ROCK WORKS ENERGY LIMITED

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ACKNOWLEDGEMENT

We highly appreciate the project proponent, Rock Works Energy Ltd for giving us the opportunity to undertake this Environmental Impact Assessment project study. Special thanks go to the project to the owner Mr. Mathenge who coordinated and facilitated meetings, site visit and correspondences with the expert. He also provided the team with detailed information through provision of information regarding the project and other documents used in this study on the proposed project. Grateful also to all the neighbours of the proposed project and concerned parties who raised their concerns addressed in the report. To all the rest who participated either directly or indirectly towards the successful completion of this report, we thank you most sincerely.

Contents

DECLARATION:

PROJECT OWNERSIP IDENTIFICATION AND CONTACTS:

According to Environmental Management and Co-ordination Act, CAP 387, every development should undergo an Environmental Impact Assessment and if NEMA deems it necessary, a project may have to undergo the full study process.

Project proponent: **ROCK WORKS ENERGY LIMITED**
Pin number: **PO51557153N**

Signature: **…….**

Contact person: **Joseph Mathenge**
Mobile No.: **…….0721 791328……**

Signature: **……..**

Expert: **Caroline Muoge**

Registration No.: **……2150……**

Signature and Stamp: **……**

Co-Ordinates: **Latitude 1°12′18.14″S**
Longitude 36°53′14.65″E

Altitude: 157

ACRONYMS

EIA	Environmental Impact Assessment
EHS	Environment, Occupational Health and Safety
EMS	Environmental Management System
SIA	Social Impact Assessment
EMCA	Environmental Management and Coordination Act, 1999
NEMA	National Environment Management Authority
NWSC	Nairobi Water and Sewerage Company
TOR	Terms of Reference
PSP	Private Sector Participation
PPE	Public Participation and Consultation
PPC	Public Participation and Consultation
EA	Environmental Audit
ISO	International Standards Organizations
OSH	Occupational Safety and Health

EXECUTIVE SUMMARY

ROCK WORKS ENERGY LTD intends to start quarring and put up a crusher at his land blocks whose specifics are organized in blocks whose titles deeds are:

i) Daiga/Umande block 8/309(Gitugi)- 1.3155HA
ii)Daiga/Umande block8/308(Gitugi)- 1.4681HA
iii)Daiga/Umande block8/307(Gitugi)- 1.1723HA
iv)Daiga/Umande block 8/306(Gitugi)- 1.0941HA

The project is in Umande area of Laikipia county. It is on a 5.05 ha piece of land
Currently the land is bare save for a planned site office block in the area .

The neighbouring land is used for small scale farming and grazing. In the wider project neighbourhood are the Home grown horticultaral farm and depot and Kongoni flower farms.

After it goes through the full cycle of construction/planning, operation and decommissioning phase, the site will be rehabilitated for later use in other commercial activities including farming and construction.

It is envisioned that minimal disturbance in terms of noise,water and air pollution is going to be released from the site especially during construction phase but controls of putting them to minimum are going to be put in place. Also traffic to and from the site will increase during construction and occupation phases but it will be done in a seamless way so that it may not interefere with normal traffic in other premises.

Stock piles are going to be at bare minimal. This will ensure that piles don’t work as habours for rodents.

There is some vegetations in the site area that are mostly shrubs common in rocky areas . There will be need of them been cleared from the site to allow for quarrying activities During decommissioning the proponent plans to plant some new vegation for aesthetic purposes and for environmental management.

The proponent is advised to build gabeons towards the sloppy area to avoid soil erosion especially on the stream side of the site.

The output of the study was the production of a comprehensive Environmental Impact study report for submission to NEMA for the purposes of seeking an approval and a license on the same.

The study established positive as well as negative impacts to the environment that will be occasioned at construction and operation phases of the commercial building. The detailed study established positive as well as negative impacts to the environment that will be occasioned at construction and

operation phases of the project. The detailed EnvironmentalMonitoring & Management Plan prescribed measures to limit and mitigate such disturbance during all phases of the project.

This environmental examination process therefore establishes a negative determination subject to conditions set forth in the Environmental Management Plan and the Site-specific Management Plan developed by stakeholders the proposed development meets the requirements) under established environmental examination procedures, and as stipulated under EMCA CAP 387 and EIA/EA guideline. This environmental examination process therefore establishes a negative determination subject to conditions set forth in the Environmental Management Plan and the Site-specific Management Plan developed by stakeholders hence recommending licensing of the proposed development of building.

The Terms of Reference were but not limited to:

- A critical look into project objectives.
- The proposed location of the project site.
- Generation of baseline information, national environmental legislative and regulatory framework, and any other relevant information related to the project.
- Evaluation of the technology, procedures and processes to be used
- Evaluation of materials and their extended sources.
- Description, evaluation and analysis of the foreseeable potential environmental effects of the project broadly classified into physical, ecological/biological and socio-economic aspects (direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated)
- Evaluation of products, by-products and waste to be generated by the project.
- To propose/recommend a specific environmentally sound and affordable waste water and solid waste management system.
- Evaluation and analysis of alternatives
- Propose measures to prevent health and safety hazards in the project cycle
- An environmental management plan proposing the measures for eliminating/minimizing or mitigating adverse impacts on the environment

The following general steps were followed during the assessment to ensure comprehensiveness and completeness of the report:

- Environment screening and environmental scooping;
- Physical inspection of the site and its environs;
- Desk top studies, consultations, questionnaires and extensive interviews with stakeholders (the local community, the neighbours, the proponent and his professional consultants among others);
- Public Participation and Consultation
- Reporting Compiling and Submission

Various alternatives were considered including having an alternative site for the project, design, technology and materials. Site was chosen due to various factors among them the availability of

rocky land, suitability of the project in the site area , potential returns, infrastructure availability and the fact that the planning policy allows such kind of development in the area.

The proposed development was noted to have positive impacts to the society both at local and national level. The benefits will be experienced during the entire project cycle. They include the following:

- Provisions of construction materials which is in high demand
- The optimal use of the land.
- Increase in land value of the adjacent plot and the neighbouring land
- The project will form a well-planned project and shall include key services and infrastructure.
- Increase in Government revenue and improvement of local and national standards of living of the society.
- Economic-investment hence increases in wealth.
- Improvement of social interaction.
- Creation of market for goods and services
- Provision of employment.

Against the background of the above positive impacts, there are a few negative drawbacks that are anticipated mostly during the construction of the project. They include the following:

- Land use conflict /disputes with neighbours
- Construction materials waste and solid wastes generation
- Air pollution from dust particles emanating from excavation and construction activities and exhausts emissions from the involved machinery will lead to increased levels of noxious gases such as sulphur, carbon, and nitrogen oxides Increased noise and vibration mostly during construction phase
- Energy Demand
- Waste Water Generation
- Impact to soil, land disturbance especially by earthworks and blasting equipment and change in drainage.
- Water demand Impact
- Constraints to other existing infrastructure i.e. power infrastructure, road network
- Potential increase in traffic leading to loose ground hence dust
- Visual Intrusion
- Construction Safety Impacts
- The health and safety of workers and immediate residents and neighbours may be compromised due to accidents, pollution and disturbance
- To minimize the occurrence and magnitude of the negative impacts, mitigation measures have been proposed against each of the anticipated impact.

Other measures have been integrated in the project designs with a view to ensuring compliance with applicable environmental laws and guidelines. The measures include the following:

- Careful sitting, planning and design of the development to ensure that it is compatible to the existing general environment
- Adherence to the provisions of Environmental Management and Co-ordination Act (Water Quality) Regulations 2006, Environmental Management and Co-ordination Act(Waste Management) Regulations 2006 and other relevant legislation
- Erection of warning / informative signs (billboards) at the site during the construction phase, and traffic control along the connecting roads (the access Road).
- Soil compaction and watering of loose soils on all unpaved access roads, parking areas and staging areas and quarrying materials, at the sites to minimize air pollution and erosion by the agents of soil erosion i.e. water, animals and wind.
- To reduce noise pollution, portable barriers to shield compressors and other small stationary equipment generating noise should be installed; Sensitization of workers on the need to switch off engines whenever possible; ensuring that the machinery is well maintained to inhibit frictional noise; install silencers whenever possible and ensure that site works/operations is carried out between 7a.m. and 5p.m.
- Proper and prompt tuning and maintenance of construction plant and equipment to minimize emission of noxious fumes and noise emanating from friction of the rubbing metal parts. Vehicle/machinery idling time should be minimized. The maintenance will be conducted in appropriate and designated service bays to reduce chances of contamination of environment by resulting oils and greases. Any of such oils must be collected and disposed appropriately.
- Since large volumes of water may be required during operation due to doing wet crushing, the contractor may be required to source water elsewhere other than the main supply; such as portable water tankers, subject to seeking water abstraction approvals from the relevant government water department. On the same note, roof catchments shall be provided with gutters to facilitate collection of the run-off during rainy season. We recommend that this water be stored for general use i.e. cleaning, firefighting, wet crushing etc. The developer should explore roof water collection systems to enhance harvesting of the run-off generated from the roof catchments. Standard gutters, down pipes and suitable water storage tanks should be provided for the run off generated within the project harvested and stored (in tanks) and used for general purposes.
- To ensure further conservation of water, the proponent shall install water-conserving taps that turn-off automatically when water is not in use.
- The vehicles access to the proposed project site is effectively provided and will be constructed to the satisfaction of the County government.
- To cater for storm water drainage, well-designed concrete inverted channel drains shall be provided to harmonize management of the resulting surface water within the site. The drains shall effectively channel storm water into the area drainage systems. Storm water runoff will be greatly reduced through rainwater harvesting from the roof catchments. The drains will be regularly maintained.
- The entire project shall be connected to the existing sewer mains.

- The proponent should leave part of the parking area covered with gravel since it semi permeable to avoid water clogging during rainy seasons and also allow track movement without them getting stuck.
- Workers shall be provided with full protective gear to beef up their health and safety standards and they should be sensitized on health, safety and environmental conservation aspects. The site is fenced off during construction to keep off animals and the public.
- To avoid constraining the existing energy infrastructure, the proponent shall liaise with the sole power distributor Kenya Power to upgrade the power supply line and install transformers(s) to meet the anticipated increased demand. In addition, the proponent shall also explore installation of solar equipment for energy conservation and installation of standby prime generator.
- During the construction phase, the contractor shall put in place effective and efficient waste disposal systems. Wastes such excavated soil and debris will be recycled or properly disposed of by backfilling or dumping in approved grounds. If rote quarrying is practised, back filling should be done in each section before moving to the next.
- The use of an integrated solid waste management system will facilitate this. This will involve a hierarchy of options: source reduction, recycling, composting and reuse, and sanitary land filling. Solid waste management shall be enhanced.
- Also to assist in backfilling of excavated areas, project proponent should liase with road constructors and other contractors to dump their unwanted debris on the site to form part of aggregate to be used as back-fillers.
- Adapt Environmental Management and Monitoring Plans within the site involving all the space occupied.

For all the associated impacts, mitigation measures have been proposed as per mitigation and EMP chapter

Various alternatives have been considered but the proposed alternative have been found the best available alternatives as it maximises the benefits to all beneficiaries and the potential negative impacts are not so significant and can further be mitigated by adherence to the proposed EMP. The project proponent shall continue to work closely with the environmental consultants; Occupational Safety and Health Department, NEMA and Laikipia County Government to enhance the environment and to ensure that issues that the environmental concerns are well addressed and integrated into the project at every stage of successive implementation. This way, the co-existence of the proposed project with the environment during planning and operation phases will have been achieved and shall influence the decommissioning phase.

Finally, an Environmental Management Plan (EMP) for the project has been developed. The proponent is advised to adhere and comply with the recommendation given in the EMP and any other recommendation given by the Authority or any other relevant authority in the field. The experts recommend that NEMA approve the project since it is not unique in the area as there are other compatible developments still in the surrounding area, enabling the proponent to commence with the development.

1 INTRODUCTION

1.0 Introduction

The proponent (Rock Works Energy Ltd) intends to put up a quarry and a crasher in Umande area Laikipia County on his land segmented in blocks. The final product quarried will be crushed stones that will be sold for construction in roads or buildings or other infrastructures that use crashed stones as a project in-put.

