ENVIRONMENTAL IMPACT ASSESSMENT

FULL STUDY REPORT (*NEMA/NRB/PR/5/1/10360*) FOR

THE PROPOSED ARISTOCRATS CHIROMO APARTMENTS ON LR. NO .209/18650

CHIROMO ROAD, NAIROBI.

Proposed site; Source field work 2017

GRID Consortium Ltd.

South B Shopping Centre
P.O. Box 2982-00200 Nairobi, Kenya
Mobile: 0724-350-783, 0720-060-037
Email: gridconsortium@gmail.com

NEMA CONSULTANTS | PROJECT MANAGERS | OSH ADVISORS | PHYSICAL PLANNERS

TABLE OF CONTENTS

CERTIFICATION

This EIA study report was prepared in accordance with the Environmental Management and Coordination Act (EMCA) 1999 and the Environmental (Impact Assessment) and Audit Regulations 2003 which requires that every development project must have an EIA report prepared for submission to the National Environmental Management Authority (NEMA).

The following EIA Experts conducted the study and prepared this report.

Grid Consortium LTD

P.O Box 2982-00200

Nairobi, Kenya.

Signature: _____ Date: _____

For and on Behalf of:

Project proponent:

AQUILA PROPERTIES LIMITED

P.O. BOX, 30118-00100

Nairobi, Kenya.

Signature: _____ Date: _____

LIST OF TABLES

ABBREVIATIONS

EIA : Environmental Impact Assessment

NEMA : National Environment Management Authority

EMCA : Environmental Management and Coordination Act

NBSAP : National Bio-diversity Strategy and Action Plan

CBD : Convention on Biological Diversity

NEAP : National Environmental Action Plan

EMP : Environmental Management Plan

EHS : Environmental Health and Safety

KPLC : Kenya Power and Lighting Company

OHS : Occupational Health and Safety

TOR : Terms of Reference

EHS : Environmental Health and Safety

NCWSC : Nairobi City Water and Sewerage Company

WRMA : Water Resource Management Authority

EXECUTIVE SUMMARY

Rapid urbanization has resulted in an increased demand for more urban land, shelter, infrastructure, social facilities, and jobs. Kenya's rate of urbanization is escalating and being a developing country; most of its urban population is forced to live in slums. Formal housing has been a challenge for most urban dwellers especially the low and middle income earners because of its high costs. It's in line with this, that there is a need for improved provision of housing services; especially low cost housing to cater for the low and middle income earners who can't easily afford housing mortgages. The Kenyan government has attempted to provide decent housing to its urban population through several strategies, one of which is the private sector. Conceivably, it will stimulate economic and social development of the residents through the provision of social amenities and services that would make life both meaningful and honorable. Indeed, the year 2015 witnessed a boost in the real estate sector partly due to the country's strategic destination within the region, and various infrastructural developments going on.

Kenya has also established deliberate policies and plans that are aimed at spurring economic growth and social development. With the ever increasing rates of urbanization and population growth rates the housing sector in Kenya if not well addressed is bound to impact negatively on the environmental attributes of the project areas and its surroundings. Nairobi being the capital of the country continues to attract and accommodate most of the mega real estate developments. Aquila Properties Limited (herein referred to as the proponent) has proposed to develop 18 No of Floors apartments on plot L.R. No. 209/18650 Chiromo Road- Nairobi County. The development will comprise a total of 180 units.

This Environmental Impact Assessment (EIA) study report has critically considered the likely positive and negative impacts of the proposed development in Chiromo area and its neighborhood. Besides, alternatives to the proposed project have been identified and analyzed with the aim of establishing the most sustainable and cost effective way of mitigating any negative impact that may arise as a result of the implementation of the proposed project.

Scope, Objectives and Terms of Reference (TOR)

Scope

The scope of the study included carrying out of environmental investigations in line with current provisions on environment/legislations. This was done in line with the requirements of Environmental Management and Coordination Act (EMCA) 1999 and Environmental (Impact Assessment) and Audit regulations 2003. The study is aimed at analyzing all the physical extent of the project site and its immediate environs, implementation works of the proposed development (ground preparations foundation, walling, roofing, fixtures and fittings among other activities. Also taken into consideration, is the installation of key utilities and other facilities required for the optimal functioning of the project.

Overall objective of the project

The proposed study had the overall objective of putting up residential apartments and a bridge connecting the apartments to Arboretum Road. This will not only attempt to solve the current housing shortage but also meet the economic goals of the proponent and the increasing housing needs of the middle income City residents while at the same time improving the economy of the country. The aim of EIA study was to evaluate the effects/impacts of proposed development in relation to the general environmental aspects i.e. physical, biological, and social-economic environments. Generally, it seeks to influence the protection and co-existence of the development with the surroundings as well as the compatibility of the proposed development to the area. Eventually, the study will guarantee and augment sustainable environmental management during implementation as well as operation of the project.

Specific Objectives of the study

The key objectives of this study include:

i) To determine the compatibility of the proposed facility with its neighborhood and evaluate the local environmental conditions.

ii) To identify and evaluate the significant environmental impacts of the proposed project.

iii) To assess the environmental costs and benefits of the proposed project to the local and national economy.

iv) To evaluate and select the best project alternative from the various options.

v) To incorporate environmental management plans and monitoring mechanisms during implementation and operation phases of the project.

Terms of Reference (TOR)

The following Terms of Reference (TORs) apply to the study:

i) Hold appropriate meetings with the project proponent to establish the procedures, define requirements, responsibilities and a time frame for the project.

ii) Provide a description of the proposed activities throughout the entire implementation process of the project with a special focus on potential impacts to the surrounding environment

iii) Carry out a systematic environmental assessment at the proposed project site and the surrounding area

iv) Produce an EIA report that contain among other issues potential negative and positive environmental impacts and recommendation of appropriate mitigation measures to minimize or prevent adverse impacts.

v) Develop an Environmental Management Plan and cost estimates for the proposed project.

Consultancy Organization

The EIA study report was written by private consultants (Grid Consortium Limited) duly registered by The National Environment Management authority-NEMA to undertake an activities of this nature. The study was carried out between 21st February 2017 and 1stMarch, 2017. Over this period, a number of vital data pertaining to the project's design, technology, and legal framework were collected and analyzed.

Methodology

The methodology used in the study consisted of the following.

.

i) Desktop Review-Deskwork provided a detailed description of the project with respect to spatial coverage, preliminary design layout, magnitude, implementation schedules and costs as well as human resources. Relevant documents were reviewed to obtain information on the baseline information in general but specifically at the project site. This documentary review provided further understanding the project design (site plan and architectural drawings), land use, local micro-environmental conditions, data on demographic trends, land use practices, development strategies and plans (local and national) as well as the policy and legal documents among others. Others included area maps, Development Plans of the Nairobi City, National Development and Economic Surveys, relevant legislations, regulations and guidelines and standards.

ii) Field Assessment -Physical evaluation of the project area was carried out with specific focus on landform trends, land use patterns, biodiversity, natural resources, hydrology and climatic variations. This was also an evaluation of the current environmental status with respect to physical, biological and socio-cultural perspectives. It was a systematic field inspection backed with available documentation and direct interviews. Field evaluation was planned to enable determination of the exact physical environmental features to be taken into consideration.

iii) The fieldwork was extensive and included several activities. A reconnaissance visit was made to the project area by the EIA team on 21st Feb, 2017. Based on this, the team set out key areas of observation. This was then followed by detailed visits of the project area and neighboring facilities taking records of observations as well as interviewing community members

iv) Observations- Detailed field observation assessment was undertaken to enable determination of the exact socio-economic activities within the proximity of the project site. Among the broad focal areas for which observation was done included settlement patterns, land use commerce, trade, and industry among others. Checklists were used along with observations to check on possible environmental impacts of the project would have on the environment during both construction and operational phases. In this assessment, checklists were utilized to: facilitate identification of potential environmental impacts; provide a means of comparing the predicted environmental impacts; indicate the magnitude of both positive and negative environmental impacts; indicate possible adverse environmental impacts that are potentially significant but about which sufficient information can be obtained to make a reliable prediction; and Indicate negative potential environmental impacts in the project area, which merit mitigation measures and monitoring during project implementation.

v) Consultation and Public Participation- the stakeholders, that include the neighbors to the proposed site were interviewed and asked to fill in questionnaires, in order to get their views, expectations, projected economic and social effects regarding the proposed project activities and location.

Output of the Study

The output of the study is the production of this EIA Study report with recommendations to be presented to NEMA for purposes of seeking an EIA license.

Positive Impacts

The positive benefits associated with the proposed project include the following:

i) Provision of standard, safe and affordable housing facilities to the public

ii) Economic investment hence employment creation and economic growth Creation of market for goods and services as well as provision of commercial facilities. This will be significant especially during construction period. The goods will be sourced from local suppliers; thus, creating a ready market. Employment opportunities will be created to the watchmen, cleaners, house-helps among others. Other secondary businesses are also likely to come up especially during construction phase; for instance, those selling food to the construction workers.

iii) Improvement of areas general security

iv) Development of Chiromo area by making more economic use of land, and

v) Provision of revenue to National and County governments amongst other agencies.

Potential negative impacts associated with the proposed project

There are several potential negative impacts associated with the proposed project. These are anticipated mostly during the construction phase and can easily be mitigated. They include the following:

i) Increased noise and vibrations during construction.

ii) Solid waste and wastewater management. There will be increased waste generation especially during construction phase.

iii) Air pollution as a result of dust particles emanating from excavation and construction activities.

iv) Impacts on human health and safety. The health and safety of workers may be an issue during the construction phase.

v) Interference with the river ecosystem and possible diversion of a river cause as a result of blockage.

vi) loss of vegetation at the site and the adjacent area during construction

vii) Dust to the neighboring residential building arising for the construction activities.

viii) Compromised privacy to the neighbours

ix) Oil Spills,

x) Increased water demand,

xi) Increased Energy Consumption,

xii) Demand for building materials extracted from natural resource base,

xiii) Workers accidents and hazards during construction.

xiv) Traffic congestion and accidents

xv) Work place accidents

Potential mitigation measures

Mitigation and management measures to minimize and control the above listed negative impacts of the project; and ensure compliance with the relevant environmental legislation and management standards have been integrated in the report. For instance, there shall be:

i) Soil compaction and watering of loose soil shall be done on all disturbed areas during construction phase to minimize air pollution (by dust) and erosion by the agents of soil erosion,

ii) Well-designed concrete drain channels have been proposed to harmonize management of the resulting storm water within the site,

iii) Portable barriers to shield compressor and other small stationery equipment where necessary will have noise suppressor or silencers to control noise. Additionally, Noise shield e.g. corrugated iron sheet structure to control noise propagation shall be provided. Furthermore, workers will be sensitized on the need to switch off engines when not in use and all machinery will be well maintained through regular oiling,

iv) Capacity building and training of personnel with respect to environment, health and safety. Besides, there shall be Personnel Protective Equipment as per health safety regulations and medical checkup of workers as is required by factories and other places of work Act (cap 514) shall be observed,

v) Effective emergency response plans will be observed both during construction and operation phase to reduce health and safety risks.

vi) During the construction phase, the contractor shall put in place effective and efficient waste disposal systems. Waste, including excavated soil and debris shall be properly disposed of by backfilling and landscaping. The contractor shall provide acceptable and standard sanitary

convenience to the workers during construction. Additionally, the contractor shall ensure that trees are preserved around the site, as much as possible to ensure that the adequate vegetation cover is maintained.

vii) The proponent will arrange with contractor to landscape the area and increase tree cover after construction.

viii) The contractor and the site manager will ensure that there are no oil spills in the site during and after the construction.

ix) Water conservation mechanisms will be observed through turning off taps when they are not in use, having water reservoirs within the site.

x) The proponent shall ensure that no waste water or liquid waste is channeled to the nearby river but instead find a sustainable way of disposing waste water without contaminating the adjacent stream,

Conclusion

The proposed development will not have adverse environmental impacts either in the immediate neighborhood or to the entire area at large. The proponent has followed all the legal procedures necessary for the execution of a project of this nature and adequate mitigation measures have been put in place to preclude any negative impacts. The implementation of the project should however be subject to the observance of all the legal and regulatory frameworks governing an activity of this nature. The recommended Environmental Management Plan (EMP) should also be observed throughout the entire life of the project.

