ENVIRONMENTAL IMPACT ASSESSMENT REPORT

THE PROPOSED JOSEPH KIMANI RIBUU/NDANI IKAME/ JOSEPH KABORO KIBOBO QUARRIES LOCATED ON LR NO. KIAMBU/MUNYU/372/406/209

AT KOMO AREA, MUNYU SUB-LOCATION IN THIKA DISTRICT, KIAMBU COUNTY

PROPONENT
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DISCLAIMER

The information contained within this Environmental Impact Assessment Report has been compiled with due care and published in good faith. It is for the purpose of guidelines in decision making for **Joseph Kimani Ribuu, Ndani Ikame and Joseph Kaboro Kibobo** (in line with to establish a quarry) and NEMA. Any use of this material thereof shall strictly be in accordance with the agreement of the proponent and the expert. It is however, subject to conditions spelt out in the Environment Impact Assessment Report Regulations 2003 under the Gazette supplement No 56 of 13th June 2003.

This environmental impact assessment report is strictly for **Joseph Kimani Ribuu, Ndani Ikame and Joseph Kaboro Kibobo Quarries** and NEMA. Any use of this material thereof should strictly be in accordance with the agreement of the proponent and the author. It is however, subject to conditions spelt out in the Environment (Impact Assessment and Audit) Regulations 2003 under the Gazette supplement No 56 of 13th June 2003.

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Abbreviation

EIA……Environmental Impacts Assessment

EMCA……Environmental Management Co-ordination Act

EMP……Environmental Management Plan

JKUAT…….Jomo Kenyatta University of Agriculture and Technology

MKU……Mount Kenya University

KM……..Kilometer

KPLC……Kenya Power and Lighting Company

NEMA……...National Environmental Management Authority

TOR……Terms of Reference

LR /NO……Land Registration Number

EXECUTIVE SUMMARY

This Environmental Impact Assessment Report has been carried out on behalf of **Joseph Kimani Ribuu, Ndani Ikame and Joseph Kaboro Kibobo** with respect to the proposed to establish a quarry on 4 Ha, in parcel Number Kiambu/Munyu/372/406/209. This land they are in one area, which located at Komo area in Thika District, Munyu Sub-location, Gatuanyaga Location in Kiambu County at 1.0500^0S, 37.0833^0 E

In accordance with the Terms of Reference (TOR) for this study, likely environmental impacts have been assessed and proposal for mitigation measures and monitoring plans prepared with regards to construction and operation phases of the proposed development.
The project operation will mainly involve the extraction of the rock layer in the project area primary using stone cutting machine. The stone blocks produced will then be loaded manually into transporting tracks to their various destinations.

The study was carried out through desktop study and field investigation. The consultant conducted extensive literature review pertaining to the current study. During the field investigations, reconnaissance survey was conducted to gather information on biophysical and socio-economic aspects of the area and its environs. In conducting the environmental Impact study, the team has compiled with the requirement of the National Environmental Management Authority (NEMA), following the Environmental (Impact and Auditing) Regulation of 2003, The Environmental Impact Assessment Guidelines, the World Bank procedures as indicated in the World Bank's Environmental Impact Assessment Sourcebooks.

The environmental considerations evaluated for the proposed development includes: Ecological Considerations (biological diversity, sustainable land use and ecosystem maintenance), Social-economical consideration, Geophysical and land used. The EIA identified the definite and the probable impacts of the project. The potential environmental impacts were classified into the following categories:

Positive impacts:
Employment creation, increase income and revenue generation, increased utilization of natural resource, increased development in housing sector.

Negative impacts
The negative impacts which were identified includes: noise, air pollution, oil spills, removal of vegetation, and deep depressions.

In-order to alleviate any negative impacts emanating from the construction and operation activities of the proposed project, relevant and cost effective mitigation measures are proposed.
The environmental Management and monitoring plan was later prepared to guide the proponent and his employee to ensure that mitigation process is successful achieved.

1.0 INTRODUCTION

This project report has been prepared in respect of a proposal by **Joseph Kimani Ribuu, Ndani Ikame and Joseph Kaboro Kibobo Quarries**. To start a quarry on the said LR No acres on 4 Ha, in parcel Number Kiambu/Munyu/372/406/209 has as attached agreement which is in Komo area in Thika District , Munyu Sub-location, Gatuanyaga Location in Kiambu County.

Thika east District the nearby towns recently have been experiencing accelerated development in housing demand, this has triggered development in housing units to cope with the demand. In the past, environmental management has been based on reactive policies which led to belated measures that did not necessarily save ecosystems from damage. Most measures only looked at end products and the wastes management concentrated on the end-of-pipe waste treatment. A new philosophy of waste prevention and reduction has emerged and is fast gaining popularity. Today industrial facilities are fast realizing that their focus should be on how to prevent generation of waste and how to reduce accumulation of waste generated by re-use or recycling whenever possible.
For many years Kenyan environmental policies were handled by different arms of government which made it difficult for proper monitoring and implementation resulting into conflicts and duplication of duties.

In 1999 Kenya enacted the Environmental Management and Co-ordination Act (EMCA), 1999. The Act provides for the formation of National Environmental Management Authority (NEMA).Environmental Audit is one of the provisions of EMCA 1999 and Environmental impact Assessment and Audit regulation 2003.
In compliance with the Environmental Act (1999) the project requires an Environmental Impact Assessment done and the report submitted to NEMA for approval.

2.0 SCREENING

This involved determination whether or not an EIA study was required for the proposed project. This depends on the significance of the project's environmental impacts. The significance itself depends on such factors as: the sensitivity of the area likely to be affected; public health and safety; possibility of uncertain, unique or unknown risks; the possibility of having individually insignificant but cumulatively significant impacts; whether the proposed project will affect protected areas, endangered or threatened species habitats. A screening checklist was designed to help users decide whether EIA was required based on the characteristics of a project and its environment and the result appended.

2.1 Scope the study.

The project assessment investigates the anticipated environmental impacts of the proposed development in line with the Environmental (Impact and Audit 2003 Regulation. Consequently, the report will provide the following information:

- Review of the policy, legal and administrative framework.
- The nature of the project.

- The location of the project, including physical area that may be affected.
- The activities that shall be undertaken during project; construction, operation and decommission phases.
- The materials to be used, products and by-products, including wastes to be generated and methods of disposal.
- The potential environmental impacts of the project and the mitigation measures to be put in place during construction operation and decommission phases.
- An action plan for the prevention and management of possible accident

2.3 Objectives of the project.

The main objectives of the quarry are to:

1. Produce building stones for the local market and the country as a whole.
2. Create employment for the local population.
3. Create profit for the proponent.
4. To develop an Environmental Management Plan (EMP) for future environmental auditing.
5. To propose cost effective mitigation measures for the significant negative impacts of the project on the environment

3.0 Description of the project environment

3.1 Biodiversity

Flora

The dominant vegetations at the project site are: shrubs, with patches of grass cover. The adjacent to the site are other quarries. There are presences of sisal, lantana camara, Gravelia Robusta and scattered aloe Vera.

