its operations, identify and determine parameters and measurable indicators and conduct changes that occurred after implementation. The aim of this section is to provide the Proponent and Contractors with quick reference to most critical legal and policy provisions to enable proper planning and impact assessment during project planning and implementation.

4.4 The Environmental Management and Coordination (Amendment) Act (EMCA)-2005

This project report has been undertaken in accordance with the Environment (Impact Assessment and Audit) Regulations, 2003, which operationalizes the Environment Management and Co-ordination (Amendment) Act, 2015. The report is prepared in conformity with the requirements stipulated in the Environment Management and Co-ordination (Amendment) Act, 2015 and the Environmental Impact Assessment and audit Regulations 2003, Regulation 7 (1) and the Second Schedule (Legal Notice 31)

Part II of the said act states that every person is entitled to a clean and healthy environment and has the duty to safeguard the same. In order to achieve the goal of a clean environment for all, new projects listed under the second schedule of Environment Management and Co-ordination (Amendment) Act, 2015 shall undergo an Environmental Impact Assessment. The Environment Management and Co-ordination (Amendment) Act, 2015 provides for the establishment of an umbrella legal and institutional framework under which the environment in general is to be managed and the law is implemented by the guiding principle that every person has a right to a clean and healthy environment and can seek redress through the High court if this right has been, is likely to be or is being contravened.

Pursuant to section 25 (4) of NEMA, the National Environmental Management Authority (NEMA) is required to restore degraded environmental sites using the National Environmental Restoration Fund. Currently, the restoration fund consists of 0.1 % levied from industries and other project proponents through the EIA process. Section 58 of the Act makes it mandatory for an

Environmental Impact Assessment study to be carried out by proponents intending to implement projects specified in the second schedule of the Act which are likely to have a significant impact on the environment. Similarly, section 68 of the same Act requires operators of existing projects or undertakings to carry out environmental audits in order to determine the level of conformance with statements made during the EIA study. The proponent is required to submit the EIA and environmental audit reports to NEMA for review and necessary action.

Section 72 of the Act prohibits discharging or applying poisonous, toxic, noxious or obstructing matter, radioactive or any other pollutants into aquatic environment. According to section 73 of the act, operators of projects which discharge effluent or other pollutants into the aquatic environment are required to submit to NEMA accurate information on the quantity and quality of the effluent. Section 76 provides that all effluent generated from point sources are to be discharged only into the existing sewerage system upon issuance of prescribed permit from the local authorities. The proponent is ready to seek for the prescribed permit when the trunk sewer will be in place. Section 87 (1) makes it an offence for any person to discharge or dispose of any wastes, whether generated within or outside Kenya, in such a manner as to cause pollution to the environment or ill health to any person.

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 orin any public place except in a designated waste receptacle.

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

5 (1) A waste generator shall minimize the waste generated by adopting the following cleanerproduction 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 regulationsfor 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.

1. 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, steam, 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 riveror stream, and as may be determined by the authority from time to time.

The proponent intends to use septic tank for waste water management

4.8 Physical and Land use Planning Act, 2019

This is the principle Act governing land use planning in Kenya. The Physical Planning Act (Cap. 286), aimed at developing a sound spatial framework for coexistence, through plan proposals that enhance and promote integrated spatial/ physical development of socio-economic activities. Because building/construction of commercial units constitutes making of material change to land, the activity constitutes ‚development', hence need to be controlled by relevant authorities. From the foregoing,

the Physical Planning Act (Cap. 286) has made specific provisions in respect to the mandate of relevant authorities in the need for physical planning. The project proponent is required to acquire a Certificate of Compliance or approval letter from the relevant institutions as set out in the Act. The sole objective of the Act is to harmonize development.

The said Act section 29 empowers the local Authorities (Now County Governments) to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same section allows for prohibition or control of the use and development of an area. Section 30 state that any person who carries out development without development permission will be required to restore the land to its original condition. It also states that no other licensing authority shall grant license for commercial or industrial use or occupation of any building without a development permission granted by the respective local Authority.