The project is in Umande area of Laikipia County. It is on a 5.05 ha piece of land to avoid unnecessary biophysical and social economical conflicts that retard development of this character, the proponent undertook this EIS report for the proposed project and incorporated environmental concerns as advised by the Authority and per requirements under Environmental Law (Environmental Management and Coordination Act, 1999, CAP 387. The development plot neighbors other commercial developments. The design involves the development of a commercial building with two basements, ground floor and five other floors, which will mainly consist of office spaces, a banking hall, restaurants, lounge, changing rooms, and kitchenette and air conditioning units. Lifts and staircases serve the whole building.

1.1 Definition of Technical Terms

The following words or phrases shall be limited to the meaning indicated against them:

"Developer" means a person who is developing a project which is subject to an environmental impact assessment;

"Environment" includes the physical factors of the surroundings of human beings including land, water, atmosphere, climate, sound, odours, taste, the biological factors of animals and plants and the social factor of aesthetics and includes both the natural and the built environment;

"Environmental management" includes the protection, conservation and sustainable use of the various elements or components of the environment;

"Environmental Monitoring" means the continuous or periodic determination of actual and potential effects of any activity or phenomenon on the environment;

"Noise" means any undesirable sound that is intrinsically objectionable or that may cause adverse effects on human health;

"Pollution" means any direct or indirect alteration of the environment so as to affect any beneficial use adversely;

"Project" includes any project, programme or policy that leads to projects which may have an impact on the environment;

Environmental Thresholds

Negative determination: the project does not cause any negative impact on the environment; it has only positive impacts

Negative determination with conditions: the project causes negative impacts on the environment but they can be effectively mitigated through implementation of the environmental management plan

Positive Determination: the project causes adverse impacts on the environment and as such it should be redesigned or abandoned.

We can say the threshhold on this project is negative determination since it has some negative impact that include dust pollution and noise pollution. Since the immediate neighbours arent in the visinity, it is projected that no person will be affected directly but never the less measures put in place is that there will be wet crushing of stones and for noise, blasting dynamites will be used by professionals so that they can hit only targets. Also at all times, users and visitors to the site are advised to wear proper PPEs on the site and reflective materials/clothing.

1.3 Project Objectives

The broad objective in establishing of a quarry and a stone crusher on the site

i. To utilize the piece of land optimally
ii. To pride measurable revenue to the proponent and government
iii. Offer employment
iv. To provide measurable revenue for the government
v. To increase construction material that will help in attaining Vision 2030

1.4 Project Justification and Rationale

The development is located in Daiga/Umande in Laikipia county an area that is semi arid and rocky. To optimally use the land and make it beneficial, the proponent saw it fit to start a quarrying project and crush the stone resource to be supplied to contractors who need the aggregate. Hence, this is a win win project.

1.5 Justification and Rationale for EIA

The rationale for the EIS report is to integrate environmental aspects in the planning and implementation processes of the proposed project to mitigate adverse impacts and enhance the positives. Besides, it is now a legal requirement to protected the general environment. The ultimate objective of such a report is to provide decision makers, relevant institutions/organizations, proponent and other stakeholders with the foreseeable environmental impacts of a proposed activity and therefore enable planning ahead taking into account all predictable outcomes and adequately providing for them for sustainability.

The purpose of the study is to identify foreseeable potential impacts (physical, ecological and cultural/socio-economic) to enhance the benefits and at the same time avoid negative impacts (costs) or provide appropriate cost effective measures to remedy the negative impacts that cannot be completely avoided. It also purposes to draw wide comments on the project by various stakeholders so as the licensing process can be fully informed on other stakeholders concerns. The study is expected to raise both the potential positive and negative impacts likely to emanate from the proposed project. Integrating *Sustainable Environmental Management principles* in the planning, implementation and through- out the project cycle is vital in reducing/mitigating conflicts and enhancing environmental conservation.

1.6 Terms of Reference

i. A critical look into project objectives.

ii. The proposed location of the project site.
iii. Generation of baseline information, national environmental legislative and regulatory framework, and any other relevant information related to the project.
iv. Evaluation of the technology, procedures and processes to be used
v. Evaluation of materials and their extended sources.
vi. To identify and assess positive and negative impacts of the proposed development
vii. To develop mitigative measures for the identified negative impacts
viii. To propose/recommend a specific environmentally sound and affordable waste water and solid waste management system.
ix. Evaluation and analysis of alternatives
x. Propose measures to prevent health and safety hazards in the project cycle
xi. Develop a site specific environmental management plan

1.7 Scope of study

The study has been conducted as per the above TOR and as set out in EMCA 1999 CAP 387 and the Environmental (Impact Assessment and Audit) Regulations, 2003. i.e. to evaluate the potential and the foreseeable impacts of the proposed project, generation of baseline information, evaluation and recommendation of the best alternatives from the options available (if any), the nature, order of magnitude, extent, duration and reversibility of the potential changes. EIA is site specific, the geographical scope is therefore limited to the site for which this study is conducted, direct and indirect physical extent as may be foreseeable affected by the proposed project.

1.8 EIA Study Methodology

a) The methodology used in conducting and writing of this EIA report consisted of the following:
b) A site reconnaissance and visual survey to determine the baseline information of the project
c) comparative study of the project with the existing land uses in the neighbourhood
d) Analysis of the project documents
e) Discussion with the proponent, surveyor and the architect
f) Assessment of the site to detail the various existing and likely impacts of the project on the environment.
g) Assessment of health and safety issues
h) Assessment of conservation concerns
i) Seeking public views through interviews and holding barazas on the project impacts
j) Extrapolating and inferring environmental conditions and responses from baseline information or from other similar cases where actual data is lacking;
k) Preparation and submission of the report

2 PROJECT DESCRIPTION

2.1 Nature of the Proposed Project

ROCK WORKS ENERGY LTD intends to start quarring and put up a crusher at his land blocks whose specifics are organized in blocks whose titles deeds are:

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The project is in Umande area of Laikipia county. It is on a 5.05 ha piece of land
Currently the land is bare save for a planned site office block in the area .
The neighbouring land is mostly under developed with part of it used for small scale farming and grazing. In the wider project neighbourhood are the Home grown horticultaral farm and depot and Kongoni flower farms.

2.2 The Project Processes

The project processes are divided into different stages namely predevelopment physical layo ut design stage, contracting and procurement of materials,
construction stage, operation and maintenance, and decommissioning stage. All these stages have been evaluated and are factored in the comprehensive management plan.

2.2.1 Predevelopment Stage

This is the planning stage of the project. It entails the tendering process to develop Bills of Quantities, architectural design and site layout plan for the project, and procurement of project materials. It also entails conducting a baseline survey and an environmental impact assessment prior to commencing construction of the office plaza. The purpose of the baseline survey is to collect eco- physiological data of the project site against which future environmental audits can be done. This stage is the basis of this report. It was also meant to determine the predevelopment and construction impact of the project.

2.2.2 Physical Layout Design

Strategies to maximize land use and follow the laid down measures by County government and other government agencies e.g NEMA.

2.2.3 Constructing and Procurement of Materials

This is the sourcing of materials to be used for construction. The contractor would endeavor to use some recycled building materials where appropriate, utilizing appropriate building technologies and materials.
The Contractor would also use local contractors to supply construction materials that meet appropriate standards set for the building and use local staff for construction as much as possible.

The contractor shall among other things: provide all materials, tools and scaffolding; complying with local authority regulations and by-laws; providing adequate supervision; transporting

materials and workmen where possible; complying with relevant acts governing construction works and employment; security for the works; cleaning and making good damage to access trails; testing of materials as required; sanitation of the works; protecting the works and all plant and materials; cleaning the site on completion; and site safety and first aid facilities.

2.2.4 Construction Activities Outline

Most of construction and structures (wooden) will be done offsite then transported to site. It is anticipated that during construction, an average of 40-50 construction workers will be on-site depending on the extent of work to be done at any given time. Staff will consist of both skilled and un-skilled labour as many of them are possibly hired from the local community adjascent to the site. Temporary sanitation facilities will be provided for staff on-site but they will be accommodated outside the site apart from approximately 2 guards at night for security reasons. Specific activities during construction phase will entail the following

- Rehabilitation of access road including lay of culverts at streams. Low-impact technology will be used to ensure minimal environmental denudation occurs.
- Site preparation (minimal clearance of vegetation, preparation of a site office and stores to avoid intrusion)
- Disposal of demolition wastes by a licensed waste disposal agent who will do it in accordance to NEMA regulations, excavations/earth moving, filling and laying of foundation.
- Storage of the materials and gradual utilization as construction progresses.
- Only required materials will be procured at a time to avoid storage complications that would lead to environmental degradation.
- Civil, mechanical and electrical works
- Completion of the construction works
- Solid waste collection
- Commissioning of the project

2.2.5 Construction Materials

The site buildings will be constructed using common construction materials mainly timber/wood,bricks,cement,sand and construction procedures that are not expected to compromise the integrity of the environment; most of the structures will be assembled on site but constructed offsite. Materials to be used will be procured and delivered to the site when appropriate at different stages of construction. This will help to minimize destruction of vegetation and interferencewith environment as much as possible. Also it will avoid having very high stock piles that may attract theft and rodents Wood used on site will be sourced from sustainable sources.
Among the following inputs will be required for construction:

- Raw construction materials e.g. sand, cement, natural building stone blocks, hard core, gravel, ballast, etc
- Reinforcement concrete frame and steel bars of various sizes depending on the parts of the building, wire-mesh, etc.

- Timber (e.g. doors, windows, trusses, frames, fixed furniture, internal finishes, external finishes, etc)
- Glass panes for various sections of the building
- Electrical engineering installations, insulated electrical cables
- G.I. and PVC Pipes (steel and plastics) for plumbing and waste conduits
- Sanitary fittings,
- Construction labour force of both skilled and unskilled workers.

2.2.6 Solid Waste

Excess waste materials generated by the construction work especially rappings will be shipped out of the site and transported by a waste disposal agent duly registered and disposed according to laid down regulations as per EMC(Waste management) regulations 2006 (CAP 387). These waste products envisioned here including small pieces cut from the construction materials mentioned above.

Human waste generated by the construction staff will be disposed within the requirements of the law endeavouring to protect the environment as stipulated in the regulations. Toilets will be put up for use on the site after which the waste will be directed to the sewer line on site. Other type of waste will be segregated accordingly and disposed off to the waste disposal site designated by the Authorities or the proponet who will dig a gurbage pit on site.

2.2.7 Effluent Waste Facility

Special attention is given to the effluent waste facility as a critical component in environmental management. The project has allowed for two pit latrines that have been labeled male/female

2.3 Operation and Maintenance during Occupation Stage

One of the critical things to observe once the development becomes operational is solid waste management. Adherence to NEMA's solid waste management practices is advised.

2.3.1 Solid Waste Management Plan

Part II (General Regulations) of Environmental Management and Co-ordination (Waste Management) Regulations, 2006 are used as the guidelines for managing solid waste. NEMA gazetted these rules under Legal Notice 121 of 2006 to regulate how solid waste is generated, segregated, transported and finally disposed. It deals with all forms of waste including solid, industrial, hazardous, pesticides, biomedical and radioactive wastes. Under these regulations no person shall dispose off any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle. The regulations further require that every person whose activities generates wastes has an obligation to ensure that such waste is transferred to a person who is licensed to transport and dispose off such waste in a designated waste disposal facility. Section 2 part II of the regulations requires that any person whose activities generate waste shall collect, segregate and dispose or cause to be disposed off such waste in the manner provided for under the Regulations.

An Integrated Solid Waste Management Plan (ISWMP) is advised for this project, where sources of solid waste would be identified, their composition analysed for segregation purposes and the potential to reduce and recycle solid wastes components are explored. ISWMP is based on 3Rs principle i.e. reduce,

reuse, recycle. With appropriate segregation and recycling system significant quantity of waste can be diverted from landfills and converted into resource.

The proponent intends to reuse debris emmanating from the crushed stones as back fill aggregate. Also top materials that are not used as part of project input e.g shrubs and rocks not meeting quality/ standard required will be used as backfill aggregate.

3 BASELINE INFORMATION

3.1 Site Location and Characteristics

The land on Land Reference no.is on several blocks of land in Umande Daiga, Laikipia county. It measures approximately 5.05 HA . Co-ordinates are
Latitude:
1°12′18.14″S
Longitude:
36°53′14.65″E

3.2 Soils and Geology

The geology of the project area comprise of red soil, laterites, ashes, younger moraines, glaci- fluvial deposits, older moraines basaltic pumice cones, ithanguni, riebechite, olivine, mugearites, simbara series and Nyeri tuff. Soil is shallow. Surface water is not common in the region.

