ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED APARTMENTS DEVELOPMENT ON PLOT L.R. No. 209/1249/1 ALONG MUSHEBI ROAD, NGARA, NAIROBI CITY COUNTY

VOLUME I: FINAL EIA STUDY REPORT

PROJECT PROPONENT

STIMA INVESTMENT COOPERATIVE SOCIETY LIMITED

P.O. Box 37895 – 00100, NAIROBI

FEBRUARY 2023

FACT SHEET

PROJECT NAME	Proposed Apartments Development
PROJECT PROPONENT	Stima Investment Cooperative Society Limited Stima Investment Plaza, Mushebi Road, Parklands Nairobi P.O. Box 37895 – 00100, NAIROBI TEL: 0709495000 /0731298917/0713905195 EMAIL: customercare@stimainvestment.co.ke
REPORTS	Environmental Impact Assessment Study Report Volume I: Environmental Impact Assessment Study Report Volume II: Annexures/Attachments
PROPOSED PROJECT DETAILS	• One 21 Floor Apartments Block • Roof top to host water storage tanks and solar panels • Terrace floor to host gym and washrooms, terrace and drying yard • 18 Floors of residential apartments a mix of studio (214 units) and one bedroom (235 units) total of 449 apartments units. • Ground to host cafeteria, a convenience store, management offices, generator and switch room and stores • First floor to serve as parking • One basement to serve parking, • Lift serving all the floors
PROJECT COST	KSHS 884,756,389.00
PROJECT SITE LOCATION & SIZE	Plot L.R. No 209/1249/1 along Mushebi Road, Ngara, Nairobi City County GPS Coordinates: -1.273142, 36.820466 Plot Size: 0.1101 Hectares
TERMS OF REFERENCE NEMA APPROVAL REFERENCE NUMBER	NEMA/TOR/5/2/441.

DECLARATION

We, the undersigned, certify that the particulars in this Environmental Impact Assessment Study Report for the Proposed Apartments Development on Plot L.R. No 209/1249/1 along Mushebi Road, Ngara, Nairobi City County are correct and righteous to the best of our knowledge.

FOR AND ON BEHALF OF THE PROJECT PROPONENT

Stima Investment Cooperative Society Limited

Stima Investment Plaza, Mushebi Road, Parklands Nairobi

P.O. Box 37895 – 00100, Nairobi

Tel: 0709495000 / 0731298917/0713905195

Email: customercare@stimainvestment.co.ke

Name.....JONATHAN MUENDO KINYENZE.....

Designation....CHIEF EXECUTIVE OFFICER.....

Signature.....**Date**...17TH MARCH 2023...**Stamp**.....

STIMA INVESTMENT CO-OPERATIVE SOCIETY LTD. P.O. Box 37895 - 00100 NAIROBI

ENVIRONMETAL LEAD EXPERT

NAME:	**CHRIS KARIUKI KIMANI**
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NEMA REG. NO.	4019
SIGNATURE:	
DATE:	FRIDAY 17TH MARCH 2023

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ACRONYMS AND ABBREVIATIONS

CCTV	Closed Circuit Television
CBD	Convention on Biological Diversity
EA	Environmental Audit
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EMMP	Environmental Management and Monitoring Plan
EHS	Environmental Health and Safety
IUCN	International Union for Conservation of Nature
GIS	Geographical Information System
GHG	Green House Gases
GOK	Government of Kenya
GPS	Global Positioning System
HIV/AIDs	Human Immunodeficiency Virus/Acquired Immune Deficiency
HVAC	Heating, Ventilation and Air Conditioning
HSE	Health Safety and Environment
IFC	International Finance Corporation
INL	International Narcotics And Law Enforcement Affairs
KMD	Kenya Meteorological Department
KPLC	Kenya Power and Lighting Company
KRA	Kenya Revenue Authority
KSHS	Kenya shilling
KFS	Kenya Forest Service
MSDS	Material Safety Datasheets
NCA	National Construction Authority
NET	National Environmental Tribunal
NEMA	National Environment Management Authority
NEAP	National Environmental Action Plan

NEP	National Environment Policy
NGO	Non-Governmental Organization
NPEP	National Poverty Eradication Plan
NCWSC	Nairobi City Water and Sewerage Company
OHS	Occupational Health and Safety
PPE	Personal Protective Equipment
SWM	Solid Waste Management
INLUG	Integrated National Land-use Guidelines
TOR	Terms of Reference
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization
WRA	Water Resources Authority
WSP	Water Service Provider
WIBA	Work Injury Benefits Act
WWTP	Waste Water Treatment Plant
mm	Millimeter
m	Meter
km	Kilometer
m^3	Cubic metre
m^3/hr-	Cubic metre per hour
m/hr-	Metre per hour
M^3/day	Cubic meter per day
Sq. km	Square Kilometre

ACKNOWLEDGMENT

The EIA team wishes to express its gratitude and acknowledges all the respondents who availed information sought by the team. We would like to thank Stima Investment Cooperative Society personnel led by the Chief Executive Officer for availing all the necessary documentation for the proposed project, assisting in organizing the site visits and answering the numerous requests for information on the proposed project.

We wish also to acknowledge the valuable support accorded by key stakeholders including Mr. Kiritu, Senior Chief, Ngara West Sub-location, Mr. Fred Mbaka, Chief, City Centre Sub-location and the members of the public who attended the public meetings and responded to questionnaires.

EXECUTIVE SUMMARY

The Proposed Project

The Proponent, Stima Investment Cooperative Society Limited, has proposed to construct a 21 floor apartments block in Ngara, Nairobi. According to the architectural drawings, the proposed project shall comprise the following: The design consists of one 21 floor apartment block with a total of 449 residential units of different typologies occupying 18 floors. These include 235 - one bedroom apartments and 214 - studio apartments with parking spaces at basement and first floor. The ground floor is reserved for commercial purposes – cafeteria and a convenience store. The first floor level is wholly reserved for parking space. Internally, apartments are planned to meet the highest standards of modern day living. A spacious lounge, generous open plan kitchen/dining area, washroom, spacious bedrooms and private balconies oriented to maximize views from the site. This facility has a gym area, laundry/drying yard on the terrace floor and roof top to house water storage tanks and solar water heaters. The proposed site is located on plot L.R. No. 209/1249/1 along Mushebi Road, Ngara, Nairobi City County.

Environmental Management and Coordination Act (EMCA) and the Environmental (Impact Assessment and Audit) Regulations, 2003 (Amendment 2019), it is a requirement that all major projects undergo an Environmental Impact Assessment (EIA) process to evaluate the existing and potential positive and negative impacts of the proposed project so as to ensure the project is aligned to sustainability requirements. It is in this respect that this EIA Study report has been prepared.

Policy, Legal and Institutional Framework

The Constitution of Kenya, 2010 and the National Environment Policy (NEP) underscores the linkages between the environment and natural resources and the local and national economy people's livelihoods and the provision of environmental services. They both advocate for a balanced development while protecting the environment i.e. sustainable development. The Environmental Management and Co-ordination Act (EMCA), 1999 and (Amendment) 2018 provide a legal and institutional framework for the protection and conservation of the environment, Environmental and Impact Assessment (EIA), environmental auditing and monitoring. This requires major development projects to undergo an EIA study. EMCA (Environmental Impact Assessment and audit) regulations 2003, among others, reiterate the need for a full EIA study. Other laws contain provisions for the health, safety, and welfare of persons employed as well as the general public.

Anticipated Project Impacts and mitigation measures

The proposed project is envisaged to lead to positive and negative environmental and social which could be direct or indirect. The process of determining the various impacts was done through site visits, discussions with the Proponent's technical team; review of the available documentation and stakeholder engagement and public participation as well as from professional judgment.

Anticipated Positive Impacts

- Provision of quality apartments
- Creation of Employment
- Generation of Revenue
- Business opportunity for goods and services
- Optimal use of the prime land.

Anticipated Negative Impacts

a) Air pollution, dust and particulate emission;

b) Exploitation of raw materials

c) An increase in solid and liquid waste generation;

d) Increased pressure on the available infrastructure and social services;

e) Environmental and health safety concerns during construction;

f) Alteration of natural drainage systems;

g) Noise and excess vibrations

h) Increased water and energy demand

i) Surface runoff and storm water drainage

j) Risk of fire outbreak;

k) Oil leakages

l) Increased traffic

m) Impacts on occupational health and safety

n) Soil erosion;

For air, water and noise pollution, the Proponent will be required to strictly adhere to the EMCA regulations on air quality, water, and noise regulations to prevent pollution. This can be achieved in various ways as outlined in the Environmental Management and Monitoring Plan (EMP). The EMP is developed to ensure the sustainability of the project, from construction through to operation and decommissioning phases. The plan provides a general outlay of the activities, associated impacts, mitigation action plans and appropriate monitoring indicators. Implementation timeframes and responsibilities are also defined. The County Government of Nairobi and the National Government are responsible for the provision of services such as solid waste management, electricity supply, major public facilities, sewer and water provision, security services, transport infrastructure, etc. To mitigate against pressure on social services and infrastructure, the proponent will work in close collaboration with relevant government agencies to ensure minimal disruption of services in the proposed site and all the surrounding environs. This may involve working in collaboration to upgrade the local infrastructure where needed. The Proponent will engage with the relevant government authorities in the areas of water provision, road infrastructure, power provision, security services, and fire-fighting services. This is so as to ensure that the proposed development bears minimal pressure on the existing facilities and infrastructure in the area.

Stakeholder Engagement and Public Participation

The aim of public participation is to disseminate information to interested and affected parties, consult and solicit comments in order to incorporate their views in the project design considerations. Methods used in public participation exercise include the following:

- **Direct interviews** where necessary, to get responses from the proponent, project manager and project consultants and members of the public.

- **Public baraza** a total of three public meeting were held in City Primary School, Ngara where community members raised concerns about the impact of the proposed project including matters of air pollution, traffic congestion during project construction and operation, demolition, jobs and the disruption of the social life setting. However, they also noted that the project has numerous positive impacts particularly noting the creation of job and business opportunities, increased employment and trading opportunities, land value appreciation and improved infrastructural development triggered by the proposed development

- **Questionnaire administration**, over 28 open-ended questionnaires were administered during the one on one interviews. This was so as to sensitize the community about the project and draw local knowledge in the identification of the various impacts relating to the project.

Project Alternatives

A no construction/project alternative would imply that the situation on the proposed site would be left in its present state. While this ensures non-interference and preservation of the status environment and social conditions, without the proposed project, the anticipated benefits as outlined would not be achieved. The "No Action Alternative" should not be adopted, as we need to encourage development so long as it is undertaken on a sustainable basis as per the environmental and social management plan developed in this report, all the relevant mitigation measures advised by the relevant government agencies and good management practices.

Environmental Management and Monitoring Plan (EMP)

In terms of mitigating the environmental impacts, the proponent and the contractor will be required to implement comprehensive environmental management programmes. The EMP is developed to ensure the sustainability of the project, from construction through to operation. The plan provides a general outlay of the activities, associated impacts, mitigation action plans and appropriate monitoring indicators. Implementation timeframes and responsibilities are also defined. The EMP also outlines social mitigation measures. The most crucial and urgent is the need for comprehensive mitigation measures against pressure on services and social amenities. The County Government of Nairobi and the National Government are responsible for the provision of services such as Solid Waste Management, electricity supply, major public facilities, water provision, security services, transport infrastructure, etc. The Proponent will work in close collaboration with the government agencies to ensure minimal disruption of services in Ngara and all the surrounding environs. This may involve working on upgrading the local infrastructure where needed. The primary responsibility for the integration of the mitigation measures for the proposed development lies with the project proponent and by extension the contractor during the construction stage, while the proponent takes over the duty upon commissioning of the project. At every stage, the objective should be to ensure that the specified mitigation measures are implemented.

Conclusion and Recommendation

As per the analysis of the aspects of both positive and negative environmental impacts of the project's development, The Experts found no significant negative impacts that could pose adverse effects to the extent that the proposed project should not be implemented. The local community has overwhelming support for the project and they are very well informed having conducted the public meetings and several stakeholder engagements with the different stakeholders. There is a high expectation of employment for the youths and improvement in the household incomes, infrastructure and general delivery of social services. It is also recommended that the positive impacts that emanate from such activities shall be maximized as much as possible. It is expected that these measures will go a long way in ensuring the best possible environmental compliance and performance standards. The proponent shall be committed to putting in place several measures to mitigate the negative environmental, safety, health and social impacts associated with the life cycle of the project. It is therefore recommended that the proposed project be approved subject to the following recommendations: -

a) Proponent to ensure implementation of the proposed mitigation measures and compliance with EMP during construction, operational and decommissioning and phases.

b) The Proponent to implement all relevant permit conditions as required.

c) Annual Audit from the start of operations consistent with NEMA requirements.

d) Continuous Stakeholder engagement throughout construction and operational phases. This will help establish and maintain a productive relationship between the Project and stakeholders.

CHAPTER ONE: INTRODUCTION

1.1 Introduction

The project proponent, Stima Investment Cooperative Society Limited is an investment company registered under the co-operative act whose main mandate is to carry out investment activities using member's funds. Some of their business activities include buying and selling of land to both members and non-members, real estate development - residential and commercial housing**,** sale of residential houses and letting of offices.

Stima Investment Cooperative Society Limited propose to build a 21 floor apartments block consisting of one basement that shall serve as parking bay, first floor shall also serve as parking lot, ground floor shall consist of convenience store and a cafeteria and management offices plus 17 floors of residential units of different typologies. The residential units shall comprise of 214 studio units and 235 one-bedroom units with 449 total number of residential units.

1.2 Project's Objectives

a) To put up quality residential apartments with adequate, functional, safe and pleasant living space in Ngara.

b) To maximize utilization of the prime land;

c) Generation of revenue for the proponent.

1.3 Project Justification

The right to accessible and adequate housing is provided for under the bill of rights in the Kenyan constitution (Republic of Kenya 2010). Under the Vision 2030, the Kenyan government has committed to provide adequate, affordable and quality housing for all citizens, particularly the low income groups (Government of Kenya 2007). Furthermore, the Kenyan government launched an ambitious goal of supporting the construction of at least 500,000 affordable houses by the year 2022. One of the key targets of sustainable development goal 11 is to ensure access to adequate, safe and affordable housing and basic services for all and upgrade slums by 2030. Kenya ratified the SDGs in 2015. To help its members and non-members acquire properties - housing, Stima Investment Cooperative Society proposes to construct the proposed project to confront the housing gap and supplement the Kenya Government affordable housing initiative.

1.4 Objectives of the EIA Study

1.4.1 General Objective

The general objective of the EIA study shall be to carry out a systematic examination of the present environmental situation within the project area to determine likely impacts of the proposed Project in Ngara with a view of improving the sustainability of the project.

1.4.2 Specific Objectives of the EIA Study

a) To highlight environmental issues of the proposed project with a view to guiding policy makers, planners, stakeholders and government agencies to help them in understanding the implications of the proposed project on environmental elements within the proposed project area;

b) To review existing legal institutional, and policy framework relevant to the proposed project;

c) To find out impacts – both environmental and social - associated with implementation of the proposed project. with a view to suggesting mitigation measures for the negative impacts;

d) To asses and give recommendations on the various mitigation measures to be taken to reduce possible negative impacts on the proposed piece of land for development;

e) Analyze occupational health and safety issues associated with the proposed project;

f) To determine the compatibility of the proposed facility with the neighboring land uses and evaluate local environmental conditions.

g) Facilitating public meetings for the stakeholders to air their views.

h) Identifying and contacting the project stakeholders to seek their views on the proposed project.

i) To assess the relative importance of the impacts of alternative plans, design and sites;

j) To generate baseline data for monitoring and evaluation of how well the proposed mitigation measures are being implemented during the project operation period;

k) To develop an Environmental Management Plan (EMP) to guide in decision making and for future auditing;

l) To raise stakeholder awareness on potential impacts of the project on the environment with a view to making them understand the implication of the project in their environment;

m) To develop an EIA study report in conformity with the EMCA 1999, Environmental (Impact Assessment and Audit) Regulations 2003 and EMCA (amendment) 2015 and legislation under it; and

n) Submission of the final EIA report to NEMA and subsequent follow up to obtain relevant authorization/permit in order for the project to commence.

1.5 EIA Study Methodology

The methodology used in the EIA Study included the following.

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

b) Comparative study of the project with existing land uses in the neighborhood.

c) Reviewing and analysis of the project documents

d) Discussion with the proponent and the other consultants

e) Assessment of the site to detail the various existing and likely impacts.

f) Assessment of health and safety issues

g) Seeking public views through interviews and questionnaire administration

h) Proposal of mitigation measures to minimize any negative impacts.

i) Preparation and submission of study report to NEMA

1.5.1 Screening

Screening of the project in line with legal notice No. 31 of 2019 of EMCA Cap 387. We established that the development falls under high risk projects (Urban development including establishment of new housing estate developments exceeding one hundred housing units) which requires submission of an environmental impact assessment study report under section 58(2) of the Environmental Management and Co-ordination Act, 1999.

1.5.2 Approaches to undertaking the EIA Study Process

The study methodology also comprised the following activities:

1.5.2.1 Desktop Study

The desktop study involved:

a) Initial meetings with project architects and engineers to discuss the proposed project, including activity options under consideration;

b) Preparation of a checklist that consisted of a simple catalogue of environmental factors, which were compared with the activities to be performed;

c) Collection and review of baseline data, maps, reports and other relevant information on the existing environmental and social conditions of the project area;

d) Review of existing legislation, regulation and policies relevant to the proposed project;

e) Review of proposed project engineering designs and construction inputs, including anticipated technical processes.

1.5.2.2 Field investigations

Field investigations involved:

a) Site walks within the project area and the neighbouring areas that are within the zone influenced by the project;

b) Taking photographs of significant aspects to assist in describing the baseline environmental and social conditions of the project area and its influence zone;

c) Taking of the site coordinates and the area elevation;

d) Conducting public barazas and interviews with representatives of relevant key regulatory authorities within the project area and interested and affected parties mainly within the project influence zone;

e) Obtaining relevant documents from the authorities such as the County Government, and key authorities within the project influence zone.

f) Filling in of the questionnaires to facilitate environmental impact data collection

g) The aim of the field investigations was to verify information and data collected during the desktop study and to collect any new information that may have been important in the assessment of impacts and design of mitigation measures.

1.6 Terms of Reference for the EIA Study

The terms of reference for this EIA study were prepared based on the findings of screening and scoping study, field visits, and information collected from both primary and secondary sources including the information provided by the Project Proponent. The ToR (Reference Number: NEMA/TOR/5/2/441) were submitted to National Environment Management Authority and approved on 9th June 2022. Thereafter, the client changed proposed site and architectural drawings. An addendum to modify TOR was submitted to NEMA on 6th February 2023 and approved 10th February 2023. *Copies of the terms of reference approval letters are attached as annex 6.*

1.7 EIA Study Team

Find attached as annex 5

1.8 Reporting and Documentation

This EIA study report was prepared in accordance with the Environmental (Impact Assessment and Audit) Regulations of 2003 (Amendment 2019) and Environmental Management and Coordination Act of 1999 (Amendment 2015). This EIA study report is prepared for purposes of presenting to NEMA for review, approval and licensing of the proposed project.

