ENVIROMENTAL IMPACT ASSESSMENT

STUDY REPORT

For

THE PROPOSED HAZARDOUS WASTE TREATMENT AND TRANSFER STATION IN KANGPETEI AREA OF LOKORI, TURKANA EAST CONSTITUENCY

PROPONENT:	EIA EXPERT
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DOCUMENT AUTHENTIFICATION

This project report on Environmental Impacts Assessment has been prepared by Environ Consulting Ltd a NEMA registered and licensed EIA/EA Firm of Experts.

This report has been done with reasonable skills, care and diligence in accordance with the Environmental Management and Coordination Act, 1999 and the Environmental (Impact Assessment and Audit) Regulations 2003.

We the undersigned, certify that the particulars given in this report are correct to the best of our knowledge.

Sign: …… ……

Date

Firm of Experts

PROPONENT

Sign: …… ……

Dr. Philip Mwabe Date

ABSTRUCT

Waste management is a growing problem in most of the developing nations including Kenya. One of the proposed solutions is to establish a transfer- and recycling station in the proposed site above which could serve as an important part in the aim to create a well-organized waste management system. A transfer station could make the waste management more efficient meanwhile; a recycling station could provide the society with a possibility to reduce materials being disposed on a landfill and/or through incineration process. The purpose of this report therefore, is to conduct a feasibility study to support the Environmental Impact Assessment (EIA) that would have to be done before such a station can be constructed. The feasibility study presented here provides information about identified impacts and assessed consequences caused by the waste transfer- and recycling station. Methods used to present the study were mainly performed by field studies at the suggested alternative sites and by informal key informant interviews with experts from Turkana City Council. The result of the report shows a summary of similar consequences at the suggested sites but the analysis, including additional aspects, concluded a differentiation between the sites that enabled a final recommended location.

ACRONYMS AND ABBREVIATIONS

CPP	Consultation and Public Participation
EA	Environmental Audit
EIA	Environmental Impact Assessment
EHS	Environment, Occupational Health and Safety
EMS	Environmental Management System
EMP	Environmental Management Plan
EMCA	Environmental Management and Coordination Act, 1999
NEMA	National Environment Management Authority
NCW&SC	Nairobi City Water and Sewerage Company
NEAP	National Environmental Action Plan
NEC	National Environmental Commission
NPEP	National Poverty Eradication Plan
NWMS	Northern Waste Management Services
WSSD	World Summit on Sustainable Development
PEC	Provincial Environmental Commission
OSHA	Occupational Safety and Health Act

EXECUTIVE SUMMARY

Waste management is an integral part of industrial development in Kenya and all over the world. Without this, all the development activities would be detrimental the environment and to life in general. Waste management in the Kenya has been assumed to be managed by the National Environmental Management Authority (NEMA) and the County governments. However, The national environmental management authority have had private entities to help in the collection, transfer of wastes to designated areas and waste management through other means including incineration. It is in this regard that Environmental and Combustion Consultants Limited (ECCL) become a leading hazardous manager in the country having its main operation site in Kitengela area of Kajiado County. Upon realization of the growing hazardous wastes challenges, ECCL through Northern Waste Management Services Ltd is seeking to expand and improve its waste management by installing a waste treatment and transfer station in Kangpetei area of Lokori of Turkana County to increase its waste handling capacity with enhanced safety and health and without compromising environment and public health.

Waste transfer stations play an important role in a community's total waste management system, serving as the link between a community's solid waste collection program and a final waste disposal facility. While facility ownership, sizes, and services offered vary significantly among transfer stations, all the transfer stations serve the same purpose —consolidating waste from multiple collection vehicles into larger, high-volume transfer vehicles for more economical shipment to distant disposal sites. In its simplest form, a transfer station is a facility with a designated receiving area where waste collection vehicles discharge their loads. The waste is often compacted, then loaded into larger vehicles (usually transfer trailers, but intermodal containers, railcars, and barges are also used) for long-haul shipment to a final disposal site — typically a landfill, waste to- energy plant, or a composting facility, or an incineration plant. No long-term storage of waste occurs at a transfer station; waste is quickly consolidated and loaded into a larger vehicle and moved off site, usually in a matter of hours

The realization of the project will ensure that waste will be transported using tracks and deposited for pretreatment before final disposal as appropriate either in landfills or incineration. At the station wastes sorting otherwise called material recovery station using localized mechanical biological treatment system to remove recyclable items from the waste stream. In the realization of the project, the proponent will employ soil washing of contaminated soil and ensuring proper disposal at the process.

The installation of the proposed project is necessitated by the ever escalating hazardous waste generation from Industrialization and other development activities in Kenya – more so oil and gas exploration in this part of the country - and the implementation of Environmental Management and Coordination (Waste Management) Regulations, 2006 in addition to the need to cope and comply with other regulatory framework. Environmental & Combustion Consultants Ltd was started in 1995 and among its objectives was to provide local industry and the public sector with the technical infrastructural capacity to manage hazardous wastes. Due to the experience in hazardous waste management by the company, and the increased base of clients, the company is in a position to manage such station in the proposed site.

The company's waste management strategy desires to have a source reduction and recycling approach to its waste management which will also play an integral role in the country's total waste management system. These two activities will significantly reduce the weight and volume of waste materials requiring disposal, which reduces transportation, landfill, and incinerator costs. Source reduction consists of reducing waste at the source by changing product design, manufacturing processes, and purchasing and sales practices to reduce the quantity or toxicity of materials before they reach the waste stream. The Environmental Management and Coordination Act (EMCA) promote source reduction as the waste management technique of choice.

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 waste treatment and transfer station 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 company has acquired 100 acres in Kangpetei area of Lokori in Turkana East Constituency. Local Authority change of user to Industrial use is currently being done on the acquired piece of land. The purpose of this EIAS report submission to the National Environment Management Authority (NEMA) is to grant the proponent an opportunity to install a waste treatment and transfer station in the aforesaid location. It has good geological structure in a remote location that will ensure list interference from the locals.

Currently, the company (Environmental and Combustion Consultants Ltd - ECCL) is a leading hazardous manager in Kenya operating two rotary kiln incinerators in the country located at Kitengela Township in Kajiado County. Upon realization of the growing hazardous wastes challenges, ECCL is seeking to the proposed facility to increase its hazardous waste handling capacity to cater for the need of such waste handling and posal by ever increasing industrial establishments in the country. The site will also take advantage of its remoteness to ensure that pollution aspects to human habitation are checked at all times whenever in operation. In compliance to the Environmental Management and Coordination Act (EMCA), 1999 as well as the related regulations, ECCL 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 purpose of this study will ensure that all negative impacts to human habitation and the environment at large is checked and suggestions of handling is incorporated in the development process. It is, therefore, expected that there will be potential emission of various gases and particulate matter into the atmosphere from the

handling process, impact to water resources through surface runoffs. 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 primary reason for using a transfer station is to reduce the cost of transporting waste to disposal facilities. Consolidating smaller loads from collection vehicles into larger transfer vehicles reduces hauling costs by enabling lection crews to spend less time traveling to and from distant disposal sites and more time collecting waste. This also reduces fuel consumption and collection vehicle maintenance costs, plus produces less overall traffic, air emissions, and road wear. In addition, a transfer station will among other benefits provide:

i) An opportunity to screen waste prior to disposal

ii) Flexibility in selecting waste disposal options

iii) An opportunity to serve as a convenience center for public use in waste management

The plant has an overall positive implication to the country, and especially for such developments that produce hazardous wastes in their operation. 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 waste transfer station:

(i) Mopping up of hazardous and toxic materials by reducing the amount of waste mobility over long distances,

(ii) The station will act like a filter to ensure that the many different types of waste end up in the right places. They improve the ability to reuse or recycle as much waste as possible – e.g. converting green waste into compost or diverting recyclable glass out of landfill – all of which have economic as well as environmental benefits

(iii) The stations are generally busy places, with waste continuously being dropped off, bundled and transported on for processing. By regularly removing waste from the transfer stations, the risk of fire and odour is also reduced.

(iv) In improving efficient waste management after doing your bit to sort waste and recyclables before placing them in the correct areas at the Waste Transfer Station helps to save time and costs further along the waste management cycle

(v) The facility will provide a safe point for disposal of industrial hazardous and toxic wastes, most of which currently is dumped into public garbage disposal sites with adverse implications to thee ecology and human health,

(vi) The facility will provide a multiple of direct and indirect employment opportunities within the country

POTENTIAL NEGATIVE IMPACTS

The schedule below provides an outline of the anticipated impacts. The impacts have been predicted such as to cover the construction, operation and decommissioning phases of the project.

Development Stage	Environmental Aspects	Anticipated Impacts
Construction	Environmental Pollution	▪ Emissions into the air of dust, ▪ Emissions from construction equipment and material deliver trucks, ▪ Public nuisance from construction equipment.
	Drainage	▪ Change in storm water regime around the site, ▪ Soil erosion creating siltation of natural drains during rains, ▪ Discharge of wastewater from the site into dry drainage system with risks of environmental pollution downstream.
	Social Issues	<u>Noise Levels:</u> ▪ High noise levels from construction machinery and materials' delivery trucks,
		<u>Health and Safety:</u> ▪ Bronchial infections from dusts and other emissions, ▪ Risks to food based industry in the area, ▪ Water sources contamination, ▪ Risks to health and safety of the construction workers
		<u>Cultural Values:</u> ▪ Social interaction of construction workers with local communities, ▪ Moral effects as a result of increased earnings
Operation	Waste Water Aspects	▪ Surface water contamination, ▪ Land and soil degradation ▪ Pollution from disposal of scrap oil, leachates and wastewater, ▪ Pollutants from hazardous wastes holding yard, ▪ Pollution from off-site solid waste dumping,
	Air Quality	▪ Aerial emissions from the kilns and other stacks,– carbon dioxide, nitrogen oxides, hydrocarbons, water

Development Stage	Environmental Aspects	Anticipated Impacts
		vapour, hydrogen chloride gas, ▪ Arial pollution from dust, kiln fly ash, emissions, etc., ▪ Particulate matter blown from waste holding yards,
	Noise Levels	▪ Occupational health and safety of the workers, ▪ Levels above the ambient noise levels the surrounding areas,
	Biological Diversity	▪ No signs of significant wild life in the area, ▪ Removal of grass cover, arid trees and shrubs, ▪ Related microorganisms associated with the scarce vegetation removed.
Operations	Social Impacts	<u>Income Generating Initiatives:</u> No directly negative impact to income generation on the area. Positively affecting the local social and economy
		<u>Social and Cultural Issues:</u> ▪ Social nuisance from pollution to physical environment such as land and air by emissions from the site, ▪ Social complaints and concerns on health and safety, ▪ Cultural intrusion from employee intrusion, ▪ Conflict on land use, ▪ Conflicts at off-site solid waste dumping areas, ▪ Potential of social diseases (HIV/AIDS, TB, etc.).
		<u>Health and safety:</u> ▪ Risk to workers' health from aerial emissions originating from the site operations, ▪ Risks to life through outbreak of fires, ▪ Risks of fire to the site property and that of the neighbours, ▪ Risks from internal movements of workers and customers, ▪ Slippery surfaces, e.g. store rooms,
Operations	Solid Waste Management	▪ Risks to Health and safety, ▪ Risks to environmental pollution, ▪ Ground water quality degradation at off-site disposal sites, ▪ Aesthetic pollution in the site and neighbourhood (acetylene gas production residuals – calcium oxide slurry), ▪ Public nuisance at off-site disposal sites, ▪ Illegal waste dumping
	Compliance	▪ Penalties from non-compliance,

The Site

At the time of the initial assessment to ascertain the proposed site location, one hundred acre piece of land had been approved for execution of the proposed project. The site is in a remote location of Turkana - Northern Kenya. The allocation was given by the county government to the proposed purpose to help in the management of wastes including wastes from the nearby towns and other industrial development in the area.