Hydrogeology

The numerous rivers and streams dictate the natural drainage within the project area. All the rivers flow from the Mt. Kenya. The underground water channels are dominant in the region that helps keep a balance in the ecosystem. It forms part of the Tana and Athi Rivers, which eventually flows into the Indian Ocean. The major sub-catchments areas in the project area is the Nanyuki River land but is not an immediate neighbour to the site area with a seasonal river on the perimeter of the block of land but is not an immediate neighbour to the plot area.
Groundwater sources include sources from the major faults and are important for ground water recharge of aquifers in the project area. Other sources of water in the area include boreholes (mainly in private premises and institutions).It forms part of the Ewaso Ngiro catchment area
.

3.3 Climate

Climate and temperature in the project area are influenced by altitude. In general temperatures are fairly uniform with coolest months occurring from June to August while hottest temperatures typically occur from January to March. Rainfall is bimodal with long rains occurring from March to June while the short rainy period occurs from October to December. The average annual rainfall in Nanyuki and its environs ranges between 100 mm and 250 mm per annum.

3.4 Flora and fauna

There is no significant wildlife in the project area, a situation associated with the areas climate that is general characterized by high temperature. Vegetation generally comprises grassland characteristic of savanna and scattered tree species. The region is predominantly semi-arid.

3.5 Land use Activities

The adjascent land isn't used for economic gains since it is rocky. There is few vegetation that is used for small scale grazing and farming done in patches

3.6Infrastructure

The area can be acessed on feeder roads that are mostly dirt roads leading to the site. Plans are underway to upgrade the site to a rough road/ murram road hence will ease transport in the area. The land is connected to Kenya power though there will be need to step up the current power need so that it can be sustainable.

3.7 Justification for selecting the site

The site area is in a prime land that is currently under utilised optimally since the area is rocky. There is also a need for stone aggragate of a given stanard by different construction projects. At the same time, the location is ideal since no disturbances of delicate ecosystem is foreseen. The project is therefore viable for this particular use.

4 INSTITUTIONAL, POLICY AND LEGAL FRAMEWORK

4.1 General Overview

The proponent aspires to set up the proposed project in accordance and in conformity with the laid down institutional, policy and legal framework. A review of these frameworks as they pertain to the proposed project was done. These ranged from national institutions governing environmental matters, to policies guidelines and legislations enacted to enforce environmental policies. Some of the policies and legal frameworks reviewed include the National Policy on Environment and Development under the Sessional Paper No. 6 of 1999, EMCA 1999 which establishes a requirement for environmental impact assessment (EIA) study for a project such as this that is out of character with the surroundings to establish the potential positive and negative impacts of the project to the integrity of the environment which forms the basis of this study.

Environmental Impact Assessment is a tool for ensuring new projects and programmes incorporate appropriate measures to mitigate adverse impacts to the environment and people's health and safety as well as enhancing sustainable operations with respect to environmental resources and co-existence with other socio-economic activities in their neighbourhood. Necessary policies and legislation that ensures annual environmental audits (EA) are carried out on every running project, activity or programme and a report submitted to National Environmental Management Authority (NEMA) for approval and issuance of relevant certificates.

According to the Kenya National Environmental Action Plan (NEAP, 1994) the government recognized the negative impacts on ecosystems emanating from industrial, economic and social development programmes that disregarded environmental sustainability. Following on this, establishment of appropriate policies and legal guidelines as well as harmonization of existing ones have been accomplished and/or are in the process of development. The NEAP process introduced environmental assessments in the country with among the key stakeholders being industrialists, business community and local authorities. This culminated into the enactment of the Policy on Environment and Development under the Sessional Paper No. 6 of 1999.

Other legal and policy frameworks that informs this study that are reviewed for the purpose of this Project study report include: Hotel and Restaurants Act (CAP 494), Regulations under section 29; Occupational Safety and Health Act 2007; The Environmental Management and Coordination (Water Quality) Regulations, 2006; The Environmental Management and Coordination (Waste Management) Regulations, 2006; Employment Act 2007; Work Injuries Benefits Act 2007; Labour Institutions Act 2007; The Public Health Act (CAP 242); Physical Planning Act (CAP 286); National Poverty Eradication Plan; The Water Act 2002; Factories and Other Places of Work Act (CAP 514); The Local Government Act; Land Control Act.

4.2 National Institutional Framework

4.2.1 The National Environment Council

The National Environment Council (the Council) is responsible for policy formulation and directions for the purposes of the Act. The Council also sets national goals and objectives and determines policies and priorities for the protection of the environment.

4.2.2 The National Environmental Management Authority

The responsibility of The National Management Authority (NEMA) is to exercise general supervision and coordination over all matters relating to the environment and to the principal instrument of government in the implementation of all policies relating to the environment.

4.2.3 The Standards and Enforcement Review Committee

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

4.3 National Policy Framework

4.3.1 National Policy on Environment and Development

- *The National Policy on Environment and Development presents broad categories of development issues that require sustainable approach. Among the goals of the policy are:*
- *To incorporate environmental management and economic development as integral aspects of the process of sustainable development,*
- *To encourage sustainable utilization of resources and ecosystems for the benefit of the present generations, while ensuring their potential to meet the needs of the biosphere and the future dependants.*

Following on this, the policy targets various aspects on the environment and seek to tailor make policies that guides on their sustainable use respectively. For this particular project, we deal with the following but its not limiting:

Arid And Semi-Arid Lands Ecosystems (Asals)

In Kenya all the grasslands are in the ASALs. The ASALs therefore provide critical habitats for wildlife and ecosystem diversity, including grasslands and wetlands for migratory species. Grasslands are well known as the habitats of the greatest assemblages of large wild mammals in the world and support a rich bird fauna. Consequently, grasslands are important for nature-based tourism, extensive livestock production and recreation activities as well as for water conservation and erosion control. Arid and Semi-Arid Lands (ASALs) are fragile but very resilient ecosystems that receive very low and unreliable rainfall. The main form of land use in ASALs is livestock grazing mainly camels, cattle, goats and sheep accounting for a large proportion of the total livestock population in the country. Pastoralism involves considerable mobility to capitalize on spatially and temporally dispersed commonly-owned natural resources which are regulated collectively rather than by separate landowners. The main threats to ASALs include expanding agriculture, charcoal burning and fuel wood collection, uncontrolled fires, human settlements, land degradation, deforestation and overgrazing. Climate change influences the ability of ASALs to cope with these challenges.

Land

Land is a key resource in Kenya and is the basis of livelihood for vast majority and a foundation of economic development. Land resources are finite, fragile and non-renewable and are considered a

capital and asset that provides the essential services for development and human well being. Consequently, the demand and pressure on land is ever increasing. The main driving force leading to pressure on land resources is the increasing rate of population growth; hence demand for more food and shelter. The unsustainable use of land in urban and rural areas remains a major challenge to all Kenyans due to the serious impact on the environment. Activities contributing to land degradation include unsuitable agricultural land use, poor soil and water management practices, deforestation and overgrazing. Natural disasters, including droughts, floods and landslides, also contribute to land degradation.

Soils

Quality fertile soils are a foundation of sustainable agriculture. Soils are also essential in the hydrological cycle. Soil degradation processes of particular concern throughout the country include erosion, compaction and soil fertility depletion. Loss of natural habitats has reduced vegetation cover and exposed soils to extensive wind and soil erosion in many parts of the country. Soil erosion is a major factor in land degradation and has severe effects on soil functions, such as the soil's ability to act as a buffer and filter for pollutants, its role in the hydrological and nitrogen cycle, and its ability to provide habitat and support biodiversity. Soil erosion also causes increased rates of siltation of dams and rivers, and increased risk of flooding in rivers and estuaries. Thus, soil erosion reduces the productivity of land, requiring farmers to apply more and more fertilizers and other chemicals that help check declining productivity. The resultant excessive use of fertilizers and other chemicals contributes to soil degradation and water pollution.

- *Conservation and management of the natural resources of Kenya including air, water, land, flora and fauna,*
- *Promotion of environmental conservation through the sustainable use of natural resources to meet the needs of the present generations while preserving their ability tomeet the needs of future generations, Meeting national goals and international obligations by conserving biodiversity, arresting desertification, mitigating effects of disasters, promoting the ozone layer and maintaining an ecological balance on earth.*

4.3.2 The National Poverty Eradication Plan (NPEP) and the Poverty Reduction Strategy Paper (PRSP)

The NPEP has the objective of reducing the incidence of poverty in both rural and urban areas by 50% by the year 2015, as well as strengthening the capabilities of the poor and the vulnerable groups to earn income. It also aims to narrow gender and geographical disparities and create a healthy, better educated and more productive population. This plan has been prepared in line with the goals and commitments of the World Summit for Social Development Of 1995. Poor people and their communities are at the core of poverty eradication. The NPEP emphasizes the empowerment of poor people and their communities to better manage their available resources for collective advancement. The PRSP has the twin objective of poverty reduction and economic growth. The paper articulates Kenya's commitment and approach to

fighting poverty with the basic rationale that the war against poverty cannot be won without the participation of the poor themselves.

4.4 National Legal Framework

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

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

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

It is worthwhile to note that where ever any of the laws contradict each other, the Environmental Management Coordination Chapter 387 prevails.

Environmental management and co-ordination act chapter 387

An Act of Parliament to provide for the establishment of an appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto [Act No. 8 of 1999, Act No. 6 of 2006, Act No. 17 of 2006, Act No. 5 of 2007, Act No. 6 of 2009.]

Application for an Environmental Impact Assessment Licence (1) Notwithstanding any approval, permit or license granted under this Act or any other law in force in Kenya, any person, being a proponent of a project, shall before for an financing, commencing, proceeding with, carrying out, executing or conducting or causing to be financed, commenced, proceeded with, carried out, executed or conducted by another person any undertaking specified in the Second Schedule to this Act, submit a project report to the Authority, in the prescribed form, giving the prescribed information and which shall be accompanied by the prescribed fee. (2) The proponent of a project shall undertake or cause to be undertaken at his own expense an environmental impact assessment study and prepare a report thereof where the Authority, being satisfied, after studying the project report submitted under subsection (1), that the intended project may or is likely to have or will have a significant impact on the environment, so directs. (3) The environmental impact assessment study report prepare under this subsection shall be submitted to the Authority in the prescribed form, giving the prescribed information and shall be accompanied by the prescribed fee. CAP. 387 Environmental Management and Co-ordination [Rev. 2012] [Issue 1] E12 - 40 (4) The Minister may, on the advice of the Authority given after consultation with the relevant lead agencies, amend the Second Schedule to this

Act by notice in the Gazette. (5) Environmental impact assessment studies and reports required under this Act shall be conducted or prepared respectively by individual experts or a firm of experts authorized in that behalf by the Authority. The Authority shall maintain a register of all individual experts or firms of all experts duly authorized by it to conduct or prepare environmental impact assessment studies and reports respectively. The register shall be a public document and may be inspected at reasonable hours by any person on the payment of a prescribed fee. (6) The Director-General may, in consultation with the Standards Enforcement and Review Committee, approve any application by an expert wishing to be authorized to undertake environmental impact assessment. Such application shall be made in the prescribed manner and accompanied by any fees that may be required. (7) Environmental impact assessment shall be conducted in accordance with the environmental impact assessment regulations, guidelines and procedures issued under this Act. (8) The Director-General shall respond to the applications for environmental impact assessment license within three months. (9) Any person who upon submitting his application does not receive any communication from the Director-General within the period stipulated under subsection (8) may start his undertaking. 59. Publication of Environmental Impact Assessment (1) Upon receipt of an environmental impact assessment study report from any proponent under section 58(2), the Authority shall cause to be published for two successive weeks in the Gazette and in a newspaper circulating in the area or proposed area of the project a notice which shall state— (a) a summary description of the project; (b) the place where the project is to be carried out; (c) the place where the environmental impact assessment study, evaluation or review report may be inspected; and (d) a time limit of not exceeding sixty days for the submission of oral or written comments environmental impact assessment study, evaluation or review report. (2) The Authority may, on application by any person extend the period stipulated in sub-paragraph (d) so as to afford reasonable opportunity for such person to submit oral or written comments on the environmental impact assessment report. 60. Comments on Environmental Impact Assessment report by Lead Agencies A lead agency shall, upon the written request of the Director-General, submit written comments on an environmental impact assessment study, evaluation and review report within thirty days from the date of the written request.

