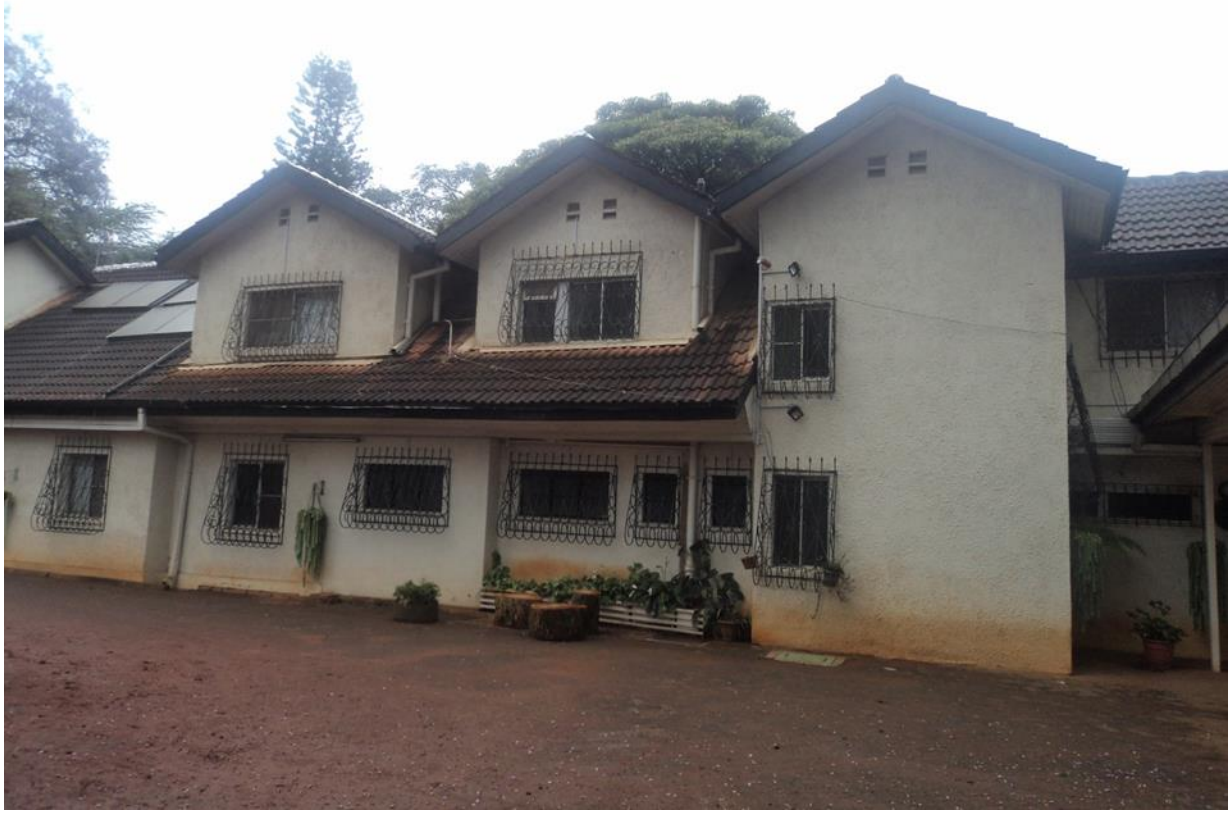
ENVIRONMENTAL IMPACT ASSESSMENT

STUDY REPORT

FOR

PROPOSED RESIDENTIAL DEVELOPMENT ON PLOT L.R. NO. 209/4906 ALONG RIVERSIDE GARDENS IN RIVERSIDE AREA OF NAIROBI CITY COUNTY.



This Environmental Impact Assessment (EIA) Study 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:

Wei Lin Loh,

P.O. Box 56038 – 00200,

Nairobi.

The following expert(s) conducted the assessment and prepared this EIA Study Report

Name of the Expert	Designation	Reg. No.	Signature
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For and on behalf of:

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Signed: _____ Date: _____

Name: .....

Designation: .....

TABLE OF CONTENTS

Executive Summary

Introduction

According to State Department for Housing and Urban Development, there is currently a backlog of 1.85 million housing units. The deficit is bound to rise due to the country's 4.4 per cent urbanization rate that welcomes 0.5 million new city dwellers annually. Nairobi is among the areas affected by the deficit with close to 60 per cent of its population living in slums. This therefore calls for the development of more housing units to meet the demand.

It is in light of the above situation that the proponent, *Wei Lin Loh,* has proposed to construct residential development consisting of two blocks of twelve (12) floors comprising of forty six (46) housing units in Block 1 and eighty one (81) housing units in Block 2 on plot LR No. 209/4906 located along Riverside Gardens on latitude 1°16'8.43''S and longitude 36°47'23.14''E in Riverside area of Nairobi City County.

Scope

The scope of the report was to describe the project, document all baseline information, legal and regulatory frame work associated with project, analyze the project alternatives, assess the environmental impacts and develop mitigation measures for the negative impacts including designing Environmental Management and Monitoring Plan (EMP) for the project.

Project Objectives

The objectives of the proposed project include:

i. To construct one hundred twenty seven (127) housing units in riverside area.
ii. To put the current land into more productive and economic use.
iii. To meet the economic desires of the proponent.

Objectives of the EIA

The objectives of undertaking the EIA were as follows;

i. To identify potential environmental impacts of proposed project and assess the significance of these impacts.
ii. To assess the relative importance of the various project alternatives.
iii. To propose mitigation measures for the significant negative impacts of the project on the environment.
iv. To seek the views and concerns of all the Project Affected Persons (PAPs) in regards to the proposed project.

v. To generate baseline data for monitoring and evaluation of how well the mitigation measures are being implemented during the project cycle.

vi. To develop comprehensive Environmental Management Plan (EMP) for the project cycle with mechanisms for monitoring and evaluating the compliance and environmental performance which shall include the cost of mitigation measures and the time frame of implementing the measures.

vii. To present the results of the EIA in such a way that they can guide informed decision making.

Methodology

The methodology used in the EIA consisted of the following:

i. Environmental screening of the proposed project in line with EMCA Cap 387, Legal Notice No. 150 of 2016. We established that the development falls under **High Risk Projects** (Urban development including establishment of new housing estate developments exceeding one hundred housing units).

ii. A site reconnaissance and visual survey to determine the baseline information of the project area.

iii. Analysis of the project documents such as the architectural plans with the proponent and project team.

iv. Assessment of occupational health and safety issues during the implementation of the project.

v. Seeking public views through a public meeting, direct interviews and administering of questionnaires.

vi. Proposal of feasible mitigation measures to minimize anticipated negative impacts during the project cycle.

vii. Preparation and submission of the EIA Study Report to the National Environment Management Authority (NEMA).

Environmental Impacts and Mitigation Measures

The potential negative environmental impacts of the proposed project and possible mitigation measures are summarized below:

Anticipated Impacts	Mitigation Measures
Increased Traffic	▪ Ferry building materials during off-peak hours. ▪ Employ traffic marshals to control traffic in and out of site. ▪ Provide bill boards at the site/entrance to notify motorists and general public about the proposed project. ▪ Enforce speed limits for construction vehicles especially along the roads leading to the site. ▪ Develop a traffic management plan to ensure that the site vehicles do not interfere with the regular traffic along the access roads. ▪ Ensure that the vehicles comply with axle load limits. ▪ Employ well trained and experienced drivers.
Solid waste	▪ Engage the services of registered waste handler to transport the waste at the designated areas. ▪ Covering of trucks when transporting building materials and waste. ▪ Use of an integrated solid waste management system; through a hierarchy of options: source reduction, recycling, composting and reuse. ▪ Provision of waste management room at a strategic place within the apartments for segregation and disposal of the waste. ▪ Efficient use of the materials to reduce waste and recycling/reuse where feasible. ▪ Monitor waste in line with the waste management regulations
Liquid waste	▪ Channel all liquid waste to the existing sewer line along the road. ▪ Conduct routine inspection and monitoring of the internal drains to identify and repair any leakages and blockages. ▪ Provision of sanitary facilities to the workers during the construction and proper decommissioning of the facilities once construction is complete. ▪ All waste pipes will have rodding eyes accessible from outside i.e. free to every part of the system for inspection, cleaning and repair. ▪ Regular inspection and maintenance of the internal sewer system. ▪ Residents should report any incidence of blockages in their units immediately they occur for prompt maintenance
Increased water demand	▪ Drill a borehole to supplement the existing water supply. ▪ Connect to the existing water supply after acquisition of the relevant permits. ▪ The contractor will engage the eservices of water vendors to supplement the water supply. ▪ Use of water efficient appliances and fixtures for plumbing products and white goods. ▪ Provision of adequate underground and roof water tanks for water storage.

	▪ Prompt detect and repair of the water fixtures and fittings.
Air Pollution	▪ Use of dust screens/nets around the construction site to contain and arrest dust. ▪ Regular sprinkling of water on work areas to prevent fugitive dust violations especially during the dry spell. ▪ Ensure no burning of waste such as paper and bottles on site/non-designated areas. ▪ Covering and regular watering of the exposed stockpiles on site such as the sand and ballast. ▪ Regular and prompt maintenance of construction machinery and equipment to minimize generation of hazardous gases.
Noise Pollution	▪ Construction works will be carried out during the day between 0800hrs to 1800 hrs. ▪ The contractor shall use noise shields on noisy equipment such as corrugated iron sheet structures. ▪ All noisy activities shall be scheduled concurrently during the construction to reduce the exposure period. ▪ Operation of the noisy machinery shall be carried out when necessary and switch them off when not in use. ▪ Provide and enforce use Personal Protective Equipment (PPE) by the workers at all times during the construction. ▪ Regular maintenance of the machinery to reduce frictional noise. ▪ Monitor noise levels as per regulations.
Energy Demand	▪ Use of solar energy as an alternative source of energy. ▪ Install and routine maintenance of energy efficient fixtures and fittings. ▪ Turn off the machinery and equipment when not in use. ▪ Put off all the lights immediately when not in use. ▪ Regular inspection and repairs of the solar panels.
Occupational Health and Safety of workers and public	▪ Workers shall use properly fitting PPEs to avoid accidents, injuries and illness ▪ The contractor shall adapt a suitable emergence response plans to manage occurrence of anticipated hazards during construction phase. ▪ Provide appropriate signage and warnings in work areas. ▪ Provide first aid facilities and ensure that workers are trained on emergency response such as first aid skills. ▪ Local individuals preparing food for the workers at the site shall be controlled, monitored and evaluated to ensure that food is hygienically prepared. ▪ Workers shall always be sensitized on social issues such as drugs, alcohol, diseases such as HIV/AIDS and STIs etc. ▪ Provide adequate and functional sanitary facilities for the workers. ▪ Comply with OSHA 2007 and all other relevant regulations governing health and safety of workplaces.

Conclusion and Recommendations

The proposed project will have numerous benefits to the housing sectors in the area and the country at large. However, the development will cause negative impacts hence the need to mitigate them in order to reduce their adverse effects to the environment. The study has evaluated the anticipated impacts and developed an EMP which shall be implemented by the proponent to ensure environmental protection, health and safety of the workers and the general public. It is therefore our recommendation that the proponent be granted EIA licence to implement the proposed project.

Acronyms

CBD	Central Business District
CPP	Consultations and Public Participation
DRSRS	Department of Resource Surveys and Remote Sensing
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EMP	Environmental Management Plan
ERC	Energy Regulatory Commission
GRM	Grievances Redress Mechanism
HIV	Human Immune Virus
KBS	Kenya Bureau of Statistics
KEFRI	Kenya Forestry Research Institute
KFS	Kenya Forest Service
NCA	National Construction Authority
NCC	Nairobi City County
NCWSC	Nairobi City Water and Sewerage Company
NEAP	National Environment Action Plan
NEMA	National Environment Management Authority
NET	National Environmental Tribunal
No.	Number
OHS	Occupation Health and Safety
OSHA	Occupational Safety and Health Act
PAPs	Project Affected Persons
PPP	Public Private Partnership
SDG	Sustainable Development Goals
STI	Sexually Treatment Infections
TOR	Terms of Reference
VOC	Volatile Organic Compounds
WCC	Waste Collection Centre

CHAPTER ONE: INTRODUCTION

1.1 General overview

The Kenyan constitution which is the supreme law of the country empowers every citizen with a right to accessible and adequate housing coupled with reasonable standards of sanitation. According to World Bank 2017 report on Kenya Economic Update on unavailable and unaffordable housing, there is an estimated accumulated housing deficit of over 2 million units. This is as a result of the increased population, rapid urbanization and current production of less than 50, 000 units annually.

The national government has been unable to meet the annual housing requirements providing a perfect opportunity for the private sector players to invest by buying land and developing housing units to cater for escalating demand for the residential development. It is due to this prevailing circumstances that the proponent, *Wei Lin Loh*, is proposing to construct two blocks of **twelve (12) floors comprising of one hundred twenty seven (127) apartments, one hundred fifty six (156) parking bays and other auxiliary facilities** on plot LR No. 209/4906 located along Riverside Gardens off Riverside Drive in Riverside area of Westlands Sub County, Nairobi City County.