Electricity needs will be met from the KPLC grid where applicable. However, before connection the company will employ the use of power generator to cater for the internal power needs in the station. The main road access to the facility is an all weather road that will be upgraded to serve the area. The proponent will improve the road to the site to ensure accessibility and safe deliver of raw materials and taking of finished products.

The site is expected to be designed such as to ensure optimal utilization of space, ensure minimal waste movement, easy and safe movement for the forklifts and other machines. At full operations the plant is expected to help recycle a lot of waste from within the country. Wastes will be segregated and contained safely at specific locations around the premises. Spills, emissions and friable materials will be contained in the premises.

Findings

At the time of this assessment, the 100 acre parcel of land had been allocated by the county government and process of finalizing on documentation was being done and the proponent is tasked to ensure that the parcel of land is being utilized for the purpose on which the allocation is given. Of the land portion, the proponent will develop design and apportion site plan to ensure maximum use of given land parcel. No permanent structured were sighted in the surrounding area since the local communities are nomadic pastoralist and the reason for purchasing such a large parcel of land was to keep any intrusion by the locals to the proposed site.

No form of services (water supply, power or communication) is available to the site area while the access road will be upgraded and constructed where possible to the site to aid the construction and operation stages of the site. Detailed physical and social status of the site area in given under chapter 3 of the report (baseline information).

ENVIRONMENTAL MANAGEMENT PLAN

This environment management plan presents integrated scenarios with the environmental aspects, anticipated impacts during construction and occupation as well as preventive (mitigation) action plans. Other issues covered include the responsibilities, costs implications, timeframes and parameters for monitoring of the trends. The EMP matrix is designed such that it is self-implementing and can be implemented.

The development and operation of the waste management plant would be expected to observe environmental conservation requirements in accordance to the national regulations. To realize this goal, acceptability and minimal effects to the physical environment as well as the wellbeing of the surrounding communities will require to be integrated in the completion of the project through constant consultations, evaluations and review of the design aspects and modes of operation throughout the project cycle. Among the factors that need to be considered in this project implementation and its post evaluation initiatives will include;

(i) Preservation of the natural beauty of the immediate surrounding areas,

(ii) Control of soil erosion and siltation of springs downstream as public sources of water,

(iii) Enhanced integration of environmental, social and economic functions,

(iv) Incorporation of safety provisions in the premises including easy accessibility to the road, adequate in-house signage and information systems among others.

(v) Enhancing the contractor's performance,

(vi) Realization of cordial relations among various community, economic, social and cultural groups as well as between the local community and the contractor,

(vii) Enhancing equity and maximizing social and economic benefits for the local community through income generation from employment,

It is recommended that specific guidelines are developed to allow integration of environmental management considerations in the construction, commissioning as well as the use of public amenities and resources within site area. The guidelines will be a basis for compliance actions, responsible practices for the local residents and appropriate code of conduct for all stakeholders to the project. Among the factors that need to be considered in this guideline will include;

(i) The contractor and other players in the construction activities be prevailed upon to implement this EMP,

(ii) The development should appreciate the interests of the neighbouring communities at all stages of the project,

(iii) Maintenance of the natural beauty of the countryside around the site area such as to include green belts and other beatification initiatives,

(iv) Enhanced integration of environmental, social and economic functions in the project design and implementation plans including safety provisions,

(v) A site specific environmental, health and safety plan is established soon after commissioned.

In order to implement the management plan, it is recommended that a position is created for an appropriate expertise to oversee matters of environment and social management as well as enhanced safety and security measures within and around the site. The services of an environmental expert may be required to co-ordinate and monitor environmental management for the site during construction and post monitoring audits. This would be done under the responsibility of the site contractor during construction.

The responsibility relationships are presented in the EMP matrix alongside the timeframe, targets and the cost estimates.

CHAPTER ONE:

1. INTRODUCTION

Waste transfer stations play an important role in a community's total waste management system, serving as the link between a community's solid waste collection program and a final waste disposal facility. While facility ownership, sizes, and services offered vary significantly among transfer stations, all the transfer stations serve the same purpose —consolidating waste from multiple collection vehicles into larger, high-volume transfer vehicles for more economical shipment to distant disposal sites. In its simplest form, a transfer station is a facility with a designated receiving area where waste collection vehicles discharge their loads. The waste is often compacted, then loaded into larger vehicles (usually transfer trailers, but intermodal containers, railcars, and barges are also used) for long-haul shipment to a final disposal site — typically a landfill, waste to- energy plant, or a composting facility, or an incineration plant. No long-term storage of waste occurs at a transfer station; waste is quickly consolidated and loaded into a larger vehicle and moved off site, usually in a matter of hours.

Waste management is an integral part of industrial development in Kenya and all over the world. Without this, all the development activities would be detrimental the environment and to life in general. Waste management in the Kenya has been assumed to be managed by the National Environmental Management Authority (NEMA) and the County governments. However, The national environmental management authority have had private entities to help in the collection, transfer of wastes to designated areas and waste management through other means including incineration. It is in this regard that Environmental and Combustion Consultants Limited (ECCL) become a leading hazardous manager in the country having its main operation site in Kitengela area of Kajiado County. Upon realization of the growing hazardous wastes challenges, ECCL is seeking to expand and improve its waste management by installing a waste treatment and transfer station in Kangpetei area of Lokori of Turkana County to increase its waste handling capacity with enhanced safety and health and without compromising environment and public health.

The installation of the proposed project is necessitated by the ever escalating hazardous waste generation from Industrialization and other development activities in Kenya – more so oil and gas exploration in this part of the country - and the implementation of Environmental Management and Coordination (Waste Management) Regulations, 2006 in addition to the need to cope and comply with other regulatory framework. Environmental & Combustion Consultants Ltd was started in 1995 and among its objectives was to provide local industry and the public sector with the technical infrastructural capacity to manage hazardous wastes. Due to the experience in hazardous waste management by the company, and the increased base of clients, the company is in a position to manage such station in the proposed site.

1.1 Project overview and justification

As the urbanization in developing countries increases so also does the demand for well functioning waste management. In order to create sustainability in this matter would it be of importance to implement a waste management beneficial for the public health and for the environment. The establishment of a transfer- and recycling station could be a step towards a more sustainable society. A transfer station could provide a more efficient waste management system by decreasing the driving distances for waste collecting vehicles to the final disposing site. To engage citizens in the aim of a better waste system could a recycling station be an asset in the municipality since it could create awareness regarding the importance with recycling and reuse of materials.

The Industrialization in Kenya and the implementation of Environmental Management and Coordination (Waste Management) Regulations, 2006, has necessitated the need to develop a proper and environmentally friendly way of handling all wastes more so hazardous wastes to include treatment facilities and proper containment to cope with the increased demand from industry and at the same time meet the ever demanding regulatory framework. Environmental & Combustion Consultants Ltd was started in 1995 and among its objectives was to provide local industry and the public sector with the technical infrastructural capacity to manage hazardous wastes. The proponent of the aforesaid project is known for hazardous waste handling over a period of time that brings experience and expertise to the management of such waste within Kenya.

As a result of the increasing waste disposal problem, Environmental Impact study is necessary as a requirement by the international and the national environmental authorities to address for the new/upcoming projects and developments. The purpose of this Terms of Reference; therefore, is to seek approval for the go ahead to conduct environmental impact assessment study (EIAS) of the proposed project and to provide baseline information upon which subsequent environmental audits studies shall be based in line with environmental (impact assessment and Audit) Regulations 2003, Kenya Gazette Supplement No. 31, Legal Notice No. 101 0f 13th June 2003.

The planning and execution of the proposed project will ensure that the needs of the companies that will use the facility should be accommodated. Key variables to consider include waste type and quantity, site constraints, climate, wind, customers (private, commercial or public) and local zoning requirements. Examining these details will help produce an efficient operation. In considering the location, ECCL has acquired enough space within the county to erect the facility.

Our investigation will involve examination of 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 transfer station will be a key component of cost-effective solid waste transportation. The realization of the project will ensure that waste from local collection vehicles are sorted and loaded into larger trucks or other transport modes that will be cost effective in the long run, freeing collection-specific vehicles and crews to devote their time to actual collection activities. In addition, the main benefit will include: -

- Provides opportunity to screen incoming trash for such purposes as removing hazardous waste or recovering recyclables
- Provision of fuel saving, reduction in road wear and less air pollution due to fewer vehicles being on the road
- Provides a trash and recyclable material drop-off location for citizens
- Reduce total traffic congestion in the community by transferring it onto larger trucks
- Reduced traffic hence improving safety at the landfill or waste management facilities

1.2 OBJECTIVE SCOPE AND CONTENT OF THE EIA PROCESS

1.2.1. Objectives

The purpose of this EIAS 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:

i. To identify possible environmental impacts, both positive and negative

ii. To assess the significance of the impacts

iii. To assess the relative importance of the impacts of relative plan designs, and sites

iv. To propose preventive mitigation and compensative measures for the significant negative impacts of the project on the environment.

v. Generate baseline data for monitoring and evaluating how well the mitigation measures are being implemented during the project cycle.

vi. To present information on impact of alternatives

vii. To present the results of the EIAS that can guide informed decision making and safe operation of the incineration plant

1.2.2. Scope

The Environmental Impact Assessment was conducted at the site and the surrounding area. The assessment involved the physical examination, interviews with beneficiaries, neighbouring communities, relevant consultants and government agencies.

To generate environmental impacts assessment study report for submission, it involved a systematic examination of all proposed activities.

The project assessment investigates and analyses the anticipated environmental impacts of the proposed development in line with the Environmental (Impact Assessment and Audit) Regulations of 2003.

Consequently, the report will generate the following:

- Nature of the project
- The location of the project including the physical area that may be affected by the project activities
- The activities that shall be undertaken during the project phases
- The potential environmental impact of the project and mitigation measures to be undertaken during and after the project cycle
- An action plan for prevention and management of possible accidents during the project cycle
- A plan to ensure that the health and safety of the workers and the neighbouring communities
- The economical and socio-cultural impacts to the local community and the nation in general
- The project budget
- Any other information that the proponent may be requested to provide by NEMA

1.2.3. Criteria

The environmental impact assessment was carried out in line with the environmental management, statutory and regulatory requirements in Kenya as outlined in section two of this report, the Environmental (Impact Assessment and Audit) Regulations 2003 and best practice guidelines on safety and health as per the Occupation Safety and Health Act, 2007.