CHAPTER ONE: INTRODUCTION

The Kenyan government has with great concern realized significant short fall in housing infrastructure; mostly in the urban areas. This has been caused by the increased rural- urban migration especially in the past two decades, coupled with increased urbanization. In view of the foregoing, the government has come up with a policy document that aims at providing approximately 150,000 new housing units per annum. It has in addition recognized the input of the private sector in providing housing facilities/infrastructure to bridge the gap in the housing sector. This is reflected in the National Housing Policy Sessional paper No. 3 of 2004 which sets out the government role as that of facilitating the private sector, cooperatives, local government and individuals in providing housing and related services. It is upon this background that the Aquila Properties limited seeks to put residential apartments, complete with basement parking areas, and a bridge leading to the apartments from Arboretum road

Pursuant to the provisions of Environmental Management and Coordination Act section 58 (1) and the Environmental Impact Assessment and Audit Regulations, 2003 part II, an environmental project study was carried out for the proposed residential apartment's project. Indeed, the study was conducted with a view of determining the anticipated environmental impacts of the proposed project and to identify the necessary mitigation measures in order to incorporate sustainable development aspects in the project cycle. Eventually, the immediate goal of conducting the study was to obtain the necessary approvals and licenses from NEMA so as to proceed with the project.

Kenya being a developing country is rapidly urbanizing; hence, experiencing the challenges of urbanization. The proponent has proposed to develop residential apartments on plot L.R. No. 209/18650, Chiromo Road-Nairobi County.

Policy makers worldwide promote the need to pursue sustainable development guided by sound environmental, social, cultural and ethical considerations. To achieve these, development plans in both developed and developing countries should be managed to maintain or improve the resource and environmental base on which they depend. This will allow future generations to live equally well asthe current generation. The goal of sustainable development cannot be achieved without significant changes in the ways development initiatives have been planned and implemented. In order to achieve these changes we must consider as a matter of priority environmental protection and environmental security as essential elements of national and international security. As the sixteenth principle of the

world charter for nature adopted by the General Assembly of the United Nations on 28th October 1982 states;" …….All planning shall include among its essential elements, the formulation of strategies for the conservation of nature, the establishment of inventories of ecosystems and the assessments of the effects on nature of proposed policies and activities; all of these elements shall be disclosed to the public by appropriate means in time to permit effective consultation and participation." It is in pursuit of this principal that this environmental impact assessment report has been written.

The need for this project arose out of the desire to; to improve housing industry through provision of housing facilities to meet the increasing demand, to invest in housing for economic gain and to improve the general aesthetics of the area.

1.1 Background and rationale of the EIA study report

In accordance to the Nairobi County zoning ordinances the project area is proposed for residential development. It's thus rational for the project proponent to put up housing apartments to tap on the increasing demand for affordable housing in the area and in the City. This is in attempt to meet the demands of suitable high end housing facilities among the Nairobi Residents. This project will therefore help solve the problem of limited housing facilities faced by Kenyans especially in urban areas such as Nairobi, while enhancing the growing real estate sector in the country. The proponent's building plans have been approved by the County Government of Nairobi Planning department (see appendix).

1.2 Objective

The objectives of the proposed residential flats include;

- To improve housing industry through provision of housing facilities to meet the increasing demand in Nairobi county
- To invest in housing for economic gain.
- To improve the general aesthetics of the area

Demand for high end houses in Nairobi has increased. By constructing residential Apartments, the proponent will maximize gains from the piece of land as well as increase housing facilities in the area to meet the high demand.

1.3 Specific Objectives of the project

The project proponent aims at achieving the following objectives:

ii) To reduce the current high-end housing shortage by providing affordable residential apartments

iii) Maximize returns on investment for the proponent while taking due consideration of policy, legal and administrative procedures governing the operations of an activity of this nature.

iv) To ensure that the project is in character with the other developments in that area.

v) Ensure that the project activities do not in any way interfere with the environmental sustainability of the area in question giving due consideration to:

- Habitat and vegetation.
- Neighboring population and land uses.
- Changes in the water system resulting from the project construction and operation.
- Increased change in traffic volumes.

vi) Put in place mitigation measures that will ensure that any potential negative impacts resulting from project activities are taken care of at the earliest opportunity to obviate any harmful effect to the neighboring environment.

vii) Contribute to economic growth by providing commercial facilities to the neighborhood as well as boost the economy by providing jobs to the unemployed and market to the suppliers.

1.4 Objectives of EIA the study

The key objectives of this study include:

i) To determine the compatibility of the proposed facility and evaluate the local environment conditions.

ii) To identify and evaluate the significant environmental impacts of the proposed project.

iii) To assess the environmental costs and benefit of the proposed project to the local and national economy.

iv) To evaluate and select the best project alternative from the various options.

v) To incorporate Environmental Management Plans (EMP) and monitoring mechanisms during implementation and operation phases of the project

1.5 Scope of the study

The study has been conducted to evaluate the potential and foreseeable impacts of the proposed development. The physical scope is limited to the proposed site LR. No. 209/18650 Chiromo Road, Nairobi; and its immediate environment as may be affected or may affect the proposed project. Any potential impacts (localized or delocalized) are also evaluated in line with EMCA 1999 and the Environmental (Impact Assessment) and Audit Regulation 2003. This report includes an assessment of impacts of the construction and operations/occupation on the proposed site and its environs.

1.6 Methodology

The methodology used in the study consisted of the following.

i) A site reconnaissance and visual survey to determine the baseline information of the project area
ii) Comparative study of the project with existing land uses in the neighborhood.
iii) Analysis of the project documents.
iv) Discussion with the proponent and his consultants
v) Assessment of the site to detail the various existing and likely impacts.
vi) Assessment of health and safety issues
vii) Seeking public views through questionnaires and interviews
viii) Proposal of mitigation measures to minimize any negative impacts.
ix) Preparation and submission of the report,

CHAPTER TWO: PROJECT DESCRIPTION

2.1 Nature of the project

The project constitutes one block apartments having 18 No. floors each having 10 No. residential units. Additionally, there is the ground floor, 4 level parking decks, and 4 level basement floors. The ground floor will be connected to Arboretum Road by a proposed bridge across *Mathare* River. The roof plan will consist of six water tanks and two stores. The 1st, 2nd,5th, 6th, 9th,10th, 13th, 14, and 17th floors will each have 3 No. bed room units, complete with a master bed room, 2 other bedrooms, a kitchen, lounge, and balconies. The shared facilities in these floors will be the lobby area, corridors, lift, and staircases. The remaining floors namely; 3rd, 4th, 7th, 8th, 11th, 12th, 15, and 18th, will not have balconies, but will have similar attributes as in the previously mentioned floors. The ground floor, also known as the pool deck area, will have common amenities such as canteen, gym, pump room, pantry, kitchen, social hall, laundry, chemist, business center, and a swimming pool.

Furthermore, the Parking levels and basements will basically be used as parking lots and tank areas. For instance, Dec level 4 will have 5 double + 33 Single parking totaling to 43 parking spaces. Similarly, Packing Deck 1, 2 and 3 will each have 5 Double + 31 Single Parking totaling to 41 for each Deck. The entry level on the other hand will have 2 Double + 23 Single Parking totaling to 27; while Basement 1 and 2 will be built to accommodate 5 Double + 31 Single Parking adding up to 41 parking spaces. Basement 3 and 4 will both have 4 Double + 28 and 30 Single parking totaling to 36 and 38 parking spaces respectively. Besides, there will be a 4 m high perimeter wall around the site and a bridge connecting the apartment's ground floor to the Arboretum Road. Water will be provided by the NCWSC. Liquid wastes shall be channeled to an existing sewer line, while solid wastes shall be managed by engaging the services of private waste and refuse handlers. The negative environmental impacts anticipated from the construction activities are minimal. They will be confined to the construction stage and within the limited boundary of the construction site.

2.2 The location of the project

The project is located in Westlands area, approximately 3km North West of Nairobi CBD; in between Riverside drive, Arboretum road and Ring road. It occupies an area of approximately ¼ acre piece of land. It borders the Nairobi Arboretum and easily accessed through the Arboretum Road. The area in the neighborhood has been developed with similar development such as *Caribbean Apartments* among others. The land reference number is LR.NO 209/18650 Chiromo Road, Nairobi. The site is gently sloping towards a stream *River Mathare* separating Arboretum Road with the site. The proposed site is triangular and square in shape and bordered by residential developments to the East, a river to the south, similar residential apartments to the west and the north, and University of Nairobi Surgical Skills Center to the North-east.

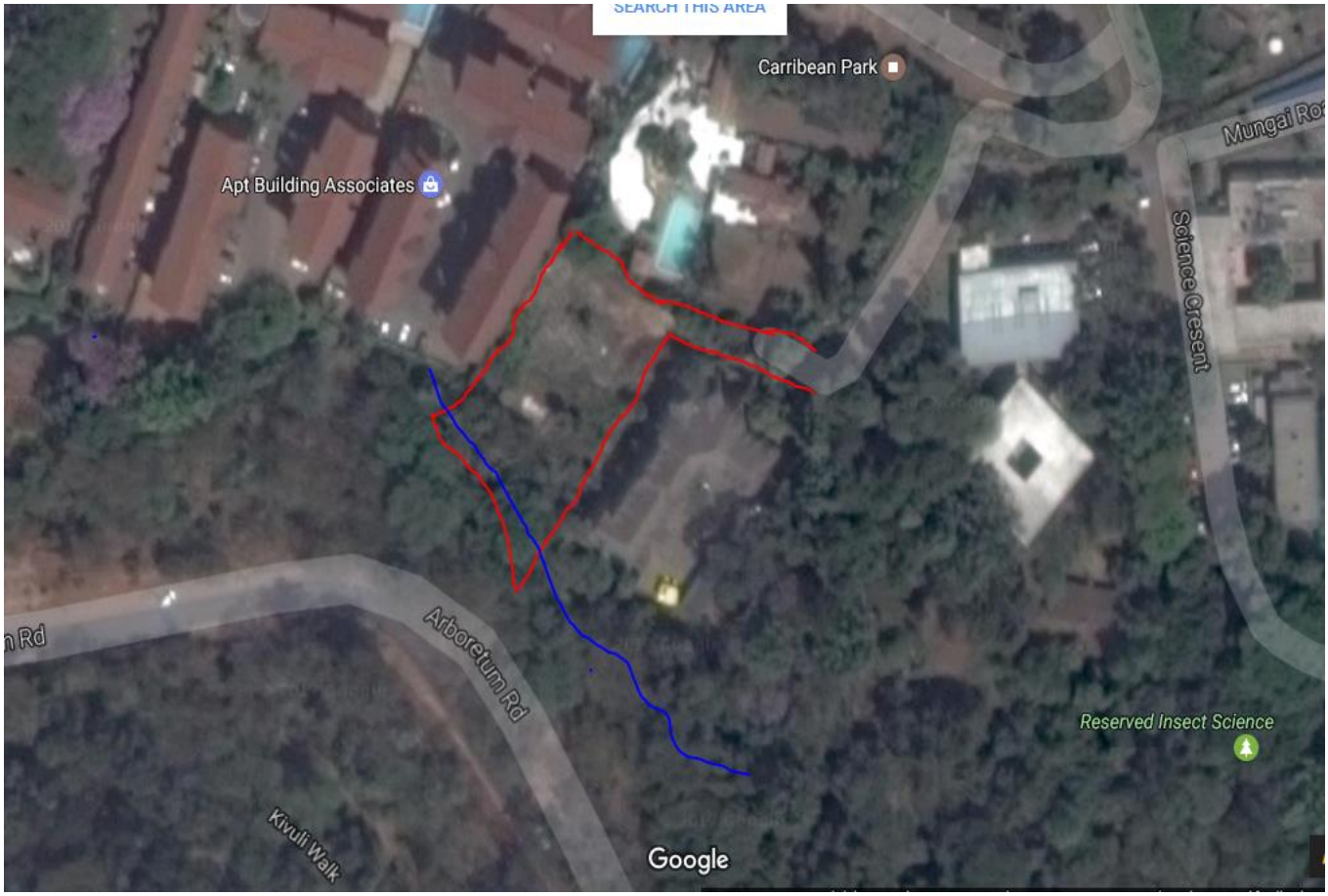

Figure 1; A Google map showing the location of the site (boundary in red) and the river (Blue Line) passing through the site. Source, Google Map Earth, 2017.