CHAPTER TWO: PROPOSED PROJECT DESCRIPTION

2.1 Site Location, Description and Ownership

The proposed project is located Ngara West Location, Starehe Sub-County on plot L.R. No 209/1249/1 along Mushebi Road, Ngara, Nairobi City County. GPS Coordinates: -1.273142, 36.820466. *A copy of the site location map is attached in appendix 7.* The proposed site is approximately 0.1101 Ha rectangular-shaped plot, with a relatively flat gradient and owned by the project proponent. The site access roads are tarmacked, marked and well drained. Electricity supply line is along the road and easily accessible. Water and sewer lines are available along Mushebi Road. Currently, there is an existing one storey building on the site which shall be demolished to pave way for the proposed project. The site is adjacent to Stima Hotel and in front of Qwetu Hostel and opposite Stima Sacco Offices. *A copies of the land ownership documents are attached as annex 3.*

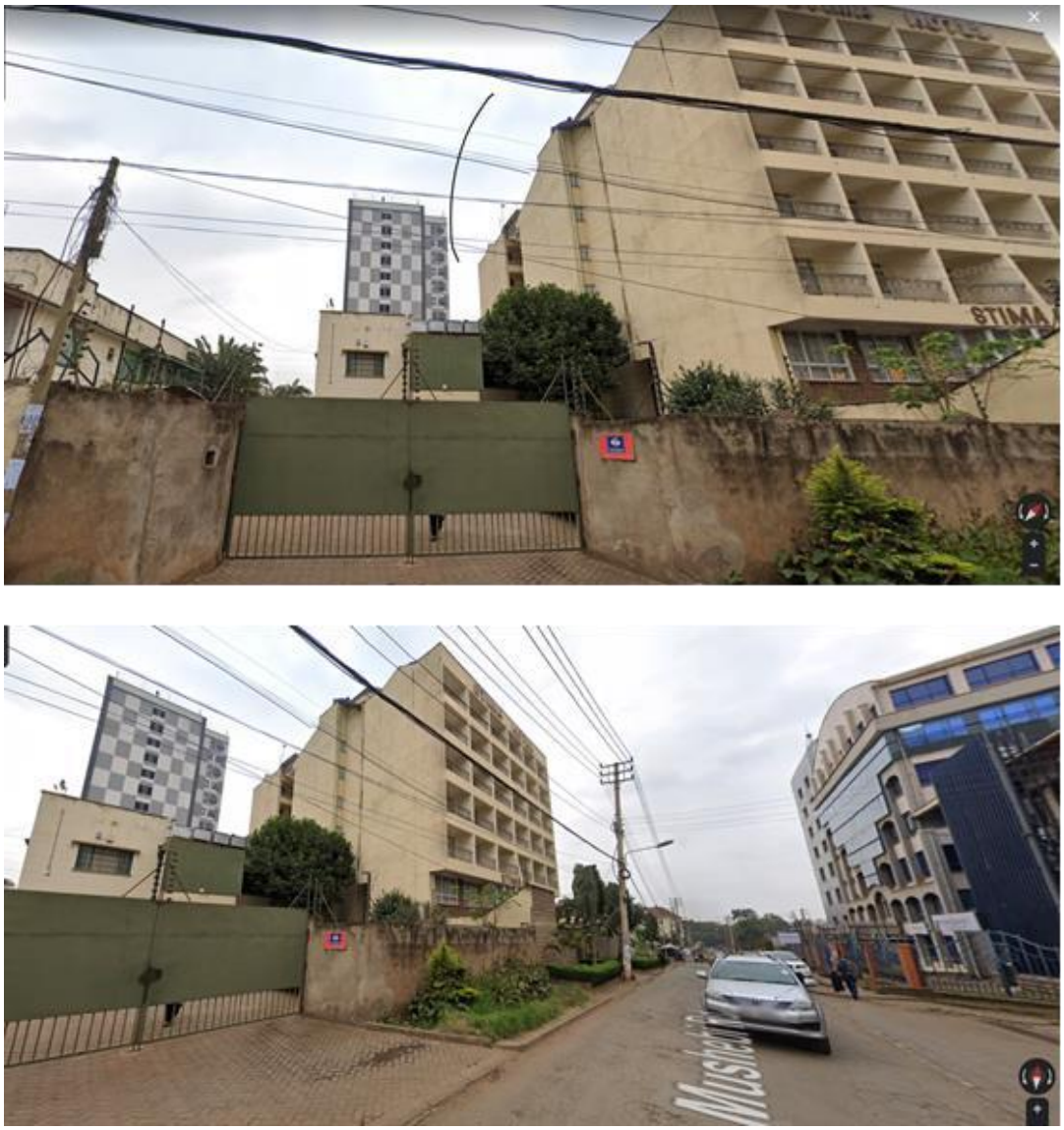
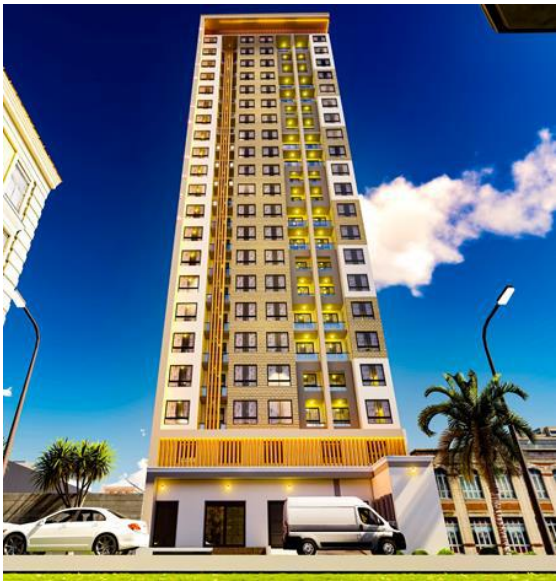


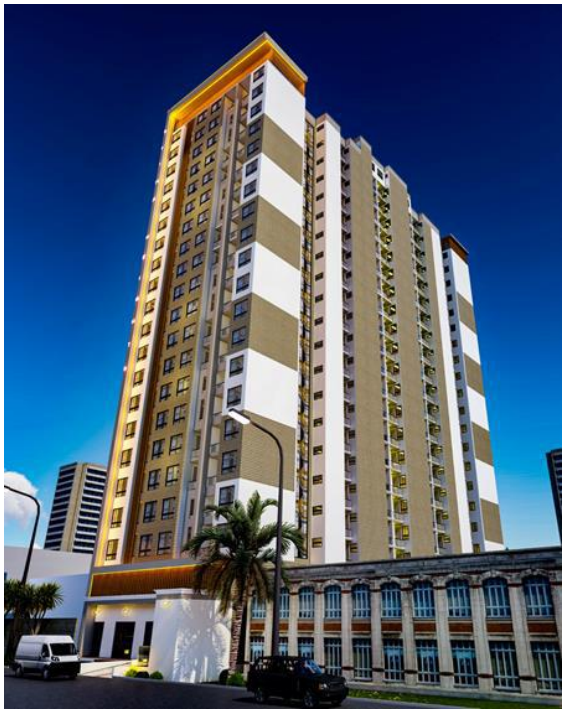
Plate 1: The current status of the proposed site. *See more site photo attached as annex 9*

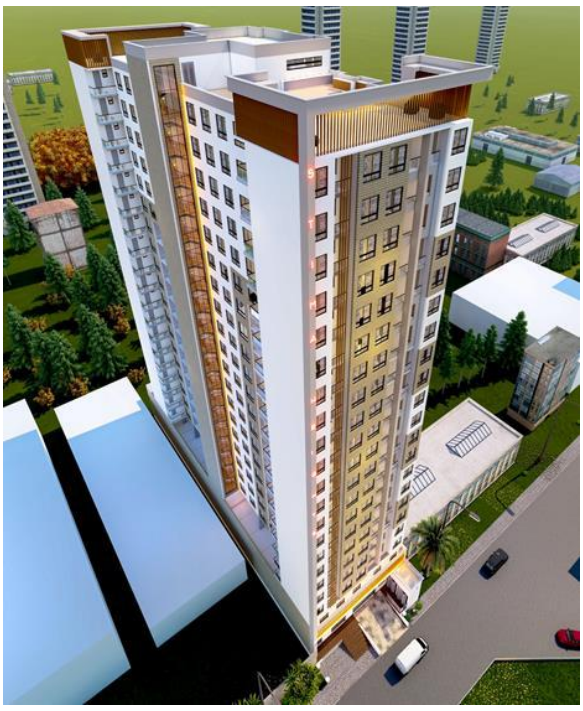
2.2 The Proposed Project Design

The design consists of one 21 floor apartment block with a total of 449 residential units of different typologies occupying 18 floors. These include one bedroom (235) & Studio apartments (214) with parking spaces at basement, ground floor and first floor. The ground floor will also host a – cafeteria and a convenience store and management offices. The first floor level is wholly reserved for parking space. Internally, apartments are planned to meet the highest standards of modern day living. A spacious lounge, generous open plan kitchen/dining area, washroom, spacious bedrooms and private balconies oriented to maximize views from the site. This facility has a gym area, laundry/drying yard at the terrace floor and roof top area to house water storage tanks. *A copy of the approved architectural drawings is attached in as annex 8.*

Plate 2: Architectural rendering/perspectives for the proposed project







2.2.1 Project Proposal

- 21 floor apartment block
- 18 Floors (2nd floor – 20th floor) of residential apartments - a mix of studio apartment (214) and one-bedroom apartments (235) making a total of (449) units.
- Ground floor to host cafeteria, a convenience store, gate house/store, generator and switch room and management offices and parking area.
- First Floor to serve as parking
- One Basement to serve as parking
- Terrace floor to house a gym, washroom and changing rooms, drying yard and terrace
- Roof to house water storage tanks and solar panels.

2.2.2 Project Planning and Development

a) **Access road point:** The residential development will be accessed from the Mushebi as the Main Entrance

b) **Control / gates:** The Project will establish a main entrance for security screening, control and overall record keeping of the movements into/out of the building.

c) **Parking at first floor level/ basement:** There's need to provide for adequate parking and this is achieved through basement parking and first floor.

d) **Power/Generator Room location:** The power supply room with generators will be located at the ground floor to ensure these are away from the human operations/ movements.

e) **Garbage handling area:** A section of the site near main entrance has been designed for waste holding bay before it is collected by the Garbage Company or Nairobi County

f) **Management offices**, day to day operations shall be located on ground floor.

g) **Firefighting;** fire hydrants strategic The Mechanical Engineer will design multiple fire hydrants at strategic points which can easily be accessed in-case of an emergency.

h) **Design for the disabled:** The design has made provision for the physically challenged by providing ramps along the walkways where there's change of levels. Also a number of parkings will be marked and reserved for the disabled. A lift shall serve all floors.

i) **Flat roof**: The design for the residential blocks has provided for flat roofs which will be utilized for utility such as drying yards and water storage tanks as well as solar water heating panels.

j) **Materials, low maintenance/ durable floor/wall**: The material specifications has picked durables, low maintenance materials e.g. wall master masonry as well as minimal painting on the external surfaces. This will reduce the maintenance cost over the life of the project.

k) **Day Lighting**: The designs provide large windows to all the rooms to ensure that daylighting is getting into all spaces and therefore minimize the need for artificial lighting.

l) **Solar water heating**: The solar water heating will be provided for bathrooms and kitchen to save on power related costs for heating water.

m) **Solar power security lighting:** The Security lights will be solar powered; which is an integral part of sustainable development and also low cost for maintenance.

n) **Water Resources**

- Rain water harvesting: The design provides for rainwater harvesting, which will be channeled into storage water tanks for cleaning the premises.

- Storm water drainage system: The structural Engineer will design the storm water management systems to ensure all the surface run-off is drained off and stored for reuse and excess directed into a suitable drainage system in the area.
- Nairobi water and sewerage company shall provide clean water and sewer line to serve the proposed development

o) **Waste Management**

- **Recycling:** The users will be provided with separate bins for various types of waste so that recyclable waste can be isolated for reuse.
- **Proper Waste Disposal:** The facility manager will coordinate the waste handling systems and will contract relevant service providers for collection and disposal of the waste.
- A Sewer line be built and connected to the existing sewer line in the area to handle the wastewater from the development.

2.3 Construction Inputs and Major Project Activities

Various construction inputs will be involved in the project. The following provides a summary of key apparent inputs and activities.

2.3.1 Construction Materials

- Ordinary Portland cement – bagged
- Ordinary Portland cement – bulk
- Fine aggregate
- Coarse aggregate
- Concrete mix at central batch plant characteristic strength 20 MPa, slump 80mm and maximum aggregate size 20mm
- Reinforcing steel
- Structural steel
- Machine cut stones/sand/rock sand
- Paint, varnish, anti-termite chemicals, mazeras,
- Timber, MDF boards, granite tiles, boarded tiles, sanitary fittings

2.3.2 Construction Equipment and Machinery

Equipment	
Bulldozers Hydraulic excavators Mobile cranes Track type loader Air compressors Generator	 Concrete mixer Concrete vibrators Self-propelled water tanker Water pump centrifugal Tipper trucks,

2.3.3Labour

The proposed development will cause the demand for labour to increase. In the construction industry, skilled labourers such as bricklayers, carpenters, painters, electricians, welders, plumbers, plant operators, among others, form a large part of the site labour force whose input determines, to a great extent, the quality of the industry's product.

Both skilled, unskilled labour and project consultants will have input of substantial man hours in providing technical supervision and mechanical operation.

2.3.4 Major Construction Activities - The Construction Stage

- Demolition of the existing building/Site clearing
- Building site house and material hording site
- Basement excavation/Foundation
- Plinth beam or slab
- Superstructure
- Brick masonry work
- The lintel
- Roofing coating
- Electrical and plumbing
- Exterior and interior finishing
- Flooring
- Painting
- Connection to utilities electricity, water and sewer line
- Cleaning and removal of construction waste and Landscaping
- County Government inspection/occupation certificate and completion of works certificate issued.

2.4 Project Cost and Duration

The project is expected to cost approximately KES 884,756,389. The construction duration is estimated to take 24 months. *A copy of the bills of quantities- summary page is attached as annex 10.*

2.5 Description of the Project's Operational Activities

2.5.1 Facility

Once complete the facility shall be used as a residential premise.

2.5.2 Solid Waste Management

The proponent will provide facilities for handling solid waste generated within the facility. These will include dust bins/skips for temporarily holding waste within the premises before final disposal at the designated dumping site. The solid wastes from each unit will be assembled in the garbage collection point ready for disposal by a NEMA licensed waste disposal company.

2.5.3 Waste Water and Storm Water Management

Sewage generated from building will be discharged into the existing sewer line. Storm water will be properly channelled to the existing main drainage channel in the area.

2.5.4 Cleaning

The proponent will be responsible for regular cleaning of the buildings and common areas. Cleaning operations will involve the use of substantial amounts of water, disinfectants and detergents.

2.5.5 General Repairs and Maintenance

The housing units and auxiliary facilities will be repaired and maintained regularly during the operational phase of the project. Such activities will include repair of building walls and floors, repairs and maintenance of electrical gadgets and equipment, repairs of refrigeration equipment, repairs of leaking water pipes, re-painting, and replacement of worn out materials among others.

2.6 Description of the Project's Decommissioning Activities

Decommissioning is an important phase in the project cycle and comes last in wind up the operational activities of a particular project. It refers to the final disposal of the project and associated materials at the expiry of the project lifespan. If such a stage is reached, the proponent needs to remove all materials resulting from the demolition/ decommissioning from the site. The following should be undertaken to restore the environment:

- Demolition of the building, any; reusable material or equipment should be secured
- The site should be well landscaped by flattening the mounds of soil;
- Planting indigenous trees and flowers;
- All the equipment should be removed from the site;
- Fence and signpost unsafe areas until natural stabilization occurs;

2.6.1 Dismantling of Equipment and Fixtures

All equipment including electrical and mechanical installations, furniture partitions, pipe work and sinks among others will be dismantled and removed from the site on decommissioning of the project. Priority will be given to reuse of this equipment in other projects. This will be achieved through resale of the equipment to other building owners or contractors or donation of this equipment to schools, churches and charitable institutions.

2.6.2 Site Restoration

Once all the waste resulting from demolition and dismantling works is removed from the site, the site will be restored through replenishment of the topsoil and re-vegetation using indigenous plant species.

2.7 Construction materials, activities and waste generated during construction phase

The table below gives a summary of construction materials, activities and waste generated during construction phase of the proposed project.

Table 2. 1: Construction Materials, Activities and Waste Generated During Construction Phase

Element	Building equipment/materials/ products	Waste generated/ by products.
Foundation	Concrete, high tensile steel	Steel bars and concrete waste
	Natural stone chiseled on both sides	Stone chippings
	Excavators, back hoes	Excavated soils and vegetation
	Hard core, chemicals for anti-termite treatment, damp proof membrane, plinth treatment materials.	Hard core, membrane cuttings
floor construction	Concrete, fabric mesh	Solid waste composed of concrete and metallic waste from steel and wires.
Structural frame	Concrete, high tensile steel	
External façade	Stone or concrete blocks, cement, sand, hoop irons, damp proof course	Solid waste composed of concrete and metallic waste, broken glasses, dry paint, packing materials, empty paint containers, wood chippings etc.
	Timber overlays, timber and mazeras cladding materials	
	Aluminum window frames, window panes, glazing materials, paint, ironmongery	
	Metal casement & timber paneled doors, paint	
Roof		Solid waste including wood chippings, metallic objects such as nails and bolts, destroyed shingles, dry paint, broken stones, concrete
	Roofing	
	Timber and paint	
	Rain water harvesting system/gutters	
	Load bearing stone and water proof materials	
Internal divisions	Concrete blocks, sand, cement	Solid waste including concrete, broken stones, sand, wood, broken tiles, granite waste, broken timber, MDF waste, sand, plaster, granite, electrical wires, broken electrical socks, pipes, insulating materials etc
	Wooden doors	
Floor and internal wall finishes	Timber, granite tiles, cement, sand creed, skirting, ceramic tiles	
	Quality paint, ceramic wall tiles, plaster, sand screed, cement, boarder tiles	
Ceiling and soffits	Slab and soffits finishes, Plaster, Paint, gypsum,	
Fittings	Wardrobes made of wood, varnish, paint	
	MDF boards for cupboards, granite for worktop, paint.	
Internal plumbing	Pipes, sanitary facilities and drainage pipes	
Electrical installation	Wires, insulating materials, sockets, circuit breakers, flood and garden light, bulbs including builders work	Solid waste including concrete, broken stones, sand, wood, broken tiles, granite waste, broken timber, MDF waste, sand, plaster, granite, electrical wires, broken electrical socks, pipes, insulating materials, effluent and storm water
Soil Drainage	Construction to civil engineer specifications	
Storm water drainage	Ogee pipes, sand, concrete, natural stone	
Water supply	Pipes, tanks and water meters	
Civil works	Cabro paving blocks and kerbs	
	Concrete, sand, cement	
Garden works	Red soil, manure,	Excavated soil, packaging materials. Organic matter, dead plant

2.8 Waste Management

Solid waste management will incorporate the segregation of waste at source, transportation of the waste to the central transfer station and final disposal through a contracted NEMA licensed waste handlers and recyclers. During construction phase;

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

- Excess soil from excavation and foundation works shall be reused for earthworks and landscaping within the site. Excess waste shall be disposed by licensed waste haulers.

