ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE PROPOSED CONSTRUCTION OF DRY BULK HANDLING TERMINAL AT ATHI RIVER, MACHAKOS COUNTY.

Site Coordinates: Latitude, S 01°27 ′58.25′′ and Longitude, E 036°59′22.20′′

Name and Address of Proponent:	**FIRM OF EXPERTS:**
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SEPTEMBER, 2019

CERTIFICATION

Project Proponent: Grain Bulk Handlers Limited

Assignment Title: Environmental Impact Assessment Study for the Proposed Construction of Dry Bulk Handling Terminal on Plot L.R. No. 10424, adjacent to the Athi River SGR Station, Machakos County.

Report Submitted by:

Signature: ……. Date: ……..

For Gomake Consultancy Company Limited,
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On Behalf of:

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Designation:

ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED CONSTRUCTION OF DRY BULK HANDLING TERMINAL AT ATHI RIVER

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LIST OF ACRONYMS AND ABBREVIATIONS

DOSHS	Directorate of Occupational Safety and Health Services
EA	Environmental Audit
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EMP	Environmental Management Plan
ESMP	Environmental and Social Management Plan
GBHL	Grain Bulk Handlers Ltd
GoK	Government of Kenya
IEIA	Integrated Environmental Impact Assessment
ISO 14001:2015	International Standard for Environmental management systems
JKIA	Jomo Kenyatta International Airport
KRC	Kenya Railway Corporation
NEMA	National Environment Management Authority
OSHA	Occupational Safety and Health Act
PCM	Public Consultation Meeting
PPE	Personal Protective Equipment
SGR	Standard Gauge Railway
WRA	Water Resources Authority

EXECUTIVE SUMMARY

This Environmental Impact Assessment (EIA) Study report was prepared as per the provisions of the Environmental Management and Coordination Act No. 8 of 2015, and the Integrated Environmental Impact Assessment Regulations, 2018. It is also in line local and international laws and policies that regulate projects of this nature. This Study gives the findings of the Environmental Impact Assessment undertaken as an integral part of the planning and design process. The Study highlights salient social, economic and environmental issues associated with the design, construction and operational aspects of the Proposed GBHL Dry Bulk Handling Terminal.

The adverse elements notwithstanding, the benefits that will be realized from the construction of the Proposed GBHL Dry Bulk Handling Terminal at Athi River outweigh most of the inconveniences and negative impacts that have been categorized in this EIA Study as temporary, moderately significant and limited to the project construction phase. The EIA Study determined that if the project construction and operation is implemented with due attention to the mitigation and monitoring measures entailed in this document, most if not all, adverse environmental and social impacts will be manageable. Overall, the Dry Bulk project is deemed timely, highly beneficial and should therefore be allowed to proceed within the given framework.

It is recommended that for the prevention and mitigation of potentially adverse environmental and socio-economic impacts, the following should be done:

- The operation and maintenance of the proposed project must comply with the best management practices and the principles of environmental management including the principles of sustainability, intergenerational equity, prevention and precaution
- Ensure the views expressed by the public during the consultation exercise are integrated in the design and implementation plan of the project, especially where aspects of social interest are concerned.
- Regular environmental and social safeguard monitoring and auditing should be undertaken and any identified shortcomings addressed. This will ensure that all projects are in conformance with established laws and regulations for the management of environment, safety and health
- Institute effective communication, education and awareness raising for project workers and neighbours for enhanced acceptability and social harmony
- The proponent should ensure the local community benefits from employment opportunities in each phase of the project that is being executed
- The Contractor should expedite on the works to minimize adverse livelihood impacts and inconveniences to the community.

1. INTRODUCTION

1.1 The Proponent

Grain Bulk Handlers Ltd (GBHL) is a private Kenyan company, which commenced operations in the year 2000. It owns and operates a specialized dry bulk discharge and handling terminal for grain and fertilizer imports, located in Shimanzi and linked by overhead conveyor directly to Berth No.3, Kilindini Port, Mombasa. GBHL's facilities comprise a vessel handling facility, a bulk transit terminal, a bulk storage terminal, bagged warehousing and local transportation.

GBHL, an ISO 14001:2015 certified firm's use of a highly mechanized system with dust suppression filters has resulted in shorter ship dwell times, reduced dust emissions to the environment, and reduced cargo wastage. Compared to conventional discharge which takes 2 weeks to discharge a ship, GBHL can do the same ship in 5 days. This GBHL advantage allows clients to increase raw material imports and at a lower cost, increase production of consumer goods and lead to greater economic growth while minimizing the environmental impact of the discharging and delivery processes.

GBHL services entail discharge of bulk vessels; bulk silos for transit and long term storage capacity; delivery to road/rail in bulk/bags; warehousing for bagged cargo for long term storage; local transportation provided by a fleet of truck/trailer units for bagged cargo. The terminal is gazetted and recognized by Kenya Revenue Authority, Customs & Excise Department as a Customs Area, allowed to receive un-entered cargo. Through road/rail transport, the terminal serves the immediate hinterland with transit/transshipment services in conjunction with the Kenya Ports Authority.

GBHL has proposed to construct a new dry bulk handling terminal for non-food products such as clinker, coal and fertilizer adjacent to the Athi River Standard Gauge Railway (SGR) Station to receive cargo from their terminal in Mombasa. With the Standard Gauge Railway (SGR) having been built within the Port, the company plans to leverage the railway infrastructure to speed up deliveries to up country and the hinterland. The ripple effects of such a facility will be felt through the nation in the form of greater economic growth.

The Proposed GBHL Dry Bulk Handling Terminal Project at Athi River is listed in the EMCA Amended Second Schedule under High Risk Projects as any structure of a scale not in keeping with its surrounding. The proposed project has the potential of causing impacts to the environment. It is against this backdrop that GBHL commissioned Gomake Consultancy Company to carry out an Environmental Impact Assessment (EIA) Study for the project.

1.2 Objectives of the EIA study

The main objective of the EIA study is to carry out a systematic examination of the baseline environmental conditions within the project area in order to determine how the project will impact the environment. The specific objectives of the study included, but are not limited to the following:

- Determination of the compatibility of the establishment of the Proposed GBHL Dry Bulk Handling Terminal with the local environmental conditions.
- Identification and evaluation of the significant environmental impacts of the proposed project with special emphasis on:
  - Compatibility with neighboring land uses
  - Landscape alteration
  - Solid and liquid waste management
  - Air and noise pollution
  - Impact on socio-economics and livelihoods
- Assessment and analysis of the environmental and social costs and benefits that may accrue from the proposed projects
- Incorporation of the Environmental and Social Management Plan and Monitoring mechanisms during construction and operation phases of the projects

1.3 Scope of the ESIA Study

The study identified the anticipated and foreseeable impacts on the environment resulting from the implementation of the dry bulk handling project. The physical scope covers the 50-acre parcel of land where the project will be sited and the adjacent environment that may be affected by, or which may affect the project. All potential impacts, (localized or delocalized) have been carefully evaluated against the guidelines provided by the Environmental Management and Coordination Act, EMCA 1999 (Amended 2015) and the Integrated Environmental (Impact Assessment and Audit) IEIA/EA Regulations 2018. This report is structured into the following sections:

- Project Description
- Gathering of environmental and socio-economic baseline
- Review of policy, legal and regulatory framework
- Analysis of project alternatives
- Analysis of the potential impacts on the project environment
- Devising of Mitigation Measures and preparation of an Environmental and Social Management Plan

1.4 EIA Study Methodology

Screening was done to determine whether or not the proposed project falls within a category that requires EIA prior to commencement. Other considerations during the screening process included a preliminary assessment of the environmental sensitivity of the areas surrounding the Proposed GBHL Dry Bulk Handling Terminal. This entailed a desk review of information and designs availed by the Proponent. It was determined that the is listed in the EMCA Amended

Second Schedule under High Risk Projects as any structure of a scale not in keeping with its surrounding among projects requiring an EIA Study. The Proponent therefore, commissioned this study in line with the provisions of the said Act.

1.4.1 EIA Study Terms of Reference

The project scoping stage which followed the screening stage was done to narrow down to the project issues that require detailed analysis. Terms of Reference for the Study was formulated and submitted to NEMA for approval and is attached in Appendix I. The key issues identified are concerned with effects on neighboring land uses such as residential and schools, vegetation, water resources, health and safety, soils, air quality, solid and liquid waste management, noise and ground vibrations, socio-economic aspects such as HIV prevalence, employment, poverty, human resource development, gender considerations, among others. The process involved having discussions with the Proponent on the key issues and collection of primary and secondary data on the same. The primary data was collected using both qualitative and quantitative methods of data collection through field visits/site walks, public and stakeholders consultation. Secondary data was collected through literature review which included the review of policies, Acts and regulations; County Development Plans; project area maps; previous project area reports among others.

This exercise was designed to meet the requirements of EMCA 1999 (Amended 2015) and the IEIA Regulations of 2018. For the most part, the exercise involved studying the proposed design of the Proposed GBHL Dry Bulk Handling Terminal, the operational mechanisms of each component, the input and outputs of the facility and determining the impacts that may manifest during design and construction. In addition, baseline information was obtained through desk studies, physical investigation of the project areas, public and key informant consultations. The study adopted an integrated approach whereby a multi-disciplinary team was engaged in the data collection and analysis.

Generally, the key activities that fed in to the EIA Study entailed, but are not limited to the following:

- A sit visit to collect baseline information of the project area.
- A comparative analysis of the project with existing land uses in the neighborhood.
- A review of relevant policy and legislation.
- Discussions with the project proponent to obtain information on various project aspects.
- Identification of health and safety concerns that may be occasioned by the project.
- Seeking views and input through discussions and interviews with the public and key informants.
- Assessment of the site to detail the various existing and likely impacts.
- Proposal of mitigation measures to avert or minimize negative impacts.

Both positive and negative impacts of the proposed project have been identified and appropriate measures to abate any adverse effects that may emanate from the dry bulk handling activities. The Environmental Impact Assessment (EIA) Study determined the inter-relationship between the Proposed GBHL Dry Bulk Handling Terminal, the natural environment and social fabric.

This was done with a view of integrating environmental protection measures in the implementation of the project from the design stage through construction, commissioning and eventually long term operation.

Upon identification of the impacts from the project, appropriate measures have been drawn to mitigate the impacts. This led to the development of the Environmental and Social Management Plan to guide the project implementation based on project knowledge and information available up to this step of the ESIA process. This will ensure proper integration of the ESMP in various project stages. The Monitoring Plan will serve as a supervisory schedule with respect to the environmental aspects.

The Environmental and Social Management Plan (ESMP) describes a range of environmental issues that may be occasioned by the project and outlines corresponding measures that will be employed to mitigate adverse impacts and enhance positive impacts. A detailed Environmental and Social Management Plan (ESMP) has been prepared to demonstrate how site specific concerns will be addressed during the design, pre-construction, construction and operation phases of the project. As the project progresses, some components of the ESMP might require amending due to variations in the design or changes in site conditions. The ESMP is therefore a working document, which may periodically be reviewed and updated by Lead Experts subject to the approval of the National Environment Management Authority (NEMA).

1.5 The Project Cost

The Proponent avers that the total estimated project cost is *Kenya Shillings Two (2) billion* to set up. The amount to be expended in the different project phases of design, construction and installation of various facilities.

2. PROJECT DESCRIPTION

2.1 The Proposed Site

The Proposed GBHL Dry Bulk Handling Terminal will be constructed on approximately 50 acres of land (L.R. No. 10424) adjacent to the Athi River Standard Gauge Railway (SGR) Station that is owned by the Kenya Railways Corporation. The proponent entered into a lease agreement with the Kenya Railways Corporation on the 28th of November 2018. The agreement allows Grain Bulk Handlers to peacefully reside and conduct business within the premises without hindrance as long as the proponent fully observes its obligations as outlined in the said lease agreement. Other terms and conditions of lease are entailed in the lease agreement in Appendix III of this report.

2.2 Design Concept

The Dry Bulk Handling Terminal for non-food products such as clinker, coal and fertilizer will comprise several components among them a standard gauge railway siding, conveyors, diesel powered generators, weigh bridges, Six (6) flat sheds, one (1) with a capacity of 38,500m^3, two (2) with a capacity of 40,000m^3, two (2) with a capacity of 46,900m^3 and one (1) with a capacity of 60,000m^3, bag loading stations and an administrative block. At the proposed SGR siding, there will be a tipping pit for the sole purpose of collecting cargo that has been discharged from containers being carried on the wagons. Inside this tipping pit will be a conveyor system with a flow capacity of 600 tonnes/hour for moving bulk cargo to the storage flat sheds. To minimize dust emissions, the tipping pit and the conveyor system will have their dust collection systems.

Once in the flat sheds, the product can be stored long term or act as a buffer in the event that trains bringing in cargo to the terminal exceed deliveries to Clients by truck. In the event that Clients need to pick their cargo, the cargo will be released from the flat sheds to a conveyor belt system underneath that is dedicated to deliveries at a flow rate of 300t/h. These conveyors will deliver cargo to the bulk loading station or to the bagging station through an elevator. Trucks will then be loaded, weighed and dispatched. The bagging station and bulk loading points will all have dust suppression systems in place to minimize dust emissions.

2.3 Planned Scope of Works

The construction phase of the project will entail various works that can be categorized in to mechanical works, electrical and instrumentation works and civil works. Being a new site at Athi River, downtime shall not need to be considered. The initial proposal is to fabricate majority of the structural works off-site at a designated area for hot works. These shall then be connected on site so as to have ample working space.

To enable GBHL to handle bulk cargo consisting of fertilizer, clinker and coal in Athi River, a storage terminal needs to be constructed together with all associated conveyor systems as below:

The mechanical and piping engineering work to be carried out shall include:

- Construction of Standard gauge railway siding to enable trains to come to site with loaded cargo;

- Installation of two (2) Bagged fertilizer warehouses;
- Installation of one (1) Bulk fertilizer warehouse;
- Installation of one (1) Clinker warehouse;
- Installation of one (1) Coal warehouse;
- Installation of two (2) wagon unloading stations

The preliminary electrical and instrumentation works that are envisaged shall include:

- Power supply to all conveyor systems;
- Power supply to all metering units, load computers etc;
- Installation of switchboards and MCC as well as cable tray routes;
- Control cabling for motors, slide gates, weighbridges etc;
- Lighting for the facility;
- All additional instrument installation materials, such as field junction boxes, GI conduit cable support, cable tray, ducts, compression fittings, cable glands, instruments support, etc., as required for the system; and
- Minor civil works like chipping of pavement and grouting on the pavements the instruments panels/support, and chipping and refilling of the pavement for conduits.