1.2 Project Objectives

The objectives of the proposed project include:

i. To construct one hundred twenty seven (127) housing units in riverside area.
ii. To put the current land into more productive and economic use.
iii. To meet the economic desires of the proponent.

1.3 Objectives of EIA

The overall objective of EIA is to ensure that environmental concerns are integrated in the proposed project in order to contribute to sustainable development.

The specific objectives are:

i. To identify potential environmental impacts of proposed project and assess the significance of these impacts.
ii. To assess the relative importance of the various project alternatives.
iii. To propose mitigation measures for the significant negative impacts of the project on the environment.
iv. To seek the views and concerns of the PAPs in regards to the proposed project.

v. To generate baseline data for monitoring and evaluation of how well the mitigation measures are being implemented during the project cycle.
vi. To develop Environmental Management and Monitoring Plan (EMP) for the project cycle.
vii. To present results of the EIA Study Report in such a way that they can guide informed decision making.

1.4 Terms of Reference (TOR)

A scoping exercise was undertaken to identify the key issues to be addressed in the study and feasible project alternatives. During the exercise, terms of reference (TOR) were developed and submitted to the authority on 26th October 2018 in line with section 11 of the EIA Regulations and approved *(Attached is the TOR approval letter)*. Below are the TOR;

i. the proposed location of the project;
ii. a concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project;
iii. the objectives of the project;
iv. the technology, procedures and processes to be used, in the implementation of the project;
v. the materials to be used in the construction and implementation of the project;
vi. the products, by-products and waste generated project;
vii. a description of the potentially affected environment;
viii. 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;
ix. alternative technologies and processes available and reasons for preferring the chosen technology and processes;
x. analysis of alternatives including project site, design and technologies and reasons for preferring the proposed site, design and technologies;
xi. an Environmental Management Plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment; including the cost, time frame and responsibility to implement the measures;

xii. provision of an action plan for the prevention and management of foreseeable accidents and hazardous activities in the cause of carrying out activities or major industrial and other development projects;

xiii. the measures to prevent health hazards and to ensure security in the working environment for the employees and for the management of emergencies;

xiv. an identification of gaps in knowledge and uncertainties which were encountered in compiling the information;

xv. an economic and social analysis of the project;

xvi. an indication of whether the environment of any other state is likely to be affected and the available alternatives and mitigating measures.

1.5 Methodology

The methodology used for the preparation of this EIA Study Report was as follows:

i. Screening of the proposed project in line with legal notice No. 150 of 2016 of EMCA Cap 387. We established that the development falls under **High Risk Projects** (Urban development including establishment of new housing estate developments exceeding one hundred housing units).

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. Consultations and Public participation with the PAPs, proponent and the project team through a public meeting, administration of questionnaires and direct interviews.

v. Physical investigation of the site and the surrounding areas using a pre-prepared checklist.

vi. Reviewing the proposed project designs and implementation plan/schedules with a view to suggesting suitable alternatives.

vii. Develop an EMP outlining the responsibilities, schedules, monitorable indicators and time frames among other aspects.

viii. Preparation and submission of the EIA Study Report in line with the Environmental (Impact Assessment) Regulations 2003 to the National Environment Management Authority (NEMA).

1.6 Project Justification

1.6.1 Demand for housing

According to Cytonn Research on Nairobi Metropolitan area residential report, there is an estimated accumulated housing deficit of approximately two million units in 2018 having grown from 1.9 million in 2017. This has been attributed to an estimated population growth of 3.3% in the Nairobi City County. The national government through the Big Four Agenda on affordable housing proposes to construct 500, 000 residential units in partnership with the private sector to alleviate the escalating housing demand. Therefore, the proposed project will be within the overall policy direction of provision of affordable housing units in the country.

1.6.2 Size of the plot

Riverside area is in Zone 4 in accordance to the Nairobi City Development Ordinances and Zones Guidelines which allows Residential (Apartments) at a minimum area of 0.05Hectares. At 0.3338 hectares, the plot is large enough to accommodate the proposed project while adhering to the planning standards and policies provided by the County Government.

1.6.3 Socio-Economic Benefits of the Project

The proposed project will have numerous socio-economic benefits to the area and the country at large. Some of the following benefits will include the following;

i. Provision of quality habitable housing units in the area in line with the *Big Four Agenda* on Affordable Housing.
ii. Contribute towards the economic growth of our nation through revenue generation.
iii. Provision of employment opportunities to both skilled and unskilled personnel throughout the project cycle.
iv. Creation of market for goods and service during the project cycle.
v. The optimal use of land will result in increased utility of the parcel of land.

1.6.4 Neighborhood Development Trend

The neighborhood is currently undergoing urban transformation with the previous single dwelling units being replaced by mixed development including apartments, commercial and institutions. The proposed project will therefore be in conformity with this trend which will ensure better utilization of the land giving it higher quality and urban character as well as increase its profitability.

1.6.5 Adjacent Land use analysis

The area has undergone development regeneration and restructuring in the recent years at a high rate as a result of its strategic location and closeness to the Central Business District (CBD). Due to high demand for apartments, the area is now characterized by High-End Apartments such as ongoing construction of the Rumaisa Apartments, Krishna Pointe Apartments, Embassy of Chile and Allianz Plaza. Therefore, the development will be in conformity with the current land uses.

Plate 1: Ongoing Construction of Rumaisa Apartments

Source: Field Work, 2/11/2018

CHAPTER TWO: PROJECT DESCRIPTION, DESIGN AND IMPLEMENTATION

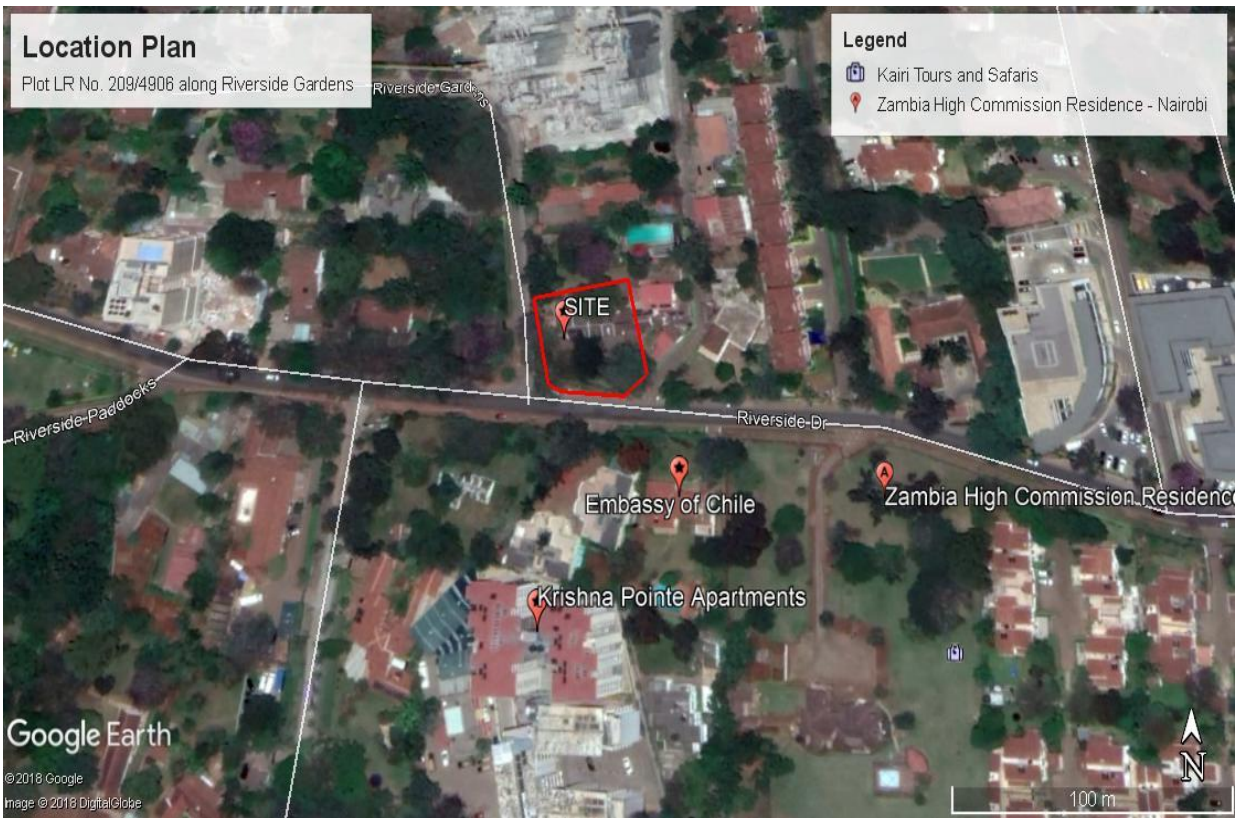
2.1 Nature of the Project

The proposed project will consist of two blocks of twelve (12) floors comprising of 46 units in Block 1 and 81 units in Block 2, one hundred fifty six (156) parking pays and other auxiliary facilities. The existing bungalow will be demolished to pave way for the proposed project. The project aims at provision of housing units in line with the local physical planning policy and increase in the utility of the land in the area.

2.2 Project Location and Size

The project site is located along Riverside Gardens off Riverside Drive on latitude 1°16'8.43''S and longitude 36°47'23.14''E adjacent to the Embassy of Chile in Riverside Area of Westlands Sub County, Nairobi City County. The portion of the parcel of land to be developed measures approximately **0.3338 Hectares** *(Attached is copy of the ownership documents).*

Plate 2: Site Location



Source: Google Earth, 2018

2.3 Land Tenure, Use, Ownership and Management

The parcel of land on which the subject development is proposed is held on leasehold interest for 99years from 9/9/1953. The certificate of title is drawn under The Registration of Titles Ordinance (Chapter 160) as Plot L.R. No. 209/4906 and the current registered proprietor is **Wei Lin Loh** (Post Office Box Number 56038 – 00200 Nairobi) who is hereby seeking the EIA Licence for the proposed project *(See attached the ownership document).*

According to the Nairobi City Development Ordinances and Zones Guidelines, the area is in Zone 4 which allows Residential (Apartments) at a minimum area of 0.05Hectares. Therefore, the proposed project is in line with the zoning of the area that permits apartments. The proponent applied for a change of use from single dwelling to multiple dwelling (Apartments) and the approval granted by County Government (**Ref: PPA-CU-AAB358**) on 13-09-2018 *(Attached is the change of use approval).*

2.4 Project Description

The project proponent proposes to construct a residential development on the aforementioned land comprising of 127 housing units, 156 parking bays and other auxiliary facilities as described below:

i. **Basement 1** comprising of 82 parking bays and electrical services room.

ii. **Basement 2** comprising of 74 parking bays, water tank and pump room.

iii. **Ground floor** comprising of 6 units of two bedroom apartments and 5 units of one bedroom apartments having a living room, dining, kitchen and washrooms, swimming pool and changing rooms.

iv. **Typical 1st to 10th Floor levels**

BLOCK 1

- 4 units of two bedroom apartments having a living room, dining, kitchen and washrooms.

BLOCK 2

- 2 units of two bedroom apartments and 5 units of one bedroom having a living room, dining, kitchen and washrooms.

v. **11th and 12th floor (Penthouses).**

BLOCK1

- 2 units having a living room, dining, kitchen, DSQ, washrooms in the 11th floor, four bedrooms and family room in the 12th floor.

BLOCK 2

- 3 units having a living room, dining, kitchen, washrooms in the 11th floor and three bedrooms in the 12th floor.
- 1 unit having a living room, dining, kitchen, DSQ, washrooms in the 11th floor, four bedrooms and family room in the 12th floor.

Other salient features include 3 staircases, 4 lift lobbies, balconies and gardens. In summary, there are 46 units in Block 1 and 81 units in Block 2. More fine details, specifications and features of the proposed project can be obtained from the drawings (*Attached are architectural drawings*).

2.5 Construction Inputs

The project inputs will include the following:

i. The materials that shall be used will include stones, cement, sand, crushed rock (gravel/ballast), ceramic fixtures, reinforcement bars, wood/timber, glass, painting materials, plastic, electrical and mechanical fixtures. All these materials shall be obtained from licensed dealers who have complied with the environmental management guidelines and policies and approved by Kenya Bureau of Standards (KBS).

ii. Several machines shall be used which will include earth moving equipment (excavators, loaders, wheel loading shovels and backhoe), material handling equipment (cranes and hoists), construction equipment (concrete mixers and vibrators) and Engineering vehicles (trailers, tippers and dumpers).

iii. The project will require a labour force of both skilled and non-skilled workers. The skilled personnel will include the project consultants (architects, engineers, quantity surveyors and environmental experts) and the contractor with a team of foreman, masons, plasterers, carpenters, plumbers, welders, electricians, glaziers, painters and casual labourers.

iv. Other construction inputs will include water and electricity from the main grid or provided by generators.