The proponent has already acquired the necessary approval from the department of Physical Planning.

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 well-being 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 Cap 242

Part IX Section 115 of the Act states that no person or institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires that local Authorities take all lawful necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to injuries or dangerous to human health. Environmental degradation may cause health hazard to the general public. Both solid and liquid waste should be handled professionally by approved exhausters and licensed garbage collectors.

For this project, the plans, architectural drawings and structural designs have been approved by Baringo County Government. All employees will be expected to have personal protective gear during the entire process of construction. Solid and wastewater will be handled as stipulated by provisions of the law as discussed in Section 4.2, Section 4.3 and Section 4.4.3.

4.11 The Way Leaves Act

The areas zoned for communication line, sewer lines, power lines, water pipes etc are known as way leaves. The way leave act prohibits development of any kind in these designated areas. Thus any developer is bound by this act to see to it that no development takes place in these areas. The proponent has taken into consideration the requirement of the act. The proposed project will not encroach on power line way leave which is close proximity to the site and will leave the required space for such services – the project manager to supervise and ensure compliance is attained.

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 thework places. In particular the project should be implemented during construction in accordancewith 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.

4.15 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 foran 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.

4.16 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 re- use 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 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 intending to apply for waste transportation license from the Authority.

4.17 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.

4.18 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.

4.19 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.

4.20 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 in1990, the plan's effort was to integrate environmental considerations into the country's economic and social development. The integration process was to be achieving 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.

4.21 Building Code 2000

This by-law recognizes the County authorities as the leading planning agencies. It compels the potential developer to submit development application for the approval. The County authorities are hence empowered to approve or disapprove any plans if they do or don't comply with the law respectively. Any developer who intends to erect a building as herein proposed must give the respective County authority a notice of inspection before the erection of the structure. On completion of the structure, a notice of completion shall be issued by the County authority to facilitate final inspection and approval. No person therefore shall occupy a building whose certificate of completion has not been issued by the County authority.

Section 214 of the by law requires that any public building or structure where the floor is more than 20 feet above the ground level should be provided with firefighting equipment that may include one or more of the following hydrants, hose reels and fire appliances,

external conations portable fire appliances, water storage tanks, dry risers, sprinkler, drencher and water spray spring protector system.

The proponent is in the process of making all the necessary applications to the County authority of the area.

CHAPTER FIVE: ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

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 both positive and negative impacts are listed below:

5.2 Positive Impacts

There are a number of positive benefits associated with the proposed project. The following are some of the positive benefits anticipated:

i) The project will provide employment opportunities to the community during construction and operation phase
ii) Economic returns in terms of revenue generation to the government
iii) Economic investment hence increases in wealth; the proponent will receive returns on his investments.
iv) The development will improve the security of the area
v) The development will provide sustainable facility for hazardous waste management in Gilgil area and other parts of the Country.

5.3 Negative impacts

5.3.1 Loss of Biodiversity

The site has minimal vegetation cover including the grass and shrubs. The proponent intends to clear part of the land to create room for developing the proposed incineration plant. Oncompletion 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 plantingtrees and ornamental flowers on the disturbed and undisturbed areas.
- Project implementation should disturb as little area as possible in order to minimizepotential impacts to biodiversity.

5.3.2 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 hazardous waste materials as received will likely be sources of dust, particularly from the transfer process to the sorting areas and into the incinerator.
- The hazardous 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,
- The incineration will involve burning hazardous at very high temperatures (between 800^{o}C –1,500^{o}C). Particulate matter will comprise of ashes and flue gases from the burning process and smoke as a combustion product. Other emissions from this point are hydrocarbon residuals, carbon dioxide, carbon oxide, nitrogen oxides and sulphur oxidesfrom fuels and related combustion processes. However the incinerator is fitted with a scrubber and as seen in the incinerator descriptions these will be reduced to the minimum.

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. However at the moment there are very few inhabitants in the immediate neighbourhood and as mentioned above there is very little smoke emanating from the incinerator.
- 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,
- Emissions of acetylene gas into the air have a potential to cause fire in the premiseswith far reaching implications on the neighbouring land users.