Fauna

The rock parts inhabits; reptiles (lizards) and rodents (squirrels, Hares). The shrubs and the grasses also form the habitat for; Antelopes, and Gazelles. The area also forms grazing land for goats from the adjacent dwelling. There is also high human presence in the adjacent quarry area. These are either involved in direct mining activities or supplies of essential commodities (food and drinks) to the mine workers.

3.2 Geology and soils.

The area generally forms the western border zone of the plains with volcanic lavas that occurred about three million years ago. The lavas rest on the basement rocks. They are deep and a gentle slope. The project area is located in an area covered by the Kerichwa Valley sediments and tuffs underlying the trachytes series. The Thika Trachytes with intercalated sediments and tuffs underlies the kerichwa series. The kerichwa valley trachytes consist of thickly bedded impermeable strata. Dark Mica sporadic hexagonal flakes characterize the coarse pumiceous layer. They are also interwoven with layers of

clay stones and predominantly soils are Ferrosols, Acrisols and some patches of Vertisols on flat areas.

3.3 Climate

The climate around Thika is humid-highlands subtropical with dry and wet seasons. Rainfall is seasonal with a bimodal pattern of rainfall. The long rains are received in March to May and short rains in October to December. The average rainfall is about 750mm. The dry spells are in between the two seasons from January to February and a longer spell from June to September. The temperatures range from 34◦c during months of August to a lower as 9◦c during the month of July, the coldest in the year. These scenarios have not been spared by the ongoing climate change. The rainfall patterns has not been consistent and occurred within short period leaving the rest of the year with very little rainfall.

3.4 Topography

The proposed project location is generally sloping towards the river with a maximum slope of 20-25%. Otherwise the adjacent land is relatively flat. The project site is on the slope of a ridge on the reach of Komo River. The general slopes of the area have been reduced over time due to the ongoing mining activities. The area is within the sub-catchments of Athi basin.

3.5 Population

Thika, Ruiru and Gatundu Districts have high population density and development of this project will continue easing building pressure. There is high influx of people in districts during the day due to commercial activities which characterize major town in this country. The proposed project site is currently sparsely populated; it has just few permanent buildings. Juja areas have had high population increase due to increase in the number of students residing outside the campus, thus increasing the pressure on the housing facilities within the area. This forms the market for the dressed building stones for building.

The majority of the populates are low income earners who rely on the employment and trade to make the ends meet while a smaller segment of this people falls within the high income earners. These are majority these people are the employees of the Bidco, BAT and Mount Kenya University and prominent businessmen. At the project site are people who come mainly from Komo, Munyu and Muguga to work as casual labourors and loaders in the mines.

3.6 Socio-economic

The economic basis of Thika town is dominated by developments of industries, agricultural activities, building, commerce and institutions. These are the most significant developments that generate employment in the neighborhood. Since the area is predominately residential, industrial development is restricted from a planning perspective so as to avoid land use conflicts.

There are a host of socio-economic activities occurring next to the proposed project site. These include; Agriculture, horticulture, small-scale business enterprises and quarrying which is a common activity due to the nature of the sub-stratum rock formation. The area depends upon rivers, dams, streams, boreholes, springs, and rainwater harvesting. The ground water resources are high with a slight saline gradient due to the basement rock.

A major highway Thika-Garrisa Highway road transects through the area making it accessible to major markets. The area is well served with electricity, telephone services, schools, and hospitals, providing opportunities for development.

3.7 Project description location

3.7.1 Present site conditions

The project area was selected following field survey and consultations with proponent during the survey it was found that the underlying rock is suitable for construction stones. The rock can physically be seen from surface and it will not require deep excavation before commencing the project. Since the rock is close to the surface, the area currently is unsuitable for any agricultural use. There are also other quarries within the facility hence it is evident that the area is suitable for the proposed project. Due to the increase in population there is high demand for construction within Munyu Sub- location and environs. The site is also well serviced with good road network

The site is relatively flat. The area covered by few grass and a few shrubs. There are some quarries in the adjacent neighborhood. These quarries used machine to extract building blocks of various sizes.

3.7.2 Design

The quarrying is going to a continuation of already existing quarry activities in the same piece of land. It is intended for production of building stones using machine cut technology. In this case, the machines are adjusted to produce stones of the required sizes, eliminating the need for hand dressing later.

The main parts of the project include, clearing of vegetation, removal of overlaying soils through excavation. The project occupies an area of 4 Hectares. The site will include an office block, sentry, surrounded by a perimeter wall.

3.7.3 Operation of the quarry

During operation, mechanized plants will be used for excavation of top soil to expose the rock beneath. Stone dressing machine with axial and horizontal rotating blades will be used to cut and dress the building blocks according to predetermined sizes. The dressed blocks will then be loaded manually into the waiting trucks for transportation to various destinations. The common block sizes produced by this method are nine by nine feets and six by nine feets; as dictated by the local building demands.

3.7.4 Infrastructure

Access roads

The proposed site can be access through a murram road about 60 Kilometers from Nairobi –Thika highway – Garissa road at Makongeni Junction, Kang'oki route (which is main road for dumping site). The road is currently in good condition as it is constantly maintained by the Municipality council of Thika and quarry owners. The means of transport to the proposed site are Bodaboda motor bicycles, tracks for building block and personal cars. There is also a police station at Komo, Makongeni and Kiganjo

Electricity

There is electricity supply.

Education

There also exist various education facilities in the areas ranging from nursery, primary, secondary schools and post secondary. Among the schools within the vicinity are: Komo primary school, Komo mixed secondary school, Munyu girls secondary school, Munyu mixed day school, Theos Senior School a private mixed primary school there is also nearby university MKU. These have ensured that the people in this area receive the best education necessary.

Recreation facilities:

The area is endowed with many recreational facilities where people come for various activities.

Water supply

This area has a river called Komo and Chania river which is basically serving the community within. The People in the area are well supplied with tapped water through Thika Water and Sewerage Company. The water supply in the area is metered to allow efficient application of billing system. Also people in the vicinity have also dug shallow well in area where the water table is high enough to allow this.