When in operation, the proponent shall provide solid waste collection bins strategically across the buildings. The proponent will contract a licensed waste handler who will collect all solid wastes at agreed intervals and dispose them at licensed dumping sites. Recyclable waste shall be held at temporary collection points awaiting collection by a licensed recycler who shall be contracted to collect at regular intervals. Skips shall also be provided which will temporarily hold the waste before collection.

During construction stage, portable toilets should be provided. Contaminated wastewater shall be channelled into a conservancy tank for storage before disposal. Effluent during operational phase shall be managed through connection to an existing sewer line.

CHAPTER THREE: STUDY AREA BASELINE INFORMATION

3.1. Introduction

The Nairobi County has a total area of 696.1 Km^2 and is located between longitudes 36° 45' East and latitudes 1° 18' South. It lies at an altitude of 1,798 meters above sea level. The proposed project site is located along Mushebi Road within the Ngara neighborhoods in Nairobi County. The site GPS coordinates are 1°16'22.5"S 36°49'16.8"E. Administratively, the proposed site is in Ngara West Location, Starehe Sub-County, Nairobi County.

3.2. Physical environment

3.2.1. Climatic Conditions

The climate in Nairobi is warm and temperate. There is a great deal of rainfall in Nairobi, even in the driest month. This climate is considered to be Cfb according to the Köppen-Geiger climate classification. The temperature here averages 18.8°C. In a year, the average rainfall is 962 mm. The average annual temperatures of the area range from 18 to 20°C, with average minima and maxima of 12–14 and 24 – 26°C, respectively. The warmest period occurs from January to March. Average potential evaporation is between 1,550 and 2,200 mm per year.

3.2.2 Hydrological, Physical and Topographic Features

The terrain in the eastern side of the County is gently rolling but divided by steep valleys towards the city boundaries. To the north, there is the Karura forest which is characterized by steep sided valleys. The Karen - Lang'ata area is characterized by plains surrounded by Nairobi National Park on the east and Ngong Forest on the south.

Several streams with steep-sided valleys covered with vegetation are a dominant landscape feature of the County. The main rivers in the County are Nairobi River, Ngong River and Kabuthi River. These rivers are highly polluted as open sewers and industrial waste is directed towards them. Nairobi dam, which is along the Ngong River, and Jamhuri dam are the main water reservoirs in the County. The main types of soils are the black cotton and the red soils that form patches in different parts of the County.

There are three forests in the County namely Ngong Forest to the south, Karura Forest to the north and the Nairobi Arboretum. The three forests have a total coverage of 23.192 Km^2.

3.2.3 Geology and soils

The project site is covered by black cotton soil. Soils in the area are mostly deep black vertisols commonly known as black cotton soils. These soils have a high content of expansive clay that has a tendency to form deep cracks in drier seasons. The heavy texture and unstable behavior of these soils makes it difficult for different tree species to grow, and therefore the characteristic vegetation of the area is grass and shrubs. The black cotton soils are underlain by Nairobi phonolites which in turn overly Athi tuffs and lake beds of the upper Athi series, that overlay the Kapiti phonolites.

3.3 Biological Environment

3.5.1 Flora

The county has both indigenous and exotic forests which have a wide variety of trees, plants, herbs and other floral species. The proposed site area is characterized by some local indigenous and exotic floral species which play a significant role in the ecology. Michuki Park is closest to the proposed site. It boosts of a variety of indigenous and exotic vegetation after its establishment. The proposed site is classified a high density area and has an existing building occupying the entire plot thus no vegetation on site.

3.5.2 Fauna

Nairobi County is rich in biodiversity despite the accelerated pace of urbanization and development. The County is home to about 100 mammal species, 527 bird species and a variety of plant species. Nairobi hosts a variety of wildlife such as lions, leopards, cheetahs, hyenas' monkeys, buffaloes and birds among others found in Nairobi National Park. Tourists both local and international come to see these animals. Therefore, wildlife is a source of tourist attraction thus main source of county income. During the site visit there was evidence of small animals such as insects and bird species none of which is endangered.

3.5.3 Forests

Nairobi County is home to three gazetted forests managed by Kenya Forest Service namely Karura, Ngong forest and Nairobi Arboretum. Karura forest is the largest of the three with 1,041 hectares and one of the largest urban gazetted forests in the world. About 632 hectares contain exotic tree plantations while indigenous trees cover 260 hectares. The rest of the forest is shrubs and other plants. Ngong forest covers 538 hectares with 80 per cent being indigenous trees and 20 per cent exotic eucalyptus plantations. Nairobi Arboretum is 30 hectares of wooded landscape and situated about 3Kms from the city center. The forests are rich in different species of trees, plants and insects.

To achieve the national forest cover target of 10% of land area, the major afforestation effort will have to be in community and private lands. According to a study by Kenya Forest Service (2013) the national tree cover is about 7.2% while for Nairobi City County the cover is 7.6%. The challenge facing the tree cover in the County is the growing demand for land for real estate development, which more often result in the cutting of trees. The current road expansion programme, currently being undertaken by the National Government, although good for the city, has also resulted in the reduction of tree cover, especially along the road corridors.

3.4 Socio-Economic Profile

3.4.1 Population Size and Composition

In 2009, the County population was projected to be 3,138,369 and is expected to rise to 4,941708 in 2018, 5,433,002 in 2020 and 5,958,338 in 2022 respectively. The female population projections from age cohorts 0-4, 5-9, 10- 14, 15-19 and 20-24 remain slightly higher than that of male except for under 5 where the number of boys is higher than that of girls. From the age bracket 35-39 the population of males overtakes that of females and remains higher up to the age bracket 75-79. This is attributed to influx of men from rural areas to Nairobi in search of white color jobs. Above 80+ years the female population remains higher than the male counterparts. This is a result of life expectancy where men's life expectancy is shorter than women.

3.4.2 Education Institutions

The County has 211 public ECD centres. Among these 21 are stand-alone ECDs while us 190 are in main primary schools. The private ECDs are 344 in number. The County has 205 public primary schools with total enrolment of 193,058 and 2000 private primary schools with a total enrolment of 254,476. There are twelve vocational centres in the county with total enrolment of 477 students. Nairobi County has 95 public secondary schools and 57 private secondary schools. Nairobi County hosts two public universities, that is, University of Nairobi and Technical University of Kenya. There are ten private universities and 16 campuses operated by both public and private universities in the County. Most of the campuses are located within the Central Business District (CBD). In addition, the County has 237 science and technology institutes.

3.4.3 Urban Centres and Markets

Nairobi County is a major trading centre. It provides a conducive environment for doing businesses by both locals and international communities. Majority of Nairobians especially middle earners get their income from businesses. There are various types of markets namely; open air markets; self-constructed markets, development tenant purchase markets, rental markets, hawkers' markets and wholesale markets.

The Gikomba market is Kenya largest market. It offers affordable second-hand clothing, furniture, accessories, fresh produce and processed materials. Another open-air market is Maasai market situated on Taifa road and it a place to shop for all sorts of jewellery, fashion, ornaments and paintings. Other markets are Toi markets, city market, Ngara Market, Muthurwa market, Githurai market among others.

3.4.4 Tourism and Wildlife

Nairobi County has major parks and museum which serves as main tourist attraction and activities centres. The main national parks are Nairobi national park (NNP), Nairobi safari walk and Nairobi mini orphanage. The Nairobi Safari Walk is a major attraction to tourists as it offers a rare foot experience for wildlife viewing. The County boasts of the Nairobi National Museum which houses a large collection of artifacts portraying Kenya's rich heritage through history, nature, culture and contemporary art. Other important museums include Nairobi Gallery and the Nairobi snake park

3.4.5 Employment and Livelihood

Nairobi commands the largest share of formal sector wage employment in Kenya with a total of 453,000 people. The manufacturing industry accounts for the highest wage employment followed by trade, restaurants and hotels. The construction, transport and communications industry also play key role in generation of wage employment. Other important sectors include finance, real estate and business services. The main formal employment zones in Nairobi are the Central Business District (CBD), Industrial area, along Mombasa Road, along Thika Road and Dandora.

A large segment of the labor force in Nairobi is self-employed largely in the informal sector with 1,548,100 being employed in this sector. This is about 3.5 times those in wage employment. The informal sector covers small scale activities that are semi-organized, unregulated and uses low and simple technologies while employing few people per establishment. The ease of entry and exit into the informal sector, coupled with the use of low level of technology at all makes it easy avenue for employment creation especially for the youth. The level of unemployment in Nairobi stands at 14.70 per cent with the female unemployment rate standing at 18.99 per cent while that of males is 11.55 per cent.

3.4.6 Health

Kenyatta National Hospital (KNH) is the major referral hospital in the County. There are 45 hospitals with a bed capacity of 6,990. There are 141 health, 200 dispensaries and 551 Clinic. The public health workforce in the county is 3695 comprising mainly of nurses, clinical officers and public health officers. The doctor patient ratio stands at 1:17,000.

3.4.7 Infrastructure

3.4.7.1 Road, Railway Network and Airports

The current road network in the County is inadequate in terms of coverage to meet current and future demands as envisaged in the Vision 2030. There is heavy congestion on most of the City roads especially during the morning and evening peak hours. The total road network covers 3602km out of which 1735km are tarmac road while 1867km are earth roads. The

current poor state of road network is a great impediment to socio-economic growth leading to high production costs and low productivity. The completion of Thika Super highway, by-passes and missing links within the County will help in reducing traffic congestion.
Nairobi County hosts 3 airports; Jomo Kenyatta International Airport, Wilson Airport and EastLeigh Airport. Jomo Kenyatta International Airport (JKIA) is the biggest Airport in East and Central Africa, and is the focal point for major aviation activity in the region.
The County has a railway network of 75km and a total of 15 functional railway stations with the current main one being the Standard Gauge Railway (SGR). These railway networks are found with the locality areas of: Embakasi, Makadara, and Nairobi main terminal, Dandora, Githurai, Kahawa, Kibera, Dagoretti, JKIA and Syokimau. The establishment of Makadara and Imara Daima railway stations and expansion of Nairobi platform will help to improve public transportation in Nairobi for socio-economic development.

3.4.7.2 Information, Communication and Technology (ICT)

Posts and telecommunication sub-sector has experienced mixed growth in the recent past. While the County has 38 post office branches, the growth of postal services has rather been declining due to increase in mobile telephony. Mobile telephony has the highest coverage in Nairobi compared to other parts of the country with over 95 per cent of the inhabitants having access to mobile communication. The players engaged in mobile telecommunication include: Safaricom, Orange, Airtel and YU while those in mailing services include Kenya Postal Corporation, Group 4 Securities (G4S), Direct Handling Limited (DHL), Wells Fargo among others.

3.4.7.3 Energy Supply

The main sources of energy in Nairobi County are electricity, solar, wind energy, LPG, biogas paraffin, charcoal and firewood. Lack of access to clean sources of energy is a major impediment to development through health related complications such as increased respiratory infections and air pollution. 63.2 per cent of the population use paraffin as cooking fuel. Other sources of energy for cooking include LPG gas (20.2per cent), charcoal (10.5 per cent) and firewood (1.8 per cent). About 68.2 per cent of households use electricity as a means of lighting 28.8 per cent use paraffin while 2.9 per cent and 1.7 per cent use grass and dry cells respectively.
The main electrical energy provider is Kenya Power and Lighting Company (KPLC). The project proponent intends to connect the development with the KPLC main grid.

3.4.7.4 Housing

Although the county targeted to undertake slum upgrading e.g., in Kasarani, slum upgrading was undertaken in Embakasi West and Embakasi East in KCC and Kayole Soweto informal settlements where a total of 8.4 Km of roads and drainage were developed, 9 flood lights installed and 5.4 Km of sewer developed. Another twelve settlements were also planned and are awaiting provision of infrastructure. The county had also targeted to renovate all county rental houses (17,000). However due to limited funding it managed to renovate 150 housing units and also carried out repair works of about 1,000 units. Routine maintenance was undertaken in the estates. The proposed project is expected to help bridge the housing gap once complete.

3.4.8 Land Use and Zoning

Currently, the Ngara and Parklands areas are zoned for development of Commercial/Residential (High-rise Flats). The proposed project falls within this classification.

3.4.9 Solid Waste Management

Major challenges facing Nairobi County with respect to Integrated Solid Waste Management (ISWM) include management of waste collection and disposal. Identification and maintenance of final disposal sites will be a critical concern in the immediate term. There is need for private organizations to take up critical functions like recycling, transportation and Solid Waste Management. Nairobi County generates over 2000 tons of garbage per day and most of this garbage finds its way to the final destination at the Dandora dumpsite in an environmentally unsustainable manner. There is need for the County government to sensitize residents on garbage management.

3.4.10 Water Supply

The site is serviced by piped water supply connected to the Nairobi City Water and Sewerage Company service line. The water supply from this line is sometimes erratic and unreliable. It is expected that the project proponent will supplement water supply. The water quality within the larger Nairobi area has been dropping in quality due to the pollution of ground water resources by improper disposal of liquid waste. The development will source water from reticulated supply by NCWSC supplemented by borehole supply water owned by NCWSC.

3.4.11 Sewer system

The proposed site is served by NCWSC sewer line. According to the 2019 Kenya Population and Housing Census report, only 18 percent (792,000) of households in the city have a functional septic tank. About 2.1 percent of residents use uncovered pit latrines. Shockingly, some 4,400 people still defecate in the open.

Areas well covered with a sewer line include the city centre, Lavington, Lang'ata, Upper Hill, Industrial Area, areas along Mombasa Road except the Inland Container Depot and the area bordering Kyang'ombe. Areas along North Airport Road, the whole of Eastlands up to Njiru area, Buruburu, Kariobangi, Dandora, Ruaraka, old city council houses, Pangani, Ngara, Parklands and Eastleigh are 90 percent covered. Partially covered areas are Kasarani, Zimmerman, Kahawa West, Mirema, Satellite and Kibera, which Mr Thuita attributes to change of style of housing, where highrise buildings are replacing single dwellings.

For areas that are not covered, but which rely on exhausters to empty their septic tanks, the destination of their waste might not be so clear. But even in the covered areas, problems such as non-functional sewerage, accidental breakages or deliberate vandalism of manhole covers, blockages due to deliberate dumping of solid waste or accidental entry of stones and boulders into open manholes and also blockage of sewer lines still reign supreme.

The NCWSC is embarking on an ambitious sewerage expansion projects across the city. Currently, the city is served by a paltry 163 km long of sewer covering an area of about 208 km^2. This is less than 30% of the 696 km^2 area of the city. It further puts the total population connected to sewerage system at 41% against water service coverage of over 80%. The current waste-water treatment capacity is 112,000 cubic meters (Dandora at 80,000 and Kariobangi at 32,000). The amount of waste treated so far is below the available capacity.

CHAPTER FOUR: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

4.1 National Environmental Policies

4.1.1 National Environmental Action Plan (NEAP)

The purpose of the National Environmental Action Plan (NEAP) is to promote and facilitate the coordination of strategies and measures to protect and manage the environment into plans and programmes for the social and economic development of Kenya. The Environmental Management and Coordination Act, 1999, established the NEAP to address the protection and management of the environment at district, provincial and national levels.

Relevance to the project

The proponent should comply with the NEAP policies and legislative with regards to preventing, controlling or mitigating specific as well as general adverse impacts on the environment. The project activities will interact with the various elements and components of the physical, social and economic environments in ways that could lead to negative impacts. Stakeholders in the project will therefore ensure that projects covered under consideration should be implemented in ways that ensure environmental integrity. Issues of environmental integrity will be addressed through project level Environmental Impact Assessments (EIAs).

4.1.2 Environmental and Development Policy (Session Paper No. 6 1999):

The goal of this Policy is a better quality of life for present and future generations through sustainable management and use of the environment and natural resources

Relevance to the project

The main objective of this Policy is a better quality of life for present and future generations through sustainable management and use of the environment and natural resources. The proposed project once complete will offer the best housing units to the people of Ngara Area.

4.1.3 National Environment Policy, 2012 Revised Draft #4:

The major objective of the policy is to provide a framework for an integrated approach to planning and sustainable management of Kenya's environment and its natural resources. The policy further ensures that the environment is integrated in all government policies in order to facilitate and realize sustainable development at all levels. This would help promote green economy, enhance social inclusion, improve human welfare and create opportunities for employment and maintenance of a healthy ecosystem

Relevance to the project

EIA study will developed an environment and social management and monitoring plan to mitigate the impacts that may result during the construction and operation phases of the project. This tool is aimed at promoting coordination of environmental management of the project such that sensitive ecosystems are not destabilized by project activities. The developer should ensure that the provisions of this policy are followed to ensure the protection of the environment.

4.2 National & Local Legislative Framework

4.2.1. Constitution of Kenya (2010)

Article 42-Environment; Indicates that every person has the right to a clean and healthy environment, which includes the right to –

a) Have the environment protected for the benefits of present, future generations through legislative and other measures, particularly those contemplated in Article 69, and
b) Have obligations relating to the environment fulfilled under Article 701.

Article 43-Economic and social Rights

Indicate that every person has the right to accessible and adequate housing and to reasonable standards of sanitation.

4.2.2 County Government Act 2012:

This Act vests responsibility upon the County Governments in planning of development projects within their areas of jurisdiction on projects of importance to the local County Government or those of national importance.

Section 102 of the Act provides the principles of planning and development facilitation which include integration of national values in county planning, protect the right to self-fulfillment within the county communities and with responsibility to future generations, protection of rights of minorities and marginalized groups and communities, promotion of equity resource allocation, among others.

Relevance to the proposed project

The project proponent should initiate the process of County Government engagement in the initial project planning through application of essential development approvals from Nairobi City County Government. The proponent will comply fully with the Act.