The civil and structural scope shall involve the construction of all conveyor systems and storage structures required for efficient operation of the plant. Some of the civil works will include:

- Demolitions and disposals as required;
- New drainage system for the facility;
- All required structures to support conveyor system and loading points including column plinths and steelworks;
- Cladding for all bulk loading points and towers as required; and
- All necessary anchors and cast HD bolts.

In addition to the constructions above of conveyor lines and warehouses, the company intends to install weighbridges for client cargo control.

2.3.1 Progression of Project Implementation Activities

The Proponent is in the process of procuring the services of a competent Contractor to execute the construction works. Typically, as with all projects involving construction and earth moving activities, the following procedure is proposed:

- Securing all approvals, permits and licenses before commencing construction works;
- Procurement by the Contractor of a performance bond to ensure that the works shall not be abandoned midway and, if abandoned, would not suffer as the client would still be able to engage another contractor;
- Mobilizing equipment, machinery, personnel, construction camp including accommodation, securing and fencing of the construction site;
- Recruitment of the labor force;
- Identification of dumping sites for any unsuitable, excavated or demolished waste materials or any other generated waste;

- Provision of sanitation facilities such as a temporary latrine or mobile toilet for the construction workers;
- Construction of storage areas for delivery of construction materials;
- Ground investigations should be done prior to actual construction works, the Contractor will undertake confirmatory ground investigations over and above the one done for the design;
- Site preparation and clearance will involve general site clearance of remnants of material from the current site occupant including the disposal of any arising wastes or debris;
- Utilities such as power lines, water pipes etc. that may interfere with site operations or that may be affected by the operations of the site facility need to be relocated accordingly;
- Earthworks for preparation of foundation of buildings and other structures will include but not be limited to:
  - Scarifying the ground, excavating and dumping or backfilling with excavated earth; and
  - Other works as outlined in the project scope of works including civil works, mechanical works, electrical works

2.4 Project Input during Construction Phase

2.4.1 Land

The project will utilize to the best extent possible the 50 acre parcel of land leased from the Kenya Railways Corporation. At the time of conducting the EIA Study exercise, the parcel of land was undeveloped however a boundary wall (under a separate project report) was under construction to secure the land and make it ready for the project implementation.

2.4.2 Materials Sources

The Dry bulk handling facility will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental sustainability requirements. Equipment that saves energy and water will be given first priority without compromising on cost or availability of other factors. It is recommended that as much as practically possible, such material should be sourced locally.

The proposed development is expected to utilize the following materials during its construction;

- Water;
- Cement;
- Petroleum products;
- Sand, gravel, hard stone;
- Precast concrete blocks;
- Reinforcement steel;
- Timber for formwork;
- Paints; and
- Equipment and machinery are likely to include shovels, hoists, concrete mixers, trucks and excavators

2.4.3 Water Sources for Construction

The project area is under the coverage of the Mavoko Water and Sewerage Company Ltd. There is a 10" water pipe belonging to Mavoko Water passing across the land parcel and which has been tapped to serve the SGR Athi River Station. The proponent intends to tap water from the same line serving the SGR in addition to drilling some boreholes at the site to supplement the supply from the water company.

2.5 Operation and Maintenance Phase

Other works to be carried out after construction and during the life span of the project will involve routine maintenance including periodic inspection and repairs of certain components of the Proposed GBHL Dry Bulk Handling Terminal infrastructure. These activities will have varying degrees of impact on the environment. This EIA Study report includes an Environmental and Social Management and Monitoring Plan which should be implemented during routine and periodic maintenance of the facilities to mitigate any adverse environmental and social impacts.

2.6 Project Outputs

2.6.1 Management of the Waste Generated

Different types of waste will be generated during the construction, operation and decommissioning phases of the project. The waste will be inert, hazardous and non-hazardous. The operation phase of the terminal will result in quite a significant volume of waste, mostly from project workers and the day-to-day operations of the facility. Maintenance and repair activities conducted during the operational lifetime of the project may generate limited volume of waste. Demolition of structures during decommissioning will result in large volumes of debris and other wastes.

2.6.2 Waste Management Strategy

Prior to the commencement of construction, the Proponent will prepare a Waste Management Plan that will:

- State the methods for properly managing waste i.e. sorting, handling, storing, transporting and disposing wastes;
- Identify and describe possible locations of landfills or designated disposal sites;
- Propose a minimization/collection/storage/treatment/re-use/disposal route for each waste;
- Identify potential third party re-users;
- Contract a NEMA licensed waste collector; and
- Propose location of waste storage and duties of site personnel.

2.6.3 Waste Management Standards

The standards to be used for the construction, operation and decommissioning of the terminal will be in conformance with Legal Notice 121 on Waste Management Regulations 2006. If these regulations do not cover certain aspects of the project then the Proponent shall comply with international regulations on environmentally sound management of waste.

2.6.4 Waste Inventories and Classification

Waste inventories will be created to quantify and characterize waste streams at each stage of the project. Separate inventories will be developed for construction wastes and for commissioning/operational wastes. The volumes of waste requiring ultimate disposal will be minimized both through the control of waste generation and through landfilling. Inert and non-hazardous wastes that cannot be reused or recycled may be incinerated in a facility designed and operated in accordance with the Management Regulations 2006.

2.6.5 Hierarchy of Waste Management Practices

Each waste stream will be managed according to the following hierarchy of techniques, in which the technique chosen should be the first in the hierarchy that is safe and practicable:

- Eliminate or reduce the waste;
- Re-use as a material or fuel;
- Process and re-use as a material or as a fuel;
- Incinerate or re-use or landfill the ash;
- Landfill;
- Landscape - Landfill with appropriate vegetation planted; and
- Discharge to a receiving water course (applicable only to waste water)

2.6.6 Transfer of Waste to Third Parties

It is expected that there will be several third parties that may receive wastes generated during the construction of the Dry Bulk Handling Terminal for non-food products such as clinker, coal and fertilizer. These third parties will include commercial waste disposal contractors and entities (corporate or individual) that have the capacity to reuse or recycle waste materials. In general, transfer to third parties for ultimate disposal will only be permitted if the part of their operation that is used for the proposed project waste is licensed. However items such as timber wastes and other re-useable project wastes may be disposed to local population on the basis of case by case review by the proponent.

Table 1: Potential Construction Waste and Emission Inventories

SOLIDS	**METALS**
Broken building blocks	Welding Rods
Cement (Dust)	Isolated Steel Piles Wasted Lengths
Paper and Cards	Copper (Electrical Wires etc)
Plastic bottles, cans, drums & packaging bags (both polythene and biodegradable)	Reinforcement steel
Aggregates	**SLUDGES**
Vehicle parts	Grease
Glass	Paint
Rags and Oil Adsorbents	Oil
Light bulbs and tubes	**LIQUIDS**
Paint cans and brushes	Wash down water and drum water
Stone and Rocks	Oily water
Tyres	**DOMESTIC**

Waste Timber	Food
Cleared undergrowth, shrubs etc	
Concrete Shuttering	

2.6.7 General Waste Water Disposal

Waste water includes all water flows from the construction sites, work sites and subsidiary operations such as vehicle and equipment washing. Waste water from temporary site offices should be treated in a septic tank and soak pits. Waste water from the works will generally be from curing of concrete works. This waste water is not hazardous but should be monitored to ensure it does not cause adverse effects.

2.6.8 Atmospheric Emissions Operations

Atmospheric emissions will be generated by diesel-powered generators and company vehicles during construction and operation phases. It is anticipated that the most significant components of such emissions will be combustion gases, specifically:

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

Emission of pollutants by vehicles contributes to global warming ultimately climate change. The emissions will vary from time to time depending on the traffic volume and traffic composition.

3. ANALYSIS OF ALTERNATIVES

3.1 Overview

Alternatives with respect to the proposed project, technology and waste management were analyzed with an aim of coming up with the most sustainable project considerations that will ensure optimal benefits are realized from the project. A range of factors were put into consideration including the receiving environment, anticipated impacts and views and concerns gathered from the stakeholder consultations. The alternative options are discussed below.

3.2 No Project Option

Grain Bulk Handlers Limited indicate that construction of the Proposed GBHL Dry Bulk Handling Terminal for non-food products such as clinker, coal and fertilizer will enable importation of raw material at a lower cost, increase production of consumer goods, improve farm yields and lead to greater economic advantages while minimizing the environmental impact that may arise from the discharge and delivery processes. Further, a Dry Bulk Handling Terminal for non-food products such as clinker, coal and fertilizer outside the environs of the Mombasa port averts storage and transportation challenges associated with shortage of space and narrow roads around the Mombasa Port. The no project option therefore means that the aforementioned benefits are foregone. The only possible advantage of this option is that the environment and the social set up will not be interfered with.

On the flipside, this option will deny the project region and the entire Nation benefits that can only be realized from the construction of Dry Bulk Handling Terminal for non-food products such as clinker, coal and fertilizer in the outskirts of the country's capital at allocation that is in proximity with the standard gauge railway. With no project, the country will continue facing constraints arising from an inefficient transport system attributable to limited storage capacity and time wastage due to congestion at the Mombasa port. The No Project Option is the clearly the least preferred also due to the following factors:

- The local skills would remain underutilized as no employment opportunities will be created for those who would otherwise have worked in the project;
- The project region area not realize its economic potential and the living standards of the locals and other Kenyans would remain unchanged;
- Limited growth of the cement and agricultural industry due to conditions not being favorable for such business; and
- Reduced interaction at the local, regional and national levels that would foster stronger social networks.

3.3 Analysis of Alternative Approaches to Dry Bulk Handling

Grain Bulk Handlers has been in the business of handling and storage of grain in massive quantities for almost two decades. The company is conversant with the country's legal and regulatory requirements and has operated within these confines for the said period. Armed with prior experience, the proponent seeks to establish in Machakos County, a similar facility to the one in Mombasa to handle non-food products such as clinker, coal and fertilizer. An option that has stood the test of time in a different part of the country is less risky. This makes the option of an alternative approach less feasible.

3.4 Analysis of Alternative Construction Materials and Technology

The materials to be used for construction should be locally and internationally acceptable to uphold the highest environmental, health, safety and engineering standards. Energy saving equipment should be prioritized over its non-saving counterparts.

Project equipment and machinery should be incorporated with pollution control devices like noise abatement devices, dust precipitators and dust arrestors. The proponent is urged to purchase equipment and vehicles with enhanced safety features, the highest combustion efficiency and capability to use cleaner fuels such as bio-diesel and low sulphur fuels.

The Proponent is urged to use recyclable materials and be creative in selecting machinery and equipment that has multiple uses incorporated in one. Cutting down of trees for form works and burning of fuel wood is highly discouraged to minimize contributing to greenhouse gas levels in the atmosphere. The Proponent is further urged to adopt international best practices by considering naturally occurring material for construction.

3.5 Solid Waste Management Alternatives

Solid waste generation is expected to be highest during the construction phase. The proponent will be required to develop an integrated solid waste management plan for sound waste management. The proponent will be required to segregate waste at source as stipulated in the Waste Management Regulations (2006). The waste management strategy should embrace the '3R' principle of Reduce, Reuse and Recycle. Management and workers should be informed that waste will be reduced at source. Certain types of waste may be identified for reuse such as large plastic water bottles may be cut and used for planting flowers or seedlings. Used engine oil from vehicles and machinery may be used to cure wood for protection from termites and ants.

Recyclable waste can be sold to waste buyers for instance worn out tyres can be sold to dealers. The other alternative is to decompose bio-degradable waste and workers should be made aware that open burning of waste is highly discouraged as it is prohibited by the environmental regulations. Waste should be collected by a NEMA licensed waste handler for proper disposal in approved or designated dump sites. Hazardous wastes including medical waste should be handed over to incinerator operators for destruction. Sanitary land filling will be the last option for the proponent in areas provided with the facilities.

4. ENVIRONMENTAL AND SOCIO-ECONOMIC BASELINE CONDITIONS

4.1 Bio-Physical Conditions

4.1.1 Location and Size

Machakos County is one of the 47 counties in Kenya. Its capital and largest town is Machakos, which was the country's first administrative headquarters. The County has good road network connecting eight neighboring counties with the Standard Gauge Railway (SGR) terminus at Athi River. It borders Jomo Kenyatta International Airport (JKIA) and Nairobi, the capital city of Kenya. The County was ranked position 3 in ease of doing business by the World Bank Group 2016 and banks on transformative projects such as the Konza Technology City and the Machakos New City for its growth and development.

The County has a total area coverage of 6,208.2km^2 with availability of vast land for investment and a set industrial development corridor in Mavoko Sub-County. The County has modern real estate facilities that provide habitat for residents of Machakos and neighboring counties, especially Nairobi. Building materials such as cement, building stones, ballast, sand, steel etc. are readily available due to the various industries located within the County.