Following the preliminary visit of the proposed site, the following was undertaken

(i) Screening of the project, a process that identified the project as being among those that requiring EIA under schedule 2 of the EMCA 1999

(ii) A scoping exercise that identified the key issues to be identified in the study

- Documentary review on the nature of the proposed activities, policy and legal framework, environmental setting of the area and other available relevant data/information
- Detailed discussions with the proponent and the consultation with the relevant officials in the regulatory authorities
- Physical investigation of the site and the surrounding areas using a pre-prepared checklist identifying possible environmental and human safety issues that are likely to be affected
- Reviewing the proposed project designs and implementation plan/schedules with a view to suggesting suitable alternatives
- Developing an environmental management plan with responsibilities, schedules, monitorable indicators and time frame among other aspects
- A comprehensive report including all issues as listed in the Environmental (Impact assessment and audit) Regulations 2003

1.3 TERMS OF REFERENCE (TOR)

The environmental Impact (EIA) report considered the following aspect and other that proved of significance during the study

1. Project developments impacts on the ecology. This in essence covered:
    - The impacts of the development on biodiversity both within and outside the project development site
    - Impacts on habitat quality and issues of habitat disruptions
    - Surface water runoff and containment

2. Social implications of the development within the locality, region and nationally. This included:
    - Economic implications of the development
    - Security, risk and safety
    - Employment
    - Livelihoods
    - Public health implications
    - Demand and development of infrastructures and social amenities

3. Assess the impacts of development on landscape and land use:
    - Determine the impact on change on civic shape, scenery, aesthetic modifications
    - Examine the compatibility and complimentarily of the development of the surrounding land uses

4. Assess the impacts of the development on current demands on water source as well as possible implications on surface and ground water qualities and quantities

5. Develop an environmental management plan (EMP) that would mitigate the possible impacts on the environment

1.4 Duties of the Proponent

The report emphasizes the duties of the proponent and the contractor/supplier during the project phase. It will be the duty of the proponent to ensure that all legal requirements as pertaining to the development are met as specified by the law.

1.5 Duties of the contractor/supplier

- Prepare and maintain an approved time and progress chart showing clearly the period allowed for each section of the work

- The contractor/supplier is to comply with all regulations and by-laws of the local authority including serving notices and paying of the fees

- The contractor shall make good at his own expense any damage he may cause to any public and private roads and pavements in the course of carrying out his work

- The contractor/supplier shall be responsible for all the action of the sub-contractor in the first instance

- The contractor or supplier shall take all possible precaution to prevent nuisance, inconvenience or injury to the neighbouring properties and to the public generally, and shall use proper precaution to ensure that safety of willed traffic and pedestrian

- All work which may produce under level of noise, dust vibration or any other discomfort to the workers, and/or guest of the client must be undertaken with care with all necessary precautions taken

- The contractor or supplier shall upon completion of working remove and clear away all plant rubbish and unused materials and shall leave the site in a clean and tidy state to the certification of the site engineer. He shall also remove from the site all rubbish and dirt as it is produced to maintain the tidiness of the premise and its immediate environs

- The standard of workmanship shall not be inferior to the current British codes of practice or the Kenya Bureau of Standards where existing. No materials for use in the permanent incorporation into the works shall be used for any temporary works or purpose other than that for which it is provided. Similarly, no material for temporary support shall be used for permanent incorporation into the works.

- All the materials and workmanship used the execution of the works shall be of the best quality and description. Any material condemned by the site engineer shall immediately be removed from the sit at the contractor/supplier expense

CHAPTER TWO

2. PROJECT DESCRIPTION

2.1 Nature of the project

The proponent (ECCL) is seeking to install a waste treatment and transfer station in Kangpetei area of Lokori of Turkana County to increase its waste handling capacity with enhanced safety and health and without compromising environment and public health. Waste will be transported using tracks and deposited for pretreatment before final disposal as appropriate either in landfills or incineration or any other method appropriate depending on the nature of waste being handled. At the station wastes sorting of waste otherwise called material recovery station using localized mechanical biological treatment system to remove recyclable items from the waste stream

2.2 Site Location

The proposed waste treatment and transfer station is located in unreferenced land in Kangpetei area of Lokori of Turkana County to increase its waste handling capacity with enhanced safety and health and without compromising environment and public health. The land is being allocated to the proponent from the county government of Turkana.

2.3 Site Characteristics

At the time of the initial assessment to ascertain the proposed site location, one hundred acre piece of land had been approved for execution of the proposed project.

Electricity needs will be met from the KPLC grid where applicable. However, before connection the company will employ the use of power generator to cater for the internal power needs in the station. The main road access to the facility is an all weather road that will be upgraded to serve the area. The proponent will improve the road to the site to ensure accessibility and safe deliver of raw materials and taking of finished products.

The site is expected to be designed such as to ensure optimal utilization of space, ensure minimal waste movement, easy and safe movement for the forklifts and other machines. At full operations the plant is expected to help recycle a lot of waste from within the country. Wastes will be segregated and contained safely at specific locations around the premises. Spills, emissions and friable materials will be contained in the premises.

2.4 Proposed site development

While 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 proposed site is designed for waste reception and sorting of hazardous waste and minimal treatment as soil washing.

The integrated waste management facility is being designed to facilitate handling of hazardous wastes and will accommodate the following basic components;

2.4.1 Waste reception

It is intended that waste will be delivered to the site by tracks from all part of the country as desired. Delivery will also mainly by road but in compliance with regulations. The waste reception will comprise of;

(i) A service road from the offloading bay to the site capable of handling a forklift and 40ft.container at all weather conditions,

(ii) Offloading using forklift where appropriate since the wastes will be delivered using large tracks,

(iii) A container offloading bay will be provided at the site that will also be installed with safety measures environmental protection provisions.

(iv) Paring area from trucks and forklifts

2.4.2 Waste Sorting

The waste receiver may be mixed depending on sources. Parts of the waste may require varying handling options such as soil washing for contaminated soil, holding in bunkers or recycling. Sorting bay will therefore, be provided fitted with appropriate quantification facilities, documentation and holding zones. Necessary safety and environmental protection provisions will be provided.

2.4.3 Recycling yard

All recyclable materials will be moved to a yard for storage depending on nature and target re-users. Necessary management provisions will be part of the yard,

2.4.4 Incineration facility description

The company will transfer all wastes after sorting to their plant in Kitengela for further management using incineration process. ECCL has been operating an incineration unit at their Kitengela plant that houses two incinerators. 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 company regularly subject its operation to air quality measurements to ensure sound environmental management in its operation.

The solid waste container at the Kitengela site include a $5m^3$ solid waste container, attached to a feed conveyor system for loading the materials into the screw hopper. The facility is installed to have a height efficiency steam generator for recovering heat from the resulting exhaust gases. The generator includes sufficient heat exchange surface to remove 65-80% of the available heat. The standard unit for solid waste uses a conservatively designed afterburner to assure maximum oxidation and minimal particulate emissions. The rotary system is sized based on operating with materials that require constant mixing, drying, and agitation.

The Rotary Kiln System is equipped with modulating Natural Gas or light oil burners with flame safety. The burners will be mounted to the outer shells of both chambers and are directed to assure maximum turbulence. Also included will be complete fuel trains. The ash drops out of the primary chamber once the proper burn time has elapsed. Directly below the opening is a collection container or an optional ash conveyor to an ash container. The ash shall be cooled with water spray prior to removal for emptying.

The incineration plant is fitted with constant air emission monitors that will provide a CEM including a draw sample system that will monitor O_2, CO, HCl, hydrogen fluoride, sulphur dioxide, NOx, particulate, and HC. This eventually regulates particulate matter to the atmosphere reducing air pollution.

2.4.5 Waste disposal

Waste water emanating from operation areas as well as surface run off from the premises 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 stabilization ponds and sedimentation lagoons that shall be established within the premise for proper management and to avoid contamination to the natural environment.

2.4.6 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 of the above magnitude, rainwater will not be adequate for the operations and in any case, the area is not endowed with adequate rainfall. As a result, a high capacity borehole has been sunk at the site to meet water requirements for the project.

2.4.7 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

2.5 Site alternatives

The development of feasible alternatives, to meet the overall objectives of the proposal calls for technical knowhow and informed knowledge. During this process of alternatives review to the proposed project, reference is made to:

- **Available technology,**

The site is expected to be designed such as to ensure optimal utilization of space, ensure minimal waste movement, easy and safe movement for the forklifts and other machines. At full operations the plant is expected to help recycle a lot of waste from within the country. Wastes will be segregated and contained safely at specific locations around the premises. Spills, emissions and friable materials will be contained in the premises.

- **Policy objectives,**

The main objective of the proposed project is designed to meet the policy objective of The Environmental Management and Coordination Act in managing of all issues that pertains to clean and healthy environment since everyone is entitled to clean and healthy environment *(Section 3 of EMCA.* Policy for environmental management entails that there should be cleaner development mechanisms and this means that every development should have measures in place to ensure that produced waste is managed at source and that natural environment is not disturbed in a negative way.

- **Social attitudes,**

The proposed project should in line with the development of the surrounding areas. Consultation to the local communities should be a mandatory process to the project implementation to ensure inclusivity in the project cycle. The local residents must be receptive to the project to ensure smooth running and coexistence. This ensures that the community's interests are taken care of. The process will therefore include publishing the proposed project in the local dailies and radio station to create awareness.

- **Environmental and site constraints and project economics**

Waste sorting requires enough space to ensure that there is no interference from all quotas. This has necessitated acquiring of enough space for the management of all waste necessitating the allocated one hundred acres of land in this area. For control of external access, the company will ensure that the land is condoned by fencing it all round having only one gate for the access to the site.

2.5.1 Alternative 1 (Existing Locations)

The proposed site for the waste transfer station is located at a remote area of Turkana County in Lokori Area with no settlements in the vicinity - the area being in a nomadic pastoralist area. This alternative entails that

here be no disturbance of the proposed area which is absolute conservationist view. This will mean that the company will still be transporting bulky hazardous waste to its Kitengela plant for management. This may pose public health challenge in case of any accident in transportation. It is, therefore, becoming increasingly important that the operations are relocated to a suitable site with minimal impacts to people's lives and the general environment.

2.5.2 Alternative 2 (Proposed Location)

Following the current scenario illustrated above on the current waste transfer in the process of hazardous waste management, the proposed site is the only other location found suitable. This conclusion has been arrived at due to the following considered reasons;

(i) The land is legally allocated to the proponent by the county government making the development more feasible as planned,

(ii) There are no significant settlements around the site, and hence it will be possible to present a case of appropriate zoning in future to the Local Government Authorities to ensure minimal social impacts

(iii) There are no significant environmental sensitive features around the site (no surface water bodies, no forest cover, no wetlands, not sensitive habitats noted, etc.). It is, therefore, likely to have minimal environmental impacts,

(iv) The proponent is ready to abide by the law for a long term suitability of the site.