Figure 2: Some of the similar developments (Apartments) neighboring the site. Source, Field work, 2017

2.3 Justification of the proposed project

The project is justified on the basis that there is currently a shortage of high end housing in Kenya, thus it's meant to provide decent and affordable housing facilities to the public. The zone is near other facilities such as Sarit Center, arboretum, Statehouse Girls School, and Westlands shopping center among others thus making it a high demand area for rental houses.

2.4 Site ownership

The site is owned by the proponent, Aquila Properties Limited as per the land registration documents and has a title deed for the same. The title number of the property is LR.NO 209/18650 Chiromo Road-Nairobi and the property is not encumbered or mortgaged in any way. The property is registered under the Registration of properties Act (Cap 281).

2.5 Project description and design

The proposed project is a construction of one block apartments having 18 No. floors each having 10 No. residential units. Waste water from the housing units shall be managed through an existing sewer line. Water for use will be sourced from the NWSC. The building has ample parking for tenants and a gate plus a hired security agent will ensure the safety of the tenants and their property.

Blocks A,			
Floor(Typical block)	**Description**	**No.** Parking spaces and units	
Basement	Parking area, tanks area ,and store	156	
Parking Deck	Parking area, tank area ,and store	111	
Roof Top	Six Tanks, and 2 stores		
Ground floor	Amenities area (Canteen, gym, pools, chemist, laundry , kitchen, Business Center, social Hall, and a pump room)		**Total**
Typical 1st to 18th floor	3bedroom units (Kitchen, Lounge, Master Bedroom, bedroom 1 and 2, with /without balconies)	10	180
	Lift/stairs, lobby, and corridors	3,2 2, 2 respectively	
Total no of units			**180**

2.6 Construction activities and inputs

2.6.1 Project input and activities

The development of the proposed project will utilize but not be limited to the following inputs:

i) **Land: -** Land is necessary for the anchorage of the of the apartments' foundation. The proponent has acquired land under private title land ownership; hence, the land belongs to the proponent-Aquila Properties.

ii) **Water: -** The project area is served by the NCWSC. The total demand for potable water for the development is estimated to be approximately 200 cubic meters per day with a peak demand of 30 litres per second. Therefore a 200mm diameter feed will be maintained from the NCWSC and the residual volume and pressure will be available for the development from this main will be determined in liaison with the company. However the project will also consider other sources of water due to the known high demand on water infrastructure in Nairobi. Thus the following are some of the sources of water that the project will use. For instance, the project developers will sink a borehole as source of alternative water for the project during construction, and harvest rain water during the operation a to be stored in underground tanks and used in cleaning and w3atering of soft landscape.

iii) **Labour during the construction and operation of the project: -** It is the intention of the proponent that this labour is sourced from within the local community. This will be a direct economic benefit to them and will go far in creating a friendly relationship between the project and the neighboring community.

iv) **Input during Construction: -** The materials that shall be used include building sand, aggregates, natural stones; masonry dressed construction stones, roofing iron sheets and floor tiles. Other materials include timber concrete block for constructing selected internal and external pavements, precast units for drains, PVC pipes for sewer and water reticulation, wire mesh, water tanks and aluminum gutters. Window casement and glasses, spades, pick axes, and jembes and a host of other tools will also be needed. For the construction and ground preparation, there will be earth movers, graders, and a concrete batching plant will be set on the site for mixing concrete used in construction.

2.6.2 Project execution

The project will start immediately NEMA's approval is obtained.

2.6.3 Existing technology

The construction will involve: earth work, foundation and building and construction involving mixing different types of building materials among other procedures.

The subsequent processes include:

i) Clearing of the construction site of debris
ii) Assembling of the materials and machinery required for the construction activities
iii) Commencing the construction according to the laid out plans including a boundary wall.
iv) Making the final touches on the finished units.
v) Connection to the necessary services such as sewer, electricity and water.
vi) Occupation of the facility

2.6.4 Construction Activities and Timetable

The construction activities shall begin from the time NEMA approves EIA study report. The construction activities shall begin with excavation of soil and rocks from the site. Materials from the excavations of the ground and foundation work will be re-used for earth works and landscaping. The site will then be filled with hardcore and murram then be compacted as other civil and engineering works shall follow as here on:

i) Normal excavation of soil and filling with hardcore
ii) Laying of foundation slab and walling
iii) Plastering and painting
iv) Landscaping
v) Storm water and drainage construction
vi) Laying of the pavement blocks
vii) Installation of electrical works
viii) Government inspection/occupation certificate and completion of works issued
ix) Beginning of occupation

2.7 Project implementation sequencing

2.7.1 Pre-construction stage: - The preconstruction activities will involve:

i) Plan preparation and seeking of the appropriate approvals from the relevant authorities.
ii) Appraisal of baseline condition to determine supply and demand for required infrastructural services.
iii) EIA study report preparation.

2.7.2 Construction stage: - This will involve the following:

i) Establishment of related works and all support infrastructures that are significant for the construction work: - This will involve the transportation of machinery and deployment of the workers to the construction site. The machinery will be used for transportation of materials from the sources to the site. It is important to note that light machinery will be used at this stage. The major machineries that will be used include: Mixers, Welding machines and transmission machines. The contractor will also mobilise human workforce to the site. Both casual (unskilled) and permanent (skilled) will be hired.

ii) Site Clearance: - This will involve clearing of the site of any debris and foreign materials.

iii) Acquisition and transportation of building materials: - The contractor shall source for materials for construction from the various available suppliers. Supply of materials will be a continuous activity throughout the project life since different materials will be needed at different phases of the construction. The materials that shall be used in the construction include among others building stones, sand, ballast, cement, timber, reinforced concrete frame, steel, bars, G.I pipes, PVC pipes, pavement blocks, concrete slabs, murram, hardcore, insulated electrical cables and timber among others.

iv) Construction of the apartments: - The engineering designs and site layout plans that have been approved shall be implemented. The setting will comply with the specifications set out by the

client to the contractor under the supervision of qualified engineers. In accordance with the designs and the layout plans, the construction of the proposed project and associated infrastructure will begin immediately NEMA approves the study report. The contractor will then be supplied with all the approved documents including the EIA report.

v) Excavation and land filling works: - This is part of normal construction works.

vi) Transportation of the construction wastes from the site for landscaping: - This will involve getting rid of any debris material from the site.

vii) Solid and liquid waste management: -An existing sewer line will handle the waste water. Solid waste will be managed by disposal into the proper sites; paper waste will be dispensed to recyclers for example.

2.7.3 Occupation stage: - This stage shall involve running and managing the facility as per the laid down rules and procedures.

2.7.4 Decommissioning Phase: - Decommissioning refers to the final disposal of the project and associated materials at the expiry of the project life span. This is dealt with in chapter ten of this study report.

2.8 Products, by products and wastes

2.8.1 Products

The residential building will offer housing facilities.

2.8.2 By-Products

There are no byproducts associated with the project.

2.8.3 Wastes

In major construction projects, some waste is usually generated at the project site. These wastes include; broken glasses, pieces of broken tiles, nails and pieces of broken wood. In this project the construction wastes will be minimal. The removal and disposal of such refuse and other related wastes comes in handy. The contractor shall work hand in hand with private refuse handlers and the relevant authorities to facilitate waste handling and disposal from the site. The wastes shall be disposed into the approved dumpsites. There shall also be liquid wastes from the operations within apartments and during the construction. The site has access to a NCWSC system where all the liquid waste from the construction and operations within the apartments will be channeled.

2.8.4 Air emissions

Relative air emission is expected during construction when dust will be emitted. It is recommended that watering be enforced to keep dust at minimal levels. The employees at the site shall also be provided with dust masks to protect them from dust emissions. Other sources of emissions will include smoke emissions from machinery.

2.8.5. **Firefighting Systems**

All floors, including the car parks, shall be protected by sprinklers designed in accordance with NFP. All areas will be protected with the exception of electrical equipment rooms, lift shafts, small washrooms and cupboards. Hose reels will be provided for the use of occupants in event of fire. Various protection systems including oil leak detection, local water leak detection, major water leak protection, water supply protection and high temperature alarms will be installed for critical installations and where required. A fire lane and security checks have also been incorporated in the design to cater for the emergencies around the building.

2.8.6. Water Services

Portable water for consumption will be sourced from Nairobi City Water and Sewerage Company and boosted by an onsite water borehole. This potable water will be stored in bulk storage tanks located within the site and constructed from lined reinforced concrete. The connections from these tanks will be directed to serve potable water outlets throughout the building including wash hand basins, the tenants' wet stack, kitchens, etc. and cold water connections to MEP plant

2.8.7. Lighting Systems

Corridor and security lighting shall be managed by a lighting control system comprising central controllers, area controllers, lighting control modules, occupation sensors, LED Lighting, multi

sensors and software. Lighting will be dimmable and be under daylight and occupancy controls. To save energy, provision is made for lighting controls with; daylight linked dimming, occupancy controls in spaces which are not continuously occupied including the car park, time and daylight sensor controls on external lighting, energy management, lamp management monitoring for failure and integration for control and monitoring of emergency lighting.

2.8.8. Safety and Security Systems

A fully automatic fire alarm system shall be installed incorporating the functions of fire detection and alarm, voice alarm and emergency voice communication. The building shall be provided with a distributed type Fire Alarm System comprising multiple alarm collection panels, linked into the a high integrity data collection reporting to the building fire command centre and repeater panels as agreed with the fire service. A CCTV camera system will be installed with fixed and cameras monitoring the main access points and final escape exits and additional key internal areas, including the car park, lift lobbies/communication corridors on each floor. The system will incorporate monitoring and recording facilities.

2.9 Waste management

The principle objective of waste management program is to minimize the pollution of the environment as well as to utilize the waste as a resource. This goal should be achieved in a way that is environmentally and financially sustainable.

2.9.1 Solid waste management

The technologies for the management of the solid wastes shall incorporate the collection of the waste from the source, transportation of the waste to the place of processing and treatment and final disposal.

The following waste management techniques shall be used in the different stages of the Project.

i) During construction: - Wastes at this stage shall be managed as follows:

- Express condition shall be put in the contract that before the contractor is issued with a completion certificate; he will clear the site of all debris and restore it to a state acceptable by the supervising architect and environmental consultant.

- Materials from excavation of the ground and foundation works shall be reused for earthworks and landscaping.
- Remnants from the construction materials will also be re-used in the construction and also for landscaping.

ii) During operation: The following methods shall be used to manage wastes:

- **Used Paper: -**Used paper shall be thrown in designated dustbins labeled within the property area. The paper waste shall then be collected and kept in a central place pending disposal.