3.7.5 Materials and equipment

During construction cement, sand and natural stones will be used for perimeter wall; steel will also be used in reinforcing the concrete for the wall. The quarry will put up offices for the management and other supportive staffs. The construction technology that will be used in erecting the perimeter wall will be according to standards recognized by various regulatory bodies and government departments (building codes, British standards).

3.8 NEIGHBOURHOOD

The area is surrounded by various quarries, agricultural land and undeveloped land.

3.9 COST

Total cost is estimated at 9,200,000 million as we are buying an old machine to cut stones and hiring other required machinery. Land is as per production as stated on the contract.

3.10 ALTERNATIVES TO THE PROJECT

The following are alternative of the projects.

a) Land to remain the way it is.

Advantage.

1) No negative impacts associated with quarry mining.
2) No massive investments.
3) Less injuries as compared with quarry activities.

Disadvantage.

1) Lack of development in the area.
2) Lack of employment.
3) Lack of building materials within the environs.
4) Against government of Kenya policies on job creations and investments.
5) Lack of wealth creation for the owners.
6) Minimal financial contribution to county government of Kiambu.

b) Housing.

Advantages.

1. Good ashestic compared with quarry.
2. Will increase housing within the environs.

Disadvantages.

1) Capital intensive compared to quarry.
2) Lower return to the owners
3) Area not ideal for housing
4) Minimal financial contribution to county government of Kiambu

c) Ranching.

Advantage.

1) No negative impacts associated with quarry mining.
2) Increase in availability of livestock within the area.
3) Less injuries as compared with quarry activities

Disadvantages.

1) Capital intensive.

2) Area has very low rainfall and stocking rate will be very low.
3) Poor returns to the owners.
4) Minimal financial contribution to county government of Kiambu.

4.0 Legal and regulatory framework

The following Laws and Standards apply to the building and the tenancy for the activities of businesses housed therein.

4.1. National Environmental Action Plan (NEAP)

According to the Kenya National Environment Action Plan (NEAP), the Government recognized the negative impacts on ecosystems emanating from industrial, economic and social development programs that disregarded environment sustainability. Following on this, establishment of appropriate policies and legal guidelines as well as harmonization of the existing ones have been accomplished and / or are in the process of development. Under the NEAP process, Environmental Impact Assessment and Audit were introduced targeting the industrialists, business community and local authorities.

4.2. Policy paper on Environment and Development

(Sessional paper No. 6 of 1999):

The key objectives of the policy includes:-
To ensure that from the onset, all development policies, programs and projects take the following environmental considerations into account:
To ensure that an independent environmental impact assessment (EIA) report is prepared for any industrial venture or other development before implementation, and Environmental Audits undertaken for existing enterprises.
To come up with effluent treatment standards that will conform to acceptable health guidelines. Under this paper, broad categories of development issues have been covered that require a "sustainable development" approach. These issues relate to waste management and human settlement. The policy recommends the need for enhanced re-use/recycling of residues including waste water, use of low or non-waste technology increased public awareness raising and appreciation of a clean environment. It also encourages participation of stakeholders in the management of waste within their localities. Regarding human settlement, the paper encourages better planning in both rural and urban areas and provision of basic needs such as water, drainage and disposal facilities among others.

4.3 The EMCA 1999

Part II of the Environment Management & Coordination Act, 1999 states that every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment.

According to section 58 of the Act an environment impact assessment study needs to be carried out on projects specified in the second schedule of the Act that are likely to have a significant impact on the environment. This project is considered to fall under the second schedule of the Act.
Part VII section 68 of the same Act requires operators of projects or undertakings to carry out subsequent environmental audits in order to determine level of conformance with statements made during the EIA. The Impact Assessment Impact report should be submitted to NEMA.
Part VIII section 78 of the Act prohibits discharging or applying poisonous, toxic, noxious or obstructing matter, radioactive or any other pollutants into aquatic environment. Section 73 requires that operators of projects which discharges effluent or other pollutants to submit to NEMA accurate information about the quantity of the effluent. Section 74 demands that all effluent generated from point sources are discharged only into the existing sewerage system upon issuance of prescribed permit from the local authorities.
Section 87 sub-section 1 states that no person shall discharge or dispose of any wastes, whether generated within or outside Kenya, in such a manner as to cause pollution to the environment or ill health to any person.
Section 89 provides that any person who, at the commencement of this Act, owns or operates a waste disposal site or plant that generate hazardous waste, shall apply to the NEMA for a license.
Section 90 through 100 outlines more regulations on management of hazardous and toxic substances including oils, chemicals and pesticides.

4.4 The Water Act, 2002

Part II section 18 of this Act provides for national monitoring and information system on water resources. Section 73 of the Act allows a person with (licensee) to supply water to make regulations for purposes of protecting against degradation of water sources. Section 75 and sub-section 1 allows the licensee to construct and maintain drains, sewers and other works for intercepting, treating or disposing of any foul water arising or flowing upon land for preventing pollution of water sources within his/ her jurisdiction.

Section 76 state that no person shall discharge any trade effluent from any trade premises into sewers of a licensee without the consent of the licensee upon application indicating the nature and composition of the effluent, maximum quantity anticipated, flow rate of the effluent and any other information deemed necessary. The consent shall be issued on conditions including payment of rates for the discharge as may be provided under section 77 of the same Act.
Section 94 of the Act makes it an offence to throw or convey or cause or permit to be thrown or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive or unwholesome matter or thing into or near to water resource in such a manner as to cause, or be likely to cause pollution of the water resource.

4.5 The Public Health Act (Cap. 242)

Part IX, section 115 of the Act state 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 areas under 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 waste pipes, sewers, drains or refuse pits in such a state, situated or constructed as in the opinion of the medical officer or health to be offensive or injurious to health. Any noxious matter or waste 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 by a medical officer of health is also deemed as unacceptable and is likely to harbour rats or other vermin.

Part XI section 129 of the Act state in part "It shall be the duty of every local authority to take all lawful, necessary and reasonably practicable measures for preventing any pollution dangerous to health of any supply of water which the public within its district has a right to use and does use for drinking or domestic purpose".

Section 130 provides for making and imposing regulations by the local authorities and others the duty of enforcing rules in respect of prohibiting use of water supply or erection of structures draining filth of noxious matter into water supply as mentioned in section 129. This provision is supplemented by section 126A that requires local authorities to develop by-laws for controlling and regulating, among others, private 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 state that all collections of water, sewage, rubbish, refuse and other fluids which permits or facilitate the breeding or multiplication of pest shall be deemed nuisances and to be dealt with in the manner provided by this Act.

4.6 The Local Government Act (Cap. 265)

Section 160 helps local authorities ensure effective utilization of the sewage systems. It state in part that municipal authorities have powers to establish and maintain sanitary services for the removal and destruction of, or otherwise deal with all kinds of refuse and effluent and where such service is established, compel its use by person to whom the service is available.