2.6 Construction Activities

2.6.1 Pre-Construction Stage

This stage shall involve:

i. Seeking of the appropriate approvals from the relevant authorities such as change of land user, demolition, tree cutting, hoarding and excavation permits.
ii. Preparation of the preliminary architectural designs for the proposed project and submission to the County Government for approval.
iii. Conducting a preliminary geotechnical exploration investigation for the project.
iv. Appraisal of baseline conditions to determine supply and demand for required infrastructural services.
v. Conducting an EIA and submission of the Study Report to NEMA for licensing.

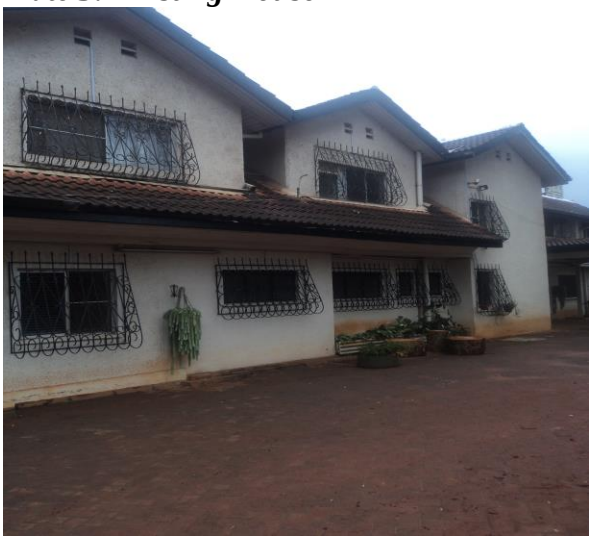
2.6.2 Construction Stage

This stage shall have several processes as discussed below:

i. **Demolition of the Existing Structures**

There is an existing bungalow on the proposed site which shall be demolished to pave way for the proposed project. The demolition works shall be carried during the day licensed contractor and upon acquisition of the permits the relevant authority. The structure shall be pulled down manually and mitigation measures observed to reduce air (dust) and noise pollution, solid waste (demolition debris) and accidents. The debris and materials such as the generator and solar panels shall be re-used and/or transported for re-use in other construction projects.

Plate 3: Existing House



Source: Field work, 2/11/2018

ii. **Construction site preparation**

After the demolition of the existing structure, the site preparation will commence with the construction of the hoarding area around the boundary of the plot to prevent the public from the falling objects. Other preparation works shall include construction of temporary site office and storage rooms, proviso of adequate sanitary facilities for workers, first aid office and utilities area. The contractor shall mobilize materials, workforce and machinery required for ground breaking.

iii. **Excavation and Foundation works**

The excavators, bulldozers, backhoe, loaders and tippers shall be used for the excavation works to pave way for the construction of the foundation and the basements. The machinery will aid in the removal of the soils/rocks and transporting of the waste to an approved disposal site. Proper excavation and foundation works shall be observed to ensure that the volumes of excavations are clearly defined. Shallow foundations which include the pad and strip footings shall then be constructed in liaison with the project structural engineer.

iv. **Concrete and Masonry works**

The construction of the superstructure will be carried out in line with the approved plans and comply with the specifications issued and approved by the project team and the proponent. Concrete works will involving the mixture of cement, sand and ballast in the specified ratios and pouring it in already constructed form work. The concreting will be supplemented by concrete mixers and vibrators. The poured concrete will be cured for a specified period under the supervision of the structural engineer. The internal and exterior walls will be built using machine cut stones sourced from a licenced supplier. The process will be under supervision of the project consultants including the environmental experts.

v. **Structural Steel works**

The structural elements which include the slabs, beams, columns, retaining walls, shear walls and foundation bases will be constructed using reinforced concrete. The structural steel will be used to reinforce the concrete since the concrete is weak in tensile strength. Structural steel works will involve steel cutting, welding and fixing on the already constructed formwork before concreting is carried out. Other steel works will include fabrication and installation of metal guard rails and balustrades as specified from the approved plans.

vi. **Plumbing, Mechanical and Electrical works**

This phase will involve installation of water and waste water piping, electrical gadgets and appliances including lighting fixtures and connection of the electrical and mechanical configuration to the sewer line and existing power lines upon acquisition of the necessary approvals. All the electrical works will be carried out by a licensed electrician to the satisfaction of the Kenya Power and Lighting Company (KPLC). The phase will followed by an inspection and a report issued to the relevant authorities before approval is granted.

vii. **Interior and Exterior Finishes**

After concrete and masonry works are completed, plastering will be carried out to ensure the building is structurally strong, protected from weather effects and given an attractive look. This will be done both internally and externally in line with the specifications of the project architect. After plastering, the painting of the development will be carried out with cement primer and eco-friendly zero Volatile Organic Compounds (VOC) paints and fixing of the floor and wall tiles.

vi. **Landscaping and Final clean up**

The final cleanup will be done once the construction activities are completed. All the waste will be reused where feasible and/or transported to designated approved dumpsites. Thereafter, a landscaping exercise will be carried out to improve the aesthetic value or visual quality of the site. This will include planting of grass bed and trees, establishment of a theme gardens and lush grass lawns where applicable. It is noteworthy that the proponent will use plant species that are available locally preferably indigenous ones for landscaping.

2.6.3 Occupation Stage

The project will be used for residence for a total of 127 families. Several family activities will accompany residence such as cooking, laundry, cleaning, leisure and recreational activities (swimming).

2.6.4 Decommissioning Stage

This is the stage where the final disposal of the residential apartments and its associated facilities will be carried out after the expiry of the project life span. All relevant agencies including the project consultants will be notified before the decommissioning is carried out with a bid to ascertain guidelines on possible impacts and mitigation measures. Some of the project decommissioning activities will include;

i. All equipment including the mechanical and electrical fixtures and fittings will be dismantled and removed from the site. Priority will be given to reuse of the equipment in other projects through auctioning to other contractors or reuse in another proponent's site.
ii. The project components including the buildings, pavements, parking areas and perimeter fence will be demolished. The debris will be reused where feasible and/or disposal off by a licenced waste handler.
iii. The site will be restored through replenishment of the topsoil and re-vegetation using indigenous plant species. The unsafe areas will be fenced until natural stabilization occurs.

2.7 Construction Products, By Products and Wastes

2.7.1 Products

The final product will be **one hundred twenty seven (127) apartments, one hundred fifty six (156) parking bays** and other auxiliary facilities.

2.7.2 By-Products

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

i. Soil generated during excavation will be reused elsewhere in the project and/or transported for disposal at designated areas by licenced waster handler.
ii. Excess sand, ballast and material stockpiles will be used for future construction activities e.g. renovations. Upon completion of the project, these will be moved by the contractor to a suitable yard.
iii. Empty cans and drums will be used to store water during construction and the damaged ones will be recycled.
iv. Pieces of timber/wood will be used as formwork in other proposed projects.

2.7.3 Solid and Liquid Waste Management

The solid waste generated during construction will include construction and demolition debris, sanitary waste, excavated soil and rocks. During operation phase, the solid wastes that may likely to be generated are paper, plastics, cans, pieces of metal and glass, sanitary and organic waste. All liquid waste will be treated before being directed to the existing sewer line whereas the solid waste will be segregated, reused and/or recycled where appropriate and disposed at designated areas by licenced waste handler.

The wastes shall be disposed by the proponent in accordance with the standards and documented procedures stipulated in the Waste Management Regulations of 2006.

2.8 Project Budget and Duration

The proposed project is estimated to cost **one billion one hundred million Kenyan shillings** (KShs 1, 100, 000, 000). The project implementation works is estimated to take 2 years to completion.

CHAPTER THREE: BASELINE INFORMATION

3.1 PHYSICAL ENVIRONMENT

3.1.1 Climate

According to Nairobi County Integrated Development Plan of 2014, the County has a fairly cool climate resulting from its high altitude. Temperatures range from a low of 10°C to a high of 29°C. It has a bi-modal rainfall pattern. The long rains season fall between March and May with a mean rainfall of 899 millimetres while the short rains season falls between October and December with a mean rainfall of 638 millimetres. The mean annual rainfall is 786.5 millimetres.

3.1.2 Topography and Drainage

The site lies at an altitude of approximately 1700 meters above sea level. It slopes towards the northern part of the plot towards the Nairobi River. The site is well drained by use of natural drainage and permeable soils. There is also an already existing open drain along the road.

3.1.3 Geology and Soils

The soils are predominantly red loam soils just like most of the region. The proponent is expected to carry out a geo-technical survey to establish the soil's carrying capacity as well the minimum foundation depth hence make appropriate designs that will put into consideration the findings of the survey.

3.1.4 Hydrology

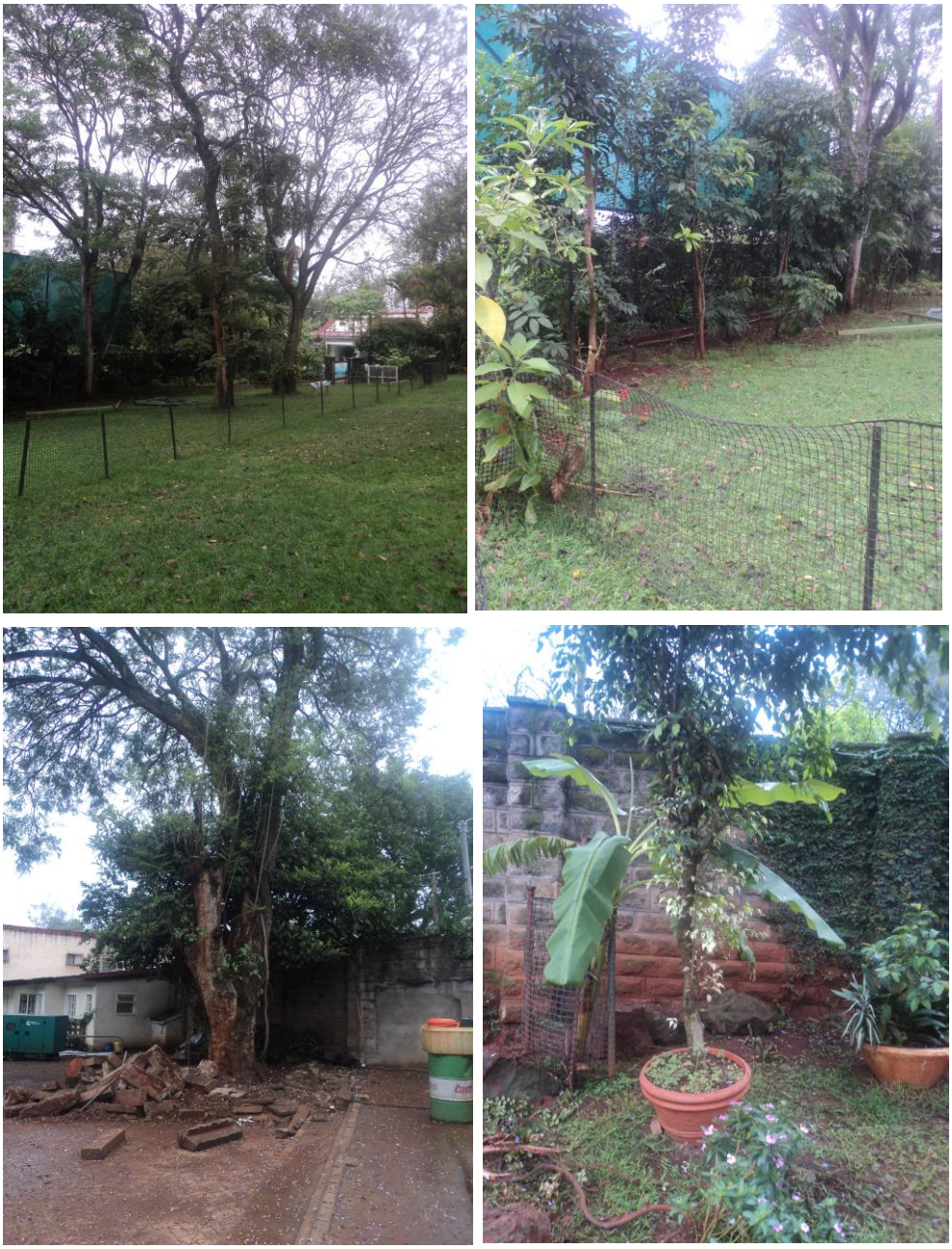
The closest river to the project site is Nairobi River which is at a distance of approximately 200 meters northwards from the project site. This is the nearest surface water but the property **does not** border any river or stream.

3.2 BIOLOGICAL ENVIRONMENT

3.2.1 Flora

The site has no exotic plants species but is characterized by grass, flowers and trees as shown on plate 4 below. The trees along the plot boundary, potted flowers and trees shall be conserved. Some of the trees will be cut to pave way for the proposed project and measures will be taken to replant observing the necessary relevant policies. The developer will seek tree cutting permit from the Nairobi County Director of Forestry before carrying out the activity.

Plate 4: Vegetation within the site



Source: Fieldwork, 2/11/2018

3.2.2 Fauna

The project site is situated within a commercial/residential zone where human activities have altered the natural habitat for animals over the years. The property is characterized by few bird species. None of the faunal species observed are rare or endangered. The proponent keeps dogs in his compound which are used to enhance security during the night.