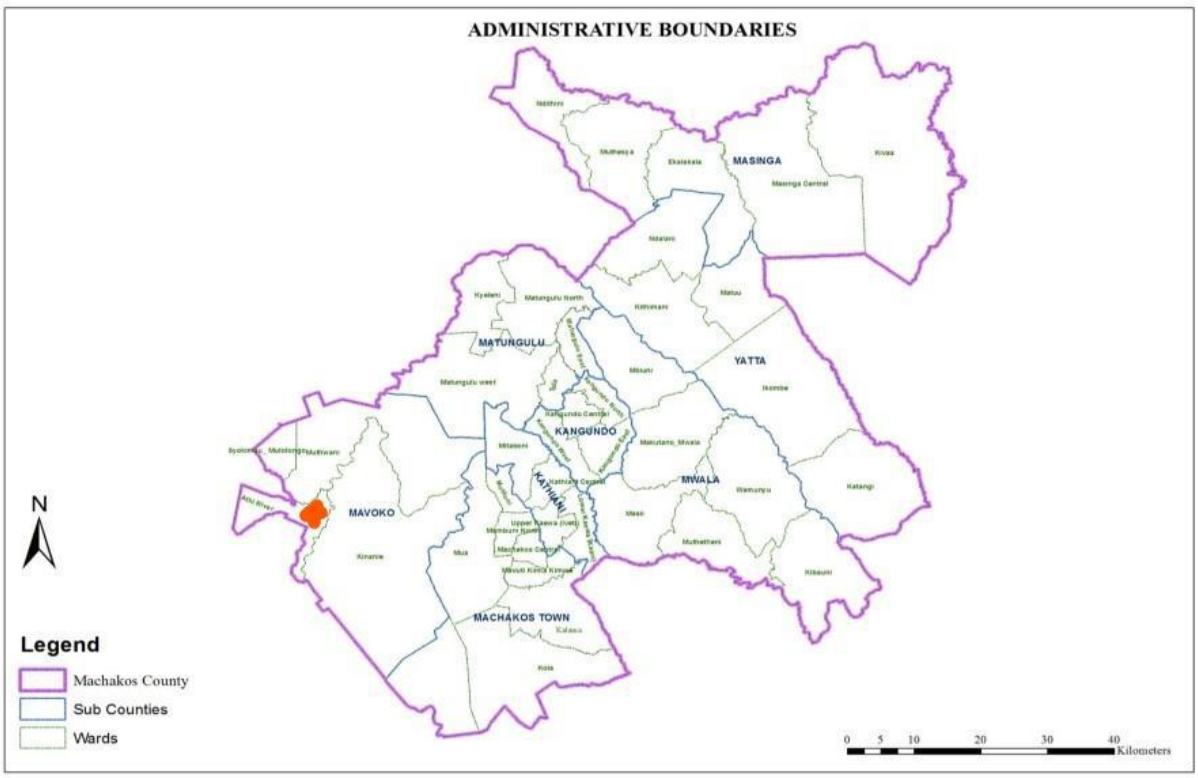

Figure 1: Location of Project Area in Machakos County
Source: Machakos County Spatial Database

The project site is located off the Nairobi-Mombasa (A109) road at coordinates of **Latitude, S 01°27 ′58.25′′ and Longitude, E 036°59′22.20′′**. The proposed site borders the Athi River SGR Station to the east and Jonguine Residential Estate and Kanani Secondary School to the west. The old railway line way leave provides a buffer zone between the project land and the nearest residential area. This project land is characterized by grassland and scattered Acacia trees with sporadic shrubs of cactus. The total proposed project area is approximately 50 acres

and is mostly flat and largely with grassy surface. Neither environmental sensitive areas (e.g. rivers, lakes, swamps, dams) nor wildlife corridors borders the proposed project land. The area is served with good road network including the new Nairobi-Mombasa road and the new standard gauge railway line. The project site is crossed by way leave containing an underground KPLC Power cables serving the SGR and the MAVWASCO 10" main water distribution pipe which will need to be secured to avoid disruptions of services during construction phase.

Plate 1: An Impression of the Site Location on Satellite Imagery

Source: Google Earth Images

To access the site from Nairobi Town, drive up to Small World turn-off on the right from Mombasa Road immediately after Athi River Steel Plant. From the junction, the site is located at the end of approximately 2km earth road passing under the SGR from Athi River Station.

4.1.2 Administrative Units

Administratively, the County is sub-divided into eight sub-counties/constituencies, namely Mavoko, Kathiani, Machakos, Matungulu, Yatta, Masinga, Mwala, and Kangundo. The eight sub-counties are further sub-divided into twenty-two divisions, seventy-five locations and two hundred and thirty nine sub-locations. Mavoko sub-county where the project is located is divided into four (4) divisions and seven (7) locations.

4.1.3 Climate

The County receives bimodal rainfall with short rains in October and December while the long rains from March to May. The rainfall range is between 500mm and 1250mm, which is unevenly distributed and unreliable. The altitude mainly influences rainfall distribution in the county. The high areas such as Mua, Iveti and Kangundo receive an average rainfall of 1000mm

while the lowland areas receive about 500mm. Temperatures vary between 18°C and 29°C throughout the year. The dry spells mainly occur from January to March and August to October.

4.1.4 Topographic Features

The County has unique physical and topographical features. These include hills rising between 1800 – 2100m above sea level and Yatta plateau, which is elevated to about 1700m above sea level and slopes to the South East. There are isolated hills in the North West. In the plains, the soils are well-drained, shallow, dark and red clay soils. In addition, the vegetation across the entire County varies according to the altitude. The plains receive less rainfall and are characterized by open grassland with scattered trees as compared to high altitude areas, which receive high rainfall and have dense vegetation.

4.1.5 Soils

The soils on site are black cotton, commonly associated with the Athi Kapiti Plains and are prone to waterlogging during rainy seasons. The site area is generally flat which may intensify water logging in wet weather. There are however provisions for roadside drainage to control runoff. Despite the water logging concerns, the stability of soils in the area is implied owing to the structures put up in the area. Nonetheless, the proponent sampled the soils within the site.

Sub-Surface Soil Analysis Results

Baseline monitoring was carried out in accordance with the Dutch Intervention Values for contaminated sites (soil):

- Traces of heavy metals including iron, nickel chromium, zinc and lead were detected in soil samples taken within the project area and outside the project area.
- Furthermore, Petroleum hydrocarbons concentrations have been reported at a range of 1.2 – 1.5mg/kg; these concentrations were consistent with the guideline limits of 5,000mg/kg.
- The concentrations of Barium have been reported at a range of 120.0- 156.12mg/kg; these concentrations were consistent with the Dutch Soil reference value 200mg/kg.
- The other heavy metals tested, and volatiles were consistent with the guideline limits.

The findings of the laboratory analysis are attached in Appendix II to this report.

4.1.6 *Flora* and *Fauna*

The County is predominantly a terrestrial habitat that supports a diverse web of biodiversity ecosystems. The larger proportion of the site ground have minimal vegetation, mostly grasses and a few acacia trees and cactus shrubs. No wild animals were found at the site during the study.

Plate 2: Vegetation cover on the proposed site

4.1.7 Land Use

Land use in Machakos County urban centres is generally mixed development. There are no clear-cut zones for specific land uses in the county. This is because all the existing physical development plans except Machakos New Town Local Physical Development Plan are outdated hence not in force. There is no well-defined zoning policy in the county that guides land use development in all its urban centres sometimes leading to overlaps and mixing of incompatible land uses. There are 2 basic land use structures which are rural and urban. Rural: Agriculture (arable), Urban: residential, commercial, industrial, recreational, wildlife, rangeland.

Most of the heavy industries in Machakos County are concentrated in Mavoko Sub County. The other towns mainly have light industrial establishments.

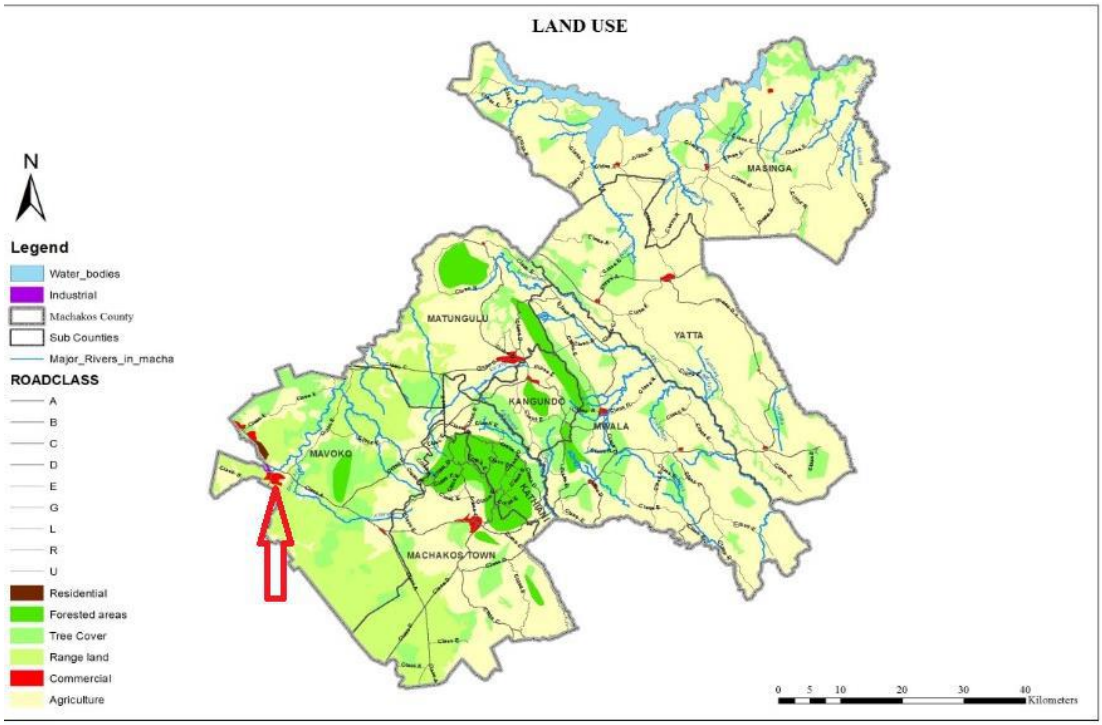

Plate 3: Project site in relation to land use within the County

The project site is off the old Mombasa Road and has largely commercial and industrial land-uses. The project area is also compatible with the recent land use within the County.

Plate 4: Neighbouring SGR facility bordering the site

4.1.8 Road, Railway Network and Airports

The current road network in the County is inadequate in terms of coverage to meet current and future demands as envisaged in the Vision 2030. There is heavy congestion on most of the city

roads especially during the morning and evening peak hours. The current poor state of road network is a great impediment to socio-economic growth leading to high production costs and low productivity. One of the motivations for the proponent to set base at Athi River is to get away from the congestion challenges at the port of Mombasa and the narrow road network that hinder easy and quick movement of cargo.

The neighbouring Nairobi County hosts 3 airports; Jomo Kenyatta International Airport, Wilson Airport and Eastleigh Airport. Nairobi's importance as an aviation center makes it the pacesetter for other airports in the region. The JKIA located 18 kilometers to the East of Nairobi City center, is served by 49 scheduled airlines. JKIA has direct flight connections to Europe, the Middle East, Far East and the rest of Africa. JKIA has five cargo facilities with a capacity to handle 200,000 tonnes of cargo annually, and an animal holding facility which occupies 4,318.95 square feet. The airport has a runway measuring 4,117m long and 45m wide on 4,472.2 ha of land.

Ambient Noise Results

Baseline noise monitoring was carried out in accordance with Noise & Excessive Vibrations Pollution Control Regulations 2009.

- Noise levels between 40.1 to 73.2 dB(A) during the day and 33.4- 35.0 dB(A) during the night had been consistently recorded. The day time baseline noise levels at the sensitive receptor was mostly due to operations at SGR station and light traffic along the road to SGR Athi River terminal.
- The higher levels of 35.0 dB(A) recorded at night from the site boundary fence was from the extraneous noise coming from the nearest estate.

The findings of the laboratory analysis are attached in Appendix II of this report.

4.1.9 Information, Communication and Technology

The County has estimated mobile network coverage of about 85% with good internet connectivity supported by both the mobile network and fibre optic cable. According to 2009 Kenya population and Housing census, Machakos County was ranked position 11 out of 47 with 67.7% of households owning mobile phones. However, Mwala, Kibauni, Yathui and Kalama are some of the areas with poor network coverage.

4.1.10 Energy Access

The main source of energy for cooking and lighting is wood and electricity respectively. Other sources of energy across the County are solar, wind, biogas, gas, charcoal and paraffin. Masinga dam is one of the Seven Folks dams, which produce hydroelectric power for the national electricity grid. There is increasing connectivity to the national grid across the County because of the implementation of "last mile" power project by the national government.

4.1.11 Water Resources

Machakos County is a water scarce County with its water situation levels below the national natural endowment of 647m per capita per year. Its arid and semi-arid areas are critically limited in water endowment. This serious water stress adversely affects food production and often disrupts economic development. To address the water scarcity situation, more investment

in water storage infrastructure should be done to increase water storage per capita. Water resources in the County are mainly seasonal rivers, dams and springs. Furthermore, the County has two perennial rivers. One of them traverses the County namely Athi River and the other namely Tana River forms the County boundary with Embu and Tharaka Nithi counties. The dams include Maruba, which is the main source of the water consumed in Machakos town whereas Masinga dam on Tana River is shared between Machakos and Embu counties. In addition, several earth dams and springs across the County serve as water resources.

Underground water sources (boreholes and wells) supplement surface water sources. Most of these water sources are under threat of pollution from agricultural chemicals, urban and industrial wastes especially Athi River, which is under threat of pollution from the Nairobi city and adjacent towns. The water resources are also under pressure for use in agricultural irrigation, domestic, industrial and use for hydroelectric power generation.

The project area is under the coverage of the Mavoko Water and Sewerage Company Ltd. There is a 10" water pipe belonging to Mavoko Water passing across the land parcel and which has been tapped to serve the SGR Athi River Station. The proponent intends to tap water from the same line serving the SGR in addition to drilling some boreholes at the site to supplement the supply from the water company.

4.1.12 Air Quality

Air pollution in Athi River is on the rise due to industrial growth, high vehicular traffic density and urbanization. It is a major problem because it has adverse effects on human health, materials and environment. Air pollution contributes to formation of acid rain, affects soil by reducing its fertility, destruction of aquatic ecosystems and death of certain plants. The proponent commissioned an assessment of the baseline air quality parameters for purposes of monitoring the impacts of his activities to the quality of air.

Air Quality Results

Baseline Air Quality monitoring was carried out in accordance with EMCA Air Quality Regulations 2014.

- Baseline levels for particulates have been recorded in the range of 8.8µg/m3 -12.6µg/m3 (SPM), 5.5µg/m3 - 7.2µg/m3 (PM10) and 2.6µg/m3-3.1µg/m3 (PM2.5) respectively. This was widely attributed to traffic to SGR station and construction work on site.
- Generally, the area is dry and flat. NO2 (0.02 µg/m3) and Ozone (0.2ppm) has been detected at monitoring point 01 and 02 which are at the SGR boundary fence with the project area; this can also be associated with traffic along the road. All other gases of concern were below their respective detection limits.
- Traces of lead detected range between 0.018-0.002µg/m3 which are below the allowable limits; sources of lead in the vicinity would include burning of car exhausts and smoke fumes from the train along the old railway line.

The findings of the laboratory analysis are attached in Appendix II of this report.

4.1.13 Sanitation

There are two sewer lines in Machakos and Athi River towns. However, the former is partially connected to sewer lines-this includes parts of Kariobangi and Mjini where more than 50% use pit latrines. Garbage disposal is done by the County Government, private firms and individual households. Currently the site is not connected to sewer-line and the construction workers make use of temporary pit latrines which will be decommissioned when the site is eventually connected to the neighbouring sewer-line serving the SGR. In his engineering designs, the proponent plans to construct an adequate number of appropriate sanitation facilities to cater for his staff and visitors.

4.2 Socio-Economic Baseline Conditions

4.2.1 Population

The total population of the County was 1,098,584 as per the 2009 Kenya Population and Housing Census. The projected population for the year 2018, 2020 and 2022 is 1,426,211, 1,511,377 and 1,601,629 respectively.

Mavoko where the project is located and being an urban centre has a projected urban population of 178,131. This can be attributed to it being an industrial town, real estate ventures and its proximity to Nairobi. There is need to expand the social amenities in this areas to cater for the increasing population.