Section 163 (e) gives powers to the local authorities to prohibit businesses which by reason of smoke, fumes, chemicals, gases, dust, smell or noise may be or become a source of danger, discomfort or annoyance to the neighbourhood, and to prescribe conditions subject to which such businesses shall be carried on Treasure industries will need to observe these requirements during the operation of the station.

Section 165 empowers the council to grant or to renew business licenses or to refuse the same.

Section 170, allows the right of access to private property at all times by local authorities, its officers and servants for purpose of inspection, maintenance and alteration or repairs of sewers. To ensure sustainability in this regard, the local authority is empowered to make by-laws in respect of all such matters as are necessary or desirable for the

maintenance of health, safety and wellbeing of the inhabitants of its area as provided for under section of the Act.

4.7 The Physical Planning Act, Cap 286

The Local Authorities are empowered under section 29 of the Act to reserve and maintain all land planned for open spaces, parks, forests and green belts. The same section, therefore, allows for prohibition or the use and development of land and buildings in the interest of people and orderly development of an area.

Section 30 state that any person who carries out development without permission will be required to restore the land to its original condition. It also state that no other licensing authority shall grant license for commercial or industrial use or occupation of any building without a development permission granted by the respective local authority.

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

4.8 The Penal Code (Cap. 63)

Section 192 state that any person who voluntarily violates the atmosphere in any place, so as to make it noxious to the health of people in general dwelling or carrying on business in the neighborhood or passing along a public way, is guilty of a misdemeanor.

Section 193 state that any person who, for the purpose of trade or otherwise, makes loud noise or offensive or unwholesome smells in such places and circumstances as to annoy any considerable number of person in the exercise of their common rights commits an offence and is liable to be punished as for nuisance.

4.9 The employment ACT, 2007

Section 3. (1) States that this Act shall apply to all employees employed by any employer under a contract of service. Section 5 (3) demand that no employer shall discriminate directly or indirectly, against an employee or prospective employee or harass an employee or prospective employee-

1. On grounds of race, colour, sex, language, religion, political or other opinion, nationality, ethnic or social origin, disability, pregnancy, mental status or HIV status;
2. In respect of recruitment, training, promotion, terms and conditions of employment, termination of employment or other matters arising out of the employment.

4.9 The occupational safety and health ACT, 2007

Part II section 6. (1) Every occupier shall ensure the safety, health and welfare at work of all persons working in his workplace. Section (3) of the same Act allows every occupier

to carry out appropriate risk assessments in relation to the safety and health of persons employed and, on the basis of these results, adopt preventive and protective measures to ensure that under all conditions of their intended use, all chemicals, machinery, equipment, tools and process under the control of the occupier are safe and without risk to health and comply with the requirements of safety and health provisions in this Act.

Part IV section 47. (1) Demands 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 subsection (1) Section 48. (1) Also requires that an occupier shall ensure that his workplace shall not, while work is carried on, be so overcrowded as to cause risk of injury to the health of the persons employed therein. 49. (1) an occupier shall ensure that effective and suitable provision is made for securing and maintaining, by the circulation of fresh air in each 50**.** (1) An occupier shall ensure that effective provision is made for securing and maintaining sufficient and suitable lighting, whether natural or artificial, in every part of his workplace in which persons are working or passing. 52. (1) Sufficient and suitable sanitary conveniences for the persons employed in the workplace shall be provided, maintained and kept clean, and effective provision shall be made for lighting the conveniences; and, where persons of both sexes are or are intended to be employed (except in the case of workplaces where the only persons employed are members of the same family dwelling there), such conveniences shall afford proper separate accommodation for persons of each sex.

4.10 The work injury benefits ACT, 2007

Part 111 section 7. (1) States that every employer shall obtain and maintain an insurance policy, with an insurer approved by the Minister in respect of any liability that the employer may incur under this Act to any of his employees. Section 10. (1) Says that an employee involved in an accident resulting in the employee's disablement or death is subject to the provisions of this Act, and entitled to the benefits provided for under this Act. (2) An employer is liable to pay compensation in accordance with the provisions of this Act to an employee injured while at work.

4.11 The trade licensing Act Cap 497

Section 5 of the Act makes it mandatory for all business to obtain trading licenses.

4.12 Workmen's Compensation Act, Cap 236.

Part 2 section 5 states that if any personal injury by accident arising out of and in the course of the employment is caused to a workman, his employer shall, subject as hereinafter provided be liable to pay compensation in accordance with the provision of this Act and for the purposes of this Act. An accident resulting in the death or serious and permanent incapacity of a workman shall be deemed to arise out of and in the course of his employment, not withstanding that the workman was, at the time when the accident happened, acting in contravention of any statutory or other regulation applicable to his employment, or that he was acting without instruction from his employer if such act was done by the workman for the purposes of and in connection with his employers trade or business.

4.13 Agriculture Act Cap 318

This Act provides legislative control over soil conservation and land management. The clearing of vegetation in steep slopes or in areas adjacent to water causes without authorization is strictly forbidden. The Ministry of Agriculture can impose land conservation orders to control cultivation, grazing and clearing of vegetation.

The Mining Act 306

Legal framework in mineral resources development mineral exploration and exploitation are presently carried out under the auspice of the mining ACT CAP.306 of the laws of Kenya. This act promulgated in 1940, has been reviewed to match contemporary international miming practice. The reviewed draft mineral law is to provide for lesser discretionary powers to licensing authorities and hence provide for greater security of tenure. It also aim to provide for greater environmental protection, as embodied in the 1999 environmental management and coordination Act, from the undesirable effects of mining activities. Together with the 1999 environmental management and coordination act from the undesirable effects of mining activities. Together with the review of the Act, the government is also in the process of formulating a mineral policy in Kenya.

5.0 Environmental Impacts of the project

Introduction

The proposed project is small-scale in nature. However, it will have impacts on the natural environment, the social environment as well as the economic status of the local society and the nation at large. Different impacts will be experienced at different project phases. A useful way of identifying the potential impacts of a project is to identify all the activities or sources of impact that could arise from construction, operation or decommissioning of the project, and to consider these alongside the characteristics of the project environment that could be affected, to identify where there could be interactions between them.

The scoping checklist was used to show how the secondary and higher order effects could occur as a result of a primary interaction between a project activity and the project environment i.e. a change in site run-off could affect the hydrology of a watercourse; this could subsequently affect water quality and the ecology of the watercourse.