- **Empty Cans and Plastic Containers: -**These should be collected and stored in a designated area pending disposal to designated areas or awaiting interested parties for recycling.

iii) Decommissioning: -During this stage, the following shall be observed:

i) Wastes generated as a result of facility decommissioning activities shall be characterized in compliance with standard waste management procedures.

ii) Disposal locations shall be selected by the contractor and the local council based on the properties of the particular waste generated

iii) All buildings, machinery, equipment, structures and partitions that will not be used for other purposes shall be removed and reused or rather sold/given to scrap material dealers.

2.9.2 Effluent treatment

There will be effluents from the civil works, workers and storm water drainage. It is envisaged that during construction stage, waste water that shall be discharged shall be sprinkled on the working areas to reduce dust generation by the construction machinery. Wastewater from the toilets and water points will be handled through the existing sewer line.

CHAPTER THREE: STUDY AREA

3.1 Baseline Information and Environmental Settings

Introduction

The proposed project site lies within Chiromo area in Nairobi City County. Bordering Westlands to the South East is the Nairobi City CBD. Nairobi is one of the fast growing cities in Africa. The city has experienced rapid growth both in terms of population and physical expansion in the past decades. The physical area of Nairobi has been expanding tremendously due to rapid urbanization. Nonetheless, its current official area is 696 Km2.

i) Climatic conditions: -

The project area has a mean rainfall of 1080mm falling into two distinct rainfall seasons. The mean annual rainfall in this area is about 600mm.The sunniest and warmest part of the year is from December to March, when temperatures average the mid-twenties during the day. The temperature usually peaks at 25°C. The rainfall regime is generally bimodal, with long rains that start from March to May and the short rains from November to December.

ii) Drainage

Nairobi City lies in the Athi River Drainage Basin. The major rivers that cross the City include Nairobi, *Ngong* and *Mathare* Rivers. All these drain from the West and flow towards the Eastern direction to join River Athi downstream. As the rivers pass through the City, industrial effluents, municipal waste and siltation heavily pollute them. Nairobi River is approximately 700 m south of the proposed project site, flowing to the city center. Otherwise, *Mathare* River which is one of its tributaries passes right beside the land.

iii) Administrative Framework of Westlands

Westlands is a suburb of Nairobi composed of residential homes and high end shops. Indeed, this has made the area to develop into a major commercial and economic area outside the Central Business District of Nairobi. Apart from being a commercial center, Westlands is also one the eight administrative Sub-counties in Nairobi, with the following six locations.

1. Parklands

2. Kitisuru
3. Highridge
4. Kangemi
5. Kilimani
6. Lavington

Westlands is also an Electoral Constituency. It has the same borders with Westlands Sub-County. The Constituency has a total area of 98 km².

iv) **Geology and Soils: -**

The soils in Nairobi are mainly products of weathering and erosion of underlying volcanic rocks under relatively high temperatures, rainfall and poor drainage. Soils are predominantly red volcanic with a loam texture. These soils are non-saline .The vertisols have low profile permeability when saturated. However, they are fertile, have a high water holding capacity and require tillage practices to drain. The area has red soil within the top 0 to 1.0m depth and weathered limestone (nodular calcium carbonate – $CaCO_3$) within a depth of 1.0 to 2.0m and is underlain by weathered upper Athi tuffs (volcanic tuffs or building stones) at depths greater than 2.0m. In some areas, the soil is to a depth of 65cm and is above a limestone layer of 1 to 1.4m depths. The parent material comprises deep phonolitic basement system rocks of tertiary age. The project will not cause physical change to the environment because in terms of topography, slope and stability of the soils.

The rocks on the other hand, comprise of a succession of lavas and Proclastics of the Cainozoic age and overlying the foundation of folded Precambrian schist's and gneisses of the Mozambique belt. The crystalline rocks are rarely exposed but occasionally fragments and found as agglomerates derived from the former Ngong volcano. The soils of the Nairobi area are products of weathering of mainly volcanic rocks. Weathering has produced red soils that reach more than 15m in thickness in some parts of Nairobi.

i) Socio-Economic Set Up: - The project area boasts of a mixed kind of socio-economic activities ranging from institutional activities, recreational, residential, trading, and transport. People in private business, schools, employees in private sector, public sector etc. as well as commercial

activities. Land in the project area has been sub divided for residential purposes and public utilities.

3.2 Infrastructural Facilities

Due to rapid urbanization, provision of basic infrastructure for all has become an important concern of development planners in Nairobi. Basic infrastructural services that have deteriorated due to such rapid increase in population include: Solid Waste Management (SWM) system; Water and Sewerage Systems; Drainage and flood protection; Roads and Rail; Mass transportation; Electric installations; and telecommunications. Greater environmental pollution, congestion and problems have been the result of under-provision of such basic services.

Nairobi city is well served with good telecommunication and transport network such as air, road, and railway. It is centrally located to serve the Eastern African Countries. Bus and train stations are within an easy walk of the City centre.

The main Railway line runs from Mombasa through Nairobi to *Malaba*. The latest ongoing project of the Standard Gauge Railway intended to connect the whole of East African countries will open up international networks and improve the ease of movement. The Network facilitates transportation of agricultural products from Western Kenya to the Coast. The city is a hub of road transport connection other major towns in the country. On air transport, Jomo Kenyatta International Airport makes it easy to transport people and goods from all over the world into the country and vice versa. Energy in its various forms is used to varying degrees, but by far the most common is electricity, wood fuel supplemented by fossil fuels is used in relatively very few residents. Other sources of energy such as solar, wind and biogas are rarely used.

i) **Energy sources: -** The project area gets its energy supply from the Kenya Power and Lighting Company (KPLC). The site in particular will not have difficulty accessing electricity, since there is power transformer just about 30 m from its main gate as illustrated in **fig3**.

Figure 3: Electricity transformer situated about 30 m for the main gate of the site. Source Field Work, 2017.

ii) Transport and Communication: - The major roads in the project area are *Arboretum Road, Riverside Drive,* Ring road and Waiyaki Way. The area is well covered by mobile phone service providers.

iii) Health: - Health facilities serving the project area are located within the area, about a kilometer radius from the project site there is a health centre. Some of the health centers include: Chiromo Lane Medical Center, The Aga Khan University Hospital, Blooming Beauty Clinic, Westlands Medical Center, Avenue Hospitals, and Westlands Physiotherapy Clinic.

iv) Educational Facilities: - Some of the educational facilities within close proximity to the site include; the Consolata School, University Of Nairobi Surgical Skills Center, Logos Christian School, Statehouse Girls High School, And Chiromo Campus Library.

3.3 Waste Management

Waste handling companies have been contracted by the residents of the area to handle their solid wastes. Liquid waste in the area is mostly managed through the existing NCWSC sewer system.

3.4 Waste Water Disposal

The proponent will connect the premises to an existing sewer line that will hold the waste generated.

CHAPTER FOUR: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

As a government policy enshrined in the Constitution of Kenya, every citizen has a right to clean and healthy environment. In return, every citizen has the obligations and responsibilities to undertake in order to ensure the state of Kenyan environment remains clean and healthy. This chapter covers all relevant laws and regulations pertaining to the project and their relevance towards ensuring a clean and healthy environment as well as sustainable project implementation mechanism. Kenya has a policy, legal, and administrative framework for environmental management. Under the framework, NEMA is responsible for ensuring that EIAs are carried out for new projects and Environmental audits on existing facilities as per EMCA, 1999. Otherwise, there are a number of policy and legal framework that have direct bearing on the construction and optimum operation of housing projects. They include the following:

4.1. Relevant national policies

National Policy	Relevance to the proposed project
The constitution of Kenya 2010 Constitution of Kenya, 2010 The Supreme Law of the Republic of Kenya was voted in a national referendum on 4 August 2010 and promulgated on 27 August 2010. As the benchmark for all legislation and regulatory frameworks in the country, the Constitution of Kenya acts as a regulator and supervisor of all development measures and project control device. In its preamble, the constitution demands maximum value to environment as a national heritage and unifier of all citizens that needs proper management for the benefits of the future	The Project Proponent has a right to carry out the project but within the Kenya's legal structures. While carrying out the project, the proponent should ensure that the right to a clean and healthy environment for all is upheld in all during the project schedule. The project proponent is entitled to a fair administrative decision making process from NEMA and other state organs. The project proponent will ensure that there is minimal disturbance of the existing environment.

generations. In Chapter 4 on the Bill of Rights, the Constitution of Kenya, 2010 gives every person a fundamental right to clean and healthy environment. In such section 1, of the article, it directs that such cleanliness and health must take into account protection, management, and conservation of environment and associated resources for the benefits of the future generations.	The project proponent must ensure that all the applicable provisions of the constitutions are adhered to.
Environment and development policy (Sessional Paper No.6 of 1999) The aim of this policy is to harmonize environmental and development goals so as to ensure sustainability. The paper provides comprehensive guidelines and strategies for government action regarding environment and development.	The proposed project has the objective of improving the economy through job creation and paying taxes to the county and central government. Sound measures have been put in the design of the project so that its implementation does not negatively affect the environment and the neighbours.
The National Environmental Action Plan (NEAP) The NEAP was a deliberate policy effort to integrate environmental considerations into the country's economic and social development. The integration process was to be achieved through a multi-sectoral approach to develop a comprehensive framework to ensure that environmental management and conservation of natural resources are an integral part of societal decision making.	Issues of environmental integrity have been addressed by this project, which the proponent needs to abide by.

The National bio-diversity strategy The overall objective of the National Bio-Diversity Strategy and Action Plan (NBSAP) Is to address the national and international undertakings which are elaborated upon in article 6 of the Convention on Biological Diversity (CBD) It is a national frame work of action to ensure that the present rate of biodiversity loss is reversed and the present levels of biological resources are maintained at sustainable levels for posterity. The general objectives of the strategy are to conserve the Kenya's biodiversity, to sustainably use its components, to fairly and equitably share the benefits arising from the utilization of biodiversity resources and to enhance the technical and scientific cooperation and exchange of information in support of biological conservation.	The design of the project has taken into consideration the interactions of man and the biological environment. To ensure that nothing is overlooked, an EIA study has been done to inform the modalities of such interactions.