2.5.3 PROJECT COSTS AND IMPLEMENTATION SCHEDULE

The projected will cost **Ksh.392, 200, 000** including the legal costs, land acquisition, borehole digging, security fence, personnel fees, management offices, power supply by generator, waste reception weighbridge, waste management and mobile plant equipment among other daily provisions for the running of the station.

CHAPTER THREE

3. POLICY, LEGAL ADMINISTRATIVE FRAMEWORK

3.1 Introduction

The Environmental Impact Assessment is a useful tool for protection of the environment from the negative effects of developmental activities. It is now accepted that development projects must be economically viable, socially acceptable and environmentally sound. It is a condition of the Kenya Government for developers to conduct Environmental Impact Assessment on the development Projects.

There is an existing policy, legal and administrative framework regulating the proposed project. The government has established regulation to facilitate the process of EIA study and EA. The regulations are contained in the Kenya Gazette supplement No. 56, legislative No. 31, legal notice No. 101 of 13th June 2003. In addition, the government has a number of National Policies and statutes to enhance environment and sustainable development. Some of the policies and legal provisions are discussed below.

3.2 Policies

Both the development and environment policies are being formulated by the respective ministries in consultation with relevant stakeholders. Government intentions in reducing air emissions has been on the rise ever since through initiatives of tree planting. This target will be realized through investments by government, private sector, civil society and individuals.

Environmental Impact Assessment (EIA) is a methodology used to identify the actual and probable impacts of the projects and programmes on the environment and to recommend alternatives and mitigating measures. The assessment is required at all stages of project development with a view to ensuring environmentally sustainable development for both existing and proposed public and private sector development ventures. The National EIA regulations were issued in accordance with the provisions of Environmental Management and Co-ordination Act (EMCA) of 1999. The EIA Regulations must be administered, taking into cognizance provisions of EMCA 1999 and other relevant national laws. The intention is to approve and license only those projects that take into consideration all aspects of concern to the public as they impact on health and the quality of the environment.

3.2.1 National Environmental Action Plan (NEAP)

The NEAP for Kenya was prepared in mid 1990s: It was a deliberate policy effort to integrate environmental considerations into the country's economic and social development. The integration process was to be achieved through a multi-sectoral approach to develop a comprehensive framework to ensure that environmental management and the conservation of natural resources are an integral part of societal decision-making

3.2.2 The National Poverty Eradication Plan (NPEP)

The NPEP has the objective of reducing the incidence of poverty in both rural and urban areas by 50 percent by the year 2015; as well as the capabilities of the poor and vulnerable groups to earn income. It also aims to

narrow gender and geographical disparities and a healthy, better educated and more productive population. This plan has been prepared in line with the goals and commitments of the World Summit for the Sustainable Development (WSSD) of 1995. The plan focuses on four WSSD themes of the poverty eradication; reduction of unemployment; social integration of the disadvantaged people and the creation of an enabling economic, political, and cultural environment. This plan is to be implemented by the Poverty Eradication Commission (PEC) formed in collaboration with Government Ministries, community based organizations and private sector.

3.2.3 National Policy on Water and Resources Management and Development

While the National Policy on water resource management and development (1999) seeks to enhance systematic development of facilities in all sectors for the promotion of the country's socio-economic progress, it also recognizes the by-product of this process as wastewater. It, therefore, calls development of appropriate sanitation systems to protect people's health and water resource from any source of pollution.

Industrial and business development activities therefore should be accompanied by corresponding waste management systems to handle the waste water and other wastes emanating from such processes. The same project requires that such projects should also undergo comprehensive EIA studies that provide sustainable measures to be taken to ensure environmental resources and people's health in the immediate neighbourhood and further downstream are not impacted by the emissions. As a follow-up to this, EMCA 1999 requires annual environmental audits to be conducted in order to ensure that mitigation measures and other improvements identified during EIA study are implemented.

In addition, the policy provides charging levies on waste on basis of quantity and quality. The "polluter-pays-principle" applies in which case parties contaminating water are required to meet the appropriate cost of remediation. The policy provides for establishment of standards to protect water bodies receiving waste water, a process that culminated in the enactment of the environment Management and Coordination (Waste Management) Regulations 2006.

The key objectives of the policy include:

- To ensure that from the onset, all development policies, programs and projects takes environmental consideration into account.
- To ensure that independent environmental impact assessment (EIA) report prepared for any industrial venture or other development before implementation
- To come up with effluent treatment standards that will conform to acceptable guidelines. This has already been done by NEMA through the Environmental Management and Coordination Waste Management) Regulations 2006, and environmental Management and Coordination (water Quality) Regulations 2006.

3.3 Legal Aspects

The key National laws that govern the management of environmental resources in the country have been briefly discussed in the paragraph below. Note that whenever any of the laws contradict each other, the environmental management and coordination act prevails

3.3.1 The Environmental Management and Coordination Act, 1999

a) Background and administrative Structures

The environment Management and Coordination Act of 1999 received a presidential assent on January 6th, 2000 and was gazetted on January 14th, 2000.

The main objectives of the act are:

- Provide guidelines for the establishment of a legal and institutional framework for the management of environment in Kenya
- Provide a framework of legislation for over 77 statutes in Kenya that contain environmental provisions
- Provide guideline for environmental impact assessment, environmental audit and monitoring, environmental quality standards and environmental protection orders

In 2001, the government established the administrative structure to implement the act. The two main administrative structures are:

i. The National Environmental Council (NEC)

The National Environmental Council (the council) is responsible for policy formulation and directions for the purpose of the Act. The Council also sets national goal and objectives and determines policies and determines policies and priorities for the protection of the environmental.

ii. The National Environment Management Authority (NEMA)

The responsibility of the National Environment Authority, (NEMA) is to exercise general supervision and co-ordination over all matters relating to the environment and to be principle instrument of government in the implementation of policies relating to the environment.

In addition to NEMA, the act provides for the establishment and enforcement of environmental quality standards to be set by the technical committee of NEMA known as the standards and Enforcement review Committee (SERC).

b) EMCA requirements for Environmental Impact Assessment and Audit

The Act aims to improve the legal and administrative co-ordination of the diverse sectoral initiatives in the field of environment so as to enhance the national capacity for its effective management. The Act harmonizes the sector specific legislations touching on the environment in a manner designed to ensure greater protection of the environment in line with national objectives and the sustainable development goals enunciated in Agenda 21 of the Earth Summit held in Rio de Janeiro in 1992. The ultimate objective is to provide a framework for integrating environmental considerations into the country's overall economic and social development.

The second schedule of the Act lists the projects for which an EIA and/or EA must be carried out. Section 68 of the Act specifies that accurate records should be maintained and annual reports submitted to NEMA, as required.

This project report has been undertaken in accordance with the Environment (Impact Assessment and Audit) regulation 2003, which operationalize the Environment Management and Coordination Act EMCA) 1999. The report is prepared in conformity with the requirements stipulated in the (EMCA) and the Environmental Impact Assessment and Audit regulations 2003 regulation7 (1) and the second schedule. 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 Section 58 of EMCA No 8 0f 1999 shall undergo an environmental impact assessment. This includes development activities such as the installation of this new incineration plant. In additional to the legal compliance above, the following legal aspects have also have been taken into consideration

c) The Environment Impact (Assessment and Auditing) Regulations, 2003

Legal Notice No. 101 stipulates the ways in which environmental experts should conduct Environmental Impact Assessment and Audits in conformity with the stated requirements. It is concise in its report content requirements, processes of public participation, licensing procedures, inspections and any possible offences under the Act.

d) Environmental Management and Coordination (Waste Management) Regulation 2006

The Legal Notice No. 121 stipulates the responsibility of any waste producer. Part II section one states that: "No person shall dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle. And that; any person whose activities generate waste shall collect, segregate and dispose or cause to be disposed off such waste in the manner provided for under these Regulations". Subsection three of Part II highlights the way waste should be handles stating that, "any person whose activities generates waste has an obligation to ensure that such waste is transferred to a person who is licensed to transport and dispose off such waste in a designated waste disposal facility".

e) Water Quality and Waste Management Regulations 20006

The regulations were gazetted in September 2006 and come into force in 1st April, 2007. The regulation details the waste management requirements and also requires application of a license to all those premises discharging the waste to the environment.

3.3.2 The Water Act 2002

The purpose of the Water Act is to provide the management, conservation and use and control of water resources and for the acquisition and regulations of use of water, to provide for the regulation and management of water supply and sewerage supply. Except for waters that are wholly situated in a private landowner's domain, the act vests the right over all surface and ground water in the state. This is only subject to the rights which users may acquire under license from time to time.

The overall power for the control for the control of every body of water is exercised by the minister. The minister has the duty to promote the investigation, conservation and proper use of water resources throughout Kenya.

The act provides for a water resource management authority whose functions include, *inter-alia,* developed principles and procedures for allocation for water resources, monitor national water resource management strategy, determine applications for permits for water use, regulate and protect water resources quality from adverse impacts, manage and protect water catchments, e.t.c. In addition, under the water (catchments board) rules promulgated by the minister, the country is divided into six catmint boards, vis-avis Tana Catchments board, Rift Valley Catchment's Board, Athi River Catchment's Board, Ewaso-Nyiro Catchment's Boar, Lake Victoria (North) Catchment's Board and Lake Victoria (South) Catchment's Board. But these boundaries are subject to variation depending on available hydrological information.

Under the act, the minister may declare an area to be a conservation area and direct that special measures be taken for the conservation for the ground water therein. Every person who has been using ground water in an area declared to be a conservation area and who desires to continue with the use must obtain a permit within six months of the order. It's an offence to disobey such an order.

Protection of water supply is clearly a critical issue under the act. Accordingly, whenever the minister is satisfied that special measures are necessary for the protection of a catchment area from each quarter is obtained; he may declare such an area to be a protected area. By order, the minister may regulate or prohibit the activities within that area which may be contrite to the requisite conservation goals.

An in-depth analysis of the new water Act reveals that the Act has created an integrated water resources management framework in Kenya which is participatory and likely to have a wider acceptance and implementation than the predecessors. Part II, section 18 of the act provides for the National monitoring and information systems on water resources. Following on this, sub-section 3, allows the water resource management authority to demand from any person or institution specified information documents samples or

materials on water resources. Under these rules, specified information document, samples or materials on water resources may be kept by a water user and the information thereof furnished by the authority.

Section 73 of the Act allows a person with a license (licensee) to supply water and make regulations for purposes of protecting against degradation of water resources. Section 75 and Sub-section 1 allows the licensee to construct and maintain drains, sewers and other works for intercepting, treating or disposing any foul water arising or flowing upon land for preventing pollution of water sources within his/her jurisdiction.

Section 94 of the Act makes it an offense through or convey or cause or permit to be thrown or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive or unwholesome matter or thing into or near to water resources in such a manner as to cause or be likely to cause pollution of water resource.

Section 23 indicates that the authority shall approve community projects after they are approved by the persons owning or occupying at least two thirds of the particular area concerned in the project and that provision is made by the project for an adequate alternative supply of water when and if the available levels to other users is.

It also prohibits cancellation of a permit of a community project without the consent of the minister.

Section 24 requires all beneficiaries of a community project whose construction is funded in full or in part by the government, if the minister so determines, to pay a rate or charge for that benefit.