4.2.3 The Environmental Management and Coordination Act, 1999 Revised in 2015

The Environmental Management and Coordination Act (EMCA) chapter 387, and its Attendant Environmental (Impact Assessment and Audit) Regulations of 2003 Provides for the establishment of an appropriate legal and institutional framework for the management of environment in Kenya. The Act introduces two important aspects of urban environmental management, which are directly related to the proposed project: environmental impact assessment (EIA) and environmental audit (EA). Section 58 (1) has underscored that any person being a proponent of a project Shall before financing, commencing or proceeding with submit an EIA report to the National Environmental Management Authority (NEMA) of Kenya. Section 68 (1) gives NEMA the mandate for carrying out all environmental audits of all activities that are likely to have significant impacts on the environment. It authorizes environmental inspectors, as appointed by NEMA to enter in any premise and determine how far the activities carried out conform to statements in EIA study.

Compliance with EMCA

a) The proponent has undertaken an EIA study as per the requirements of Section 58 (1) of EMCA chapter 387 awaiting approval prior to the commencement of the project.
b) The proponent will implement the proposed EMP and adhere to the conditions set in the license of the proposed project.

c) The proponent will adhere to subsequent EMCA legislations such as the noise and waste regulations throughout the cycle of the project.
d) The proponent shall undertake EA for the project and submit the reports to NEMA as per the EIA/EA guidelines

4.2.4 Physical Planning and Land Use Planning Act, 2019

An ACT of Parliament to make provision for the planning, use, regulation and development of land and for connected purposes. Section 57 (1) A person shall not carry out development within a county without a development permission granted by the respective county executive committee member. (2) A person who commences any development without obtaining development permission commits an offence and is liable on conviction to a fine not exceeding five hundred thousand shillings or to imprisonment for a term not exceeding two months or to both. (3) A county executive committee member shall require a person who has commenced a development without obtaining development permission to restore the land on which the development is taking place to its original condition or as near to its original condition as is possible and that such restoration shall take place within ninety days.

Section 59 (1) A person applying for development permission shall ensure that any documents, plans and particulars that are provided to the respective county executive committee member while applying for development permission have been prepared by the relevant qualified, registered and licensed professionals.

Section 65 A county executive committee member may impose conditions or impose a fine to be prescribed in regulations on an applicant for development permission for building works where that applicant fails to complete the building works within five years. According to the Third Schedule Development Control,

Section 4. Planning authorities shall require applications for major developments to be subjected to environmental and social impact assessment.

Compliance with this legislation

a) The architectural plans of the proposed development are within the requirements of the larger Nairobi County Zoning guide,
b) The proposed project has been subjected to the requisite EIA and report submitted to NEMA for licensing to acquire the EIA license.
c) The proponent will ensure that the land is utilized in an ecofriendly manner and is restored to its original condition once the project is decommissioned.
d) Ensure the development does not in away have injurious impact on the environment and that a developmental footprint does not cover the entire parcel.

4.2.5 Physical Planning (Building and Development Control) Regulations

Under the provisions of the Physical Planning (Building and Development control) Regulations; The Director of Physical Planning shall refuse to recommend any new building or proposed development, or alteration or addition to any existing building if:

a) The proposal is not in conformity with approved development plan.
b) Such plans disclose a contravention of the physical Planning (Building and Development) rules.
c) The plans are not correctly drawn or omit to show information required.

d) On such being required, separate application accompanied by sets of plans has not been lodged in respect of building on separate plots or subplots etc.
e) The proposed development is in line with the overall project site zoning guide and will acquire an approval from Nairobi City County.
f) The proponent shall adhere to the recommendations given in the building order by the county physical planner
g) The proponent shall ensure that the building plans are available on site for inspection by county officials during construction and at any other time.

4.2.6 The Public Health Act (Cap 242)

Section 15 (1x) –Nuisance

Any noxious matter or wastewater discharged from any premise, such as a building constitutes nuisance. Any premise not kept in a clean and free from offensive smell such as gases which are injurious to health such as those from commercial establishments shall therefore generate nuisance. The Act therefore stresses that no person shall cause a nuisance to exist on any land or premise occupied by him. The Act acknowledge that it shall be the duty of all local authorities to take all lawful measures for maintaining its district at all times in a clean and sanitary condition for remedy of any nuisance or condition liable to be injurious to heath. To safeguard against this, part X of the public Health Act states that where in the opinion of the Medical Officer of Health that food stuffs within a warehouse, or a building are insufficiently protected, the owner shall be compelled to observe the require regulations, else he shall be guilty of an offense.

The Public Health (Drainage and Latrine) Rules made under s.126 of the Act, makes more specific provision for drainage. The Rules require the drainage of new buildings;

- Prohibit the drainage of surface water into foul water sewers;
- Prohibit the discharge into sewers of matter which may interface with the free flow of the sewage or injure the sewer;
- Empower the local authority to prohibit the discharge of injurious matter into sewers;
- Impose a requirement for permits to be obtained from the local authority before the making of sewer connections or the construction of sewage treatment works.

Compliance

a) The proponent will ensure solid waste shall be handled by a NEMA approved garbage collector on regular basis and disposed appropriately as per the waste regulations.
b) Sanitary facilities shall be in conformity with MOH standards and installation of standard fittings.

4.2.7 Occupational Health and Safety Act 2007

The purpose of this Act is to secure the safety, health and welfare of persons at work, and protect persons other than persons at work against risks to safety and health arising out of, or in connection with, the activities of persons at work. It applies to all workplaces where any person is at work, whether temporarily or permanently. Failure to comply with the OSHA, 2007 attracts penalties of up to KES 300,000 or 3months jail term or both or penalties of KES 1,000,000 or 12 months' jail term or both for cases where death occurs and is in consequence of the employer

Compliance

a) The proponent shall register the site as a work place
b) The proponent will appoint a reputable contractor who will be responsible for enforcing the requirements during construction and subsequent repairs and maintenance after project completion.
c) The proponent will make provision for the health, safety and welfare of persons employed in factories and other places of work.
d) The proponent shall ensure that every work place shall be kept in a clean state and free from effluvia, arising from any drain, sanitary convenience or nuisance.
e) Avail fire extinguishers, which shall be adequate and suitable in case of fire out breaks. Provide adequate means of escape in case of fire outbreak for the employees.
f) Provide suitable PPEs for all workers.

4.2.8 The Workmen's Injury and Benefits Act, 2007

This Act provides for compensation to employees for work-related injuries and diseases contracted in the course of their employment and for connected purposes. Key sections of the Act include the obligations of employers; right to compensation; reporting of accidents; compensation; occupational diseases; medical aid; appeals; and miscellaneous provisions. Schedules provided in the Act outline the degree of disablement; occupational diseases; and dependent's compensation. In case of any accidents or incidents during the project cycle, this Act will guide the course of action to be taken

Compliance: The proponent will comply fully with the Act.

4.2.9 National Building Regulations, 2017

The National Building Regulations (NBR) is a set of rules to be used by professionals in the building industry to guide design, construction and maintenance of buildings in Kenya. The review was necessitated by the frequent disasters that have befallen the country in the recent past and the generally decaying built environment. The NBR replaced the 1968 Building Code which has been in use since the colonial era. The 1968 Building Code had many shortcomings and could not adequately address the needs of a safer, secure, healthier, attractive and well maintained built environment. It remained static and failed to move in tandem with the trends and shifts in building industry, such as emerging technologies and materials, green building and security intelligence. The NBR 2015 is informed by the Constitution of Kenya 2010, Vision 2030 and other relevant unfolding reviews such as the National Construction Act which seeks to register contractors' in Kenya.

Section A - 5 Development Permissions; A - 5.1 No person shall develop or cause to be developed any building on land where development permissions applicable to the area have not been granted.

A - 5.2 Any person who contravenes the provisions of these Regulations shall be guilty of an offence.

Section 27 Construction

All workmanship in the erection of any building shall be in accordance with sound planning and building practice. Any building, including any structural element or component thereof, shall be constructed so as to comply with the design requirements of these Regulations.

Precautions shall be taken during all stages of construction or any building to ensure that the structural system is not damaged or distorted during the course or erection of such building.

Section A - 33 Certificates of Occupation

A - 33.1 On completion of any building works, the person for whom the building works were carried out shall apply to the approving authority for: -

(a) a full Occupation Certificate; or

(b) a Sectional Completion Certificate

(c) a Temporary Occupation permit.

A - 34.5; Protection of Persons and Property

Throughout the progress of any work to which these Regulations apply, every person responsible for the erection of a building, shall ensure by suitable means the safety and protection of all persons and property liable to be affected by the work.

Compliance

a) The proponent should ensure that the regulations as guided by various approving and licensing authorities are adhered to strictly.
b) The project proponent has submitted the building plans and the required information to the approving authority County government of Nairobi for requisite approval before commencement of the work and regular monitoring will follow to ensure compliance with set standards and conditions.
c) The proponent should ensure that any persons affected by the project‘s activities are protected from all harm and that all hoarding of the site is made to prevent unauthorized entry.
d) The proponent will obtain Certificate of Completion. They shall further provide fire-fighting equipment that may include one or more of the following: hydrants, hose reels and fire appliances, portable fire appliances, water storage tanks and dry risers,

4.2.10 Penal Code (Cap. 63)

The chapter on ―Offences against Health and Conveniences‖ strictly prohibits the release of foul air into the environment, which affects the health of other persons. Any person who voluntarily violates the atmosphere at any place, to make it noxious to health of persons in general dwelling or carrying out business in the neighborhood or passing along public ways is guilty of misdemeanor, i.e. imprisonment not exceeding two years with no option of fine. Under this Act, any person who for the purpose of trade or otherwise makes loud noise or offensive awful smell in such places and circumstances as to annoy any considerable number of persons in the exercise of their rights, commits some offences, and is liable to be punished for a common nuisance, i.e. imprisonment not exceeding one year with no option of fine.

4.2.11 The Employment Act, 2007

This Act declares and defines the fundamental rights of employees; minimum terms and conditions of employment; to provide basic conditions of employment of employees; and to regulate the employment of children, among other rights. Key sections of the Act elaborate on the employment relationship; protection of wages; rights and duties in employment; termination and dismissal and protection of children, among others.

Compliance: Contractor to be strictly advised not to engage any underage persons (under 18 years of age) to perform any form of work at the site during construction. The proponent shall also ensure that the contractor is conversant and adheres to all the provisions of the Employment Act

4.2.12 The Energy Act 2019

The Act consolidates the laws the relating to energy & provides for National & county government functions in relation to energy. Provides for promotion of renewable energy; exploration, recovery & commercial utilisation of geothermal energy; regulation of midstream & downstream petroleum and coal activities; regulation, production, supply & use of electricity & other energy forms; Enforcement & review of environmental, health, safety & quality standards. Provision for construction permit request to be accompanied by EIA study

Compliance: The project proponent will comply with Legal Notices 43 & 102 to ensure conformity with the Energy Act provisions. The proponent will be required to address provisions raised in the Energy (solar water heating) regulations.

4.2.13 National Construction Authority Act No. 41 of 2011

An Act of Parliament to provide for the registration of contractors operating or willing to undertake construction operations in Kenya as by law through the National Construction Authority (NCA), which is constituted under Act No. 41 of 2011 Laws of Kenya. Section 15 of this Act demands registration of contractors with NCA while section 17 and 18 outlines the procedure of registration of contractors.

Compliance: The proponent will comply with the Act by ensuring that the site and project contractors are registered and certified by NCA. The proponent will also ensure that the proposed project is registered with NCA.

4.2.14 County Government by-laws

Prescribes the necessary easements required for the establishment of any project within the County.

Compliance: Ensure adherence to the by-laws provisions and acquire the necessary approvals and permits.

4.2.14 Water Quality Regulations, 2006

The law is based upon the principle that everybody is entitled to a healthy and clean environment. Section 42, is pertinent to the implementation of this project. These Regulations shall apply to drinking water, water used for industrial purposes, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife, and water used for any other purposes.

4.2.15 Noise and Excessive Vibrations Pollution (Control) Regulations, 2009

Part II of the regulations; section 3 states:

1. Except as otherwise provided in these Regulations, no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.

Compliance: The proponent shall take into concern the provisions of the local authority act to ensure that the development complies with the provisions of the Act.

4.2.16 Air Quality Regulations, (Legal Notice No. 34 of 2014)

These regulations are aimed at controlling, preventing and abating air pollution to ensure clean and healthy ambient air

Compliance: The proponent will ensure that operations at the site do not generate dust, particulates and other emissions beyond allowable limits especially during construction by deploying efficient dust screens, PPE and other dust suppression measures.

4.2.17: The Environmental Management and Co-ordination (Controlled Substances) Regulations, 2007

The regulations regulate the importation and use of Ozone Depleting Substances. Regulations No. 3 gives a classification of Controlled Substances.

Compliance: The proponent will comply fully with the Regulations by not using Ozone Depleting Substances

4.2.18: Environmental (Impact Assessment & Audit) Regulations, 2003 Amended 2019

Provides for the procedure for carrying out the EIA Provides for the contents of an EIA study report

Compliance: The EIA to be carried out in accordance to the regulations. The Project proponent is required to contract services of a license EIA expert, submit an EIA report to NEMA and acquire an EIA license before commencing any construction activities

4.2.19: The Water Act (Act No.8 of 2002) revised in 2016

Provides that a permit shall be required for any use of water from a resource, especially where there is abstraction and use of water with the employment of works. The legislation provides for the management of water resources at national and county level. Article 40(4) provides an application for a permit to which shall be subject to public consultation and, where applicable EIA in accordance with the requirements of the EMCA. 108(1) sewage & effluent management to avoid environmental pollution.

Compliance: Use of water abstracted from the natural spring requires an abstraction permit. A permit will be required from WRMA for any water borehole construction works and an abstraction license. The proponent will comply fully with the Act.

4.2.20 Waste Management Regulations (2006)

This legislation gives guidelines for handling different kinds of waste. Some of the relevant sections to the proposed project are as follows:

Part II Section 1: No person shall dispose of any waste on a public highway, street, road,

recreational area or in any public place except in a designated waste receptacle

Part II Section 6: Any person who owns or controls a facility or premises which generate waste shall minimize the waste generated by adopting the following cleaner production principles:

a) **Improvement** of production process through:
   - ✓ Conserving raw materials and energy

- ✓ eliminating the use of toxic raw materials within such time as may be prescribed by the Authority
- ✓ reducing toxic emissions and wastes

b) **Monitoring** the product cycle from beginning to end by:

- ✓ Identifying and eliminating potential negative impacts of the product.
- ✓ Enabling the recovery and re-use of the product where possible.
- ✓ Reclamation and recycling.

c) **Incorporating environmental concerns** in the design, process and disposal of a product6.

Compliance

- The proponent will ensure that all waste is segregated before being transported to a designated waste treatment facility by a contracted NEMA licensed waste transporter
- A contracted waste handler licensed by NEMA will be responsible for safe disposal of solid wastes from the residence.

4.2.21 The National HIV Policy

The HIV policy is geared towards ensuring that new development projects encourage preventive and responsible behaviour both for the workers involved in such projects and the local people within which projects are taking place as a goal towards curtailing the spread of the disease. The proponent is advised to put in place adequate measures so as to ensure that implementation of the proposed projects does not heighten the spreads of HIV and AIDS

4.2.22: The Land Act, 2012

The Land Planning Act (Cap 303)

Section 9 of the subsidiary legislation (the development and use of land Regulations 1961) under which it require that before the local Authority to submit any plans to then minister for approval, steps should be taken as may be necessary to acquire the owners of any land affected by such plans. Particulars of comments and objections made by the landowners should be submitted, which intends to reduce conflict of interest with other socio-economic activities.

Land Titles Act, Cap 282

This Act makes provision for the removal of doubts that have arisen in regard to titles to land and to establish a Land Registration Court. Specific provisions include guidelines on adjudication of claims, and registration of documents after certificate of ownership is granted.

Registration of Titles Act, Cap 281

This Act provides for the transfer of land by registration of titles. Parts within the Act elaborate on mechanisms of bringing lands under the Act, grants, transfers and transmissions of land, registration of titles, and mode and effect of registration, transfers, leases, charges, powers of Attorney, and rectification of titles, among others.

Registered Land Act, Cap 300

The Act provides for the registration of title to land and provides for the regulation of dealings in land so registered, and for purposes connected therewith. The Act elaborates on the organization and administration of the Act, the effect of registration, title deeds, certificates of lease and searches, instruments and agents, transmissions and trusts, restraints on disposition, rectification and indemnity, and decisions of registrars and appeals.

Compliance: The proposed project site is registered & has a title deed. The proponent will be required to comply fully with these Acts

4.3 Institutional Framework

The environmental impact assessment for the proposed development is influenced by interest of several stakeholders and lead agencies, either exclusively or concurrently. Some of these stakeholders and lead agencies include:

- National Environmental Management Authority (NEMA)
- Director of Physical Planning
- The County Government of Nairobi
- The Ministry of Environment and Natural resources
- Directorate of Safety, Occupational, Health and Services DOSHS
- National Construction Authority

National Environment Council (NEC): The council sets national goals and objectives and determine policies and priorities for the protection of the environment that are to be followed by the developer of the proposed Apartment development Project.

County Environment Committee: The project is in Nairobi County and will be subject to site visits by the County Environmental Committees. The committees will review environment related reports of the project and on occasions could attend site meetings.

National Environment Complaints Committee, NECC (Public Complaints Committee): If any disputes will arise in regards to this project, the NECC will also play an important role in the facilitation of alternative dispute resolution mechanisms relating to environmental matters.

National Environmental Tribunal: The tribunal is formed under section 125 of the EMCA, Cap 387 and handles all cases related to environmental offences in the Republic of Kenya. The tribunal's principal function is to receive, hear and determine appeals arising from decisions of the National Environment Management Authority (NEMA) on issuance, denial or revocation of environmental impact assessment (EIA) licenses, among other decisions.

Relevance: If disputes with respect to the proposed project arise, the NET will function very much like a court of law.

CHAPTER FIVE: STAKEHOLDERS CONSULTATION AND PARTICIPATION

5.1 Introduction

Public consultation is useful for gathering environmental data, understanding likely impacts, determining community and individual preferences, selecting project alternatives and designing viable and sustainable mitigation and compensation plans. Public consultation process for the apartments development took place at the scoping stage and the EIA stage. The main objective for the consultation process was to involve the community at the very early stage of design so as to identify likely negative impacts and find ways to minimize negative impacts and enhance positive impacts of the project within the final design.
Public participation in all stages of the project is likely to contribute to maximization of expected benefits and minimization of mitigation costs of expected negative socio-economic impacts on the immediate environment.