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 indirect use to reduce exhaust emissions.
- Regular maintenance of construction plants and equipment's.
- 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.
- Hazardous wastes holding yards require to be kept moist at all times to prevent dust emission into the atmosphere and the windward side of the site during deliveries, in- house movement or just in storage,
- The kilns should be designed with provisions of flue gas trapping, smoke interception and stacks fitted with scrubbers (for gases) and filters for particulate matter removal,
-

5.3.3 Effluent disposal

Developers who construct projects without planning on how effluent will be disposed appropriately, channel their waste water (raw sewage) to water bodies, or dispose carelessly to the environment. Lack of maintaining sewer line leads to blockage of pipes. Areas not served with a sewer line use septic tanks which also poses greater risks if not well managed. Some are poorly constructed and others have inadequate water supply hence posing a dangerous health risk to the living organism including human.

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

Operation phase

Discharging wastewater into open drainage system around the premises would subsequently be carried into public water sources through surface runoff. Pollutants in this case include hazardous residuals, heavy metals, suspended solids, oils and lubricant residuals as well as mixture of contaminants brought along the hazardous 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 sanitary facilities since the process of incineration does not use water as raw material.

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 hazardous wastewater,
- Surface runoff and spills from the galvanizing areas should be collected and channeled into an oil interception chamber, stabilization/ sedimentation tank and a treatment facility before discharge.
- Appropriate design for septic system should be developed and approved for implementation,
- Maintain appropriate records on wastewater quality for compliance evaluation and comparison with NEMA/KEBS recommended standards on a continuous basis,
- Oil storage areas should be provided with slabs with surrounding bunds to contain any spilt oils.

5.3.4 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 areprepared in unhygienic conditions.

Operation phase

Health risks are found in the management of the hazardous 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,

Combustion areas are the most critical section in respect of health and safety. The kilns emit fumes and particulate matter originating from the wastes burning exposing the workers directly handling the same as well as others working elsewhere within the same premises. The affected workers are exposed through inhalation, skin and to some extent ingestion. Emissions from the kilns is also likely to reach external recipients through stacks if not well designed and managed,

There are risks of fire outbreaks from kilns, oil storage areas posing potential danger to not only the site, but also the neighbouring land users,

Heat is also a serious impact to the employees operating the kilns since they are likely to be open. The general ambient heat around the entire premises is also likely to be relatively high extending the risk to more workers,

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.
- All moving machine parts and high temperature areas should be fitted with guard rails and restrict access,
- 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.
- Workers operating within the high temperature zones should not exceed 2hrs continuous presence or/as may be directed by the Occupational Health and Safety Experts,

5.3.5 Soil Erosion

In this particular project, soil erosion might be an environmental issue of concern although this will not be more pronounced since less excavation, leveling of the soil will 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 reduceimpact 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.

5.3.6 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 Council 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.

5.3.7 Solid Waste

Waste collection within the area boundary is the responsibility of the Gilgil Municipal Council, 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 estates which pose a health risk to the residents.

To curb this issue the proponent will engage the services of a registered private garbage company to collect waste from within the compound. Considerable amounts of solid waste will be generated during construction and operational phase. This will include metal cuttings, rejected materials, excavated materials, paper bags, empty cartons, broken glass among other materials.

Operation phase

Disposal of inert solid waste from the premises could become an extended environmental problem that would affect physical environmental quality, biodiversity and public health at points of disposal. Such waste including fry ash, drums, scrap metals and kiln tiles are notable potential waste requiring planned disposal strategy.