3.3.3 The 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 local authorities to take all lawful, necessary and reasonable practicable measures to maintain areas under their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable for injurious or dangerous to human health.

Such nuisance or conditions are defined under section 188 wastes, sewers, drains or refuse pits in such estate, situated or constructed as in the opinion of the medical officer of health to be offensive or injurious to human health. Noxious matter or waste flowing or discharged from any projects into a public street or into the gutter or side charnel or watercourse, irrigation channel or bed not approved for discharge is also deemed as a nuisance. Other nuisances are accumulation of materials or refuse which in the opinion of medical officer of health is likely to harbor rats or other vermin.

On the responsibility or local authorities, Part XI section 129 of the Act states in part “it shall be the duty of every local authority to take all lawful, necessary and reasonable practicable measures for preventing any pollution dangerous to health of any supply of water which the public within its district has a right to use and does use for drinking or domestic purposes……”

Part XII section 136 states that all collection water, sewage, rubbish, refuse and other fluids which permits or facilitates the breeding or multiplication of pests shall be deemed nuisance and are liable to be dealt with in the manor provided by this act.

3.3.4 The Physical Planning Act, Cap 286

The local Authorities are empowered under section 29 of the act to serve and maintain all land planned for open spaces, parks, urban forests and green belts, the same section therefore, allows for prohibition or control of the use and development of land and building in the interest of proper and orderly development of an area.

Section 30 states that any person who carries out development without permission will be required the land to its original state. It also states that NO licensing Authority shall grant land license for commercial or industrial use or occupational or any building without development permission granted by the respective local authority.

Finally, section 36 states that if in connection with a development application, local authorities is of the opinion that that the proposed development activity will have injurious impact on the environment, the applicant shall be required to submit together with the application of the environmental impact assessment (EIA) report. EMCA, 1999 echoes the same by requiring that such an EIA is approved by the National Environmental Management Authority (NEMA) and should be followed by annual environmental Audits.

3.3.5 The penal Code Cap 63

Section 193 of the code states that any person or institution that voluntary corrupts or foils water for public springs or reservoir, rendering it less fit for its ordinary use is equally of an offence.

Section 192 of the same act states that a person who makes or vitiates the same atmosphere in any space to make it noxious of health of a person/institution in dwellings or projects in the neighbourhood or those passing along public way commits an offence

3.3.6 Occupational Safety and Health Act (OSHA) 2007

The Act requires all employers to register their workplaces by making an application to the Director of Occupational Health and Safety Services before they start any operations. The Act also sets minimum standards that are to be maintained in such workplaces to safeguard health, safety and welfare of workers. These are all aimed at elimination of hazardous wastes from workplaces. The act also requires that all workplaces to display the abstract of the act for all workers to read and remind themselves on how to protect themselves from hazard.

The act and its subsidiary legislation makes provision for health, safety and welfare persons employed in factories and other places of work such as in building construction and project operations are defined. The act prohibits emissions of dust, fumes or impurities into the atmosphere without proper treatment to prevent pollution or other ill effects to life and property. These provisions require that all practical measures be taken to

protect all persons employed in a factory from air emission or impurities originating from any process within the factory.

The act also requires that no discharges should be made into the environment from factories and workplaces without proper treatment that requires them harmless to the environment.

The act also has specific measures that need to be taken to protect health, safety and welfare of workers and environmental conservation. The same act also requires all operation that fall under it to apply for registration as such to the Directorate of Occupational Health and Safety Services.

3.3.6.1 Safety and Health Committee Rules of 2004

The rule states that any employer/proponent/occupier who employs more than twenty persons must establish a committee to address health, safety and welfare of workers. The employer must also cause to be carried out a health and safety audit of all its operations in an annual basis by a registered health and safety advisor who should forward such a report to the Directorate of Occupational Health and Safety Services.

3.3.6.2 First Aid Rules

These have details on first aid requirements in terms of facilities and capacity building among residential workers.

3.3.6.3 Hazardous Substances Rules

These regulate the handling, transportation and use of certain listed chemicals which may have negative effects on the body when one is expected.

3.3.6.4 Noise Prevention and Control Rules of 2005

These rules have set minimum and maximum exposure limits beyond which workers and members of the public should not be exposed to noise without adequate means of protection. The rules also have exposure limits for exposure out of workplaces. The rules have several recommendations on a comprehensive noise control program for workplaces that includes a requirement for medical examination of workers who are exposed to noise. The rules have also set the minimum noise levels that should emanate from a facility to public/neighbouring areas by day or by night.

3.3.6.5 Building Operations and Works of Engineering Rules

The rules guides health and safety matters in all building/construction and civil engineering works

These rules states clearly that it is the duty of the proponent to ensure health, safety and welfare of all workers are and authorized visitors to the site before commencement of operations, the proponent should notify the Director of Occupational Health and Safety Services of the intention so that from then on, the director advises and follows up on the necessary conditions to safeguard the health, safety and welfare of workers on site.

The rules also states that qualified and experienced persons must be appointed to act as safety supervisors by the proponent. These should supervise the enforcement of the standards to achieve the objectives mentioned above.

The rules have specific sections on excavation, transport, demolition, formwork and scaffolds, lifting and lifting equipment and other safety measures.

CHAPTER FOUR

4. BASELINE INFORMATION OF THE STUDY AREA

Turkana County is situated in North Western Kenya. It borders West Pokot and Baringo Counties to the south, Samburu County to the South East, and Marsabit County to the East. Internationally it borders South Sudan to the north, Uganda to the west and Ethiopia to the north east. The County shares Lake Turkana with Marsabit County. The total area of the county is 68,680.3 Km² and lies between Longitudes 34^0 30' and 36^0 40'East and between Latitudes 1^0 30' and 5^0 30' North.

4.1 Present Environmental Conditions

Evaluation of the physical and biological environmental will be undertaken through observations around the site, records and available literature. The following sub-sections provide an outline the existing status in this regard.

4.2 Physical and Topographical features

The physiographic features in the county include low lying open plains, mountain ranges and river drainage patterns. Lake Turkana is at an elevation of 360 meters (1,181 feet) while the surrounding basin is anywhere from 375-914 meters (1,230-3,000 feet). The main mountain ranges of the county are Loima, Lorengippi, Mogila, Songot, Kalapata, Loriu, Kailong'kol and Silale mountains. The mountain ranges, because of their high elevation, are normally green, covered with dense bushes and high woody cover. The ranges support important economic activities like honey production, grazing during the dry season, wood production, and charcoal production. Thereare also water catchment sources thus supporting gum Arabica growing and small household shambas,The hills in the county consist of Tepes Hills in Kibish Division, Lokwanamoru Hills and Lorionotom Hills in Kaikor Division, Pelekech Hills in Kakuma Division and Loima Hills in Loima Division which are characterized by large forests.

The open lying plains consist of the Kalapata and Lotikipi Plains. The plains form part of the arid area in the County and receive the lowest amount of rainfall of around 180 mm per annum. These plains are dominated by dwarf shrub and grassland, which provide forage for livestock during and shortly after the rainy season. However, this forage dries rapidly at the onset of the dry season.

Rivers Tarach, Kerio, Kalapata, Malimalite and Turkwel are the major rivers in the county making them the most important with a potential of producing large amounts of food for the county, if properly utilized. Lake Turkana is the largest and most saline of the Rift Valley lakes. There is no outlet, and with reduced inflows and high evaporation this results into depositing of salt in the soil and capping on the surface. The water level is subject to three to four metres seasonal fluctuations. In total, the water level dropped 10m between 1975 and 1992. River Omo from Ethiopia which is permanent drains into Lake Turkana. The lake is situated on the eastern part of the county and has northern island and is endowed with a variety of wild animals namely: hippos, crocodiles and water fowls. Fishing is the major activity in the lake.

Soils in Turkana County are not well developed due to aridity and constant erosion by water and wind. Often they are capped by stone mantles. Colluvial soils tend to be reddish over the basement system and generally grey buff or white over the volcanoes. Aeolian soils are dune sands either active or fossil; Alluvial soils range from coarse sands to flash flood silts, while black or brown clays occur locally in areas of impended drainage.

Topography of the area

4.2.1 Ecological Conditions

The county is endowed with the Lake which is a world heritage; it also has a number of rivers that flow into the lake. These include Rivers Turkwel and Kerio among others that are seasonal. The County also has several springs which are scattered across the county especially parts of the lake zones and the Turkana East. There are insufficient details showing agro-ecological zones by Division but the zones in proportion can be estimated as below: -

Agro Ecological Zones	Zones	Description	%
Lower midland	5	Semi-Arid	3
Inner midland	4	Transition	1
Inner lowland	5	Semi-arid	16
Inner lowland	6	Arid	42
Inner lowland	7	Very arid	38

The forest cover in the county is held in trust by the Local Government where communities utilize all natural resources without many restrictions. There is no gazetted or surveyed forest in the County.

4.2.2 Geology and Soils

The crystalline rocks of the Basement System cover wide areas of the country, and are particularly extensive in the eastern half. They comprise principally various types of sediments-grits, sandstones, limestone and shale that have been metamorphosed into gneisses, schist and marbles by heat and pressure or by impregnation by pervading fluids. Other types are derived from lavas and volcanic fragmental rocks. Igneous rocks are relatively scarce and consist of granite sheets and dykes, and sills of epidiorite and amphibolite derived from originally doleritic or allied rocks, and some ultrabasic rocks. Some are apparently of later date than the metamorphism of the sedimentary hosts, but are probably Precambrian in a

The variety of rocks in the sedimentary series is extensive and includes, besides widespread mica- and mica-hornblende schists and gneisses, such types as graphite schists, kyanite gneisses, garnet gneisses and schists, sillimanite gneisses, pyroxenite granulites, quartzites and crystalline limestones. Other and rare kinds include actinolite schists, anthophyllite schists, and epidolite schists and gneisses. In some areas there are considerable developments of migmatites, which have arisen by the injection of granitic magma into the gneisses and schists, or by their permeation by granitic fluids. Several granites of northern and northwestern Kenya are considered to be the products of granitization of metasediments. Pegmatites of various types are frequently associated with the Basement System rocks, particularly where metasomatic action has been prominent.

The crystalline limestones form notable bands and lenses, often of considerable thickness and length, though some are small. A series of outcrops extends discontinuously through the central part of the county.


The site topography

4.2.3 Climatic Conditions

Turkana is one of the driest counties of Kenya. It experiences very high temperatures during the day and moderate temperatures during the night all year round. The temperatures are estimated to be 25-35°C and rarely deep blow 75^0F. This persistent hot and dry climate condition is one of the core contributing factors to famine in the county. The county receives between 150mm and 400mm of rainfall annually, with average precipitation being 250mm and the sun is ever high and shining. The rainfall pattern is unpredictable and at times Turkana receives no rain in a whole year. As a result, the residents of Turkana County are faced with a persistent threat of starvation

Turkana County is arid and semi-arid and is characterized by warm and hot climate. The temperatures range between 20ºC and 41ºC with a mean of 30.5ºC. The rainfall pattern and distribution is erratic and unreliable both with time and space. There are two rainfall seasons. The long rains (akiporo) usually occur between April and July and the short rains between October and November and ranges between 52 mm and 480 mm annually with a mean of 200 mm. The driest periods (akamu) are January, February and September. The rainfall is distributed on an east-west gradient with more rainfall in the western parts and other areas of higher elevation. The rainfalls in brief violet storms resulting in flush floods. The surface runoff and potential evaporation rates are extremely high.