5.1 Positive Impacts

Employment

The proposed project will require both skilled manpower to operate and service the machinery used , Semi-skill manpower will also be require to load the blocks of the stones into transporting tracks. This creation of employment will reduced the agony this country is currently facing due to unemployed youths. Employment created will also lead to increase in standard of living of these people. There are many people who will benefit from this proposed project in that, the worker will have to stay nearer to their working site, this will increase revenue of the local landlords and those who sales essential commodities to these workers. For example, that mama Uji who will be selling food and drink to the workers, Those Bodaboda operators who will be transporting workers to and from the site. The improved standards of living of these people will improve their resilience against economic hardships.

Increased development

The availability of relatively cheap building blocks will increase the rate of development activities. Developer in most of targeted areas will have raw materials to increases the amount of housing units and thus even push shanty dwelling to a thing of the past. The demand of housing facilities will be readily met i.e. Thika, Makongeni and landless areas which have been experiencing high demand for houses in the area as a result of increase in population due to influx of people to the area for better opportunities; will be among the beneficiaries of this proposed expansion of this project.

Revenue generation

The operation of the proposed project will create income both for the government and the local authority. The transporting track will pay levy to the local authority. This revenue will enhance service delivery by the authority. The taxes from all these activities will improve the overall government income at the national level.

5.2 Negative impacts

Accidents and occupational hazards

The construction of the quarry will require the used of earth moving equipment and machine cutting machines. These if not proper precaution is not taken may cause accidents and injuries may be lethal. The act of loading blocks of stones into transporting tracks may also be very dangers to the workers and may cause injuries too. The abandon quarries if not properly filled may be filled with water and the may be dangerous and to people and animals.

Insecurity

The abandon quarry site may be a dangerous place to walk alone. These sites if left unattended after decommissioning may harbors thugs who may cause terror to the neighboring estate.

Change in land use

The land use in this area has been changing from Natural vegetated area to commercial coffee farms. Since the proposed project will involve removal of top soils by used of scrappers and bulldozers and the extraction of building blocks. This will change the current use to a mine and later to a rehabilitated land after decommission.

The alternative uses of the mine after decommission may range from refilling to tree planting.

Loss of vegetation

The area currently is under sparse vegetation and sparse grass cover. The parts are just bear with rock outcrops. The vegetation will be cleared using pangas and any other tool, but most of them will be uprooted using bulldozers. There will be loss in diversity of trees and shrubs of which some are of medicinal value i.e. aloe Vera.

Disturbance of soil structure

The action of removing the overlaying soil material will involve scrapping and pushing of soils using bulldozers. The interaction of the blades and the soil will lead to major destruction of soil structure.

The disturbance of geological structures of the area many affect the foundation of the nearby structures, thus reducing their life span.

Impact on air quality

The process of removing the overlaying soils and also transportation of the blocks a lot dust road, results to emission of a lot of dust to the atmosphere. These may cause health problems to the workers or those who are residing along or users of the same the roads. Emission from the equipment and vehicles will cause atmospheric pollution especially when the engines are not properly serviced.

Aesthetic value

The abandon quarry sites presents will present displeasing scenario (an eye sour); of which many people would not like being near or exposed to. Many people may be afraid of accident or situation that may make the uneasy.

Increased run-off

The area is relatively flat one section and on one side, it slopes at 20-30% towards the River Ndarungu. The topography become steeper as you move downward and flattens as you approach the river. This type of landscape is prone to erosion. This risk may be accelerated by a lot of earth movement during construction and operation. The eroded soils may increase the silt load in the River thus lowering that water quality and possibly loss of aquatic life

Noise

The operation of the quarry will involve the use of heavy machines with powerful engines to excavate the top soils and cut the building blocks to required sizes. The machine will produce noise pollution to the surrounding areas.

These may cause the following adverse effects:

- It creates annoyance to the receptors due to sound level fluctuations. The aperiodic sound due to its irregular occurrences causes displeasure to hearing and causes annoyance.
- The physiological features like breathing amplitude, blood pressure, heart-beat rate, pulse rate, blood cholesterol are effected.
- Long exposure to high sound levels cause loss of hearing. This is mostly unnoticed, but has an adverse impact on hearing function.
- The working performance of workers/human will be affected as they'll be losing their concentration.
- Nervous system: pain, ringing in the ears, feeling of tiredness, thereby effecting the functioning of human system.
- Damage to materials**:** The buildings and materials may get damaged by exposure to infrasonic / ultrasonic waves and even get collapsed.

Waste generation

The possible wastes which will be generated are oil spills from the tracks, bulldozers, and any other machine. There are also likely of having hips of wastes soils and dusts from beneath the surface. These may contain a lot of heavy metals and may generally be infertile.

5.3 Analysis of Environmental Impacts

In the analysis of environmental impacts, the Leopold Matrix was adopted and appended in table a. The importance and magnitude were determined for various environmental characteristics vis-à-vis project activities. The product of magnitude and importance were computed and a scale was used to determine the level of significance; high, medium, low.

High

These impacts will usually result in long-term effects on the biophysical and/or socio-economic environment. Impacts rated as high will need to be considered as constituting a major and usually long-term change to the biophysical and/or socio-economic environment.

Moderate

These impacts usually result in medium-term effects on the biophysical and/or socio-economic environment. They could either result in major changes that are limited in extent, or in minor changes that affect a wide area or large group of people. Impacts rated as moderate need to be considered as constituting a fairly important and usually medium-term change. These impacts are not substantial and may have no real threat to the environment.

Low

These impacts will usually result in short-term effects on the total environment. They would result in minor changes that affect a small area or a small group of people. Impacts rated as low need to be considered as constituting a fairly unimportant and usually very short-term change to the environment.

The impacts identified were arrived at by evaluating the extent of the quarrying and the flora and fauna on the proposed site, as well as conducting interviews and holding discussions with the public.
The possible impacts at the various stages of the project are as outlined below:

Prospecting and Exploration Stage
During this stage the rock potential of the area is investigated through trial and experimental techniques. Some excavation of the potential site will be carried out until the rock layers are exposed to evaluate whether they are of the required quality. If found to be appropriate, quarrying will proceed. The activities to be carried out at this point will have minimal impacts on the environment.

5.4 Mitigation measures

The purpose of mitigation is to identify measures that will safeguard the environment and the community affected by the proposal project expansion. The objectives of mitigation are to:

- Find better alternatives and ways of doing things;
- Enhance the environmental and social benefits of a proposal;
- Avoid, minimize or remedy adverse impacts; and
- Ensure that residual adverse impacts are kept within acceptable levels.

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Mitigation measures must be translated into action in the correct way and at the right time if they are to be successful. Mitigation can be carried out by: structural measures, such as design or location changes, engineering modifications and landscape or site treatment; and non-structural measures, such as economic incentives, legal, institutional and policy instruments, provision of community services and training and capacity building.