Mitigation Measures:

- The contractor or the proponent should work hand in hand with the private refuse handlers and the Gilgil Municipal Council to facilitate waste handling, and disposal from the site. The resulting debris will be collected, transported and disposed off at suitably approved dumpsites.
- It is recommended that land clearance, excavation and construction waste be recycled or reused to ensure that materials that would be disposed of as waste are diverted for productive use. In this regard the proponent is committed to ensuring that construction materials are left over at the end of construction will be recovered for refurbishing and use in other projects. Such measures will involve the sale or donation of such recyclable/reusable materials to construction companies, local community and residents.
- The waste slab should be provided with compartments for segregation of various categories of waste classified on source and physical nature that should

also be handled separately,

- Fry ash and other incineration residuals should not be disposed on land but rather be disposed of in proposed ash pit on site or other approved dumping grounds,
- Oils and grease from moving machine parts and other sources should be handled as hazardous wastes in accordance with the waste regulations,

5.3.8 Noise Pollution

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 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 hazardous wastes, movement of hazardous materials from one point to another within the plant and operations of the incineration equipment components. This situation is likely to have occupational health and safety implications as well effects to the workers. Currently, there are no settlements or other businesses in the immediate neighborhood, but any such future land use may 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 of75dBA.

Mitigation Measures:

- Construction works should be carried out only during the specified time of 0800hrs to1700hrs.
- Machinery should be maintained regularly to reduce noise resulting from friction
- There should not be unnecessary horning 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.
- Maintain plant equipment
- 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.

5.3.9 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 groundbreaking
- Operations will be timed to take place during the dry season when the soil are dry to reduce the risk of soil compaction

5.4 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 construction 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

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 incinerator. A relocation option 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 positive response by the relevant authorities including NEMA, the project would have been 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 would also lead to a situation like no other project alternative option; the other consequences of this would be a discouragement to local/private investors especially in this waste management sector that has been shunned by many public and private investors already aggrieving high investment costs and professional skills. From the bone statements relocation of the project to different site is not viable hence it's ruled out.

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 constructed/installed and there would be no demand for the incinerator. This option will however, involve several losses both to the land owner and the community as a whole. The proponent will not utilize the land for the purpose it was intended for leaving the property remains idle. The no project option is the least preferred from the socio-economic and partly environmental perspective due to the following factors;

- Discouragement for investors
- There will be no incinerator installation yet there is acute need for such facility within Nakuru County.
- 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 constructed using modern, locally and internationally accepted materials to achieve public health safety, security and environmental aesthetic requirements. Equipment's that save energy and water will be given first priority without compromising on cost or availability factors. Heavy use of timber during construction is discouraged because of massive destruction of forests. The exotic species would be preferred to indigenous species in the construction where need may arise. However, this will require very little timber. ***The proponent should consider installing solar panels so that solar energy is also used as an alternative.***

6.4 Waste Water (Effluent) Management alternatives

Five locally available technologies are discussed below:

1. Waste water treatment plant: This involves the construction of a plant and use of chemicals to treat the effluents to locally accepted environmental standards before it is discharged into the environment. As mentioned elsewhere in the report the operational stage will only require water for the sanitary facilities. Since the proponent intends to employ not more than 10 persons this will mean that a septic tanks will be appropriate for the site during the operational stage.

2. 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.

3. 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.

4. Use of septic tanks: This involves the construction of underground concrete-made tanks to store the sludge with soak pits. It is expensive to construct and requires regular empting. Septic tanks if not well constructed and monitored can lead to blockages and leaks to the underground water. This is the alternative since the area is not served with a sewer system which is more efficient for use in effluent management. The proponent hence intends to install septic system for used at the facility.

5. Connection to the existing sewer system: Connection to a sewer line would solve the effluent management issue at a very minimal cost and in environmentally efficient manner. The proposed site is not covered with a sewer line hence connection to sewer line is not an alternative.

6.5 Solid Waste Management

The proposed project will generate considerable amounts of solid wastes both during construction and operational phases. An integrated solid waste management system is recommended. The proponent will give priority to reduction of the materials at source. This option will demand a solid waste management awareness programme in to be effected by the management and the entire workforce. In addition to that recycling, reuse and composting of waste will be an alternative in priority. This issue calls for a source separation programme to be put in place-the proponent/ building management should introduce separate and adequately marked skips/ dustbins for sorting the recyclable wastes, organic matter and the other waste.

