ENVIRONMENTAL IMPACT ASSESSMENT

REPORT FOR

THE PROPOSED THREE BLOCK RESIDENTIAL UNITS' DEVELOPMENT ON PLOT L.R NGONG/NGONG/4483, ONGATA RONGAI, KAJIADO COUNTY.

This Environmental Impact Assessment (EIA) Report is submitted to the National Environment Management Authority (NEMA) in conformity with the requirements of the Environmental Management and Coordination Act, Cap 387 and the Environmental (Impact Assessment and Audit) Regulations, 2003

PROJECT PROPONENT SUNRISE ECOVALE LIMITED P.O. BOX 30551, NAIROBI, KENYA	**LEAD EXPERT** Arch. Patrick M. Karugo, NEMA Reg. No. 0742, P.O. BOX 5015-00506 Nairobi

GENERAL INFORMATION

PROJECT TITLE

Environmental Impact Assessment for the proposed Three Block Residential Units Development on plot L.R Ngong/Ngong/4483, Ongata Rongai, Kajiado County.

PROJECT LOCATION

The proposed project is located Off Gataka Road behind St. Mary's Catholic Church, it is 500m from Magadi Road in Ongata Rongai area within Kajiado county. It lies on latitude -1.3923724 South and longitude 36.7608354.

LEAD EXPERT

Arch. Patrick M. Karugo,
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PROJECT PROPONENT

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CONTACT PERSON

Mr. Gitonga
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PIN NUMBER

P052267651K

COORDINATES

Latitude: -1.3923724

Longitude: 36.7608354 East

CERTIFICATION

This Environmental Impact Assessment study report has been prepared by Arch. Patrick M. Karugo (NEMA Reg. No. 0742) and James K. Mbuthia (NEMA Reg. No. 13160). The report has been done with reasonable skills, care and diligence in accordance with the Environmental Management and Co-ordination Act, 1999 and the Environmental Impact Assessment and Audit Regulations, 2003.

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ACROMYMS

EIA	Environmental Impact Assessment
CCTV	Closed Circuit Television
CPP	Consultations and Public Participation
EA	Environmental Audit
EMCA	Environmental Management and Coordination Act
ERC	Energy Regulatory Commission
ERP	Emergency Response Plan
ESH	Environmental Sanitation and Hygiene
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GDP	Gross Domestic Product
GHG	Green House Gases
ILO	International Labor Organization
ISWMS	Integrated Solid Waste Management System
KEBS	Kenya Bureau of Standards
KPLC	Kenya Power and Lighting Company
LED	Light Emitting Diode
LPG	Liquified Petroleum Gas
NCA	National Construction Authority
NCCRS	National Climate Change Response Strategy
NEAP	National Environmental Action Plan
NEC	National Environment Council

NEMA	National Environmental Management Authority
NET	National Environment Tribunal
NGO'S	Non-Government Organizations
NLC	National Land Commission
NPEP	National Poverty Eradication Plan
OSHA	Occupational Safety and Health Act
PAP	Project Affected Persons
PPE's	Personal Protective Equipment's
SDG	Sustainable Development Goals
SPSS	Statistics Packages for Social Sciences
UN	United Nations
UNCED	United Nations Conference on the Environment and Development
NFCCC	United Nations Framework Convention on Climate Change
VAT	Value Added Tax
WCC	Waste Collection Centre
WIBA	Work Injury Benefit Act

EXECUTIVE SUMMARY

Introduction

Housing is a key component of urban development. Improved housing is not only a desirable goal in its own right, but it also contributes to economic growth, social development, improved governance and enhanced security and stability. Failure to deal with housing issues will lead to the continued growth of slums and poorly serviced informal settlements on the urban periphery. Considering these conditions, the proponent, Sunrise Ecovale ltd., proposes to construct a multi-units residential development consisting of three blocks with 1st and 2nd basement as a parking lot and ground floor to 8th floor accommodating 6 shops and 448 units residential apartment of one, two and three bedrooms.

Subsequently, construction activities have an impact to the environment in one way or another, be it the social, economic, biological or physical environments. Such impacts should be checked to avoid or reduce any negative effects to the environment, the general public and its health. With improved infrastructure in the form of housing provision, there is bound to be a rise in business opportunities leading to increased population. Increase of population, be it temporary (during construction as a result of labor import) or permanent (as a result of employees or tenants to reside/operate from the proposed development), is likely to stretch services and other facilities in and around the project area. Measures should be put in place to ameliorate against any potential negative impacts and maximize on any positive ones.

According to the Environmental Law of Kenya, Section 58 of the Environmental Management and Coordination Act (EMCA) Cap 387, Amended in 2015 and Legal Notice No. 101 of 2003, procedural steps involved in this assessment are as follows

- Baseline Studies, Identification of key stakeholders, Consultation and public participation
- Scoping and development of the Terms of Reference (ToRs)
- Analysis of project alternatives
- Impacts identification and analysis and Development of mitigation measures
- Development of the Environmental Management Plan (EMP) Objectives of the ESIA are to:

i. To identify potential environmental impacts of proposed project, policies, plans and programmes
ii. To assess the significance of these impacts
iii. To assess the relative importance of the impacts of alternative plans, designs and site.
iv. To propose mitigation measures for the significant negative impacts of the project on the environment
v. To generate baseline data for monitoring and evaluation of how well the mitigation measures are being implemented during the project cycle
vi. To present information on impacts of alternatives
vii. To present the result of an EIA in such a way that they can guide decision making.

In Kenya, ESIA has to be conducted according to the requirements of EMCA. An ESIA document submitted to the enforcement authority, NEMA, enables the issuing of an ESIA License. When properly designed and implemented, ESIA is a powerful tool for ensuring that environmental issues are given due consideration during project design, allowing the benefits of the project to be maximized, while reducing the potential environmental and social costs of development. Thus, all due care should be taken into account to ensure that the environment of the project area is not disturbed in a way that could affect the living standards and styles of the surrounding people in a negative manner.

The ToR for the ESIA were to establish baseline conditions, impact assessment, development of mitigation measures and an EMP with respect to the environment, socio-economic and community participation, physical environment, energy, environmental health/public health and safety, analysis of legislative and institutional framework for environmental management in Kenya, and analysis of project alternatives. It was also required to establish institutional needs to implement the recommended action plans.

The methodology for conducting this study included: mobilization and planning; desk review of documents; field data collection; project data synthesis; public consultation and participation. A number of stakeholders were consulted for their inputs to the study through public meetings (baraza), key informant interviews and completion of qualitative questionnaires. The applied field methodologies for data collection included:

qualitative questionnaires; key informant interviews and random field visits to the project area.

A number of project alternatives were considered in the assessment. These include the "no project" alternative. Although this would lead to preservation of the environmental conditions, this alternative was the least favorable if we are to seriously consider the economic advantage of

the proposed project. Potential Decommissioning phase impacts include loss of direct and indirect employment, demolition waste, noise pollution, dust and exhaust emissions, occupational health and safety hazards.

The EMP that was developed for this ESIA report outlines the actions that are required to address the identified potential negative impacts, responsibility, implementation stage, costs and relevant regulations/standards to guide monitoring and auditing of the effectiveness of the proposed mitigation measures.

The proposed project offers many significant positive impacts at the local, regional, national and even international levels. The anticipated positive impacts include: direct and indirect employment generation, increase in revenue collection, increased business opportunities, promotion of enterprises and above all, increase in the much needed housing facilities in the City of Nairobi.

On the other hand, potential significant negative environmental impacts of the proposed project may affect environmentally sensitive areas such as underground water sources, air quality, humans and their cultural properties. The potential social impacts could include loss of sense of place, lack of privacy, increased traffic and setting of a building trend in the area. The main issues are geographically limited, well defined, and well understood in Kenya. Thus, the proponent's major task in respect of the EMP is to properly manage the potential negative impacts while enhancing the positive ones to ensure a project that is economically, socially and environmentally sustainable. The proposed project could be approved for implementation provided that the proponent adequately incorporates measures to mitigate the potential negative impacts while enhancing the potential positive impacts as well as implementing the EMP.

Conclusion and Recommendations

In conclusion, the proposed project shall have several positive economic benefits during its different phases and does not pose any serious negative environmental impact on the Environment if the set guidelines, laws and building standards are adhered to strictly. Moreover, these impacts are synonymous with development project and can adequately be mitigated through the implementation of the EMP. Our conclusion is that the project is important for economic development and its benefits outweigh its shortcomings. Thus, the proposed development is recommendable for approval by the authority for issuance of an EIA License.

CHAPTER ONE: INTRODUCTION

1.1 Introduction

Worldwide, the need to pursue sustainable development guided by environmental, social, cultural and ethical considerations has been accorded high priority. The goal of sustainable development cannot be achieved without significant changes in the ways development initiatives are planned, implemented and managed. In order therefore to achieve these changes, humanity has to consider as a matter of priority environmental conservation, protection and security as essential elements of the entire process of sustainable development. Kenya has made significant steps in the implementation of environment-friendly legislations, significant of which is the Environmental Management and Coordination Act (EMCA) CAP 387 which makes Environmental Impact Assessment an essential element in the overall project management cycle.

1.2 Objectives of the EIA

The main objective of the ESIA study is to carry out a systematic examination of the present environmental situation within the project area, to determine whether the proposed project will have any adverse environmental impacts to the surrounding area. Specifically, the study set out to achieve the following objectives:

i. To identify potential environmental impacts of proposed project, policies, plans and programmes.
ii. To assess the significance of these impacts.
iii. To assess the relative importance of the impacts of alternative plans, designs and site.
iv. To propose mitigation measures for the significant negative impacts of the project on the environment
v. To generate baseline data for monitoring and evaluation of how well the mitigation measures are being implemented during the project cycle
vi. To present information on impacts of alternatives
vii. To present the result of an EIA in such a way that they can guide decision making.

1.3 Project Objectives

The proposed project objectives are:

i. To provide a three block a multi-units residential development.
ii. To meet the economic desires of the proponent;
iii. To put the current land into more productive and economic use.

1.4 Terms of Reference (TORs)

Mr. Patrick M. Karugo was appointed as consultants to conduct the Environmental Impact Assessment of the proposed residential apartments on plot **L.R Ngong/Ngong/4483, Kajiado County.**

The scope of the assessment covered implementation works of the proposed project which included ground preparation, and construction of the development as well as associated utilities required by the project. The output of this work was a comprehensive Environmental Impact Assessment project report for the purposes of applying for an EIA license.

It was recognised that any form of development such as the proposed project is likely to impact the site and the surrounding environment hence, before any commencement of any work, there was an urgent need to carry out an Environmental Impact Assessment in compliance with the Environmental Management and Coordination Act (EMCA) of 1999 and Environmental Impact Assessment and Audit Regulations, 2003.

The Environmental Impact Assessment included the necessary specialist studies to determine the environmental impacts relating to the biophysical, health and safety, and socio-economic aspects and to determine the issues or concerns from the relevant authorities and interested and/or affected parties. The appropriate measures to ensure the co-existence of the proposed development with other social and economic activities in the area will be provided as part of an Environmental Management Action Plan.

The main objective of the assignment was to assist the project proponent to prepare a project report after carrying out an Environmental Impact Assessment (EIA) of the proposed project, to it takes into consideration appropriate measures to mitigate any adverse impacts on the environment. The study identified existing and potential environmental impacts and possible concerns that interested and/or affected parties have with the development, as well as the associated prevention and mitigation

measures for the negative impacts as stipulated in the Environmental Management Plan (EMP) as proposed.

The consultant on behalf of the project proponent conducted the study by incorporating but not limited to the following terms of reference: -

- The location of the proposed project site.
- A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project.
- Objectives of the proposed project.
- The technology, procedures, and processes to be used, in the implementation of the project.
- The materials to be used in the construction and implementation of the project.
- The products, by-products, and waste to be generated by the project.
- A description of the potentially affected environment.
- The environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term, and long-term effects anticipated.
- Provide alternative technologies and processes available and reasons for preferring the chosen technology and processes.
- Analysis of alternatives including project site, design and technologies.
- An environmental management plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, timeframe and responsibility to implement the measures.
- Provide an action plan for the prevention and management of foreseeable accidents and hazardous activities in the cause of carrying out development activities.
- Propose measures to prevent health hazards and to ensure security in the working environment for the employees, residents and for management in case of emergencies.
- An identification of gaps in knowledge and uncertainties which were encountered in compiling the information.

- An economic and social analysis of the project.
- Such other matters as the Authority may require.

1.5 Scope of the study

The study has been conducted to evaluate the potential and foreseeable impacts of the proposed development. The physical scope is limited to the proposed site and the neighboring environment as it may be affected by or may affect the proposed project. Any potential impacts, (localized or delocalized) are also evaluated as guided by EMCA CAP 387 and the Environmental (Impact Assessment and Audit) Regulations 2003. This report includes an assessment of impacts of the proposed site and its environs with reference to the following:

i) A review of policy, legal and administrative framework

Several policies, legal and administrative arrangements and protocols - both local and international - that have a direct bearing on the proposed development were reviewed. This was in an attempt to establish the frameworks within which the significance of the various impacts expected from the proposed development could be evaluated. These have formed the basis for the determination of the significance of the various impacts associated with the proposed project.

ii) Description of the proposed project

The proposed project has been described in terms of location and physical characteristics of the project area, design of the development, products, by-products and waste. This approach is important because it makes it possible to know the likely sources of impacts how the impacts relate to one another in terms of being direct, indirect, cumulative, reversible etc. in order to suggest practical recommendations for their proper management.

iii) Review of the baseline information

Baseline information forms the basis of degree and magnitude of the impact since they give the conditions of the environment in terms of resources and impacts before the implementation of any project and its infrastructure. This helps in the monitoring

exercise and for that matter brings into focus the extent of the accuracy of the prediction of the impacts in question.

iv) Proposition of alternatives

Any planning activity must strive to give practical alternatives with regard to resource allocation. EIA as a planning tool must therefore give options that can be pursued in order to get sustainable results. The alternatives are looked at in terms of product mix, site, technology, design, scale and extent. The comparisons of these with the proposed project give rise to the best project option.