Mitigation against air Quality
The process that will contribute to air pollution will be confined to the dust emitted during the rock cutting stage transportation along the murrum road. The significance

level of this impact is moderate. The most probable cause of the pollution will be dust. However, this will be minimized by sprinkling water frequently a long the road.
Since the cutting machines are diesel-powered, the impact will be minimal as proper servicing and maintenance will be done. Water will be continuously used in the process to wet the rocks, cool the machines and in the process it will settle the dust. The management proposes to provide the machine operators with dust masks and ear muffs as a mitigation measure against these impacts.

Mitigation against Land scarification

The expected impact on the existing land during the mining stage will be the clearing of vegetation in an area of approximately 30 Acres of land. Deep excavations of up to 70-90 feet will be made, depending on the depth of the underlying rock. These impacts will be relatively major and can be categorized as high.

The site should be into other uses after rehabilitation at the end of the project life to ensure that most is gotten out of it. The area could be refilled with debris and later replanted with suitable species of plants.

Mitigation against noise pollution

The techniques employed for noise control can be broadly classified as:

- Control at source: Maintenance of automobiles by regular servicing and tuning of vehicles will reduce the noise levels. The vibrations of materials may be controlled using proper foundations, rubber padding etc. to reduce the noise levels caused by vibrations. Selection of machinery**:** Optimum selection of machinery tools or equipment reduces excess noise levels

- Using protective equipment: The usage of protective equipment and the worker's exposure to the high noise levels can be minimized by rotating the job between the workers working at a particular noise source or isolating a person, the adverse impacts can be reduced. Exposure reduction: Regulations prescribe that, noise level of 90 dB (A) for more than 8 hr continuous exposure is prohibited. Hearing protection: Equipment like earmuffs, ear plugs etc. are the commonly used devices for hearing protection. Average noise attenuation up to 32 dB can be achieved using earmuffs

6.0 Environment Management /Monitoring Plan

The objectives of impact management are to: ensure that mitigation measures are implemented; establish systems and procedures for this purpose

Project Stage	Impact	Mitigation Measure	Timing of Mitigation	Cost Mitigation (Khs)	Person Responsible	Monitoring Measure	Time of Monitoring	Cost of Monitoring(kshs)	Responsibility
Construction	Soil Erosion	Plant a grass waterway	On commissioning	50000	Site Manager	Ensure that the grass water-way is maintained	quarterly	2000	Foreman
	Air Pollution	Sprinkling water to reduce dust, service and maintenance of vehicles and machines.	On commissioning	20000	Site Manager	Ensure Full time watering of the roads, regular servicing of the vehicles and machines	quarterly	5000	Foreman /Manager
	Water Pollution	Plant a grass waterway	On commissioning	10000	Site Manager	Ensure the grass water-way is maintained	quarterly	2000	Foreman /Site Manager
	Noise Pollution	Service and maintenance of vehicles and machines, provide ear muffs for the workers, Construction a perimeter wall	On commissioning	25000	Site Manager	Review log sheets and ensure regular servicing of the vehicles and machines. Ensure PPE's are provided	quarterly	2000	Foreman /Site manager
	Loss of Aesthetics	Fencing off the site	Before commencing site works	5,000	Site Manager	Ensure fencing is done in good time and adequately done.	bi annually	20000	site manager
	Flooding	Build drainage trenches, Pump out the water	When necessary	5000	Site Manager	Ensure proper maintenance of drainage trenches and continuous pumping of flood waters when necessary	quarterly	1000	Foreman
	Land Pollution	Sprinkling water to reduce dust, service and maintenance of vehicles and machines.	On commissioning	10000	Site Manager	Ensure roads are frequently sprinkled with water, reviewing of log sheets and regular maintenance of vehicles and machines	quarterly	1500	Foreman/ site manager

Project Stage	Impact	Mitigation Measure	Timing of Mitigation	Cost Mitigation (Khs)	Person Responsible	Monitoring Measure	Time of Monitoring	Cost of Monitoring(kshs)	Responsibility
	Disease and Insect Vectors	Control flooding, Provide PPE's, water and sanitation.	From inception	30000	Site Manager	Regular health check-ups of the workers, proper use of PPE's, provide a reliable source of water and sanitation	quarterly	5000	site health officer
	Influx of people	Expand the existing social amenities and infrastructure	On commissioning	Nil	Municipal Council / Site Manager				
	Traffic Congestion	Expand the existing road networks, Erecting road signs.	On commissioning	Nil	Municipal Council / Site Manager	Ensure vehicles are road worthy, road signs are in place and provide a traffic controller	Yearly	1000	site manager
	Accidents	Fencing off the site, Train staff on occupational health and safety	On commissioning	50000	Site Manager	Ensure workers are properly trained on site operations, construct guard rails, ensure moving parts are covered and keeping proper records of occurrences and near misses.	bi annualy	3000	site manager
	Fire		On commissioning	20000	Site Manager	Use skilled labourers, Erect signs, Provide fire fighting equipment	annually	2000	site manager
Decommissioning	Air Pollution	Sprinkling water to reduce dust, service and maintenance of vehicles and machines, Use of PPE's.	On commissioning	5000	Site Manager	Ensure sprinkling of water regularly, service and maintenance of vehicles and machines, Review service logs	quarterly	1000	care taker
	Water Pollution	Sprinkling water to reduce dust, Service and maintenance of vehicles and machines	On commissioning	2000	Site Manager	Ensure that the embankment is well built and that grass is planted	quarterly	1000	Foreman/Sit manager

Project Stage	Impact	Mitigation Measure	Timing of Mitigation	Cost Mitigation (Khs)	Person Responsible	Monitoring Measure	Time of Monitoring	Cost of Monitoring(kshs)	Responsibility
	Noise Pollution	Use of PPE's, service and maintenance of vehicles and machines.	On commissioning	2000	Site Manager	Ensure roads are frequently sprinkled with water,reviewing of log sheets and regular maintainance of vehicles and machines	quarterly		Foreman
	Land Pollution	Sprinkling water to reduce dust, service and maintenance of vehicles and machines.	On commissioning	5000	Site Manager	Ensure roads are frequently sprinkled with water,reviewing of log sheets and regular maintainance of vehicles and machines, and proper waste disposal	quarterly		site manager
	Soil Erosion	Plant a grass waterway, building an embankment	After Land fill	2000	Site Manager	Ensure land embarkments are built well and grass is planted	quarterly		Foreman
	Change in Soil structure	Planting of soil compacters eg leguminous plants	After Land fill	1000	Site Manager	Ensure plant compactors are planted	bi annualy	1000	Foreman
	Transport Congestion	Erect road signs and appoint a transport controller,	From inception	3000	Site Manager/ Transport manager	Ensure vehicles are road worthy, road signs are in place and provide a traffic controller	annually		Foreman/ Site manager
	Accidents	Erect road signs and appoint a transport controller, use skilled labourers	From inception	Nil	Site Manager/Health care provider				
	Unemployment	Training and capacity building, Introduce self-help groups.	Before operations begin	Nil	Proponent/ Site manager				
	Diseases	Use of PPE's, Provision of a health care provider, Sprinkling of water to reduce dust.	On commissioning	Nil	Health care provider/Site manager/Proponent				
	Social Disruption	Training and capacity building, Introduce self-help groups.	From inception	Nil	Proponent/ Site manager				