The recyclable will be sold to waste buyers within the Nakuru County and surrounding areas, organic matter could be sold to farmer for food or for use as compost while the rest will be disposed of to an ash pit or can be taken to an approved dump-site/ sanitary landfill i.e. ash that will be generated by the incinerator.

6.6 Comparison of alternatives

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

CHAPTER SEVEN: PUBLIC PARTICIPATION

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 24th July 2024 by qualified environmental experts via administration ofpre-designed questionnaires and by interviewing neighbors surrounding the proposed project site. The positive and negative views regarding the project were sought from the project site neighbors and other stakeholders.

The immediate neighboring lands are all vacant. There are other residential dwellings within the area and the nearest to the site is approximately 500 meters away to the north.

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 Gilgil area since it will help manage hazardous waste in the area and improvement of industrial development, and should therefore be undertaken.
- The project will improve businesses in the area and also create job opportunities to the local Youth during construction phase.
- The project is a waste management facility hence will promote environmental conservation.
- The project will be a blue print to other similar projects which may come up in the County.
- The project will encourage other investors to consider investing in the County.

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.
- Increased water and electricity demand
- Noise pollution
- Insecurity in the area
- Waste generation by the project.
- 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 incinerator installed should be modern to ensure minimal particulate matter is released to the atmosphere.
- The proponent should consider employing casual workers from the local areas during construction and operation phase of the project.
- Noise pollution should be controlled.

- Ensure that the project area is protected during construction and enough security during the operation phase. Consider installing security lights
- Install firefighting equipment like fire extinguishers.
- 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

8.0 Climate change and variability

This Environmental and Social Impact Assessment (ESIA) report acknowledges that the project area experiences variable climatic conditions, characterized by alternating dry and wet seasons. The long rains typically occur from March to May, while the short rains fall between October and December, with the rest of the year being predominantly dry. The site, located at an elevation of 2004m above sea level, has a temperate climate with relatively low annual rainfall, making it susceptible to climate variability. Given these conditions, the proponent and consultant have taken several measures to mitigate climate change impacts and enhance the project's sustainability.

To ensure environmental protection, the project incorporates an Environmental Management Plan (EMP) that outlines strategies for pollution control, waste management, and continuous environmental monitoring. One key adaptation measure is the introduction of vegetation around the site, including indigenous trees, shrubs, and grass, which will help enhance biodiversity, stabilize the soil, and mitigate the effects of extreme weather conditions such as heavy rainfall and strong winds. Additionally, since the area lacks a public sewer system, the project includes a septic system for wastewater management, preventing contamination of nearby water sources.

Recognizing the need to minimize emissions and reduce its carbon footprint, the project design features flue gas trapping, smoke interception, and stack filters to control air pollution from the incineration process. This aligns with Kenya's Vision 2030, which emphasizes environmental conservation and climate change adaptation. Furthermore, the project contributes to sustainable waste management by providing a controlled disposal system for hazardous materials, reducing the risk of environmental degradation. Measures have also been put in place to enhance disaster preparedness, including fire safety protocols, energy efficiency strategies, and improved water conservation practices.

The proponent and consultant have integrated climate change mitigation and adaptation measures into the project's design and operation, ensuring compliance with environmental regulations while promoting sustainable development. These efforts not only safeguard the environment but also contribute to the resilience of the local ecosystem against the effects of climate change and variability.

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 theyare 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. A set of protective clothing will last one worker throughout the construction phase.

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

Development Stage	*Potential Impact*	*Recommended Mitigation Measure*	*Responsibility And Timeframe*	*Targets And Cost Estimates*	*Monitorable Indicators*
Construction /Installation	Environment Pollution	• Ensure contractor undertaking On environmental considerations, • Monitor trends on health and safety of construction/installation workers and neighbourhood, • Contractor to maintain material balance records at all times	Proponent and Contractor Continuous throughout construction period	Sustainable construction No direct cost involved	• Complaints from neigbourhood, • Concerns from environmental authorities and local County Council.
	Waste Management	• Disposal of waste be done in accordance to waste regulations, • Contractor to undertake safe waste disposal, • Verify legality of waste disposal destination	Proponent and Contractor Continuous throughout construction period	Safe construction waste management	Compliance with waste management regulations
	Social Aspects	• Address concerns of neighbouring land users as per this report, • Integrate public safety in the construction process, • Utilize local labor for construction to enhance social harmony.	Proponent and Contractor Initiate action With construction	Social harmony No direct cost involved	Residents complaint Public opinion

