

**AN ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT
FOR THE PROPOSED AFFORDABLE HOUSING PROJECT ON
LAND REGISTRATION NUMBERS 12430/34, 35, 38 & 39 LOCATED
OFF THE KASARANI-MWIKI ROAD WITHIN NAIROBI CITY
COUNTY.**



Site for the proposed Housing project in Mwiki –Kasarani area.

<p>LOCATION: MWIKI, OFF THE KASARANI –MWIKI ROAD, WITHIN NAIROBI,COUNTY</p> <p>PLOT NUMBER: LR NO 12430/34,35, 38 & 39</p> <p>SITE COORDINATES: S01°13'14.5"036 54 42.8E</p> <p>PROPONENT: CENTUM DEVELOPMENT C/o HACO INDUSTRIES COMPANY LTD PO BOX 10518-00100 NBI NAIROBI.</p>	<p>EIA PROJECT REPORT PREPARED BY: JAMES K. NJERU LEAD EXPERT NO. 2146</p> <p>P.O BOX 51681-00100 NAIROBI.</p> <p>TEL: 0720-373711</p> <p>Email: jkithinji@ecopekenya.com</p>
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This Environmental Impact Assessment (EIA) Project Report is submitted to the National Environment Management Authority (NEMA) in conformity with the requirements of the Environmental Management and Coordination Act, 1999 and the Environmental (Impact Assessment and Audit) Regulations, 2003

CERTIFICATION

This Environmental Impact Assessment (EIA) Study report Report was prepared by a team of Licenced EIA/EA Experts and some other professionals in other relevant fields in accordance with the Environmental (Impact Assessment and Audit) regulations for submission to the National Environment Management Authority (NEMA).

I therefore certify that all information contained in this report is accurate and a truthful presentation of all findings as relating to the proposed project.

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ACRONYMS

AHP	AFFORDABLE HOUSING PROGRAM
°C	Degree Celsius
CBD	Central Business District
CPP	Consultation and Public Participation
EA	Environmental Audit
EAC	East African Community
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Co-ordination Act
EMP	Environmental Management/Monitoring Plan
Ha	Hectares
ISWM	Integrated Solid Waste Management
KEBS	Kenya Bureau of Standards
KPLC	Kenya Power and Lighting Company
Km	Kilometres
L.R	Land Registration/Reference
m	Metres
NCW&SC	Nairobi City Water and Sewerage Company
NEC	National Environmental Council
NEMA	National Environment Management Authority
OSHA	Occupational Safety and Health Act
PCs	Private Companies
PPG (E)	Personal Protective Gear (Equipment)
SWM	Solid Waste Management
ToR	Terms of Reference
UNEP	United Nations Environmental Programme

EXECUTIVE SUMMARY

The Government of Kenya, under the leadership of H.E president of the Republic of Kenya, launched some key priority programs and reforms that would not only mark his legacy but also ensure Social and economic transformation for all the Kenyan Citizens. The key programs popularly known as the Big four agenda include Housing, Food and nutrition, Manufacturing and Universal health care for all citizens. The big four agenda is set to be implemented within five years, that's from 2018 to 2022.

This EIA Study report is based on the affordable housing program which is aimed at improving the living conditions of the citizens in major towns across the country. The government, under the leadership of H.E the president is keen on delivering a total of 500,000 affordable units by 2022. The implementation of the program will in addition provide an additional 350,000 jobs; provide market for manufacturers and suppliers and raise the contribution of real estate and construction sector from 7% in 2017 to 14% of GDP. The proponent of the project realized a ripe opportunity to construct some affordable units thus enjoying the Tax holiday and other benefits being offered by the governed as an incentive to the potential developer under the AHP.