7.0 Economic and social analysis of the quarry

Quarrying has direct and indirect impacts on the economy at the local and national levels. Its economic usefulness is derived from its way of wealth creation and conversion of natural resources to products useful to other sectors of the economy.

This activity will create direct and indirect employment opportunities which will raise the living standards of the local community. The project will be an income generating activity for the proponent and a source of wealth creation.

The project will also contribute to the national economy in the sense that, they will not only pay taxes inform of trade license, but will also supply building materials to the construction industry. Thus enhancing the growth of national development.

8.0 Conclusion

The project will not only enhance economic sustainability within the university but also at the municipality and district levels. The results of the assessment and the compliance rating results show that the proponent has put in place several measures to mitigate the negative environmental, social, health and safety impacts associated with the projects activities, in accordance to the projects objectives of job creation, income generation and extraction of building materials.

8.1 Recommendation

The proponent agrees to adhere to prudent Environmental Management Plan and therefore it's recommended that;

a) The proponent should address and implement all proposed mitigation measures.
b) A formal constitution of an environmental committee and social welfare unit for the workers be set up for the capacity building and training. There should also be a provision for adequate resources and facilities.
c) Laborers to be sourced from the local community where possible so as to increase the economic gains of the community and alleviate poverty.

Appendices

Table a. showing a screening checklist

- Yes - if the answer is yes
- No - if the answer is no
- - If the answer is don't know

Questions to be Considered For further guidance on factors to be considered see the more detailed questions listed in the Scoping Guidance	Yes / No / ? . Briefly describe	Is this likely to result in a significant effect? Yes/No/? - Why?
Brief Project Description: The proposed mine will involve the machine extraction of building stones of various sizes.		
1. Will construction, operation or decommissioning of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in water bodies, etc)?	Yes The activities of the mining will involve the removal of top soil and building blocks	Yes Loss of agricultural land and siltation of the nearby dam.
2. Will construction or operation of the Project use natural resources such as land, water, materials or energy, especially any resources which are non-renewable or in short supply?	Yes The project will occupy the rest of the 30acre that has not been mined.	No The largest portion of the land has already been mined.
3. Will the Project involve use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health?	No	No
4. Will the Project produce solid wastes during construction or operation or decommissioning?	Yes Overlying debris and dusts from the mine	Yes May pollute the surface water and cause health problems
5. Will the Project release pollutants or any hazardous, toxic or noxious substances to air?	Yes Dusts and smoke from poorly maintained engines	Yes May cause respiratory problems
6. Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?	Yes Noise from the engines, and transporting tracks	Yes May impair earring and lack of concentration.

7. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into surface waters, groundwater, coastal wasters or the sea?	Yes Soil debris and dust	Yes This may compromise water quality further
8. Will there be any risk of accidents during construction or operation of the Project which could affect human health or the environment?	Yes The mines may pose a lot of risk of accident. This will leave a permanent scare on the surface	Yes Injuries and possible loss of life. The surrounding has already undergone degradation.
9. Will the Project result in social changes, for example, in demography, traditional lifestyles, employment?	No	No
10. Are there any other factors which should be considered such as consequential development which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality?	Yes Availability of building material will enhance building development in the targeted areas.	No.
11. Are there any areas on or around the location which are protected under international or national or local legislation for their ecological, landscape, cultural or other value, which could be affected by the project?	No	No
12. Are there any other areas on or around the location which are important or sensitive for reasons of their ecology e.g. wetlands, watercourses or other water-bodies, the coastal zone, mountains, forests or woodlands, which could be affected by the project?	No.	No.
13. Are there any areas on or around the location which are used by protected, important or sensitive species of fauna or flora e.g. for breeding, nesting, foraging, resting, overwintering, migration, which could be affected by the project?	No	No
14. Are there any inland, coastal, marine or underground waters on or around the location which could be affected by the project?	No	No

15. Are there any areas or features of high landscape or scenic value on or around the location which could be affected by the project?	No	No
16. Are there any routes or facilities on or around the location which are used by the public for access to recreation or other facilities, which could be affected by the project?	No	No
17. Are there any transport routes on or around the location which are susceptible to congestion or which cause environmental problems, which could be affected by the project?	No	No
18. Is the project in a location where it is likely to be highly visible to many people?	Yes Mines will be very deep	No
19. Are there existing land uses on or around the location e.g. homes, gardens, other private property, industry, commerce, recreation, public open space, community facilities, agriculture, forestry, tourism, mining or quarrying which could be affected by the project?	Yes Quarry.	Yes They may affected
23. Are there any areas on or around the location which are densely populated or built-up, which could be affected by the project?	No.	No
25. Are there any areas on or around the location which contain important, high quality or scarce resources e.g. groundwater, surface waters, forestry, agriculture, fisheries, tourism, minerals, which could be affected by the project?	No.	No.
27. Is the project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions e.g. temperature inversions, fogs, severe winds, which could cause the project to present environmental problems?	No	No
Joseph Kimani Ribuu, Ndani Ikame and Joseph Kaboro Kibobo Quarries will produce building stones in Thika east area around 60km from Nairobi- Thika highway and 14kms from Thika, Makongeni to Komo. The proposed activities will has warrant a project proposal.		

Table b: showing the scoping checklist for evaluating the Significance of Impacts.