1.6 Methodology

Since the proposed site is located within an area with no rich natural resources whose total effect to the surroundings could not be adverse and noting that the intended development and use of the facility will be in line with what exists in the surrounding areas, an environmental project report would be seen to be adequate. The general steps followed during the assessment were as follows:

i. Screening of the project in accordance to the requirements of schedule 2 of the EMCA Cap 387 and EMCA (Amendment) 2015,
ii. A scoping exercise that identified the key issues to be addressed in the assessment.
iii. Documentary review on the nature of the proposed activities, policy and legal framework, environmental setting of the area and other available relevant data/information.
iv. Public participation and discussions with the local community, proponent and the project team.
v. Physical investigation of the site and the surrounding areas using a pre-prepared checklist identifying possible environmental and human safety issues that are likely to be affected,
vi. Reviewing the proposed project designs and implementation plan/schedules with a view to suggesting suitable alternatives,
vii. Developing an EMP outline with responsibilities, schedules, monitorable indicators and time frames among other aspects,

viii. A comprehensive report including issues as listed in the Environmental (Impact Assessment) Regulations 2003.

1.7 Justification of the project

1.7.1 Housing as a Human Right

Housing is a human right in as much as air and/or water. Like food, even those who cannot afford it need it perhaps much more than those who can, because the latter could be in it for the investment returns. By its nature, housing represents a major investment requiring a substantial capital outlay. In the majority of housing projects, the developer, whether as a corporate or individual, has to recognize the time value concept of money.

1.7.2 The Gap

There is a glaring gap between the demand and availability of affordable middle and upper class housing in the more affluent sections of urban centers. It is against this backdrop that areas near cities and urban centers have attracted an interest in housing property development. Land Tenure, Financing, Legal Framework, Building Materials and Appropriate Technology seem to be the greatest challenges to affordable housing in both rural and urban areas. Invariably they generate informal settlements in towns and rural areas alike.

1.7.4 Socio-economic Benefits

The proposed development is in line with the government housing policy that aims at facilitating the attainment of adequate shelter and healthy living environment to all socio-economic groups in the country. Further, the proposed project will aid in achieving one of the country's big four agenda: affordable housing.

In particular, the proposed development will generate the following positive socio-economic impacts:

i. Provision of houses, hence increase in the national/local housing stock and quality.
ii. The optimal use of land i.e. increased utility of the parcel of land.

iii. Boost local investment to both the government and the proponent. The proponent will benefit through renting of the residential units and the government through levies and taxes.

iv. Creation of market for goods and services. Many secondary businesses are also likely to spring up during the construction phase especially those providing foods and beverages to the construction workers.

v. Provision of employment opportunities throughout the project cycle.

vi. The proposed development will indirectly contribute towards enhancement of security in the neighborhood of the area.

1.7.5 Neighborhood Development Trend

The neighborhood of the plot is currently undergoing transformation with several high rise apartments coming up. The proposed development shall therefore be in conformity with this trend which shall ensure better utilization of the land giving it higher value.

CHAPTER TWO: PROJECT DESCRIPTION, DESIGN AND IMPLEMENTATION

2.1 Nature of the proposed Project site

Currently the proposed project site is occupied with a residential apartment and a private residential Masonite. At site, there is other temporary structures, an open ground area, boundary wall, gate and a guardhouse. There is also presence of vegetation and grass as ground cover, some will be cleared to pave way for the proposed project.

Figure 1:Existing Building Structures at Site

Building structures present at site will be decommissioned to pave way for the development of the proposed project. The development shall comprise of a basement, ground floor and seventeen upper floors. The total number of units proposed for development will sum up to ninety.

2.2 Project Location and Size

The subject plot is located Off Gataka Road behind St. Mary's Catholic Church, it is 500m from Magadi Road in Ongata Rongai area within Kajiado county. It lies on latitude -1.3923724 and longitude 36.7608354.

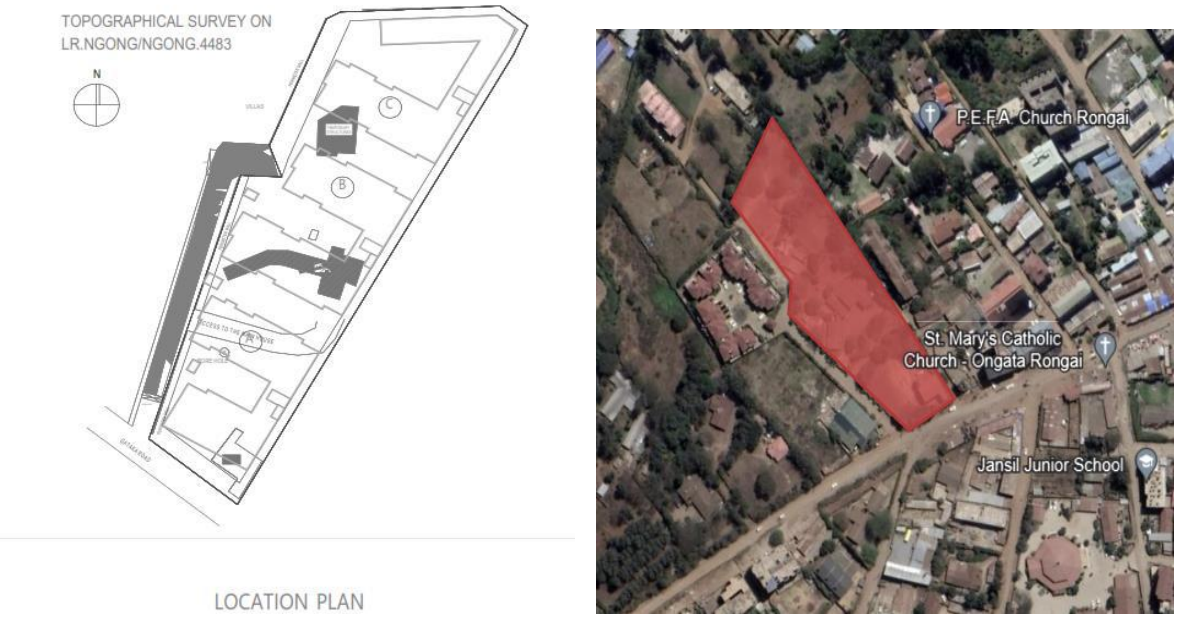

Figure 2: proposed site location

2.3 Project Description

The proposed development will comprise of a total of Eighty two (448) units, and other auxiliary amenities. A brief description of the proposed development is as follows:

(i) **Basement one and two:** will comprise of parking bays.

(ii) **Ground floor level** will comprise of 17 one bedroom units, 18 two bedroom units, 2 three bedrooms units, 6 commercial shops unis, club house, gym, multipurpose room and a management office

(iii) **Typical 1ST and 2nd floor levels** will comprise of 26 units of one bedroom on each floor, 14 two bedroom on each floor, and 4 units of three bedroom on each floor.

(iv) **Typical 3rd to 8th floor levels:** will comprise of 25 units of one bedroom on each floor, 24 two bedrooms on each floor, and 5 units of three bedroom on each floor.

(v) **Roof terrace** will comprise of solar panels and roof water tanks.

(vi) **Other features** include lifts shafts, staircase, fire riser duct, pressurization duct and gardens.

2.6 Project Design Considerations

The design considerations incorporate aspects of modern architecture, the current local government building policy guidelines and the latest standards developed by Kenya Bureau of Standards including:

1. **Ventilation:** the design caters for natural ventilation with features that encourage natural air circulation (including use of permanent air vents above all doors and windows).
2. **Lighting:** the design caters for various types of energy efficient luminaires including fluorescent lamps and natural lighting through glass windows and doors as appropriate for both security and lighting.
3. **Sanitary accommodation**: The number of toilets, bathrooms and wash hand basins has been selected according to guidelines in BS 6465.
4. **Sustainable resource use**: The design of the development incorporates landscaped gardens which will be planted with suitable species of trees/ shrubs and grass to prevent ecological deterioration and improve aesthetic value of the site. Part of the excavated soil will be used for landscaping therefore reducing the amount of soil to be transported away from the site.
5. **Solid waste management**: the proponent will be required to manage solid waste effectively, this may require the proponent to contract waste handler for proper waste management. It is recommended the proponent to hire waste handlers who are licensed.
6. **Fire protection**: the design of the proposed developments incorporates firefighting equipment to be installed in the building and the provision of a fire station.
7. **Plumbing and drainage**: sewage to be discharged to the proposed sewer line to be upgraded. Water supply and reticulation to be done using galvanized steel piping to BS and or PPRC piping.

The consulted environmental experts will make an effort in ensuring they monitor the site to ensure all the above discussed standards are followed strictly. This is during both the construction and operational phase.

2.4 Construction Inputs

The project inputs include the following:

i. Construction raw materials i.e. stones, cement, sand, crushed rock (gravel/ ballast), ceramic tiles and other ceramic fittings, steel and wooden fixtures and fittings, glass, steel metals, timber, roofing materials, painting materials among others. All these should be obtained from licensed dealers, especially those that have complied with the environmental management guidelines and policies.

ii. Construction machines such as. Concrete mixers will be used to mix concrete and cement in the specified quantities. Trucks will also be used in transportation of construction materials to the site. Most of the machinery will use petroleum products to provide energy.

iii. A construction labour force of both skilled and non-skilled workers. These will require services such as energy, water supply and sanitation facilities.

2.5 Construction Activities

2.5.1. Pre-construction Investigations and activities

Activities at this stage entail:

i. Investigation of the site's biological and physical resources in order to minimize any unforeseen adverse impacts during the project cycle.

ii. Carrying out soil feasibility studies to determine stability and other site characteristics to guide and inform the construction phase.

iii. Obtaining relevant construction permits from related authorities.

iv. Conducting an EIA and submitting the Study Report to NEMA for licensing.

2.5.2 Construction Stage

i. Demolition

The existing apartment and Masonite shall be demolished to pave way for the proposed development. The proponent shall apply for applicable permits from relevant authorities such as NCC before commencing the demolition exercise. A registered private contractor shall be engaged to carry out the demolition. The exercise shall be limited to day time only and all personnel working on the project shall be provided with PPEs such as helmets and dust masks. The demolition debris shall be disposed to designated areas by registered NEMA waste handler.

i. Site Preparation

Site preparation will entail building a perimeter wall around the project site to keep away the public. Setting up temporary storage rooms for cement, paints, glasses and

first aid facilities. Constructing sanitary facilities for workers and mobilizing materials, workforce and machinery required for ground breaking.

iii. Excavation and Foundation works

Excavation will be carried out to prepare the site for construction of foundations, pavements and drainage systems. This will involve the use of heavy earthmoving machinery such as tractors and bulldozers.

iv. Concrete and Masonry works

Concrete works will be involving volume batching where materials are measured by volume and expressed in relative ratios or weigh batching where materials are measured by weight before mixing. The ready-mix concrete is poured on the already formed works. In order to achieve dense concrete for better strength, air trapped while placing concrete must be expelled. While concreting, vertical penetration by concrete mixers and vibrators on the formwork should give adequate consolidation. Finishing will entail screeding concrete to the level of form works followed by troweling, edging and patterning and curing of the concrete.

v. Structural Steel works

Structural steel works will involve steel cutting, welding and fixing on the already constructed formwork before concreting is done. The rationale for carrying out steel works is to reinforce the concrete for structural stability.

vi. Electrical and Mechanical work

Electrical work during construction of the premises will include installation of electrical gadgets, devices and appliances including electrical cables, lighting apparatus, sockets etc. In addition, there will be other activities involving the use of electricity such as welding and metal cutting. All the electrical works will be carried out by licensed electricians to the satisfaction of the relevant authorities.

The mechanical works during the construction stage will include setting up:

i. Plumbing and drainage pipes
ii. Service ducts accessible from all floor levels
iii. Soil vent pipes (SVP) provided on doors and windows

iv. Storm drains pipes
v. Inspection chamber covers and framing
vi. Underground foul and waste drain pipes

All works shall be done by qualified technicians under the supervision of the Project Mechanical Engineer and shall follow the set standards.

vii. Interior and Exterior Finishes

Finishes will entail plastering to improve the aesthetic value and to ensure the building is structurally strong. Both internal and external finishes will be carried out in accordance to the specifications of the project architect. The ultimate step will be fixing of wall and floors tiles followed by painting of the entire development.

2.6 Construction Products, By Products and Wastes

It is anticipated that the project will generate a variety of products, by-products and wastes during its construction and operational phases. The characteristics of the products, by-products and wastes are discussed in this section.

2.6.1 By-Products

The by-products will be disposed-off as follows:

Surplus soil will be transported for disposal at designated dumping sites by NEMA licensed waste handlers. Pieces of timber/wood generated during the construction phase will be transported back to the contractor's yard for reuse in future or they can be sold to be use as fuel for cooking and heating.

Solid waste such as plastic cans will be used to store water during construction while steel metals will be disposed-off to registered scrap metal and plastic waste dealers.

Excess sand, ballast and stock piles will be moved by the contractor to a suitable yard

2.6.2 Wastes

Waste expected to be generated during construction include debris, sanitary waste, excavated soil and rocks. The operation phase will generate waste such as paper, plastics, cans, glasses, metallic pieces, and organic waste. All wastes will be disposed by the proponent in accordance with the standards and documented procedures stipulated in the EMCA Waste Management Regulations of 2006.

2.7 Description of the Project's Operational Activities

i Solid waste and waste water management

During the operational phase, a lot of solid waste shall be generated from the daily activities of the occupants hence need to put in place a comprehensive solid waste management system within the project site. The proponent shall provide a solid waste collection cubicle next to the main entrance to ensure that all the generated solid waste is properly collected before dumping is done via a licensed solid waste collection company.

The proposed project is located within an area that is not connected to the county government's sewer system. The proponent to this project shall construct a septic tank technology for the management of all the waste water generated from the proposed project as opposed to the commonly used septic tank technology.

ii. Cleaning

The proponent will be responsible for regular washing and cleaning of the pavements and communal areas. The tenants/occupants of the apartment units will be responsible for washing and cleaning their own residences.

iii. General Repairs and Maintenance

Maintenance works during the operation phase will include walls and floors repairs, maintenance of electrical gadgets and equipment, repairs of leaking water pipes, painting and replacement of worn-out materials among others.