CENTUM DEVELOPMENT COMPANY In partnership with HACO INDUSTRIES LTD have come up with a project to support the Government's affordable housing program. They have engaged a qualified and experienced team of Technical professionals to come up with a design which would be implemented. The proposed development would be located in Kasarani area, off the Kasarani -Mwiki road. The project is purely residential and it would consist of the following components as summarised below:

- 3No. Adjoined blocks of 8 floors. i.e. ground plus 7 floors
- The development would be on an area of **0.496Ha**(Total land area) with the development occupying an area of **16,573 M²**
- The development would have a total of **268 units** distributed as following: -
 - ✓ Studio units- -----42 units

- ✓ One bedroom-----84 units
- ✓ Two bedrooms(BAY WINDOW)-----24UNITS
- ✓ TWO BEDROOM(BALCONY)-----94UNITS
- ✓ STUDIO LOFTS-----24 UNITS
- TOTAL NUMBER OF UNITS -----268

- The development would have a Total of 120 Parking slots.

Other features of the project would include: -

- ✓ Mini Tennis and Football Pitch
- ✓ Roof top resident lounge.
- ✓ A borehole on site to provide water to the project
- ✓ Landscaped gardens to promote greenery and aesthetic value of the project.

The Kenya Government policy on such projects, programmes or activities requires that an Environmental Impact Assessment (EIA) be carried out at the planning stages of the proposed development to ensure that significant impacts on the environment are taken into consideration during the design, construction, operation and decommissioning of such projects, programmes or activities. Therefore, in compliance with the law and to avoid unnecessary conflicts that retard development in the country, the proponent undertook this EIA Study and incorporated environmental concerns as required.

The scope of this EIA study, therefore, covered:

- The baseline environmental conditions of the area
- Description of the proposed project,
- Provisions of the relevant environmental laws governing the project.
- Identification and discussion of any adverse negative impacts to the environment anticipated from the proposed project,
- Appropriate mitigation measures against the identified impacts.
- Provision of an Environmental Management Plan (EMP) outline.

Since environmental concerns now need to be part of the planning and development process and not an afterthought, it is therefore advisable to avoid land use conflicts with the surrounding area. To avoid unnecessary conflicts that retard development in the country, the proponent undertook this EIA and incorporated environmental concerns as advised by the Authority. This EIA Study has therefore identified possible environmental impacts that could arise because of the development, assessed them and suggested measures of intervention to minimize the negative impacts.

EIA is a tool for environmental conservation and has been identified as a key component in new project implementation. According to section 58 of the Environmental Management and Coordination Act (EMCA) No.8 of 1999 second schedule 9 (1), and Environmental Impact Assessment and Audit Regulations, 2003, new projects must undergo Environmental Impact Assessment. The Report of the same must be submitted to National Environment Management Authority (NEMA) for approval and issuance of relevant certificates. This was necessary as many forms of development activities cause damage to the environment and hence the greatest challenge today is to maintain sustainable development without interfering with the environment.

Scope, Objective and Criteria of the Environmental Impact Assessment (EIA)

The scope of the assessment covered construction works which included ground preparation, masonry of the proposed development as well as installation of utilities required by the proposed project. The output of this work was a comprehensive EIA study Report for the purposes of applying for an EIA licence.

The consultant on behalf of the proponent conducted the EIA by incorporating but not limited to the following Terms of Reference (ToR) :

- The location of the proposed development. These entails analysis of the proposed site, its characteristics, location, scope etc.
- A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project.
- The technology, procedures and processes to be used in the implementation of the project.
- The materials to be used in the construction and implementation of the project.
- The products, by-products and waste to be generated by the project.
- A description of the potentially affected environment.
- The environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated.
- To recommend a specific environmentally sound and affordable wastewater management system.
- Provide alternative technologies and processes available and reasons for preferring the chosen technology and processes.
- Analysis of alternatives including project site, design and technologies.

- An EMP proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, timeframe and responsibility to implement the measures.
- Provide an action plan for the prevention and management of the foreseeable accidents and hazards in the cause of carrying out development activities.
- Propose measures to prevent health hazards and to ensure security in the working environment for the employees and the management in case of emergencies.
- An identification of gaps in knowledge and uncertainties which were encountered in compiling the information.
- An economic and social analysis of the project.