5.2 Objectives of the Public consultation

The specific aims of the consultation process during the EIA study stage were:

- To inform the local people, leaders and other stakeholders about the proposed Apartments development project and its objectives;
- Obtain the main concerns and perceptions of the population and their representatives regarding the project;
- Obtain opinions and suggestions directly from the affected communities on their preferred mitigation measures;
- To find out if there are issues or places of cultural/or religious importance to the local communities that could be negatively impacted upon by the project and it infrastructure;
- To improve project design and, thereby, minimize conflicts and delays in implementation;
- To reduce problems of institutional coordination, especially at the different levels of government.

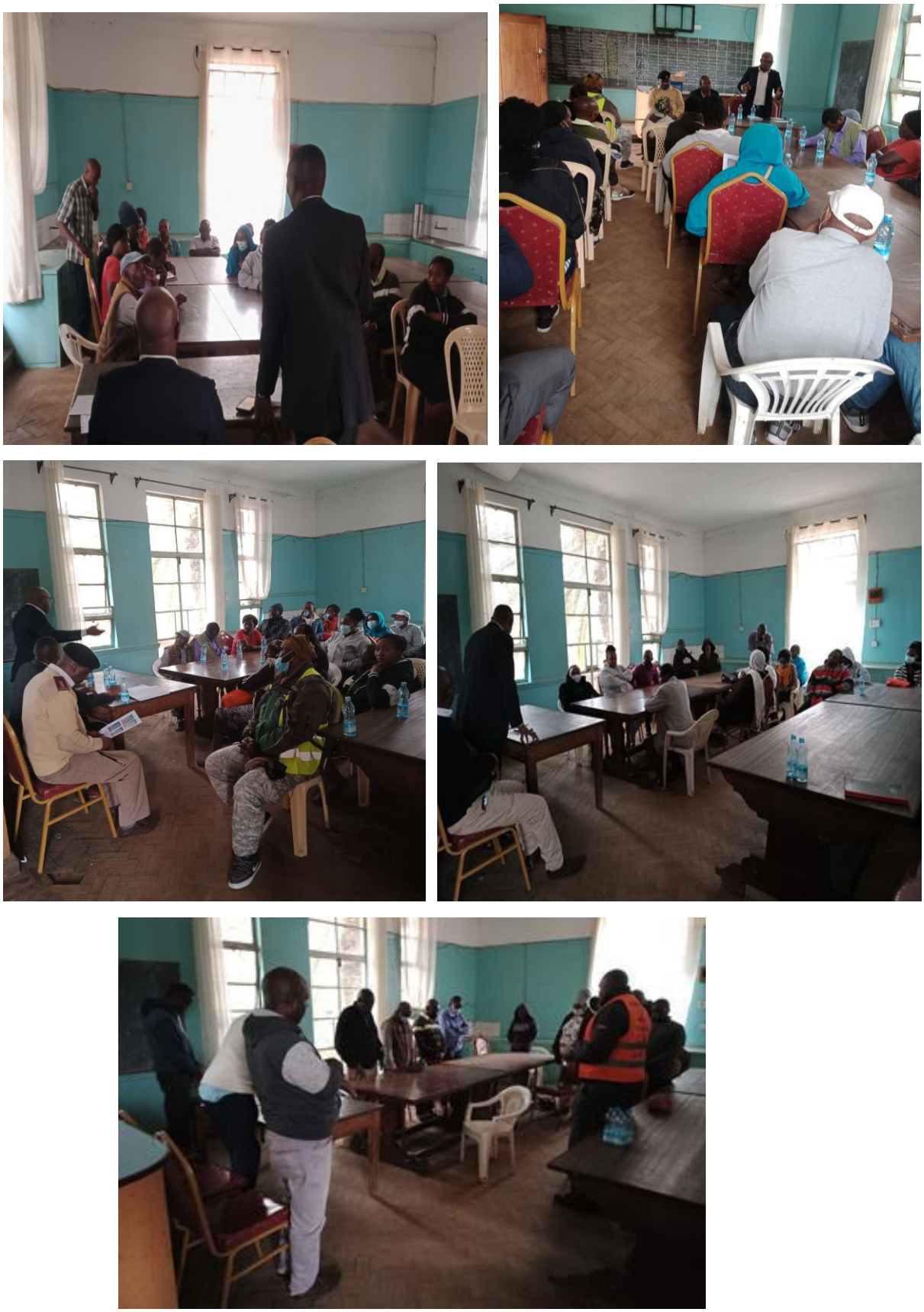
5.3 Stakeholder Consultation schedule

Public consultation barazas where organised through the office of the Senior Chief, Ngara West Sub-Location. Once the dates and venues of the meeting had been confirmed, public notices in A3 sizes where printed and put up at the Chiefs Camp, and areas surrounding the site one weeks prior to the meeting dates to create awareness on intended meetings. The planned public meetings were also announced through invitation letters to the neighbours and project affected persons. The public barazas were scheduled as follows:

Meeting Venue	**Date and time**	**Number of people who attended the meetings**
City Primary School, Ngara	18/02/2023 10.00am	27
City Primary School, Ngara	20/02/2023 4.30pm	21
City Primary School, Ngara	21/02/2023 4.30pm	20
	Total	**68**

See attached certified minutes of the public meetings and attendance lists as annex 11

Plate 3: Selected Photos of public meetings that took place in City Primary School, Ngara



Further consultation was done through the use of semi structured questionnaires that were randomly given to the area residents around the nearest neighborhood 0.5-2km away. The respondents were mainly residents and had resided or worked in the area for a period of between 5 months-60 years. Out of those interviewed, 6% were not aware of the proposed project while 94% were aware of it. *See attached filled questionnaires in appendix 11*

5.4 Summary of issues raised from the consultation process

Generally, the local administration representatives and communities were consulted to give their views towards the proposed project since they anticipate numerous benefits upon implementation of the project.

5.4.1 Benefits of the proposed project

- Enhanced security around the location area, as the station will be operational 24 hours with security deployed full time;
- Provision of parking facility;
- Food eating place and shopping at the mini market;
- Improved local socio-economy by contribution to Kenya government revenue;
- Creation of employment opportunities;
- Market for construction materials;
- Improved infrastructure;
- Maximum utilization of land
- Public consultation and awareness for gathering environmental data, understanding likely impacts, determining community/ individual preferences, designing viable and sustainable mitigation plans.

5.4.2 Problems and concerns cited on the proposed development

- Possibility of pollution / contamination of surface and groundwater resources;
- Health and safety of workers;
- Noise and vibration management;
- Increased generation of solid and liquid waste and management;
- Increased demand for water and energy use;
- Fire outbreak;
- Security
- Local labor not utilized by the contractor
- Increased traffic during construction and operation of the proposed project

CHAPTER SIX: ANTICIPATED IMPACTS AND MITIGATION MEASURES

6.1 Introduction

This chapter will discuss the prediction, identification and analysis of the anticipated project impacts throughout the project cycle, that is construction, operation and decommissioning phases. The identified anticipated impacts emanating from the proposed project will result to effects which may be positive or negative on the environmental and social elements thus influencing to analysis and categorizing them into four major parameters, which are;

- **Magnitude** - described as being major or minor positive/negative.
- **Duration** – refers to period/time and is described as short-term or long term
- **Extent** – refers to coverage and it is evaluated in terms of being specific (localized) or
- widespread
- **Reversibility** – described as in terms of being reversible or irreversible.

6.2 Positive impacts

Positive impacts that shall be associated with the implementation of the project include and are not limited to the following:

6.2.1 Provision of housing units

The proposed development will provide 391 No. decent housing units for many Kenyans to buy and own.

6.2.2 Provision of employment opportunities

The proposed project will create employment opportunities for both skilled and semi-skilled workers. During the construction phase, the project will employ a large workforce including; masons, plumbers, electricians, cooks among others. For the operation phase, the project will employ a work force that will include cleaners, security guards and caretakers among others.

6.2.3 Provision of market for goods and services

During the construction phase, the project will consume a lot of building materials sourced both locally and in other parts of the region. This will have a positive impact towards the economic status of the supplies and to the national economy through VAT rates for goods.

6.2.4 Increase in revenue to the government.

Through payment of relevant taxes, rates, the project will contribute towards the national and local revenue earnings.

6.2.5 Gains in the local economy

The economy of the neighborhood will receive a boost especially during the construction phase due to the activities of the workers; buying food, drink and commodities.

6.2.6 Improved Security

Security will be ensured around the proposed development through distribution of suitable security lights and presence of 24 hour registered security guards and CCTV surveillance. This will lead to improvement in the general security in the surrounding area.

6.2.7 Optimal Land Use

The development will result to a more economical use of the land without significant environmental degradation. The area has been zoned for high rise residential units, meaning that the proposed development will be in conformity with the zoning regulations.

6.2.8 Infrastructure expansion

This being a project that will introduce a large population into the area, there is need to provide services and utilities that will serve the people conveniently without depleting the existing ones. E.g. water delivery systems and connections to the sewer trunk in future and the maintenance of the access road.

6.3 Negative Impacts and Potential Mitigation Measures

6.3.1 Exploitation of construction materials

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

Proposed mitigation measures

a) The Proponent will source building materials such as sand, ballast and hard core from registered quarry and sand mining firms, whose extraction sites have undergone satisfactory environmental impact assessment/audit and received NEMA approval.
b) To reduce the negative impacts on availability and sustainability of the materials, the Proponent will only order for what will be required through accurate budgeting and estimation of actual construction requirements. This will ensure that materials are not extracted or purchased in excessive quantities.
c) The Proponent shall consider reuse of building materials and use of recycled building materials where applicable. This will lead to reduction in the amount of raw materials extracted from natural resources as well as reducing impacts at the extraction sites.

6.3.2 Solid Waste Generation

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

Potential Mitigation Measures

a) Segregation of waste at the source during the project cycle.

b) Use of an Integrated Solid Waste Management System; through a hierarchy of options: source reduction, recycling, composting and reuse, will facilitate waste handling during operation/occupation phase.
c) Engage the services of registered waste handlers to collect and transport waste to designated disposal sites.
d) Provision for waste management rooms at strategic places within the development facility.
e) Efficient use of building material to reduce waste and recycling/reuse where feasible.
f) To manage waste in line with the Waste Management Regulations, 2006.

6.3.3 Increase Generation of Waste Water

There will be increased generation in liquid waste as a result of increased population inflow within the project site both during construction and operation phases of the development. Inadequate provision of sanitary facilities during the construction period may result to defecation of secluded areas within the site creating unsanitary conditions and source for fly infestation. Improper liquid waste disposal may be a threat to human health for both workers and the neighboring community and also result to contamination of water resources, land and air. All liquid waste shall be properly managed through connection to the existing sewerage system that serves the area.

Potential Mitigation Measures

a) Connecting and channeling all liquid/effluent wastes to the existing city county sewerage system.
b) Provision of adequate and appropriate sanitary facilities for the workers during construction phase and tenants during the operation phase of the facility.
c) Proper decommissioning of the sanitary facilities shall be carried out once construction is complete.
d) Sanitary facilities shall be kept clean always through regular cleaning.
e) Ensure regular maintenance of foul water drainage works at the premises to prevent clogging and fore-stall breakdowns.
f) The design of the internal sewerage system shall consider the estimate discharges from individual sources and the cumulative discharge of the entire project, that is, it will have the capacity to consistently handle the loads even during peak volumes.
g) All drain pipes passing under building should be of heavy duty PVC pipe tube encased in concrete surround.
h) All manholes should have heavy-duty covers set and double sealed airtight as approved by specialists.

6.3.4 Air Pollution, Particles and Dust Emission

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

Potential Mitigation Measures

a) Regular sprinkling of water on work areas to prevent fugitive dust violations.

b) Use of dust nets/screens around the construction site to contain and arrest dust.
c) Use environmentally friendly fuels such as low sulphur diesel.
d) Minimize the period for idling of machinery and construction vehicles.
e) Minimize exposed areas through the schedule of construction activities to enable dust control.
f) Regular and prompt maintenance of construction machinery and equipment to minimize generation of hazardous gases.
g) Ensure no burning of waste such as paper and plastic containers on sites/non-designated areas.
h) Onsite dirt piles or other stockpiled material should be covered, wind breaks installed, water and/or soil stabilizers employed to reduce wind-blown dust emissions.
i) Restricting heights from which materials are to be dropped, as far as practicable to minimize the fugitive dust arising from unloading/loading.
j) Where a vehicle leaving a construction site is carrying a load of dusty materials, the load shall be covered entirely by clean impervious sheeting to ensure that the dusty materials will not leak from the vehicle.
k) Provide PPEs to the workers in dusty areas on the site.
l) Monitor the air pollution levels regularly as per the Air Quality regulations.

6.3.5 Noise and Excessive Vibrations

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

Potential Mitigation Measures

a) Construction works shall be carried out only during the day from 0800hrs to 1800 hrs.
b) Noise shields shall be used on noisy equipment, such as corrugated iron sheet structures, to minimize the exposure to the neighbors and other workers within the site
c) The construction vehicles and machinery shall be switched off when not in use to reduce idling time.
d) All noisy activities shall be scheduled concurrently during the construction period to reduce the exposure period to the PAPs.
e) Equipment installed with noise abatement devices shall be used as much as practicable.
f) All machines and equipment shall be maintained regularly to reduce frictional noise.
g) All workers shall be trained and provided with PPEs such as helmets, earmuffs, dust mask, etc. which will be used at all times when operating within the site area.
h) Drivers delivering materials shall avoid unnecessary horning of the trucks/vehicles.
i) Bill board shall be erected at the construction site entrance to notify of the construction activities and timings.
j) Regular monitoring of noise levels at the site as per the regulations.

6.3.6 Increased Water Demand

The demand and usage for water will increase during the project cycle. During construction, water will be required for activities such as cement mixing, curing of concrete, sprinkling of water on dusty areas to suppress dust and drinking water for workers. During operation phase, water will be needed for bathing, washing, cleaning, drinking and cooking. This will place strain on the existing water supply by Nairobi County Sewerage and Water Company (NCSWC).

Potential Mitigation Measures

a) Drill a borehole to supplement the county supply.
b) The contractor shall use water bowers and tankers to bring in water for construction activities i.e. during periods of high water demand (i.e. during slab formation). Water fetching shall however be subject to authorization by the relevant authority.
c) Provision of adequate underground and roof tanks for water storage that covers two days' water demand.
d) Use water efficient appliances and fixtures for conservation of water during the project cycle.
e) Provide notices and information signs to sensitize on means and needs to conserve water resource i.e., "Keep/Leave the Tap Closed", etc. This will awaken the civic consciousness of the workers and residents with regard to water usage and management.
f) Prompt detect and repair of all the water fixtures and fittings to reduce water wastage.

6.3.7 Increased Energy Demand

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

Potential Mitigation Measures

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

6.3.8 Surface Run-off and Storm Water Management

The proposed project construction phase will lead to increased release of sediments into the drainage systems. The building roofs and pavements may lead to increased volume and velocity of storm water or run-off flowing across the area covered by the building. This can

lead to increased amounts of storm water entering the drainage systems, resulting in overflow and damage to such systems.

Potential Mitigation Measures

a) Semi permeable materials will be used for construction of pavements.
b) After completion of construction, the proponent shall embark on comprehensive landscaping.
c) Drainage channels shall be covered; say with gratings, to avoid occurrence of accidents and entry of dirt.
d) Construct gently sloping drains to convey water at non-erosive speed directing the storm water to the main drainage system in the area.

6.3.9 Risk of Fire Outbreak

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

Potential Mitigation Measures

a) Post "No smoking signs" where flammable materials are stored.
b) Hire competent and properly authorized electrical contractor to do the electrical works.
c) Train staff on the use of the available firefighting equipment. At least one person trained on handling firefighting equipment should be available through-out the construction phase of the project.
d) Conduct regular firefighting drills within the site.
e) Develop and post at the site fire emergency and evacuation procedures.
f) Provide adequate number of appropriate firefighting equipment at accessible strategic places within the property.
g) Organize for inspection and maintenance of fire equipment at least once in a period of six months.
h) Maintain on site telephone contacts for fire brigade and ambulance service provider.

6.3.10 Oil Leakages and Spills on the Environment

Though this may not be common at the site, it is wise to control and observe the little that could occur especially during maintenance of the involved machinery. During operational phase, oil spills might occur at the parking lots and cooking oil from kitchens.

Potential Mitigation Measures

a) All machinery shall be keenly inspected not to leak oils on the ground. This can be ensured through regular maintenance.
b) Install oil trapping equipment in areas where there is a likelihood of oil spillage
c) Maintenance will be carried out in a well-designed and protected area and where oils/grease is completely restrained from reaching the ground. Such areas should be covered to avoid storm from carrying away spilled oils into the soil/water systems.
d) All oils/grease and materials will be stored in a site's store, in the contractor's yard.
e) Proper disposal of oil handling materials such as drums, oily clothes/papers/materials and cans.

f) All drainage facilities shall be fitted with adequate functional oil-water separators and silt traps.
g) Collect the used oils and re-use, re-sell, or dispose of appropriately using expertise from contracted licensed waste handlers.

6.3.11 Emergence and Spread of Social Vices

The proposed development will lead to potential for employment opportunities and access to new services which will draw people to the area more specifically the project site. This factor will further lead to a temporary increase in economic activities and employment of skills for the development. This will lead to population influx which might lead to changes in or unwanted behaviors in the area. This unwanted or change in behavior may be in the form of loose morality, an increase in school drop-out due to cheap labor, child labor, drug use and abuse, theft/robbery and increased incidences of HIV/AIDS and related infections/diseases and other communicable diseases.

Potential Mitigation Measures

a) To minimize project effects on local social set up, the proponent will;
b) The contractor shall ensure that there is adequate street lighting and a security guard within the site to help curb with issues that may arise from theft. Also installing 24hr operating CCTV surveillance, which will be monitored regularly.
c) It is recommended that the contractor employs workers from the immediate area where possible to avoid social conflict
d) Conduct periodic sensitization forums for employees on ethics, morals, general good behavior and the need for the project to co-exist with the neighbors.
e) Offer awareness, guidance and counselling on HIV/AIDS and other STDs to employees;
f) Provide safety tools such as condoms to employees
g) Ensure enforcement of relevant legal policy on sexual harassment and abuse of office.

6.3.12 Occupational Health and Safety

During construction phase, there will be increased air and noise pollution which are considered harmful to human health. The neighbors and workforce involved shall be subjected to these environmental hazards putting them at high risk. Waste material such as pieces of glass and nails left lying on the ground may cause injuries/accidents to the workers on site. Food for the construction workforce is usually provided by mobile individuals most of which operates without licenses. This can compromise health of the workers especially if such foodstuffs are prepared in unhygienic conditions.