4.2.2 Infrastructure Development

The County has an averagely good road network. Major roads include the Mombasa Highway, Machakos – Kitui, Machakos – Wote, Garissa and Kangundo roads, among others. The County has successfully constructed the following roads among others, the Mwala – Kithimani road, Kathiani – Kangundo road and Athi river road. It has also upgraded most access roads within the County. There are ongoing road initiatives in the County through partnership with the national government and other development partners. These include dualling of Mombasa road (Namanga road interchange to Makutano Kyumbi), Koma – Konza, Matuu – Ekalakala, Kenol – Kaseve, Tala – Oldonyo Sabuk roads, among others.

4.2.3 Energy Access

The main source of energy for cooking and lighting is wood and electricity respectively. Other sources of energy across the County are solar, wind, biogas, gas, charcoal and paraffin. Masinga dam is one of the Seven Folks dams, which produce hydroelectric power for the national electricity grid. There is increasing connectivity to the national grid across the County because of the implementation of "last mile" power project by the national government.

4.2.4 Health Access

The construction of health facilities programme through Economic Stimulus Programme (ESP) and Constituency Development Fund (CDF) led to increase in health facilities in all subcounties. The County Government has greatly improved the health facilities with one Level 5 hospital located at Machakos town and four Level 4 hospitals in Kathiani, Mwala, Matuu and Kangundo. Other health facilities by ownership include 193 under the County Government, 32 owned by FBOs, 9 owned by NGOs and 128 private-owned. The total health facilities in the County are 367. Most of the health facilities are found in the urban areas. Patients/clients in

rural areas travel longer distances to access health services. In response, the County Government has instituted measures to ensure access to well-equipped health centres within the wards.

4.2.5 Education, Skills, Literacy and Infrastructure

Education provides individuals with technical or professional skills and increases their chances and capacity to obtain a higher income and standard of living. Literacy levels in the county stand at 92.4% of which male and female literacy levels is 95.4% and 89.4% respectively. Education status in the county is as in the table below.

Table 2: Education status

Population with KCPE certificate	Population with KCSE certificate	Population with College certificate	Population with diploma certificate	Population with degree certificate	Population with no qualification
32.4%	19.9%	1.8%	2.6%	1.5%	40.1

Source: *Machakos County Integrated Development Plan, 2018-2022*

4.2.6 Mining

The major mineral deposits within the County are limestone, granite and sand. Most of the major cement factories in Kenya are located in Mavoko Sub-county namely Bamburi Cement, East Africa Portland, Mombasa Cement, Ndovu Cement, Simba Cement, Athi River Mining and Savanna Cement. Sand is mostly harvested along the river beds by private individuals. In addition, there are quarries for stone mining.

4.2.7 Industry and Trade

Industries in the County are mostly located in Athi River, Mavoko Sub-county. Some of these include cement industries, agro-chemicals industries, steel plants and textile industries in EPZ, among others. Trade across the County is mainly on small scale basis. However, there are large scale businesses like godowns, business parks, industrial parks, malls and supermarkets. These are bound to increase drastically because of development of modern infrastructure across the County. A module plant for production of aflasafe in the country has been established in the county at Katumani.

4.2.8 Employment

Wage Earners

There are few formal employment opportunities within the County. Majority of employees in the County are casual labourers working in the farms, construction, manufacturing and textile industries.

Self Employed

Most residents in the County are self-employed. Those living in the rural areas engage in agricultural activities while those in the urban areas engage in small scale businesses as their sources of livelihood. The national government has set up various funds such as Youth Fund, Uwezo Fund and Women Fund to provide affordable credit to small businesses and/or self-

help groups to start or improve their businesses and agricultural activities. On the other hand, the County Government has set up a fund to support women commonly referred to as table banking.

Labour Force

The County has a high number of skilled and unskilled labour which is steadily increasing. This poses a major challenge in matching employment opportunities with the surplus labour.

Unemployment Levels

The unemployment rate in the County is high due to increasing level of labour force with unmatched slowly growing commercial sectors. In addition, land use change from agricultural to real estate development and other uses has shrunk employment opportunities in agriculture sector. Mostly, the youth are unemployed due to their preference for white collar jobs, shying

5. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

5.1 Legal Framework

5.1.1 The Constitution of Kenya, 2010

Article 42 of the constitution provides for a right to a clean and healthy environment to every person. Article 69-72 of the Constitution of Kenya 2010 provides for the management of natural resources and the environment; and enforcement of environmental rights.

The proponent is expected to comply with the provisions of Constitution of Kenya, 2010 on environmental management during all phases of the project.

5.1.2 Environmental Management and Coordination Act, 1999 (Revised 2015)

Part II of EMCA 1999 states that every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment. In order to partly ensure this is achieved, Part IV of the act directs that any new programme, activity or operation should undergo EIA Study and a report prepared for submission to NEMA who in turn may issue a license as appropriate. Under EMCA, a set of regulations have been developed to address management and compliance in special aspects of the environmental. Some of the regulations are listed here below:

5.1.3 Waste Management Regulations, 2006 (Legal Notice No. 121)

The regulations are formed under sections 92 and 147 of the Environmental Management and Coordination Act, 1999. Under the regulations, a waste generator is defined as any person whose activities produces waste while waste management is the administration or operation used in handling, packaging, treatment, conditioning, storage and disposal of waste. The regulations requires a waste generator to collect, segregate and dispose each category of waste in such manners and facilities as provided by relevant local authorities.

Regarding transportation, licensed persons shall operate transportation vehicles approved by NEMA and will collect waste from designated areas and deliver to designated disposal sites.

5.1.4 Noise and Excessive Vibration Pollution Control Regulations, 2009

Part II section 3(I) of these Regulations states that: no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment and section 3(2) states that in determining whether noise is loud, unreasonable, unnecessary or unusual. Part II Section 4 states that: except as otherwise provided in these Regulations, no person shall:

(i) Make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment;
(ii) Cause to be made excessive vibrations which exceed 0.5cm per second beyond any source property boundary or 30m from any moving source.

Part III, Section 11(1) states that any person wishing to:

(i) Operate or repair any machinery, motor vehicle, construction equipment or other equipment, pump, fan, air-conditioning apparatus or similar mechanical device;
(ii) Engage in any commercial or industrial activity, which is likely to emit noise or excessive vibrations shall carry out the activity or activities within the relevant levels prescribed in the First Schedule to these Regulations. Any person who contravenes this Regulation commits an offence.

Section 13(1) states that except for the purposes specified in sub-Regulation (2) hereunder, no person shall operate construction equipment (including but not limited to any pile driver, steam

shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations. These purposes include emergencies, those of a domestic nature and /or public utility construction. Section 14 relates to noise, excessive vibrations from construction, demolition, mining or quarrying sites, and states that: where defined work of construction, demolition, mining or quarrying is to be carried out in an area, the Authority may impose requirements on how the work is to be carried out including but not limited to requirements regarding machinery that may be used and the permitted levels of noise as stipulated in the Second and Third Schedules to these Regulations.

The receptors in the site vicinity do not generally qualify to be sensitive receptors to noise and vibrations since most of them are engaged in noise generating industrial activities. Nonetheless, the proponent has carried out a baseline noise survey of the site against which he will monitor the noise emissions from his activities during construction and operation. The results are annexed to this report under Appendix II.

5.1.5 Environmental Management and Co-ordination Act, 1999; Environment Co-ordination (Air Quality) Regulations, 2014

The government has gazetted the Environmental Management and Co-ordination (air quality Regulations). The regulation has provisions with prohibitions of priority air pollutants associated with machine operations and burning activities (general sources, mobile sources and greenhouse gasses) outlined under the second schedule of the regulations. Tolerable air quality limits are provided under the first schedule of the regulation while lists specific limited for emissions from controlled and non-controlled facilities by sector. An operator of a site or equipment is required to obtain a license under the regulations and stipulated regulations. A compliance is also required as part of the emission license.

The proponent has carried out baseline air assessment of the site and will use the results to monitor the emissions from his activities during construction and operation. The results are annexed to this report under Appendix II.

5.1.6 Integrated Environmental Impact assessment and Audit Regulation, 2018

EIA is a tool for environmental conservation and has been identified as a key component in on-going project execution. Section 58 of the EMCA no.8 of 1999, second schedule 9 (i) and environmental (impact assessments and audits) regulation 203, stipulate that both new and old projects must undergo EIA and audits. This is necessary as many forms of developmental activities cause damage to the environment and hence the greatest challenge today is to maintain sustainable development without interfering with the environment. There are many environmental problems and challenges in Kenya today for instance, land degradation, water management and environmental pollution. This is aggravated by lack of awareness and inadequate information amongst the public on the consequences of interaction with the environment. The policy recommends the need for enhanced reuse/recycling of residues including waste water and use of non-waste technologies. It recommends participation of stakeholders in the management of waste within their locality. It encourages better planning in both urban and rural areas and provision of basic needs such as water, drainage and waste disposal facilities.

This study was in conformance with this regulation. Emphasis was put of stakeholder participation, especially for institutions with a regulatory role over activities such as those that may be carried out by the proponent.

5.1.7 Physical Planning Act (Cap 286)

Section 24 of the Physical Planning Act gives provision for the development of local physical development plan for guiding and coordinating development of infrastructure facilities and services within the area of authority of County, municipal and town council and for specific control of the use and development of land. The plan shows the manner in which the land in the area may be used. Section 29 of the physical Planning Act gives the county power to prohibit and control the use of land, building, and subdivision of land, in the interest of proper and orderly development of its area. The same section also allows them to approve all development applications and grant development permissions as well as to ensure the proper execution and implications of approved physical development plans. On zoning, the act empowers them to formulate by-laws in respect of use and density of development.

Section 30 states that any person who carries out development within an area of a local authority without development permission shall be guilty of an offence and the development shall be invalid.

Section 36 states that if in connection with development application a local authority is of the opinion that, the proposed activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an Environmental Impact Assessment report. The environmental impact assessment report must be approved by the National Environmental Management Authority (NEMA) and followed by annual environmental audits as spelled out by EMCA 1999. Section 38 states that if the local authority finds out that the development activity is not complying to all laid down regulations, the local authority may serve an enforcement notice specifying the conditions of the development permissions alleged to have been contravened and compel the developer to restore the land to its original conditions.

The proposed project has been approved by the relevant planning authority implying that the development is in conformance with the zoning requirements set out by the Physical Planning Department of the Machakos County Government. Where the proponent had any concerns with regard to the compatibility of this development, relevant studies have been conducted and concluded. The bird hazard assessment and height restriction assessment reports are annexed to this report under Appendix IV and V.

5.1.8 Occupational Safety and Health Act No. 15 of 2007

This Act provides for safety, health and welfare of workers and all persons who are lawfully present at work places. Part VI provides for general health provisions while Part X provides for the general welfare of the workers with respect to supply of drinking water, washing facilities and first aid among other aspects. Section 53 of this Act requires that for workers employed in a facility involving exposure to any injurious or offensive substances, suitable protective clothing and appliances (gloves, footwear, goggles, and head coverage) shall be provided.

Workers at the terminal may be exposed to various risks including risk of tripping, getting knocked over, noise, inhaling dust and equipment exhausts. The proponent should provide necessary protective clothing and appliances during construction and operation of the facility.

5.1.9 Work Injury Benefit Act, 2007

This Act provides for compensation of employees on work related injuries and diseases contacted in the course of employment and for connected purposes. The act includes compulsory insurance for employees. The act defines an employee as any worker on contract of service with employer.

The proponent will need to register for workmen's compensation for his employees.

5.1.10 Water Act, 2002

Section 73 of the Act of the Act allows a person with licensee to supply water to make regulations for purposes of protecting against degradation of water sources. Section 75 and sub-section 1 allows the licensee to construct and maintain drains, sewers and other works for intercepting, treating or disposing of any foul water arising or flowing upon land for preventing pollution of water sources within his/her jurisdiction. Section 76 states that no person shall discharge any trade effluent from any trade premises into sewers of a licensee without the consent of the licensee upon application indicating the nature and composition of the effluent, maximum quantity anticipated, flow rate of the effluent and any other information deemed necessary. Under the Water Act 2002, Water Rules were developed to ensure sustainable and harmonized utilization of water resources throughout all sectors.

The proponent will be required to utilize the available water resources in a manner that does not conflict with the water needs of other users. In addition to the water supplied by the Mavoko Water and Sewerage Company Ltd, the proponent will have boreholes as a supplementary source.

5.1.11 Public Health Act (Cap. 242)

Section 115 of the Act states that, no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires County Governments to take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable for injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 as waste pipes, sewers, drains or refuse pits in such a state, situated or constructed as in the opinion of the medical officer of health to be offensive or injurious to health.

Other nuisances are accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbour rats or other vermin. On the responsibility of local authorities, Section 129 of the Act states in part "It shall be the duty of every local authority to take all lawful, necessary and reasonably 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…". Section 136 states that all collections of water, sewage, rubbish, refuse and other fluids which permits or facilitate the breeding or multiplication of pests shall be deemed nuisances and are liable to be dealt with in the manner provided by this Act.

The proponent shall conduct operations in manner that does not cause nuisance or jeopardize the health of the public.

5.1.12 Penal Code Act (Cap. 63)

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

5.2 Institutional Framework

5.2.1 National Environment Management Authority (NEMA)

NEMA is the supreme regulatory and advisory body on environmental management in Kenya. It is mandated by EMCA to assess EIA reports and EAs and issue licenses of compliance.

5.2.2 Machakos County Government

This is the principle agency in all matters pertaining to physical development and development control within Mavoko. The Machakos County Government is empowered by two key acts of parliament to carry out physical planning and development control within its area of jurisdiction. The County has by-laws that enable it to carry out daily operations. Besides the approvals of plans and developments of the proponent's development plans, the Machakos County Government will also be responsible for ensuring that the terminal is built in accordance with the approved designs.

5.2.3 Directorate of Physical Planning

This office was established by the Physical Planning Act Cap 286. This office shall be responsible for advising the County on the application for development permission for the proposed development facility.

5.2.4 County Environment Committees

According to EMCA, 1999 No. 8, the Minister by notice in the gazette appoints County Environment Committees of the Authority in respect of every former province and district respectively.

5.2.5 Public Complaints Committee

The Public Complaints Committee consists of: Chairman, a representative of the Attorney General, (AG), Law Society of Kenya (LSK), Non-governmental Organizations (NGOs), business community, and two members appointed by the Minister for their active role in environmental management. The Committee performs the following functions: Investigate any allegations or complaints against any person or against the authority in relation to the condition of the environment in Kenya and on its own motion, any suspected case of environmental degradation and to make a report of its findings together with its recommendations thereon to the Environmental Council.