Due to the low rainfall and high temperatures there is a lot of evapo-transpiration resulting into deposition of salt in the soil and capping on the surface. As a result, only about 30 per cent of the county's soil can be rated as moderately suitable for agricultural production. These moderately fertile soils are found at the central plains of Lorengippi, the upper Loima, the lowlands of the Turkwel, Nakaton and Kawalathe drainage along the lake at the lower Kalokol, Turkwel and Kerio rivers and a portion of the Loriu Plateaus. For the last two and a half decades, the county has frequently suffered from failures of the annual rains. However, years 2006, 2007 and 2011, witnessed a higher than expected rainfall. This resulted to flash floods with many parts of the county experiencing loss of livestock and pasture.

4.2.4 Hydrology

The county has inadequate water for domestic use, livestock and crop irrigation. The rainfall is inadequate and unreliable amounting to an average of 200 mm of rainfall per annum. About 88 percent of the county's residents depend on surface and sub-surface dams for water, which often do not hold sufficient water due to the high evaporation rate during the dry seasons.

The already existing water supplies are overstretched and unable to supply enough water for the increasing population. To improve the water supply situation, the county needs to embark on the rehabilitation of the existing water schemes to increase their efficiency and construction of earth dams and pans. The communities need to be encouraged to build shallow wells, sub-surface dams and also undertake roof catchments to harvest rainwater. Programmes aimed at protecting the water catchment areas and harnessing the water from Kerio, Malimalite, Tarach, Suguta, Kalapata and Turkwel Rivers will also be of great importance

4.2.5 Air Quality

The site is located far from any industrial or major human activities including settlements. Save for natural dust (particulate matter) resulting from the dry conditions and withered plants, air pollutants including hydrocarbons, NO_x, SO_x, CO_2 and CO and other emissions are not expected to be detected.

4.2.6 Energy Sources

The area is deficient of most of infrastructure including proper roads and energy provisions except in major towns within the county. However, the county government has a goal to facilitate accessible and reliable meteorological information and services, conservation of environment and natural resources through sustainable management and utilization of forest, wildlife and renewable energy with supervision and coordination of environmental matters, conducting research and disseminating corresponding funding for stability and socio-economic development. The county government is also keen in promoting and utilization of green energy, efficient use of energy and develops new energy technologies.

4.3 Social setting

4.3.1 Population distribution

The population density in the county varies from 24 persons per Km² in Turkana Central Constituency to 5 persons per Km² in Turkana East Constituency. The average population density in the County is 12 persons per km^2. This is based on the 2009 Kenya Population and Housing Census.

Settlement patterns in Turkana County correspond with natural resource endowment. This is exhibited by low population densities in the rural areas and high population in towns and 10 market centers where economic opportunities prevail. Lake Turkana as a resource has influenced a high settlement patterns in the areas along it. Turkana East where the proposed project lies has the smallest population density densities because of the insecurity levels in the area which is mainly caused by cattle rustling.

Population projection by urban centers

Urban Centers	2009 (Census)			2012 (Projection)			2015 (Projection)			2017(Projection)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Lodwar	22,349	23,0169	45,368	27,083	27,895	54,978	32,819	33,803	66,623	37,304	38,422	75,726
Kakuma	16,820	15,142	31,962	20,383	18,349	38,732	24,700	22,236	46,936	28,075	25,274	53,350
Lokichoggio	9,313	8,382	17,695	11,286	10,157	21,443	13,676	12,309	25,985	15,545	13,991	29,536
Total	48,482	46,543	95,025	58,751	56,402	115,153	71,196	68,348	139,544	80,924	77,688	158,612

Source: KPHC 209

Lodwar Town has the highest population projected to be 54,978 in 2012. The high number in these urban centres is attributed to more influx of people seeking employment and the availability of infrastructure and social amenities. According to the Cities and Urban Areas Act of 2012, only the above three urban centres qualify to be classified as Towns. There is need for improved infrastructural facilities and social amenities in these towns.

4.4 PUBLIC PARTICIPATION

Public participation was done in calling out the community together to form a public hearing in relation to the project. They community including those in local authority were in attendance during the hearing on the proposed project where all the concerns from the community was addressed. Attached at end of this report shows list and designation of those who attended the hearing. Additional public participation is expected during the advertisement period in the assessment process.

4.4.1 Consultation with interested and affected parties

The consultation process included to a large extent public consultation through structured meeting with interested and affected parties. Consultation to the county government of Turkana was done and as a result the county government issued an allotment to the company as a go-ahead with the proposed project.

4.4.2 The Questionnaire

Questionnaires were not administered since this could not be appropriate because of sparse population density in the area and the fact that most of the locals are nomadic pastoralists.

CHAPTER FIVE

5. ANTICIPATED IMPACTS AND MITIGATION MEASURES

5.1 Introduction

The proposed project will involve hazardous waste treatment and transfer station for such wastes that will require incineration. 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.

5.2 Positive Impacts

The primary reason for using a transfer station is to reduce the cost of transporting waste to disposal facilities. Consolidating smaller loads from collection vehicles into larger transfer vehicles reduces hauling costs by enabling lection crews to spend less time traveling to and from distant disposal sites and more time collecting waste. This also reduces fuel consumption and collection vehicle maintenance costs, plus produces less overall traffic, air emissions, and road wear. In addition, a transfer station will among other benefits provide:

i) An opportunity to screen waste prior to disposal

ii) Flexibility in selecting waste disposal options

iii) An opportunity to serve as a convenience center for public use.

5.3 ANTICIPATED NEGATIVE IMPACTS

Waste transfer stations that minimize environmental impacts involve careful planning, designing, and operation. This section focuses on neighborhood quality or public nuisance issues and offers “good neighbor practices” to improve the public’s perception of the transfer station. Design and operational issues regarding traffic, noise, odors, air emissions, water quality, vectors, and litter are discussed below. Proper facility siting, design, and operation can address and mitigate these potential impacts on the surrounding natural environment and the community.

5.2.1 Construction phase

Particulate Matter

There will be minimal production of particulate matter during the project execution. There will be construction of service station operation office and a soil washing bay, weigh bridge, drain well and a site wall. Particulate matter will result mainly from trucks transferring materials to the site

The main impacts of the dusty conditions are;

(i) Aesthetic and visual problems, though there are no notable settlements within the vicinity of the site,

(ii) Potential risks of health (mainly bronchial infections) though there are no notable inhabitants in the immediate neighbourhood,

(iii) Deposition of dust on vegetation hampering development of the same,

(iv) Air pollution aspects including contribution towards climate change.

Noise Levels

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 western land has not been developed and hence effects of noise during construction will not have any significant social implications.

Water Quality

There are no sources of surface water at the site vicinity. No impacts, therefore, are anticipated on water surface water quality. However, oil spills from the machinery and depositions at the construction site camp has the potential for contamination of surface runoff (that may eventually end up into surface water streams) or infiltrate into the groundwater sources. Water from contaminated soil washouts will be contained within the site to avoid any percolation thereby avoiding any underground water contamination.

Land Degradation

No significant impacts in this regard are anticipated.

Health and Safety

The main concern in this regard is the occupational welfare of the construction workers from the effects of dust and emissions from the machineries. Health and safety concerns will eventually be addresses during the operation states of the station. The concerns are projected to come from the incoming waste handling process. Neighbouring residents are not likely to be affected since the construction site will be fenced off to keep off intruders. However, access by cattle herders will require to be addressed. It could be a point of high road safety risk in this regard.

Biodiversity

There will be little disturbance to biodiversity at the site location being in arid land.

Social Impacts

There are no displacements or direct interference with any social groups within and around the site since no settlements were found at the time of this assessment. Anticipated social impacts would be related to gaseous emissions, generation of dust and noise but there are no inhabitants in the immediate neighbourhood of the site.

5.2.2 OPERATIONS

Air Quality

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

(i) Holding areas for the hazardous waste materials as received will likely be sources of dust, particularly from the transfer process to the sorting areas. 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,

Impacts associated with the above air pollution would include;

(i) Health effects mainly bronchial infections, skin problems, visibility, etc. This is likely to affect the employees and the immediate residents and communities (at the moment there are no inhabitants in the immediate neighbourhood),
(ii) Soil quality degradation that may result from deposition of pollutants from the plant operations of carried to other areas through surface runoff,
(iii) Pollution of water sources through direct deposition, surface runoff and/or infiltration into groundwater aquifers,
(iv) Emissions of acetylene gas into the air have a potential to cause fire in the premises with far reaching implications on the neighbouring land users.

Noise Levels

The proposed plant operations are likely to generate high noise levels from deliveries of hazardous wastes, movement of hazardous materials from one point to another within the plant. This situation is likely to have occupational health and safety implications as well effects to the workers and the nearest neighbourhood. 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. Measurements confirmed this as the existing baseline situation.

Environmental Pollution

The key environmental pollution anticipated from the site activities includes the following;

(i) Discharging wastewater into open drainage system around the premises that 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 peoples health and the aquatic life,

(ii) Discharge of oil residuals into open drains from point sources (moving machine parts, storage areas, delivery bays, etc) are potential sources of environmental contamination,

(iii) Deposition of emitted particulate matter and dust on land affects the soil quality that and the effect could also compromise on the integrity of water sources (both the surface and ground aquifers). The area is generally dry and accumulation of pollutants on soil provide heavy pollution loads in storm water and consequently surface water sources,

(iv) 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.

Health and Safety

The health of the plant workers varies from one section to another as outlined below;

(i) 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.

(ii) Personal accidents and risks of getting injured by falling objects to the workers and visitors while moving around the premises cannot be ignored. Heavy, corrosive and hot objects are among potential risks to safety anticipated in the proposed premises,

(iii) Accidents from waste transporting vehicles could also pose a challenge to those involves.

5.2.3 DECOMMISSIONING PHASE

The site is designed for a lifespan of between 50 – 100 years subject to effective maintenance. During this period, it is possible that necessary retrofications will be carried out on the equipment, plant layout could be reviewed and processes could be changed while major structural changes and expansions might be found necessary. At the end of the site life, a scheduled plant will be necessary to remove the site component, a process referred to as decommissioning.

The decommissioning process will require that the proponent contract an environmental decommissioning audit and to obtain necessary approvals from the county government together with the national environmental management authority.

5.3 MITIGATION MEASURES

Following are global mitigation measures while specific actions are presented in the matrix under Table 1 below.

5.3.1 MANAGEMENT MEASURES

Corporate Initiatives

While planning the site management, it will be necessary to consider the following basic aspects on environmental conservation;

(i) The health and safety of the workers, the neighbouring communities and on-site installations should of key importance and necessary mechanisms should be provided at all times during the project cycle,

(ii) Emissions into the environment (gaseous, particulate matter and noise) have undesirable off-site effects on public health, particularly those in the windward direction. In this regard it will be necessary to plan for a monitoring mechanism and maintenance of records on air quality profiles as part of the corporate capacity building plan,

(iii) Capacity building in environmental conservation will also be a necessary item in the site management such as to address the entire management structure as well as suppliers of goods and services including waste generators.