This section will identify operation standards, which the project must address to be environmentally acceptable.

Legal notice no. 101 the environmental (impact assessment and audit) regulations, 2003

Give regulations pertaining carrying out of An Environmental Impact Assessment project report or study report on Environmental Audits.

It gives guidelines of step to be taken in the various approval processes to ensure policies/ regulations are followed. Notwithstanding ensuring that due process is adhered to.

Physical Planning Act; laws of Kenya, Chapter 386

This act provides for the preparation and implementation of national, regional, and local development polices guidelines and strategies. Director of Physical Planning on behalf of the Minister responsible for lands and settlement enforces the act. He advises the Commissioner of Lands on appropriate uses of land and on land management. This Act also has a direct bearing to the proofed development providing prohibition, and offers controls the use and development of land and buildings.

Section 24 of the Physical Planning Act gives provision for the development of local physical development plan for guiding and co-coordinating development of infrastructure facilities and services within the area of authority of 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 councils power to prohibit and control the use of land, building, and subdivision of land, in the interest of proper and orderly development of its area.

The same section also allows them to approve all development applications and grant development permissions as well as to ensure the proper execution and implications of approved physical development plans. On zoning, the act empowers them to formulate by-laws in respect of use and density of development.

Section 30 states that any person who carries out development within an area of a local authority without development permission shall be guilty of an offence and the development shall be invalid. The act also gives the local authority power to, compel the developer to restore the land on which such development has taken place to its original conditions within a period of ninety days. If no action is taken, then the council will restore the land and recover the cost incurred thereto from the developer

In addition, section 30 states that no person shall carry out development within the area of a local authority without development permission granted by the local authority. At the same time, sub-section 5, re-enforce it further that, no licensing authority shall grant under any written law, a license for commercial use for which no development permission had been granted by the respective local authority.

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 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.

Land Control Act (Cap. 302)

Land Title Deed

A land title deed shall be applied for where land is to be disposed of by way of sale, transfer, lease, exchange or position to a person who is; -

(i)A citizen of Kenya; or

(ii)A private company or co-operative society all of whose members are citizens of Kenya; or

(iii)Group representatives incorporated under the land (Group Representatives) Act; or

(iv)A state corporation within the meaning of State Corporation Act:

Registration of Titles Act: Cap. 281

An Act of Parliament to provide for the transfer of land by registration of titles. Section 23 Certificate of Title Deed

The certificate of title issued by the registrar to a purchase of land upon a transfer or transmission by the proprietor therefore shall be taken by all courts as conclusive evidence that the person named therein as proprietor of the land is the absolute and indefeasible owner thereof, subject to the inconveniences, casements, refractions and the title of that proprietor shall list be subject to challenge, except on the group of fraud or misrepresentation to which he is proved to be a party.

Land Planning Act (Cap. 303)

Section 9 of the subsidiary legislation (The Development and Use of Land Regulations, 1961) under this Act requires that before the local authorities submit any plans to then Minister for approval, steps should be taken as may be necessary to acquire the owners of any land affected by such plans.

Electricity Power Act No. 11 of 1997

The Electric Power Act No. 11 enacted in 1997 deals with generation, transmission, distribution, supply and use of electrical energy as well as the legal basis for establishing the systems associated with these purposes. In this respect, the following environmental issues will be considered before approval is granted:

- *The need to protect and manage the environment, and conserve natural resources;*
- *The ability to operate in a manner designated to protect the health and safety of the project employees; the local and other potentially affected communities.*

Under schedule 3 of the Electric Power (licensing) Regulations 2003, it is mandatory to comply with all safety, health, and environmental laws. Moreover, schedule 2 (regulation 9) of the Electric Power (licensing) Regulations 2003 stipulates that licensing and authorization to generate and transmit electrical power must be supported by the following documents which are approved by NEMA.

1. *Environmental Impact Assessment Report (EIA) or*
2. *Initial Environmental Audit Report (IEA) and*
3. *Environmental Management Plan (EMP)*

Registration of Titles Act Cap 281

Section 34 of this Act states that when land is intended to be transferred or any right of way or other easement is intended to be created or transferred, the registered proprietor or, if the proprietor is of unsound mind, the guardian or other person appointed by the court to act on his/her behalf in the matter, shall execute, in original only, a transfer in form F in the First Schedule, which transfer shall, for description of the land intended be dealt with, refer to the grant or certificate of title of the land, or shall give such description as may be sufficient to identify it, and shall contain an accurate statement of the land and easement, or the easement, intended to be transferred or created, and a memorandum of all leases, charges and other encumbrances to which the land may be subject, and of all rights-of-way, easements and privileges intended to be conveyed.

Land Titles Act Cap 282

The Land Titles Act Cap 282 section 10 (1) states that there shall be appointed and attached to the Land Registration Court a qualified surveyor who, with such assistants as may be necessary, shall survey land, make a plan or plans thereof and define and mark the boundaries of any areas therein as, when and where directed by the Recorder of Titles, either before, during or after the termination of any question concerning land or any interest connected therewith, and every area so defined and marked shall be further marked with a number of other distinctive symbol to be shown upon the plan or plans for the purposes of complete identification and registration thereof as is herein after prescribed.

County Governments Act No. 17 Of 2012 Rev.2015

An Act of Parliament to give effect to Chapter 11 of the Constitution; to provide for county governments' powers, functions and responsibilities to deliver services and for connected purposes [Act No. 17 of 2012, Act No. 13 of 2014, Act No. 1 of 2016, Act No. 7 of 2016.]

The Public Health Act; Laws of Kenya, chapter 242

The act prohibits activities that may be injurious to human health. It then becomes the responsibility of the local authority to maintain clean and sanitary conditions. This Act:

- *Calls for cleanliness of premises;*
- *Calls for supply of potable water for human purposes;*
- *Offers guidelines on waste water disposal and management; and*
- *Prohibits the discharge of emissions that may be injurious to health.*

The Water Act No.43 of 2016

The Water Resource Harvesting and Storage Authority has been established under this act to:
Establish the water resource users association and their function.
The Water Act provides for the conservation and controlled use of water resources in Kenya. Under the Ministry of Water, the Act prohibits pollution of water resources and controls the discharge of industrial and municipal effluents into the ocean and other water bodies.
These affect developments in their impacts to water resources and in their ability to have the required demand of water consumption for their stated activities. The above acts taken together guide the development of such infrastructure as the one proposed by the proponent. It also recognizes Water Resources Users Association, which are community-based groups that regulate and mitigate conflicts concerning a water system within an area.
The water Act aims to "make better provision for the conservation, apportionment and use of water resources of Kenya." It prohibits persons from diverting, abstracting, obstructing or using water from a body of water except as provided for in the Act (Section.5).
The Act stipulates that a permit shall be required in all cases of proposed diversion, abstraction, obstruction, storage or use of water, with minor exceptions relating to use for domestic purposes (Section.36). Under the Water Act (General) Rules, it is stated that any rights acquired under the permit are subject to the Public Health Act and the Malaria Prevention Act, in addition to the Water Act itself. The Public Health Act has wide-ranging provisions on pollutant discharges, which are set out below.
The Water Act (General) Rules make provision for discharges in a number of respects, as follows:
Effluent shall not be returned to any body of water unless it has been purified. Further, it must not contain poisonous or injurious matter or excess silt, gravel or boulders.
The regulating authority may determine the potential prejudicial effects of the pollutant discharges and order the removal already made.
Additionally the applicant for a water permit is required to outline the methods to be used for treating effluent before discharge (Form WAB 13, question 18). The permit would only be issued subject to satisfactory provision being made for the treatment of effluent. The Water Act, apart from the Rules, makes only limited provision for controlling water pollution The provision is limited to the pollution of drinking water.
Under section 145, the water undertaker may make regulations to control polluting activities which may threaten its source of water. It may itself construct the necessary works for intercepting, treating or disposing of foul water (s.149). Section 158 makes it an offence to pollute such waters. Similarly, under section 169, it is an offence to throw or convey polluting matter into a body of water.

The Occupational Safety and Health Act, 2007

The Act makes provision for the health, safety and welfare of persons employed in factories and other places of work. The provisions require that all practicable measures be taken to protect persons in places of work from dust, fumes or impurities originating from any process within the workplace. The provisions of the Act are also relevant to the management of hazardous and non-hazardous wastes, which may arise at a project site. The Act provides for all necessary safety precautions to ensure the health and safety of workers. Part II – General Duties of the Occupiers

In Section 6 (1), it is stated that the occupier shall ensure the safety, health and welfare at work of all persons working in his work place.

Without prejudice to the generality of an occupier's duty under sub section 1 above, the duties of the occupier includes:-

- *The provision and maintenance of plant and systems and procedures of work that are safe and without risk to health;*
- *Arrangements for ensuring safety and absence of risks to health and connection with the use, handling, storage and transport of articles and substances;*
- *The provision of such information, instruction, training and supervision as is necessary to ensure the safety and health at work of every person employed;*
- *The maintenance of any workplace under the occupier's control, in a condition that is safe and without risks to health and the provision and maintenance of means of access to and egress from it that are safe and without such risks to health;*
- *The provision and maintenance of a working environment for every person employed that is, safe, without risks to health, and adequate as regards facilities and arrangements for the employees welfare at work;*

Inform all persons employed of:-

- *Any risks from new technologies; and Imminent danger; andEnsuring that every person employed participates in the application and review of safety and health measures.*
- *Every occupier shall carry appropriate risk assessments in relation to the safety and health of persons employed and adopt preventive and protective measures to ensure that under all conditions of their intended use without risk to health and comply with the requirements of safety and health provisions.*

The occupier shall send a copy of a report of Risk Assessment carried out under this section to the area occupational safety and health officer and shall take (occupier) immediate steps to stop any operation or activity where there is an imminent and serious danger to safety and health and to evacuate all persons employed as appropriate.

Duty to prepare a safety and health policy statement

In Section 7 (1) (a) and (b), it is established that except in such cases that as may be prescribed it is the duty of every occupier to:-

Prepare and, as often as may be appropriate, revise a written statement of his general policy with respect to the safety and health at work of his employees and the organization and arrangements for the time being in force for carrying out that policy; and To bring the statement and any revision of it to the notice of all of his employees.

Safety and Health Committee

Section (9) (1) Illustrates that an occupier shall establish a safety and health committee at the Workplace in accordance with the regulations prescribed by the Minister if:-

- *There are twenty or more persons employed at the workplace; or*
- *The Director directs the establishment of such a committee at any other workplace.*

Duty not to charge employees for things done or provided

Section (10) (1) states that an Employer shall not make any deduction from an employee's remuneration or levy, or permit to be levied on any of his employees any charge in respect of anything done or provided in pursuance of this Act or any regulation made there under.

Safety and Health Audits

Section 11 (1) of the Occupational Safety and Health Act 2007 outlines that the occupier of a workplace shall cause a thorough safety and health audit of his workplace to be carried out at least once in every period of twelve months by a safety and health advisor, who shall issue a report of such an audit containing the prescribed particulars to the occupier on payment of a prescribed fee and shall send a copy of the report to the Director.

The Audit report referred above shall be preserved and be kept available for inspection by the Occupational Safety and Health Officer.

Notice of accidents and dangerous occurrences

Section 21(1) Stipulates that an employer or self employed person shall notify the area Occupational Safety and Health Officer of any accident, dangerous occurrence, or occupational poisoning which has occurred at the work place

Where an accident in a workplace, causes the death of a person therein, the employer or self employed person shall:-

Inform the area occupational safety and health officer within twenty-four hours of the occurrence of the accident; and Send a written notice of the accident in the prescribed form to the area occupational safety and health officer, within seven days of the occurrence of the accident.

Where an accident in the workplace cause non fatal injuries to a person therein, the employer shall send to the area occupational safety and health officer, a written notice of the accident in the prescribed form within seven days of the occurrence of the accident; and

In case of death due to a workplace accident, non-fatal injuries arising from a work place accident, an occupational disease or a dangerous occurrence at the workplace, involving a self-employed person incapable of submitting notification, such notification shall be submitted to the area occupational safety and health officer.