3.3 SOCIO-ECONOMIC ENVIRONMENT

3.3.1 Land Use

According to African City Planner, Nairobi County has a population of 3.5 million and a density of 4,850 people/Km^2 and about 5.8 million people estimated to live in the city by 2025. This calls for planning towards sustaining the population. It is in line with this that the County has seen trends appearing to change in the land use inventory of the years. The neighborhood which was characterized with low density residential units like Riverside area is now changing to mix of different uses such as commercial, institutions and residential high-rise apartments.

This has seen developers put up high rise mixed use developments which are towering the landscape and also rise in the number of institutions within the area. Reference is made to Krishna Pointe Apartments, Embassy of Chile and ongoing construction of Rumaisa Apartments.

Plate 5: Rumaisa Apartments

Source; Field Work, 2/11/2018

3.3.3 Educational Institutions

There has been an increase in the number of educational facilities in the area as a result of incoming population. Some of the institutions found in the area include pre-primary schools, primary schools, secondary schools, colleges and university. Notable references include Riverside Farm Nursery School, Consolata School, St. Austin's Academy, Strathmore School, Kenya high School, Nairobi International School and University of Nairobi which are within three kilometre radius from the project site.

3.3.4 Religious Institutions

Religious institutions in the neighbourhood include churches and mosques such as Parklands Baptist Church, St. Jude Catholic Church, Consolata Shrine, Masjid Ibrahim Kileleshwa Mosque and Westlands Mosque.

3.3.5 Commercial Activities

These commercial activities in the area are concentrated at a radius of one kilometer from the site and include shopping complex such as the Diamond Plaza and Sky mall with restaurant, supermarkets, leisure and recreation areas, merchandise, services and activities related to Malls and Retail & Shopping. Other commercial activities include financial institutions such as I&M Bank, Imperial Bank, SBM Bank and Prime Bank, offices, Sports Clubs and light industries such as Shell and Oilibya Petrol Stations.

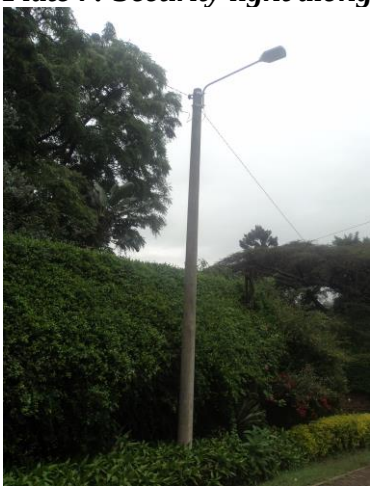
Plate 6: Allianz Plaza

Source: Field Work, 2/11/2018

3.3.6 Security

There are security lights installed along the access road. These lights are used to promote security in the area, increase quality of life by artificially extending the hours in which it is light and also improve safety of drivers, riders and pedestrians. Security in the area is also beefed up by the nearby Kileleshwa Police Station which is located approximately one kilometer from the proposed site.

Plate 7: Security light along the road



Source: Fieldwork, 2/11/2018

3.3.7 Health Facilities

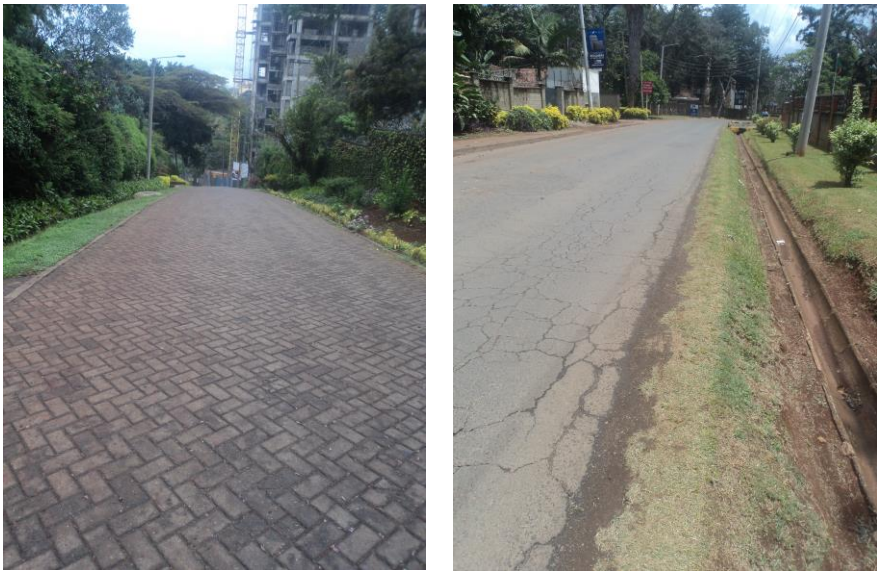
The health facilities located within 1500 meters radius from the project site are AIC Kijabe Hospital Nairobi Clinic, Mater Misericordiae Hospital Westlands and Bliss Medical Centre Westlands.

3.4 INFRASTRUCTURE

3.4.1 Roads and accessibility

The property is accessed along Riverside Gardens off Riverside Drive in Riverside Area, Westlands Sub-county of Nairobi County. The access road is in cabro state and in good condition. The accessibility of the site will be instrumental during project cycle.

Plate 8: Riverside Gardens and Riverside Drive



Source; Fieldwork, 2/11/2018

3.4.2 Water supply

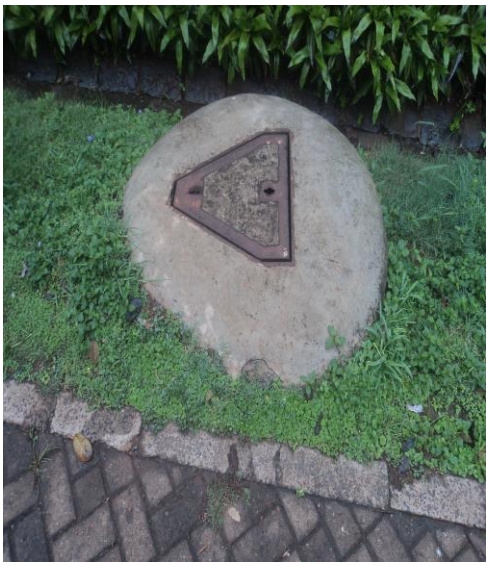
The general area is served with water supplied by Nairobi City Water and Sewerage Company (NCWSC). The developer intends to connect to the main water supplier upon acquisition of the relevant permits from the company. However, to supplement the water supply from the company, the developer also intends to:

i. Drill a borehole to supplement the county supply. The proponent shall apply for a permit from the Water Resource Authority and undertake a separate EIA for the borehole before drilling commences.
ii. Make arrangements with registered water vendors to supply water to the site in case of short-fall in the normal supply.
iii. Provision of underground and roof tanks for water storage for the proposed project.

3.4.3 Sewer System

The general area is served with public sewerage system of NCWSC. The proponent therefore intends to connect to the trunk sewer for sewerage disposal. The liquid waste will be treated before disposal to the sewer system to reduce the load and pressure on the system. The internal sewer system of the proposed project will be suitably designed to collect all effluent/waste water from the development. All sanitary works will be done to the entire satisfaction of County Government and Ministry of Health.

Plate 9: Sewer manhole

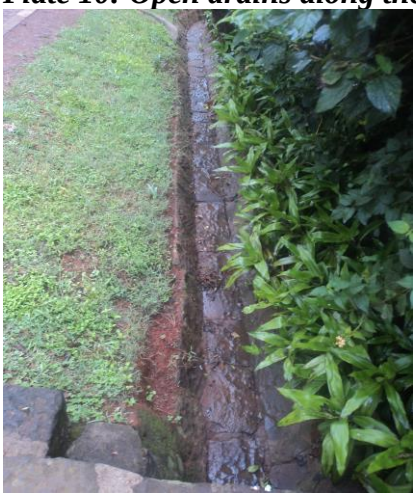


Source: Fieldwork, 2/11/2018

3.4.4 Storm Water Drainage

There are already constructed open drains along Riverside Gardens as shown on plate 10. The proponent will ensure that the drainage systems are designed and effectively constructed to manage the storm water derived from the parking area, driveway and the proposed project. Measures will also be put in place to install rain water harvesting facilities to reduce the surface run off from the proposed project.

Plate 10: Open drains along the road

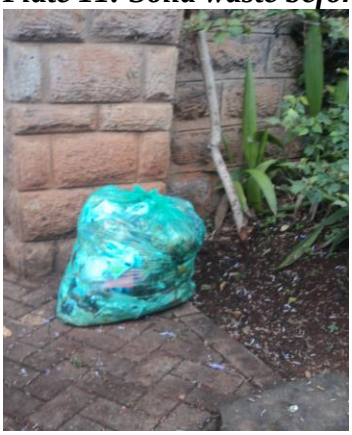


Source: Fieldwork, 2/11/2018

3.4.5 Solid Waste Management

The solid waste within the area is managed by the county government and private contractors who collect the waste on weekly basis. The solid waste generated from the proposed project will be segregated, reused/recycled where feasible and transported for final disposal. The proponent will engage the services of a licensed waste handler to transport waste on regular intervals during the project cycle.

Plate 11: Solid waste before disposal

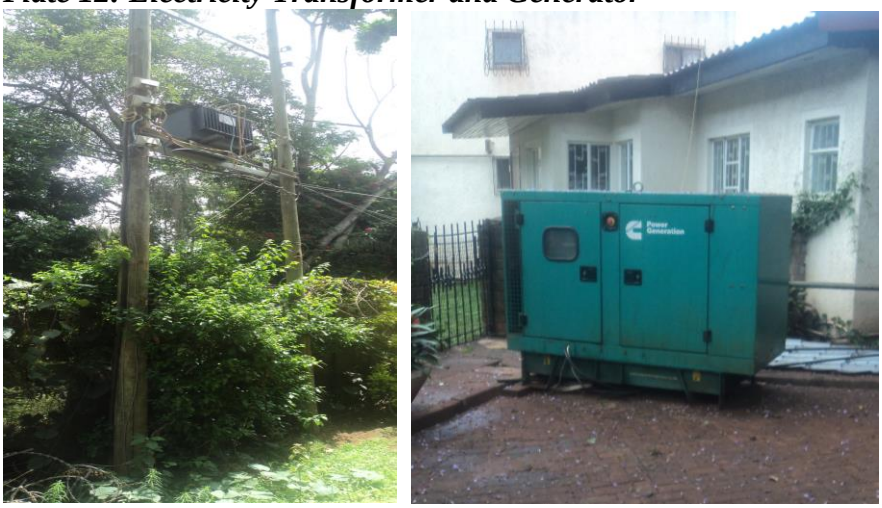


Source: Fieldwork, 2/11/2018

3.4.6 Electricity

The site is not served by electricity from the National grid but there are existing electric lines along the road adjacent to the property. The proponent will connect the proposed project to the national grid upon acquiring relevant permits.

Plate 12: Electricity Transformer and Generator

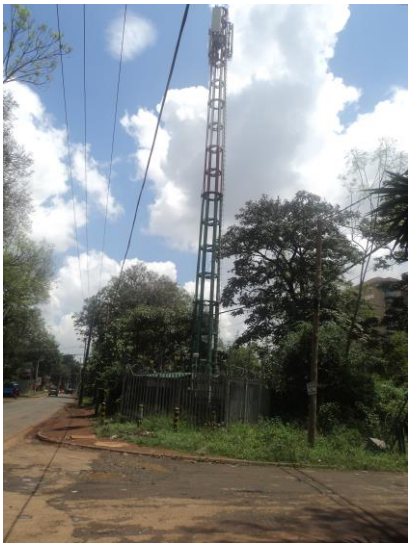


Source: Fieldwork, 2/11/2018

3.4.7 Communication

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

Plate 13: Communication Booster along Riverside Drive



Source: Fieldwork, 2/11/2018

CHAPTER FOUR: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

4.1 INTRODUCTION

The protection, conservation and exploitation of the natural resources is governed by a number of policies, laws and regulations coupled with the provisions for the environmental management. Some of the key national policies, laws and regulations that have a direct bearing on the optimal operation of the proposed project are discussed in this chapter.

4.2 NATIONAL POLICIES

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 initiatives/plans. 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. As a result of its adoption and implementation, establishment of appropriate policies and legal guidelines as well as harmonization of the existing ones have been accomplished and/or are in the process of development. Under the NEAP process, EIAs were introduced targeting the industrialists, business community and local authorities (now the county governments).

The proposed project shall be implemented and operated based on these guidelines.

4.2.2 National Policy on Water Resources Management and Development (1999)

While the policy enhances a systematic development of water facilities in all sectors for promotion of the country's socio-economic progress, it also recognizes the by-products of this process as wastewater. It therefore calls for development of appropriate sanitation systems to protect people's health and water resources from institutional pollution. This implies that industrial and business development activities should be accompanied by corresponding waste management systems to handle the waste water and other waste emanating there from. The same policy also requires that such projects undergo comprehensive EIAs that will provide suitable measures to be taken to ensure environmental resources and people's health in the immediate neighbourhood are not negatively impacted by the emissions.