5.2.6 Kenya Railway Corporation

The proponent intends to construct a standard gauge railway siding alongside the existing SGR for purposes of receiving and offloading cargo imports from the port of Mombasa. This development will definitely happen within the railway reserve. The Kenya Railway Corporation will execute their mandate of approving and managing developments within the railway reserve and ensuring it is done within the required standards.

5.2.7 Corporates and /or Business Persons

The Proposed GBHL Dry Bulk Handling Terminal projects are likely to attract key interest of parties with interests in the cement and agriculture business. Key among them is associations that serve the interest of:

- Traders;
- Cement factories; and
- Long distance truck drivers.

6. CONSULTATION AND PUBLIC PARTICIPATION

6.1 Overview

The need for public involvement in development projects is in the Constitution. This is further set out in EMCA 1999 (Amended 2015), and the Integrated Environmental (Impact and Audit) Regulations of 2018. Community consultation and participation ensures that project stakeholders are part and parcel of the proposed development and in so doing ensures the sustainable management of resources. Evidence shows that projects that are subjected to a consultative and public participation process acquire higher level of acceptance and accrue benefits to a wider section of the society.

6.2 Aim of the Stakeholder Consultations

The aim of the public consultation process was to:

- Share project information with stakeholders;
- Collect the views and concerns of the stakeholders regarding the project;
- Gather stakeholder perceptions on the positive and negative project impacts and how these can be enhanced or overcome, respectively; and
- Build stakeholder consensus of the project

6.3 Consultation Methodology

Questionnaires were prepared and administered to the public and to institutions identified during mapping of stakeholders. Stakeholder consultations were carried out between Thursday 6th September, 2018 and Friday 21st September, 2018. Sample copies of the filled questionnaires are annexed to this report under Appendix VI.

The study employed three main methods of consultations to get the data presented in this report. These are:

- Meetings and discussions with Key Stakeholders;
- Questionnaire administration and interviews;
- Convening of Public Consultation Meeting within the project area.

6.4 Public Consultation Meetings (PCMs)

The meetings were facilitated by the Chiefs and Assistant Chiefs of the area where the project was to be implemented.

The PCM Agenda

The Agenda of the PCM convened on Saturday June 8, 2019 was as follows:

1. Arrival of Guests/Participants
2. Opening prayer by one of the participants
3. Introduction of the participants
4. Purpose of conducting the ESIA and the Consultation Meeting.
5. Various project components, benefits and possible impacts/mitigation measures.
6. Comments/Questions on the Proposed Project by Participants (Q & A).
7. Filling of the ESIA Questionnaires/Feedback Forms.
8. Closing Prayer.

The attendance of the PCM was good and the community showed a lot of interest and support for the project.

Minutes of the discussions at the PCM were recorded and form part of this ESIA Project Report. During the PCM, the proposed project was elaborated to the participants through a presentation that was conducted in Kiswahili to ensure participants understood all the issues related to the project. An interactive questions and answers session took place during the PCM immediately after the presentation on the proposed project. Participants finally filled in feedback forms/questionnaires. The questionnaires have been included in **Appendix V** while Minutes of Public Consultation Meeting and attendance register are provided in **Appendix IV**.

Plate 5: The Local area chief addressing the PCM

Plate 6: Participants at the PCM

Plate 7: The Area Assistant County Commissioner addressing the PCM

Feedback from stakeholder interviews

6.5 Consulted Parties

The respondents were identified through simple random sampling technique. Some of those interviewed had prior knowledge of the proposed project, particularly those living in the vicinity of the proposed site. The public survey focused around economic, social, safety, health, environmental and welfare issues. Those interviewed were welcoming of the project since in their opinion, the project will create employment for skilled and unskilled labourers especially bearing in mind that the area relies heavily on casual employment from a number of factories and processing facilities in the area.

6.6 Summary of Responses

This section presents a brief compilation of the responses obtained from those interviewed.

6.6.1 Perceived Positive Impacts

Respondents acknowledged that the project will have some positive impacts which they enumerated as below:

- Respondents mentioned that the project will make transportation of the materials easier and deduce pressure on the road thus reduce accidents on Mombasa road
- Create more job opportunities to the local community
- More revenue to the national and the county government
- Land lords will benefit because there will be more people to rent houses
- Increased economic status of the town
- Transportation of farming materials such as fertilizer will be cheaper therefore reducing the prices in the market currently.

6.6.2 Perceived Negative Impacts

Majority of the people whose opinion was obtained during the ESIA consultations had no objection to the implementation of the project but agreed that the project has potential gains and costs. The negative impacts perceived by respondents have been highlighted in the subsequent section.

- The public cautioned that the drainage within the town is a challenge and implementation of the project may result into flooding of the downstream residents;
- Noise pollution during construction
- Air pollution because of the trucks coming in and out
- Loss of the existing Natural environment
- Increased traffic during and after construction
- Increased demand of water and electricity
- Injuries from bulk handling
- It may bring diseases to the residents like HIV/AIDS due to the long-distance drivers
- Transportation business investors will lose the business
- Population will increase due to available employment opportunities that overcrowding
- Insecurity is likely to increase because of the newcomers
- Livestock grazing land will decrease

The respondents urged the proponent to look into the following issues before commencing the project:

- Provision of Personal Protective Equipment before start of operation;

- Fencing of the working area i.e. under construction
- The developer should put in place proper mechanisms to ensure that the non-food items are properly handled so as not to cause pollution
- Ensure that proper control measures are put in place to control dust and noise pollution
- The local community should be given a priority for jobs when the project commences
- Site to have plenty of water to minimize dust
- Health education to the community around to reduce the spread of diseases like HIV/AIDS
- Have tight security to control crimes at the site and offer security to the community at large.

The table overleaf presents an analysis of some of the Key Stakeholder Questionnaires and PCM Feedback Forms. The Key Stakeholders and Feedback Forms filled in by PCM respondents are placed in **Appendix V.**

Table 3: Analysis of Stakeholder and PCM Participant's Feedback

Name	Tel no.	Representation	Impacts		Suggested mitigation measurers	Concerns/ Recommendations
			Positive	Negative		
Esther. M. Mutua	0726906537	Kanaani integrated primary school	Make transportation of the materials easier. Create more job opportunities More revenue to the government	Much noise during construction Air pollution because of the trucks coming in and out Vegetation cover is interfered with (after cleaning)	Check on speed limit of service vehicles and machinery Avoid hooting	Fencing of the working area i.e. under construction The company can give CSR e.g. building three classrooms to replace the iron sheet ones, improve condition of the road leading to the school
Johnstone Mutava	072259339	Department of Environment and Natural Resource, Machakos County Government	Revenue to the national and the county government Job availability Reducing pressure on the road traffic after the completion of the project	Loss of the existing Natural environment Increased traffic during and after construction Increased demand of water and electricity	The developer should put in place proper mechanisms to ensure that the non-food items are properly handled so as not to cause pollution	The developer should put in place proper mechanisms to ensure that the non-food items are properly handled so as not to cause pollution Ensure that proper control measures are put in place to control dust and noise pollution The local community should be given a priority for jobs when the project commences

Name	Tel no.	Representation	Impacts		Suggested mitigation measurers	Concerns/ Recommendations
			Positive	Negative		
Marietta Kyalo	0721605084	Kanaani Girls High School	Employment to the local community Land lords will benefit because there will be more people to rent houses	Our school is close to the site and are likely to have a lot of noise due to the machinery Dust from the construction site will affect the school because of its closeness Pollution of air	Put in place measures to reduce noise pollution Use of fuels that don't pollute air	The school is a day girl school so the facility should be fenced to ensure the girls don't stray to the site The school has acute shortage of water and my request to the developer is to sink us a borehole in order to grow trees and greenery in order to change the environment around the school
Zakayo Muihusi	0726903845	County Government of Machakos	Creation of new jobs from the project Materials will be brought near the factories thus reduce accidents on Mombasa road Reduced cost of fertilizer Reduced cost of factories using coal for power	Pollution of water sources if fertilizer is not handled properly Injuries from bulk handling Dust from coal will the community at large Noise pollution during offloading and on-loading materials Dust from un-tarmacked road to the depot (during dry climate it will emit a	Provide tarmacked road from the site Avoid spillage of the fertilizer to avoid water contamination	To have a fully drawn plan with sheds, toilets, offices and fence wall (PPE's) to be in place and fire extinguishers Site to have plenty of water to minimize dust Health education to the community around to reduce the spread of diseases like HIV/AIDS Have tight security to control crimes at the site and offer security to the community at large

Name	Tel no.	Representation	Impacts		Suggested mitigation measurers	Concerns/ Recommendations
			Positive	Negative		
			Increased economic status of the town	lot of dust because of the trucks coming in and out Spread of diseases e.g. HIV because of the drivers Increased crime rates because people may want to steal from the depot		
Bilha Wambui	0726118396	Machakos County Government	Transportation of farming materials will be cheaper therefore reducing the prices in the market currently Also creating of new job to the unemployed Kenyan	Transportation business investors will lose the business	As firefighters provide accessible road that in case of emergency, they shall be able to respond in accurate time Installation of the fire facility should be done at the same time train the fire fighters	To provide the fire office with the fire lay out Installation of the fire facility should be done at the same time train the fire fighters As fire fighters provide accessible road that in case of emergency, they shall respond in accurate time

Name	Tel no.	Representation	Impacts		Suggested mitigation measurers	Concerns/ Recommendations
			Positive	**Negative**		
			especially the ones around Athi River			
Kimathi Mwangwi	0721339764	Athi river	Businesses within Athi river will grow Employment opportunities will be created	Pollution Floods Insecurity	Employ good mechanism to deal with the dust materials that will pollute our environment Employ locals	That drainage system to meet standards That road connection to be concluded that no more accidents will be encouraged due to massive traffic Dialogue to be conducted across the concerned institutions and the government to ensure the smooth running of the project
Onesmus Mwathe	0713573230		Employment Products will be cheap because the cost of transport will be reduced This will bring development in the area Products will be easily available	Population will increase due to available employment opportunities that overcrowding Resources will be strained Insecurity is likely to increase because of the newcomers	Security should be beeped up Assessment should be done on the resources available to see whether They sustain the increased population Drainage should be rescheduled	Those working in the site should be provided with safety materials and training Caution should be taken to avoid accidents Drainage should be monitored to make sure it does not become a menace to the locals Measures should be put in place to ensure the locals benefit

Name	Tel no.	Representation	Impacts		Suggested mitigation measurers	Concerns/ Recommendations
			Positive	Negative		
Francisco Maweu	0729369105	Athi River	Employment to the people nearby Change of lifestyle for people Increased and improved economy to the county and the national government	Farming land will decrease Dust in the area Livestock grazing land will decrease Air pollution Noise pollution	Water sprinkling Improve machines should be used to minimize noise	Sprinkling water Security measures to the workers at the site Qualified and skilled persons in the job
Cosmas Musyoki	0721817273	Athi River	Creation of employment Business improvement Levies for the county Government	Increased Traffic Noise and Air pollution	Introduce Traffic marshals Put high perimeter walls to reduce noise and air pollution	Introduce traffic marshals Put high perimeter walls to reduce noise and air pollution All NEMA assessment report should be fully implemented

Name	Tel no.	Representation	Impacts		Suggested mitigation measurers	Concerns/ Recommendations
			Positive	Negative		
Cecilia M. Nzioka	0718102193	Athi River	Creation of job opportunities to the locals Growth of Athi River sub county Improvement of infrastructure within the sub county for easier transportation of materials It will help to bring raw materials for cement factories	Noise to the neighbors during construction It may bring diseases to the residents like HIV/AIDS to the long-distance drivers	Residents should be educated on safety measures in order to decrease accidents Residents should be given health talks The contracted contractors should use the machines that are less noisy	The contractors should give the locals priority when it comes to job opportunities Residents should be educated on safety measures and health talks through the barazas before the project commences
Mildred Mukoya	0700270877	Athi river	Creation of job opportunities	Noise pollution	Inform the locals before the project begins	Take insurance covers for the people who will be working in the project to cater for the accident patients Workers should have protective gears during working hours to minize on accidents Locals should be given job opportunities

Name	Tel no.	Representation	Impacts		Suggested mitigation measurers	Concerns/ Recommendations
			Positive	Negative		
						There should be rules governing the workers at the site
Catherine	0710560105	Athi River	More casual workers around Athi river will get job opportunities	Drainage from grain bulk handlers ltd should be observed	Before the start of the project they should know where to drain their waste products	Give the youth the job opportunities Communicate to the locals before the star of the project
Patrick Mate	0722956434	Athi River	Employment opportunities to the locals	- Poor drainage		-K.M.C road to be properly constructed so to be used as a feeder road to the terminal Ensure good drainage systems Opportunities to be given to the locals first
Rehema Noel	0728765364		Growth of the economy Realization/creation of jobs for the locals	Environmental pollution	Consistent spraying of water on the road	Try and find an alternative way out for the water ways Consistent spraying of water on the road
Thomas Xuma	0706469156		Creation of job opportunities	There will a lot of dust that will affect people There will be a lot of traffic		

Name	Tel no.	Representation	Impacts		Suggested mitigation measurers	Concerns/ Recommendations
			Positive	Negative		
Bonface Mutuku	0734089273	AKM	Improved living standards because of jobs will be available hence development of individuals	Air pollution due to the dust Lack of proper drainage will affect the society	Direct the drainage system to possible other area apart from the drainage that are flooding the area	Air pollution should be checked Water drainage taken to consideration Dumping areas for the excavation The local youth should be given the job opportunities
Kilonzo Kimote	0708792191	Athi River	Creation of job opportunities	-It will lead to poor drainage thus the locals will be affected by it		
Bonface Munithya	0721689344		The locals will get jobs	A lot of dust from the project Huge traffic on the road	-Control the traffic on the road	-Control traffic on the road
Samson K. Mwilu	0722956441		Job creation Availability of raw materials to factories that are near	Air pollution Water pollution Noise pollution Traffic on roads during the project	Try to control the traffic on roads to avoid time wastage Minimize on the pollution	Minimize the noise, water and air pollution to the locals Consult with the necessary authorities before the start of the project Follow all the suggestions given by the locals

Name	Tel no.	Representation	Impacts		Suggested mitigation measurers	Concerns/ Recommendations
			Positive	Negative		
						Give priority to the locals in terms of job opportunities

7. IMPACT ANALYSIS AND PROPOSED MITIGATION MEASURES

7.1 Introduction

This section outlines the potential negative and positive impacts associated with the construction of the dry bulk handling facility. The impacts are related to activities carried out during construction, operation, maintenance, commissioning and decommissioning phases of the projects.