Health - General Provisions

- *Under Section 47 (1) It is established that Every workplace shall be kept in a clean state and free from effluvia arising from any drain, sanitary convenience or nuisance, and, without prejudice to the generality of sub section (1):-*
- *Accumulations of dirt and refuse shall be removed daily by a suitable method from the floors and benches of workrooms, and from a staircases and passages;*
- *The floor of every workroom shall be cleaned at least once in every week by washing or, if it is effective and suitable, by sweeping or by any other method;*
- *All inside walls and partitions, and all ceilings or tops of rooms, and all walls, sides and tops of passages and staircase, shall:-*
- *Effective screening methods against birds, animals, and vermin including insects and rodents.*
- *Paragraph 11gives sanitary facilities to be provided for;*
- *Paragraph 15 gives the health measures to be taken in a food plant*

4.4.2 Waste Management Regulations (2006)

The Waste Management Regulations (2006) are contained in the Kenya Gazette No. 69, Legal Notice No. 121. Of immediate relevance to proposed development for the purposes of this project report is Part II Sections 4(1-2), 5 and 6. Section 4 (1) states that "No person shall dispose of any waste on a public highway, street, road, recreational area or any other public place except in a designated waste receptacle". Section 4(2) and 6 explain that the waste generator must collect, segregate 9hazardous waste from non-hazardous) and dispose waste in such a facility that shall be provided by the relevant local authority.

Section 5 provides method of cleaner production (so as to minimise waste generation) which includes the improvement of production processes through conserving raw materials and energy.

4.4.3 The Environmental Management and Coordination (Noise and Excessive

Vibration pollution) (Control) Regulations, 2009 Part II Section 3 (1) of these Regulations states: no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, response, health or safety of others and the environment and Section 3 (2) states that in determining whether noise is loud, unreasonable, unnecessary or unusual, the following factors may be considered:

a) time of the day

b) proximity to residential area

c) whether the noise is current, intermittent or constant

d) the level and intensity of the noise

e) whether the noise has been enhanced in level or range by any type of electronic or mechanical means, and

f) Whether the noise can be controlled without much effort or expense to the person making the noise.

Part II Section 4 state that: except as otherwise provided in these Regulations, no person shall

a) make or cause to be made excessive vibrations annoys, disturbs, injures or endangers the comfort, response, health or safety of others and the environment; or

b) Cause to be made excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source.

Part III Section 2 (1) states that any person wishing to a) operate or repair any machinery, motor vehicle, construction equipment, pump, fun, air conditioning apparatus or similar mechanical device; or b) engage in any commercial or industrial activity, which is likely to emit noise or excessive vibrations shall carry out the activity or activities within the relevant levels provided 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 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 domestic nature and/or public utility construction.

Section 14 relates to noise, excessive vibrations from construction, demolition, mining or quarrying site, and state that: where defined work of construction, demolition, mining orquarrying is to be carried out in an area, the Authority may impose on how the work is to be carried out including but not limited to requirements regarding a) machinery that may be used, and b) the permitted levels of noise as stipulated in the Second and Third Schedules to these Regulations. It further states that the relevant lead agency shall ensure that mines and quarries where explosives and machinery used are located in designated areas and not less than two kilometres away from human settlements and any person carrying out construction, demolition, mining or quarrying work shall ensure that the vibration levels do not exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving
source.

4.4.8 Water Resource Management Rules (2007)

In addition to the Water Act 2002, the main document outlining the regulations is the Water Resource Management Rules (2007). The rules set out the procedures for obtaining water use permits and conditions placed on permit holders.

4.4.9 Water Quality Regulations (2006)

The Water Quality Regulations (2006) are contained in the Kenya Gazette Supplement No. 68, Legal Notice No. 120. Of immediate relevance to the proposed facility for the purpose of this Project Report is Part II Sections 4-5 as well as Part V Section24.

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

Part IV Section 24 states that "No person shall discharge or apply any poison, toxic, noxious or obstructing matter, radio active wastes, or other pollutants or permit any person to dump any such matter into water meant for fisheries, wildlife, recreational purposes or any other uses".

4.4.10 The Public Health Act (Cap. 242)

Part IX 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 Local Authorities to take all lawful,

necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable for injurious or dangerous to human health.
Such nuisance or conditions are defined under section 118, and include waste pipes, sewers, and drains or refuse pits constructed or situated in such a state as in the opinion of the medical officer of health to be offensive or injurious to health. Any noxious matter or waste water flowing or discharged from any premises into a public street or into the gutter or side channel or watercourse, irrigation channel or bed not approved for discharge is also deemed as a nuisance. Other nuisances are accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbor rats or other vermin.
Section 130 provides for making and imposing regulations by the county councils and others the duty of enforcing rules in respect of prohibiting use of water supply or erection of structures draining filth or noxious matter into water supply as mentioned in section 129. This provision is supplemented by Section 126A that requires county councils to develop by-laws for controlling and regulating among others private sewers, communication between drains and sewers and between sewers as well as regulating sanitary conveniences in connection to buildings, drainage, cesspools, etc. for reception or disposal of foul matter.
Part XII 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.

4.4.13 Building Code By-Laws

The By-law of Building Code 3 (I) states 'A person who erects a building or develops land or changes the use of a building, or who owes or occupies a building or land shall comply with requirements of these by-laws'. By-law 5 states that a person who intends to erect a building or materially change the use of a building or part of a building shall furnish the council in the
matter provided in Part A of the First Schedule to these By-laws. Section 194 requires that where e sewer exists, the occupants of the nearby premises shall apply to the local authority for a permit to connect to the sewer line and that all waste water must be discharged into the sewers. The code also prohibits construction of structures or buildings on sewer lines.

4.4.15 The Penal Code (Cap. 63)

Section 191 of the Penal Code states that any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence. Section 192 of the same act says a person who makes or vitiates the atmosphere in any place to make it noxious to health of persons/institution in dwellings or business premises in the neighborhoods or those passing along public way, commit an offence and is guilty of a misdemeanor i.e. imprisonment not exceeding two years with no option for a fine.
Section 191 – Fouling water
The contractor shall ensure that during construction no foul water of any public spring or reservoir is rendered unfit for the purpose for which it was ordinarily used for by the community.

4.4.16 Occupiers Liability Act (Cap. 34)

Section 3 requires that an occupier of premises owe the "common duty of care" to all visitors and workers. Rules of common law regulates the duty which an occupier of premises owes to his visitors in

respect of danger and risk due to the state of the premises or to things omitted or attributes an affliction on his/her health to a toxic materials in the premises.

4.5 Work Injuries Benefits Act, No13, 2007

AN ACT of Parliament to provide for compensation to employees for work related injuries and diseases contracted in the course of their employment and for connected purposes.

4.6 Explosive act CAP 115

Permit necessary to acquire blasting materials (1) No person shall purchase or otherwise acquire blasting materials except under the authority of, and to the extent authorized in, a written permit issued by an inspector. (2) No person shall sell or dispose of blasting materials to any person who fails to produce at the time of the transaction a permit of the type referred to in subsection (1) nor shall any person sell or dispose of any such materials in excess of the quantity referred to in such permit. (3) Any person who contravenes this section shall be guilty of an offence and liable to a fine not exceeding three thousand shillings or, in default of payment, to imprisonment for a term not exceeding one year

5 ANALYSIS OF PROJECT ALTERNATIVES

I) Relocation Alternative

Relocation option to a different site is an option for the project implementation. At the moment, the proponent has no alternative sites for relocation. Looking for the land to accommodate the scale, type and size of the project and completing official transaction on it may take a long period. Besides, there is no guarantee that such land with suitable rock deposits would be available. Suitability is another very important factor, which cannot be ignored. The other problem is that the alternative may be available but far from, customers and this will increase the transport.

Although monetary costs should not be used to justify a wrong project, this would also call extra costs in terms of money and time. For example, whatever has been done and paid to date would be a direct loss to the proponent. This may also lead to a No Action Alternative situation. The other consequence is that it would discourage both foreign and local investors. In consideration of the above concerns and assessment of the current proposed site, relocation of the project is not a viable option. The problem is further aggravated by the characteristics of quarrying in that the location of rocks is fixed, and the situation is not like developing a new factory, where there is much more choice in the location of the premises.

II) The No Action Alternative

The No Action Alternative in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. The anticipated environmental impacts resulting from quarrying activity would not occur.

This option will however, involve several losses to the project proponent and other stakeholders such as the local community and Government. The landowner will continue to pay high taxes on the unutilized property.

On the other hand, the quarry is expected to create employment opportunities therefore contributing positively to the national economy .The No Project Option is the least preferred option and it becomes apparent that the No Project Alternative is not the appropriate alternative.

III) Buying Land from the neighbour who is has raised issues the project

The neighbour approached the proponent with an offer to sell off her land after the E.I.A project report was done. The offered price is too high, almost four times the value of land in the area hence it is not a workable plan to the proponent.

Alternative Design and Technology Options

There are various quarrying technology used in quarrying which include:-

a) Manual quarrying; - This uses simple tools such as chisel, mallet and hammer to cut and shape stones. This method is slow and produces low quality stones. The proponent does not intend to use manual quarrying.

b) Explosive;- This method uses explosives to blast and reduce the rock into small size. The stones can then be shaped manually as above. For one to blast, explosive act requires one to be licensed. Blasting produces very loud noise and heavy vibrations and should not be done near residential area. The proponent does not intend to use this method, as it is also slow.

Mechanized quarrying;- This method uses heavy earth moving machines and equipment such as stone cutting machine, wheel loader and bull dozers. The method is efficient and produces large amount of high quality stones within a short time. The proponent intends to use mechanized and explosive quarrying. He will also make use of three loader to clear the site.

Manual quarrying would involve use of simple tools like chisels to cut and shape stones and also employing so many people to produce the required amount of stones. In addition, it would have to involve use of explosive to blast. The stone produced would not exactly match the quality demanded by the market. Manual quarrying also require a hard rock. Therefore, manual quarrying may not be suitable for the proposed project site since the rock is soft.

Mechanized quarrying produced large quantities of high quality stones. It is best where the rock is soft as is the case in the proposed project site

Proposed Technology

The Proponent having evaluated the available technologies, he thereby intends to use Explosives quarrying due to the magnitude of the project and make use of stone cutting machines which will produce stones of different sizes and a wheel loader to clear the site. This method uses heavy earth moving machines and equipment such as stone cutting machine, wheel loader and bulldozers. The method is efficient and produces large amount of high quality stones within a short time

Quarrying will be done in iteration. The parcels of land will be divided into different portions and one portion will be cleared and quarried at a time. Top soil from one portion and one portion will be cleared and quarried at time top soil from one portion and waste will be kept in a separate site and when all the rocks are exhausted in the portion, it will be backfilled and landscaped before shifting to the next portion

The Comparison of Alternatives

Under the No Action Alternative, there would be no quarrying at all. There would be no benefits from the site and neither would there be the insignificant environmental Impacts.

Also buying out the neighbour is not feasible plan since the land is expensive and projected ROI cannot sustain the cost.

If the proposed alternative goes on, the project would create employment opportunity both directly and indirectly. Stone produced would generate income for the proponent and hence maximum utilization of land. It would also provide building materials that will be used in construction of both

residential and commercial premises. The area would also be opened up and this will promote development.

Provided the recommended Environmental Impact mitigation measures are adapted and implemented, negative impacts will be avoided /minimized. However, commitments related to development alternative would ensure that potential impacts are minimized to insignificance levels as envisaged in the EMP.

6 ENVIRONMENTAL IMPACTS ASSESSMENT AND MITIGATION MEASURES

This chapter largely focuses on the anticipated impacts from the construction works of the proposed quarry that will include site clearing and putting up of an administration block, rehabilitation of the access road, site preparation, commissioning and operation and decommisioning phases

6.1 Specific Impacts and Mitigation Measures

6.1.1 Positive Impacts

The proposed development will have a number of positive impacts and benefits that include:

a) During Construction/Operation Phases

- Employment generation and income opportunities for the foreman, construction staff and other professional service providers.
- New business opportunities for the local community
- Optimal use of land.
- Revenue to Contractors and suppliers and buyers
- Provision of much needed stone aggregate(crashed stones)
- Revenue to proponent and governments; both local and county.
- Indirect growth in other sectors e.g Agriculture and industries due to increase in procurement
- Increase in land value

6.1.2 Hydrology and Drainage

The gound is slanted slightly and there is a natural drainage sytem.