No.	Questions to be considered in Scoping	Yes/No/ ?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
1. Will construction, operation or decommissioning of the Project involves actions which will cause physical changes in the locality (topography, land use, changes in water bodies, etc)?				
1.1	Permanent or temporary change in land use, land cover or topography including increases in intensity of land use?	Yes	Land use and land cover	Yes. For land use change from agriculture to mine
1.2	Clearance of existing land, vegetation and buildings?	Yes	Removal of vegetation	No
1.3	Creation of new land uses?	Yes	Mines to be created	Yes. Huge depressions
1.4	Pre-construction investigations e.g. boreholes, soil testing?	Yes	No..	No
1.5	Reclamation works?	No		
1.6	New road, rail or sea traffic during construction or operation?	Yes	Access roads	No
1.7	New road, rail, air, waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?	No		
1.8	Impoundment, damming, converting, realignment or other changes to the hydrology of watercourses or aquifers?	No		
1.9	Stream crossings?	No		
1.10	Abstraction or transfers of water from ground or surface waters?	No		
1.11	Changes in water bodies or the land surface affecting drainage or run-off?	Yes	There could be runoff	No
1.12	Long term dismantling or decommissioning or	Yes	Restoration or rehabilitation at	Yes. Problem of cleaning up the site

	restoration works?		decommissioning	
1.13	Ongoing activity during decommissioning which could have an impact on the environment?	Yes	Reclamation of the ponds	Yes. Land use change
1.14	Influx of people to an area in either temporarily or permanently?	Yes	Influx of workers	Yes. Social impact and strain of resources
1.15	Loss of native species or genetic diversity?	Yes	Insects and rodents	No
1.16	Any other actions?	Yes	Soil erosion	Yes. Siltation of lagoons and river water pollution
2. Will construction or operation of the project use natural resources such as land, water, materials or energy, especially any resources which are non-renewable or in short supply?				
2.1	Land especially undeveloped or agricultural land?	Yes	Change in land use	Yes. Land is scarce and possibility of relocation
2.2	Water?	Yes	During construction and dust settling	Yes. More water will be needed
2.3	Minerals?	No		
2.4	Aggregates?	Yes	During construction	No
3. Will the Project involve use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health?				
3.1	Will the project affect the welfare of people e.g. by changing living conditions?	Yes	Improved housing	Yes. Improved health
3.2	Any other causes?	No.		No.
4 Will the project produce solid waste during construction, operation or decommissioning?				
4.1	Spoil, overburden or mine wastes?	Yes	During excavation	Yes. Disposal site required
4.2	Municipal waste (household and or commercial wastes)?	No		
4.3	Hazardous or toxic wastes (including radioactive wastes)?	No		
4.4	Other industrial process wastes?	No		
4.5	Construction or demolition wastes?	Yes	Small buildings	No

4.6	Redundant machinery or equipment?	Yes	Broken down machines	
5. Will the Project release pollutants or any hazardous, toxic or noxious substances to air?				
5.1	Emissions from production processes?	Yes	Dust and debris	Yes. Results in pollution
5.2	Emissions from materials handling including storage or transport?	No		
5.3	Emissions from construction activities including plant and equipment?	Yes	Vehicular emissions during construction	Yes. Health hazard
5.4	Emissions from any other sources?	No		
6. Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?				
6.1	From operation of equipment eg engines, ventilation plant, crushers?	Yes	During construction and excavation	Yes. Noise and air pollution
6.2	From construction or demolition?	No		
6.3	From blasting or piling?	No		
6.4	From construction or operational traffic?	Yes	Earth movers and tippers	No
6.5	From any other sources?	No		
7. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into sewers, surface waters, groundwater, coastal waters or the sea?				
7.1	From handling, storage, use or spillage of hazardous or toxic materials?	Yes	Debris and silt	Yes. Siltation and pollution
7.2	By deposition of pollutants emitted to air, onto the land or into water?	Yes	Gases and Dust	No
7.3	From any other sources?	No		
7.4	Is there a risk of long term build up of pollutants in the environment from these sources?	Yes	Heavy metals from quarry dust	No.
8. Will there be any risk of accidents during construction or operation of the Project which could affect human health or the environment?				
8.1	From events beyond the limits of normal environmental	Yes	Possibility of flooding during el nino,	Yes. Will interfere with the treatment

	protection eg failure of pollution control systems?		earthquakes and dry season	
8.2	From any other causes?	No		
8.3	Could the project be affected by natural disasters causing environmental damage (*eg* floods, earthquakes, landslip, *etc*)?	Yes	Possibility of flooding during el nino, earthquakes and dry season	Yes. Will interfere with the treatment
9 Will the project result in social changes e.g. in demography, traditional lifestyles, or employment?				
9.1	Changes in population size, age, structure, social groups *etc*?	Yes	Influx of people due to improved sanitation	Yes. Strain on the resources
9.2	By resettlement of people or demolition of homes or communities or community facilities eg schools, hospitals, social facilities?	No		
9.3	Through in-migration of new residents or creation of new communities?	Yes	Influx of new residents and workers	Yes. Strain on the resources. Increase in commerce
9.4	By placing increased demands on local facilities or services eg housing, education, health?	Yes	Influx of people	Yes. Strain on limited resources
9.5	By creating jobs during construction or operation or causing the loss of jobs with effects on unemployment and the economy?	Yes	Many jobs created during construction and limited long jobs during operation	No
9.6	Any other causes?	No		
10 Are there any other factors which should be considered such as consequential development which could lead to environmental effect or the potential for cumulative impacts with other existing or planned activities in the locality?				
10.1	Will the project lead to after-use of the site which could have an impact on the environment?	Yes	Site could be turned into a tree nursery and recreation site	Yes. Land use change
10.2	Will the project set a precedent for later developments?	Yes	Will precipitate major developments into a major urban centre	Yes. Will impact land use in the area.
10.3	Will the project have	Yes	Will compound the effect	Yes. Will add on to

	cumulative effects due to proximity to other existing or planned projects with similar effects?		the coffee and flower farms which also discharge effluents into the river	the pollution of the river

APPENDIX III

Table c. showing the Leopod matrix

Project action activities	Loss of vegetation	Noise	Dust	Employment	Aesthetics	River/Gwater pollution	Landuse change	Diseases/ Vector	Erosion	**Total**
Site clearance	-2/1	-3/1	-2/2	3/2	-4/1	-3/3	-4/3		-2/1	**-15/14**
Construction of wall		-1/1	-1/1	3/2	-2/2	-1/1	-1/1	-2/1	-1/1	**-6/10**
Operation phase		-3/2	-2/2	4/2	-2/1	-2/1	-2/2	-1/1	-1/1	**-9/12**
Decommissioning		-2/1	-2/1	1/1	-2/2	-1/1	-3/2	-2/2	-1/1	**-12/11**
Total	**-2/1**	**-/95**	**-7/6**	**11/7**	**-10/6**	**-7/6**	**-10/5**	**-5/4**	**-5/3**	

APPENDIX IV

Attached

1. Questionnaires
2. Copy of title deed
3. Copy of lease agreement
4. Copy of experts practicing Licence
5. Geological Report
6. Copy of ID