4.2. Legal framework

Act	Cap	Relevance to the proposed project
The water Act This prohibits the pollution of water. Part ii, section 3 states" every water resource is hereby vested in the state subject to any rights of user granted by or under the Act of any law. In addition the right to any use of water from any water resources is vested in the minister for water Resources	**2002**	Waste disposal facility should be well designed. The development should not pollute the neighbouring river. The water from the river should not be used in any way without the necessary permit from

Development and Management except to the extent that it is alienated by or under the act or any other written law (Section 5). Consequently a water permit must be obtained before using any water resource.		Water Resource Management Authority, and the same agency should be consulted before any construction is erected in, above or under a river as provided in law.
The Physical Planning Act of 1996 Part IV No 36 of the act requires that, "If in connection with a development application a local authority is of the opinion that proposals for industrial location, dumping sites, sewerage treatment quarries or any other development activities will have injurious impact on the environment the applicant shall be required to submit together with the application an environmental impact assessment report."	**286**	The project must be implemented based on the provisions of this Act, Enforceable by the Nairobi city council with respect to this project.
Environment Management and Coordination Act, 1999 This is an act of parliament, which provides for the establishment of an appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto. Section 58(1) states that notwithstanding any approval, permit or license granted under this act or any other law in force in Kenya, any person being a proponent of a project shall, before carrying out, executing, or conducting or causing to be financed, commenced, proceeded with, carried out, executed or conducted by another person any undertaking specified in the second schedule to this act submit an Environmental impact assessment report.		The proposed project falls under the second schedule in section 58, "any activity out of character with its surrounding" since it is likely to cause substantial impact to the environment in areas such as waste disposal, sustainable resource use, ecosystem's maintenance, social environment, land use and water conservation.
Environmental Impact Assessment and Audit Regulations 2003. These regulations stipulate how an EIA report should be done and specify all		The proposed project shall be constructed and operated based on these regulations. It should

the requirements. It highlights stages to be followed, information to be made available, role of every stakeholder and rules to observe during the whole EIA study report making process		also be maintained and guided by the same regulations and an environmental audit study will be done periodically to monitor compliance with the set environmental standards.
Air Quality Regulations 2014 These regulations provide for the prevention, control and abatement of air pollution to ensure clean and healthy ambient air. Section 33 of the act stipulates 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.		The regulations will be adhered to and the contractor shall ensure that air pollution is minimised to the lowest possible level.
Waste Management Regulations 2006 This regulation gives guidelines on both operational and administrative activities that are used in handling, packaging, treatment, condition, storage and disposal of waste and is implemented by NEMA. It prohibits anyone from disposing any waste on any part of the environment except in designated waste receptacle or facility provided by the relevant local authority which may be legitimate dump sites or landfills Section 3 of these regulations stipulate that any person whose activities generates waste has an obligation to ensure that such waste is transferred to a person who is licensed to transport and dispose of such waste in a designated waste disposal facility.		Since the proposed project will generate both solid and liquid wastes during construction, operation, and decommissioning phase, this act provides for the waste generator to be responsible for collection, segregation at source and proper disposal of their wastes.
Noise and Excessive Vibrations Pollution Control Regulations 2009 This regulation prohibits any person from causing unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers		The project shall be implemented based on the provisions of these regulations.

the comfort, repose, health or safety of others and the environment. Part 11 section 6 (1) states that no person shall cause noise from any source which exceeds any sound level as set out in the First Schedule of the regulations. It gives standards for maximum permissible noise levels for construction sites, mines and quarries. It also gives maximum permissible noise levels for silent zones, places of worship, residential (indoor/outdoor), mixed residential; and commercial.		
Water Quality Management Regulations, 2006 These regulations were drawn under section 147 of the Environmental Management and Coordination Act 1999. In accordance with the regulations, every person shall refrain from acts that could directly or indirectly cause immediate or subsequent water pollution and no one should throw or cause to flow into water resources any materials such as to contaminate the water. The regulation also provides for protection of springs, streams and other water sources from pollution.		The proposed project will operate under this regulation. The proponent shall ensure that there is the no population of the river and or any other water body.
Conservation Of Biological Diversity And Resources, Access To Genetic Resources And Benefit Sharing) Regulations, 2006 Part II of Regulations, section 4 states that no person shall engage in any activity that may have adverse impacts on ecosystems, lead to introduction of exotic species or lead to unsustainable use of natural resources without an EIA license. The regulation puts in place measures to control and regulate access and utilization of biological diversity that include among others		The proposed project will uphold this regulation and ensure the conservation of biodiversity where possible.

banning and restricting access to threatened species for regeneration purposes. It also provides for protection of land, sea, Lake or river declared to be a protected natural environmental system in accordance to section 54 of EMCA, 1999.		
The Penal Code The chapter on "offences against health and convenience" contained in the penal code enacted in 1930 strictly prohibits the release of foul air into the environment which affects the health of the other person. Any person who voluntarily violates the atmosphere at any place to make it noxious to the health of persons in general, dwelling or carrying of business in the neighbourhood or passing along public ways is guilty of a misdemeanour, i.e. imprisonment not exceeding two years with no option of fine.	**63**	Waste disposal and other project related activities would have to be done in keeping with the provision of this law.
Factories and Other Place of Work Act The Act makes provision for the health, safety and welfare of persons employed in factories and other place of work. The provision requires that all practicable measures be taken to protect persons employed in the factory and other places of work from any injury. The provisions of the Act are also relevant to the management of hazardous and non-hazardous wastes, which may arise at the project site. The Act provides that all measures should be taken to ensure safety, health and welfare of the entire stakeholder in the work place.	**514**	Workers safety needs to be given priority during both construction and operation of the project.
County Government Act This act outlines county governments' powers, functions and responsibilities	**265**	The county government of Nairobi run all services within the project area and their rules

to deliver services and the connected purposes. Section 116 (1) of the act stipulates that A county government and its agencies shall have an obligation to deliver services within its designated area of jurisdiction. (2) A county shall deliver services while observing the principles of equity, efficiency, accessibility, non-discrimination, and transparency, accountability, sharing of data and information, and subsidiary.		shall be adhered to.
The Public Health Act This act has provisions for maintaining and securing health. It defines what environmental nuisance is.	**242**	Various health hazards are likely to emanate from the proposed project's activities such as workplace accidents, air, and water and land pollution. There is therefore need to integrate health issues to the project to ensure healthy environment.
Urban and Cities Act No 13 of 2011 The Act came into function with regard to Article 184 of the Constitution providing regulations on the classification, governance and management of urban areas and cities and further providing the criteria of establishing urban areas. Part III of the Act gives the regulations and functions of every city or municipality with regard to integrated development plans, which shall include but not limited to environmental plans and disaster preparedness, within the area of jurisdiction in achieving objects of devolved governments		The Nairobi City County Planning and Environment Department have been actively involved in the planning of this development as from its initial stages.

under section 174 of the constitution while maintaining the socio-economic rights of the people. Moreover, in the first schedule, the Act enlists the services the services that the any municipality/ City shall provide to its residents which include but not limited to traffic control and parking, water and sanitation, refuse collection, solid waste management, pollution abatement services among others.		
The Environment and Land Court Act, 2011 This Act is in place to give effect to Article 162(2) (*b*) of the Constitution; to establish a superior court to hear and determine disputes relating to the environment and the use and occupation of, and title to, land, and to make provision for its jurisdiction functions and powers, and for connected purposes.		This Act shall of great essence to the proponent, public, interested or affected party that may want to litigate against the development on settlement issues, location of project or even effects of the project to the public

4.3. Administrative and Institutional Framework

There are several institutional arrangements responsible for development control in different sectors. In this project, some of the institutions whose mandates fall within the assignment include:

I. National Environmental Management Authority (NEMA)

Established under EMCA, 1999, NEMA acts as the lead agency in regulating development in relations to conservation, utilization, and management of environmental resources in the country.

The objects and purpose of the NEMA are stipulated in Section 9(1) of EMCA, 1999 that charges the Authority with the responsibility of general supervision and co-ordination of all matters relating to the environment and representation of government in the implementation of all policies and regulations relating to the environment.

Relevance to the Project

NEMA is responsible for conditional issuance of Environmental Impact Assessment license. Besides, the authority has the responsibility to follow up on project development to ensure compliance to conditions set out in the license, and it has the power to revoke EIA license upon when convinced that project component violates the provisions of the license.

II. County Government Nairobi

Constituted under the First Schedule of the CoK, 2010, the county government Nairobi is responsible for initiating local and development projects within its jurisdiction. Some of the roles of the Nairobi government include the provision of county planning needs in the development arena; provision of health services; and provision of water and sanitation service. Similarly, Nairobi County government is responsible for development control in the local sub-counties, regulation of housing development through control and supervision measures; and maintenance of an inspectorate department for regulation and supervision of all development projects in the county.

Relevance to the Project

The County government of Nairobi is the custodian of the county's physical development plans. It must approve the development projects through the department of physical planning and housing development. Also Nairobi County government is responsible for regulation and inspection of development projects. Compliance to the provision of the licenses ensures smooth implementation for the project.

III. Ministry of Health

This is the agency charged with the responsibility of ensuring adequate health and sanitation programs in the country on behalf of the national government. In the water and sanitation services, the ministry is responsibility for supervising the development of health and sanitation policies for effective management of wastes. The ministry is also responsible for provision of community health service, promotion of healthy behaviors, reproductive health campaigns, and ensuring food hygiene among other functions.

Relevance to the Project

The county government institutions in collaboration with, the ministry provide relevant advice on the location of water and sewerage treatment systems in the county. Consulting the national government before implementation of the project gives the project proponent a preamble of the expected systems of water and sewerage services provision in the county.

IV. Ministry of Labour and Social Security Services

As a government agency, this ministry seeks to enforce labor laws, maintain industrial peace, industrial training and promote safety and health of employees. The Ministry also has a responsibility to develop and coordinate implementation of policies and strategies for human resource development, micro, and small enterprise sector and productivity improvement.

Relevance to the Project

The ministry is responsible for implementation and enforcement of occupational, health, labor, and social service policies in the country.

Proponent's compliances to the safety, social security, and welfare of the persons employed in the project implementation will be supervised by the ministry of labor and social security services.

The department of occupational health and safety, the ministry will supervise the occupational health and safety policies set out by contractors the ensure conformity with the country's demands and expectations.

V. Water Resource Management Authority

This is an institution established under the Water Act 2002 as the principle authority of the government on all matters related to water utilization, resources, management and distribution. Part II, section 18, of the Water Act 2002 provides for national monitoring and information system on water resources. Additionally, sub-section 3 allows the Water Resources Management Authority (WRMA)

to demand from any person or institution, specified information, documents, samples or materials on water resources.

Relevance to the project

The proponent and all the allied stakeholders to the project shall ensure proper water use, management and conservation. In the event of borehole drilling WRMA shall be consulted by the project hydro geologists for the purpose of attaining permits for borehole sinking. Besides, specific records may require to be kept by a facility operator and the information thereof furnished to the Authority

CHAPTER FIVE: ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1.Description of the existing and anticipated impacts

i. Existing impacts: -

As at the time of the study, the following impacts existed within the project area; Noise from vehicles, especially the ones using Arboretum Road, and debris from the previous land use within the site.

ii. Anticipated impacts: -

The impacts of the proposed project on the environmental elements are both positive and negative. The magnitude of each impact is described in terms of being significant, minor or permanent, short-term or long term, specific (localized) or widespread, reversible or irreversible. Most of the impacts have been addressed in the proactive design of the project and other mitigations can only be guaranteed through active and responsible management committed to the propositions of the environmental management plan.

5.2.Positive impacts

5.2.1. Construction phase

- **Employment Creation**

  With the implementation of the project, there will be employment opportunities for not only those who will be providing manual work, but also those providing professional works and consultancy.

- **Increased value of land**

The proposed development is bound to increase the value of the land as a result of the infrastructural development and the demand for the proposed facilities. The apartments will be constructed in a way that appeals not only to the local investors, but also international. Hence, the apartments will raise the profile of the Chiromo area with regard to the resident it will attract.

- **Aesthetic value**

The proposed development will enhance the site aesthetic value. The designs of the proposed facilities will ensure visual attractiveness which will thus add beauty to the site. The proponent has put in place, elaborate mechanism to improve the vegetative landscape of the area after construction.

- **Increase in the number of residential units**

The intended construction of the proposed apartment will lead to an increase in the stock of high quality apartment in Chiromo are and environs.

- **Creation of business opportunities**

As a result of the proposed project a large number of people (skilled and unskilled) will be required during the construction stage. The construction will provide a ready market for various goods and services, leading to several business opportunities for small-scale traders such as food vendors around the construction site.

- **Improved land utilization**

The development of proposed site is expected to lead to better (maximized) utilization of land, per square metre of built up area.

- **Market for Building Materials**

The project will require supply of large quantities of building materials most of which will be sourced locally in and around Nairobi area. This will provide a ready market for building materials.

5.2.2. Operational phase

- **Revenue to local and national Government**

The development will provide revenue both to the local and the National Governments through payment of relevant taxes, rates and other levies after revaluation.

- **Employment Creation**

Employment will be generated with a number of people being employed at the project site including security personnel, ordinary labourers' cleaners and gardeners. Some of the amenities with prospects for employment during the operational phase is; gym, social hall, business centre, pools, and chemistry.