I t is envisioned that proponent will plant vegetation towards the river side to control water movement into the river

6.1.3 Soil Erosion

Potential Impacts

Soil erosion happens especialy during constuction/operation phases

Recommendations:

- Only minimal bush clearing should be done and only when necessary
- Gabions should be dug if deemed necessary. Terrace clearing of land should be encouraged during quarrying process
- Excavations of the site will be confined only within the sections upon which constructions is taking place.
- Excavated earth will be held away from locations of the site not susceptible to surface runoff of storm water.
- The earth removed from external disposal will require to be deposited on sites without the risk of being washed down during rains and where it will not compromise other land use activities in those areas.
- Extra precautions on control of soil erosion will be required on construction during periods of heavy rainfall.
- Re-vegetate exposed areas on the site so as to mitigate further erosion of soil.
- Landscaping with indigenous species will help to mitigate soil erosion during the operation phase of the project.

- Rote quarrying should be practised where each block is quarried at exhausting one
- Wet quarrying where dusty areas are sprinked with water to hold down soil.

6.1.4 Water Resources

Potential Impacts

- There will be increase in water consumption.
- Installed pipes should be of good quality to avoid leakages andincase of leakages, repairs should be done promptly.
- Any harvested rain water should also be dosed with chlorine as described above, on
- account of organic matter which may contaminate the water.
- Good environmental practice would entail properly recording and filing water treatment
- procedures, so that in the absence of the person normally responsible for treatment of
- water, any other assigned person is able to competently carry out this function.
- In the same vein, guests as well as staff should be sensitized with regard to minimizing
- water usage.

6.1.5 Noise and Vibrations

Potential Impacts

Noise and vibrations are expected mainly during construction phase with the major receptors being the project neighbours as well as the construction workers. Sources of noise would be the earth-moving machines; materials delivery/picking trucks, blasting as well as noise generated by the work force. Earth-moving machines are also likely to cause vibrations. However, all these will be transient impacts that will end ones construction phase is over.

During operational phase, vehicles accessing the building could also introduce additional noise.

Recommendations:

- Ensure that construction equipments are maintained at the best operating conditions to avoid unnecessary noise.
- All equipment and machinery must be regularly maintained.
- Workers must be advised to keep noise levels down, especially when watching game.
- Playing radios and ghetto-blasters should not be permitted within the site. Hooting must also be prohibited.
- Ensure workers are provided with the necessary personal protective equipment
- including earplugs or earmuffs when operating or working with noisy equipment.
- Power generators should be installed in acoustically designed structures to prevent noise pollution.

6.1.6 Air Quality

Potential Impacts

Vehicles as well as vehicles bringing in supplies to the site will create dust. Buyers vehicles are likely to come to the site every day of the week.

Blasting of quarries and mechanized quarrying will also create dust

Recommendations:

Drivers are advised to avoid idling and unnecessary idling of their vehicles while within the Site.

Regular servicing of vehicles to avoid emitting of fumes beyond the required level

Sprinke water on the ground
Quarry face to block neighbours to the site
Trucks to pass through a wet surface before leaving the site to wet/dust off their wheels.
Workers/visitors of the site to remove their dusty clothes when leaving the site.
Use of dust masts at all times by occupiers and visitors to the site.

6.1.7 Solid Waste

Potential Impacts
-Solid waste has the undesired potential of polluting the environment if not well handled. These could be from plastic wrappings that could be harmful to humans and litter the environment besides being unsightly.
-Overbearing from the quarrries also form as part of soilid waste.
Recommendations

- As per the Proponent's proposal workers should follow the "3Rs" philosophy of reuse, recycle and
- reduce will be adopted. To do this, all solid waste generated in the camps should be segregated at source into organic/biodegradable, metal, plastic, cardboard, hazardous (batteries, fluorescent tubes, bulbs etc), so that it can be recycled, reused or buried.
- Legible advisory messages to avoid littering should be placed at strategic places and litter bins providedon site which should be emptied in appropriate designated disposal bins within the site for onward disposal as per the waste disposal regulations which the proponent will adhere to.
- Organic waste should be put into a secure pit, and frequently sprinkled with ash, lime and soil where it will eventually degrade into compost (it can be used to generate biogas). It can also be used as a factor of rehabilitating the site during decommisioning phase.
- Labeled bins should be provided for each area of the camp according to the type of waste generated there. At the same time, staff should be trained as to what types of waste should be put into each of the labeled bins. Hazardous and non-hazardous waste should be stored separately. A specific and secure area should be allocated for the segregation and storage of garbage before disposal. This area has to be fenced off and locked, and must be kept clean and tidy at all times.
- Much of the solid waste generated in the camps can be taken back to settlite towns or regions that neighbour the area to be utilised.

6.1.8 Water Quality

Potential Impacts
Pollution of water sources when the construction is being set up may be attributed mainly to temporary eco-toilets used by the workers who are employed during the construction phase.
Unless there is an accidental spill (for example when draining oil out of a broken down vehicle), pollution due to oil spill is unlikely to occur whilst the quarry and crasher is being set up.
Once the building is operational, water pollution could occur due to waste water (grey-water or foul water). Grey-water will be discharged from wash basins, staff showers and wash basins, and laundry area. Foul water (sewage) will come from toilets (pit latrines). Kitchen water is also usually classified as foul water because of its grease content. No waste water will be discharged directly to the water courses.

During the operational phase, fuel will be required for the generators and for the vehicles. In addition other oils and lubricants may be required for various equipment and machinery used on the site . Pollution due to oil may result from improper storage, handling or disposal of oil and oil products, leading to spills and leaks. This can lead to contamination of soils as well as water sources.
The building will also use chemicals such as detergents, cleaning solutions, etc, but on a small scale. There is a chance of pollution due to these chemicals.
Recommendations:

- The location of temporary toilets from water courses should be at least 30m away from water
- In gravel (or porous soils) or fissured rock, it is recommended that the minimum distance from a water course is 200m (Mann and Williamson, 1996). Grey water should be used to water the surrounding trees and bushes. This can be done using French drains.
- Waste water shall be treated after it enters the waste water treatment plant and discharged when it meets NEMA prescribed standards
- The reservoir water tanks, whether constructed of steel or fibre-glass reinforces plastic should be designed and built according to recognized industry standards.
- Use of corrosion protection in water tanks and piping system. The tank should undergo periodic inspection for corrosion and structural integrity and be subject to regular maintenance and replacement of equipment (eg pipes, seals, connectors, and valves).
- Oil spills and wastes from vehicles can be avoided if vehicle and equipment maintenance are done outside the site area.
- The generators should stand in large metal trays so that if there is a spill during refueling or maintenance any oil will be captured.
- There should be no drains leading outside either from the generator shed or the fuel storage shed, and all doors should have lips and should open outwards.
- Good housekeeping practices should be employed to minimize chances of spills. All oil products and lubricants should be placed on sump pallets, and deep trays should be used whenever oil or fuel is decanted or drained. Simple spill kits box containing sand, sawdust or rags and a boom or kapok-stuffed cushions) should be provided in areaswhere oil spills could occur. Any spills should be mopped up, and the floors swept – they should not be washed with water or detergent and water.
- Materials Safety Data Sheets for fuels and lubricants should be readily accessible to all persons who handle those materials. These should be obtained from the fuel supplier.
- All staff who deals with fuels and oils should be trained in the storage, handling and management of these compounds. Instructions for storage, handling and disposal can be obtained from the major fuel suppliers.
- Domestic chemicals should be stored properly – stores should be well ventilated, with lips at the doors and enclosed. Chemicals and food should not be stored together.
- LPG cylinders should be stored erect in bays, and properly secured at all times.

6.1.9 Construction of administration block materials

Potential Impacts

The types of construction materials to set up the administration block are likely to use stone, plaster,

cement, paint, wood/timber andconcrete will be used. It is not anticipated that any materials that may pose potential health risks will be used on-site.
Provided construction materials are sourced from approved suppliers, and no materials that are potentially hazardous to health are used, the risks to the environment will be minimal.
In addition, gravel may be required for improving the access road to the site.

Recommendations:

Construction materials will only be transported to the site when needed to avoid stock piling on the site.
No potentially hazardous materials such as lead paint, or asbestos containing materials (roofing/lagging) should be used in the construction

- Excavation is done such that no erosion occurs either in and around the pits (for example, sides of pits should not be vertical) or along access roads to the pits
- The pits are excavated so that they drain properly
- Owners of the land where the murram is excavated are adequately compensated

6.1.10 Construction Workers Health, Safety and Awareness

Potential Impacts

The construction phase has the most significant safety impacts that ranges from accidents related to construction vehicles and trucks, residents falling into the construction sites, falling objects and occupational dangers to construction workers. Dust, emissions and noise are notable health hazard to the neighbours as well as the construction workers. There is tendency of informal food vendors selling food to construction workers at the work sites and this has a potential health implication to the workers.
Construction workers are normally drawn away from the construction site. They are therefore likely to interact with the residents whose lifestyles are different, creating grounds for social problems including insecurity, immorality, conflicts, to mention a few.
Recommendations:

- The contractor should provide a small section of the construction site complete with a shed and a water stand pipe where the food vendors can serve the construction workers
- to promote hygiene and health of the employees
- Workers should be provided with suitable personal protective gear (such as nose masks, ear plugs/muffs, helmets, overalls, industrial boots, etc) and ensure they are used at all times while at their place of work. A fully equipped first aid kit should also be provided at site
- The contractor must have Workmen's Compensation cover as required by law (The Workmen's Compensation Act), as well as other relevant Ordinances, Regulations and Union Agreements
- The contractor should ensure there are a temporary toilet/pit latrine and a stand pipe for water on site for use by the construction workforce.
- The workers will be sensitized of the dangers and risks associated with construction works for enhanced self responsibility on personal safety at all times during the construction. The Proponent should ensure that adequate security is provided to the construction workers at all times during the construction period,
- The completed buildings should be fitted with safety facilities, including fire detectors, firefighting equipment, fire exits, adequate access and buffer between the residential premises, disabled access features, safety signage placed strategically around within the building.

6.1.11 Vegetation/Flora

Potential Impacts

During construction it will be necessary to clear some of the existing vegetation , but the extent of clearing is minimal.

Recommendations:

Clearing activities should be supervised so that unnecessary clearing of vegetation does not occur.

•No non-endemic plant should be planted in the project area

6.1.13 Energy and Water Conservation

Potential Impacts

The main source of energy at the site will be electricity energy, supplemented by generators and solar energy if proponent will install some to be used as alternative source of energy.

Recommendations:

Good site practices can serve to minimize energy consumption, for example, turning off lights and electrical equipment if rooms are not occupied, using LED bulbs.

7 ENVIRONMENTAL MANAGEMENT AND MONITORING

7.1 Overview

An Environmental Management and Monitoring Plan outline has been developed to ensure sustainability of the project from construction through to decommissioning. The plan provides a general outlay of the activities, associated impacts, mitigation action plans and appropriate monitorable indicators. Implementation timeframes and responsibilities are also defined.

A general guideline for the decommissioning phase has been presented elsewhere in this report. It is recommended that a detailed decommissioning audit be undertaken at the appropriate time.

The responsibility for the integration of the mitigation measures for the proposed development lies with the contractor during the construction stage while the Proponent takes over the duty upon commissioning of the project.

At every stage, the objective would be to ensure that the specified mitigation measures are implemented.