7.2 Categorization of Impacts

The possible impacts can be categorized in various ways depending on the following factors:

- Type of impact: whether positive or negative;
- Significance: whether low, intermediate or high;
- Intensity: whether low, intermediate or high;
- Magnitude: whether localized or widespread;
- Its effects: whether direct, indirect or cumulative;
- Duration: whether permanent, or temporary; short term or long term; and
- Reversibility: reversible or irreversible

7.3 Analysis of Project Impacts

The table below illustrates the category of potential environmental and social impacts. A positive sign "+" denotes a positive impact and a negative sign "-" denotes a negative impact. The types of impacts to be considered include primary impacts, secondary impacts (those occurring away from the primary source) and cumulative impacts. The results of the analysis indicate that most of the impacts from the project will be site-specific, negative, temporary, and direct, of low intensity, reversible and of moderate significance.

Table 4: Impact Classification Matrix

KEY:					
Type of Impact	**Symbol**	**Significance of Impact**	**Symbol**	**Effect of Impact**	**Symbol**
Major negative impact	(- -)	Slightly significant	SS	Direct impact	DI
Minor negative impact	(-)	Moderately significant	MS	Indirect impact	II
Major positive impact	(++)	Highly significant	HS	Cumulative impact	CI
Minor positive impact	(+)	Insignificant	IN		
Neither positive nor negative	X				

Table 5: Impact Scoring Matrix

Environmental and Safety Aspects					
Aspect	**Anticipated Impact**	**Project Phase**	**Nature of Impact**	**Significance of Impact**	**Effect of Impact**
Landscape	- Altered landscape	Site preparation and construction	(-)	MS	DI
	- Interference with soil structure	Site preparation and construction	(--)	HS	CI
Waste Management	- Solid and liquid waste generation	Construction and operation	(--)	HS	DI
Energy Consumption	- Increased demand for energy	Operation phase	(-)	SS	DI
Soils	- Susceptibility to erosion due to loosening of soils during construction	Site preparation and construction	(-)	MS	DI
	- Soil contamination by fuel spills from vehicles and generators	Construction and operation	(--)	HS	DI
Noise and Vibrations	- Noise and vibrations from vehicles and machinery	Construction	(--)	HS	DI
Air Pollution	- Generation of dust during construction - Gaseous emissions from diesel powered machinery and vehicle exhausts	Site preparation, construction and operation	(--)	HS	DI
Visual Impact	Change in the appearance of the area	Construction and operation	(x)	IN	II
Public Health	Air and noise pollution may compromise public health	Construction	(--)	HS	DI

Flora and Fauna	Interference with biodiversity	Pre-construction and Construction	(-)	SS	DI
Safety Concerns	Increased risk for occupational incidents and accidents	Construction and operation	(--)	HS	DI
Socio-Economic Aspects					
HIV/AIDs and STIs	Risk of contracting STD's by project workers and neighbouring community	Construction and operation	(--)	HS	CI
Access and transportation	Improved access to raw materials	Operation	(+)	HS	CI
	Convenience in movement of clinker and fertilizer	Operation	(++)	HS	CI
Economic growth	For the country through revenue collection	Construction and operation	(++)	HS	DI
	Promotion of investment in cement factories and farming	Operation	(++)	HS	CI
Food security	Enhanced food security due to enhanced and faster distribution of fertilizer	Operation	(++)	HS	CI
Employment Creation	Employment creation for skilled and unskilled workers	Construction and operation	(++)	HS	DI
	Skills transfer	Construction and operation	(+)	HS	CI
Influx of people in the area	Inter-cultural exchanges	Construction and operation	X	SS	II

7.4 Analysis of Project Impacts

7.4.1 Potential Positive Impacts

7.4.1.1 Creation of Employment Opportunities

The construction and operational phases of the Proposed GBHL Dry Bulk Handling Terminal project will create employment opportunities for skilled and unskilled labourers, as well as technical personnel.

The construction phase is expected to extend over a period of time and to create temporary employment opportunities. The work associated with the construction phase will be undertaken by contractors. In terms of skills levels, the majority of the construction phase jobs will be available to medium skilled and high skilled personnel, with the remainder being available to lower skilled personnel. The high number of required skilled personnel is due to the technical nature of the project. It is therefore reasonable to assume that the potential employment opportunities for local community members from Athi River Town and the Mavoko Sub-county region will be enhanced.

Operation phase will provide additional employment opportunities with direct and indirect job opportunities. This is linked to increased expenditure by GBHL in the local area and region on items such as transport and handling services, engineering services and supplies, etc. A key beneficiary during the operation phase will be the transport sector. The non-food products are imported to Kenya via the Port of Mombasa. From here it is transported either the standard gauge rail to Athi River station in Mavoko for handling on behalf of importers.

The proponent's terminal in Mombasa hires an average of 750 casuals on a daily basis and 175 permanent skilled staff. Even though the proposed project may not match these numbers, the opportunities created will be substantial.

7.4.1.2 Revenue Generation

The proponent will have the obligation of remitting money to ex-chequer from earnings of workers hired in the project. The project being a capital intensive investment is likely to yield high returns for the proponent. Part of these proceeds will be remitted to the national government as taxes hence contributing to the nation's revenue.

7.4.1.3 Contribution to the general development of the project area

The proposed construction of a New dry bulk handling terminal is supported by Vision 2030 which aims to transform Kenya into a newly industrializing, "middle-income country providing a high-quality life to all its citizens by the year 2030". The dry bulk handling terminal will give the project area a facelift by improving the infrastructure in the area.

Representatives from the Mavoko Sub County, Education institutions, Mavoko Local leadership, all indicated that the investment in the dry bulk handling terminal in Mavoko will have a significant positive impact on the town and the region. The investment will also provide the catalyst for the local cement industry to produce more and will significantly affect the price of fertilizers downwards thus spurring an enhanced agricultural activity that will greatly boost the Kenyan economy.

7.4.1.4 Creation of income generation opportunities

The construction phase of the project will present business opportunities for those who will be employed directly by the project. Others who may directly generate income from the project are parties contracted by GBHL to supply various goods and services. For example, the proponent will procure the services of a Contractor for the construction works. The expenditure during the construction phase will create business opportunities for the regional and local economy. The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. The potential opportunities for the local service sector would be largely linked to accommodation, catering, cleaning, transport and security, etc. In terms of accommodation, the construction workers from outside the area will need to be accommodated in Mavoko, which will benefit the local hospitality sector. The local hospitality industry will also benefit from the accommodation and meals for professionals (engineers, quantity surveyors, project managers, product representatives, etc.) and other personnel involved in the project. Experience from other construction projects indicates that the potential opportunities are not limited to onsite construction workers, but also to consultants and product representatives associated with the project.

7.4.1.5 Technology and Skills Transfer

The project will expose workers to sophisticated technology and they will have an opportunity to operate the machinery. Further, local workers will interact with the technical team from Grain Bulk Handlers and acquire a variety of skills which they can apply working for the project and even when they move to different employment. This will put them at a great advantage when seeking job opportunities for advancement.

7.4.1.6 Reduced cost of doing business

This project will rely solely on the standard gauge railway to collect the raw materials and fertilizer from GBHL terminal at the Port of Mombasa and deliver to the proposed GBHL handling facility at the Athi-river station.

Currently, the costs of transport for imported and exported goods in East Africa accounts for 40% of total cargo charges. With the new standard gauge railway line, transport costs have dropped significantly owing to economies of scale since a single train has the capacity to haul 216 20-foot containers in a single trip, which would otherwise require the engagement of 108 trucks.

Besides, travel time has reduced while accidents and cargo pilferage common in road transport has been eliminated all which translate to lower cost of doing business.

7.4.1.7 Reduction of road maintenance cost

The heavy weight of trucks has been a major contributor to the wear and tear of roads across the country especially considering that 95% of all cargo moves by road. This means roads are in constant need of maintenance at exorbitant costs. With the proposed dry bulk handling terminal in Athi-river, freight haul trucks carrying inputs for the cement industry will be phased out of the roads thus enhancing their longevity. Concisely, effects of this project on the economy after development are numerous and a gleaming symbol of progress towards achievement of vision 2030 goals.

7.4.2 Measures to Enhance the Positive Impacts

To ensure optimization of positive impacts, a programmatic approach that includes, but is not limited to the following will be required:

- Give priority to the local population during recruitment of laborers;
- Engage local communities in project activities such as periodic maintenance of infrastructure to instill a sense of ownership of the project and a need to safeguard the project from adverse interests;
- Sensitize the local communities on the operations of the project for transparency;
- Procure locally available construction materials from locals;
  - Employ pro-active planning to avert potential adverse impacts that have been identified by the EIA Study; and
  - Regional planning and development to take into account the dry bulk handling facility as a key economic driver in Machakos County.

7.4.3 Potential Negative Impacts

7.4.3.1 Alteration of Site Habitat

Construction of the Proposed GBHL Dry Bulk Handling Terminal and its components such as the railway siding and the shed complex will involve soil excavations, clearance of terrestrial vegetation (mostly grasses and scattered trees and shrubs), influx of machinery, construction material, personnel and frequent drives to and from the site will negatively impact on the natural habitat.

Some of the plant life that may be affected could be unique to a particular area. Regeneration of the destroyed species may be perturbed by compaction, leveling and landscaping of project areas. This will result in an irreversible destruction of the natural habitat in the particular area. When considered on its own, this impact may appear insignificant but the cumulative impact can cause have secondary environmental impacts.

Mitigation Measures

- Limit site clearance to areas required for construction works;
- Identify plants populating an area for replanting during landscaping;
- On completion of works, restore sites to their initial status if not better, to encourage regeneration of vegetation cover;
- Create a landscape schedule to be implemented for planting trees, grass cover on the road side and material sites to substitute for lost vegetation; and
- Compact and stabilize the soils to allow for plant growth.

7.4.3.2 Noise and Vibration Pollution

Construction activities such as earth excavation, piling, movement and hooting by project vehicles, operation of machinery and equipment including, mixers, generators, bulldozers, shovels and excavators are likely to emit noise and ground vibrations. The noise and vibrations will disrupt quiet particularly during construction. Noise and vibrations from earth moving equipment can particularly cause nuisance to workers in the neighboring institutions. The Proponent's Contractor will therefore have to exercise caution.

The parameter for assessing ground vibrations is the peak particle velocity (ppv) expressed in millimetres per second (mm/s) which is considered to be the best descriptor for assessing human comfort and the potential damage response of structures. Vibration can cause varying degrees of damage parameter normally used to assess the ground vibration to buildings and affect vibration-sensitive machinery or equipment. Its effect on people may be to cause disturbance or annoyance or, at higher levels, to affect a person's ability to work.

Table 6: Typical levels of vibration sources during construction phase

Construction Activity	Typical Ground Vibration Level
Vibratory roller	Up to 1.5mms @ 25m
Hydraulic rock breakers	4.5 mm/s @ 5m, 0.4 @ 20m, 0.1 @ 50m
Compactor	20mm/s @ 5m, <0.3mm/s @30m
Pile driving technique	1-3mm/s @ 50m depending on soil conditions and piling
Bulldozer	1-2mm/s @ 5m, 0.1 @ 50m
Truck traffic	(smooth surface) <0.2mm/s @ 20m
Truck traffic	(rough surface) <2mm/s @ 20m

Mitigation Measures

- Restrict construction hours to daytime only (between 8.00 am to 5.00 pm);
- Regularly service machinery and equipment according to the operational manual to ensure they are in the best working condition and emitting less noise;
- Ensuring machinery and equipment used in the project are fitted with noise reduction devices such as silencers and mufflers on exhaust systems;
- Warning project drivers against unnecessary hooting; and
- Providing workers operating in noisy work areas with ear muffles.

7.4.3.3 Water Pollution

Water resources in the project vicinity may be polluted by accidental fuel/oil spills emanating from project vehicles or diesel-powered machinery such as generators. Pollution is more likely to occur during operation when fuel for vehicles and generators is offloaded on site. This impact may be highly significant depending on the amount of spillage. Spillage of materials containing hydrocarbons can have residual and cumulative effect in soil and water for years.

Mitigation Measures

- Oil reservoirs should be inspected regularly for possible leaks and repaired or replaced;
- Develop and implement spill control procedures which entail cleaning up spills immediately they occur; and
- Fuel containers should be handled and stored ideally on concrete surface or on a place underlain with water proof sheet.

7.4.3.4 Soil Erosion

The terminal construction will have direct impacts on the soils on which the facilities will be erected. Construction activities will entail removal of overburden, deep excavation and dumping of excavated soils that will lead to increased susceptibility to soil erosion. Areas subjected to such construction activities may permanently lose their initial soil structure. Effects on soils will be direct, short-term and moderate, if only the areas necessary for construction to occur are cleared of vegetation and if soils are appropriately compacted and stabilized.

Mitigation Measures

- As far as possible avoid excavating during wet seasons since this will increase susceptibility to soil erosion;
- Excavated materials and excess earth should be kept at appropriate sites away from strong winds and exposure to rain water;
- Works in areas susceptible to erosion should not be prolonged unnecessarily;
- Adhere to specified cut and fill gradients and consider planting bare soils with grass cover; and
- Areas affected by construction related activities and are susceptible to erosion should be monitored regularly.

7.4.3.5 Increased Waste generation

The highest volume of solid and liquid waste will be generated during the construction phase due to activities such as site clearance, digging of foundations and procurement and unpacking of construction material etc. Waste that may be generated includes debris, food waste for site workers sites, timber, stones, rock, metals, paper, plastics, used oil etc. There is potential for nuisance as a result of improper disposal of liquid and solid waste from construction activities and construction camps. If not well managed, solid and liquid waste can have detrimental effects on the environment and on human health such as transmitting diseases like cholera, dysentery and typhoid.

Mitigation Measures

- Have an integrated waste management plan;
- Provide an adequate number of waste receptacles at strategic points ;
- The final disposal of project wastes should be done by NEMA licensed waste handlers at an approved disposal facility;
- Wherever possible, materials used or generated by construction should be recycled;
- Provide for responsible management of any hazardous waste generated according to NEMA regulations on waste management;
- Provide an adequate number of sanitary facilities to workers and visitors to the site;
- Minimize waste generated by adopting cleaner production methods such as source reduction, recycling, reuse, combustion and sanitary land filling; and
- Containers or package for storing waste such used oil to be securely bundled and labeled as provided for by Regulation 18 under the Environmental Management and Coordination (Waste Management) Regulations, 2006.