Potential Mitigation Measures

a) Provide adequate and functional sanitary facilities for the workers.
b) All workers shall use properly fitting PPEs to avoid injuries and illness which include working boots, overalls, helmets, goggles, earmuffs, masks, gloves etc.
c) Provide appropriate signage and warnings in work areas to avoid injuries to the workers and occupants.
d) The contractor shall adapt a suitable emergence response plan to manage occurrence of anticipated hazards during construction phase.
e) Safety awareness may be gained through regular safety meetings, safety training or personal interest in safety and health.

f) Provide first aid facilities and ensure that workers are trained on emergency response such as first aid skills.
g) Local individuals preparing food for the workers at the site shall be controlled, monitored and evaluated to ensure that food is hygienically prepared.
h) Workers shall always be sensitized on social issues such as drugs, alcohol, diseases such as HIV/AIDS and STIs etc.
i) Comply with OSHA 2007 and all other relevant regulations governing health and safety of workplaces.

6.3.13 Impacts on Workers' and Community Health and Safety

Workers and local community members in the project area may be exposed to various risks and hazards including falling from height during construction which may lead to fatality, falling objects, collapsing of excavations, road accidents, slips and trips, flammable and explosive substance, electrical shocks, dust, noise and vibrations, poor hygiene, fire exposures, bruises and cuts, etc.

Potential Mitigation Measures

The proponent and project contractor will implement all necessary measures to ensure health and safety of the workers and the general public during construction, operation and decommissioning of the proposed development as stipulated in the Occupational Safety and Health Act, 2007.

6.3.14 Increased Traffic

Obstruction by construction transport vehicles and construction activities adjacent to the nearby roads during the construction phase may lead to the increase traffic along Muchebi Road. This may be exacerbated if these activities time/schedule coincide with Peak Traffic hours.

Proposed mitigation measures

a) Ensure that the Entry/Exit to the project site is located where it will cause minimal traffic
along adjacent roads
b) Ensure all construction vehicles to and from the construction site use the designated Entry/Exit to the project site
c) All transportation of construction raw materials and excavated materials are to be conducted at traffic off peak hours only
d) Ensure there is a traffic marshal at the site directing traffic
e) Sensitize truck drivers to avoid unnecessary road obstruction
f) Cover all trucks hauling soil, sand and other loose materials to avoid spillage and dust emissions that may interfere with smooth motoring
g) "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.

6.3.15 Soil Erosion

The topographical nature of the proposed project site is generally flat and gentle slope. The activities involved in the site preparation such as excavations in order to construct the foundations may have a major negative impact on soil and geology of the project site. Heavy machinery will be traversing the site may lead to soil compaction and erosion.

Potential Mitigation measures

a) Control excavation works especially during rainy / wet conditions

b) The stockpiling of construction materials shall be properly controlled and managed.

c) Materials to be delivered on site in installments.

d) Provide soil erosion control measures i.e. suppressing open surfaces with water or use of soil erosion control structures on soil-erosion prone areas within the site.

e) Avoid unnecessary excavations and other soil disturbances that can predispose it to the agents of erosion.

f) Avoid unnecessary movement of soil materials from the site.

g) Re-surface open areas on completion of the project and introduce appropriate vegetation.

h) Leveling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil

CHAPTER SEVEN: ANALYSIS OF PROJECT ALTERNATIVES

7.1 Introduction

In order to enable the proposed project to seek different ways of minimizing its impacts on the environment and at the same time achieve its objectives several alternatives were assessed.

7.2 'No Action' Project Alternative

This option implies forfeiting the proposed development and thus avoiding both the positive and negative impacts that would have arisen during its implementation. This option is mostly applicable in situations where the proposed project area is in ecologically sensitive areas. The land in which the proposed project is to be constructed is in a stable environment and therefore will not be affected by this development activity. From a socio-economic perspective the "no action" alternative may not be the best alternative as the numerous benefits to be gained from the development both locally and nationally would not be realized and the resources in the area would continue to be underutilized. Furthermore, this is a noble initiative that enables middle income earners dwelling in Nairobi to own homes and enjoy a sense of security for their families.

7.3 Proposed Project Alternative

In line with the zoning policies, the proposed site is in an area where commercial/residential high rise buildings are allowed by Nairobi City County. The proposed project will provide modernized quality affordable housing units, create employment, increase the governments" revenue through taxes, provide a market for goods and services and ensure optimal use of the land. Thus, the project is a timely venture and this is the best option for the proposed site. Furthermore, support infrastructures such water supply system, sewer system, electricity and tarmacked roads are available in the project area.

7.4 Alternative Design

This option entails undertaking the project but with different infrastructural designs that encompass buildings layouts and location of supporting infrastructure. The presented project design was however achieved by considering the options available that would ensure cost-effectiveness and avoid or reduce environmental and social impacts as much as possible. The prevailing design shall increase commercial viability as well as its targeted balance with nature that will create ambient living conditions for its occupants. The proponent has settled on the proposed design after thorough consultation with architect and engineers. The design meets the proponent's vision and objectives.

7.5 Alternative Construction Materials and Technologies

There is a wide range of construction and furnishing materials which can be sourced locally and internationally most of which shall be low maintenance and environmentally sound. The proposed project will be constructed using reinforced concrete, natural stones for the walling, cement for mortar and plaster works, structural steel, metal scaffolds and formwork. The concrete structure will be built using locally sourced sand, cement, metal bars and fittings that meet the Kenya Bureau of Standards (KBS) requirements. The metal scaffolds will be advantageous than timber because it will reduce the wasting of precious trees, has a longer

lifetime, provides a steady and firm standing, easily assembled and dismantled and it increases the work efficiency.

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

7.7. Waste Water Management Alternatives

Four locally available technologies are discussed below: -

7.7.1 Alternative One: Waste Water Treatment Plant

This involves the construction of a plant that will enable the recycling of the waste water from the project activities to reusable standards and utilised within the site in activities such as irrigating the flower gardens and flashing of the toilets. It is usually expensive to construct and maintain, but it is the most reliable, efficient and cost-effective in the long term. This option is not viable for the proposed project due to lack of space.

7.7.2 Alternative Two: Use of Stabilization Ponds/Lagoons

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

7.7.3 Alternative Three: Use of Constructed/Artificial Wetland

This is one of the powerful tools/methods used in raising the quality of life and health standards of local communities in developing countries. Constructed wetland plants act as filters for toxins. The advantages of the system are the simple technology, low capital and maintenance costs required. However, they require space and a longer time to function. Long term studies on plant species on the site will also be required to avoid toxin accumulation in the plants. Hence it is not the best alternative for this kind of project

7.7.4 Alternative Four: Use of Septic Tank

This involves the construction of underground concrete-made tanks to store the sludge with soak pits. This option is viable in instances where the project is not served with a sewer system or is far from a sewer line.

7.7.5 Alternative Five: Use of Existing Sewer Line Systems

This involves seeking approvals from the relevant authority and connecting the proposed project development with the NCWSC sewer system that exists and offers services within the area. This is the most viable alternative since the proposed development surrounding site area is connected and served by a 1.5M wide sewer system in addressing waste water issues. The

developer has opted in using the sewer systems existing and connected in the area for the disposal and management of waste water generated throughout the project cycle.

7.8 Solid Waste Management Alternatives

Throughout construction, the project will produce wastes such as excavated soil, wood chips, metal scraps and paper wrappings among other. Wastes to be generated during operation phase are mainly domestic in nature. The Proponent is expected to observe EMCA (Waste Management Regulations, 2006).

An Integrated Solid Waste Management System (ISWMS) is recommended for management of all solid wastes generated throughout the projects phases. The following shall be given preference in its descending order:

a) The developer shall give priority to waste reduction at source of the materials. This option will demand a solid waste management awareness programme in the management and the residents.
b) Secondly, Reducing, Recycling, Reuse and composting of the waste. This calls for a source separation programme to be put in place. The recyclables will be sold to waste buyers within Nairobi County or donated.
c) Finally, sanitary land filling will be the last option for the developer to consider.

CHAPTER EIGHT: ENVIRONMENTAL MANAGEMENT PLAN

8.1 Introduction

The Environmental Management Plan is an important process of ensuring project sustainability and environmental and social protection. The process and plan involve measurement of relevant parameters, at a level of details accurate enough, to distinguish the anticipated changes. It is therefore important to integrate the environmental and social impact assessment process, an environment monitoring and management plan that includes the monitoring of the progress of mitigation measures being implemented while also monitoring the project for any new negative impacts that were not earlier considered or anticipated.

Monitoring aims at determining the effectiveness of actions to improve environmental quality. The EMP outlined in the tables below addresses the identified issues of concern (potential negative impacts) and mitigation measures as well as roles, costs and monitorable time-frame that can help to determine the effectiveness of actions to upgrade the quality of environment; as regards the proposed project. The EMP have been considered for all phases; construction, operational and decommissioning phases

8.2 Construction Phase Environmental Management Plan

Table 8. 1: Environmental management and monitoring plan during construction phase

	Source Of Impact	Potential Impact	Controls	Responsibility	Timing	Performance Indicator	Monitoring Requirement
General site management	General construction activities; unsafe site conditions; unsafe acts and practices	Accidents with potential to cause physical injury, damage to property; environmental pollution	Provide Environmental, Health and Safety training to workers to ensure that they understand the requirements of the environmental, health and safety management plans as applicable to their responsibilities	Contractor	Construction Phase	Trainings carried out on the ESMP and HSP	Quarterly inspection of training records
			Ensure that workers sign a code of conduct to observe established procedures and are well behaved towards the surrounding community	Contractor	Construction Phase	Signed code of conduct by worker	Quarterly inspection of worker contracts
Visual and landscape management	Site clearance; Excavations; alteration of ground level; piling of spoils on site	loss of vegetation; soil erosion; siltation of water courses; loss of aesthetic value	Maintain as much as possible the natural drainage systems and patterns;	Contractor	During Construction	Non-interference with drainage patterns;	Regular (monthly) Inspections
			Preserve the existing natural vegetation as much as possible	Contractor	During Construction	Number of mature trees cleared/retained	Regular (monthly) Inspections
			Ensure the protection of vegetation using any of the following methods: mark, flag or fence areas of vegetation to be preserved; designate limits of root systems (tree drip line); and locate construction traffic routes, spoil piles etc away from existing vegetation	Contractor	During Construction	Marks, Fences and flags around vegetation to be preserved; storage of spoils away from vegetation	Regular (monthly) Inspections
			Where possible, commence landscaping activities as soon superstructures are erected;	Contractor	During Construction	Commenced landscaping works	Regular (monthly) Inspections
			Set out a plan for re-vegetation of disturbed areas,	Contractor	During Construction	Revegetation plan for disturbed areas	Once towards Project completion
			Prioritize indigeno us trees and shrubs in the choice of plants	Contractor	During Construction	Species of trees proposed for revegetation	once-Upon preparation of revegetation plan

	Source Of Impact	Potential Impact	Controls	Responsibility	Timing	Performance Indicator	Monitoring Requirement
Air pollution, particle and dust emissions	Earthworks; vehicle movements; transportation of materials and wastes; running of engines and motors	local air pollution by dust and exhaust fumes; potential respiratory illnesses among impacted neighbors	Sprinkle water on work areas, and materials heaps to minimize dust emissions;	Contractor	During construction	Dust levels at the site and accesses	Regular (weekly) inspections; sprinkling records
			Minimize exposed areas through the schedule of construction activities to enable dust control	Contractor	During construction	Disturbance outside active work areas	Regular (weekly) inspections
			Utilize vegetation, mulching, sprinkling and stone/gravel layering to quickly stabilize exposed soil	Contractor	During construction	Stabilized sections at construction site and accesses	Regular (weekly) inspections
			Identify and stabilize primary entrances/exits prior to commencement of construction;	Contractor	During construction	Stabilized site entrance/exit	Regular (weekly) inspections
			Direct construction vehicular traffic to stabilized roadways	Contractor	During construction	Existence of stabilized roadway; Use of stabilized roadways by construction traffic	Regular (weekly) inspections
			Maintain equipment and machinery to manufacturers' specifications by regular servicing to maintain efficiency in combustion and reduce carbon emissions;	Contractor	During construction	opacity of exhaust gases from vehicles; Regular maintenance of vehicles; vehicle maintenance schedule	Quarterly inspection of maintenance records
			Use environmentally friendly fuels such as low Sulphur diesel;	Contractor	During construction	Type of fuel in use	Quarterly inspection of maintenance records
			Minimize the period for machinery idling	Contractor	During construction	Existing practices and awareness of operators about machinery idling	Quarterly inspection of maintenance records
			Ensure that no burning of waste is done on site; and	Contractor	During construction	Waste Disposal methods in use	Weekly inspection of practices
			Provide appropriate Personnel Protective Equipment such as dust masks to site workers.	Contractor	During construction	Existence and usage of PPE	Weekly inspection of usage of PPE

	Source Of Impact	Potential Impact	Controls	Responsibility	Timing	Performance Indicator	Monitoring Requirement
Energy demand and usage	Use of fossil fuel-ran and/or electricity-ran equipment in construction works	Increased demand on fossil fuel and electricity to run equipment	Ensure the use of rated equipment in welding and related works;	Contractor	During Construction	Rating cards/plaque on equipment	One-time inspection of existence of rating cards on equipment
			Maintain equipment and machinery to manufacturers' specifications by regular servicing to maintain efficiency in combustion and reduce carbon emissions	Contractor	During Construction	Established maintenance schedules for equipment in use	Quarterly review of maintenance records for adherence to schedules
			Use environmentally friendly fuels such as low Sulphur diesel;	Contractor	During Construction	Type of fuel in use on equipment	Quarterly review of the fuel type in use
			Minimize the period for machinery idling to save on fuel	Contractor	During Construction	Existing practices and awareness of operators about machinery idling	Visual observation of practices in weekly inspections
			Specify and procure the most energy efficient plant options fit for purpose and avoid use of plant with unnecessary and excess capacity	Contractor	During Construction	List of requirements for each type of equipment	inspection of equipment against specifications
Noise and vibrations management	Nuisance to surrounding communities	Potential to cause physical injury, damage to property; environmental pollution	Install portable hoods to shield compressors and other small stationary equipment where necessary	Contractor	During Construction	Presence of noise attenuation features on equipment	monthly inspection of equipment features and state
			Endeavour to use equipment installed with noise abatement devices as much as practicable;	Contractor	During Construction	Presence of noise attenuation features on equipment	Monthly inspection of equipment features and state;
			Reduce idling time on trucks and other noisy equipment	Contractor	During Construction	awareness of operators about machinery idling	quarterly noise measurements at point sources
			Encourage drivers to turn off vehicle engines when not in use and avoid unnecessary hooting/revving of engines;	Contractor	During Construction	Switch off machinery when not in use	quarterly noise measurements
			Provide personal protective equipment such as ear muffs to workers at the site as necessary; and	Contractor	During Construction	Existence and usage of PPE	Weekly inspection of usage of PPE
			Carry out construction work during the day only. No works shall be carried out on Sundays	Contractor	During Construction	Defined construction hours of between 7am and 6pm	

	Source Of Impact	Potential Impact	Controls	Responsibility	Timing	Performance Indicator	Monitoring Requirement
Increased Water demand and usage	Construction water needs; generation of wastewater during construction works	Increased demand in the project area; contamination of surface and ground water resources	Close water taps when not in use. Repair broken pipes	Contractor	During Construction		
			Ensure that water is used efficiently by avoiding extravagant water use and wastage;	Contractor	During Construction	Instituted measures for efficiency in consumption	Continuous review of usage and water requirements
			Monitor water consumption and maintain records;	Contractor	During Construction	Installed consumption meter(s); records of deliveries by bowsers	Monthly inspection of records
			Harvest storm water wherever possible to supplement other sources of water;	Contractor	During Construction	Water harvesting infrastructure at the site	Quarterly review of water harvesting opportunities
			Channel construction wastewater into temporary holding ponds to allow sedimentation before release in to the environment; and	Contractor	During Construction	Presence of a sump for holding construction wastewater	Visual observation in weekly review of effectiveness of the sump
			Recycle and reuse construction wastewater wherever possible	Contractor	During Construction	Evidence of recycling of wastewater at the site	Monthly review of opportunities for reuse or used of recycled water
Soil erosion	Excavation for foundations; leveling of the site; compaction of the soil by construction vehicles and machinery; storage and handling of hazardous materials and wastes at the site	Compaction of soil by vehicles leading to loss of soil structure and increased susceptibility to erosion; depletion of fertile top soil at the site; contamination of soil resources from spillages and leakages of hazardous materials and wastes; erosion and sedimentation of	Salvage, stockpile and ensure re-use of native topsoil during re-vegetation activities in disturbed areas	Contractor	During Construction	Preservation and reuse of topsoil at the site	Visual observation in quarterly inspection of soil management practices
			Identify fertile soil borrow-pits as close as possible to the project site;	Contractor	During Construction	Nearness of identified borrow pits	One-time inspection of identified borrow pit
			Ensure re-vegetation of disturbed areas as soon as possible to prevent soil erosion;	Contractor	During Construction	Time lag between disturbance actions and revegetation	Visual observation in monthly inspection of activities and program of works
			Ensure that construction vehicles use predetermined tracks at the site to reduce ground compaction;	Contractor	During Construction	Established tracks/paths for use by construction vehicles	Visual observation in weekly inspection of the site for extent of compaction outside established tracks

		surface water resources	Utilize vegetation, mulching, sprinkling and stone/gravel layering to quickly stabilize exposed soil Utilize vegetation, mulching, sprinkling and stone/gravel layering to quickly stabilize exposed soil	Contractor	During Construction	Stabilized sections at construction site and accesses	Visual observation in monthly inspection of accesses
			Identify and stabilize primary entrances/exits prior to commencement of construction	Contractor	During Construction	Stabilized site entrance/exit	Visual observation in monthly inspection of entry/exit for effectiveness of stabilization
			Construction wastewater shall be channeled to a predetermined area such as a temporary holding pond where sedimentation can take place and reduce the amount of soil carried away in wastewater;	Contractor	During Construction	Presence of a sump for holding construction wastewater	Visual observation in weekly inspection of use and effectiveness of the sump
			Oils, fuels, paints and any hazardous materials to be stored in accordance with their respective MSDS's, and in such a manner to avoid spillages or leakages. Bund walls should be constructed around these substances' storage area so as to enable containment in the event of spillage or leakage	Contractor	During Construction	Storage of hazardous chemicals and wastes in bunded areas	Visual observation in weekly inspection of storage practices and evidence of leakage/spillage
			Implement erosion and sedimentation controls and ensure proper disposal of liquid waste	Contractor	During Construction	Use of silt traps on potential erosion channels	Monthly inspection of effectiveness of silt traps
Traffic management	Construction vehicles movements in the project area	Accidents involving the surrounding community; nuisance from snarl ups	Contractor shall ensure that construction traffic movement does not coincide with the known rush hours in the project area, and that speed and loading limits are observed	Contractor	During Construction	Delivery times for materials and carting of wastes; established speed limits	Review of delivery records for delivery times
			Develop a traffic management plan to ensure that site vehicles do not interfere with the regular traffic on the access roads, or pose safety hazards to site workers or the general public	Contractor	During Construction	Established Traffic management plan	Monthly review of effectiveness of the Traffic management plan
			Set up traffic control/warning signs along the access road near the site entrance informing other motorists of potential hazards of construction vehicles turning	Contractor	During Construction	Erected warning signage at critical areas	Visual observation in weekly inspection of signages