Site Operations

Appropriate financial and human resources will require to be provided for continuous improvement of the environmental performance at the premises and the surroundings. In this regard performance evaluations, reviews of management practices and assessment of material consumption and capacity of the workers are among the operational aspects that will require constant attention.

Infrastructural Maintenance

Management of environment at the active site cannot be complete until an effective monitoring and maintenance schedule is established. This includes a continuous performance improvement, integration of environmental issues in hygiene and sanitation, provision of basic "green" facilities (e.g. hazardous waste receptacles, safe in-house movement and performance evaluation from customers) are some of the continuous improvement tools that may be applied. Others important tools include;

(i) Carrying out regular operation performance appraisals,

(ii) Follow scheduled maintenance of equipment and facilities,

(iii) Documentation and record-keeping on resource utilization and conservation,

(iv) Observing good house-keeping at all times with specific focus on waste management,

(v) Regular review of site planning,

(vi) Contractual documents with customers and goods/service suppliers to reflective environmental responsibility,

(vii) Undertake scheduled monitoring and statutory annual environmental auditing.

Capacity Building

The environmental issues identified in this report require that the proponent shall establish appropriate technical and physical capacity to ensure sustainability and continuous improvement in environmental management. Capacity is required in;

(i) Documented guidelines on environmental conservation to enable the firm identify environmental issues and adopt appropriate action plan towards minimizing impacts to the environment, health and safety.

(ii) The guidelines should be established and formulated into a corporate policy statement, an environmental policy, environmental management programme, environmental management operational manuals, standard operation procedures, standard contractual documents for customers as well as goods and service suppliers and a legal register,

(iii) Physical infrastructure for environmental management at the site maintained at optimum performance levels. Among the basic structural features are in-house solid waste storage arrangements to prevent residuals reaching the external environments, waste water (leachate and wash water) drains and the related containment reservoirs,

(iv) Awareness and skills in environmental management for the operators, supervisors, support staff, customers and material suppliers,

(v) A qualified environmental officer to oversee all matters related to management and conservation aspects who would also take charge of health and safety issues including basic training on specific skills and technical understanding on environmental, health and safety to all workers, a general awareness to the customers, contractors and suppliers.

5.3.2 OPERATIONAL MEASURES

Hazardous Wastewater Management

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;

(i) Construct a concrete slab for holding of the scrap metals and other wastes 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,

(ii) Proper containment of all waste especially waste water from soil washing facility to ensure that there is no environmental contamination during the entire waste handling process,

(iii) Maintain appropriate records on wastewater quality for compliance evaluation and comparison with the gazetted standards on a continuous basis,

(iv) Isolate domestic wastewater from process wastewater for containment in septic tanks and regular exhaustion,

(v) Oil storage areas should be provided with slabs with surrounding bunds to contain any spilt oils. Runoff from the oil storage areas.

Hazardous Solid Waste Management

Handling of solid wastes at the site will require the following components and handled in compliance with the waste regulations Legal Notice No. 121 of September 2006;

(i) 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,

(ii) Provide solid waste holding bins at strategic locations around the premises and install transfer stations and modalities of waste removal to approved dumping grounds. Hazardous materials should be handled through incineration,

(iii) Oils and grease from moving machine parts and other sources should be handled as hazardous wastes in accordance with the waste regulations,

Aerial Emissions

Gaseous and particulate matter is perhaps the most critical environmental aspect associated with the proposed operations. The following measures should be considered to reduce the elated impacts;

(i) 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,

(ii) Reduce the resident time of waste within the site to reduce air emission as a result of solid waste degradation in the waste handling process,

Health and Safety

Attention should also be on the health and safety of the workers, visitors, customers and neighbouring community such as to include;

(i) All moving machine parts and high temperature areas should be fitted with guard rails and restrict access,

(ii) Provide all employees with personal protective gear and enforce application at all times within the place work,

(iii) Enhance waste segregation and sorting on sources basis and devise safe modes of handling each category with particular focus on those likely to be hazardous/toxic.

(iv) Training and induction of all employees and visitors on site to enhance safety.

5.4 MITIGATION MEASURES

Table 1: Impact – Mitigation Matrix

Development Stage	Environmental Aspects	Anticipated Impacts	Recommendations Mitigation Measures
Construction/ Installation	Environmental Pollution	▪ Emissions into the air of dust, ▪ Emissions from construction equipment and material deliver trucks, ▪ Public nuisance from construction equipment.	▪ Maintain construction site dump at all times, ▪ Construction equipment maintained a good working order at all times, ▪ Fence up the construction site to keep off intruders.
	Drainage	▪ Change in storm water regime around the site, ▪ Soil erosion creating siltation of natural drains during rains, ▪ Discharge of wastewater from the site into dry drainage system with risks of environmental pollution downstream.	▪ Consider surface contours and channel storm water appropriately, ▪ Link the site drainage with natural drainage pattern in the area.
	Social Issues	*Noise Levels:* ▪ High noise levels from construction machinery and materials' delivery trucks,	▪ Construction to take place only during the day, ▪ Maintain machinery in good working order.
		Health and Safety: ▪ Bronchial infections from dusts and other emissions, ▪ Risks to food based industry in the area, ▪ Water sources contamination, ▪ Risks to health an safety of the construction workers, e.g. HIV/AIDS.	▪ Keep dry construction materials dump at all times, ▪ Keep emissions from sources the lowest possible, ▪ Provide personal protective gear to the workers ad ensure application at all times, ▪ Fence up the construction site to keep off intruders, ▪ Install warning signage around the construction site,
		Cultural Values: ▪ Social interaction of construction workers with local communities, ▪ Moral effects (e.g. rise in prostitution, crime, etc.)	Sensitize workers and local communities on moral values and cultural integration.
Operation	Waste Water	▪ Surface water contamination, ▪ Land and soil degradation	▪ Ensure acceptable solid waste collection systems from sources, storage arrangement and transfer,

Development Stage	Environmental Aspects	Anticipated Impacts	Recommendations Mitigation Measures
	Aspects	▪ Pollution from disposal of scrap oil, leachate and wastewater, ▪ Pollutants from hazardous wastes holding yard, ▪ Pollution from off-site solid waste dumping,	▪ Develop appropriate documentation and waste manifest for hazardous waste movement, ▪ Ensure containment of solid waste leachate and runoff in the hazardous waste holding platforms, ▪ Establish engineered containments and pre-treatment for liquid effluents from all point sources, ▪ Install oil interceptors and grit traps along all the affected drainage system, ▪ Slab the hazardous wastes holding yard and install trapping arrangement for leachate and surface runoff there from.
	Air Quality	▪ Aerial emissions from the kilns and other stacks,– carbon dioxide, nitrogen oxides, hydrocarbons, water vapour, hydrogen chloride gas, ▪ Arial pollution from dust, emissions, etc., ▪ Particulate matter blown from waste holding yards,	▪ All stacks be fitted with appropriate facilities to intercept gaseous emissions, ▪ Maintain records of the air quality within and around the premises for continuous improvement, ▪ Collect and keep covered zinc and fly ashes from the furnaces to prevent blowing into the air,
	Noise Levels	▪ Occupational health and safety of the workers, ▪ Levels above the ambient noise levels the surrounding areas,	▪ Undertake noise level measurements a different locations around the plan, ▪ Carry out a noise mapping around the site precincts,
	Biological Diversity	▪ No signs of significant wild life in the area, ▪ Removal of grass cover, arid trees and shrubs, ▪ Related microorganisms associated with the scarce vegetation removed.	▪ Ensure solid refuse handlers dispose into approved grounds to avoid biodiversity degradation, ▪ Plant trees on the open spaces continuously, ▪ Externalize initiative for ecological conservation.

Development Stage	Environmental Aspects	Anticipated Impacts	Recommendations Mitigation Measures
Operations	Social Impacts	<u>Income Generating Initiatives:</u> No directly negative impact to income generation on the area. Positively affecting the local social and economy	▪ Enhance employment opportunities for the local community, ▪ Provide leadership on opportunity for collaboration with waste recyclers, ▪ Ensure sustainability through cost savings from waste minimization at sources and recycling options, ▪ Expand the scrap metal market and create more opportunities.
		<u>Social and Cultural Issues:</u> ▪ Social nuisance from pollution to physical environment such as land and air by emissions from the site, ▪ Social complaints and concerns on health and safety, ▪ Cultural intrusion from employee intrusion, ▪ Conflict on land use, ▪ Conflicts at off-site solid waste dumping areas, ▪ Potential of social diseases (HIV/AIDS, TB, etc.).	▪ Maintain efficiency in the emission reduction point sources and minimise external effects, ▪ Establish a public relation strategy with the neighbourhood for enhanced co-existence, ▪ Undertake statutory annual environmental audit for continuous improvement on social issues. ▪ Enhance monitoring system on social concerns, ▪ Sensitize workers and communities on protection against HIV/AIDS spread, ▪ Invest in social responsibility initiatives, ▪ Comply with labour laws and related regulations.
		<u>Health and safety:</u> ▪ Risk to workers' health from aerial emissions originating from the site operations, ▪ Risks from internal movements of workers and customers, ▪ Slippery surfaces, e.g. store rooms, ▪ Health infections from contamination of waterways and underground waste sources.	▪ Provide all workers with the necessary personal protective equipment and ensure application at all times, ▪ Enhance good hygiene practices to reduce exposure of the employees and customers to infections, ▪ Provide suitable signage for fire escapes and convenience directions, ▪ Develop a disaster management manual on a wide range of health, safety and security issues, among them fire accidents,

			▪ Ensure diligence in waste handling especially soil washing to avoid any chance of contamination,
Operations	Solid Waste Management	▪ Risks to Health and safety, ▪ Risks to environmental pollution, ▪ Ground water quality degradation at off-site disposal sites, ▪ Aesthetic pollution in the site and neighbourhood (acetylene gas production residuals – calcium oxide slurry), ▪ Public nuisance at off-site disposal sites, ▪ Illegal waste dumping	▪ Develop a procedure for waste segregation on site, through provision of necessary containers for various waste categories, ▪ Contracts with external waste recyclers and/or handlers should include conditions on waste transfers and verification of final destination, ▪ Characterize all wastes and keep a record of types and quantities. Annual waste audit may be necessary.
	Compliance	▪ Penalties from non-compliance,	▪ Environmental compliance to be based on the provisions of EMCA, 1999 and the Waste Regulations thereof (Legal Notices 120 and 121 of September 2006), ▪ Undertake annual environmental audits as per the law, ▪ Establish environment compliant objectives for the specific operations in liaison of a legal expert,, ▪ Establish a corporate environmental policy, ▪ Establish an environmental management committee with a qualified team leader, ▪ Increase workers awareness on environmental policies and their responsibilities, ▪ Develop a legal register for continuous compliance self evaluation

CHAPTER SIX

6. ENVIRONMENTAL MANAGEMENT PLAN

This environment management plan presents integrated scenarios with the environmental aspects, anticipated impacts during construction and operation as well as preventive (mitigation) action plans. Other issues covered include the responsibilities, costs implications, timeframes and parameters for monitoring of the trends. The EMP matrix is designed such that it is self-implementing and can be implemented.