The wastewater from the proposed project shall be directed to the existing conventional sewer system.

4.2.3 Policy Paper on Environment and Development (1999)

The key objectives of the policy include;

i. To ensure that from the onset, all development policies, programmes and projects take environmental considerations into account,
ii. To ensure that an independent EIA report is prepared for any industrial venture or other development before implementation,
iii. To come up with effluent treatment standards that will conform to acceptable guidelines.

Under this paper, broad categories of development issues have been covered that require a sustainable development approach. These issues relate to waste management and human settlement. The policy recommends the need for enhanced re-use/recycling of residues including wastewater, use of low or non-waste technologies, increased public awareness and appreciation of a clean environment. It is also encourages participation of stakeholders in the management of wastes within their localities. Regarding human settlement, the paper encourages better planning in both rural and urban areas and provision of basic needs such as water, drainage and waste disposal facilities among others.

The proposed project has been designed to cater the basic needs addressed in this policy paper.

4.2.4 Sustainable Development Goals (SDGs)

The United Nations Sustainable Development Goals were adopted by countries in 2015. The SDGs aims at contributing towards ending poverty, protecting the planet and ensuring prosperity for all as part of a new sustainable development agenda. The SDGs have very significant implications for investment needs and the role of the public and private sectors is indispensable.

The proponent shall be committed to the SDG's through the proposed project in the following ways:

Goal 3: Good Health & Well Being

The project will contribute to improved health and productivity through the provision of a safe and clean environment.

Goal 6: Clean Water and Sanitation

The connection of the liquid waste to the sewer system and provision of adequate sanitary facilities shall improve water quality and sanitation by ensuring untreated wastewater is not discharged to the environment.

Goal 7: Affordable and Clean Energy

The implementation of an energy management system through good orientation, solar shading, natural ventilation, natural lighting, energy efficient fitting and appliances shall contribute to increased energy efficiency. The proponent shall also use solar energy as an alternative source of energy.

Goal 8: Decent Work and Economic Growth

The creation of employment opportunities during the project cycle shall contribute to reducing the unemployment rate in the country. The proponent shall ensure an environment that emphasizes on protection of labor rights and promotes safe and secure working environment for all workers during the project cycle.

4.3 LEGAL FRAMEWORK

4.3.1 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 on 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 and other measures, particularly those contemplated in Article 69; and to have obligations relating to the environment fulfilled under Article 70.

Article 43 (1) (b) states that every person has the right to accessible and adequate housing, and to reasonable standards of sanitation. Article 69 (1) (d) also stipulates that the state shall encourage public participation in the management, protection and conversation of the environment and utilize the environment and natural resources for the benefit of the people of Kenya. Section 2 of article 69 states that every person has a duty to cooperate with state organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

The proponent shall adhere to the provisions of the EMP provided in this report and ensure the right to a clean and safe environment is not infringed. Consultations and public participation with the PAPs has been undertaken and questionnaires annexed in the report.

4.3.2 Environment Management and Coordination Act, EMCA Cap 387 and Amendment 2015

The Act states in section 3 (1) and (2) that every person 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).

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 experts conducted the EIA in line with the regulations, guidelines and procedures issued under the Act.

4.3.3 The Environmental (Impact Assessment and Audit) Regulations, 2003

These regulations stipulate how an EIA study 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 EIA Study Report making process. Section 4 (1) states that no proponent shall implement a project likely to have a negative environmental impact or for which an EIA is required under the Act or these Regulations unless an EIA has been concluded and approved in accordance with these Regulations.

Section 11 (1) states that an EIA study shall be conducted in accordance with terms of reference developed during the scoping exercise by the proponent and approved by the Authority. Section 13 (1) and (2) further states that proponent shall, on the approval of the terms of reference under regulation 11, submit to the Authority the names and qualifications of the impact assessment experts appointed to undertake the EIA study and authorized so to do in accordance with section 58 (5) of the Act and that every EIA study shall be carried out by a lead expert qualified in accordance with the criteria of listing of experts specified in the Fourth Schedule to these Regulations.

Section 17 (l) stipulates that during the process of conducting an EIA study under these Regulations, the proponent shall in consultation with the Authority; seek the views of persons who may be affected by the project. Part IV of the regulations states how an EIA Study Report is conducted, contents and information required, submission, timelines and review process.

The proponent has undertaken this EIA Study report in line with all the provisions set out in these regulations. The TOR was submitted to the authority and approved in line with the regulations. A public meeting, administration of questionnaires and direct interview were conducted to seek views of PAPs in line with these regulations.

4.3.4 Environmental Management and Co-ordination (Water Quality) Regulations, 2006

The Regulations apply to drinking water, water used for industrial purposes, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife, and water used for any other purposes.

Part II Section 4 (1) states that every person shall refrain from any act 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. Subsection (2) further states that no person shall throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit.

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.

All waste water shall be channeled to the sewer line so as not to pollute the ground and surface water and if a pollution incidence occurs the proponent shall notify the authority immediately.

4.3.5 Environmental Management and Co-ordination (Waste Management) Regulations, 2006

Section 4 (1) and (2) of the regulations 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 and that any person whose activities generate waste shall collect, segregate and dispose or cause to be disposed off such waste in the manner provided for under these Regulations.

Section 9 states that any person licensed to transport waste shall collect waste from the designated area of operations or storage areas and shall deliver such waste to the designated storage site, disposal site or plant.

The proponent shall engage the services of a licenced waste handler to transport waste to the designated areas. During occupation, the proponent has set aside waste management room to be used for collection and segregation of waste before disposal.

4.3.6 The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009

Section 3 (1) and (2) of the regulations states that no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment except as otherwise provided in the Regulations. 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 can be controlled without much effort or expense to the person making the noise.

These regulations also relate noise to its vibration effects and seek to ensure no harmful vibrations are caused by controlling the level of noise. Part II Section 4 states that except as otherwise provided in these Regulations, no person shall make or cause to be made excessive vibrations annoys, disturbs, injures or endangers the comfort, response, health or safety of others and the environment or cause to be made excessive vibrations which exceed 0.5 centimeters per second beyond any source property boundary or 30 meters from any moving source.

Section 13 (1) states that no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations except for the purposes in sub-Regulation (2) hereunder. These purposes include emergencies, those of domestic nature and/or public utility construction.

Section 14 relates to noise, excessive vibrations from construction, demolition, mining or quarrying site, and state that where defined work of construction, demolition, mining or quarrying is to be carried out in an area, the Authority may impose on how the work is to be carried out including but not limited to requirements regarding machinery that may be used, and the permitted levels of noise as stipulated in the Second and Third Schedules to these Regulations.

The contractor shall ensure that all construction activities are carried out between 0800hrs and 1800hrs on weekdays to ensure that the neighbors are not disturbed. The contractor shall also

ensure that all machineries are in good working condition to reduce frictional noise. The demolition of the existing house shall be carried out in line with these regulations.

4.3.7 The Environmental Management and Co-Ordination (Air Quality) Regulations, 2014

The objective of these regulations is to provide for the prevention, control and abatement of air pollution to ensure clean and healthy ambient air. Clause 5 states that no person shall act in a way that directly or indirectly causes, or is likely to cause immediate or subsequent air pollution; or emit any liquid, solid or gaseous substance or deposit any such substance in levels exceeding those set out in the first Schedule.

Further, clause 6 stipulates that no person shall cause or allow emission of the priority air pollutants prescribed in the second schedule to cause the ambient air quality limits prescribed in the first schedule to be exceeded. Clause 25 (1) states that no person shall cause or allow the emission of visible air pollutants from a stationary or mobile vehicle in excess of the limits set out under the prescribed Standard. Clause 33 states that no person operating construction equipment or handling construction material shall allow emission of particulate matter so as to adversely affect the limits set out in the First schedule.

Clause 35 states that no person shall cause or allow stockpiling or other storage of material in a manner likely to cause ambient air quality levels set out under the First Schedule to be exceeded.

Clause 38 stipulates that no person shall cause or allow emissions of priority air pollutants set out under the Second Schedule from disposal of medical waste, domestic waste, plastics, tyres, industrial waste or other waste by open burning.

The proponent shall comply with these regulations and implement all mitigation measures provided in the EMP to prevent air pollution during the project cycle

4.3.8 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 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 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.

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

4.3.9 Occupational Health and Safety Act 2007

This is an act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The key areas addressed by the Act include:

i. General duties including duties of occupiers, self-employed persons and employees.
ii. Registration of workplaces.
iii. Health General Provisions including cleanliness, ventilation, lighting and sanitary conveniences.
iv. Machinery safety including safe handling of transmission machinery, hand held and portable power tools, self-acting machines, hoists and lifts, chains, ropes & lifting tackle, cranes and other lifting machines, steam boilers, air receivers, refrigeration plants and compressed air receiver.
v. Safety General Provisions including safe storage of dangerous liquids, fire safety, evacuation procedures, precautions with respect to explosives or inflammable dust or gas.
vi. Chemical safety including the use of material safety data sheets, control of air pollution, noise and vibration, the handling, transportation and disposal of chemicals and other hazardous substances materials
vii. Welfare general provisions including supply of drinking water, washing facilities, and first aid.

Under section 6 of this act, every occupier is obliged to ensure safety, health and welfare of all persons working in his workplace. The occupier shall achieve this objective by preparing and as often as may be appropriate, revising a written statement of his general policy with respect to the

safety and health at work of his employees and the organization and arrangements for the time being in force for carrying out that policy (Section 7). He is also required to establish a safety and health committee at the workplace in a situation where the number of employees exceeds twenty (section 9) and to cause a thorough safety and health audit of his workplace to be carried out at least once in every period of twelve months by a registered safety and health Advisor (Section 11).

To ensure machinery safety, every hoist or lift (section 63) and all chains, ropes and lifting tackles (section 64 (l, d)), shall be thoroughly examined at least once in every period of six months by a person approved by the Director of Occupational Health and Safety Services.

In relation to fire safety, section 78 (3) requires spillage or leaks of any flammable liquid to be contained or immediately drained off to a suitable container or to a safe place, or otherwise treated to make it safe. Furthermore, section 78 (5) states that a clear and bold notice indicating that smoking is prohibited should be conspicuously displayed in any place in which explosive, highly flammable or highly combustible substances, are manufactured, used, handled or stored.

In summary, this act will be used a guideline to ensure health and safety of workers is guaranteed.

The proponent shall ensure that safety measures are implemented in use of tools and machinery within site and that protection of the workers and general public with any form of interaction with the construction site is observed as stipulated in the act.

4.3.10 The Physical Planning Act of 1996 CAP 286

In section 30 (1) of the act stipulates that no person shall carry out development within the area of a local authority (now county government) without a development permission granted by the local authority under section 33. Section 31 further states that any person requiring development permission shall make an application in the form prescribed in the Fourth Schedule, to the clerk of the local authority responsible for the area in which the land concerned is situated. The application shall be accompanied by such plans and particulars as are necessary to indicate the purposes of the development, and in particular shall show the proposed use and density, and the land which the applicant intends to surrender for Purposes of principal and secondary means of access to any subdivisions within the area included in the application and to adjoining land public purposes consequent upon the proposed development.

Section 36 states 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 activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an environmental impact assessment report.

The proponent has submitted the change of use and architectural designs to the county government for approval.

4.3.11 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.

The proponent shall contract a licensed waste handler to collect all waste from the site to disposal at approved dumping site. Sewage from the site shall be discharged into the conventional sewer system. The proposed project shall be kept clean at all times and the proponent shall ensure all provisions of this act are implemented.

4.3.12 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.

The proponent shall work in liaison with County Government and in particular the Water, Energy, Forestry, Environment and Natural Resources Sector.

4.3.13 Energy Act, 2006

The Act establishes an Energy Regulatory Commission (ERC) mandated to perform all functions that pertain 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 Cap 387. 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.

The proposed project shall be connected to the national electricity supply from the KPLC upon acquisition of the relevant permits.

4.3.14 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.

The proponent shall apply for a permit from the NCA before the construction begins. He shall also coordinate with the authority during the construction period to ensure that the works are undertaken in accordance to the dictates of the construction industry and that the personnel is licensed by the authority.

4.3.15 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 (county governments) 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.

The architectural and structural plans for the proposed project have been submitted to the county government for approval before the project commences.

4.3.16 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 that any person who voluntarily corrupts or fouls the water of any public spring or reservoir, so as to render it less fit for the purpose for which it is ordinarily used and 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 neighbourhood or passing along a public way, is guilty of a misdemeanour.

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

4.3.17 Land Registration Act, 2012

According to section 26 subsection (1) states that the certificate of title issued by the Registrar upon registration, or to a purchaser of land upon a transfer or transmission by the proprietor shall be taken by all courts as prima facie evidence that the person named as proprietor of the land is the absolute and indefeasible owner, subject to the encumbrances, easements, restrictions and conditions contained or endorsed in the certificate, and the title of that proprietor shall not be subject to challenge, except on the ground of fraud or misrepresentation to which the person is proved to be a party; or where the certificate of title has been acquired illegally, unprocedurally or through a corrupt scheme. A certified copy of any registered instrument, signed by the Registrar and sealed with the Seal of the Registrar, shall be received in evidence in the same manner as the original.