Development Stage	*Potential Impact*	*Recommended Mitigative Measure*	*Responsibility And Timeframe*	*Targets And Cost Estimates*	*Monitorable Indicators*
Decommissioning		• Construction camp decommissioning on pre-planned schedule, • File a completion report to NEMA for initial inspection	Proponent Upon operation commencement	Identifiable baseline status Of the plan	Fulfillment of the Mitigation measures recommended
Operation:	Environment Pollution	• Equipment specifications to conform with environmental standards, • Integrate environmental components in the site design (waste management, emission controls, etc.), • Apply to the extent possible provisions of the waste management regulations, Nakuru County Council by-laws, Public Health Standards, etc., • Enhance in-house awareness and sensitization on environmental protection initiatives,	The proponent Immediately and continuous.	Integration of environmental components/idea in the site operations. **KShs. 200,000** for initial investment	• Discharges into the public drainage system, • Emissions into the air, • Related health effects to the site operators, • Public complaints.

	Waste Management	• Maintain Isolation of surface stormwater drains from those carrying oil/grease residuals, • Enhance water recycling forconservation purposes, • Compliance to waste management regulations (Legal Notice Nos. 120 and121), • In-house training on waste management options for managers andsupervisors, • Provide leadership in waste recyclingand re-use.	The proponent Immediately and continuous.	Streamlined waste flow paths. KShs. **200,000** as initial capital	• Waste categories andseparation, • Mode of transfer • Final destinations.

Development Stage	*Potential Impact*	*Recommended Mitigative Measure*	*Responsibility And Timeframe*	*Targets And Cost Estimates*	*Monitorable Indicators*
Operations	Air Quality	• Dry materials shall be kept dump orcovered at all time, • Install gadgets to intercept the particulate matter as well as controllinggaseous emissions.	Project Manager Initial installation are design controlled	Reduced concentrations ofaerial pollutants KShs. 100,000 peryear.	Visibility of chimney emissions, Public complaint PM(50), SOx(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 thesite. Indigenous species would be preferred.	The proponent Upon commissionin g	Greening the compound and Landscaping. **KShs100,000** over 1 year period.	Number of trees planted. This action will develop a vegetated landscape that willalso help contain dust originating from the site.
	Social Aspects	• Draw of-site contracts to enhancesocially acceptable procedures, • Involve more independent interested parties (waste collectors) in establishing options for waste recycling,	The proponent Upon commissionin g then continuous	Social acceptability andco-existence.	Health problems and degradation of environmentalresources, The public opinion, Satisfaction to the relevantauthority

	Occupational Health and Safety	• Constitute health and safety committee, • Maintain safety reticulation (e.g. fire detection and fighting equipment), • Train on HS issues and provide PPEs and enforce applications, • Install all machines and equipment with protective guard rails at the moving parts.	The proponent. Immediately	Quick and effective response to emergencies . Annual budget Of **KShs. 200,000**	• The security and safety of the neighbouring premises, • Safety cases over a period of time, • Response period on safety and medical aspects.

Development Stage	*Potential Impact*	*Recommended Mitigative Measure*	*Responsibility And Timeframe*	*Targets And Cost Estimates*	*Monitorable Indicators*
Operation	Noise levels:	• Initiate a noise mapping programme and keep monitoring, • Undertake a annual hearing survey of all the workers, • Train, provide ear muffs/corks And enforce compliance,	The Supervisors. Upon commissioning and continuous.	Compliance **KShs. 200,000** For equipment and professional guidance.	Occupational levels of 70dBA, External receptors as defined under the EMCA regulations on noise and vibrations (2009)
	Compliance aspect	• Develop an environmental policy, • Establish a legal register on critical relevant environmental laws, • Annual environmental audits as required by law, • Develop Standard Operation Procedures focusing on environment, health and safety.	The proponent Continuous	An all-time compliance **KShs. 200,000** Per year	A facility to ensure compliance with laid down guidelines at all times
	Institution Framework	• Adapt environmental aspects in administrative framework, • Review the contracting arrangement at all levels of the operations, • Establish a monitoring and reporting protocol on environmental conservation, • Engage a professional to Oversee environmental management.	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