6.1 The EMP Guiding Principles

The development and operation of the waste management plant would be expected to observe environmental conservation requirements in accordance to the national regulations. To realize this goal, acceptability and minimal effects to the physical environment as well as the wellbeing of the surrounding communities will require to be integrated in the completion of the project through constant consultations, evaluations and review of the design aspects and modes of operation throughout the project cycle. Among the factors that need to be considered in this project implementation and its post evaluation initiatives will include;

(i) Preservation of the natural beauty of the immediate surrounding areas,

(ii) Control of soil erosion and siltation of springs downstream as public sources of water,

(iii) Enhanced integration of environmental, social and economic functions,

(iv) Incorporation of safety provisions in the premises including easy accessibility to the road, adequate in-house signage and information systems among others.

(v) Enhancing the contractor's performance,

(vi) Realization of cordial relations among various community, economic, social and cultural groups as well as between the local community and the contractor,

(vii) Enhancing equity and maximizing social and economic benefits for the local community through income generation from employment,

6.2 Environment Management Policy

It is recommended that specific guidelines are developed to allow integration of environmental management considerations in the construction, commissioning as well as the use of public amenities and resources within site area. The guidelines will be a basis for compliance actions, responsible practices for the college residents and appropriate code of conduct for all stakeholders. Among the factors that need to be considered in this guideline will include;

(i) The contractor and other players in the construction activities be prevailed upon to implement this EMP,

(ii) The development should appreciate the interests of the neighbouring communities at all stages of the project,

(iii) Maintenance of the natural beauty of the countryside around the site area such as to include green belts and other beatification initiatives,

(iv) Enhanced integration of environmental, social and economic functions in the project design and implementation plans including safety provisions,

(v) A site specific environmental, health and safety plan is established soon after commissioned.

6.3 Specific Management Issues

6.3.1 Health and Safety

Safety Issues

Collaboration with relevant environmental and health related authorities, compliance to OSHA 2007 as well as appropriate experts would be necessary to provide necessary advice in this regard. At the site, appropriate safety measures would be observed, but it will also be necessary to involve the workers and neighboring communities on awareness and sensitization at all times, e.g. provision of personal protection equipments to all workers and non-interference by the neighbourhood.

Health Issues

Control emissions from the machineries as well as dusty conditions throughout the construction cycle and check operation points upon commissioning.

6.3.2 Site Operation

It will be necessary to monitor certain social and economic trends associated with the zone operations. Commissioning of the facility, it is anticipated that it will motivate increased traffic flow into the area, reduce vehicular speed at the entrance point and heavy commercial trucks accessing the zone. Road accidents would be expected to rise initially before taking a predictable trend and residents residing in the area will learn to live with the new surroundings. More economic activity opportunities will also appear leading to a larger shopping centers around the free zone area.

6.4 Management Responsibilities

In order to implement the management plan, it is recommended that a position is created for an appropriate expertise to oversee matters of environment and social management as well as enhanced safety and security measures within and around the site. The services of an environmental expert may be required to co-ordinate and monitor environmental management for the site during construction and post monitoring audits. This would be done under the responsibility of the site contractor during construction.

The responsibility relationship is as follows;

(i) Northern Waste Management Services will be responsible for all coordination activities and liaisons, particularly in regard to issues of environment, social and safety issues,

(ii) The Project Manager is the Contactor's link with the occupier on matters of environmental and social nature and is responsible of implementing the environmental management plan established under this report,

(iii) It would also be recommended that a Public Relations Office (PRO) created on the basis of ability to directly interact with the local community for social sustainability. Upon commissioning, the Management should establish a PR office.

(iv) NEMA shall be responsible of surveillance of environmental and social aspects of the project implementation. It will be expected that their concerns are communicated to the ECCL.

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6.5 ENVIRONMENTAL MANAGEMENT PLAN

Table 2: EMP Matrix

Development stage	Impacts Anticipated	Proposed Actions	Responsibility and Timeframe	Targets and Cost Estimates	Monitorable Indicators
Construction	Environmental Pollution	▪ Ensure contractor undertaking on environmental considerations, ▪ Monitor trends on health and safety of construction workers and neighbourhood, ▪ Contractor to maintain material balance records at all times	NWMS and Contractor Continuous throughout construction period	Sustainable construction **No direct cost involved**	▪ Complaints from neigbourhood, ▪ Concerns from environmental authorities and local Municipal 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	NWMS and Contractor Continuous throughout construction period	Safe construction waste management	Compliance with waste management regulations especially Hazardous Waste Regulations

Development stage	Impacts Anticipated	Proposed Actions	Responsibility and Timeframe	Targets and Cost Estimates	Monitorable Indicators
	Social Aspects	▪ Address concerns of neighbouring land users as per this report, ▪ Integrate public safety in the construction process, ▪ Utilize local labor for construction for enhance social harmony.	NWMS and Contractor Initiate action with construction	Social harmony **No direct cost involved**	Residents complaint Public opinion
Commissioning	_	▪ Construction camp decommissioning on pre-planned schedule, ▪ File a completion report to NEMA for initial inspection	ECCL Upon operation commencement	Identifiable baseline status of the plant	Fulfillment of the mitigation measures recommended
Operations	Environmental 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, County Government laws and by-laws, Public Health Standards, etc., ▪ Enhance in-house awareness and sensitization on environmental protection initiatives,	NWMS Immediately and continuous	Integration of environmental components/ideas in the site operations.	▪ Discharges into the public drainage system, ▪ Emissions into the air, ▪ Related health effects to the site operators, ▪ Public complaints.
	Waste	▪ Maintain Isolation of surface storm water drains from those carrying oil/grease	NWMS	Streamlined	▪ Waste categories and separation,

Development stage	Impacts Anticipated	Proposed Actions	Responsibility and Timeframe	Targets and Cost Estimates	Monitorable Indicators
	Management	residuals, ▪ Enhance water recycling for conservation purposes, ▪ Compliance to waste management regulations (Legal Notice Nos. 120 and 121), ▪ In-house training on waste management options for managers and supervisors, ▪ Provide leadership in waste recycling and re-use.	Immediately and continuous	waste flow paths.	▪ Mode of transfer ▪ Final destinations.
Operations	Air quality	▪ Dry materials shall be kept dump or covered at all time, ▪ Install gadgets to intercept the particulate matter as well as controlling gaseous emissions.	NWMS Management managers Initial installation are design controlled	Reduced concentrations of aerial pollutants	Visibility of chimney emissions, Public complaint PM(50), SO_x(500), NO_x(750) As(0.1), Cd(0.05), Cu(0.05), Pb(0.5), Zn(1) – all in ppm.
	Vegetation cover	Introduction of vegetation (trees, shrubs and grass) on open spaces within and around the site. Indigenous species would be preferred.	ECCL Upon commissioning	Greening the compound and landscaping **KSh.500,000 over 5 years**	Number of trees planted. This action will develop a vegetated landscape that will also help contain dust originating from the site.

Development stage	Impacts Anticipated	Proposed Actions	Responsibility and Timeframe	Targets and Cost Estimates	Monitorable Indicators
	Social Aspects	▪ Draw of-site contracts to enhance socially acceptable procedures, ▪ Involve more independent interested parties (waste collectors) in establishing options for collection and management,	NWMS Upon commissioning then continuous	Social acceptability and co-existence.	Health problems and degradation of environmental resources, The public opinion, Satisfaction to the relevant authority.
	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,	NWMS. Immediately	Quick and effective response to emergencies. **Annual budget of KShs. 300,000**	▪ The security and safety of the neighbouring premises, ▪ Safety cases over a period of time, ▪ Response period on safety and medical aspects.
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 application,	NWMS Supervisors. Upon commissioning and continuous.	Compliance **KShs. 250,000** for equipment and professional guidance	Occupational levels of 70dBA, External receptors as defined under the EMCA regulations on noise and vibrations (2009)

Development stage	Impacts Anticipated	Proposed Actions	Responsibility and Timeframe	Targets and Cost Estimates	Monitorable Indicators
	Compliance Aspects	▪ 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.	NWMS Continuous	An all time compliance **About KShs. 250,000 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.	NWMS Continuous	Coordinated environmental management **No direct costs anticipated**	To ensure that all actions on environment are integrated in the future corporate business plans
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		Sustainability and sharing with others	To provide necessary knowledge, tools and awareness to all workers for effective human resource capacity development.

Development stage	Impacts Anticipated	Proposed Actions	Responsibility and Timeframe	Targets and Cost Estimates	Monitorable Indicators
		environment, ▪ Engage a qualified staff to oversee environment, health and safety.	NWMS Continuous	**No direct costs involved**	
	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			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.	NWMS	Sustained capacity building	Kenya Institute of Waste Management is recommended
Decommissioning	Composite impacts	▪ Notify NEMA and other authorities on intension to stop operations at least 1 year in advance, ▪ Carry out a **decommissioning audit** and submit report to NEMA for review six months in advance, ▪ Close down equipment and participate in	NWMS, NEMA, Turkana County Government and environmental expert.	Rehabilitated site	Air quality and soil status in the area. Social and economic implications in the area

Development stage	Impacts Anticipated	Proposed Actions	Responsibility and Timeframe	Targets and Cost Estimates	Monitorable Indicators
		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. ▪ **ALTERNATIVE:** Negotiate with a new operator BUT undertake an environmental liability audit.	Process to take 2 years on a pre-agreed schedule	**Costs to be identified through the decommissioning audit repot**	Destination of waste material disposal.

CHAPTER SEVEN

7. CONCLUSION AND RECOMMENDATION

7.1 Conclusion

This Environmental Impact Assessment study presents a literature study regarding the purpose and the functionality of the project cycle from approvals seeking, construction, operation and decommissioning of the waste transfer station and a recycling station. The main focus of this study has been to: perform field evaluation of the project area, identify impacts and effects, assess environmental consequences, analyze alternative locations, propose mitigation measures and recommend a location, in addition to develop environmental management plan for the proposed project.

From the foregoing, it is concluded that the proposed hazardous waste transfer station is in appropriate location in as far as land use and interactions with human social and economic setting is concerned. There are no 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. The proposed development has been approved by Turkana County Government subject to compliance with all regulations while land transfers to the ownership of the proponent have been accomplished. 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. The measures, if integrated in the site design and operations and maintained throughout the site lifespan, will ensure environmental and social sustainability of the facility.

7.2 Recommendation

It is recommended that the hazardous waste management and transfer station be licensed to proceed subject to full implementation of the environmental management plan in addition to observing the mitigation measures established for every impact identified. Among the specific recommendations include,

(i) 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,

(ii) Aerial emissions be controlled as proposed in the preceding chapter in this report,

(iii) Safety measures for the workers and the neighbouring community shall be integrated in the entire project cycle,

(iv) Compliance with the existing laws and regulations shall be upheld at all times,

(v) 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

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