7.4.3.6 Air Pollution

The causes of air pollution during the construction and operation of the project is dust and gaseous emissions from vehicles and diesel powered machinery. Dust is likely to originate from excavation works and vehicular movement that will unsettle dust. The proponent intends to utilize technology with in-built dust collectors to extract dust from the product received at the terminal. Dumping and loading of stockpiles on trucks is also likely to generate fugitive dust in form of fine to large dust particles. Dust and fumes will have significant, direct but short-term impacts during the project construction phase.

The effects of gaseous emissions from project vehicles and machinery during operation may however be termed as significant, long-term with cumulative effects. The air pollution levels in areas adjacent to the site shall be quickly diluted due to the area being relatively open, without impediment to air circulation.

Mitigation Measures

- Employ dust suppression techniques such as watering of haulage routes;
- Provide construction workers with protective equipment such as dust masks to prevent them from inhaling dust;
- Carry out construction in the shortest time to minimize prolonged effects of dust exposure;
- Regularly service and maintain vehicles and construction machinery in accordance with the owner's manual to minimize foul gaseous emissions;
- Sprinkle stock piles with water and keep them covered in dry weather;
- Prohibit unnecessary idling of motorized equipment;
- Use clean and low sulphur fuels for vehicles and machinery; and
- Bulk-soil transporting trucks should be covered to avoid spills and wind-blown dust.

7.4.3.7 Increase in Road Accident Risk

Increased traffic during construction and poor road safety measures like absence of signage asking pedestrian to look out may result in avoidable accidents. The proposed project will have a conveying belt running across the access road from the SGR siding to the project site.

Mitigation Measures

- Sensitization of motorists on traffic rules and safe driving will be crucial measure in curbing road accidents; and
- Factor non-motorized traffic in the design by providing signage and speed bumps at designated areas.

7.4.3.8 Increased Incidence of HIV/AIDs and STIs

One of the health risks associated with construction projects is the spread of HIV/AIDS due to the social interactions between different groups of people including project workers, neighbors' communities and immigrants in search of socio-economic opportunities. The major drivers of HIV/AIDS in the country include engaging in unprotected sex, ignorance on safe sex practices, unwillingness to use condoms, ignorance on HIV status, high levels of peer pressure and family breakdowns. Accompanying HIV/AIDS is prevalence of other sexually transmitted diseases whose infection rate mirrors that of HIV/AIDS.

The mobilization of a large workforce over a period of time is likely to increase sexual activities in the area and the presence of the workforce may even bring in a number of commercial sex

workers. From the survey done for this EIA Study, a large number of the population in the project environs is under the age of 50 and being an active age group, the impacts of new relationships are highly likely. HIV/AIDS poses a big threat to national development because of increasing dependency ratio with an increasing number of orphans and street children. These could reverse progressive gains made in poverty reduction. The youth (15-49 years) are the hardest hit and this is a threat to the labor force within the County. In the event that some workers will be recruited from other parts of the country where HIV prevalence is comparatively high, then there is the possibility of an increase in new HIV-AIDS infections in the project area. Prevention of the transmission of HIV-AIDS, therefore, represents the single most important public health issue associated with the project.

Mitigation Measures

- Run an HIV/AIDS sensitization campaign targeted at project workers and local communities;
- Issue free condoms at the work place using dispensers that are placed in a safe private site; and
- The proponent should consider facilitating HIV testing, counseling and prevention services for the project workers.

7.4.3.9 Damage to Underground Utility Cables and Water Pipes

The construction activities on the site is likely to interfere with the public utilities that pass through the piece of land casing point the underground KPLC Power cables serving the SGR and the MAVWASCO 10" main water distribution line. These utilities need to be protected to avoid damages and safety risks.

Mitigation Measures

- Incorporate the utilities providers during the project design to see the best option of securing the utilities from damages and accidents;
- The contractor should designate qualified personnel during the construction near the utility way leave; and
- The public should be prohibited from entering construction sites to avoid unwarranted accidents.

7.4.3.10 Health and Safety Risks

The construction and operation activities are likely to expose laborers and the general public to hazards. Owing to the intensive engineering and construction activities associated with the project, like operating heavy and dangerous machinery, concrete works, steel erection, metal cutting, hoisting of construction materials and welding among others, construction workers will be exposed to a range of risks and hazards. Injuries can result from cuts from sharp edges of metal sheets accidental falls from high elevations, injuries from hand held tools and construction equipment/machinery, and being run over by construction vehicles among other possible dangerous occurrences.

An increased incidence of water borne diseases such as cholera and diarrhea may arise when appropriate sanitation practices at the site are not observed. Respiratory tract infections and air-borne diseases may come about if there is exposure to dust, contaminated surfaces and close interaction with infected persons. Health and Safety risks can have long-term significant effect on the wellbeing of workers and local communities.

Mitigation Measures

- Provide project workers with safety gear to use in work situations that expose them to hazards such as dust, noise, heat, heights, glaring light, noxious smells etc.;
- The proponent should put up a staffed and well equipped first aid station for attending to minor accidents and ailments;
- Carry out an annual statutory occupational health and safety covering all work premises and sites as required by law;
- A Health and Safety committee with representatives from workers and employers should be constituted as required by law;
- The contractor should designate a qualified safety officer to oversee and coordinate health and safety aspects;
- All workers and visitors to the site to be provided with full protective gear;
- The public should be prohibited from entering construction sites to avoid unwarranted accidents; and
- Offer a safety induction to all site visitors to inform them on the risk in the site and safety measures to take.

8. OCCUPATIONAL HEALTH AND SAFETY (OHS) MANAGEMENT

8.1 Overview

Occupational Health and Safety is a broad and holistic practice of protecting the workers, the workplace, the tools / equipment and the biotic environment. It is an essential tool in determining the ESIA study. The objective of incorporating OHS Management during construction and the operation phases of the proposed project is to:

- Prevent avoidable incidents and accidents;
- Ensure prompt and appropriate response to unavoidable incidents or accidents;
- Provide a safe and healthy working environment so as to enhance maximum output;
- Control loss of working time and damages to machinery, equipment, materials and other items; and
- Enhance environmental sustainability by developing sound health and safety practices measures.

8.2 OHS Guiding Principles

The project will be guided by the following principles:

- It will be a project consciously committed to the promotion and maintenance of high standards of health and safety for its employees, the neighboring institutions and the public at large;
- Ensuring that Health and Safety activities are implemented to protect workers and public;
- The management shall demonstrate commitment and exercise constant vigilance in order to provide employees, neighbors of the project and the environment, with the greatest health and safety safeguards; and
- Employees will be expected to take personal responsibility for their safety, that of their colleagues and of the general public as relates to H&S management procedures.

8.3 Health and Safety Management

The following strategies will help to achieve the above objectives:

- Maintaining an effective reporting procedure for all incidents/accidents;
- Providing appropriate tools and personal protective devices to site workers; and
- Encouraging, motivating and rewarding employees who take personal initiatives and commitment on OHS.

8.4 Requirements in the Project during Construction Period

8.4.1 Registration of Construction Site

The Proponent shall carry out his operations in accordance with the requirements of the Occupational Safety and Health Act 2007. The proponent will be required to register the site as a work place with the Directorate of Occupational Health and Safety Services (DOSHS).

8.4.2 Give Notice Engineering Construction

The 'Building Operations and Works of Engineering Construction Rules of 1984 Rule No. 6 (1) states that:

'A main contractor shall, within seven days of commencing or undertaking building operations or works of engineering construction, notify the Chief Inspector in writing of:

- The occupiers name and postal address;
- The address or location of the site of the operations or works;
- The date of commencement;
- The expected date of completion;
- Whether mechanical power is used or not; and
- The number of persons expected to be employed.

8.4.3 Appointment of a Safety Supervisor

The Building Operations and Works of Engineering Construction Rules of 1984 Rule No. 7 (1) states: 'Every contractor who employs more than twenty persons shall, for every site on which he is the contractor appoint one or more persons experienced in the operations or works carried out at the site and suitably qualified for the purposes to:

Advise the proponent as to the observance of the safety, health and welfare requirements under the Act and under these Rules; and Supervise and ensure the observance of those requirements and promote the safe conduct of work generally at the sites.'

8.4.4 Lifting

Rule No 53 of the Building and works of engineering construction rules, 1984 on lifting of excessive weights states that: ' A person shall not be employed to lift, carry or move a load so heavy as to be likely to cause injury to him'. This should be observed.

8.4.5 Provision of Lighting at Work

During construction, effective steps shall be taken to provide lighting for the works to be carried out safely .The Occupational safety and Health Act, 2007 section 50 (1) states; 'An occupier shall ensure that effective provision is made for securing and maintaining sufficient and suitable lighting, whether natural or artificial, in every part of his workplace in which persons are working or passing'.

Rule No 47 of Building and Works of Engineering Construction, Rules, 1984 on lighting of workplaces states that; 'There shall be adequate and suitable lighting in:

a) every working place and approach thereto;
b) every work place where here is lowering and raising operations with the use of lifting appliances are in progress; and
c) All openings dangerous to persons employed'.

8.4.6 Sanitary Conveniences

The proponent is responsible for providing sanitary conveniences for his workers and visitors. Section 52 (1) of the Occupational Safety and Health Act, 2007 states that: 'Sufficient and suitable sanitary conveniences for the persons employed in the workplace shall be provided,

maintained and kept clean, and effective provision shall be made for lighting the conveniences; and, where persons of both sexes are or are intended to be employed (except in the case of workplaces where the only persons employed are members of the same family dwelling there), such conveniences shall afford proper separate accommodation for persons of each sex'.

8.4.7 Supply of Drinking Water

Workers and site visitors should be able to have access to safe and clean drinking water. Section 91 of OSHA, 2007 states: 'Every occupier shall provide and maintain an adequate supply of wholesome drinking water at suitable points conveniently accessible to all persons employed'.

8.4.8 Dust and Exhaust Fumes

Rule Number 20 of the Building and Works of Engineering Construction Rules, 1984 states that;

'In any building operation or works of engineering construction where dust or fumes is likely to be injurious to the health of persons employed are given off, all reasonably practicable measures be taken to prevent the inhalation of the dust or fumes by the persons employed by ensuring adequate ventilation or providing suitable respirators at the place where the operation or work is carried on'.

8.4.9 Excavations

Precautions shall be made to prevent persons falling into excavated areas during construction. Rule No. 8 (1) of Building and Works of Engineering Construction Rules, 1984 deals with prevention of danger in excavations. It states that 'The walls and roofs of any excavation, shaft, earthwork or tunnel, deeper than 1.2 metres shall be reinforced with timber of suitable quality or with other suitable material to prevent, so far as is reasonably practicable danger or injury resulting from a fall or dislodgement of earth, rock or other matter from the walls or roof, to any person employed or making the inspection or examination under rule 9'.

Rule No. 13 further states that: 'An occupier shall ensure that any excavation, shaft, pit or opening in the ground more than two metres in depth shall be securely covered, fenced or otherwise provided with a suitable barrier when access by workmen, plant and equipment or material to it or from it is not necessary'.

8.4.10 Fire prevention

In the execution of works the proponent will adhere to 'The Factories and Other Places of Work (Fire Risk Reduction) Rules of 2007 (Legal Notice No. 59 of 2007) OSHA, 2007.

Section 78**,** (1) states that: 'All stocks of highly inflammable substances shall be kept either in a fire-resisting store or in a safe place outside any occupied building: Provided that no such store shall be so situated as to endanger the means of escape from the workplace or from any part thereof in the event of a fire occurring in the store'.

Section 81 (1) 'In every workplace or workroom there shall be:(a) Provided and maintained, and conspicuously displayed and free from any obstruction so as to be readily accessible, means for extinguishing fire, which shall be adequate and suitable having regard to the circumstances of each case; and Present, persons trained in the correct use of such means of extinguishing fire

during all working hours. Every workplace shall be provided with adequate means of escape, in case of fire, for the persons employed therein, having regard to the circumstances of each case.

All the means of escape referred to in subsection (2) shall be properly maintained and kept free from obstruction'.

8.4.11 Hygiene

Section 92 of OSHA, 2007 on washing facilities states that: Every occupier shall provide and maintain for the use of persons employed, adequate and suitable facilities for washing, which shall be conveniently accessible and shall be kept in a clean and orderly condition. The Contractor will be required to ensure and maintain cleanliness on his part, employees and site visitors'.

8.5 Emergency Response Procedures

The Proponent will develop an Emergency Response Plan that outlines the potential risks/ hazards in the project and how to eliminate, prevent or respond to injury, incidents and accidents. The Plan will include an illustration of incident/accident reporting structure as well as show the responsibilities assigned to various personnel. In addition, the Plan should indicate the emergency contacts such as those of the police, hospital/ ambulance, fire brigade and the Health and Safety Officer.

In addition to the measures laid out in the Emergency Response Plan, the workers shall:

- Alert other persons exposed to danger;
- Inform the Health and Safety Officer;
- Do a quick assessment on the nature of emergency; and
- Employees who have been trained and skilled in first aid administration skills will assist the Health and Safety coordinator in situations where first aid will be necessary.

9. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

9.1 Scope and Objectives of the Proposed ESMP

9.1.1 Scope

The Proposed ESMP identifies the potential impacts of the proposed project on the environment and proposes how to mitigate the adverse impacts. The mitigation measures have been devised in line with various legal and regulatory requirements that are relevant to the project. This ESMP is a dynamic document that can be updated with changing project conditions.

9.1.2 Objectives of the Proposed ESMP

The objectives are to:

- Enable detection of changes in environmental conditions by highlighting anticipated impacts;
- Prescribe preventive measures that the proponent should institutionalize to mitigate adverse environmental and social impacts;
- Respond to adverse changes during construction and operation of the project through monitoring and control programmes in consultation with NEMA;
- Ensure that corrective actions are implemented appropriately and in a timely manner;
- Bring the project into compliance with applicable legal environmental policies and procedures, more so EMCA, 2015;
- Outline the mitigating and monitoring measures required to enhance the positive project impacts;
- Prescribe procedures that cause minimum environmental degradation, especially implementation of best environmental practice in the sector;
- Spell out practices to ensure all personnel engaged in the works comply with the prescriptions of the ESMP;
- Ensure that no change is made to the ESMP without the prior written permission of GBHL, or its nominated representative(s);
- To ensure environmental mainstreaming during the implementation of the project;
- To enable for a systematic and proactive approach to addressing environmental and social issues during the project's implementation;
- Ensure compliance with, among others: NEMA regulations, County By-laws; and
- Provide guidelines for record keeping on site.

This ESMP framework constitutes attendant sub-plans that will be responsive to the prevailing environmental and social circumstances at the time of construction. The ESMP will therefore remain an active document that can be continuously upgraded.