	Source Of Impact	Potential Impact	Controls	Responsibility	Timing	Performance Indicator	Monitoring Requirement
Oil leakages and Spills on the environment	Construction Machinery	Soil, water pollution	Proper storage, handling and disposal of new oil and used oil and related wastes	Contractor	During construction	Vehicle maintenance schedule	Daily inspection
			Maintain construction machinery and equipment to avoid leaks	Contractor	During construction	Vehicle maintenance schedule	Routine maintenance
			Maintenance of construction vehicles to be carried out in the contractor's yard (off the site)	Contractor	During construction	Vehicle maintenance schedule	Routine maintenance
			Provide oil interceptors along the drains leading from service bays	Contractor	During construction	Vehicle maintenance schedule	Routine maintenance
Solid Waste management	Demolition works for existing structures; Use of materials in construction; rejection of defective construction materials; packaging of materials	Generation of construction wastes that cause environmental pollution, nuisance and breeding grounds for vermin	Identify a temporary holding area for demolition and construction wastes;	Contractor	During Construction	Identified area for storage of wastes	Weekly inspection of housekeeping
			Recycle and re-use demolition and construction waste as much as possible;	Contractor	During Construction	Amount of recycled wastes at the site	Monthly review of records on quantities of recycled materials
			Ensure that all non-recyclable/reusable wastes are cleared from site at the earliest opportunity to avoid pile-up;	Contractor	During Construction	Existent plans for off-site disposal of wastes	Weekly review of waste management practices
			Avoid mixing excess concrete if possible. Discard excess concrete in a designated area;	Contractor	During Construction	Amount of concrete that is disposed as waste	Review of quantities of concrete wastes generated
			Washing of concrete-coated vehicles/equipment off-site or in a designated area. The concrete wash area will be at least 50m away from storm drain inlets or open drainage facilities. Runoff from onsite concrete wash area shall be contained in a temporary pit where concrete can set;	Contractor	During Construction	Designated wash area; an existent concrete washout pit at the site	Weekly review of usage of wash area and maintenance of washout pit
			Surface runoff within the site to be diverted in order to avoid flushing away soil and other material. Sediment traps to also be installed to remove sediments before discharge of the runoff from the site;	Contractor	During Construction	Installed sediment traps; lined drain for channeling of runoff	Monthly review of effectiveness of the site drainage
			Establish measures to ensure that construction material requirements are carefully budgeted to avoid leftovers;	Contractor	During Construction	Existent stock management plans	Quarterly review of inventories to

	Source Of Impact	Potential Impact	Controls	Responsibility	Timing	Performance Indicator	Monitoring Requirement
Health and safety of workers	Use of hand tools and machinery in construction; construction vehicle movements; housekeeping practices at the construction site; unsafe acts by construction workers	Physical injuries to workers and/or the public; damage to property	All workers will be sensitized before construction begins, on how to control accidents related to construction.	Contractor Project manager	During Construction	Level of compliance with OSHA provisions	Routine inspection
			A comprehensive contingency plan will be prepared before construction begins, on accident response.				
			Keep record of the public emergency service telephone numbers including: Fire brigade, Ambulance.				
			Accordingly, adherence to safety procedures will be enforced.				
			Provide first aid kits at strategic places in the site.				
			All workers to wear protective gear during construction e.g. helmets.				
			Provide clean water and food to the workers.				
			Construction work will be limited to daytime only.				
			Workers to be adequately insured against accidents. Ensure that the workers are registered with NHIF and NSSF and remits appropriate fee				
			Develop and implement a detailed and site-specific Emergency Response Plan				
			Provide adequate sanitary facilities on site; and				
			Provide for First Aid facilities as per the OSHA, 2007, and ensure that workers are trained on emergency response such as first aid skills;				
			Provide and clearly display emergency contacts on site;				

	Source Of Impact	Potential Impact	Controls	Responsibility	Timing	Performance Indicator	Monitoring Requirement
Raw materials extraction and use in construction	Extraction of raw materials such as sand, masonry stones, ballast	environmental degradation at quarry sites	Source construction materials such as sand, ballast, quarry stones, and hard core from registered and approved quarries and sand mining firms;	Contractor	During Construction	Available permits for materials sites	Annual check of the licensing status of materials sources
			Implement stringent inventory management mechanisms and only order for materials after a fairly accurate estimation of actual construction requirements; and	Contractor	During Construction	existent stock management plans	quarterly review of procurement plans for materials
			Manufacture building elements off-site where possible, and deliver to site.	Contractor	During Construction	Existing arrangements for offsite preparation of building elements	Quarterly review of opportunities for off-site manufacture of elements
Increase Generation of Waste Water	Workers at the site	Soil and water pollution	Connecting and channeling all liquid/effluent wastes to the existing sewerage system. Provision of adequate sanitary facilities for the workers during construction and tenants during the operation phase of the facility. Proper decommissioning of the sanitary facilities shall be carried out once construction is complete. Sanitary facilities shall be kept clean always. Ensure regular maintenance of foul water drainage works at the premises to prevent clogging and fore-stall breakdowns. All drain pipes are heavy duty PVC pipe tube encased in concrete surround. All manholes should have heavy-duty covers set and double sealed airtight as approved by specialists.	Contractor	During construction and operation		

	Source Of Impact	Potential Impact	Controls	Responsibility	Timing	Performance Indicator	Monitoring Requirement
Surface Run-off and Storm Water Drainage	Rain water	Flooding and accidents	Semi permeable materials will be used for construction of pavements. After completion of construction, the proponent shall embark on comprehensive landscaping. Drainage channels shall be covered; say with gratings, to avoid occurrence of accidents and entry of dirt. Construct gently sloping drains to convey water at non-erosive speed directing the storm water to the main drainage system in the area.	Contractor and proponent	During construction and operation	Clean and unclogged drainage	Routine inspection
Fire Outbreak Risks Occurrence, Response and Safety	Any source that may ignite fire or cause fire	Destruction of properties, loss of lives	*a)*Post "No smoking signs" where flammable materials are stored. *b)*Hire competent and properly authorized electrical contractor to do the electrical works. *c)*Train staff on the use of the available firefighting equipment. At least one person trained on handling firefighting equipment should be available through-out the construction phase of the project. *d)*Conduct regular firefighting drills within the site. *e)*Develop and post at the site fire emergency and evacuation procedures. *f)*Provide adequate number of appropriate firefighting equipment at accessible strategic places within the property. *g)*Organize for inspection and maintenance of fire equipment at least once in a period of six months. *h)*Maintain on site telephone contacts for fire brigade, G4S fire brigade and St. Johns ambulance service provider.	Contractor and proponent	During construction and operation	No fire outbreaks	Routine inspection

Emergency and spread of social vice	Workers and tentants	Spread of HIV and security risks	To minimize project effects on local social set up, the proponent will; The contractor shall ensure that there is adequate street lighting and a security guard within the site to help curb with issues that may arise from theft. Also installing 24hr operating CCTV surveillance, which will be monitored regularly. It is recommended that the contractor employs workers from the immediate area where possible to avoid social conflict Conduct periodic sensitization forums for employees on ethics, morals, general good behavior and the need for the project to co-exist with the neighbors. Offer awareness, guidance and counselling on HIV/AIDS and other STDs to employees; Provide safety tools such as condoms to employees Ensure enforcement of relevant legal policy on sexual harassment and abuse of office.	Contractor and proponent	During construction and operation		Scheduled review

8.3 Operation Phase Environmental Management Plan

Table 6. 2: Environmental management and monitoring plan during Operation phase

	Source Of Impact	Potential Impact	Controls	Responsibility	Timing	Performance Indicator	Monitoring Requirement
Noise management	Use of the standby power generator during grid-power outages	Noise nuisance	Ensure that noise abatement devices are installed and maintained for the standby generator for power supply	Proponent	Operation Phase	Noise levels from the standby generator when in use	Annual noise measurements
Energy resource management	Use of electrical appliances; lighting within the development	Increased demand on grid energy supply	Encourage members to conserve energy through awareness programs	Proponent	Operation Phase	Instituted awareness and conservation program	Annual audit
			Install and maintain energy efficient appliances e.g., indoor lights and outdoor security lights; and	Proponent	Operation Phase	Installed energy efficient lighting	Annual audit
			Continually seek avenues for energy conservation as international best practices evolve	Proponent	Operation Phase	Other energy-saving measures instituted	Annual audit
Water resource management	Usage of water by tenants	Increased water demand; increased generation of wastewater	Incorporate water accounting systems and metering for all areas;	Proponent	During Operation	Installed water meters	Annual EA
			Encourage members to conserve water through awareness programs;	Proponent	During Operation	Instituted awareness programs	Annual EA
			Install and maintain low volume fixtures in toilets, baths and other wet areas;	Proponent	During Operation	Installed low-volume fixtures	Annual EA
			Use harvested storm water in cleaning and irrigation of lawns; and	Proponent	During Operation	Use of harvested stormwater around the compound	Annual EA
			Continually seek new avenues for water conservation as International best practices evolve.	Proponent	During Operation	other conservation measures institute	

	Source Of Impact	Potential Impact	Controls	Responsibility	Timing	Performance Indicator	Monitoring Requirement
Waste management	Occupation of the housing by the tenants; consumption/use of materials	Generation of wastes; environmental pollution and creation of health and safety hazards from mismanagement of wastes	Pursue waste minimization at source principles e.g., zero generation, reduction, re- use and/or recycling;	Proponent	Operation phase	Implemented measures for reuse/recycling at household level	Annual environmental audit
			Provide mechanisms to segregate wastes at source, ensure that all wastes are stored temporarily at the designated common collection area, and that they are regularly carried away for disposal in designated areas; and	Proponent	Operation phase	Established mechanisms that allow segregation; Contracted waste handler; waste collection schedule	Annual environmental audit
			Ensure regular inspection and maintenance of foul water drainage works and storm water drainage works at the premises to prevent clogging, and fore-stall breakdowns.	Proponent	Operation phase	Maintenance/inspection schedule; Blockage incidences	Annual environmental audit
			Waste water to be direct to WWTP. Ensure there is no blockages or leakages	Proponent	Operation Phase	Maintenance/inspection schedule; Blockage incidences	Waste water analysis Obtain discharge license from NEMA
			Solid waste from garage including brake pads, metal objects, plastics should be disposed off appropriately through a licensed waste recycler	Proponent	Operation Phase	Established mechanisms that allow segregation; Contracted waste handler; waste collection schedule	Routine inspection Annual environmental Audit

	Source Of Impact	Potential Impact	Controls	Responsibility	Timing	Performance Indicator	Monitoring Requirement
Used oil management	Generators and kitchen oils	Generation of wastes; environmental pollution and creation of health and safety hazards from mismanagement of wastes	1. Drain used oil into the oil collection equipment, 2. Once the equipment is full, transfer into closed storage drums in a bunded area, 3. Place the filter upside down in an empty container and drain for 24 hours, 4. Provide a collection centre for used oil from small generators where applicable, 5. Take the used oil to licensed transfer stations or recycling facilities using a licenced transporter, 6. Dispose oil filters through licenced incinerators, 7. May offer incentives to encourage oil drain at the service station or the lubricant marketers should establish take back schemes for their used oil brands and 8. Dispose of solid waste through licenced incinerators, scrap metal dealers and licenced recyclers	Proponent	Operation phase		Routine inspection Annual environmental audit
			9. Use oil interceptor in the drainage channel				

Table 8. 3**: Occupational Health and Safety EMP for the proposed project during construction and operational phase**

Occupational Health and Safety EMP for the proposed project during construction and operational phase				
Key Issues	Mitigation Measure	Responsibility	Time Frame	Cost Ksh.
Registration of the premises	Register the premises under the Occupational Health and Safety Act Cap 514, of the Laws of Kenya is mandatory	Proponent	One-off	5, 000
General register	Keep a general register of all workers within the facility as stipulated in Sec 62 (1) of the Occupational Health and Safety Act	Proponent, contractor	Construction	500
Incidents and accidents	Report any incidents and accidents using prescribed forms obtainable from the Occupational Health and Safety Office	Site Safety Officer	Continuous	500/month
	Conduct regular safety education and training	Site Safety Officer	Quarterly	4,000
	Prepare a contingency plan for emergency response before the start of the project.	Site Safety Officer	One-off	10,000
Insurance	Insure the premises as per statutory requirements (third party and workman's compensation)	Proponent and all occupants	Annually	
Safety healthy environment (SHE) policy	Develop, document and display prominently an appropriate Safety and Healthy Environment policy	Site Safety Officer	One-off	2,000
Sanitary conveniences	Provide suitable, efficient, clean, well-lit and adequate sanitary amenities at the site taking care of gender division	Contractor, proponent and all occupants	One-off	50,000
Machinery/equipment safety	Ensure that machinery, equipment, PPE, appliances and tools to be used comply with the prescribed safety and health standards and be appropriately installed, maintained and safeguarded		One-off	-
Storage of materials	Ensure that materials are stored or stacked in such manner as to ensure their stability and prevent any fall or collapse		Continuous	-
Safe of access in the buildings	All floors, steps, stairs and lift of the premises must be of sound construction and be properly maintained		Continuous	-

Occupational Health and Safety EMP for the proposed project during construction and operational phase				
Key Issues	Mitigation Measure	Responsibility	Time Frame	Cost Ksh.
Emergency preparedness and evacuation procedures	Design suitable documented emergency preparedness and evacuation procedures for emergencies	Site Safety Officer	One-off	1,000
First Aid	on site a stocked first aid box which is easily available and accessible	Site Safety Officer	One-off	2, 000/kit
Fire protection	Regularly inspect and service fire-fighting equipment by a reputable service provider and maintain inspection records	Site Safety Officer	Every 3 months	5,000
	Prominently display signs such as "NO SMOKING" at the site especially in parts where inflammable materials are stored	Site Safety Officer	One-off	500
Ventilation	Provide adequate space within the premises to allow for adequate natural ventilation through circulation of fresh air	Contractor, occupants	One-off	-
Lighting	Provide adequate artificial or natural lighting in all parts of the premises where persons are working or passing	Contractor, all occupants	One-off	-
Electrical safety	Do not overload circuits	Proponent and Contractor,	Continuous	-
	Clearly mark distribution board switches to indicate respective circuits and pumps		One-off	-
	Ensure that no live electrical wires are exposed		Continuous	
	Earth all electrical equipment		One-off	5,000
Diseases	Provide complete refuse collection and handling service		Continuous	5,000
Security	Fence the site and employ security personnel operating 24 hours Install security alarms and/or surveillance systems.		Continuous	50,000

8.4 Decommissioning Phase Environmental Management Plan

Table 8. 4 Decommissioning Phase Environmental Management Plan

Note: An environmental impact assessment study should be undertaken and submitted to NEMA prior to decommissioning the project.

Environmental/ Social Impact	Proposed Mitigation Measures	Responsibility	Monitoring	Recommended frequency of monitoring
Demolition of existing structures	▪ Apply for demolition permit from relevant authorities before commencing the demolition ▪ Engage a registered contractor to carry out the demolition ▪ Provide workers with Personal Protective Equipment (PPEs) ▪ The demolition exercise to be limited at day time only ▪ Comply with EMCA (Noise and excessive vibration.	Project proponent Contractor NEMA inspectors	Inspection	Daily during the demolition process
Air pollution	▪ Dust suppression with water sprays on dusty areas ▪ Careful screening of construction site to contain and arrest construction related dust ▪ Ensure demolition machinery and equipment are well maintained to reduce exhaust gas emission	Proponent Contractor NEMA inspectors	Inspection Routine maintenance	Daily
Noise pollution	▪ Demolition activities to be restricted to daytime i.e. 8am to 5pm ▪ Use of Suppressors on noisy equipment or use of noise shields for instance corrugated iron sheet structures ▪ Workers in the vicinity or involved in high level noise to wear respective safety & protective gear. ▪ Comply with EMCA (Noise and excessive vibration pollution control) Regulations 2009	Proponent Contractor Workers NEMA inspectors	Inspection Observation Routine maintenance	Random

Safety of workers	▪ All workers will be sensitized before demolition begins, on how to control accidents related to construction. ▪ Accordingly, adherence to safety procedures will be enforced. ▪ All workers will be adequately insured against accidents.	Workers Proponent NEMA inspectors	activities checks	
Solid and liquid waste	▪ Ensure proper solid waste disposal and collection facilities ▪ Refuse collection vehicles will be covered to prevent scatter of wastes by wind. ▪ Demolition wastes to be collected by a licensed operator to avoid illegal final dumping at unauthorized sites. ▪ All persons involved in refuse collection shall be in full protective attire. ▪	Contractor Proponent NEMA inspectors Registered/licensed waste management company	Routine Activities checks	Daily
Re-vegetation and comprehensive landscaping	▪ Implement an appropriate re-vegetation programme to restore the site to its original status ▪ During the re-vegetation period, appropriate surface water run off controls will be taken to prevent surface erosion; ▪ Monitoring and inspection of the area for indications of erosion will be conducted and appropriate measures taken to correct any occurrences; ▪ Fencing and signs restricting access will be posted to minimize disturbance to newly-vegetated areas;	Contractor Proponent	Inspection	Random

CHAPTER NINE: SITE SAFETY AND ACCIDENT PREVENTION MEASURES

9.1 Project Employee Responsibilities

a) **Project Manager**- must lead project team by setting an example for safety awareness as well as developing, communicating and supervising the safety program. The project manager must enforce and set the tone for all safety related issues during and prior to the planning of each project phase. They must provide leadership and show commitment to a safe and healthy environment. Responsibilities shall include reviewing inspection reports, safety meeting reports and addressing health and safety issues on the jobsite.

b) **Site Agent**- must lead, oversee and manage all site work, including safety. The superintendent must ensure that safety procedures are applied in an effective manner and that all employees are conforming to established rules and regulations. Duties include establishing a pre-job assessment prior to the start of the project, ensuring site foremen comply with safety regulations, conducting safety orientations for all new employees, reviewing all incident & corrective action reports, pre-task plans and enforcing disciplinary action when necessary. The site agent will also work with the site safety representative overseeing regular site inspections, developing a site-specific emergency plan and implementing weekly tool box topics with subcontractors.

c) **Project Engineer**- Responsibilities include collecting all subcontractor safety programs, material safety data sheets (MSDS) and ensuring all site foreman have access to site plans.

d) **Site Safety Representative**- will act as the designated safety manager and will inspect the jobsite weekly, conducting safety inspections. Responsibilities include providing education and training opportunities to all employees, conducting safety audits, discussing & providing weekly tool box topics, developing an emergency action plan and procedures, reviewing all safety programs and safety data sheets (SDS), scheduling Pre-Task planning meetings & overseeing implementation, issuing violation notices, issuing corrective action reports.