2.8 Description of the Project's Decommissioning Activities

Decommissioning refers to the final disposal of the project and associated materials at the expiry of the project lifespan. At this stage, the proponent needs to remove all materials resulting from the demolition/ decommissioning from the site. Measures to be undertaken to restore the environment include:

i. Remove all underground facilities from the site
ii. Landscaping the site by flattening the mounds of soil and backfilling open surfaces.
iii. Planting vegetation which may include indigenous trees and flowers
iv. All the equipment should be removed from the site
v. Fence and signpost unsafe areas until natural stabilization occurs

2.7 Project Budget and Duration

The proposed is estimated to cost Kenya shillings one billion ninety-six million eight hundred and forty-six thousand two hundred and five. (1,096,846,205.00). *find attached summary of bill of quantity*

CHAPTER THREE: BASELINE INFORMATION OF THE STUDY AREA

3.1 Background Information on the Project Area

Ongata-Rongai is a fast developing residential urban aggregation within Kajiado County; situated at Kajiado's border Nairobi at latitude (0° -53' 60 S), and longitude (36° 25' 60 E. Located 50 Kilometres from Kajiado District Headquarters, and 28 Kilometres from Nairobi City Centre on the Langata-Magadi Road. Ongata Rongai with two administrative wards; *Ongata-Rongai* and *Nkaimurunya* have mixed population except for lacking upper class in socio-economic terms.However greater Ongata Rongai is a medium to low density area and includes Kandisi, Rimpa, Nkoroi, Merisho, Olekasasi, Tuala and Maasai lodge areas and covers a much larger area.

Ongata Rongai and its surrounding is very unique because of it close proximity to the Natural environments offered by the world renowned Nairobi National park to the East, The Woody up market Suburb of Karen to the North, The Ngong hills water catchments to the West and the , savannah grasslands of the Embakasi plains to the South.

Due to its proximity to Nairobi most of the people staying within the area work within Nairobi which is the political and commercial capital of Kenya and one of the fastest growing cities in Africa and the world. Rapid growth has been witnessed since the year 2000 in Ongata Rongai, bringing with it the associated needs for supply of various facilities such as housing, health, educational, recreational among others. The establishment of the flats can cater for such housing requirement or needs. The proposed project is located Off Gataka Road behind St. Mary's Catholic Church, it is 500m from Magadi Road in Ongata Rongai area within Kajiado county. It lies on latitude -1.3923724 South and longitude 36.7608354.

3.2 Project Location

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3.3 Physical Environment

3.3.1 Climate

The climate is moderate tropical with sunshine most of the year round and typical average temperatures of 25°C during the day with the hottest period in January & February leading to the long rains and the coldest in July after. On the other hand, the annual rainfall range is 600-1100 mm falling in two distinct seasons: the "long rains" season occurs from March to May/June. The "short rains" season occurs from mid October to December.

3.3.2 Topography

The site is fairly flat and lies at an altitude of approximately 1762 meters above sea-level.

3.4 Biological Environment

This section describes key biological elements, including the identification and distribution of dominant, rare and the unique flora and faunal species within the proposed project site and other potentially affected areas.

3.4.1 Flora

The site is located within an area with flora such as bushes, grasses and trees. It is also located within a less agricultural productive area where conditions are not much favourable for vegetation but the proponent proposed to develop the area by putting up a residential building. The neighbouring plots to be developed are covered by grass and other vegetation.

3.4.2 Fauna

There is no fauna in the site to be threatened by the development. The micro organisms in the soils are the ones which might be threatened such as millipede, centipede, earthworms etc. The moles in the area might also be threatened.

3.5Socio-Economic Environment

3.5.1 Population

Ongata Rongai over the past years had been sparsely populated but with the increased population in urban areas a lot of people have moved into the town. According to the 2019 census it hosts 172,570 people with 16% annual population change and it is amongst the towns that has rapid population growth in Kajiado County. The population in the town

has grown rapidly due to improved infrastructure, leisure joints, business and health centres. The proposed project will therefore meet the rising demand of housing.

3.5.2 Economic Activities

The economic activities of the area are influenced by the predominant land uses of residential, educational, public purpose such as religious and agricultural. Major employers include schools and other educational institutions, commercial centers, Petrol filling stations, garages, hotels and lodges, security firms and the residential. The latter typically employ domestic staffs, drivers and gardeners on a permanent basis, and a number of casual workers. In addition, informal trading activities along the major roads such as furniture displays and sales, animal feed sales, building materials offer significant levels of employment. It should be noted however that, the plan area's most significant contribution to the economy of the city is that it provides calm and a desirable place to live in. The major economic activity in the neighbourhood of the proposed site is residential building business.

3.6 Infrastructure

3.6.1 Roads and accessibility

Ongata Rongai is characterized by proliferation of road links to Nairobi, Ngong and Kiserian to enable commuter travel. The area is also linked with Standard Guage Railway(SGR) and train. However the increased population has put pressure on the available infrastructure and social amenities thus a need for expansion and development of the facilities. Rongai's single bitumen standard Magadi Road serves its entire population, while local access roads are narrow and untarmarcked. The proposed project site can be assessed Off Gataka Road 500m from Magadi Road in Ongata Rongai

Figure 3: Gataka road

3.6.2 Water supply

An inadequate supply of water to residents is the most critical single impediment to development in the plan area. As a consequence, residents have come to rely on alternative sources of water, including groundwater, surface water and harvesting rainwater sources. The proposed project the proponent has slinked a borehole on site.

Figure 4: Presence of a borehole at the proposed site

3.6.3 Surface Drainage

Most of the rainwater will mainly be absorbed into the soil during construction phase. Appropriate drainage systems have been provided for in the designs and will be put in place to handle the run-off/storm water from the site during operation of the project.

3.6.4 Solid Waste Management

Increased solid waste generation (from the project) is anticipated mainly, arising from the construction activities (wooden, debris, metals, glass, plastics, and sanitary litter etc.). The sources include the following:

i. Debris resulting from earth works and vegetative materials to be disposed of in designated dumping sites to pave way for the proposed project.
ii. All stony, wooden, metals and glass materials resulting from related activities, during implementation of the proposed project.
iii. Plastic materials resulting from such works as sewerage, drainage and water systems, electricity works etc.
iv. Sanitary litter as generated during implementation and occupation of the project.
v. Kitchen materials and other refuse especially on the occupation of the proposed project

All debris generated during project implementation process will be disposed suitably into the approved dumpsite or as directed by the Engineer, Ministry of Works.

Handling of wastes during occupation phase shall be fundamentally considered and especially through inclusion of a Waste Collection Centre (WCC) at the entrance to the site. This shall enhance storage, collection, transportation and disposal of all solid waste by a contracted licensed waste handling company of the entire project, on occupation.

3.6.5 Electricity

The project site area is already connected to electricity from the Kenya Power & Lighting Company (KPLC) national grid. Upon completion of construction, the proponent will extend the connection to the new development upon acquiring relevant permits

3.6.6 Communication

The area is well covered by communication facilities such as Safaricom, Airtel, Telkom, among others. All these will facilitate communication during the project cycle.

3.6.7 Security

Security in the area is provided by Police, whoever, some land owners have adopted hiring of security guards. There will be two gates serving as common entry and exit at the proposed project, which will be fully manned 24 hours by a contracted security company.

The entire site will also be banded with an electric boundary wall and CCTV surveillance cameras will be placed at strategic points within the property to enhance security. Further, the area is well served with security lights which improves safety for riders, pedestrians and general security of the area.

Figure 5: main gate entrance and Security guardhouse at the site area

CHAPTER FOUR: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

4.1 Introduction

There are a number of policies, laws and regulations that govern the protection, conservation and exploitation of the natural resources coupled with provisions for environmental management. These national policies, laws and regulations cover infrastructure, water, agriculture, forestry and health just to mention a few. The national environment action plan documents cover policy directions regarding integration of environmental concerns including EIA into development planning process.

Some of the key national laws, policies and regulations that govern the management of environmental resources in the country are discussed herein.

4.2 NATIONAL POLICIES

The following national policies are of relevance to the proposed project:

4.2.1 The National Environmental Action Plan (NEAP)

The NEAP was a deliberate policy effort to integrate environmental considerations into the Country's economic and social development. The integration process was to be achieved through a Multi-sectoral approach to develop a comprehensive framework to ensure that environmental Management and conservation of natural resources are an integral part of societal decision making.

Relevance to the proposed project

The NEAP has indicated how resources within particular sections of the country should be managed in order to ensure their sustainable utilization. The project should be implemented and operated based on these guidelines.

4.2.2 Environment and Development Policy (Sessional Paper No. 6 of EMCA CAP 387)

The aim of this policy is to harmonize environmental and development goals so as to ensure sustainability. The paper provides comprehensive guidelines and strategies for government action regarding the environment and development.

Relevance to the proposed project

The interaction of the proposed project with physical elements may lead to some negative impacts. Mitigation measures are therefore necessary to ensure balanced coexistence of the project and the surrounding environment and facilities.

4.2.3 Sustainable Development Goals (SDG's)

On September 25th 2015, countries adopted the United Nations Sustainable Development Goals (SDG"s) aimed at contributing towards ending poverty, protecting the planet, and ensuring prosperity for all as part of a new sustainable development agenda. The SDG's have very significant implications for investment needs and the role of the public sector is fundamental and pivotal. At the same time the contribution of the private sector is indispensable.

Relevance to the proposed project

The proponent has committed to the SDG"s through the proposed development in the following ways:

Goal 3 -Good Health & Well Being

Targets achieved:

Contribute to improved health and productivity through the provision of a safe and clean environment

Goal 7: Affordable and Clean Energy

Targets achieved include:

The implementation of an energy management system through good orientation, natural ventilation, natural lighting, energy efficient fitting and appliances shall contribute to increased energy efficiency.

Goal 8 -Decent work and economic growth

Targets achieved:

Employment creation that will contribute to reducing the proportion of youth not in employment.

Providing an environment that emphasizes on protection of labor rights and promotes safe and secure working environments for all workers

4.3 LEGAL FRAMEWORK

4.3.1 Environmental Management and Coordination Act, CAP 387

In EMCA 1999 and Amendment Act 2015 states in section 3 (1) and (2) that "Every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment and that the entitlement to a clean and healthy environment under subsection (1) includes the access by any person in Kenya to the various public elements or segments of the environment for recreational, educational, health, spiritual and cultural purposes.

Part VI Section 58 (2) of the Act states the proponent of any project specified in the Second Schedule shall undertake a full environmental impact assessment study and submit an EIA Study report to the Authority prior to being issued with any licence by the Authority: provided that the Authority may direct that the proponent forego the submission of the EIA Study report in certain cases.

Section 58 (5) states that EIA studies and reports required under the Act shall be conducted or prepared respectively by individual experts or a firm of experts authorised 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. Subsection (7) further states that EIA shall be conducted in accordance with the EIA regulations, guidelines and procedures issued under this Act.

Section 59 (1) states that upon receipt of an EIA study report from any proponent under section

58(2), the Authority shall cause to be published in the Gazette, in at least two newspapers circulating in the area or proposed area of the project and over radio stating:

(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 ninety days for the submission of oral or written comments by any member of the public on the environmental impact assessment study, evaluation or review report.

Subsection (2) and (3) of 59 states that 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 EIA report and the Authority shall ensure that its website contains a summary of the report referred to in subsection (1).

Relevance to the proposed project

The proponent has engaged the services of the environmental experts to conduct the EIA Study Report in line with the provisions of this Act. The environmental experts conducted the EIA in line with the regulations, guidelines and procedures issued under the Act.

4.3.2 EMCA (Environmental Impact Assessment and Audit) Regulations, 2003

These regulations stipulate how an EIA project report should be prepared and specifies all the requirements that must be complied with. It highlights the stages to be followed, information to be made available, role of every stakeholder and rules to be observed during the whole EIA study report making process.

Relevance to the proposed project

The proposed project will be planned, designed, constructed and operated based on these regulations. It shall also be maintained and guided by the same regulations and an environmental audit study will be done periodically to monitor compliance with the set environmental standards.

4.3.4 EMCA (Water Quality) Regulations, 2006

The Water Quality Regulations (2006) are contained in the Kenya Gazette Supplement No. 68, Legal Notice No. 120. Water Quality Regulations apply to water used for domestic, industrial,

agricultural, and recreational purposes; water used for fisheries and wildlife purposes, and water used for any other purposes. Different standards apply to different modes of usage. These regulations provide for the protection of lakes, rivers, streams, springs,

wells and other water sources. It is an offence to contravene the provisions of these regulations with a fine not exceeding five hundred thousand shillings.

In addition, of immediate relevance to the proposed project for the purpose of this Study 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, radioactive 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".

According to these regulations, "Every person shall refrain from any action which directly or indirectly causes, or may cause immediate or subsequent water pollution, and it shall be immaterial whether or not the water resource was polluted before the enactment of the Act".

Relevance to the proposed project

The proponent/contractor shall take care and precaution not to pollute underground water or even surface water in anyway and if a pollution incidence occurs the contractor should notify the authority immediately.

4.3.5. EMCA (Waste Management) Regulation, 2006

The Waste Management Regulations (2006) are contained in the Kenya Gazette No. 69, Legal Notice No. 121. The Waste Management Regulations are meant to streamline the handling, transportation and disposal of various types of waste. The aim of the Waste Management Regulations is to protect human health and the environment. The regulations place emphasis on waste minimization, cleaner production and segregation of waste at source. The regulation requires licensing of transporters of wastes and operators of disposal site (sections 7 and 10 respectively). 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 (hazardous 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 minimize waste generation) which includes the improvement of production processes through conserving raw materials and energy. In section 14 (1) every trade or industrial undertaking is obliged to install anti- pollution equipment for the treatment of waste emanating from such trade or industrial undertaking.

Relevance to the proposed project

The Developer shall ensure that the garbage collector contracted has a valid license from the National Environment Management Authority (NEMA). So as to comply with this, the contractor shall take precaution not to dump wastes in areas not registered and designated as so. Further, the project proponent shall be required to ensure, through public education and other law enforcement mechanism to ensure that all road users don't dump wastes along the road.

4.3.6 EMCA (Noise and Excessive Vibration Pollution Control) Regulations, 2009

These Regulations determine that no person or activity shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise that annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. In determining whether noise is loud, unreasonable, unnecessary or unusual, the following factors may be considered:

- Time of the day;
- Proximity to residential area;
- Whether the noise is recurrent, intermittent or constant;
- The level and intensity of the noise;
- Whether the noise has been enhanced in level or range by any type of electronic or mechanical means; and,
- Whether the noise is subject to be controlled without unreasonable effort or expense to the person making the noise.