Development Stage	*Potential Impact*	*Recommended Mitigative Measure*	*Responsibility And Timeframe*	*Targets And Cost Estimates*	*Monitorable Indicators*
Corporate Initiatives	Capacity Building (Documentation and human resources capacity	• Establish an information resource point(for reference by the site operators), • Document in-house guidelines and procedures on environmental management, • Develop a training programme for • workers on safety, health, and environment, • Engage a qualified staff to Oversee environment, health and safety.	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	• Establish a waste collection, transfer and storage mechanisms, • Characterize and identify all waste streams up to final destinations, • Monitor the carrying capacity of the environmental infrastructure receiving the wastes, • Install monitoring facilities along the waste pathways.	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.

Development Stage	*Potential Impact*	*Recommended Mitigative Measure*	*Responsibility And Timeframe*	*Targets And Cost Estimates*	*Monitorable Indicators*
Decommissioning	Compost impacts	• Notify NEMA and other relevant authorities on intension to stop operations at least 3 months in advance, • Carry out a decommissioning audit and submit report to NEMA for review six months in advance, • Close down equipment and participate in the plan for site inspection, • Initiate removal following strictly recommendations of the decommissioning audit report. • Initiate a programme to rehabilitate the site to near its original state, • Monitor the site on related Parameters for 1 year.	The proponent, NEMA, HQ/Nakuru County and environmental expert. Process to take 2 years on a pre-Agreed schedule	Rehabilitated site Costs to be Identified Through the Decommissioning audit repot	Air quality and soil status in the area. Social and economic implications in the Area Destination of waste Material disposal.

CHAPTER NINE: CONCLUSION AND RECOMMENDATION

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 hazardous waste management plant 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, no significant sensitive environmental features are found within the vicinity and the area is not fully zoned giving an opportunity to isolate the location for this purpose in future. 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 arespectful 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 proposeddevelopment is a timely venture that will increase the nation's hazardous 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 beachieved 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, solid waste collection bins and transfer arrangements. Hazardous waste holding units should be isolated from the external environment at all times

- 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.
- Aerial emissions be controlled through appropriate extraction fans in the operation areas into bag houses, electrostatic precipitators and installed scrubbers in the stacks to ensure no hazardous residuals finds their way back in to the natural environment
- All construction materials and especially pipes, pipe fittings, sand just to mention a-few should be sourced/procured from bona fide /legalized dealers.
- 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.
- Proper and regular maintenance of construction machinery and equipment will reduce emission of hazardous fumes and noise resulting from friction of metal bodies. Maintenance should be conducted in a designated area and in a manner not to interfere with the environment.
- 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

Kenya gazette supplement Acts 2000, Environmental Management and Coordination Act Number 8 of 1999. Government printer, Nairobi

Kenya gazette supplement Acts Building Code 2000 by government printer, Nairobi

Kenya gazette supplement Acts Land Planning Act (Cap. 303) government printer, Nairobi

Kenya gazette supplement Acts Local Authority Act (Cap. 265) government printer, Nairobi

Kenya gazette supplement Acts Penal Code Act (Cap.63) government printer, Nairobi

Kenya gazette supplement Acts Physical Planning Act, 1999 government printer, Nairobi

Kenya gazette supplement Acts Public Health Act (Cap. 242) government printer, Nairobi

Kenya gazette supplement number 56. Environmental Impact Assessment and AuditRegulations2003. Government printer, Nairobi.

ANNEXUS

1. Title Deed
2. General layout of the incinerator
3. Public Consultations
4.