9.2 Implementation and Monitoring of the ESMP

In executing its responsibilities of receiving and storing dry bulk in Kenya, GBHL remains committed to environmental management. The proponent and any sub contactors are bound to comply with legal and regulatory environmental requirements of Kenya.

This ESMP implementation covers pre-construction, project construction, operation and decommissioning. Even though other parties may be brought on board to attend to various project aspects, the oversight and responsibility for implementation of this ESMP in accordance with best industry practices as well as workplace health, safety and environmental (HSE) standards still remains with the proponent.

The proponent will allocate adequate budget and a proper implementation schedule for all mitigation measures specified in the ESMP. In addition, the specific roles and responsibilities will be assigned to project personnel, such as safety and health management roles.

9.3 Implementation of Corrective Action(s)

There are several mechanisms for implementing corrective action, both during the construction and operational phases. The main mechanisms to address non-conformances include verbal instruction (in the event of minor deviation from established procedure, usually following a site inspection); written instruction (identifying sources of problems, usually following an audit) and issuance of contract notice (following possible breach of contract).

9.4 Environmental and Social Management Plan Matrix

This matrix presents the proposed measures comprising individual sub-plans to address specific environmental and social concerns. The information provided in this chapter and summarized in the matrix constitutes the ESMP. The implementation of this ESMP should be carried out within the provisions of the law and for the ultimate benefit of all project stakeholders. The effectiveness of this ESMP shall be monitored and assessed during periodic checks, inspections and at the end of the Project when an overall audit shall be carried out.

Table 7: Environmental and Social Management Plan Matrix

Aspect	Anticipated Impact	Management and Mitigation/enhancement measures	Responsibility	Monitoring Timeframe	Mitigation Costs
Environmental and Safety Aspects					
Air Quality	Dust generation	- Watering of all construction sites with appreciable dust should be mandatory; - Stockpiles of fine materials e.g. sand, cement and ballast should be wetted or covered with tarpaulin during windy conditions; and - Workers in dusty areas on the site should be issued with appropriate PPE, according to their nature of work and working area.	Proponent	Construction	2,500,000
	Gaseous emission	- Use of well serviced machinery to reduce exhaust smoke levels; - Limiting idling time of vehicles and equipment, and encourage workers to switch off vehicle engines whenever possible is important; and - Regularly inspect and service company vehicles. Un-roadworthy vehicles should not be allowed on the road.	Proponent	Construction and Operation	3,000,000 Best environmental practice
Liquid Waste Management	Increased liquid waste generation	- Ensuring there is no grey water runoff or uncontrolled discharges from the site/working areas; - Water containing pollutants such as cement, concrete, lime, chemicals and fuels shall be discharged into a temporary containment tank for removal from site; - Prevent runoff loaded with sediment and other suspended materials from the site/working areas; - Potential pollutants of any kind and in any form shall be kept, stored and used in such a manner that any escape can be contained and the water table not endangered; and - Wash areas shall be placed and constructed in such a manner so as to ensure that the surrounding areas (including groundwater) are not polluted.	Proponent	Construction and operation	3,000,000

Aspect	Anticipated Impact	Management and Mitigation/enhancement measures	Responsibility	Monitoring Timeframe	Mitigation Costs
Solid Waste Management	Increased solid waste generation	- Contract a licensed garbage collecting company to manage waste; - Properly labelled and strategically place waste disposal containers within the sites; and - Construction waste should be properly collected, stored, recycled or reused to ensure that materials that would otherwise be disposed of as waste are diverted for productive uses.	Proponent	Construction and Operation	3,000,000 Best Environmental Practice
Noise, Vibration Disturbances	Increased noise and vibration levels	- As a general rule, workers operating equipment that generate noise should be equipped with noise protection gear including ear muffs and plugs; - Observance of strict working hours (preferably 8am-5pm) during construction; and - Unnecessary hooting and revving by project vehicles not be allowed. Signs prohibiting such actions should be erected at all times	Proponent	Construction and operation	200,000 Best Environmental Practice
Water Resources	Disruption of water supply to neighbours	In the unlikely event of disruption of water supply to neighbours due to proponents activities, - The proponent must adhere to water quality regulations described in Legal Notice No. 120 of the Kenya Gazette Supplement No. 68 of September 2006; and - Ensure any complaints from neighbours related to water abstraction activities are promptly mitigated	Proponent	Construction and operation	No specific allocation required
Sanitation	Increased need for sanitary provisions	- The proponent shall comply with laws and by-laws relating to public health and sanitation; - All toilets or pit latrines shall be secured to the ground; - The type and exact location of the toilets/septic tanks shall be approved by the City County in the design; - All toilets shall be maintained in a clean sanitary condition;	Proponent	Construction and operation	6,000,000

Aspect	Anticipated Impact	Management and Mitigation/enhancement measures	Responsibility	Monitoring Timeframe	Mitigation Costs
		- A wash basin with adequate clean water and soap shall be provided alongside each toilet; and - Ensure that solid/liquid exhausts are disposed by licensed agents or through approval by the local Public Health Office.			
Public Safety	Risk to public and increased risk of accidents	- Cordon off the construction site and only allow access to authorized personnel; - Need for traffic controls like speed bumps and traffic signs limiting speed when approaching the site; - Clear pedestrian / zebra crossing marks to be put on designated point, especially where the conveying belt will cross the road; and - Install sirens in vehicles and machinery to alert people of danger when moving or reversing.	Proponent	Construction and operation	As per BoQ rates
Soils	Soil erosion	- Overburden removed during excavation to be used to fill or landscape the project area or in other areas; - Immediate re-vegetation and landscaping works to be carried out after the works to protect soils that have been exposed; and - Compact soils to reduce susceptibility to erosion.	Proponent	Construction and operation	2,000,000 Best Environmental Practice
Fuels, Oils, Hazardous Substances and other Liquid Pollutants	Fuel, Oils, hazardous substance spillage	- Hazardous materials shall be stored above flood level; - Areas for the storage of fuel and other flammable materials shall comply with standard fire safety regulations; - Chemicals and fuel shall be stored in storage tanks within a secure compound. All chemicals and fuels shall be stored in accordance with their Material Safety Data Sheet (MSDS); - Storage areas or secondary containment shall be constructed of waterproof reinforced concrete or approved equivalent, which is not adversely affected by contact with chemicals captured within them;	Proponent	Construction and operation	No additional costs required

Aspect	Anticipated Impact	Management and Mitigation/enhancement measures	Responsibility	Monitoring Timeframe	Mitigation Costs
		- Pipe-work carrying product from the tank to facilities outside the containment shall be provided with secondary containment; - Tank equipment such as dispensing hoses, valves, meters, pumps, and gauges shall be located within the containment or provided with own containment; - Fence of the tank compound with locks or other adequate security controls at the site; - Appropriate training for the handling and use of fuels and hazardous material is to be provided by the Contractor as necessary. This includes providing spill response and contingency plans; - Extreme care will be taken when transferring chemicals and fuels from storage vessels to equipment and machinery on an impervious sealed area which is kerbed and graded to prevent run-off. Chemical and fuel transfer areas shall drain away from the perimeter bund to a containment pit; - All chemicals stored within the bunded areas shall be clearly labelled detailing the nature and quantity of chemicals within individual containers; - Any chemical or fuel spills shall be cleaned up immediately. The spilt liquid and clean-up material shall be removed, treated and transported to an appropriate site licensed for its disposal; and - Storm water shall be diverted away from the fuel handling and storage areas. An oil water interceptor shall be provided to treat any rainwater.			
Occupational Health and Safety	Increased risk of workplace incidents and accidents	- The proponent shall comply with all standard and legally required health and safety regulations as promulgated by Factories and Other Places of Work Act, OSHA 2007 and its subsidiary legislation and also the ILO Guidelines on Safety and Public Health in, the construction activities;	Proponent	Construction and operation	6,000,000

Aspect	Anticipated Impact	Management and Mitigation/enhancement measures	Responsibility	Monitoring Timeframe	Mitigation Costs
		- The proponent shall set up a standard first aid station on site; - There should be a Safety Officer on site who has relevant training and knowledge of safety procedures; - The Contractor shall provide the appropriate Personal Protective Equipment for staff; and - The contractor must have insurance cover for the workmen			
Vegetation	Loss of vegetation comprising grasses and sporadic shrubs	- Immediate re-vegetation and landscaping works to be carried out after the works to restore the site; and - Disturbance, clearing and excavation to be limited to just the project footprint areas.	Proponent	Pre-construction and construction	200,000
Socio-Economic Aspects					
Relocation of Utilities	Disruption of services	- Undertake inventory of existing utilities in the project area before beginning construction; - Relocation of services, if needed, should be provided for in the BOQs; - Notice should be given to the utility users prior to any interruption in supply; and - Liaise with relevant parties	Proponent	Pre-construction	As indicated by service providers
Hiring of Labourers	Bias in recruitment	- To avoid conflicts with the local people on employment it is proposed and important that the proponent employs the locals in liaison with local leaders and administration in unskilled and semi-skilled duties; - To promote the livelihood of vulnerable groups such as the women-headed households, the proponent should make deliberate efforts to include and retain women in the project; - Make deliberate efforts to include at least 33% of women as employees within the project; and - Contractor to put in place a code of conduct to prevent sexual harassment / exploitation of female employees.	Proponent	Construction and operation	No additional costs required

Aspect	Anticipated Impact	Management and Mitigation/enhancement measures	Responsibility	Monitoring Timeframe	Mitigation Costs
HIV/AIDs and STIs	Increase in prevalence of HIV/AIDs and STI's	- The HIV/AIDS awareness and prevention campaigns should be conducted on site. The proponent should take an active role in ensuring his employees have access to information and resources on the subject; and - The campaign shall include the training of facilitators among the workers, information posters in more frequented areas in the site and public areas, availability of promotional material (T-shirts banners and caps), availability of free condoms at appropriate places in the site, and theme focused entertainment.	Proponent	Construction and operation	2,000,000
Changes in settlement patterns	Emergence of unplanned settlement	- There is almost no possibility of shanties mushrooming near the project site. This is however a possible off-site impact as new workers search for cheap accommodation in the project environs; and - To forestall the growth of unplanned settlements around the site environs, the local administration will need to undertake routine surveillance.	Machakos County Government	Construction and operation	No additional cost

10. CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

GBHL, an ISO 14001:2015 certified firm aspire to be the market leader in bulk handling of non-food products such as clinker, coal and fertilizer by constructing the proposed terminal adjacent to the Athi River Standard Gauge Railway (SGR) Station to receive cargo from the Mombasa Port to enable efficient and affordable availability of raw materials for production and manufacturing industries such as cement manufacturers. The company's vision in partnership with the newly constructed SGR is to reach a wider market with their services of providing efficient and cost effective handling solutions for no food cargo transported within East & Central Africa including Great Lakes, Southern Sudan and Somalia. The construction of the proposed Dry Bulk Handling Terminal for non-food products such as clinker, coal and fertilizer at Athi River will aid in this realization.

Views gathered from stakeholders point to the anticipation that the establishment of the facility will help to absorb the work force in a region that has suffered recently from most cement manufacturing companies scaling down operations due to reduced manufacturing owing to the high cost of doing business. Many people have lost jobs and thus their livelihoods which has increased crime and reduced demand for houses and commodities. In spite of the consulted parties airing a few concerns and suggestions over how certain aspects of the project should be handled, they indicated support for the proposed development and look forward to its implementation.

The adverse elements notwithstanding, the benefits that will be realized from the construction of the Proposed GBHL Dry Bulk Handling Terminal at Athi River outweigh most of the inconveniences and negative impacts that have been categorized in this EIA Study as temporary, moderately significant and limited to the project construction phase. The EIA Study determined that if the project construction and operation is implemented with due attention to the mitigation and monitoring measures entailed in this document, most if not all, adverse environmental and social impacts will be manageable. Overall, the Dry Bulk project is deemed timely, highly beneficial and should therefore be allowed to proceed within the given framework.

10.2 Recommendations

It is recommended that for the prevention and mitigation of potentially adverse environmental and socio-economic impacts, the following should be done:

- The operation and maintenance of the proposed project must comply with the best management practices and the principles of environmental management including the principles of sustainability, intergenerational equity, prevention and precaution;
- Ensure the views expressed by the public during the consultation exercise are integrated in the design and implementation plan of the project, especially where aspects of social interest are concerned;

- Regular environmental and social safeguard monitoring and auditing should be undertaken and any identified shortcomings addressed. This will ensure that all projects are in conformance with established laws and regulations for the management of environment, safety and health;
- Institute effective communication, education and awareness raising for project workers and neighbours for enhanced acceptability and social harmony;
- The proponent should ensure the local community benefits from employment opportunities in each phase of the project that is being executed; and
- The Contractor should expedite on the works to minimize adverse livelihood impacts and inconveniences to the community.

REFERENCES

1. Machakos County Integrated Development Plan, 2018-2022. Government Printers, Nairobi.
2. Republic of Kenya, (2010). Constitution of Kenya. National Council for Law Reporting, Nairobi.
3. Republic of Kenya, (2005). Forest Act No. 7 of 2005. National Council for Law Reporting, Nairobi.
4. Republic of Kenya, (2002). Water Act, No. 8 of 2002. National Council for Law Reporting, Nairobi.
5. Republic of Kenya, (1999). Environmental Management and Coordination Act, 1999 Amended. National Council for Law Reporting, Nairobi.
6. Republic of Kenya, (1996). Physical Planning Act, Cap 286. National Council for Law Reporting, Nairobi.
7. Republic of Kenya, (2013). The Wildlife (Conservation and Management) Act, Cap 376, Revised Edition 2013. National Council for Law Reporting, Nairobi.
8. Republic of Kenya, (1968). Land Acquisition Act Cap 295. Government Printers, Nairobi.
9. Republic of Kenya, (1955). Agricultural Act, Cap 318. National Council for Law Reporting, Nairobi.
10. Republic of Kenya, (1930). The Penal Code Cap 63. Government Printers, Nairobi.
11. Republic of Kenya, Public Health Act, Cap 242. National Council for Law Reporting, Nairobi.
12. UNEP-ACTS, (2001). The Making of a Framework Environmental Law in Kenya. ACTS press, Nairobi.

APPENDICES

APPENDIX I: APPROVED TERMS OF REFERENCE

APPENDIX II: SAMPLING ANALYSIS RESULTS

APPENDIX III: LAND LEASE AGREEMENT

APPENDIX IV: PCM MINUTES AND ATTENDANCE REGISTER

APPENDIX V: SAMPLE OF FILLED QUESTIONNAIRES

APPENDIX VI: SITE LAYOUT PLANS