Relevance to the proposed project

The contractor shall be required to abide by these measures; ensure that all machineries are in good working condition to reduce noise.

4.3.7 EMCA (Air Quality) Regulations, 2013

The objective of these Regulations is to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. The general prohibitions state that no person shall cause the emission of air pollutants listed under First Schedule (Priority air pollutants) to exceed the ambient air quality levels as required stipulated under the provisions of the Seventh Schedule (Emission limits for controlled and non-controlled facilities) and Second Schedule (Ambient air quality tolerance limits).

Relevance to the proposed project

The proponent shall implement the mitigation measures provided in the EMP to prevent air pollution.

4.3.8 Occupational Health and Safety Act, 2007 CAP 514

The Act makes provision for the health, safety and welfare of persons employed in factories and other places of work. The provision requires that all practicable measures be taken to protect persons employed in the factory and other places of work from any injury. The provisions of the act are also relevant to the management of hazardous and non-hazardous wastes, which may arise at the project site. The act provides that all measures should be taken to ensure safety, health and welfare of all the stakeholders in the work place.

Relevance to the proposed project

Workers and Neighbors" safety will be given priority during construction phase of the project.

4.3.9 The Physical Planning Act of 1996, CAP 286

Part V clause 36 of the act requires that, "If in connection with a development application a local authority is of the opinion that proposals for industrial location, dumping sites, sewerage treatment, quarries or any other development, will have injurious impact on the

environment the applicant should be required to submit together with the application an environmental impact assessment report."

Relevance to the proposed project

This Act provides for order in terms of development execution. This development should therefore comply with all the provisions of this law including land use zoning requirements.

4.3.10 The Penal Code CAP 63

Chapter XVII on "Nuisances and offences against health and convenience" contained in the penal code strictly prohibits the release of foul air into the environment which affects the health of the persons. It states "Any person who voluntarily vitiates the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carrying on business in the neighborhood or passing along a public way is guilty of a misdemeanor"

Relevance to the proposed project

Waste disposal and other project related activities shall be carried out in such a manner as to conform to the provisions of the code.

4.3.11 County Government Act, 2012

The main purpose of the enactment of this Act was to give effect to Chapter Eleven of the Constitution; to provide for county governments' powers, functions and responsibilities to deliver services and for connected purposes. Functions which were carried out by local governments were effectively transferred to the county governments. The Act gives county the responsibility of planning and co-coordinating all developments within their areas of jurisdiction. Part XI (sections 102-115) of the Act provides for planning principles and responsibilities of the county governments. The land use and building plans provided for in the Act are binding on all public entities and private citizens operating within the particular county. The proposed project is within the Nairobi City Government and thus there will be need of working in liaison with the County Government. The plans for the proposed project must be approved by the County Government and the County government may also issue directives and authorizations on various aspects e.g. waste management and fire emergency preparedness among others.

Relevance to the proposed project

The proponent will work in liaison with NCC and in particular the Water, Energy, Forestry, Environment and Natural Resources sector. The plans provided in this report have been approved by the County Government of Nairobi a sign of compliance.

4.3.12 The Registration of Titles Act (Chapter 281)

According to section 23 (1) of this Act, the certificate of title issued by the registrar to a purchaser of land upon a transfer or transmission by the proprietor thereof 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 encumbrances, easements, restrictions and conditions contained therein or endorsed thereon, and the title of that proprietor shall not be subject to challenge, except on the ground of fraud or misrepresentation to which he is proved to be a party. (*Copy of land ownership documents is attached to this Report.)*

4.3.13 The Constitution of Kenya 2010

The Constitution of Kenya is the supreme law of the Republic of Kenya and binds all persons and all State organs at all levels of government. It provides the broad framework regulating all existence and development aspects of interest to the people of Kenya, and along which all national and sectorial legislative documents are drawn. In relation to environment, Article 42 of Chapter 4, the Bill of Rights, confers to every person the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislative measures, particularly those contemplated in Article 69, and to have obligations relating to the environment fulfilled under Article 70.

Chapter 5 of the new constitution provides the main pillars on which the 77 environmental statutes are hinged and covers "Land and Environment" and includes the aforementioned articles

69 and 70. Part 1 of the Chapter dwells on land, outlining the principles informing land policy, land classification as well as land use and property. Part 2 of the Chapter directs focus on the environment and natural resources. It provides for a clear outline of the state's obligation with respect to the environment. The Chapter seeks to eliminate processes & activities likely to endanger the environment.

There are further provisions on enforcement of environmental rights as well as establishment of legislation relating to the environment in accordance to the guidelines provided in this Chapter. In conformity with the Constitution of Kenya 2010, every activity or project undertaken within the Republic of Kenya must be in tandem with the state's vision for the national environment as well as adherence to the right of every individual to a clean and healthy environment. The proposed development project is a development activity that will utilize sensitive components of the physical and natural resources hence need for a clearly spelt out environmental management plan to curb probable adverse effects to the environment.

Relevance to the proposed project

The proponent will therefore adhere to the provisions of the EMP provided in this report to ensure the public and employees right to a clean and safe environment is not infringed.

4.3.14 The Water Act, 2016

This Act of Parliament provides for the regulation, management and development of water resources, water and sewerage services.

Part II section 9 of this Act states that every person has a right to access water resources, whose administration is the function of the national government. Part III section 11 states the establishment of the Water Resources Authority (WRA) whose functions is stipulated in section 12 and include but not limited to receiving water permits applications for water abstraction, collection of water permit fees and water use charges.

Section 63 of the act states that every person in Kenya has the right to clean and safe water in adequate quantities and to reasonable standards of sanitation as stipulated in Article 43 of the Constitution.

Section 143 states that a person shall not, without authority conferred under this Act;

a) willfully obstruct, interfere with, divert or obstruct water from any watercourse or any water resource, or negligently allow any such obstruction, interference, diversion or abstraction; or

b) throw, convey, cause or permit to be thrown or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive matter or thing into or near to any water resource in such manner as to cause, or be likely to cause, pollution of the water resource.

Section 147 states that a person who commits an offence under this Act, or under any Regulations or made under this Act, shall, if no other penalty is prescribed in respect of the offence, be liable to a fine not exceeding one million shillings or to imprisonment for a term not exceeding two years, or to both such fine and imprisonment.

Relevance to the proposed project

The proponent shall ensure that all provisions stated in the act and under any regulations are observed and that the EMP is implemented.

4.3.15 Public Health Act Cap 242

Part IX section 115 of the Act states that no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health.

Section 116 requires that the local authorities (county governments) take all lawful, necessary and reasonably practicable measures for maintaining its district (counties) at all times in clean and sanitary condition, and for preventing the occurrence therein of, or for remedying or causing to be remedied, any nuisance or condition liable to be injurious or dangerous to health, and to

take proceedings at law against any person causing or responsible for the continuance of any such nuisance or condition.

Part XII Section 136 states that all collections of water, sewage, rubbish, refuse and fluids which permits or facilitate the breeding or multiplication of pests shall be termed nuisances and are liable to be dealt with in the manner provided by this Act. Section 138 states that no person shall within a township permit any premises or lands owned or occupied by him or over which he has control to become overgrown with bush or long grass of such a nature as, in the opinion of the medical officer of health, to be likely to harbour mosquitoes.

Relevance to proposed project

The proponent shall contract a licensed waste handler to collect all waste from the site to disposal at approved dumping site.

4.3.16 Energy Act, 2006

The Energy Act, 2006 was enacted on 2nd January 2007 establishes an Energy Regulatory Commission (ERC) mandated to perform all function that pertains to energy production, transmission, setting and enforcing of energy policies, Public education and enforcing energy conservation strategies, prescribing the energy licensing process and issuing of licenses that pertain to energy sector in Kenya. Section 30 of the Act provides the factors that shall be taken into consideration prior to issuance of license. It states the need and expression of an entity to conserve and protect the environment and natural resources in accordance to the EMCA 1999. Moreover, the Act gives provisions for the need to protect health and safety of users of energy by providing an enabling environment of operation that protects the health and safety of users of the service for which the license or permit is required and other members of the public affected by the undertaking.

4.3.17 National Construction Authority Act, 2011

The act is set to streamline, overhaul and regulate the construction industry in Kenya for sustainable development. The NCA establishes the authority and confers on its power to register contactors within the construction industry. The act requires all the contractors, both foreign and local contractors to be registered with the authority. The act also regulates the practices of foreign contractor by limiting their work to only tender work. The foreign contractors are

licensed for only a specific period and once they certify they are in Kenya for that specific time. The foreign contractors must also produce a certificate of compliance. Furthermore they must lodge an affidavit with the NCA that once the project they have been licensed is over, they shall wind up their business. This prevents them from engaging in any other construction in the country.

4.3.18 Building Code, 2000

This gives general guidelines for the construction of buildings and attendant safety measures such as installation of firefighting appliances, fire escapes etc. It equally recognizes local authorities as lead planning agencies and thus requires every developer to submit building plans to the relevant local authority for approval. The local authorities are in turn empowered to disapprove any plan submitted if it is not correctly drawn or does not provide sufficient information that complies with the relevant by-laws. Any

developer who intends to erect a building, such as a residential block, must also give the concerned local authority a notice of inspection before the erection of the proposed structure.

After erecting the building, a notice of completion shall be issued to the local authority to facilitate final inspection/approval. No person shall therefore occupy a building whose certificate of completion has not been issued by the local authority. As a precaution against fire breakout, the by-law states that the walls of any premise shall be non-combustible throughout. Similarly, in every building which comprises more than one story, other than a small house, shall have fire resistance.

Section 214 indicates that, in any public building whose floor is more than 20 feet above the ground level, the council may recommend the provision of firefighting equipment that may include one or more of the following: hydrants, hose reels and fire appliances, external conations, portable fire appliances, water storage tanks, dry risers, sprinkler, drencher and water spray spring protector system.

4.3.19 The National Land Commission Act, 2012 (No. 5 of 2012)

Section 5 of the Act outlines the Functions of the Commission, pursuant to Article 67(2) of the Constitution as follows 5(1): (a) to manage public land on behalf of the national and county governments; (b) to recommend a national land policy to the national government; (c) to advise the national government on a comprehensive programme for the registration of title in land throughout Kenya; (d) to conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities; (e) to initiate investigations, on its own initiative or on a complaint, into present or historical land injustices, and recommend appropriate redress; (f) to encourage the application of traditional dispute resolution mechanisms in land conflicts; (g) to assess tax on land and premiums on immovable property in any area designated by law; and (h) to monitor and have oversight responsibilities over land use planning throughout the country.

4.4. INSTITUTIONAL FRAMEWORK

There key institutions that deal with environmental issues in Kenya include National Environmental Management Authority (NEMA), the Department of Resource Surveys and Remote Sensing (DRSRS), the Water Department, The Kenya Forest Service (KFS), The Kenya Forestry Research Institute (KEFRI) among others. While implementing the project,

both the proponent and the contractor will have to work in liaison with a number of these institutions when dealing with issues within the jurisdiction of the institutions.

4.4.1 National Environmental Management Authority (NEMA)

The objective for which NEMA was established is to exercise general supervision and co-ordinate over all matters relating to the environment and to be the principal instrument of the government in the implementation of all policies relating to the environment. A Director General appointed by the president heads NEMA. The Authority shall:

Co-ordinate the various environmental management activities being undertaken by the lead agencies and promote the integration of environmental considerations into development policies, plan, programmes and projects and monitor and assess activities, being carried out by relevant lead agencies in order to ensure that the environment is not degraded by such activities, environmental management objectives are adhered to and adequate early warning on impending environmental emergencies is given.

Relevance to the proposed project

The contractor and the client will work in liaison with NEMA in getting various permits, licenses, approvals and generally in complying with the provisions of EMCA 1999 and any other subsidiary legislation under the Act.

4.4.2 National Environmental Tribunal (NET)

This tribunal guides the handling of cases related to environmental offences in the Republic of Kenya. If disputes to the proposed project arise, they are supposed to be presented here for hearing and legal direction.

CHAPTER FIVE: CONSULTATIONS AND PUBLIC PARTICIPATION

5.1 Introduction

This chapter describes the process of the public consultation followed to identify the key issues and impacts of the proposed project. Views from the local residents, stakeholders, surrounding institutions and development partners who in one way or another would be affected or rather interested in the proposed project were sought through administering of questionnaires, interviews and public meeting as stipulated in the Environment Management and Coordination Act, Cap 387.

5.2 Objectives of the Consultation and Public Participation (CPP)

The objective of the consultation and public participation was to:

i. Disseminate and inform the stakeholders about the project with special reference to its key components and location.
ii. Gather comments, suggestions and concerns of the interested and affected parties. Incorporate the information collected in the EIA study.

5.3 Sources of Information

During the environmental impact assessment, public participation was a key component in getting information to be incorporated in writing this report it. Positive and negative views of the perceived affected neighbors were sought. The exercise was conducted by a team of experienced registered environmental impact assessment experts via administration of pre-designed questionnaires, and interviews in various areas surrounding the proposed project site.

The neighboring community was asked for comment and suggestions concerning the proposed project on various issues including the following:

(a) The positive impacts that may emanate from the development of the proposed project.
(b) Measures that the developer should put in place during and after the project to mitigate the impacts.
(c) Whether the proposed project construction and occupation will cause the negative impacts on the following:-

i. Local residents
ii. Natural ecology of the area
iii. The human environment
iv. Public health and safety
v. Effect on water resources and quality
vi. Effect on the soils
vii. Effect on areas of scenic beauty
viii. Effect on road transport
ix. Storm water drainage of the area

Many respondents were consulted during the public appraisal exercise although some declined to give their either real contacts or real identification card numbers. However, their views have been incorporated in this report.

5.4 Issues Raised by the would-be affected community

5.4.1 Security

Previously, the project site area and its surrounding area were being used as agricultural land hence most of the surrounding is either currently being developed or has not been developed. The respondents felt that with the construction of the proposed project, most people will move into the area making it more secure and with the presence of the security personnel to various upcoming flats around the neighborhood security within the neighborhood shall be improved. Some of the respondents requested that the proponent put up security lights especially at his site to enhance security at night.