Methodology Outline

The general steps followed during the assessment were as follows:

- Environment screening, in which the project was identified as among those requiring EIA under schedule 2 of EMCA, 1999
- Environmental scoping that provided the key environmental issues
- Desktop studies and interviews
- Physical inspection of the site and surrounding areas
- Public participation via the use of questionnaires and media advertisements.
- Reporting.

Positive Impacts

The proposed project will come along with numerous positive impacts as exhaustively discussed within the report. They include; provision of affordable housing units, Employment opportunities, gains in the local and national economy, improved security and provision of market for supply of building materials.

Negative Impacts Anticipated from the Proposed Project

The proposed project will as well come along with some negative impacts which include; Use of an undeveloped natural land resulting in a changed landscape. There will be noise, dust and exhaust emissions generated during the construction phase. Pressure on social amenities may also result. Occupational safety risks associated with the development include accidents, risks of fire out-breaks, and increased vehicle traffic along the roads especially during construction.

Mitigation Measures for the Identified Negative Impacts

Mitigation measures to address identified negative impacts include; sprinkling the soils with water to minimize the amount of dust; provision of appropriate Personal Protective

Equipment (PPEs) to the workers during construction; such PPE include dust masks, ear plugs etc; and, sealing of the area during construction for the safety of passers-by. During the operational phase, both solid and liquid wastes will be generated. There should therefore be proper arrangement for the management of such. Fire hazards can also occur in both construction and operational phases. Mechanisms must therefore be put in place to address the fire hazards. Such arrangements include a fire escape plan and the provision of fire fighting equipment. The proposed project is to be developed in an area that is already designated for such developments and hence, no conflict in land use is anticipated.

Conclusion

Considering the positive socio-economic and environmental benefits to accrue as a result of the development, and the EIA having found no major impacts to arise from the development, it is our recommendation that the project be allowed to proceed on the understanding that the proponent will adhere to the mitigation measures recommended herein and will further still implement the proposed Environmental Management Plan (EMP) to the la

1. INTRODUCTION

CENTUM Development Company in partnership with HACO Industries have come up with viable housing project in Kasarani. The project will involve construction of 268 affordable units. The development will involve construction of three blocks of apartments, comprising of ground plus seven floors. The development will provide convenience combined with luxury which will help enhance the quality of life for the inhabitants.

1.1 Background and Rationale for an Environmental Impact Assessment.

Since environmental concerns now need to be part of the planning and development process and not an afterthought, it is therefore advisable to avoid land use conflicts with the surrounding area. To avoid unnecessary conflicts that retard development in the country, the proponent undertook this EIA study and incorporated environmental concerns as advised by the Authority. Finally, a comprehensive Environmental Management Plan is mandatory for such projects.

The proposed site has adequate space for the proposed development. It was recognised that this form of development is likely to impact on the site and the surrounding environment thereby calling for an Environmental Impact Assessment so as to mitigate against any anticipated negative impacts. This was necessary as many forms of developments cause damage to the environment and hence the greatest challenge today is to maintain sustainable development without interfering with the environment.

Environmental Impact Assessment is a tool for environmental conservation and has been identified as a key component in new project implementation. According to section 58 of the Environmental Management and Coordination Act (EMCA) No.8 of 1999 second schedule 9 (1), and Environmental (Impact Assessment and Audit) regulation, 2003, new projects must undergo Environmental Impact Assessment. The report of the same must be submitted to National Environment Management Authority (NEMA) for approval and issuance of relevant certificates.

1.2 Scope, Objective and Criteria of the Environmental Impact Assessment (EIA)

1.2.1 Scope

The Kenya Government policy on all new projects, programmes or activities requires that an EIA be carried out at the planning stages of the proposed undertaking to ensure that significant impacts on the environment are taken into consideration during the design, construction, operation and decommissioning of the facility. The scope of this EIA Study, therefore, covered:

- The baseline environmental conditions of the area. Some of the aspects under the baseline study include population, soils, weather. etc.
- Description of the proposed project. This include the scope of the project and the in depth description of the design.
- Provisions of the relevant environmental laws governing this EIA study.
- Identification and discussion of any adverse impacts to the environment anticipated from the proposed project,
- Appropriate mitigation measures to control the anticipated impacts.
- Provision of an Environmental Management Plan outline.