The table below summarizes the EMP for the proposed project. It describes parameters that canbe monitored, and suggests how monitoring should be done, how frequently, and who should be responsible for monitoring and action

7.2 Environmental Management Plan (EMP)

7.2.1: Environmental Management Plan for the Construction Phase

Environmental Parameter	Recommended Mitigation Measures	Responsible Party	Time Frame	Estimate Project Cost
Land use conflict /disputes with neighbours including project implementation disputes	• Community support mobilization and sensitization through consultative forums & questionnaire methods • Sufficient planning for adequate resources required i.e. financial, personnel and equipment	Proponent , EIA Experts, Project Contractor	At Planning phase	50000
Extraction of Raw Materials	• Source building materials from suppliers who use environmentally friendly processes in their operations.	Proponent & Contractor	Throughout construction period	100,000 on transport
	• Ensure that damage or loss of materials at the construction site are kept minimal through proper offloading and storage	Proponent & Contractor	Throughout construction period	10,000
	• Use at least 5%-10% recycled, refurbished or salvaged materials to reduce the use of raw materials and divert material from landfills.	Proponent & Contractor	Throughout construction period	60000
Impacts of Construction Waste and other Solid Generation	• Through accurate estimation of the sizes and quantities of materials required, order materials in the sizes and quantities they will be needed, rather than cutting them to size, or having large quantities of residual materials. • Reducing on stock piles	Proponent & Contractor	Throughout construction period	500,000
	• Ensure that construction materials left over at the end of construction will be used in other projects rather than being disposed of.	Proponent & Contractor	One-off	Nil

	• Ensure that damaged or wasted construction materials including cabinets, doors, plumbing and lighting fixtures, marbles and glass will be recovered for refurbishing and used in other projects	Proponent & Contractor	One-off	10,000 On transport
	• Donate recyclable/reusable or residual materials to local community groups, institutions and individual local residents.	Proponent & Contractor	One-off	NIL
	• Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time	Proponent & Contractor	Throughout construction period	500,000
	• Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements	Proponent & Contractor	One-off	80,000
	• Purchase of perishable construction materials such as paints should be done incrementally to ensure reduced spoilage of unused materials	Proponent & Contractor	Throughout construction period	10,000 per order
	• Use building materials that have minimal or no packaging to avoid the generation of excessive packaging waste	Proponent & Contractor	Throughout construction period	Nil
	• Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce waste at the site	Proponent & Contractor	Throughout construction period	Nil
	• Dispose waste more responsibly by dumping at designated dumping sites or landfills only; the use of a registered waste disposal company is encouraged	Proponent & Contractor	Throughout construction period	10000 per load
Impacts due to Air Pollution (Exhausts,	• Ensure proper planning of transportation of materials to ensure that vehicle fills are increased in order to reduce the number of trips done per vehicle or the number of vehicles on the road.	Proponent & Contractor	Throughout construction period	10,000 per full load

Dusts and Noise)	• Ensure Watering to avoid any dusts	Proponent & Contractor	Throughout construction period	50,000
	• Sensitize truck drivers to avoid unnecessary racing of vehicle engines at loading/offloading points and parking areas, and to switch off or keep vehicle engines at these points	Proponent & Contractor	Throughout construction period	Nil
	• Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.	Proponent & Contractor	Throughout construction period	Nil
	• Ensure that construction machinery are kept in good condition to reduce noise generation	Proponent & Contractor	Throughout construction period	Nil
	• Ensure that all generators and heavy duty equipment are insulated or placed in enclosures to minimize ambient noise levels.	Proponent & Contractor	Throughout construction period	30,000
	• Quarry face to act as a dust bund towards side of nearest neighbour	Proponent & Contractor	Throughout construction period	100,000
Storage and Handling of materials	• Handling of materials only in predesignated handling zones. Dust suppression will be available to keep stockpiles wet. Stockpiles will be graded to minimize wind pick-up. • Discharge heights will be minimized. Locating of stockpiles to consider shelter from the wind. • Man-made bund to protect receptors to the west of the IBA processing facility area. • Natural bund protecting receptors provided by and quarry face. • Utilization of Dust Management Plan, including regular visual inspections.	Proponent & Contractor	Throughout construction period	Nil

Material Recovery Facility(MRF processing)	• The bulk of the materials processing will take place around the quarry structure. • Dust suppression will be available to dampen down materials as and when necessary. • Discharge heights will be minimized Natural bund protecting receptors to the east provided by surrounding woodland and quarry face. Utilization of Dust Management Plan, including regular visual inspections.	Proponent & Contractor	Throughout construction period	Nil
Impacts of Excessive Energy Use	• Ensure electrical equipment, appliances and lights are switched off when not being used	Proponent & Contractor	Throughout construction period	Nil
	• Install energy saving fluorescent tubes at all lighting points instead of bulbs which consume higher electric energy	Proponent & Contractor	Throughout construction period	40,000
	• Ensure planning of transportation of materials to ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts	Proponent & Contractor	Throughout construction period	Nil
	• Monitor energy use during construction and set targets for reduction of energy use.	Proponent & Contractor	Throughout construction period	Nil
Impacts of Water Consumption	• Promptly detect and repair of water pipe and tank leaks	Proponent & Contractor	Throughout construction period	20,000
	• Install appropriate water conserving taps that are automatic when water is not being used	Proponent & Contractor	One-off	30,000
	• Promote recycling and reuse of water as much as possible	Proponent & Contractor	Throughout construction period	Nil
	• Install a discharge meter at water outlets to determine and monitor total water usage	Proponent & Contractor	One-off	30,000
Impacts of Waste	• Provide means for handling sewage generated by construction workers	Proponent & Contractor	One-off	

Water	• Conduct regular checks for drainage pipes blockages or damages since such vices can lead to release of the effluent into the land and water bodies	Proponent & Contractor	Throughout construction period	
Impacts of Soil Erosion Land disturbance and change in impended drainage	• Control earthworks • Install drainage infrastructures properly • Compact loose soils &Landscaping • Ensure management of excavation activities • Provide soil erosion control structures on the steep side during construction phase • Proper installation of drainage structures to harmonize with natural drainage system • Incorporate the design of down pipes to enhance water collection in to the storage tanks. • Ensure efficiency of drainage structures through proper design • Provide gratings to the drainage channels	Proponent & Contractor	Throughout construction period	500,000
Visual Intrusion	• Landscaping appropriately where necessary. • No waste debris should be left on site once construction is complete • Design should be such that it doesn't block any natural light to any structure	Proponent & Contractor	One off	50,000

Construction Safety including traffic jams/accidents	• Construction Signboard should be provided on site on the spot. • Any area that poses a physical threat to workers and/or pedestrians requires barriers or guard i.e fencing the site to keep off intruders during construction • Do not walk, stand, or work under suspended loads. If you raise a load, be sure to crib, block, or otherwise secure the load as soon as possible. • Be prepared for unexpected hazards. BE ALERT! • Proper personal protective equipment i.e safety shoes, hardhat, goggles, and masks) must be used	Proponent & Contractor	During Construction	50,000
Habitat and vegetation disturbance (Fauna & Flora)	Minimize area of clearance -Reintroduce the vegetation that coexist with the site •	Proponent & Contractor	During Construction	10,000
Occupational Health and Safety Impacts	• Implement all necessary measures to ensure health and safety of workers, housing occupants and the general public during construction as stipulated in the Occupational Safety and Health (OSH) Act, 2007 . This is also discussed in mitigations measures at CHAPTER NINE of this report .	Proponent & Contractor	As per construction period	200,000

7.2.2 Environmental Management Plan for Operational Phase of the Project

Environmental Parameter	Recommended Mitigation Measures	Responsible Party	Time Frame	Estimate Project Cost(KSHS)
Minimize Solid Waste Generation and ensure more Efficient Solid Waste Management	Raise awareness among occupants about responsible waste management	Manager, Supervisor	Always	30,000
	Provide appropriate and adequate waste handling facilities such as bins within the premises; such facilities should be emptied regularly		One off	10,000
	Dispose waste more responsibly by dumping at designated sites only; the use of a Authorized waste disposal dealers is encouraged		Regularly	5,000 per trip
	Improve housekeeping to ensure reduced litter		One off	Nil
Reduce Electricity Consumption	Switch off electrical equipment, appliances and lights when not being used.	Manager, Supervisor	Continuous	Nil
	Install energy saving fluorescent tubes at all lighting points within the premises instead of bulbs which consume higher electric energy		One-off	Cost is 15-20 % than ordinary

	Consider the possibility of using alternative sources of energy especially renewable ones such as solar		One-off	15-20 % than ordinary
Minimize Water Consumption and ensure more Efficient and Safe Water Use	Sensitize staff to conserve water by avoiding wastage during cleaning and sprinkling exercises	Manager and proponent	Continuous	Nil
	Ensure taps are not running when not in use		Continuous	Nil
	Install water conserving taps that turn-off automatically when water is not being used		One-off	10000
	Maximize rain water harvesting through the building roofs		Continuous	Nil
	Promote treatment and recycling of water as much as possible for reuse		Continuous	Nil
	Install a discharge meter at water outlets to determine and monitor total water usage		One-off	10000
	Put in place measures for quick detection and repair of water pipe and tank leaks		One-off	15-20000 per inspection
Reduce Impact on Waste Water	• Conduct regular checks for sewage pipe blockages or damages since such vices can lead to release of the effluent into the land and surfaces • All waste pipes must have cleaning rodding eyes accessible from outside. i.e. free to every part of the	Manager/ Proponent	Continuous	15-20000 per inspection

	system for inspection, cleaning and repair			
	• All waste from premise should be directed to the existing sewer line. • Monitor effluent quality regularly to ensure that the stipulated discharge rules and standards are not violated • encourage recycling , reusing of water for other purpose like washing the premise	Manager/ Proponent	Continuous	20000
	• The design of internal reticulation effluent system should consider the estimate discharges from individual sources and the cumulative discharge of the entire project i.e. it must have the capacity to consistently handle the loads even during peak volumes.	Manager/ Proponent	One off	Nil
Security	Provide security guards and facilities during the operation for both day and night	Proponent	Continuous	50,000
Occupational Safety and Health (OSH) Concerns	Implement all necessary measures to ensure health and safety of workers, housing occupants and the general public during operation as stipulated in the Occupational Safety and Health (OSH) Act, 2007. This is also discussed in mitigations measures at CHAPTER NINE of this report. It includes offering training to health and safety committee, arranging seminars on communicable diseases, provision of PPES. Offering firefighting equipment and training on how to handle them	Proponent	One off	350,000

7.2.3 Environmental Management Plan for decommissioning phase

Environmental issue	Causes	Proposed mitigation	Responsibility	Cost(Kshs)
Solid Waste and other construction debris on site	Scrapped materials and other debris on site	• Scrap metal should be disposed to licensed dealers • All buildings, machinery, equipment, structures and tools that will not be used for other purposes should be removed and recycled/ reused say in other projects and recycling/reuse of the machinery, equipment, implements, structures, tools and other waste is not possible, the materials should be disposed appropriately	**Proponent**	**100,000**
Rehabilitation of site to original state from land disturbance	Interference with original state of the site	• Source comprehensive landscaping • Backfilling with top soil over burden removed during site clearance	**Proponent**	**150,000**
Air Pollution	Dust Emissions	• Use of dust suppressant(water) to reduce levels of dust. • Use of Well serviced machine • Dust arresting materials to be put on quarry perimeter	**Proponent**	**50,000**
Noise and Vibration	Demolition activities Machinery used	• Activities to be done during the day.	**Proponent**	**40,000**
Occupational Health and Safety Hazards	Demolition activities	• Provide protective clothing at this stage • Use qualified staff in scrapping the building and the machinery and use of appropriate PPE by decommissioning staff	**Proponent**	**50,000**
Rodents	Act as carriers for diseases	• Reduce stock piles	**Proponent**	**Nil**
Change on land /Loss of land	-Land value loss Vegetation abrasion -Soil contamination	• Rehabilitation; backfilling with aggregate in a given sustainable standard	**Proponent**	**50,000**

Water pollution	-Siltation to drainage channels and nearby rivers	- Harmonize and design drainage ditches with the natural drainage to avoid affecting nearby land -Divert run-off around working area. - Separate the quarry with the nearby river by establishing silt fence through planting vegetation at least some meters away from the river to control down washes -Install sedimentation traps or screen next to the silt fence by arranging a layer of quarry chips and gravel to trap any loose soil to the river	**Site Engineer** **Proponent** **Supervisor**	**70,000**

8.0 OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT PLAN

This chapter seeks to breakdown the occupation health and safety factory discussed in the EMPs. The project will pose potential threats to the health and safety especially to the operators in form of injuries; accidents social diseases and security through-out the project cycle hence a management action for occupational health and safety hazards.