- **Improvements in security**

The occupation of the apartments and the employment of 24-hour security officers for the premises will improve security in the area particularly at night.

5.2.3. Decommissioning phase

- **Rehabilitation**

After the decommissioning of the project, rehabilitation of the project site will be carried out to restore the site to its original status. This will include replacement of the soil and re-vegetation that will lead to improved visual quality of the area.

- **Employment Creation**

Employment opportunities will be created for the demolition staff as well as those involved in loading, transportation and unloading of the demolished materials.

- **Recycling of usable materials**

Not all the demolished materials will go to waste as some may be recycled for alternative uses.

On the basis of information gathered during both the desktop and field study, the potential environmental impacts of the proposed project are as tabulated below.

5.3.Negative Impacts and Mitigation

5.3.1. Construction phase

i. Soil erosion: -

In this project, soil erosion will be a major environmental issue or concern since there will be major excavation, and the site is sloppy towards the adjacent *Mathare* River. Consequently, there are likely to be cases of soil disturbances, exposure, and loosening to the agents of erosion.

Potential mitigation measures

- There should be no unnecessary movement of soil materials from the site
- The site shall be horded to prevent excavated soil form filing the river
- Soil conservation structures should be provided on the areas prone to soil erosion mostly to reduce impact by the run-off.
- There should be controlled construction activities especially during rainy conditions.
- Resurface (pave) open areas on completion of the project.
- A suitable storm water drainage channels should be to effectively discharge water safely. Such channels need to be regularly maintained. Point discharges which have pronounced effect to soil erosion shall be avoided
- Standard landscaping shall be conducted after project completion to maximally control any possible chance of soil movement.

- Avoid clearing of the vegetation along the stream to cat as soil erosion control agents.

ii. Water Use and Management: -

The construction activities will require large quantities of water that will be supplied by the Nairobi Water Company. Water will be used mainly for concrete mixing, curing, sanitary, and washing purposes

Potential mitigation measures

- Provide notices and information signs within the project to notify on the needs to conserve water resource.
- Encourage of water re-use/recycling during construction
- Avoid using the water from the stream for the construction purposes unless there is adequate permit from WRMA.

iii. Solid and liquid waste Generation

Solid waste will be generated during excavation of the site for foundation works and landscaping. Additionally, the used materials used as package of construction material will form solid waste. Liquid wastes will be generated from the cleaned surfaces, paints, and lavatory

Potential mitigation measures

- The contractor and proponent shall work hand in hand with private refuse handlers and local authorities to facilitate sound waste management.
- The wastes shall be properly segregated and separated to encourage recycling of some useful waste materials.
- Employ integrated solid waste management system through a hierarchy options: source reduction, recycling, composting and refuse. This will facilitate handling during occupation.
- Any waste water arising from construction should be channeled to the sewer system, except oil and paints, which should be disposed of as provided under the user instruction manual.

iv. Pollution

- **Dust pollution**

During construction, the project will generate substantial amount of dust at the construction site and its surrounding area. The sources of dust will include excavation and levelling works, and transport vehicles delivering building materials.

Potential mitigation measures

- Provide full protective gear for workers. Workers shall also be sensitized on hazards encountered in such work environment and shall undergo regular health check-ups.
- Control areas generating dust particles through regular cleaning or sprinkling of water to suppress dust.
- The number of construction equipment operating simultaneously shall be minimized through efficient management practices.
- Vehicle idling time shall be minimized.
- The contractor shall carry out routine maintenance of vehicles and other machinery as per the manufacture's specifications to ensure minimum emission of NO2 and SO2.
- Maximize the use of manual labor and hand tools.
- Avoid spillage of loose soil to the road where it will be disturbed and blown away by traffic.
- Sensitize drivers to avoid off road driving.
- Stockpiles of sand and soil should be covered or surrounded with wind breaks
- Trucks hauling dirt and debris should be covered to reduce spillage on to paved roads surface.
- Expedite construction so that it can take the shortest time possible.
- Install dust protective nets around the site to cushion the nearby residents from dust pollution.
- Preserve the trees around the site to act as dust obstructers.
- Provide adequate signage on the site for users and workers to take precautionary measures against dust infection.

- **Noise Pollution**

The construction works, delivery of building materials by heavy trucks and the use of machines/equipment such as bulldozers, generators, metal grinders and concrete mixers will contribute to high levels of noise within the construction site and the surrounding area. Elevated noise levels will affect project workers, the nearby residents, passers-by and other persons within the vicinity of the project site.

Potential mitigation measures

- truck drivers should switch off vehicle engines while offloading materials
- avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as churches, schools and hospitals
- construction machinery shall be kept in good condition to reduce noise generation
- all generators and heavy-duty equipment should be insulated or placed in enclosures to minimize ambient noise levels
- Provide the workers with sound protective gears to cushion them from noise pollution
- Provide sign on the site for purposes of informing the site users, and workers in case of previous health problem with relation to hearing.

v. Fuel Consumption, Oil leaks and spills:

The project activities will lead to an increase in consumption of fossil fuels manly diesel to run transport vehicles, construction machinery and cars for construction management staff and consultants. These are non-renewable resources and should be used economically and efficiently**.**

Potential mitigation measures

- Strict avoidance of oil grease spills and leakages and
- Construction of oil interceptors if need be.
- Oil product and materials shall be stored appropriately

vi. Visual Intrusion: -

Visual impacts will occur during earthworks for the foundation of the project.

Potential mitigation measures

- All solid wastes and debris shall be cleared on the completion of the work
- On completion of all works, the worked area shall be restored through backfilling, leveling and planting of vegetation.
- Fence the site using construction nets and iron sheets to prevent visual intrusion.

vii. Occupational Health and Safety (OHS): -

During the proposed works, there may be increased hazards to health and safety such as dust, air, and noise pollution. The workforce and general public involved would be more subjected to these environmental hazards and disturbances. Foods for the construction workforce are usually provided by itinerant individuals most of who operate without license. This can compromise health of the workers especially if such foodstuffs are prepared unhygienically.

Potential mitigation measures

- Sanitary facilities shall be provided and cleanliness shall be ensured as per set standards.
- A fully equipped first aid kit shall be provided and shall be managed by qualified persons.
- Adherence to environmental health and safety regulations.
- Individual food vendors preparing food for the workers at the site shall be controlled and monitored to ensure that food is hygienically prepared.
- Ensure consistently good water quality through regular water analysis to ascertain compliance to public health standards.

viii. Construction and Safety: -

As provided for in the factories and other places of work Act; the safety of those in the workplace should be given the weight it deserves. The following shall be given priority.

- Proper personal protective equipment i.e. safety boots, helmet, goggles, respiratory equipment and gloves shall be used at all times on the site during construction or as condition warrant and workers trained on the proper use of tools
- Prior to the start of the construction, all areas shall be inspected for the presence of potentially hazardous substances.
- Contractors and managers shall use barriers and guards as necessary to protect employees and visitors from physical hazards. Danger warning or CAUTION will be put at strategic places.
- The contractor and management shall adhere to the provisions of environmental health and safety plan (EHS).

5.3.2. Operational Phase

i. Sewage and Effluent: -

Effluent/sewage resulting from sanitary facilities and wastewater from washrooms is of significant concern with respect to the environment if it is untreated. It shall be handled by draining effectively into the existing sewer system. Sound sanitation will be ensured to influence prevention of outbreak of diseases detrimental for the general health of the workers, visitors and the general public.

Potential mitigation measures

The proponent shall ensure that there are adequate means for handling the large quantities of sewage generated by the units being directed to the Nairobi county sewer line

ii. Surface drainage

The drainage of the general site is necessary to enhance effective flow of the much-anticipated surface run-off from impermeable areas within the site.

Potential mitigation measures

- Drainage channels shall be installed in all areas that generate or receive surface water and be connected to the existing storm water drainage channel. The channels shall be covered with gratings or other suitably approved materials to prevent occurrence of accidents and dirt entry that may compromise flow of run-off.
- Paving of the sidewalks, parking and other open areas shall be done using pervious materials i.e. concrete blocks to encourage water percolation thus reducing run-off volume.
- Storm water generated from roof catchments shall be harvested, stored and made use of in various activities e.g. general cleaning and vegetation watering thus reducing run-off and pressure on water supply.

iii. Solid Waste

The proposed activities will generate related solid wastes. If solid waste is not removed promptly away from the generation points it accumulates in to large heaps harboring rats, flies etc. which transmits disease not to mention bad odors on decomposition.

- Provision of bins, one for organic matters and the other mineral matter. These will be of approved type, size and color to effect waste separation and disposal. The bins shall be kept in a good condition and sanitarily cleaned by frequent washing and disinfecting.

iv. Security: -

Security of the site and those working and living within is of utmost significance. The house-dwellers within the facility must be assured of their security at all times.

Potential mitigation measures

- Strategic installation of lighting as well as security alarms and backup systems
- Hiring security guards within the property to provide security in a 24-hour basis.
- The site shall be fenced.

v. Water Use

During the operational phase, the various activities will require large quantities of water, i.e. for cleaning, sanitary purposes etc.

Potential mitigation measures

- On occupation of the apartments, metering per unit of water shall be done and conservation be promoted.
- Installation of water conserving taps that turn-off automatically when water is not in use.
- any water leaks through damaged pipes and faulty taps shall be fixed promptly by qualified staff

vi. Fire hazards: -

The operations that lead to fire outbreaks include poor handling of electricity systems, faulty electrical equipment, carelessness etc. It is important to consider the issue of fire by bringing in the element of preparedness. In this regard, the design of the project has provided and recommended implementation of firefighting measures and control facilities. These include the following:

- All fire control and fighting facilities shall be installed following county government fire masters requirements and approval.
- The dwellers shall be encouraged to be aware of requisite actions basic first aid to take in case of fire outbreaks.
- The proponent shall ensure that all firefighting equipment are strategically positioned, regularly maintained and serviced

- There shall be provided fire hazard signs such as no smoking signs, directions to exit in case of any fire incidence; and emergency contact numbers shall be provided.

vii. Energy demand and conservation: -

Energy conservation involves optimum use of fossil fuels, electrical appliances (equipment) lighting systems and other electric machinery and equipment as used for different purposes. It also includes the use of renewable energy sources.

Potential mitigation measures

a) Electrical appliances: - All the appliances shall be switched off when not in use. Operations of electrical equipments shall be optimized so that energy is not wasted.

b) Lighting

- Energy conserving electrical lamps use shall be encouraged.
- All lights will be put off when not in use
- An alternatives energy source, a generator can be installed.

viii. Accident prevention: -

The following rules will be observed to avoid accidents both during construction and occupation of the building.

- Ensure that the operational manuals are available and accessible for every equipment /machinery
- Properly maintain all machinery and equipment to prevent premature failure or possible accidents
- All electrical equipment and machinery shall be properly grounded
- Only properly trained employees to operate equipment or machinery and proper instructions in their safe operation shall be provided.

CHAPTER SIX: PROJECT ALTERNATIVES

6.1 The proposed alternatives

This EIA study report has been prepared for submission to NEMA based on sound desktop and field studies made by the EIA team. The findings and recommendations are based on the proposed site materials and the proposed technologies to be used in implementation of the proposed project

6.2 Alternatives to site

A change of site alternative will require that the project be implemented at an alternative site other than the proposed site. Change of site will mean the proponent has to purchase an alternative piece of land. The result will be an increase in time and resources required to complete the transactions. The unpredictability of financial resources and the lengthy duration required in acquiring and completing official transaction on it may presents great challenges to having an alternative site for this project. Proposed site was chosen because the proponent already owns the plot. Besides, there is no guarantee that an appropriate land will be available at a reasonable cost within the project area.