5.4.2 Waste management

Most of the neighbors felt that waste management issues should be amicably addressed to avoid littering of garbage and pest infestation. Hence they suggested that the project proponent should subcontract a private waste garbage handlers to ensure efficient removal and disposing of both solid and liquid waste in a sound manner.

5.4.3 Population Increase

Since the proposed project located in a neighborhood that has been previously used for agricultural purposes, the recently spell of development is evident that it is no longer agricultural. The several flats that are already occupied have brought in a few people to the area and several others are seen in the neighborhood still under construction which

will again attract more people into the area. the proposed project will also bring its share of inhabitants into the area leading to increased population in the neighborhood.

5.4.4 Water Sources and Utilization

Some of the neighbor's felt that roof catchment of rain water will contribute to satisfying the local water demand in addition to the widely used council supplied water. It is therefore desired that the developer think holistically how the additional water demand will be taken care of during the dry weather of the year.

5.4.5 Noise Pollution

There was concern over the possibility of high noise and vibration levels from the proposed project site as a result of excavation and construction works. The sources of noise pollution will include transport vehicles, construction machinery and metal grinding and cutting equipment. However, the proponent will take appropriate steps to minimize noise impacts including provision of appropriate protective equipment to construction workers, planning and minimizing the frequency of materials transport, and ensuring that all equipment are well maintained. Some of the residents suggested that the workers on site should work between 8am and 5pm with a one-hour break for lunch. They said this would reduce the impact of noise levels since during those periods most of them would have gone to work. The time for entry to work and exit from workers would also be appropriate since it would reduce the impact of congestion during construction phase. Construction works in the area shall result in noise from machinery and people building though they felt that the noise will be temporary.

5.4.6 Aesthetic considerations

It was suggested that the developer incorporates intensive planting of flowers and trees to improve the aesthetic features of the neighborhood especially along the access road once the boundary wall has been constructed to ensure that the intended aesthetic value of the once agricultural area is improved and maintained. This will further assist improve the biodiversity range within the site even after construction.

5.4.7 Traffic congestion and air pollution

There were concerns that with the construction of the proposed development, the amount of vehicles that will be plying the dusty access road into the proposed site will increase hence causing congestion in the area especially by the transportation lorries. It was

suggested that the constructor to consider sprinkling water on the excavated soil to reduce air pollution and hoard the site to prevent dust from being carried away by the strong winds.

5.4.8 Employment opportunities

The respondents indicated that the project will provide employment opportunities throughout the project cycle from construction to operation. They also hinted that there is need to consider the locals first for any employment opportunity arising before sourcing from outside.

CHAPTER SIX: IDENTIFICATION OF THE PROPOSED DEVELOPMENT IMPACTS

This Section identifies both negative and positive impacts associated with the proposed commercial development. These are identified according to phases namely: Construction Phase, Operational Phase. Another study will be conducted during the decommissioning phase.

6.1 Construction Phase

Construction phase shall begin with the site preparations for construction works to take place. During site preparation, clearing of any vegetation that which is not established (e.g. grass and bush) in order to pave way for proposed development will be necessary. Construction impacts have the potential to create nuisance for residents, of the adjacent businesses, however these could be managed in acceptable limits. In addition the construction impacts are also temporary in nature.

6.1.1 Positive Impacts

6.1.1.1 Employment Opportunity

Both direct and indirect forms of employment shall arise from the project initiation. Direct employment will be mainly through skilled and unskilled laborer's whose workforce shall be needed in the construction. Employment opportunities will be a benefit both in economic and social sense. In the economic sense it means abundant unskilled labour will be used in economic production. Several workers including casual laborer's, masons, carpenters, joiners, electricians and plumbers are expected to work on the site for a period that the project will start to the end. Apart from casual labour, semi-skilled and unskilled labour and formal employees are also expected to obtain gainful employment during the period of construction. Indirect employment will be experience while buying the construction materials and food for the construction team in the neighborhood.

6.1.1.2 Local and National Economic Gains

Both the local and national economy shall gain much from the project in that materials for building shall be sourced locally within the country and that all the materials are charged VAT hence increasing revenue collection in the country.

6.1.1.3 Provision of Market for Supply of Building Materials

The project will require supply of large quantities of building materials most of which will be sourced locally. This provides ready market for building material suppliers such as quarrying companies, hardware shops and individuals with such materials.

6.1.1.4 Informal Business Growth

During construction period the informal sector will benefit from the operations. This will involve *Jua Kali* operators selling their products to be used on site. Such a move shall promote *Jua Kali* entrepreneurs in the local areas. Food business will also emerge as most of the workers who will be working on the proposed project site will be buying food from the informal business owners who shall be operating in the vicinity.

6.1.2 Negative Impacts

6.1.2.1 Noise pollution

The construction works will most likely be a noisy operation due to the moving machines (mixers, tippers, communicating workers) and incoming vehicles to deliver construction materials and workers to site. However the site workers are likely to be affected since noise beyond some level is itself a nuisance and need to be avoided. Noise created shall be a nuisance to the neighboring business. Such noise emissions should be minimized as much as possible from the source point while workers should be provided with appropriate personal protective wear.

6.1.2.2 Excavation Works

Excavation works is definite to take place during the levelling of the proposed project site in a bid to make a formidable ground for stable building structures. This results in removal of top soil to lay foundation for buildings. The excavated soils have to be disposed off in an environmentally sound manner.

6.1.2.3 Increased Water Demand

Both the workers and the construction works will create additional demand for water in addition to the existing demand. Water will be mostly used in the creation of aggregates for construction works and for wetting surfaces for softening or hardening after creating the formworks.

6.1.2.4 Dust Emissions

Particulate matter pollution is likely to occur during the site clearance, excavation and loading of the top soil, loading and transportation of the construction waste. There is a possibility of suspended and settleable particles affecting the site workers and even neighbors' health.

6.1.2.5 Solid Waste Generation

During construction solid waste will be generated. These include papers used for packing cement, Plastics and timber remains among others. Dumping around the site will interfere with the aesthetic status of the area. This has a direct effect to the surrounding community. Disposal of the same solid wastes off-site could also be a social inconvenience if done in the wrong places. The off-site effects could be aesthetic, pest breeding, pollution of physical environment, invasion of scavengers and informal recycling comm.

6.1.2.6 Extraction and Use of Building Materials

Most of the building materials such as hard core, ballast, cement, rough stone and sand required for construction of the proposed project will be obtained from quarries, hardware shops and sand harvesters who extract such materials from natural resource banks such as rivers and land. Since substantial quantities of these materials will be required for construction of the commercial development, the availability and sustainability of such resources at the extraction sites will be negatively affected as they are not renewable in the short term. In addition, the sites from which the materials will be extracted may be significantly affected in several ways including landscape changes, displacement of animals and vegetation, poor visual quality and opening of depressions on the surface leading to several human and animal health impacts.

6.2 Construction phase

6.2.2 Positive Impacts

6.2.2.1 Economy Improvement

Through the use of locally available materials during the construction phase of the project including cement, concrete and ceramic tiles, timber, sand, ballast electrical cables among others, the project will contribute towards growth of the national economy by contributing to the gross domestic product. The consumption of these materials, fuel oil and others will attract taxes including VAT which will be payable to the government hence increasing government revenue while the cost of these raw materials will be payable directly to the producers.

6.2.2.2 Employment opportunities

One of the main positive impacts during projects construction phase will be the availability of job opportunities especially to casual workers and several other specialized workers. Employment opportunities are of benefit both economically and in a social sense. In the

economic sense it means abundant unskilled labour will be used in construction hence economic production. Several workers including casual laborer's, masons, carpenters, joiners, electricians and plumbers are expected to work on the site for a period that the project will start to the end. Apart from casual labour, semi-skilled and unskilled labour and formal employees are also expected to obtain gainful employment during the period of construction.

6.2.2.3 Boosting of the informal sector

During the construction phase of the project it is expected that the other businesses in the informal sector will flourish. These include activities such as food vending who will be benefiting directly from the construction staff members who will be buying food and other commodities from them. This will promote the informal sector in securing some temporary revenue and hence livelihood.

6.2.3 Negative Impacts

6.2.3.1 Disposal of excavation soil and other materials

The project site is under developed. The soil that will be excavated partly will be reused while the unused will be collected, transported and disposed off appropriately in approved designated areas. It is encouraged that other alternative uses of this soil should be found

6.2.3.2 Noise pollution

Most machines to be used in the construction sites are usually very noisy. It is for this reason that it is postulated that the construction works will generate some substantial amount of noise. (The mixers, tippers, communicating workers), incoming vehicles to deliver construction materials, workers to site and other normal construction activities. This may prove to be a potential source of disturbance to the surrounding neighbors and a health hazard to the workers themselves. Such noise emissions should be minimized as much as possible from the source point while workers should be provided with appropriate personal protective wear.

6.2.3.3 Increased water demand

Water is one of the most essential natural resource that will be required in the construction process. It is this high demand that renders it a scarce resource. Both the

workers and the construction works will create an increased demand for water in addition to the existing demand. Water will be mostly used in the creation of aggregates for construction works, settling of dust and for wetting surfaces for softening or hardening after creating the formworks.

6.2.3.4 Dust emissions

Particulate matter pollution is likely to occur during the site clearance, excavation of the top soil and loading and transportation of the construction waste. There is a possibility of particulate matter suspended and settle-able particles affecting the site workers and even neighbor's health.

6.2.3.5 Building materials and energy used

Several building materials will be required for construction of the commercial building. These will include sand, ballast, hard core, timber, cement, metal sheets, electrical gadgets, plumbing materials, glass and paints among others. Most of these materials will be obtained locally within Nairobi and surrounding areas.

The main sources of energy that will be required for construction of the project will include mains electricity and fossil fuels (especially diesel). Electricity will used for welding, metal cutting/grinding and provision of light. Diesel will run material transport vehicles and building equipment/machinery such as bulldozers and concrete mixers. The proponent should promote efficient use of building materials and energy through proper planning to reduce economic and environmental costs of construction activities.

6.2.3.6 Waste generation and management

Large amounts of solid waste will be generated during construction of the project. These will include metal cuttings, rejected materials, surplus materials, surplus spoil, excavated materials, paper bags, empty cartons, empty paint and solvent containers, broken glass among others.

Solid wastes if not well-managed have a potential of causing disease outbreaks due to suitable breeding conditions for vectors of cholera and typhoid. Malaria outbreak could also be exacerbated by the presence of open water ditches for breeding of anopheles mosquitoes.

6.3 Operation phase
6.3.1 Positive Impacts

6.3.1.1 Creation of Employment opportunities
Employment opportunities are one of the long-term impacts of the proposed project that will be realized after construction and during the operation and maintenance of the project. This will create jobs for suppliers, cleaners, security personnel, gardeners among others.

6.3.1.2 Increase in revenue
The proposed project was initiated with a sole aim of raising revenue for the project proponent. With customers occupying the units, large amounts of revenue will be generated from the charges at the services delivered. The project proponent will thus assume the management part of the proposed project from which revenue will be collected.

6.3.1.3 Incorporation of collective waste management
The project is designed such that there will be provision of a designated spot for the dumping of solid waste which is well protected from rain and animals. This wastes will thus be collected from the site in bulk and as one unit such that the careless disposal and hence proliferation of wastes within the surrounding areas will be curbed.

6.3.2 Negative Impacts

6.3.2.1 Increased pressure on infrastructure
The proposed project will lead to increased pressure on existing infrastructure such as roads, water supply, power supply etc due to the increased number of people who will be using these facilities which will directly translate into increased in volume of the relevant parameter.

6.3.2.2 Water pollution
Poor waste management may lead to the blocking of drains, which in turn can lead to flooding and unsanitary conditions within the site. Blocked drains produce bad odor hence are environmentally unfriendly. The project management proposes to have controlled solid management to avoid this from occurring.

6.3.2.3 Solid waste

A lot of solid waste in the form of foodstuffs, empty plastic containers, cartons, papers, broken chairs, and broken bottles among others will be generated during the operational phase of the project. This waste will be both organic and inorganic.

CHAPTER SEVEN: MITIGATION MEASURES AND MONITORING PROGRAMMES

7.1 Introduction

This chapter highlights the necessary mitigation measures for the expected negative impacts of the proposed project. The potential impacts and the possible mitigation measures have herein been analyzed under two categories as done in chapter six. These are Construction and Operational phase. References are also made as to where decommissioning mitigation measures can be sought.

7.2 Construction related impacts

7.2.1 Air quality

Controlling dust during construction is useful in minimizing nuisance conditions and consequently health (respiratory and eye) complications. It is recommended that a standard set of feasible dust control measures be implemented for all construction activities. Emissions of other contaminants (Nitrogen oxides, Carbon dioxide, Sulphur oxides, and diesel related Particulate Matter) that would occur in the exhaust from heavy equipment are also included.

The project proponent is committed to implementing measures that shall reduce air quality impacts associated with construction. All personnel working on the project will be trained prior to starting construction on methods for minimizing air quality impacts during construction. This means that construction workers will be trained regarding the minimization of emissions during construction. Specific training will be focused on minimizing dust and exhaust gas emissions from heavy construction vehicles. Construction vehicles drivers will be under strict instructions to minimize unnecessary trips, refill petrol fuel tanks in the afternoon, and minimize idling of engines.

Dust emissions will be controlled by the following measures:

- Watering all active construction areas at least twice daily.
- Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.
- Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at the construction site.
- Sweep daily (with water sweepers) all paved access roads, parking areas and staging areas at the construction site.

- Fast growing trees will be planted around the project area to act as a wind breaker to reduce the particulate matter that lead to respiratory diseases.

7.2.2 Noise pollution

Significance of noise impacts depends on whether the project would increase noise levels above the existing ambient levels by introducing new sources of noise. Noise impacts would be considered significant if the project would result in the following:

- Exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
- Exposure of persons to, or generation of, excessive ground-borne vibration or ground-borne noise levels.
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

The project proponents shall put in place several measures that will mitigate noise pollution arising during the construction phase. The following noise-suppression techniques will be employed to minimize the impact of temporary construction noise at the project site.