9.2 Project Safety Orientation

Each employee working on the site are required to complete the Employee Safety Orientation. This must be complete within one week of any employee beginning work on site.

9.3 Job site Inspections

a) Site Safety Representative will conduct weekly site inspections, and review all safety documents (pre-task plan, crane plan, etc.).

b) Contractors shall perform daily safety inspections of their work area and equipment per OSHA, 2007 requirements.

c) After inspecting a job site/work area, the site safety representative and superintendent will identify and evaluate all potential hazards for: a. Possibility for severe injury. b. Probability of accident occurrence.

d) This site safety representative will also consider the skill and knowledge level demonstrated by exposed workers.

e) This site safety representative shall then take the following actions: a. Discuss all hazards with the necessary parties. b. Explain appropriate recommendations and precautions. c. Assist with any necessary training (i.e. provide appropriate Tool Box Talks), in accordance with the level of hazard. d. Issue citations & corrective actions.

f) Records shall be maintained for all recommendations, precautions, and training for each hazard identified.

g) All incidents, regardless of severity, will be discussed at the next project safety meeting, with an emphasis on eliminating future occurrences

9.4 Emergency Procedures, Investigation, and Reporting

- Contractors/employees shall report all work related injuries, illnesses, first aid cases, near misses, property damage, and environmental incidents such as a spill or release of hazardous materials, regardless of severity, immediately to the Project Superintendent and Safety Manager.
- The contractor shall investigate all incidents and forward copies of the incident report to the Safety Manager within 4 hours of the incident. An incident report must be provided for: near misses, first aid, recordable injuries, third party property damage or personal injury, and builders risk claims.
- Corrective actions will be implemented and any worker compensation or liability claims shall be reported to project manager.
- Follow-up information on personal injuries (doctor's reports, insurance or worker's compensation reports etc.), shall be forwarded to the Safety Manager within a reasonable time frame.

9.5 Emergency Signals and Procedures

1. **Serious Emergency** - A single long blast from an air horn shall be given by the Project Superintendent in the event of a serious emergency on the site. These include serious or life threatening injury, severe weather or other impending natural disaster, or other emergencies not requiring immediate evacuation of the site. Please discontinue working and report to your foreman. Foremen shall report to the Project Superintendent for further instructions. Two quick blasts from an air horn shall signal the all clear.
2. **Evacuation** - Three or more long blasts from an air horn shall be given by the Project Superintendent in the event that total evacuation of the site is necessary. Immediately discontinue working and evacuate to a safe location (designated by project superintendent). Foremen shall account for all workers in their crew and shall report to the Project Superintendent. The Superintendent shall instruct the foremen according to circumstances to remain at the gathering location or retreat to a safer distance. Two quick blasts from an air horn shall signal the all clear.

9.6 Fire Prevention Program

1. There should be a programme committed to minimizing the threat of fire to employees, visitors, and property. It is the responsibility of the contractor to have their own Fire Prevention Program (FPP) and to instruct and train all employees in fire prevention and fire response.
2. When Cutting, Welding, and Open Flame Work are performed, the contractor shall at minimum ensure the following:
    a) All cutting and welding equipment is inspected and operated by competent, trained personnel.
    b) No cutting or welding shall take place on metal walls, ceilings, or roofs built of combustible sandwich-type panel construction or having combustible covering.
    c) A fire extinguisher shall be located within 10' of all cutting, welding, or other hot work.
    d) Proper PPE must be utilized.

3. All combustible materials must be properly secured and stored outdoors.

4. Smoking is prohibited at the site projects.

5. The contractor must establish and maintain a means of proper egress, and all exits must be marked by a readily visible sign.

6. Fire Extinguishers must comply with the following: a. readily available every 3,000sf. b. Require quarterly inspection tag. Any defective device must be removed from service immediately. c. Shall be located & labeled so it can be readily seen and accessible along normal paths of travel. In multi-story buildings, at least one extinguisher must be adjacent to a stairway.

9.7 Hazard Communication Program

1. Hazard Determination

a. SDS supplied by the contractors and manufacturers shall be utilized in identifying hazardous materials.

b. Subcontractors must submit all appropriate MSDS documentation to project manager office prior to beginning work on project site.

2. Labeling

a. All containers on the jobsite shall be properly labeled by the responsible contractor.

b. All labels shall clearly indicate: 1. Identity 2. Hazard 3. Precautionary Statement 4. Name and address of responsible party

3. Safety Data Sheets (SDS)

a. SDS for all hazardous chemicals to which employees may be exposed will be kept at the corporate office and the jobsite field office.

b. SDS will be available for review to all workers and employees.

c. Notification of new or revised MSDS shall be posted

4. Employee Information

a. All known hazardous substances present on the site and location of SDS shall be disclosed to the workers in the mandatory Project Safety Orientation.

b. When workers are required to perform work in areas known to contain hazardous materials, it is the subcontractor's responsibility to identify: 1. Specific chemical hazards. 2. Protection/safety measures the employee is required to take to lessen risks. 3. Potential hazard reduction measures c. The main contractor will work with the subcontractor to the greatest extent feasible to limit exposure to the hazard(s).

5. Training

a. Employers must provide employees with effective information and training on hazardous chemicals in their work area, and whenever a new hazardous chemical is introduced. b. Employees are required to wear and have appropriate training on PPE associated with each hazardous chemical being used.

9.8 General Safety

9.8.1 Personal Protective Equipment (PPE)

- All personal protective equipment shall be provided by contractors prior to the start of job.
- Personal protective equipment including hard hats, safety glasses, work boots and high visibility shirts must be worn 100% of the time.
- Proper work attire.
- Fall protection is required for all trades when working at heights of 6' or more.
- Protective gloves or clothing shall be worn when required to protect against a hazard.
- A face shield or safety goggles are required when cutting, grinding, welding or power washing.
- Hearing protection is required when working in areas where noise levels exceed 85 decibels, or normal conversation cannot be conducted, or when the area is posted as a noise hazard.
- Dust masks or respirators shall be worn in all dusty environments. Pulmonary function testing, fit tests and written respiratory programs are required for respirator use.
- All personal protective equipment must be inspected daily as per OSHA, 2007 standards.

9.8.2 Moving Equipment

- All operating equipment shall be equipped with rollover guards per OSHA 2007 standards.
- Operating equipment shall be equipped with an audible notification, strobes and/or beacons per manufacturer's requirements.
- A spotter is required whenever a vehicle has a restricted view while operating on site.

- Properly set-up barricades or traffic control zones when operating equipment near public roadways. When construction activities are at a peak level, the use of a spotter/traffic controller is permitted to help direct and control traffic.
- Contractor/Sub-contractors is required to conduct daily inspections of all equipment.
- Employees assigned to traffic control duties must wear high visibility clothing per OSHA 2007 standards.

9.8.3 Excavating/ Site Utilities

1. The competent person must inspect the excavation:
    a) Daily before work activities commences.
    b) After a heavy rainfall.
    c) At depths greater than 4'' for oxygen deficiencies or hazardous atmospheres.
    d) For failures of protective systems, equipment and adjacent structures.
2. Miss Dig must be contacted prior to starting any excavating.
3. When working in a trench 4 feet or more in depth, proper sloping, shoring, or other cave-in protection methods shall be utilized.
4. Ladders shall be provided at least every 25 feet for access to trenches exceeding 4 feet in depth.
5. Material and spoil piles shall be kept a minimum of 2 feet away from the edge of a trench.
6. All open holes, trenches, and excavations shall be barricaded and clearly marked to alert the public and other workers in the area.
7. Excavations and trenches may be confined spaces where air monitoring could be required.
8. All vehicles hauling soil from site must pull into site and turn around.

9.8.4 Crane & Rigging Safety

- Must be included in a Pre-Task plan.
- All operators shall be certified and cards submitted to project supervision before start of work.
- All cranes are to be inspected on a daily basis.
- All cranes must have proof of annual inspection.
- Outriggers must be manufactured and be fully extended and on stable ground.
- The swing radius of all cranes must be properly barricaded.
- Contractor must submit a copy of the crane plan (operation, swing radius, etc.) to superintendent prior to the start of the project.

9.8.5 Fall Protection

1. Fall protection systems are required when exposed to heights of 6' or more. Systems include:
    a) Guardrails
    b) Safety nets
    c) Personal fall arrest systems. All systems must be inspected, constructed and installed per OSHA, 2007 requirements.

2. When conducting roofing work, contractors are required to submit a pre-task analysis.

3. All holes/ floor openings greater than 2" in depth or diameter are required to be properly barricaded/covered or secured, and clearly marked with high visibility paint as a "hole". All hole/openings that are barricaded and covered shall be securely/mechanically fixed in place.

4. Contractors are required to maintain all fall protection devices.

5. If an employer can demonstrate conventional fall protection methods are infeasible or present a greater hazard, a fall protection plan may be implemented. The fall protection plan must comply with OSHA standards and include the following:

a) Site specific requirements/unique circumstances.
b) Prepared by a qualified person.
c) Supervised by a competent person.
d) Explain why conventional methods are infeasible.
e) Discuss the safety measures that will be taken to reduce or eliminate the fall hazard of the workers.
f) Describe all controlled access zones.
g) Require training for all employees.

9.8.6 Electrical

- Cords and tools must be inspected on a daily basis. If the insulation or casing of the cord is damaged, or the ground prong is missing, the cord will be cut by project supervision.
- All cords must be 3 prong heavy duty cords and be protected from indoor/ outdoor traffic.
- Portable generators must be provided with ground fault circuit interrupters.
- Temporary lighting must be protected with safety guards.
- Stairwells, corridors & work areas shall be properly illuminated with either temporary or permanent lighting.

9.8.7 Scaffolding Safety

- All scaffolds must be erected and inspected daily by a competent person
- Each work level of the scaffold system shall be full planked and overhang the end supports by a minimum of 6 inches and a maximum of 12 inches. Planking which does not meet this requirement must be cleated.
- The scaffold system must have a ladder provided for access. Climbing the bracing is not acceptable unless the system has a built-in ladder for that purpose.
- Scaffolding height must never exceed 4 times their minimum base dimension. If this is exceeded, the scaffold must be tied into the structure.
- All working and walking levels must be fully planked and not overloaded.
- Planks must be scaffold grade lumber. Cracks shall not penetrate more than 12 inches.
- Riding of wheeled scaffolding is prohibited.
- The footing or anchorage for scaffolds must be sound, rigid and capable of carrying the maximum intended load without settling or displacement.

9.8.8 Ladder Safety

- Only type 1A ladders with a heavy duty rating are required.
- No painted or aluminum ladders are allowed on site.
- All ladders must extend a minimum of three (3) feet above the landing and be secured. If the ladder cannot be secured, it must be held at the bottom by another worker.
- Keep ladder bases clear from debris, hoses, wire, materials, etc.
- Use the "four and one" rule when positioning a ladder – one foot of base for every four feet of height.
- Step ladders must be fully extended and locked into place. Placement shall be on stable surfaces.
- Workers shall not straddle or stand on the top two rungs of a ladder, and shall work facing the ladder.

9.8.9 Aerial Work Platforms

- Must be inspected daily.
- Operated by trained and authorized personnel. Employees must have operator's certification readily available
- All employees must wear a body harness and be tied off inside the basket when elevated at all times.
- Lifts should only be operated in accordance with the manufacturer's manual.

9.8.10 Housekeeping

- Contractor/Subcontractors must properly dispose of all waste materials on a daily basis.
- Contractor/Subcontractors must properly store and secure all work material and equipment.
- Site clean-up is required on a daily basis.
- Stairways and passageways must be kept clear of debris.

9.9 Site Specific Safety Requirements

Site Work

- Employees must wear proper PPE.
- Contactor/Subcontractors must maintain a clear path through the jobsite.
- Storing of materials and goods will be located in a way as to prevent site congestion.

Concrete

- All exposed rebar will be capped, or covered to protect against impalement or injury.
- Employees operating equipment such as vibrators pump nozzles, and/ or buggies will wear appropriate clothing and PPE, such as boots, eye protection and hearing protection. Long sleeve shirts will be worn to protect against the exposure of concrete.

- Concrete contractor must appropriately barricade working area during concrete forming and after concrete has been poured.
- Material used for formwork must be removed and properly disposed of. Subcontractor will remove all debris and conduct a clean-up of the work area daily.

Steel Erection

- Subcontractor must conduct a pre-task analysis with the superintendent before all overhead hoisting activities take place.
- The area of erection must be securely barricaded. If necessary, a controlled access zone may be permitted.
- All steel erectors must wear appropriate PPE, including fall protection at heights greater than 6 feet and a face mask when welding.
- Contractor must provide the following when using a crane: Crane operator certification. Crane plan, including staging area, swing radius and required barricades.

Block Masonry

- Mason contractor must provide, if applicable, wall bracing plan prior to start of work
- Competent person (foreman) must conduct daily inspections of scaffold equipment
- Employees working within restricted fall zone must be trained and certified to work in restricted fall zone area.
- Masonry block walls at heights of 8 feet or greater, not tied into the structure, must be adequately braced.
- Restricted fall zone areas must be established prior to the construction of the wall, and will be restricted to employees who are actively engaged in constructing the wall.

Truss & Deck Framing

- All walkways and working surfaces must be clear of debris to prevent tripping hazards.
- Employees are required to wear appropriate PPE, including fall protection at heights greater than 6 feet.
- Contractors must establish a controlled access zone to prevent other contractors from entering work area.
- Trusses/Joists must be adequately braced to prevent falling or tipping.
- Contractor must barricade crane swing radius when loading and setting trusses in place.

Window Installation

- All window openings require a guardrail if the window sill measures a height below 39” and a width greater than 18”.
- When installing windows on the upper floors, the area below (ground level) must be properly barricaded.

- Employees are required to wear a personal fall arrest system when installing windows on the upper floors.
- If using any lifting devices (rough terrain, aerial), employees must: A. Wear a personal fall arrest system B. Have operator's license to use equipment. C. Inspect equipment daily.

Roofing

- Employees are required to use a method of fall protection. Slide guards are no longer permissible.
- Employees are restricted from throwing material from roof. Contractor must set up a drop zone, which requires a barricade and a spotter.
- Employees working on roofs must wear appropriate footwear that provides good traction.
- Working surfaces must be free of tripping hazards (tools, cords, etc.) and must be clean to prevent material from falling below.
- A written pre-task analysis is required and must be submitted to superintendent prior to start of work.
- Employees must have proper and safe access to roofing surface. The use of any temporary ladder must be constructed and properly secured to prevent movement.
- Employees should refrain from working on the roof during inclement weather conditions.

Drywall

- Daily cleanup is required.
- A clear path must be maintained.
- Proper storing methods are required.
- Employees must wear proper PPE at all times.

Paint Primer

- Contractor must submit all required MSDS.
- Employees must wear appropriate work attire and PPE, including face masks/ respirators when spraying paint. A written respiratory program is required as well.
- Employees must use ladders/ lifts to reach difficult areas.
- While painting/ priming, contractor must make sure work area is properly ventilated.
- Contractor is permitted to set up a restricted work zone when spraying paint.
- Properly store all paint material, and dispose of empty paint buckets daily.

9.10 Sexual Harassment

Discrimination against any employee or applicant on the basis of the person's sex is strictly prohibited. Sexual harassment is a violation of state law and will not be tolerated. Any unwelcome sexual advances, requests for sexual favors and other verbal or physical conduct of a sexual nature constitute sexual harassment when:

a) It is stated or implied that submission to such conduct is a term or condition of a person's employment; or
b) Submission to or the rejection of such conduct by a person is used as a basis for any employment decision affecting such person, such as, but not limited to, pay increases, work assignments, promotions, performance evaluation, etc. or;
c) Such conduct has either the purpose or effect of interfering with a person's work performance or creates an intimidating, hostile or offensive work environment.

Any employee or applicant who feels that he or she has been subjected to sexual harassment should report any incidents of sexual harassment to his or her supervisor, or any member of management, without fear of reprisal. The totality of the circumstances, the nature of the alleged harassment and the context in which the alleged incidents occurred should be investigated in determining whether alleged conduct constitutes sexual harassment. Every reasonable effort will be made to maintain confidentiality. Sexual harassment case shall be reported to police for further investigation and prosecution.

CHAPTER TEN: CONCLUSION AND RECOMMENDATIONS

10.1 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 as per the approvals by among others; Nairobi County Physical Planning Department, NEMA and NCA.

During project implementation and occupation, sustainable environmental management will be ensured through avoiding inadequate/inappropriate use of resources, conserving nature 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 cognation that the project is economically and environmentally sound. It is our considerable opinion that the proposed development is a timely venture that will subscribe to proponent's timely investment. It is thus our recommendation that the project be implemented provided the outlined mitigation measures are adhered to. Major concerns should nevertheless be focused towards minimizing the occurrence of impacts that would degrade the general environment. This is possible through implementation of the recommended Environmental Management and Monitoring Plans.

10.2 Recommendations

Recommendations for the prevention and mitigation of adverse impacts are as follows:

- 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.
- It is important that warning/ informative sign 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.
- All solid waste materials and debris resulting from construction activities should be disposed at approved dumpsites.
- All construction materials should be sourced/procured from legalized dealers.
- During construction all loose soils should be compacted to prevent any erosion.
- Other appropriate soil erosion control measures can 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.
- Once earthworks have been done, restoration of the worked areas should be carried out immediately by backfilling, landscaping/levelling and planting of suitable tree species.
- Proper and regular maintenance of machinery and equipment will reduce emission of hazardous fumes and noise resulting from friction of metal bodies. Maintenance should be conducted in a designated area and in a manner not to interfere with the environment.
- A fully equipped first aid kit should be provided within the site.

- Workers should get food that is hygienically prepared. The source of such food should be legalized or closely controlled.
- The contractor should have workmen's compensation cover and is required to comply with workmen's compensation Act as well as other relevant, regulations and Agreements.
- The contractor should provide adequate security during the construction period.
- The proponent should consider installing solar panels.

REFERENCE

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24. Land Registration Act of 2012 Government Printer, Nairobi
25. The National Land Commission Act 2012 Government Printer, Nairobi
26. Nairobi County Integrated Development Plan, 2018

APPENDICES: SEE SEPARATE VOLUME II

Appendix 1: Certificate of Incorporation- Stima Investment Cooperative Society Limited
Appendix 2: KRA PIN Certificate
Appendix 3: Land Ownership Documents
Appendix 4: EIA Experts Practicing Licenses 2023
Appendix 5: EIA Team
Appendix 6: EIA Terms of Reference Approval Letter
Appendix 7: Proposed Site Map
Appendix 8: Approved Architectural Drawings/Site Layout Plan/Perspective/Renders
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