6.3 Alternative to technology

The proponent should consider installing solar panels so that solar energy is also used as an alternative source of power during the project operation.

6.4 No project alternatives

This means that the status quo remains and the proponent will have to contend with the land being idle. This may lead to underutilization of the land and the proponent missing out on the good returns from the housing sector being experienced presently.

6.5 Comparison of alternatives

The proposed project is the best alternative since it will lessen the housing shortage being experienced in the country, lead to revenue for the proponent and the government, improvement in service delivery and will create employment opportunities for more people.

CHAPTER SEVEN: ENVIRONMENTAL MANAGEMENT PLAN (EMP)

7.1 Significance of EMP

EMP involves the protection, conservation and sustainable use of the various elements or components of the environment. The EMP for the proposed project provides all the details of project activities, impacts, mitigation measures, time schedules, costs, responsibilities and commitments proposed to minimize environmental impacts of activities, including, monitoring and evaluation and environmental audits during implementation and decommissioning phases of the project.

7.2 Environmental monitoring and audits

Environmental monitoring and audits are essential in Projects life span as they are conducted to establish if project implementation has complied with set environmental management standards for Kenya as spelt out in EMCA 1999 and the Environmental Impact Assessment and Audit Regulations 2003. In this Project, environmental monitoring and audit will be conducted to ensure that identified potential negative impacts are mitigated during the project's life span.

Table 7.1: Environmental Management and Monitoring Plan

Environ-mental/ Social impact	**Proposed mitigation and aspect for monitoring**	**Responsibility for intervention and monitoring during design construction**	**Monitoring means. C=construction 0=occupation**	**Recommended frequency of monitoring**
Air pollution	• Control speed and operation of construction vehicles. • Prohibit idling of vehicles. • Spray water on excavated areas. • The site shall be fenced to curb dust from spreading to the neighborhood. • Regular maintenance of construction plant and equipment. • Workers shall be provided with dust masks if working in sensitive areas. • Avoid spillage of loose soil to the road where it will be disturbed and blown away by traffic.	Contractor and proponent	(c) Inspection Air quality at the proposed site. Respiratory diseases among workers	(c). Daily

	• Sensitize drivers to avoid off road driving. • All unpaved roads used for any vehicular traffic shall be watered at least twice per day of active operations and road used for any vehicular traffic once daily. • Stockpiles of sand and soil should be covered or surrounded with wind breaks • Trucks hauling dirt and debris should be covered to reduce spillage on to paved.			
Increased traffic	• A construction site traffic management plan should be prepared for approval by the relevant County City department. • Any work that disturbs normal traffic signal operations shall be coordinated with the relevant authorities, • Ensure that the Entry/Exit to the project site is located where it will cause minimal traffic along Arboretum road or Chiromo road, • Ensure all construction vehicles to and	The Contractor , Project manager	Approval of license of the plan	Random

	from the construction site use the designated Entry/Exit to the project site, • All transportation of construction raw materials and excavated materials are to be conducted at traffic off peak hours only, • Cover all trucks hauling soil, sand and other loose materials to avoid spillage and dust emissions that may interfere with smooth motoring, • "NO PARKING" signs will be posted around the building where Parking is prohibited and likely to cause obstruction as well as other necessary traffic signs, • Traffic management/parking personnel shall be provided to monitor parking and ensure smooth motoring along the buildings adjacent roads.			

Noise pollution	• Workers in the vicinity of or involved in high-level noise to wear safety protective gear. • Maintain equipment. • Construction should be carried out only during daytime. 0800-1700hrs • Signs should be erected to restrict motorists to avoid unnecessary hooting within the compound. • Billboards should be erected at the project site to alert neighbors on the development.	Contractor and Project Manager	(c) Inspection/o Observation.	(c) Random
Water Resources overutilization	• Adopt sound water conservation measures • Recycle water at the implementation phase where possible • Provision of notices and information signs within the project to notify on means and needs to conserve water resource. • On occupation of the apartments, metering per unit of water shall be done and conservation be promoted.	Contractor and proponent	(c) Inspection/ Observation	(c) Random

	• Installation of water conserving taps that turn-off automatically when water is not in use. • any water leaks through damaged pipes and faulty taps will be fixed promptly by qualified staff			
Waste Generation	• Use durable, long-lasting materials that will not need to be replaced often, thereby reducing the amount of construction waste generated over time, • Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements; • Use building materials that have minimal packaging to avoid the generation of excessive packaging waste; • Use construction materials containing recycled content when possible and in accordance with accepted standards ,	-The proponent, contractor during construction. - The real estate management company during		

	• Ensure adequate collection and storage of waste on site and safe transportation to licensed disposal sites by licensed waste handlers			
Public health and occupational safety.	• Train staff workers on occupational health and safety. • Provide full protective gear in addition to the right tools and operational instruction manuals • Compliance with occupational health and safety requirements • Enforcement of health and safety requirements • Provision of First Aid Kit. • Emergency preparedness • Train construction workers on safe working practices • Construction crew at the site should be	Contractor proponent and management	(c) Observation	(0) Daily as provided by law and others regulations

	sensitized on social issues such as drugs, alcohol diseases. • The contractor should have workmen's compensation cover. It should comply with workmen's compensation Act, as well as ordinances, Regulations and Union Agreements. • Adequate sanitary facilities should be provided and standard cleanliness maintained. • Mobile toilets, changed regularly, to be provided on site or latrines • Food handlers preparing food for the workers at the site should be controlled and monitored to ensure that food is hygienically prepared.			
Air Dust. Reduce dust emissions	• Provide 2.4 m high hoarding along site boundary, • Sprinkle water on loose soils shield from wind, pave open areas and landscape, • Provide effective dust screen, sheeting or	Project Manager and the Contractor	Observation	Continuous

	netting where a scaffolding is erected around the perimeter of a building • Cover all trucks hauling soil, sand and other loose materials • Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction site • Down wash of trucks (especially tyres) prior to departure from site; • Sweep daily (with water sweepers) all paved access roads, parking areas and staging areas at construction sites; • Personal Protective equipment to be worn by all staff members • Post signs that limit vehicle speeds onto unpaved roads and over disturbed soils;			
Security	• Provide security guards and facilities during the entire project cycle.	Contractor proponent	c) Observation	(c) Daily

	• Strategic installation of lighting as well as security alarms and backup systems • The site shall be fenced			

Table 7.2: Environmental Management Framework

Impacts	**Mitigation**	**Monitoring**	**Responsible**	**Estimated annual cost.**
SOIL **Soil erosion. And compaction**	• Terrace, level and rip off compacted areas of the project site to reduce run-off velocity and increase infiltration of storm water into the soil • Dig trenches and cut off drains to channel runoff into existing peripheral storm water drains • Surface runoff should be harvested where applicable for reuse during construction works • Control construction activities especially during rainy conditions	Vegetation cover	Proponent/project manager	500,000

	• Re-surface open areas after completion of the project and introduce appropriate vegetation. • Provide suitable storm water drainage channels to effectively discharge water to safe areas. Channels need to be regularly maintained and repaired to avoid point discharge in case of breakages or blockages. • Use light machinery and equipment to reduce on soil disturbance. • Install drainage structures properly • Provide both soft and hard landscaping after completion of the project.			
WATER **Increase in water demand**	• Harvest rain water for general purpose use e.g. mopping floors. • Install gutters on the roof to collect rain water. • Encourage occupants to conserve water/use it sparingly • Install low flow taps • Repair leaking taps promptly	Water amount used	Project /manager proponent	500,000
ENERGY **Increased Energy demand**	• Improve lighting efficiency by efficient window placement during project design (day-lighting) • Identify and use equipment/systems having minimum	Contractor, The proponent	Low Energy bills	500,000

	energy consumption • Use alternative energy sources such as solar power	and the Operations Manager and the		
	•	Amount of dust Extent of paved area	Project Manager, The contractor.	-
BIODIVERSITY **Degradation of vegetation**	• Plant indigenous trees and other vegetation along the river bank • Do not cut down any of the existing trees along the river bankunless it's necessary • Provide the recommended distance from the river bank and do not block the stream.	Number of indigenous trees available The distance of the stream to the nearest structure.	Proponent	500,000
Total				

Considering the proposed location, construction, management and mitigation measures that will be put in place and the project's contribution in the provision of quality facility and creating employment opportunities, its implementation is considered important and beneficial.

Therefore, key effort should be geared towards safeguarding the environment. This can effectively be achieved through close following and implementation of the recommended Environmental Management Plan.

CHAPTER EIGHT: PUBLIC CONSULTATION

8.1 Public Participation

Public participation basically involved encouragement of the public to express their views. Essentially, it seeks to ensure that due consideration is given to public values, concerns and preferences when decisions are made.

Consultation and public participation for this proposed project was carried out as detailed here below:

- The first consultation took place between the consultant and the proponent. The issues discussed in this first consultative meeting include the following:
  - The proposed site location
  - The site layout plans and designs
  - The title deed
  - Proposed project budget
- The second consultation took place between the consultant and the neighbors. After inspecting the site, the consultant approached immediate neighbors who include land owners and tenants of the area. The objectives of consultation with neighbors include;
  - To disseminate and inform the area residents about the proposed project with special reference to its key components, location and expected impacts.
  - To create awareness among area residents on the need for EIA for the proposed project and its due process.
  - To gather comments, concerns and suggestions of the immediate neighbors.
  - To ensure their concerns were known to the developer and associates at an early phase of project development planning.
  - To establish a communication channel between the residents, consultants and the proponent. The consultant moved from door to door explaining the proposed project details. A questionnaire was used to elicit views of stakeholders concerning the proposed project. A sample of the neighbor's comments, occupation, contacts and signatures has been appended in this report.

There was no objection to the proposed project by any member of the neighboring community. They however reiterated that more emphasis should be put towards ensuring that the proposed project and

its infrastructure would not negatively interfere with the environmental integrity of the surrounding areas. Most of those interviewed welcomed the development of this project in the area.

8.2 Methods of Public Participation

- **Questionnaires**

Detailed questionnaires on the project were administered among the neighbours and other stakeholders within the vicinity of the project. Form the analysis; few are opposed to the project. They are proposing various mitigation measures to be implemented and their recommendations have been captured in the EMP. Sample questionnaires have been attached to the study report as an **appendix**(1).

- **Publication to the Kenya print media Dailies**

The EMP will be published in two of the Print Media dailies and the *Kenya gazette*. An advert will also be placed on the local radio station within the project area. This will be done ostensibly to reach out to other stakeholders and the entire public who may be affected by the project but are not necessarily Neighbours.

CHAPTER NINE: ENVIRONMENT, HEALTH AND SAFETY (EHS)

9.1 EHS Management and Administration

The EHS is a broader and holistic aspect of protecting the workers, the workplace, the tools / equipments, and the biotic environment. It is an essential tool in determining the EIA study. The objective of the EHS on the proposed project is to develop rules that will regulate environmentally instigated diseases and occupational safety measures during construction and the operation phases of the proposed project by:

i) Avoidance of injuries
ii) Provision of safe and healthy working environment for workers comfort so as to enhance maximum output.
iii) Control of losses and damages to plants, machines, equipment and other products.
iv) Enhance environmental sustainability through developing sound conservation measures.

9.2 Policy, Administrative and Legislative Framework

It is the primary responsibility of the contractor to promote a safe and healthy environment at the workplace and within the neighborhood in which the proposed project will be constructed by implementing effective systems to prevent occupational diseases and ill-health, and to prevent damage to property. The EHS Management Plan when completed will be used as a tool and a checklist by the contracted engineers in planning and development of the construction of this alteration project.

9.3 Organization and implementation of the EHS Management Plan

The contactor shall use the EHS plan at the proposed project site both during construction and operation. The engineer will use it during construction phase with the assistance of an EHS consultant who shall enforce its provision throughout the life of the project.