- Install portable barriers to shield compressors and other small stationary equipment where necessary.
- Use quiet equipment (i.e. equipment designed with noise control elements).
- Co-ordinate with relevant agencies regarding all substation construction activities in the buildings areas.
- Install sound barriers for pile driving activity.
- Limit pick-up trucks and other small equipment to an idling time of five minutes, observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible.

7.2.3 Construction Waste

It is recommended that demolition and construction waste be recycled or reused to ensure that materials that would otherwise be disposed of as waste are diverted for productive uses. In this regard, the proponent is committed to ensuring that construction materials

left over at the end of construction will be used in other projects rather than being disposed of. In addition, damaged or wasted construction materials including cabinets, doors, plumbing and lighting fixtures, marbles and glass will be recovered for refurbishing and use in other projects. Such measures will involve the sale or donation of such recyclable/reusable materials to construction companies, local community groups, institutions and individual residents or homeowners.

The proponent shall put in place measures to ensure that construction materials requirements are carefully budgeted and to ensure that the amount of construction materials left on site after construction is kept minimal. It is further recommended that the proponent should consider the use of recycled or refurbished construction materials. Purchasing and using once-used or recovered construction materials will lead to financial savings and reduction of the amount of construction debris disposed of as waste.

Additional recommendations for minimization of solid waste during construction of the project include: -

a) 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.
b) Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements.
c) Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste
d) Use of construction materials containing recycled content when possible and in accordance with accepted standards.

7.2.4 Generation of exhaust emission

In order to control exhaust emissions, the following measures shall be implemented during construction.

- Vehicle idling time shall be minimized
- Alternatively fueled construction equipment shall be used where feasible
- Equipment shall be properly tuned and maintained

7.2.5 Worker accidents and hazards when handling hazardous wastes

The site foreman to ensure that all staff members adhere to these standards and are thus safe shall enforce necessary health and safety rules. Adequate collection and storage of waste on site and safe transportation to the disposal sites and disposal methods at designated area shall be provided. In addition covers for refuse containers and appropriate personal protective equipment's to be used by workers shall also be provided by the proponent.

7.2.6 Worker accidents during construction and operation

Worker's accidents especially in deep trenching operations and from gas accumulation in sewers and other confined spaces shall be mitigated by enforcing adherence to safety procedures and preparing contingency plan for accident response in addition safety education and training shall be emphasized.

7.3Operation Phase Impacts

7.3.1 Ensuring efficient solid waste management

The project proponent will be responsible for efficient management of solid waste generated by the project during its operation. In this regard, the proponent will provide waste handling facilities such as waste bins and skips for temporarily holding solid waste generated at the site. In addition, the proponent will ensure that they are disposed off regularly and appropriately.

7.3.2 Management waste water

The proponent will ensure that there are adequate means of handling the large quantities of sewage generated by the proposed project. It will also be important to ensure that sewage pipes are not blocked or damaged since such occurrences can lead to release of the effluent, resulting in land and water contamination. Such blockages or damages will be fixed expeditiously.

7.3.3 Ensure efficient energy consumption

The proponent shall plan and install an energy-efficient lighting system at the proposed project. This will contribute immensely to energy conservation during the operational phase of the project. In addition, occupants of the proposed project will be sensitized to ensure energy efficiency in their domestic operations. To complement these measures, it

will be important to monitor energy use during the operation of the proposed project and set targets for efficient energy use.

7.3.4 Ensure Efficient Water Use

The project proponent will identify other water sources like drill a borehole and harvesting rain water so as to reduce the demand on the council water supply. The proponent will install water-conserving automatic taps and toilets. Moreover, any water leaks through damaged pipes will be dealt with by the qualified staff who will fix faulty taps promptly. In addition, the occupants/customers of the residential flats will be sensitized to use water efficiently.

7.4 Decommissioning Phase Impacts

7.4.1 Efficient solid waste management

Solid waste resulting from demolition waste be recycled or reused to ensure that materials that would otherwise be disposed of as waste are diverted for productive uses. In this regard, the proponent is committed to ensuring that demolition materials at the end of decommissioning phase will be used in other projects rather than being disposed of. In addition, demolition materials including cabinets, doors, plumbing and lighting fixtures, marbles and glass will be recovered for refurbishing and use in other projects. Such measures will involve the sale or donation of such recyclable/reusable materials to construction companies, local community groups, institutions and individual residents or homeowners. It is further recommended that the proponent should consider the use of recycled or refurbished demolition materials. Purchasing and using once-used or recovered demolition materials will lead to financial savings and reduction of the amount of demolition debris disposed of as waste.

7.4.2 Reduction of dust concentration

High levels of dust concentration resulting from demolition or dismantling works will be minimized by;

- Watering all active construction areas as and when necessary to lay dust.
- Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.
- Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.

- Sweep daily (with physical sweepers) all paved access roads, parking areas and staging areas at construction sites.
- Fast growing trees will be planted around the project area to act as a wind breaks to reduce the uplift of particulate matter that lead to respiratory diseases if measures are not taken to control it.

7.4.3 Minimization of noise and vibration

The proponents shall put in place several measures that will mitigate noise pollution arising during the demolition phase. The following noise-suppression techniques will be employed to minimize the impact of temporary demolition noise at the project site.

i) Install portable barriers to shield compressors and other small stationary equipment where necessary.
ii) Use quiet equipment (i.e., equipment designed with noise control elements).
iii) Co-ordinate with relevant agencies regarding all substation construction activities in the building's areas.
iv) Install sound barriers for pile driving activity.
v) Limit pick-up trucks and other small equipment to an idling time of five minutes, observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible.

CHAPTER EIGHT: OCCUPATIONAL HEALTH AND SAFETY

8.1. Introduction

Worldwide, construction workers are three times more likely to be killed and twice as likely to be injured as workers in other occupations. In Kenya, though undocumented, it is reported on our dailies that workers are injured or die on construction sites. It is therefore essential that the proponent and contractor ensure the safety and well-being of the workers, the passersby and any other person who may be directly or indirectly associated with the project.

The main hazards and risks of accidents in the construction site can be categorized and described in the following way:

- Risks of slips, trips and falls
- Risks related to instability
- Risks related to traffic
- Risks related to construction machinery
- Risks related to electricity
- Risks related to gas
- Fire and explosion risks

After identification of these major risks and the stages when they are likely to occur, efforts should then be focused on how to alleviate these dangers before they happen.

8.2. Principles of Occupation Health and Safety (OHS)

These principles involve the following three main actions:

- **Risk Identification and Assessment:**

  This shall involve identifying the various hazards and risk at the site that have the potential to occur, all the people who may be at risk such as employees, cleaners, visitors, contractors, the public, etc. as well as determine whether a control program is required for a particular hazard.

- **Risk Communication:**

  Refers to the exchange of real-time information, advice and opinions between workers and people facing threats to their health, economic or social wellbeing. The ultimate purpose of risk communication is to enable people at risk to take informed decisions to protect themselves and their loved ones. Risk communication uses many communications techniques ranging from media and social media

communications, mass communications and community engagement. It requires a sound understanding of people's perceptions, concerns and beliefs as well as their knowledge and practices.

- **Risk Management:**

  This involves actions implementing risk evaluation decisions, monitoring, re-evaluation and prioritizing, and compliance with legal requirements that safeguard health and safety at construction sites The OHS personnel shall be required to determine if existing control measures are adequate or if more should be done.

8.3. Construction Safety, Emergency Procedures and Action Plan

The following recommendations to ensure the health and safety of the workers and general public shall be taken into consideration:

1. Create a culture of safety within construction by planning, creating and supporting ongoing OHS awareness campaigns that promote the importance of workplace occupational health and safety with industry stakeholders as well as consumers.
2. Increase safety knowledge in the construction site by promoting awareness of the top construction sector hazards (trips and falls from heights, motor vehicle incidents, struck by objects, machinery) and how to control these hazards through new and improved information channels
3. Create a strategy for continuous health and safety learning for the construction workers.
4. e.g., by conducting regular training sessions and drills on how to handle emergencies and accidents at site.
5. Identify, review and enhance health and safety content of apprenticeship training standards to keep abreast with any new methods that are effective in promoting site safety.
6. Provide suitable and well maintained Personal Protective Equipment (PPEs) to all the workers and visitors and ensure they are utilized at all times and in the right manner.
7. These include safety boots, helmets, gas masks, gloves and googles.

8. Place visible and readable signs to control the movement of vehicles and notify motorists and pedestrians around the, and workers in the site.
9. Enclose or isolate hazardous parts of machines or sites within the construction site to minimize exposure.
10. Prepare and maintain emergency response equipment such as fire extinguishers and first aid kits in readiness for use when need be.
11. Encourage reporting of safety incidents as soon as they occur at the site, so as to enable a quick action to alleviate the extent of the damage.
12. Comply with the provision of the Occupational Safety and Health Act, (OSHA), 2007.

CHAPTER NINE: ANALYSIS OF PROJECT ALTERNATIVES

This chapter analyses the project alternative in terms of site and non-implementation. The purpose of including alternatives in the ESIA is to identify and evaluate alternate actions that accomplish similar goals and promote sustainable development (Anderson et al., 2003). Alternatives should be economically feasible with minimal adverse environmental impacts and time delays. Diverse alternatives to the proposed action must be included in the ESIA. Alternatives may include both design and location options (Steinneman, 2000). In most case, the ESIA process often occurs too late in the decision-making process to consider a full range of alternatives. This can undermine ESIA goals to encourage more environmentally sound and publicly acceptable solutions. Allowing new alternatives and objectives to evolve in relation to environmental conditions and public preferences may be a solution to most of the environmental and socio-economic problems associated with the implementation of new projects (Anderson et al., 2003).

9.1 Relocation Option

Relocation option to a different site is an option available for the project implementation. At present the landowner/developer does not have an alternative site. This means that he has to look for the land. Looking for the land to accommodate the scale and size of the project and completing official transaction on it may take up to three years although there is no guarantee that the land would be available. The developer will spend another two years on design and approvals since design and planning has to be according to site conditions. Project design and planning before the stage of implementation will cost the developer thousands of Kenya shillings. Whatever has been done and paid to date will be counted as a loss to the developer. Assuming the project will be given a positive response by the relevant authorities including NEMA, this project would have been delayed for about two years before implementation. This is a delay that our economy can't afford. This would also lead to a situation like No Project Alternative option. The other consequence of this is that it would be a discouragement for private/local investors especially in the housing sector that has been shunned by many public and private investors already aggravating our critical housing shortages. In consideration of the above concerns and assessment of the current proposed site, relocation of the project is not a viable option.

9.2 Nil- intervention or No Project Alternative

The No Project option 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. This option will however, involve several losses both to the landowner and the community as a whole. The landowner will continue to pay rent on the plot while the property remains idle. The No Project Option is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

- The economic status of the Kenyans and the local people would remain unchanged.
- The local skills would remain under-utilized.
- Reduced visitation due to lack of quality accommodation facilities around the project site.
- Reduced interaction both at local, national and international levels.
- No employment opportunities will be created for thousands of Kenyans who will work at the proposed project.
- Increased urban poverty and crime in Kenya.
- Discouragement for investors to produce this level of services to the visitors and Kenyans at large.
- Development of infrastructural facilities (roads, electrical etc. will not be undertaken).

From the analysis above, it becomes apparent that the No Project alternative is no alternative to the proponent, Kenyans and the government of Kenya.

9.3 Analysis of Alternative Construction Materials and Technology

The proposed project will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment's that save energy and water will be given first priority without compromising on cost or availability factors. The concrete pillars and walls will be made using locally sourced stones, cement, sand (washed and clean), metal bars and fittings that meet the Kenya Bureau of Standards requirements. Beautiful and durable reinforced concrete roofs with tiles finishing will be used because they are good in heat insulation as compared to the iron sheet roofs, and afford more security. This will ensure that the rainwater harvested will be used in the house and garden. Heavy use of timber during construction is discouraged because of destruction of forests. The exotic species would be

preferred to indigenous species in the construction where need will arise. However, this housing methods and technologies to be used will require very little timber.

9.4 Domestic waste water management alternatives

Five locally available technologies are discussed below:-

9.4.1 Alternative one: Waste water treatment plant

This involves the construction of a plant that will enable the recycling of the waste water from the project activities to reusable standards and utilized within the site in activities such as irrigating the flower gardens and flashing of the toilets. It is usually expensive to construct and maintain, but it is the most reliable, efficient and cost-effective in the long term. This is the most preferred option for such project because of its benefits.

9.4.2 Alternative two: Use of stabilization ponds/lagoons

This refers to the use of a series of ponds/lagoons that allow several biological processes to take place, before the water is released back to the river. The lagoons can be used for aquaculture purposes and irrigation. However, they occupy a lot of space but are less costly. No chemicals are used, heavy metals sink and decomposition processes take place. They are usually a nuisance to the public because of smell from the lagoons/ponds. This option is not preferable in the area because the required space is not available.

9.4.3 Alternative Three: *Use bio-digester*

This system has three main components, namely a bio-digester where all organic matter from the toilets is bio-degraded by aerobic and anaerobic bacteria; then the waste water is moved into a de-greasing manhole system and gulley trapping system where all solid in-organic matter is removed from the water, finally the water from the bio-digester, the de-greasers and gulley traps is fed into a French draining system which facilitates recycling and purification of the water reusable standards and can be re-used for various purposes within the site such as irrigating of the flower gardens

9.4.4 Alternative Four: *Use of septic tanks*

This involves the construction of underground concrete-made tanks to store the sludge with soak pits. This option is viable in instances where the project site is not sewered. The method is made expensive due to construction technology and regular exhaustion.

9.5 Solid waste management alternatives

The proposed project will generate a lot of solid wastes. An integrated solid waste management system is recommendable. First, the project proponent will give priority to Reduction at Source of the materials. This option will demand a solid waste management awareness programme in the management and the residents. Secondly, Recycling, Reuse and composting of the waste will be the second alternative in priority. This will call for a source separation programme to be put in place. The recyclables will be sold to waste buyers within Kiambu. The third priority in the hierarchy of options is combustion of the waste that is not recyclable in order to produce energy. Finally, sanitary land filling will be the last option for the proponent to consider.