Copy of land ownership documents is attached to this report.

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

Pursuant to Article 67 (2) of the constitution, the functions of the commission are outlined in section 5 of the act as follows;

i. To manage public land on behalf of the national and county governments;
ii. To recommend a national land policy to the national government;
iii. To advise the national government on a comprehensive programme for the registration of title in land throughout Kenya;
iv. To conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities;
v. To initiate investigations, on its own initiative or on a complaint, into present or historical land injustices, and recommend appropriate redress;

vi. To encourage the application of traditional dispute resolution mechanisms in land conflicts;

vii. To assess tax on land and premiums on immovable property in any area designated by law; and

viii. To monitor and have oversight responsibilities over land use planning throughout the country.

The subject plot is a private property owned by the project proponent and does not constitute part of disputed public/private utility land/allocations. Attached in the report is the ownership document.

4.4 INSTITUTIONAL FRAMEWORK

4.4.1 National Environmental Management Authority (NEMA)

The objective and purpose for which NEMA is 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 is mandated to 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 with a view to ensuring the proper management and rational utilization of the environmental resources on a sustainable yield basis for the improvement of the quality of human life in Kenya and identify projects and programmes or types of projects and programmes, plans and policies for which environmental audit or environmental monitoring must be conducted under EMCA.

The EIA Study report is submitted to the authority for review and licensing. The proponent shall work in liaison with the authority in complying with the provisions of EMCA and any other subsidiary legislation under the Act.

4.4.2 National Environment Tribunal (NET)

The tribunal is formed under section 125 of the EMCA, Cap 387 and handles all cases related to environmental offences in the Republic of Kenya. If there will be any disputes to the proposed project, they will be presented to the tribunal for hearing and determination. Any person aggrieved by the decision or order of the tribunal may appeal against such decision or order to the High Court.

CHAPTER FIVE: IMPACT ASSESSMENT, MITIGATION MEASURES AND CONSTRUCTION SAFETY

This chapter will discuss the prediction an analysis of the positive and negative impacts during the project cycle, that is, construction, operation and decommissioning phases. The various impacts were determined through discussion with the project consultants, stakeholder's participation, a review of EIA guidelines and professional judgement. The impacts are described into the following categories;

i. Magnitude (minor or major),
ii. Duration (Short-term or long term),
iii. Extent (Specific (localized) or widespread),
iv. Reversibility (Reversible or irreversible).

The significant impacts both positive and negative are tabulated below;

Table 1: Significant Impacts during the Project Cycle (Construction, Operation and Decommissioning Phases)

Impacts	**Type of Impacts during the Phases**		
	Construction	**Operation**	**Decommissioning**
Increased housing units		- Major Positive - Long Term - Localised - Irreversible	
Employment opportunities	- Major Positive - Short Term - Localised - Reversible	- Major Positive - Long Term - Widespread - Irreversible	- Major Positive - Short Term - Localised - Reversible
Revenue Generation	- Major Positive - Short Term - Widespread - Reversible	- Major Positive - Long Term - Widespread - Irreversible	- Major Positive - Short Term - Widespread - Reversible
Market for goods	- Major Positive - Short Term - Widespread - Reversible	- Major Positive - Long Term - Widespread - Irreversible	
Noise pollution and vibrations	- Major Negative - Short Term - Localised - Reversible	- Minor Negative - Short Term - Localised - Reversible	- Major Negative - Short Term - Localised - Reversible
Traffic density	- Major Negative - Short Term - Localised - Reversible	- Major Negative - Long Term - Widespread - Irreversible	- Major Negative - Short Term - Localised - Reversible -

Water demand	- Major Negative - Short Term - Widespread - Irreversible	- Major Negative - Long Term - Widespread - Irreversible	- Major Negative - Short Term - Widespread - Irreversible
Liquid waste	- Major Negative - Short Term - Localised - Irreversible	- Major Negative - Long Term - Widespread - Irreversible	- Major Negative - Short Term - Localised - Irreversible
Solid waste	- Major Negative - Short Term - Localised - Irreversible	- Major Negative - Long Term - Localised - Irreversible	- Major Negative - Short Term - Localised - Irreversible
Energy demand	- Major Negative - Short Term - Widespread - Irreversible	- Major Negative - Long Term - Widespread - Irreversible	- Major Negative - Short Term - Widespread - Irreversible
Air Pollution	- Major Negative - Short Term - Localised - Reversible	- Minor Negative - Short Term - Localised - Reversible	- Major Negative - Short Term - Localised - Reversible
Soil erosion	- Major Negative - Short Term - Widespread - Irreversible	- Minor Negative - Short Term - Localised - Reversible	- Major Negative - Short Term - Widespread - Irreversible
Oil pollution	- Minor Negative - Short Term - Localised - Irreversible	- Minor Negative - Long Term - Localised - Irreversible	- Minor Negative - Short Term - Localised - Irreversible
Occupational Health and Safety	- Minor Negative - Short Term - Localised - Reversible	- Minor Negative - Long Term - Localised - Reversible	- Minor Negative - Short Term - Localised - Reversible
Insecurity	- Minor Negative - Short Term - Localised - Reversible	- Minor Negative - Long Term - Localised - Reversible	- Minor Negative - Short Term - Localised - Reversible

5.1 Positive Impacts

There are a number of beneficial impacts associated with the proposed project as described below;

5.1.1 Housing units

The proposed project will provide one hundred and twenty seven housing units in the area. This will alleviate the shortage of the apartments in the country at large.

5.1.2 Employment Opportunities

The proposed project will create employment opportunities for both skilled and semi-skilled workers. During the construction phase, the project will employ masons, plumbers and electricians among others. For the operation phase, the project will employ cleaners, security guards, caretakers among others.

5.1.3 Government Revenue

There will be increase in revenue to the government through payment of relevant taxes, rates, permits and fees.

5.1.4 Market for goods

During the construction phase, the project will require a lot of building materials sourced locally. This will have a positive impact towards the economic status of the supplies and to the national economy through V.A.T rates for goods. The economy of the neighborhood will also receive a boost through purchase of food items, drinks and other commodities required by workers and occupants.

5.1.5 Land Use

The proposed project will result to a more economical use of the land with minimal significant environmental degradation.

5.2 Negative Impacts

5.2.1 Noise and Excessive Vibrations

Noise pollution will be negative impact and short term limited to the construction period. The noise will be caused by the construction activities, use of heavy machinery and vehicles during transportation of materials to and from the site. Vibrations will be experienced during the excavation of the basement, concrete vibration during concreting of the structural elements and hacking of the walls and building elements during plastering of the members. On occupation of the apartments, there will be minimal noise and vibrations from the units.

Potential Mitigation measures

i. Construction works shall be carried out only during the day from 0800hrs to 1800 hrs.
ii. Noise shields shall be used on noisy equipment, such as corrugated iron sheet structures, to minimize the exposure to the neighbors and other workers within the site.

iii. The construction vehicles and machinery shall be switched off when not in use to reduce idling time.
iv. All noisy activities shall be scheduled concurrently during the construction period to reduce the exposure period to the PAPs.
v. Equipment installed with noise abatement devices shall be used as much as practicable.
vi. All machines and equipment shall be maintained regularly to reduce frictional noise.
vii. All workers shall be provided and use PPEs such as earmuffs at all times.
viii. Drivers delivering materials shall avoid unnecessary horning of the trucks/vehicles.
ix. Bill board shall be erected at the construction site entrance to notify of the construction activities and timings.
x. Regular monitoring of noise levels at the site as per the regulations.

5.2.2 Traffic Density

There will be an increase in traffic along the access road which shall be experienced during construction phase since trucks shall be accessing the site to deliver construction materials and taking away construction wastes. This phase of the development may have a negative impact on the present road network in the area. During the operation phase of the project, there shall be an increase in the volume of traffic as a result of increase in the number of cars accessing the site.

Potential Mitigation measures

i. Traffic marshals shall be recruited to control traffic in and out of the site during construction.
ii. Traffic control/warning signs near construction site shall be installed informing the motorists and the public on potential hazards. The signs shall be positioned in a way to be easily viewed by the motorists.
iii. A traffic management plan shall be developed to ensure that site vehicles do not interfere with the regular traffic along the adjacent roads or pose safety hazards to workers and the public.
iv. In case the access road is damaged by the heavy trucks and machinery during the construction phase, the proponent shall repair the road.
v. Adequate parking bays shall be provided and the proponent shall ensure that they are regularly maintained.

5.2.3 Water demand

The demand for water will increase during the project cycle. During construction, water will be required for activities such as cement mixing, curing of concrete, sprinkling of water on dusty areas to suppress dust and drinking water for workers. On occupation, water will be needed for cleaning, drinking, cooking and recreational activities such as the swimming pool. This will place strain on the existing water supply by NCWSC.

Potential Mitigation measures

i. Drill a borehole to supplement the county supply.

ii. The contractor shall use water bowsers and tankers to bring in water for construction activities i.e. during periods of high water demand (i.e. during slab formation). Water fetching shall however be subject to authorization by the relevant authority.

iii. Provision of adequate underground and roof tanks for water storage that covers two days water demand plus firefighting requirements.

iv. Use water efficient appliances and fixtures for conservation of water during the project cycle.

v. Provide notices and information signs to sensitize on means and needs to conserve water resource i.e. 'Keep/Leave the Tap Closed', etc. This will awaken the civic consciousness of the workers and residents with regard to water usage and management.

vi. Prompt detect and repair of all the water fixtures and fittings to reduce water wastage.

5.2.4 Liquid Waste

There will be increase in liquid waste as a result of increase in population within the project site both during construction and occupation of the residential apartments. Inadequate provision of sanitary facilities during the construction period may result to defecation of secluded areas within the site creating unsanitary conditions and source for fly infestation. Improper liquid waste disposal may be a threat to human health of both workers and the neighboring community and also result to contamination of water resources, land and air. All liquid waste shall be properly managed through connection to the sewer line.

Potential Mitigation measures

i. Channel all liquid waste to the sewer line.

ii. Provision of adequate and appropriate sanitary facilities for the workers during construction phase.

iii. Proper decommissioning of the sanitary facilities shall be carried out once construction is complete.
iv. Sanitary facilities shall be kept clean always through regular cleaning.
v. Ensure regular maintenance of foul water drainage works at the premises to prevent clogging and fore-stall breakdowns.
vi. The design of the internal sewerage system shall consider the estimate discharges from individual sources and the cumulative discharge of the entire project, that is, it will have the capacity to consistently handle the loads even during peak volumes.
vii. All drain pipes passing under building, driveway or parking should be of heavy duty PVC pipe tube encased in concrete surround. All manholes on drive ways and parking areas shall have heavy-duty covers set and double sealed airtight as approved by specialists.

5.2.5 Solid Waste

Solid waste will be a major negative impact during the project cycle. The waste will consist of demolition and construction debris, excavated soils, cement bags, wood, broken glasses, containers, metal, sharp objects such as nails, organic waste, paper, and plastic among others. The waste may result to blockage of drainage systems, choking of water bodies and have a negative impact to the human health. During occupation, waste may be organic emanating from the kitchen, paper, plastic and containers. Unfit disposal of construction waste could have medium or long-term environmental and public health impact. Extent of this impact will be local to areas where waste is dumped or their immediate neighborhoods.

Potential Mitigation measures

i. Engage the services of registered waste handlers to transport waste to designated disposal sites.
ii. Segregation of waste at the source during the project cycle.
iii. Provision for waste management rooms at strategic places within the apartments.
iv. Use of an integrated solid waste management system; through a hierarchy of options: source reduction, recycling, composting and reuse, will facilitate waste handling during occupation phase.
v. Efficient use of building material to reduce waste and recycling/reuse where feasible.
vi. To manage waste in line with the Waste Management Regulations, 2006.

5.2.6 Energy demand

There shall be increased use of energy during the construction stage (fuel for running machinery and other equipment) and during operation phase (electricity used by the residents of the units). Energy conservation is thus fundamental and shall involve optimum use of petroleum products (diesel and gasoline), electrical appliances (equipment), lighting systems and other electric machinery as used for different purposes. It also includes use of renewable energy sources.

Potential Mitigation measures

i. Use of solar energy as an alternative source of energy.
ii. Turn off machinery and equipment when not in use.
iii. Monitor energy use during construction and set reasonable limit.
iv. Put off all lights immediately when not in use or are not needed.
v. Install and routine maintenance of energy efficient appliances e.g. LED bulbs etc.
vi. Exterior lights shall be controlled by a programmable timer.
vii. The water booster set will contain inverter pumps for energy saving and precise control of flow and pressure rate.
viii. Generator will be provided as a full backup energy source throughout the development.

5.2.7 Air Pollution

Air pollution will be a major negative impact during the construction phase as a result of increase in levels of fugitive dust emanating from the demolition, excavation, construction activities and stockpiled earth materials. This may be a public health hazard resulting to nuisance to the workers and the public. Air pollution may also be as a result of combustion of fossil fuels from the construction machinery. This is expected as a short term and reversible impact after the end of construction.