8.1 Management Action for the Safety and Health Hazards during Construction and Operation of the proposed project

HEALTH and SAFETY ASPECT	MITIGATION MEASURES	RESPONSIBILITY	TIME FRAME
Approval of building plans	Ensure that all building plans are approved by the Local Authority and the Local Occupational Health and Safety Office	Proponent	One-off
Registration of the premises and general register	Registration of the premises under the OSH Act 2007, Laws of Kenya is mandatory and A general register should be kept within the facility as stipulated in Act.	Proponent & Contractor	One-off
OSHA Act Abstract	The Abstract of the OSHA and Other Places of Work Act must be displayed at prominent places within the site	Proponent & Contractor	One-off
Incidents, accidents and dangerous occurrences	Ensure that provisions for reporting incidents, accidents and dangerous occurrences during construction using prescribed forms obtainable from the local Occupational Health and Safety Office (OHSO) are in place.	Proponent & Contractor	Continuous
Insurance	Ensure that the premises are insured as per statutory requirements (third party and workman's compensation)	Proponent	One-off

Safety, health and environment (SHE) policy	Develop, document and display prominently an appropriate SHE policy for construction works	Proponent & Contractor	One-off
Sanitary conveniences	Suitable, efficient, clean, well-lit and adequate sanitary conveniences should be provided for construction workers	Proponent	One-off
Machinery/equipment safety	Ensure that machinery, equipment, personal protective equipment, appliances and hand tools used in construction do comply with the prescribed safety and health standards and be appropriately installed maintained and safeguarded	Proponent & Contractor	One-off
	Ensure that equipment and work tasks are adapted to fit workers and their ability including protection against mental strain	Proponent & Contractor	Continuous
	Arrangements must be in place to train and supervise inexperienced workers regarding construction machinery use and other procedures/operations	Proponent & Contractor	Continuous
	A government-authorized person must examine equipment such as fire extinguishers. The equipment may only be used if a certificate of examination has been issued	Proponent & Contractor	Continuous
	Reports of such examinations must be presented in prescribed forms, signed by the examiner and attached to the general register	Proponent & Contractor	Continuous
Storage of materials	Ensure that materials are stored or stacked in such manner as to ensure their stability and prevent any fall or collapse	Proponent & Contractor	Daily

Safe means of access and safe place of employment	All floors, steps, stairs and passages of the premises must be of sound construction and properly maintained throughout the project life.	Proponent & Contractor	Daily
	Provide all staircases within the premises with suitable handrails on both sides	Proponent	One-off
	Ensure that construction workers are not locked up such that they would not escape in case of an emergency	Proponent & Contractor	Continuous
	All ladders used in construction works must be of good construction and sound material of adequate strength and be properly maintained	Proponent & Contractor	One-off
Emergency preparedness and evacuation procedures	Design suitable documented emergency preparedness and evacuation procedures to be used during any emergency	Proponent & Contractor	One-off
	Such procedures must be tested at regular intervals	Proponent & Contractor	Quarterly
	Ensure that adequate provisions are in place to immediately stop any operations where there is an imminent and serious danger to health and safety and to evacuate workers during operation	Proponent & Contractor	One-off
	Ensure that the most current emergency telephone numbers posters are prominently and strategically displayed within the site during operation	Proponent & Contractor	One-off
	Ensure there is an assembly point for workers for emergency cases	Proponent & Contractor	One-off
First Aid Box	Well stocked first aid box which is easily available and accessible should be provided within the premises	Proponent & Contractor	One-off

	Provisions must be made for persons to be trained on first aid, with a certificate issued by a recognized body.	Proponent & Contractor	One-off
Fire protection	• Install an automatic fire alarm system at occupation stage, provide some 30m hose reels, adequate fire reserve water storage tanks with an automatic booster pump for hose reel and 9kgs water or powder fire extinguisher within the floors and in basements where there are parking and appropriate Fire Hydrant Ring main with suitable outlet points. • Firefighting equipment such a PORTABLE fire extinguishers should be provided at THE SITE during construction and occupation	Proponent & Contractor	One-off
	Regular inspection and servicing of the equipment must be undertaken by a reputable service provider and records of such inspections maintained	Proponent & Contractor	Quarterly
Warning Signs	Signs such as "NO SMOKING" must be prominently displayed within the premises, especially in parts where flammable materials are stored	Proponent & Contractor	One-off
Ventilation	Enough space must be provided within the premises to allow for adequate natural ventilation through circulation of fresh air during operation	Proponent & Contractor	One-off
Lighting	There must be adequate provision for artificial or natural lighting in all parts of the premises in which persons are working or passing	Proponent & Contractor	One-off

Electrical Safety	Circuits must not be overloaded throughout	Proponent & Contractor	Weekly from the time of operation
	Distribution board switches must be clearly marked to indicate respective circuits and pumps	Proponent & Contractor	One-off
	There should be no live exposed connections at operation	Proponent & Contractor	monthly
	Electrical fittings near all potential sources of ignition should be flame proof	Proponent & Contractor	One-off
Personal Protective Gear (PPG)	Suitable overalls, safety footwear, dust masks, gas masks, respirators, gloves, ear protection equipment etc should be made available and construction personnel must be trained to use the equipment	Proponent & Contractor	One-off
Supply of clean drinking water	Ensure that construction workers are provided with an adequate supply of wholesome drinking water which should be maintained at suitable and accessible points.	Proponent & Contractor	One-off
Washing facilities	Ensure that conveniently accessible, clean, orderly, adequate and suitable washing facilities are provided and maintained in within the site	Proponent & Contractor	One-off
Cleanliness/Housekeeping	All places must be kept in a clean state, and free from effluvia arising from any drain, sanitary convenience or nuisance	Proponent & Contractor	One-off
Safety and Security	Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the construction site and operation phase.	Proponent	Daily

Training on S.T.Is and other communicable diseases	Workers should be trained on Sexually transmitted Infections to guide their interactions with other members of the community. This will go a long way in managing the H.I.V virus and other S.T.Is spread. There should also be training on Waterborne and airborne diseases so that incase of infection it can be managed before there is an outbreak. Publications on the same should be shared.	Proponent	On the onset of the project construction. New employees to be trained as they report

9 PROJECT BUDGET

The total cost of the development is expected to be about KShs.20,000,000

10 CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusion

The ESIA was carried out in hindset of legal framework envisioned in the Environmental Management and Coordination Cahapter 38) and the Environmental (Impact Assessment and Audit) Regulations (2003).

Although there is economic and social justification for the project, there are environmental issues associated with its construction and operation. The project design has been scrutinized and discussed with the Project Proponent and has been found to integrate appropriate mitigation measures with a view to ensuring compliance with all the applicable laws and procedures. In this regard, a comprehensive mitigation and monitoring plan has been developed in order to provide a detailed environmental management plan that will guide the entire project cycle (from construction through to decommissioning).

Issues raised from the prject include dust and noise pollution. It should however be noted that the neighbouring land owner hasn't put any structure on the land and hence it is based on future occurances.

It is also important to note that, the proponent is aiming at adopting the EMP throughout the project cycle therefore mitigating the issues raised on air and noise pollution.

The overall responsibility of the incorporation of mitigation measures and ensuring environmental protection lies with the Proponent and the foreman. During and after construction. The Proponent and site foreman will be responsible for the day to day management of the quarry. The site foreman contractor will be directly responsible for the construction activities, and the Building Management for the maintenance once the building is operational, and ensuring its activities are not environmentally detrimental.

10.2 Recommendations

The sheer size and economic potential of the quarry mining industry makes it extremely important for a country such as Kenya to make optimal use of its natural resources in order to increase its revenue and also ensure that stone aggregate required in the construction industry is availaible in the set grade. This can be achieved as long as operations are carried out in an environmentally sustainable manner.

To that end, recommendations for corrective measures for the potentially significant and/or adverse environmental impacts, and safety risks, have been provided as an integral part of this EIA project report and development of this project should be allowed to proceed.

A summary of the recommendations for the prevention and mitigation of potentially adverse environmental and social-economic impacts is presented below:

Planning/Design/Construction Phase:

- Control; clearing of vegetation
- Install proper drainage structures and erosion control measures on the site

- Establish flow rates into the natural drainage and costructed drain within site area.
- Also test the quality of the water
- Install proper disposal facilities for wastewater disposal (for workforce)
- Provide for disposal of construction debris and solid waste
- Provide for proper storage of oils, oil products and chemicals
- Install oil interceptors where oil is likely to enter drains
- Provide sound proofing for generators
- Use bonafide / environmentally friendly materials sources
- Rote quarrying to be done/per block of land quarring
- Ensuring controlled excavation, and rehabilitation after use
- Use solar powered technology as a subtitute and gravity flow water reticulation systems to save
- energy
- Supervise and sensitize construction traffic, prohibiting off-road driving, dust and noise emissions, and enforcing speed limits
- Locate the Building discretely, and design the facilities to maximize on natural light

Operation and Maintenance Phase:

- Maintenance of drainage and erosion control structures, roads, structures, water distribution and treatment facilities
- Minimize and manage water and energy use
- Sensitize guests and staff on water conservation issues
- Keep data on water quality baseline and follow-up testing along streams
- Sensitize all drivers with regard to dust and vehicle exhaust fumes, and careful driving
- Ensure proper storage and handling of oil, oil products and blasting materials
- Manage solid waste management, and train staff and local communities to reduce/recycle/reuse waste
- Prohibit off-road driving and enforce speed limits
- Employ local community members wherever possible
- Train local community members to provide standard services that can be used by the site occupants (food provision)
- Keep fully equipped first aid kit on site at all times, and have staff trained on first aid
- Provide and maintain firefighting equipment, and provide emergency response training
- The following aspects must be monitored during operation of the Building:
    a. Water quality in receiving waters;
    b. Adequacy and operation of waste management systems; and
    c. Wildlife kills on the roads
    d. Maintenance of the road network, equipment, structures, etc, and proper supervision by the

Decommisioning Phase:

- Silt fence should be established where erosion is predetermined

- Introduce vegetation in already mined areas
- Introduce physical barriers such as rocks/plants to intercept soil material from being carried away by the run-off
- Constant sprinkling of water to the bare areas or around stock piles
- Identify wind direction during operation to avoid exposure to emission
- Minimize the generation of bad emission from trucks used by assessing and evaluating whether they contain toxic by products
- All the workers should be provided with masks to avoid inhaling such emmissions
- Minimize area of clearance
- Reintroduce the vegetation that coexist with the site
- Backfilling the burrowed pits using earth excavated wastes
- The operation should only be done during the day time
- Planning the trips of the vehicles can reduce such impacts.
- Screening using baffle materials e.g soil and wastes that has already been removed to access the rock
- Locate screening baffle molds on site boundary to reduce noise
- The workers to be provided with earmuffs during operation hours.
- Supervision of the site by a person with knowledge of dangerous quarrying activity and accepted blasting practices
- Correct stemming will aid the control of ground vibration.
- Monitoring of blasting
- Avoid blasting in adverse weather conditions when it's too dry and windy-Soil and earth excavated wastes to be used for backfill excavated pits Surface run-off from waste tips should be captured and treated to remove suspended solids prior to discharge.
- Safe disposal of oil spills and filters from machineries
- Rehabilitation of dug out quarries as soon as quarry is exhausted Harmonize and design drainage ditches with the natural drainage to avoid affecting nearby land
- Divert run-off around working area.
- Separate the quarry with the nearby stream by establishing silt fence through planting vegetation at least some meters away from the river to control down washes
- Install sedimentation traps or screen next to the silt fence by arranging a layer of quarry chips and gravel to trap any loose soil to the river
- Isolate the site for rest of the community for their safety
- All moving parts of machine should be covered with suitable guards.
- Keep accidents and incidents records

- Provide, and enforce use of personal protective equipment and trained on occupational health.
- Fire-fighting equipment and First aid kits should also be provided at the site
- All waste excavated materials should be contained within the land parcel boundaries else, compensations claims may arise
- Holds top soils by planting vegetation on the pit backfilled.
- Ensure reduced stagnation of water in pits
- Protective structures should be used to avoid small scale landslides
- Topsoil should be stockpiled, properly backfilled and compacted separately from subsurface and after completion works be restored in order to facilitate natural regeneration around the area of quarrying site
- Planting of fast growing trees indigenous or not invasive of said species
- Design drainage ditches to avoid affecting nearby land
- Divert run-off around working area
- Create of diversion channel to ensure no water flows across rehabilitated areas until it is stable
- Minimize area of clearance
- Sensitive natural habitats (if any) should be identified early in planning so that alternative route design may be constructed
- Preserve vegetation to the nearby watercourses as much as possible
- Soiling, aggregating and grassing of all the quarry pits

11 REFERENCES

Environmental Assessment Source Book, 1999 (World Bank).
Environmental Assessment Requirements, A Guide for UN-HABITAT Activities.
Environmental Management and Co-ordination Chapter 387
Environmental (Impact Assessment and Audit) Regulations, Kenya Gazette Notice No. 56 of 13th June 2003.
The Physical Planning Act, Cap 86.
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Explosive act CAP 115
Work Injuries Benefits Act, No13, 2007
UNEP (2009): Developing Integrated Solid Waste Management Plan - Training Manual: Volume 2: Assessment of Current Waste Management System and Gaps therein

12 Appendices

Identification of Company.(Pin and Registration Certs)
Public Participation
Land ownership documents
Advert on Change of use