9.6 Alternatives to Achieving Green Building

The areas of concern may be categorized broadly as follows:

i. Proper and efficient use of resources. These include power, water and other sources of energy
ii. Reducing waste and pollution
iii. Improving occupant health

Green building can take on various forms. From the basic housing level to the national level, efforts are being put to reduce reliance on the costly fossil fuels. Some of the methods that can be adopted in this include:

9.6.1 The Use of Renewable Energy

More houses are powering up using solar panels. The availability of the technology and ease of setting up the panels have gone a long way in encouraging its adoption. The use of biomass (popularly known as biogas) is also gaining a significant foot hold in many homes. This is more so in rural areas, where animal waste is enhanced to produce gas used in powering up. Waste (such as papers, plastics, and so forth) is also being used in an ingenious pilot project in areas of Nairobi to produce heat energy. This has been embraced in these communities as it provides an affordable way to cook and heat water. The proponent is advised to explore the use of renewable sources of energy such as solar for water heating (which is currently a requirement by law) and wind for security lighting.

9.6.2 Adoption of Water Harvesting, Treatment and Re-Use

Large housing projects such as the proposed one, should adopt water treatment and re-use to cut on costs. With demanding clientele who want green compounds all year round,

this technology is quite handy. The used water is collected and treated in collection tanks placed within the estates. This water is then re-used for irrigation of lawns and also in flushing toilets. Hence this calls for the adoption of sewage treatment systems such as the bio-box.

In addition, water harvesting should also be taken more seriously. Methods include tanks and also water pans in areas having space. Trenches in gardens are also dug up with the sole intention of trapping run-off water. Hence, the proposed project should entail rain water harvesting without failure.

9.6.3 The Use of Plants or Vegetation

Plants can be used as water towers to aid in replenishing ground water. Homes in hot areas are advised to adopt plants to keep the temperatures down. The project proponent is also advised to establish a vegetation cover around the development.

9.6.4 Adoption of Natural Lighting and Ventilation

Strategic building of windows and porches goes a long way in enhancing natural lighting. Sun roofs are also becoming a common feature in many homes, allowing much sunlight into the rooms. These are just some of the few methods that could be adopted in going green in building the proposed project

CHAPTER TEN: ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN (EMP)

10.1 Significance of an EMP

Environmental Management Plan (EMP) for developing projects is usually to provide a logical framework within which identified negative environmental impacts can be mitigated and monitored. In addition, the EMP assigns responsibilities of actions to various actors and provides a timeframe within which mitigation measures and monitoring can be done. The EMP is a vital output of an Environmental Impact Assessment as it provides a checklist for project monitoring and evaluation. The EMP outlined below will address the identified potential negative impacts and mitigation measures of the proposed project based on the chapters of Environmental Impacts and Mitigation Measures of the Negative Impacts.

10.2 Pre- construction & Construction Phase EMP

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the construction phase the proposed project are outlined below:

Table 1: EMMP for Pre-construction and Construction

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Kshs)
Demolition of the existing structure	▪ Apply for demolition permit from relevant authority before commencing the demolition ▪ The demolition exercise to be limited to day time only ▪ Engage registered private contractor to carry out demolition ▪ Provide the workers with appropriate PPEs ▪ Comply with EMCA (Noise and excessive vibration pollution control) Regulations 2009	Proponent & Contractor	One-off	250,000
	▪			

Ecosystem disturbance	▪ Ensure proper demarcation and delineation of the project area to be affected by construction works.	Proponent & Contractor	1 month	50,000
	▪ Specify locations for trailers and equipment, and areas of the site which should be kept free of traffic, equipment, and storage.	Proponent & Contractor	1 month	-
	▪ Designate access routes and parking within the site.	Proponent & Contractor	1 month	10,000
	▪ Design and implement an appropriate landscaping programme to help in re-vegetation of part of the project area after construction	Proponent & Contractor	2 months	100,000
Increased exploitation of raw materials	▪ Source building materials from suppliers who use environmentally friendly processes in their operations.	Proponent & Contractor	Throughout construction period	-
	▪ 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	-
	▪ Ensure that damage or loss of materials at the construction site are kept minimal through proper storage	Proponent & Contractor	Throughout construction period	100,000
	▪ Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered	Proponent & Contractor	Throughout construction period	50,000
Solid waste generation	▪ Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered	Proponent & Contractor	Throughout construction period	-

	▪ Ensure that damage or loss of materials at the construction site are kept minimal through proper storage	Proponent & Contractor	Throughout construction period	100,000
	• 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	-
	• Donate recyclable/reusable or residual materials to local community groups, institutions and individual local residents or home owners.	Proponent & Contractor	One-off	-
	• 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	_
	• 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	100,000
	• Use building materials that have minimal or no packaging to avoid the generation of excessive packaging waste	Proponent & Contractor	Throughout construction period	-
	• Use construction materials containing recycled content when possible and in accordance with accepted standards.	Proponent & Contractor	Throughout construction period	-
	• Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce waste at the site	Proponent & Contractor	Throughout construction period	-
	• 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	10,000/ month

Air pollution	▪ Ensure strict enforcement of on-site speed limit regulations	Proponent & Contractor	Throughout construction period	20,000
	▪ Avoid excavation works in extremely dry weather	Proponent & Contractor	Throughout construction period	-
	▪ Sprinkle water on graded access routes each day to reduce dust generation by construction vehicles	Proponent & Contractor	Throughout construction period	10,000/ month
	• Sensitize truck drivers to avoid unnecessary racing of vehicle engines at loading/offloading points and parking areas, 2. switch off or keep vehicle engines at these points	Proponent & Contractor	Throughout construction period	-
	• 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	1,000
Noise Pollution	▪ Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.	Proponent & Contractor	Throughout construction period	-
	▪ Sensitize construction drivers to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as churches, residential areas and hospitals	Proponent & Contractor	Throughout construction period	-
	▪ Ensure that construction machinery is kept in good condition to reduce noise generation	Proponent & Contractor	Throughout construction period	10,000

	▪ Ensure that all generators and heavy-duty equipment are insulated or placed in enclosures to minimize ambient noise levels.	Proponent & Contractor	Throughout construction period	100,000
Violation of rules and regulations	▪ 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 under the Factories and Other Places of Work Act Cap 514, Laws of Kenya is mandatory	Proponent	One-off	5,000
	▪ A general register should be kept within the facility as stipulated in Sec 62 (1) of the Factories and Other Places of Work Act.	Proponent & Contractor	One-off	1,000
Mishaps	▪ The abstract of the Factories and Other Places of Work Act must be displayed at prominent places within the site	Proponent & Contractor	One-off	2,000
	▪ 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	500/ month
	▪ Ensure that the premises are insured as per statutory requirements (third party and workman's compensation)	Proponent	Annually	_
	▪ Develop, document and display prominently an appropriate policy for construction works	Proponent & Contractor	One-off	1,000
Injuries caused by machinery and Equipment	▪ 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	_
	▪ All machines and other moving parts of equipment must be enclosed or guarded to protect all workers from injury	Proponent & Contractor	One-off	_
	▪ Arrangements must be in place to train and supervise inexperienced workers regarding construction machinery use and other procedures/operations	Proponent & Contractor	Continuous	5,000 per training
	▪ Equipment such as fire extinguishers must be examined by a government authorized person. The equipment may only be used if a certificate of examination has been issued	Proponent & Contractor	Continuous	2,000 per examination
	▪ Reports of such examinations must be presented in prescribed forms, signed by the examiner and attached to the general register	Proponent & Contractor	Continuous	2,000 per examination
Poor 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	Continuous	100,000
	▪ Ensure that items are not stored/stacked against weak walls and partitions	Proponent & Contractor	Continuous	_
Occupational health and safety	▪ Design suitable documented emergency preparedness and evacuation procedures to be used during any emergency	Proponent & Contractor	One-off	2,000
	▪ Such procedures must be tested at regular intervals	Proponent & Contractor	Every 3 months	2,000
	▪ Ensure that adequate provisions are in place to immediately stop any operations where there in an imminent and serious danger to health and safety and to evacuate workers	Proponent & Contractor	One-off	10,000

	▪ Ensure that the most current emergency telephone numbers posters are prominently and strategically displayed within the construction site	Proponent & Contractor	One-off	1,000
	▪ Provide measures to deal with emergencies and accidents including adequate first aid arrangements	Proponent & Contractor	Continuous	5,000
	▪ Well stocked first aid box which is easily available and accessible should be provided within the premises.	Proponent & Contractor	One-off	5,000
	▪ Provision must be made for persons to be trained in first aid, with a certificate issued by a recognized body.	Proponent & Contractor	One-off	10,000
	▪ Firefighting equipment such as fire extinguishers and hydrant systems should be provided at strategic locations such as stores and construction areas.	Proponent & Contractor	One-off	50,000
	▪ Regular inspection and servicing of the equipment must be undertaken by a reputable service provider and records of such inspections maintained	Proponent & Contractor	Every 3 months	5,000
	▪ Signs such as “NO SMOKING” must be prominently displayed within the premises, especially in parts where inflammable materials are stored	Proponent & Contractor	One-off	20,000
	▪ Ensure that workers at the excavation sites and other dusty sites are adequately protected from inhalation of substantial quantities of dust through provision of suitable protective gear (e.g. nose masks)	Proponent & Contractor	One-off	50,000
	▪ Provide workers in areas with elevated noise and vibration levels, with suitable ear protection equipment such as ear muffs	Proponent & Contractor	One-off	100,000

	▪ 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	Once off	200,000
	▪ 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	10,000/ month
Sanitary	▪ Ensure that conveniently accessible, clean, orderly, adequate and suitable washing facilities are provided and maintained in within the site	Proponent & Contractor	One-off	50,000
	▪ Provide and maintain adequate and suitable storage for clothing not worn during working hours for construction employees	Proponent & Contractor	One-off	20,000
	▪ Provide and maintain, for the use of all workers whose work is done standing, suitable facilities for sitting sufficient to enable them to take advantage of any opportunity for resting which may occur in the course of their employment	Proponent & Contractor	One-off	10,000
	▪ All work places must be kept in a clean state, and free from effluvia arising from any drain, sanitary convenience or nuisance	Proponent & Contractor	Continuous	500/day
	▪ Accumulations of dirt and refuse should be cleaned daily from the floors, benches, staircases and passages	Proponent & Contractor	Daily	200/day

10.3 Operational Phase EMP

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the operational phase of the proposed project is outlined in the table below:

Table 2: EMMP Operational phase

Objective/ Plan	Recommended Mitigation Measures	Responsible Party	Monitoring Mechanism	Cost (Kshs)
Solid waste generation	▪ Construct a solid waste handling cubicle on site that should be protected from direct sunlight, rain and animals to help temporarily hold the solid waste collected from the premises before disposing to the city's designated dumpsite	Proponent	One-off	200,000
	▪ Seek the services of a NEMA registered solid waste collection company that should regularly collect and dump the solid waste generated from the operational phase of the project.	Proponent	Continuous	20,000/ month
	▪ Provide solid waste collection polythene papers to the tenants for collection of all the solid waste generated within the houses before disposing it.	Proponent	Continuous	100,000
	▪ Ensure that all the solid waste generated at the proposed project is regularly disposed of appropriately at authorized dumping sites	Proponent	Continuous	20,000/ month
	▪ Donate redundant but serviceable equipment to charities and institutions	Proponent	Continuous	-

Objective/ Plan	Recommended Mitigation Measures	Responsible Party	Monitoring Mechanism	Cost (Kshs)
Waste water management	▪ Provide a reliable and well-maintained means for handling waste water generated from the proposed project.	Proponent & Contractor	One-off	2M
	▪ Conduct regular inspections for sewage pipe blockages or damages and fix appropriately	Proponent & Contractor	Continuous	10,000 per inspection
	▪ Ensure regular monitoring of the waste water discharged from the proposed development to ensure that the stipulated effluent discharge rules and standards are not violated	Proponent	Continuous	5000/ parameter
Energy consumption	▪ Switch off electrical equipment, appliances and lights when not being used	Proponent	Continuous	-
	▪ Install occupation sensing lighting at various locations such as storage areas which are not in use all the time	Proponent	One-off	10-40 % higher than ordinary lighting
	▪ Install energy saving bulbs in all the rooms and all lighting points within the commercial development.	Proponent	One-off	20 % higher than ordinary lighting
	▪ Monitor energy use during the operation of the project and set targets for efficient energy use	Proponent	Continuous	2,000/ month
	▪ Sensitize the occupants/guests to use energy efficiently	Proponent	Continuous	10,000/ month

Objective/ Plan	Recommended Mitigation Measures	Responsible Party	Monitoring Mechanism	Cost (Kshs)
Water exploitation	▪ Promptly detect and repair of water pipe and tank leaks	Proponent	Continuous	5,000/ month
	▪ Ensure taps are not running when not in use	Proponent	Continuous	500/ month
	▪ Install water conserving taps that turn-off automatically when water is not being used	Proponent	One-off	10-40 % higher than ordinary taps
	▪ Install a discharge meter at water outlets to determine and monitor total water usage	Proponent	One-off	10,000
safety and security of the premises and surrounding areas	▪ Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises during night hours.	Proponent	Continuous	1M

10.4 Decommissioning Phase

In addition to the mitigation measures provided in two above tables in this chapter, it is necessary to outline some basic mitigation measures that will be required to be undertaken once all operational activities of the proposed project have ceased. The necessary objectives, mitigation measures, allocation of responsibilities, time frames and costs pertaining to prevention, minimization and monitoring of all potential impacts associated with the decommissioning and closure phase of the proposed residential flats are outlined in the table below:

Table 3: EMMP for Decommissioning Phase

Environmental impact	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Kshs)
Solid waste generation	▪ All buildings, machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused.	Contractor, Proponent	One-off	-
	▪ All foundations must be removed and recycled, reused or disposed of at a licensed disposal site	Contractor, Proponent	One-off	1M
	▪ Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials should be taken to a licensed waste disposal site	Contractor, Proponent	One-off	300,000
	▪ Donate reusable demolition waste to charitable organizations, individuals and institutions	Contractor, Proponent	One-off	-

Vegetation disturbance, **Land deformation:** **soil erosion,** **drainage problems**	• Implement an appropriate revegetation programme to restore the site to its original status • During the re-vegetation period, appropriate surface water runoff controls will be taken to prevent surface erosion; • Monitoring and inspection of the area for indications of erosion will be conducted and appropriate measures taken to correct any occurrences; ▪ Fencing and signs restricting access will be posted to minimize disturbance to newly-vegetated areas;	Contractor, Proponent	One-off	100,000
Loss of income, **Reduced ability to support dependants,** **Loss of quality of life**	• The safety of the workers should surpass as a priority of all other objectives in the decommissioning project • Adapt a project – completion policy: • identifying key issues to be considered earlier before decommissioning. • Assist with re-employment and job seeking of the involved workforce. • Compensate and suitably recommend the workers to help in seeking opportunities elsewhere. ▪ Offer advice and counselling on issues such as financial matters.			