Potential Mitigation measures

i. Use of dust nets/screens around the construction site to contain and arrest dust.
ii. Regular sprinkling of water on work areas to prevent fugitive dust violations.
iii. Use environmentally friendly fuels such as low sulphur diesel.
iv. Minimize the period for idling of machinery and construction vehicles.
v. Regular and prompt maintenance of construction machinery and equipment to minimize generation of hazardous gases.

vi. Minimize exposed areas through the schedule of construction activities to enable dust control.

vii. Ensure no burning of waste such as paper and plastic containers on sites/non-designated areas.

viii. Restricting heights from which materials are to be dropped, as far as practicable to minimize the fugitive dust arising from unloading/loading.

ix. Onsite dirt piles or other stockpiled material should be covered, wind breaks installed, water and/or soil stabilizers employed to reduce wind-blown dust emissions.

x. Where a vehicle leaving a construction site is carrying a load of dusty materials, the load shall be covered entirely by clean impervious sheeting to ensure that the dusty materials will not leak from the vehicle.

xi. Provide PPEs to the workers in dusty areas on the site.

xii. Monitor the air pollution levels regularly as per the Air Quality regulations.

5.2.8 Storm water drainage

There will be increase in volume and velocity of storm water due to reduction of recharge areas. This will lead to increased amounts of run off entering the drainage systems resulting in overflow and damage to the systems.

Potential Mitigation measures

i. Rain water harvesting facilities shall be installed to reduce the amount of rainfall reaching the surface.

ii. Drainage channels shall be covered with gratings to avoid occurrence of accidents and entry of dirt.

iii. Construct gently sloping drains to convey water at non-erosive speed.

5.2.9 Soil Erosion

The proposed project will have a negative impact on the geology and soil of the project site. This will be as a result of excavation of the soils to pave way for the construction of the basements and foundation. The soils will be exposed to weather elements including wind and storm water resulting to soil erosion. The traversing of heavy machinery (excavators, back hoe and tippers) during the construction will lead to compaction and erosion of the soil. Uncontrolled soil erosion can have adverse effects on the local water bodies and lead to air pollution (dust).

Potential Mitigation measures

i. Control over excavation works especially during rainy/wet conditions. Avoid unnecessary excavations and other soil disturbances that can predispose it to the agents of erosion.
ii. Use of soil erosion control structures on prone areas within the site and measures such as suppressing open surfaces with water.
iii. Ensure continuous covering of exposed soil as it is moved around site and as soil stockpiles are formed and reformed.
iv. Materials to be delivered on site in installments to reduce stockpiles.
v. Avoid unnecessary movement of soil materials from the site.
vi. Leveling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil.

5.2.10 Oil Pollution

Oil pollution will be a minor impact which may be caused by spilling or leaking of construction machinery and vehicles during the project cycle. The construction machinery and vehicles use petroleum products which contain detrimental elements to the environment such as heavy metals (mercury, lead and sulphur). The machinery will be serviced regularly in the contractor yard away from the site to avoid spillage in the project site.

Potential Mitigation measures

i. Routine inspection and regular maintenance of all machinery shall be done to avoid any oil leaks to the project site.
ii. All oils/grease and materials shall be stored in a store in the contractor's yard away from site.
iii. Maintenance shall be carried out in a well-designed and protected area and where oils/grease is completely restrained from reaching the ground. The areas shall be covered to avoid storm from carrying away spilled oils into the soil/water systems.
iv. Proper disposal of oil handling materials such as drums, oily materials and cans at designated areas.
v. All drainage facilities shall be fitted with adequate functional oil water separators and silt traps.

5.2.11 Occupational Health and Safety

During construction phase, there will be increased air and noise pollution which are considered harmful to human health. The neighbors and workforce involved shall be subjected to these environmental hazards putting them at high risk.

Waste material such as pieces of glass and nails left lying on the ground may cause injuries/accidents to the workers. Food for the construction workforce is usually provided by mobile individuals most of which operates without licenses. This can compromise health of the workers especially if such foodstuffs are prepared in unhygienic conditions.

Potential Mitigation measures

i. All workers shall use properly fitting PPEs to avoid injuries and illness which include working boots, overalls, helmets, goggles, earmuffs, masks, gloves etc

ii. The contractor shall adapt a suitable emergence response plans to manage occurrence of anticipated hazards during construction phase.

iii. Safety awareness may be gained through regular safety meetings, safety training or personal interest in safety and health.

iv. Provide appropriate signage and warnings in work areas.

v. Provide first aid facilities and ensure that workers are trained on emergency response such as first aid skills.

vi. Local individuals preparing food for the workers at the site shall be controlled, monitored and evaluated to ensure that food is hygienically prepared.

vii. Workers shall always be sensitized on social issues such as drugs, alcohol, diseases such as HIV/AIDS and STIs etc.

viii. Provide adequate and functional sanitary facilities for the workers.

ix. Comply with OSHA 2007 and all other relevant regulations governing health and safety of workplaces.

5.2.12 Fire Safety

The operations that lead to fire outbreaks include poor handling of electricity systems, faulty electrical equipment, carelessness etc. These should be avoided both during construction and operation phases of the project through proper training and sensitizations.

Potential Mitigation measures

i. Hire competent and properly authorized electrical contractor to do the electrical works.

ii. Post 'No smoking signs' where flammable materials are stored.
iii. Conduct regular firefighting drills within the site.
iv. Develop and post at the site fire emergency and evacuation procedures.
v. Provide adequate number of appropriate firefighting equipment at strategic places within the property.
vi. Train staff on the use of the available firefighting equipment. At least one person trained on handling firefighting equipment should be available through-out the construction phase of the project.
vii. Organize for inspection and maintenance of fire equipment at least once in a period of six months.
viii. Maintain on site telephone contacts for fire brigade, G4S fire brigade and St. Johns ambulance service provider.

5.2.13 Insecurity

Insecurity may arise during the construction phase since intruders may try to steal the building materials stored within the site. This especially happens in cases where there is no fence and/or boundary wall. On occupation, the proponent will provide security room and construct boundary wall to enhance the security of the development.

Potential Mitigation measures

i. The project site shall be enclosed using a perimeter wall and a guard house at the gate to beef-up security.
ii. The proponent/contractor shall employ security guards who shall be stationed at the site 24 hours. The guards shall monitor the movement of people in and out of the property to ensure that intruders are kept away from the site.
iii. The contractor shall provide adequate security during the construction period when there are no works on the site.
iv. Security lights shall be installed around the property. The lights shall be switched on during the night hours and ensure that there are regularly maintained.
v. CCTV cameras shall be installed at strategic points for monitoring and enhancing the security of the property during operation phase.

5.3 CONSTRUCTION SAFETY

The proposed site will involve construction activities that are dynamic to the workers engaged in the activities resulting to their exposure to a variety of safety hazards such as falling objects, working from rooftops or scaffolding, exposure to heavy construction machinery and electrocution while operating electrical equipment in moist areas. It is therefore a necessity to develop an EHS Management plan to regulate environmentally instigated diseases and occupational safety measures during construction and operation phases of the proposed project.

It is the obligation of the proponent and the contractor to ensure a safe and healthy environment at the workplace and within the neighborhood to prevent occupational diseases, avoid injuries, damage to property, control damage to equipment and enhance environmental sustainability through the developed sound conservation measures.

General Construction Guidelines

Construction activities can be particularly hazardous and this calls for proper application of construction standards, use of approved construction materials and PPE, fire safety, electrical safety and other precautions are essential for safe construction work. The workers and public will be guided by the following principle:

i. Do not walk, stand, or work under suspended loads. If you raise a load, be sure to crib, block, or otherwise secure the load as soon as possible.
ii. Avoid placing unusual strain on equipment or materials.
iii. Be prepared for unexpected hazards. BE ALERT ALWAYS! - DEVELOP and ADAPT an EMERGENCY RESPONSE PLAN for the proposed project.
iv. Ensuring that PPE such as safety boots, helmet, goggles, ear muffs, and gloves are used at all times.
v. Contractor and his agents shall use barriers and guards as necessary to protect employees from physical hazards. Danger warnings shall be placed as is necessary.
vi. A well-stocked First Aid kit shall be provided to take care of accidents that may arise during job executions. This shall be placed under the charge of a responsible person who shall readily be available during working hours.
vii. Employees will be expected to take personal responsibility for their safety, safety of colleagues and of the general public as it relates to the EHS management plan.

CHAPTER SIX: CONSULTATIONS AND PUBLIC PARTICIPATION

6.1 Introduction

The successful planning and implementation of projects is basically determined by effective Consultations and Public Participation (CPP) during the EIA process. CPP process helps to facilitate the involvement and participation of PAPs throughout the project cycle and ensures a sense of responsibility and commitment towards implementing the proposed project.

6.2 Objectives of the CPP

The objective of the CPP was to:

i. Disseminate and inform the stakeholders about the proposed project with special reference to its key components and anticipated impacts;
ii. Gather comments, suggestions and concerns of the PAPs;
iii. Incorporate the information collected in the EIA report.

6.3 Methodology used in the CPP

The CPP exercise was conducted between 29th October 2018 and 12th November 2018. Appropriate notices were circulated to the PAPs on 2nd November 2018 one week prior to the public meeting in accordance with section 17 (2) c of the EIA Regulations of 2003 *(Attached is the notice and delivery sheet signed by the PAP).*

The exercise was conducted in different ways as follows;

i. Interviews and discussions with the PAPs.
ii. Public meeting which was held on 9th November 2018.
iii. Administering of questionnaires.
iv. Field surveys and observations.

6.4 Analysis of the Public Consultation findings

The following are the views, concerns raised during the CPP by the PAPs:

Positive Issues

i. Increase the value of land/property within riverside area.
ii. Improve the economy of the area and country at large.
iii. Creation of employment opportunities.
iv. Provision of affordable housing in the area.
v. Change the outlook of the complete area.
vi. Increase in security within the area.

vii. Bring services closer to the people.

Negative Issues

i. Increase in the dust and noise levels during construction

ii. Uncontrolled sanitation during construction may result to breeding of mosquitoes and foul smell to the neighbours

iii. Pressure on all the services (infrastructure) such as water and sewer systems

iv. Increase in traffic along the adjacent roads

These negative impacts have been addressed in this report and especially through the EMP that the proponent is committed to implement in order to ensure sustainable development *(Attached are the filled questionnaires).*

Plate 14: Public meeting within the project site

Source: Fieldwork, 9/11/2018

CHAPTER SEVEN: PROJECT ALTERNATIVES

7.1 Introduction

The various project alternatives were analyzed for the proposed residential development. The options included the 'No Project Alternative', The Proposed Project Alternative, Alternative Construction Materials and Technologies. With such information, the reviewers will have a basis for decision making.

7.2 No Project Alternative

This alternative implies that the status quo is maintained with no development of the Proposed Apartments and auxiliary facilities. This would avoid the realization of the impacts concomitant to the proposed development and provision of the housing units. However, with the demand for housing units especially in Nairobi City County, a lack of development of the proposed apartments will mean that the existing shortfall in residential units will continue to prevail unabated. The resources in the area would continue to be underutilized since the land lies idle and the numerous benefits to be gained associated with the proposed development would not be realized. Therefore, the 'No Option alternative' is the least preferred and is deemed inappropriate on the basis that supply of housing units is a necessity in the county and the country at large.

7.3 The Proposed Project Alternative

The proposed project will consist of two blocks of twelve floors with a total of one hundred twenty seven apartments and other auxiliary facilities. The project is in line with the planning of the area as the region is in Zone 4 which allows residential apartments. The government through the Big 4 Agenda on affordable Housing encourages developers to construct more housing units to alleviate the increased demand for housing especially in the urban areas. The proposed project will provide more habitable housing units, increase in government revenue through taxes, market for goods and services and optimal use of the land. Thus, the project is a timely venture and this is the best option for the proposed site.

7.4 Alternative Construction Materials and Technologies

The proposed project will be constructed using reinforced concrete, natural stones for the walling, cement for mortar and plaster works, structural steel, metal scaffolds and formwork. The concrete structure will be built using locally sourced sand, cement, metal bars and fittings that meet the Kenya Bureau of Standards (KBS) requirements. The metal scaffolds will be advantageous than timber because it will reduce the wasting of precious trees, has a longer

lifetime, provides a steady and firm standing, easily assembled and dismantled and it increases the work efficiency. The equipment that saves on water and energy will be given priority during the construction of the proposed project.

The technologies available include the conventional brick and mortar style, concrete frame construction, prefabricated concrete panels, timber construction, steel and aluminum frame and Expanded Polystyrene Technology. The proponent has preferred the use of reinforced concrete frame construction as the technology is durable, offers outstanding resistance to explosion and/or impact and performs well during both natural and manmade disaster. Reinforced concrete can also endure very high temperatures from fire for a long time without loss of structural integrity.