9.4 The Guiding Principles to be adopted by the contractor

The company will be guided by the following principle: -

i) It will be a conscious organization committed to the promotion and maintenance of high standards of health and safety for its employees, the neighboring population and the public at large.

ii) Ensuring that EHS activities are implemented to protect the environment and prevent pollution.

iii) Management shall demonstrate commitment and exercise constant vigilance in order to provide employees, neighbors of the project and the environment, with the greatest safeguards relating to EHS.

iv) 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.

9.5 EHS management strategy to be adopted by the contractor

The following strategies will be adopted to achieve the above objectives:

i) Create an Environment Health and Safety Management committee and incorporate EHS as an effective structure at various levels and units to manage and oversee EHS programs in all construction and operation phases of the project

ii) Maintain an effective reporting procedure for all accidents.

iii) Provide appropriate tools and protective devices for the success of the project.

iv) Encourage, motivate, reward and support employees to take personal initiatives and commitment on EHS.

9.6 Safety Agenda for both the proponent and contractor

There will be a permanent EHS agenda during construction.

i) Contractors: - The EHS management plan code of practice shall be applicable to the contractors working in the premises, and shall be read and signed. It shall be incorporated into the contract to perform work. This should also remind the contractor of his/her;

- Legal requirements
- Statutory obligations
- Obligation to lay-down a system for reporting accidents
- Responsibility to ensure that his employees are supplied with personal protective equipment and where applicable as per the EHS management plan for the whole project.
- Responsibilities as it relates to contracting an EHS consultant in liaison with the proponent
- Obligation to ensure that he obtains detail of jobs and areas where permit-to-work must be issued

ii) All residents' and workers' responsibility: - Know the location of all safety equipment, and learn to use them efficiently

9.7 Safety requirement at the project site during construction and operation period

i) The contractor: - The contractor shall ensure that:

- Safe means of entry and exit exist at the proposed project site.
- Ensure adequate briefing of job at hand on the safe system of work before commencement of work
- The EHS coordinator must be in attendance at all times throughout the duration of the project.
- The EHS consultant must maintain constant assessment of the risk involved as the work progresses
- A safety harness must be worn before entry into all confined spaces
- An EHS consultant must be posted at the entrance at the project site to monitor progress and safety of the persons working at the construction site.

ii) The Traffic / Drivers: - Within the construction premises, the following traffic rules shall be observed: -

- Observe speed limits and all other signs and obey traffic rules.
- Use the vehicle for the purpose to which it is intended only.

iii) Fire hazard at the construction site: - Workers at the site shall ensure that: -

- Oxy-acetylene cylinders are not contaminated with grease or oil.
- Oxy-acetylene cylinders are not subjected to direct sunlight or heat.
- Oxy-acetylene cylinders are not to be used or stored standing in a vertical position.
- When in use, ensure the inclination should never be over 30° from the vertical.

9.8 Welding at the Construction Site

It is the responsibility of the contractor during construction to: -

i) Ensure that welding clamp is fixed such that no current passes through any moving parts of any machine.

ii) Ensure that all welding clamps are in good operating condition and conduct current without arcing at the point of contact.

iii) Ensure that welding clamps are free from any contact with explosive vapors i.e. Oil spillage, Fuel tanks, Coal dusts and miscellaneous combustible material (e.g. Cotton rags filter bags, rubber belting, and wood shavings).

iv) Ensure that any slag or molten metal arising from welding activities does not start up fires by:

- Clearing combustible material to a distance of at least 3 meters away from the working area or covering area with metal or asbestos sheet.
- Appropriate fire extinguisher is to be kept available for immediate use at all times

9.9 Emergency procedure during construction and operation

An emergency situation means:

i) Unforeseen occurrence, resulting in serious or fatal injury to employed persons or the neighboring communities

ii) Fire or explosion.

iii) Natural catastrophe

In the event of such an emergency during construction, the workers shall:

i) Alert other persons exposed to danger.

ii) Inform the EHS coordinator.

iii) Do a quick assessment on the nature of emergency.

iv) Call for ambulance on standby.

v) When emergency is over the EHS coordinator shall notify the workers by putting a message: "ALL CLEAR"

In the event of such an emergency during operation the workers shall: -

i) Alert other persons exposed to danger.

ii) Ring the nearest police station.

CHAPTER TEN: DECOMMISSIONING

Decommissioning is an important phase in the project cycle and comes last to wind up the operational activities of a particular project. Decommissioning is a controlled process used to safely retire a facility that is no longer needed. It refers to the final disposal of the project and associated materials at the expiry of the project lifespan. During decommissioning phase of a project any areas of land used for the project should be re-instated for sustainable future use. If such a stage is reached, the proponent shall remove all materials resulting from the demolition/decommissioning from the site. The following should be undertaken to restore the environment.

i) Provision of Personal Protective Equipment (PPEs) to the workers who will participate in the construction Waste from the site to be disposed in an environmentally friendly manner.
ii) Remove all underground facilities from the site
iii) The site should be well landscaped by flattening the mounds of soil and
iv) Planting indigenous trees and flowers
v) All the equipment should be removed from the site
vi) Fence and signpost unsafe areas until natural stabilization occurs
vii) Backfill surface openings if practical.

The table below shows the proposed decommissioning plan:

Table 10.1: EMP for Decommissioning

Expected Negative Impacts	**Recommended Measures**	**Responsible Party**	Time Frame	Cost (Ksh)
10.1 Construction Machinery/Structure & Wastes				
Solids waste	• Recover and re- use/sell recovered materials where practicable. • Ensure wastes is sorted before proceeding with disposal • Resultant rubble should be ferried away and leveled at sites approved by County engineer.	contractor	During decommissioning	300,000.00
Noise pollution	• Decommissioning should take place during daylight hours. • Use well lubricated/serviced machinery	contractor	During decommissioning	No additional costs

Air pollution	• Provide dust masks to workers in extreme dust operations • Use properly serviced vehicles and Machinery • Set minimum on site speed limit to 10km/h • Sprinkle water on surfaces to control dust during dry weather • Carry out air quality monitoring around the site	Decommissioning contractor	During decommissioning	300,000.00
Occupational and safety hazards	• Provide suitable PPEs to workers • Provide first Aid Kit • Maintain a safe work place • Promote safe work practices • Dismantle all electrical connections • Check potential hazards and risks to workers and the public • Fence off all dangerous areas	Decommissioning contractor	During decommissioning	300,000.00
10.2 Rehabilitation of project site				
Vegetation disturbance Land deformation:	-Implement an appropriate re-vegetation programme to restore the site to its original status. -During the vegetation period, appropriate surface water runoff controls shall be taken to prevent	Project Manager & Contractor	During decommissioning	500,000

soil erosion, drainage problems	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 put in place to minimize disturbance to newly-vegetated areas;			
10.3 Social- Economic impacts				
-Loss of income -Loss of housing facilities	The safety of the workers should surpass all other objectives in the decommissioning project. -Adapt a project – completion policy; identifying key issues to be considered. -Compensate and suitably recommend the workers to help in seeking opportunities elsewhere. -offer alternative housing facilities	Project Manager & Contractor	During decommissioning	300,000

CHAPTER ELEVEN: CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusion

The proposed project design has integrated mitigation measures with a view to ensuring compliance with all the applicable laws and procedures. The proposed project will be implemented subject to the approvals by among others, Physical Planning Department and NEMA. During project implementation and occupation, Sustainable Environmental Management (SEM) will be ensured through avoiding inadequate/inappropriate use of natural resources, conserving nature sensitively and guaranteeing a respectful and fair treatment of all people working on the project, general public at the vicinity and inhabitants of the project. In relation to the proposed mitigation measures that will be incorporated during construction phase, the development's input to the society; and cognition that the project proponent is economically and environmentally sound, establishments are considered beneficial and important. It is our considerable opinion that the proposed development is a timely venture that will help alleviate housing shortage

11.2 Recommendations

i) Ensure that worker's occupational health and safety standards are maintained through capacity building, proper training, providing protective clothing and managing their residential camps up to the required health standards.

ii) Annual environmental audits should be carried out on the project in order to ensure compliance of the project with the mitigation measures outlined in the Environmental Management Plan (EMP),

iii) All activities concerning construction and maintenance such as, work execution, site inspection, and material testing, shall be strictly monitored by an engineer or a designated official. This is important to ensure quality of maintenance works. Engineers and/or designated official shall be trained and experienced enough to judge the appropriateness of the work executed in order to carry out the monitoring properly.

iv) The proponent should therefore follow the guidelines as set by the relevant departments to safeguard and envisage environmental management principles during construction and operation/occupation phases of the proposed project.

v) It is important that warning/ informative sign (bill boards) be erected at the site. These should indicate the operation hours and when works are likely to be started and completed. The signs should be positioned in a way to be easily viewed by the public and mostly motorists.

vi) Solid waste should be disposed appropriately to avoid creation of illegal dumpsites which will finally become a health hazards in the area.

vii) All solid waste materials and debris resulting from construction activities should be transported and leveled at sites approved by the local authority engineer.

viii) All construction materials and especially pipes, pipe fittings, sand just to mention but a few should be sourced/procured from legalized dealers.

ix) Other appropriate soil erosion control measures should be adapted. Any stockpiles of earth should be enclosed, covered or sprinkled with water during dry or windy conditions to minimize generation of dust particles into the air.

x) Once earthworks have been done, restoration of the worked areas should be carried out immediately by backfilling, landscaping/ leveling and planting of suitable tree species.

xi) Proper and regular maintenance of construction machinery and equipment will reduce emission of hazardous fumes and noise resulting from friction of metal bodies. Maintenance should be conducted in a designated area and in a manner not to interfere with the environment.

xii) A fully equipped first aid kit should be provided within the site.

xiii) Workers should get food that is hygienically prepared. The source of such food should be legalized or closely controlled.

xiv) The contractor should have workmen's compensation cover and is required to comply with workmen's compensation Act as well as other relevant ordinances, regulations and Union Agreements.

xv) The contractor should provide adequate security during the construction period.

xvi) During operation phase the proponent should employ a cleaner to maintain the sanitary facilities in a clean state all the time.

xvii) The proponent should install rain water harvesting and storage facilities to supplement pipe water

xviii) Owing to the large number of tenants, unhygienic conditions may arise during periods of water shortage; the proponent should invest in water storage tanks to cater for such emergencies.

xix) The tenants should be sensitized on the need to maintain the sanitary facilities in a clean state.

REFERENCES

Amos Kiriro and Calestous Juma (eds) 1991: Gaining ground: institutional innovations in land use management in Kenya. Acts press. Nairobi, Kenya.

GOK 1978: Local Government Act (cap 265) laws of Kenya.

GOK 1986: Session Paper no. 1 of 1986 on development prospects and policies, government printers

GOK 1992: Environmental Action Plans for Arid and semi-Arid lands in Kenya

GOK 1999: Environmental Management and Coordination Act (EMCA) 1999.

GOK 1999: session Paper No 6 of 1999 on Environmental and Development.

GOK 2002: water Act Law of Kenya. Kenya Gazette supplements no. 107 (Acts No 9) Nairobi October 2002

GoK.(2010) . The Constitution of Kenya, 2010.*Kenya Law Reforms*. Nairobi, Government Printers.

James Win penny 1994: Managing water as an economic resource- Rout ledge, London

Munishinge Mohan1993: Environmental Economics and Sustainable development. The World Bank washing DC

Ojany F. F and Ogendo R B 1985: Kenya. A study of physical and human geography. Longman, Kenya.

R Good land, J R Mercier and Shimwayi M (EdS) 1995: Environmental assessment in Africa. A World Bank commitment.

APPENDIX

i) **Questionnaires**

ii) **Design of dwellings**

iii) **Title deed**