CHAPTER ELEVEN: CONCLUSION AND RECOMMENDATIONS

The proposed residential flats project will have numerous positive impacts including creation of employment; quality and modern housing for city residents, optimum use of land and increase in revenue among others has outlined in the report.

The negative environmental impacts that will result from establishment of the project which include increased pressure on infrastructure, air pollution through the dust emitted from the construction activities, generation of both solid and liquid wastes and increase in population within the area among others which however can be mitigated.

The proponent of the proposed project shall be committed to putting in place several measures to mitigate the negative environmental, safety, health and social impacts associated with the development cycle of the proposed building. It is recommended that in addition to this commitment, the proponent shall focus on implementing the measures outlined in the EMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects.

It is also recommended that the positive impacts that emanate from such activities shall be maximized as much as possible. It is expected that these measures will go a long way in ensuring the best possible environmental compliance and performance standards.

Recommendations

This report recommends that the project be allowed to go ahead provided the outlined mitigation measures are adhered to. Major concerns should nevertheless be focused towards minimizing the occurrence of impacts that would degrade the general environment. This will however be overcome through close follow-up and implementation of the recommended Environmental Management and Monitoring plans (EMPs). We recommend these:

- The proponent should follow the guidelines as set by the relevant departments to safeguard and envisage environmental management principles during construction and ooperations/occupation phases of the proposed project.
- It is important that warning or informative sign (bill boards) be erected at the site. These should indicate the operation hours and when works are likely to

be started and completed. The signs should be positioned in a way to be easily viewed by the public and mostly motorists.

- All solid waste materials and debris resulting from construction activities should be disposed off at approved dumpsites.
- All construction materials and especially pipes, pipe fittings, sand just to mention a-few should be sourced/procured from legalized dealers.
- During construction all loose soils should be compacted to prevent any erosion by water and wind.
- Other appropriate soil erosion control measures can be adapted. Any stock piles of earth should be enclosed, covered or sprinkled with water during dry or windy conditions to minimize generation of dust particles into the air.
- Once earthworks have been done, restoration of the worked areas should be carried out immediately by backfilling, landscaping/leveling and planting of suitable tree species.
- Proper and regular maintenance of construction machinery and equipment will reduce emission of hazardous fumes and noise resulting from friction of metal bodies. Maintenance should be conducted in a designated area and in a manner not to interfere with the environment.
- A fully equipped first aid kit should be provided within the site
- Workers should get food that is hygienically prepared. The source of such food should be legalized or closely controlled
- The contractor should have workmen's compensation cover and is required to comply with workmen's compensation Act as well as other relevant ordinances, regulations and Union Agreements
- The contractor should provide adequate security during the construction period.

REFERENCES

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APPENDICES

- Photographs from the proposed project site
- Sample of public appraisal questionnaires
- Ownership documents
- Architectural drawings
- Practicing licenses

Photographs from the proposed project site

Proposed project site

Existing similar apartment in the neighborhood

Gataka Access road to the site off Magadi road at Ongata Rongai

Other similar residential flats under construction near the proposed project site

St. Mary's Catholic Church neighboring the proposed project site

10 villa developments in the neighborhood with the similar concept

Ownership documents

REPUBLIC OF KENYA

THE REGISTERED LAND ACT
(Chapter 300)

Land Certificate

REGISTRATION DISTRICT: KAJIADO

TITLE NO.: NGONG/NGONG/4483

This is to certify that PHILIP GICHUKI GITONGA ID/3420117/66 of P.O Box 30551, NAIROBI

is (~~are~~) now registered as the absolute proprietor(~~s~~) of the land comprised in the above-mentioned title, subject to the entries in the register relating to the land and to such of the overriding interests set out in section 30 of the Registered Land Act as may for the time being subsist and affect the land.

GIVEN under my hand and the seal of the KAJIADO District Registry this Eighteenth day of March, 19 81

Land Registrar

See Back

No. **PVT-27U5EL8E**

CERTIFICATE OF INCORPORATION

I hereby **CERTIFY** that,

SUNRISE ECOVALE LIMITED

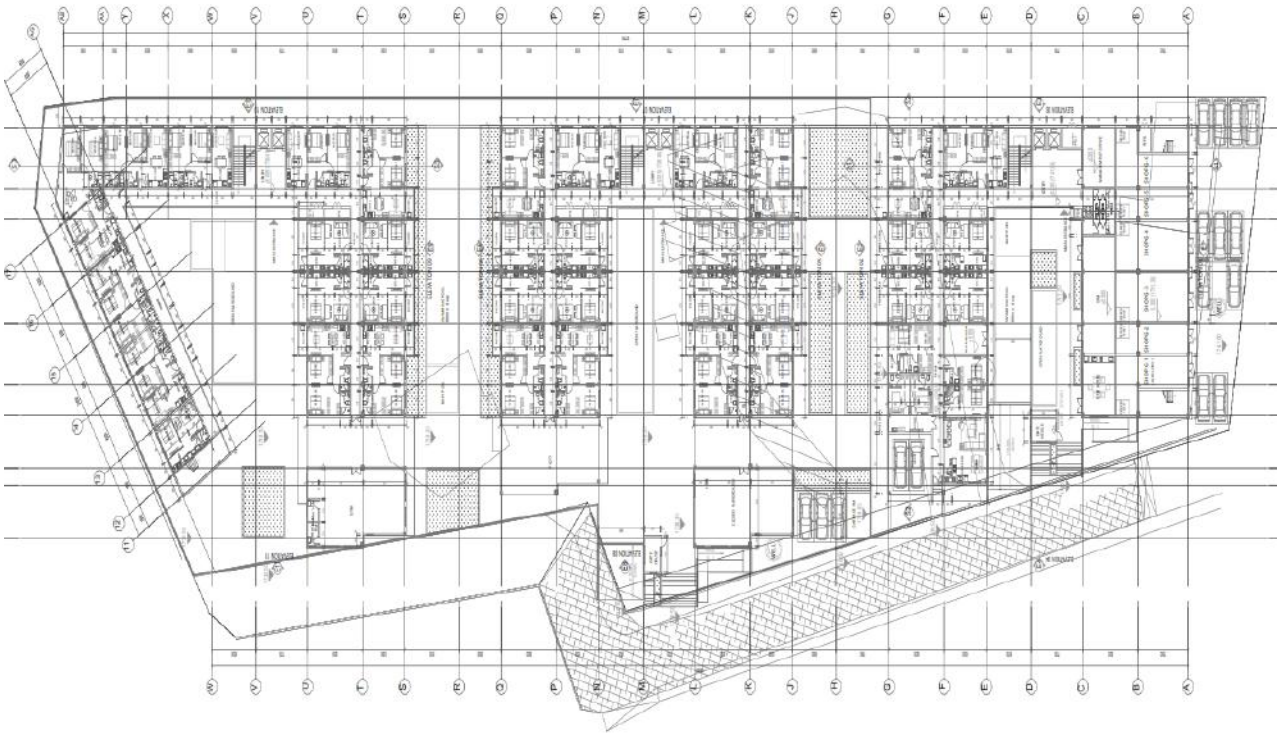
is on this date 17 Oct 2023 Incorporated under the Companies Act, 2015 and that the Company is a **PRIVATE LIMITED COMPANY.**

.....

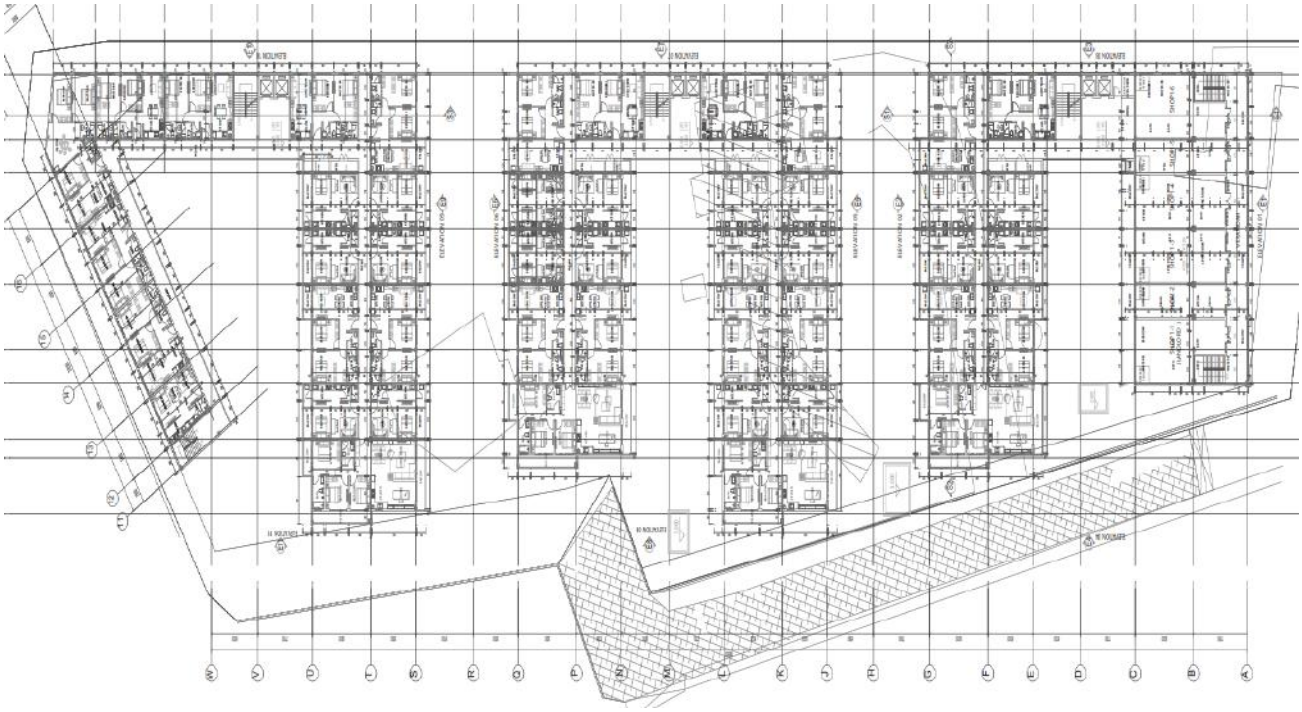
Registrar Of Companies

This is a system generated certificate. To validate this document send the word **BRS** to **21546**

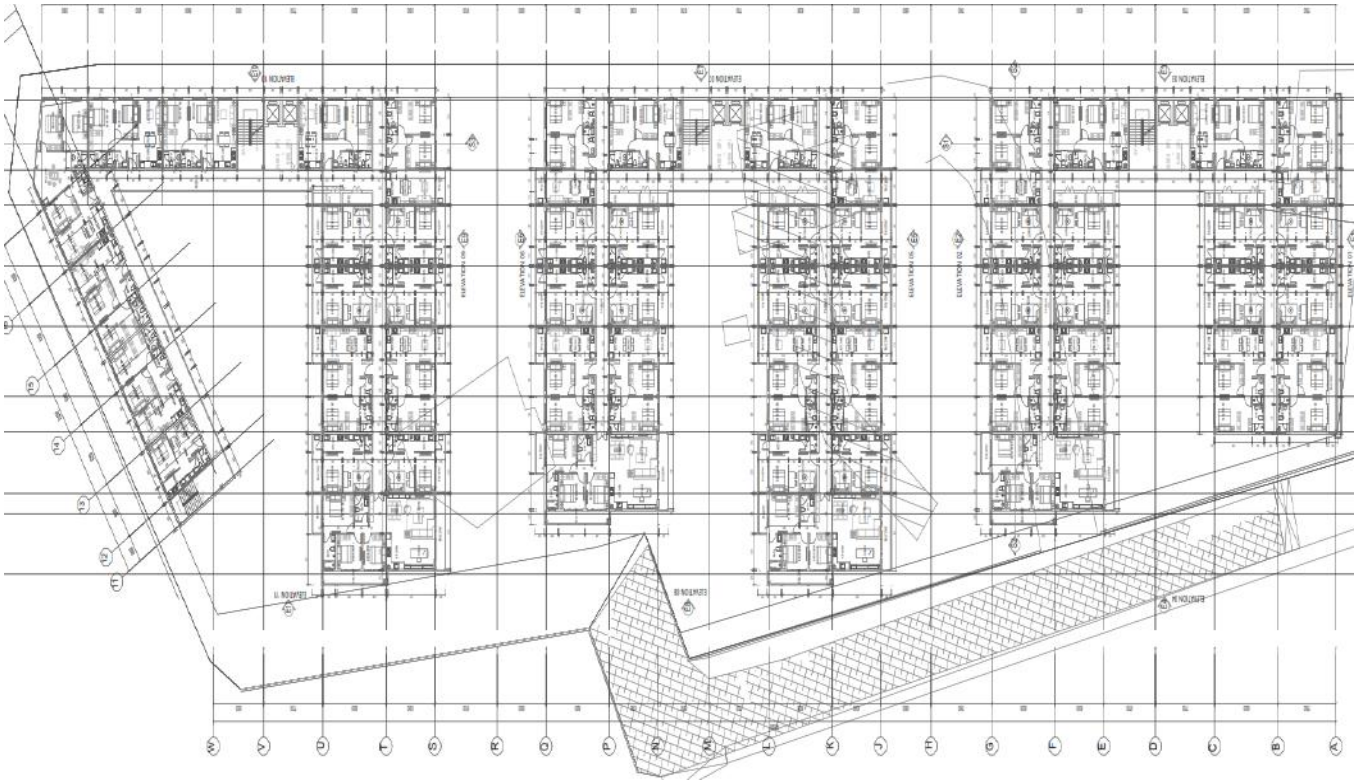
Architectural drawings



Ground floor plan



Typical 1st and 2nd floor plan



Typical 3rd to 8th floor plan