CHAPTER EIGHT: ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN (EMP)

Environmental monitoring involves measurement of relevant parameters, at a level of details accurate enough, to distinguish the anticipated changes. Monitoring aims at determining the effectiveness of actions to improve environmental quality. The EMPs outlined in the table addresses the identified issues of concern (potential negative impacts) and mitigation measures as well as roles, costs and monitorable indicators that can help to determine the effectiveness of actions to upgrade the quality of environment as regards the proposed project. The EMPs have considered for all the phases, that is, Construction, Operation and Decommissioning phases.

8.1 EMP FOR THE CONSTRUCTION PHASE

Table 2: Environmental Management and Monitoring Plan during construction phase

Environmental Impact	Proposed Mitigation Measures	Responsibility for mitigation	Monitoring frequency	Estimated Cost (Kshs)
Demolition of existing house	▪ Apply for demolition permit from relevant authorities before commencing the demolition exercise ▪ Engage a registered private contractor to carry out the demolition ▪ Provide workers with PPEs and train them before the demolition begins ▪ Ensure that demolition exercise is carried out during the day time only ▪ Comply with EMCA (Noise and excessive vibration pollution control) Regulations 2009	- Proponent - Contractor	Weekly inspection	300,000
Soil erosion	• Avoid unnecessary excavations and other soil disturbances that can predispose soil to agents of erosion. • Ensure continuous covering of exposed soil and stockpiles • Compact loose soils to minimize wind erosion • Avoid unnecessary movement of soil materials from the site • Use of soil erosion control structures on prone areas within the site and measures such as suppressing open surfaces with water • Materials to be delivered on site in instalments to reduce stockpiles • Levelling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil	- Proponent - Contractor	Weekly inspection	250,000

Air pollution	• Regular sprinkling of water on work areas and access road to prevent fugitive dust violations • Careful screening of construction site to contain and arrest construction related dust • Enclosing, covering and watering of exposed stockpiles e.g. sand • Regular and prompt maintenance of construction machinery and equipment to minimize generation of hazardous gases. • Ensure training of all personnel working on the project on air quality management during the construction • All drivers shall be under strict instructions to minimize unnecessary trips and idling of engines • Use environmentally friendly fuels such as low sulphur diesel • Restricting heights from which materials are to be dropped, as far as practicable to minimize the fugitive dust arising from unloading/loading • Provide personal protective equipment (PPE) such as nose masks, goggles etc. to the workers in dusty areas within the site • Monitor the air pollution levels regularly as per the Air Quality regulations	- Proponent - Contractor - Workers - Drivers	Daily inspection Routine maintenance	350,000
Noise pollution	• Ensure construction works are carried out only during the daytime i.e. from 0800hrs to 1800 hrs. • Ensure that all workers are provided with and wear PPE at all times • Ensure use of suppressors or noise shields on noisy equipment • Ensure regular and prompt maintenance of the machinery and equipment to suppress frictional noise • Reduce idling time on trucks and other noisy equipment. Operate noisy machinery only when necessary and switch them off when not in use • Trucks used at construction site shall be routed away from noise sensitive areas where feasible and that the drivers avoid unnecessary horning of the trucks/vehicles • Comply with EMCA (Noise and Excessive Vibration pollution control) Regulations 2009	- Proponent - Contractor - Workers - Drivers	Weekly inspection Routine maintenance	250,000
Solid and liquid waste	• Direct all liquid waste to the sewerage system • Engage services of a registered NEMA waste handler to dispose the waste regularly at approved disposal points • Ensure covering of the trucks during transportation of the building materials and waste	- Proponent - Contractor - Workers - Drivers	Weekly inspections	350,000

	• Segregate waste at the site, recyclable/reusable materials and hazardous waste for appropriate disposal • Sensitize workers on the reuse of materials where feasible • Ensure sanitary facilities are provide at the site and proper decommissioning after the construction phase			
Increased water demand	• Drill a borehole to supplement the existing county supply • Employ services of waters vendors to supplement water supply • Use of water efficient appliances, fittings and fixtures at the site • Sensitize workers to reduce water wastage or reuse water where feasible • Connect to the NCWSC water supply after acquisition of relevant permits	- Proponent - Contractor - Workers	Daily inspection	350,000
Oil pollution	• Proper storage, handling and disposal of new/used oil and related wastes • Maintain construction machinery and equipment to avoid leaks • Maintenance of construction vehicles and equipment to be carried out in the contractors yard (off the site)	- Proponent - Contractor	Routine maintenance Weekly inspection	200,000
Storm water drainage	• Routine maintenance of storm drains along the access road • Ensure efficiency of drainage structures through proper design and maintenance Proper installation of cascades to break the impact of water flowing in the drains	- Proponent - Contractor	Routine maintenance	250,000
Traffic congestion	• Employ traffic marshals to control traffic in and out of site • Ferry building materials during off-peak hours • Provide bill boards at the site/entrance to notify motorists and general public about the proposed development • Enforce speed limits for construction vehicles especially along the roads leading to the site • Ensure that the vehicles comply with axle load limits • Employ well trained and experienced drivers	- Proponent - Contractor - Drivers	Daily inspection	350,000
Health and safety of workers	• Ensure construction works are limited to daytime only • Workers to be adequately insured against accidents • All workers shall be sensitized before construction begins on how to control accidents related to construction. • Keep record of the public emergency service telephone numbers including Police, Fire brigade and Ambulance at strategic points • Provide first aid kits at strategic places in the site • Provide PPEs to the workers and ensure that they wear at all times • Ensure that the workers are registered with NHIF / NSSF and remits appropriate fees • Prepare a comprehensive contingency plan before construction begins on	- Proponent - Contractor - Workers	Daily inspection	300,000

	accident response			
Insecurity	• Employ security guards to monitor movement of people in and out of the property Keep records of movement of people and vehicles in and out of the construction site • Construct temporary barrier (iron sheet) around the site • Install security lights around the property	- Proponent - Contractor	Daily Inspection	250,000
Fire	• Provide fire fighting equipment at strategic points within the site • Ensure regular maintenance of fire fighting equipment • Sensitize the workers on fire risks and train them on first aid skills • Prepare effective emergency response plan • Provide emergency numbers at strategic points within the site • Use of signage at strategic places within the site such as 'No smoking signs' where flammable materials are stored	- Contractor - Proponent - Workers	Monthly inspection Routine maintenance	200,000

8.2 EMP FOR THE OPERATION PHASE

Table 3: Environmental management and monitoring plan during Operation phase

Environmental/ Social Impact	Proposed Mitigation Measures	Responsibility for mitigation	Monitoring frequency	Estimated Cost (Kshs)
Liquid waste	• Ensure sanitary facilities are kept clean always through regular cleaning • Ensure regular maintenance of foul water drainage works at the premises to prevent clogging and fore-stall breakdowns • Frequent monitoring of the internal drainage system	- Proponent - Residents	Periodic inspection and maintenance	300,000
Solid waste	• Use of an integrated solid waste management system; through a hierarchy of options: source reduction, recycling, composting and reuse, will facilitate waste handling • Ensure segregation of waste (organic and inorganic) at source • Provide clearly marked dustbins cubicles to serve the specified use • Ensure that wastes generated are efficiently managed through recycling, reuse and proper disposal procedures • Engage services of a registered NEMA waste handler to dispose the waste regularly at approved disposal points	- Proponent - Residents	Periodic inspection	350,000
Air pollution	• Ensure regular collection and disposal of solid waste to avoid air pollution • Periodic maintenance of generator and pump rooms • Comply with Air Quality regulations	- Proponent - Residents	Routine inspection and maintenance	250,000
Noise and vibration Pollution	• Installation of silencers on the generators and transformer rooms • Do annual noise measurements • Sensitize residents on minimal permissible noise levels • Comply with EMCA (Noise and excessive vibration pollution control) Regulations 2009	- Proponent - Residents	Routine inspection	300,000
Storm water drainage	• Proper maintenance of drainage structures • Inspection and maintenance of rainwater harvesting facilities	- Proponent - Residents	Routine inspection and maintenance	250,000

Increased water usage	• Use water efficient appliances and fixtures for plumbing products and white goods • Prompt detect and repair of all the plumbing products and white goods • Provision of roof/underground tanks for water storage • Regular maintenance of all the water components • Encourage water reuse/recycling where feasible • Provide notices and information signs to sensitize on means and needs to conserve water resource i.e. 'Keep/Leave the Tap Closed', etc. This will awaken the civic consciousness of the residents with regard to water usage and management. • Regular maintenance and servicing of the borehole.	- Proponent - Residents	Routine maintenance Periodic inspection	350,000
Increased energy use	• Solar energy will be used as an alternative source of energy • Use energy efficient appliances such as LED bulbs for lighting • Provision of a generator as a backup energy source • Switch off electrical appliances when not in use • Regular maintenance of all the electrical components • Regular inspection and maintenance of the solar panels	- Proponent - Residents	Periodic Inspection Routine maintenance	300,000
Fire	• Install fire fighting equipment at strategic points within the building • Sensitize the residents on fire risks • Conduct regular fire drills • Prepare effective emergency response plan • Ensure regular maintenance of fire fighting equipment • Provide emergency numbers at strategic points within the buildings	- Proponent - Residents	Routine Inspection and maintenance	250,000
Insecurity	• Engage services of security guards • Install and regular maintenance of the CCTV cameras • Place hotline numbers on strategic places • Sensitize residents on security precautions • Sensitize the residents on "*Nyumba Kumi Initiative"*	- Proponent - Residents	Periodic inspection Routine maintenance	200,000

8.3 EMP FOR THE DECOMMISSIONING PHASE

Note: A due diligence environmental audit will be undertaken and submitted to NEMA at least three months prior to decommissioning and in line with the Environmental Management and Coordination Act No. 8 of 1999.

Table 4: Environmental management and monitoring plan during Decommissioning phase

Environmental/ Social Impact	Proposed Mitigation Measures	Responsibility for mitigation	Monitoring Frequency	Estimated Cost (KShs)
Demolition of existing structures	▪ Apply for demolition permit from relevant authorities before commencing the demolition exercise ▪ Engage a registered private contractor to carry out the demolition ▪ Provide workers with PPEs and train them before the demolition begins ▪ Ensure that demolition exercise is carried out during the day time only ▪ Comply with EMCA (Noise and excessive vibration pollution control) Regulations 2009	- Proponent - Contractor	Daily Inspection during the demolition period	500,000
Air pollution	▪ Sprinkling of water regularly on dusty areas to suppress dust ▪ Careful screening of the site to contain and arrest demolition related dust ▪ Ensure demolition machinery and equipment are well maintained to reduce exhaust gas emission	- Proponent - Contractor	Daily Inspection Routine Maintenance	250,000
Noise pollution	▪ Demolition activities to be restricted to daytime (8am to 5pm) ▪ Use of Suppressors /noise shields on noisy equipment ▪ Ensure that all workers wear respective safety & protective gear (PPEs) ▪ Comply with EMCA (Noise and excessive vibration pollution control) Regulations 2009	- Proponent - Contractor - Workers	Routine Inspection	350,000
Health and safety of workers	▪ All workers to wear PPEs e.g. helmets. ▪ All workers shall be sensitized before demolition begins, on how to control accidents related to	- Contractor - Workers - Proponent	Daily Inspection	300,000

	demolition ▪ Adherence to safety procedures shall be enforced ▪ All workers shall be adequately insured against accidents	-NEMA inspectors		
Solid and liquid waste	▪ Ensure that all solid waste is disposed at designated areas by NEMA waste handler ▪ Reuse of construction debris where feasible ▪ Ensure refuse collection vehicles are covered to prevent scattering of wastes by wind during transportation ▪ Ensure all persons involved in refuse collection are in full protective attire (PPEs) ▪ Proper decommissioning of all the sanitary facilities	-Contractor -Proponent	Daily Inspection	350,000
Re-vegetation and comprehensive landscaping	▪ Implement an appropriate re-vegetation programme to restore the site to its original status ▪ Ensure appropriate storm water runoff controls are implemented to prevent surface erosion ▪ Monitoring and inspection of the area for indications of erosion shall be conducted and appropriate measures taken to correct any occurrences ▪ Fencing and signs restricting access shall be posted to minimize disturbance to newly-vegetated areas	-Contractor -Proponent	Random Inspection	300,000

CHAPTER NINE: CONCLUSION AND RECOMMENDATIONS

The analysis of the EIA study of the proposed project has shown that the development will have a direct benefit to the housing sector through the provision of the housing units and the service industry through improvement of the local economy and as a source of revenue to the government. However, the project development will result in some negative impacts such as increased air and noise pollution, increased traffic along the adjacent roads, increase water and energy demand, increased solid and liquid waste during the project cycle. The EMP has been formulated and sufficient mitigation measures for the predicted negative environmental and social impacts during project cycle have been proposed therein. It is in this regard that the experts recommend that the project proponent fully implement the EMP and that NEMA considers issuing the proponent with an EIA License under condition that the outlined mitigation measures shall be strictly adhered to.

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Appendices

i. Copy of ownership documents

ii. Copy of expert practicing licenses

iii. Copy of the Change of Use

iv. Copy of architectural plans

v. Copy of the invitation letter

vi. Copy of public meeting delivery receipt

vii. Copy of minutes of the public meeting and attendance sheet

viii. Location map

ix. Questionnaires