1.2.2 Terms of Reference (TOR) for the EIA Process

The scope of the assessment covered the project site, surrounding and the utilities under the project. The output of this work is a comprehensive EIA Study report for the purposes of applying for an EIA licence.

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

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

The main objective of the assignment was to assist the proponent to prepare a Study report after carrying out an EIA of the project site to ensure that the proposed development takes into consideration appropriate measures to mitigate any adverse impacts to the environment. The assessment identified existing and potential environmental impacts and possible concerns that interested and/or affected parties have with the development, as well as the associated prevention and mitigation measures for the negative impacts as stipulated in the proposed EMP.

The consultant on behalf of the proponent conducted the assessment by incorporating the following terms of reference:

- The proposed location of the project. The site characteristics and the surrounding environment.

- A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project.
- The objectives of the project. What's the purpose and end use of the project?
- The technology, procedures and processes to be used, in the implementation of the project.
- The materials to be used in the construction and implementation of the project.
- The products, by-products and waste to be generated by the project in all its phases.
- A description of the potentially affected environment.
- The environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated.
- To recommend a specific environmentally sound and affordable waste management system.
- Analysis of alternatives including project site, design and technologies to be used.
- An EMP proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, timeframe and responsibility to implement the measures.
- Provide an action plan for the prevention and management of the foreseeable accidents and hazardous activities in the cause of carrying out development activities.
- Propose measures to prevent health hazards and to ensure security in the working environment for the employees, residents and for the management in case of emergencies.
- An identification of gaps in knowledge and uncertainties which were encountered in compiling the information.
- An economic and social analysis of the project.
- Such other matters as the Authority may require.

1.2.3 Data Collection Procedures

The data collection was carried out through questionnaires/standard interview schedules, use of checklists, observations and photography, site visits and desktop environmental studies, where necessary in the manner specified in Part V (section 31-41) of the Environmental (Impact Assessment and Audit) Regulations, 2003.

1.2.4 Reporting and Documentation

The EIA Study Report from the findings was compiled in accordance with the guidelines issued by NEMA for such works and was prepared for submission by the proponent for consideration and approval. The Consultant ensured constant briefing of the client during the exercise.

1.2.5 Responsibilities and Undertakings

The Consultant undertook to meet all logistical costs relating to the assignment, including those of production of the report and any other relevant material.

The consultant arranged for own transport and travel during the exercise. On the other hand, the proponent who is CENTUM together with Haco Industries provided contact persons to provide information required by the consultant. The output from the consultants includes the following:-

- An EIA Study report comprising of an executive summary, study approach, baseline conditions, anticipated impacts and proposed mitigation measures,
- An EMP outline which also forms part of the report recommendations.

1.2.6 Methodology Outline

The general steps followed during the assessment were as follows:

- Environment screening, in which the project was identified as among those requiring EIA under schedule 2 of EMCA, 1999
- Environmental scoping that provided the key environmental issues
- Desktop studies and interviews
- Physical inspection of the site and the surrounding areas
- EIA Public participation by the use of questionnaires
- Advertisement in the Kenya Gazette, Newspaper and the radio.
- Reporting.

1.2.6.1 Environmental Screening

This step was applied to determine whether an EIA was required and what level of assessment was necessary. This was done in reference to requirements of the EMCA, 1999, Second Schedule. Issues considered included the Scope of the project, the physical location of the site and its characteristics, sensitive issues and nature of anticipated impacts.

1.2.6.2 Environmental Scoping

The scoping process helped narrow down onto the most critical issues requiring attention during the assessment. The scoping process was done in coordination with the public. Environmental issues were categorized into physical, natural/ecological and social, economic and cultural aspects.

1.2.6.3 Desktop Study

This included documentary review on the nature of the proposed activities, project documents, designs policy and legislative framework as well as the environmental setting of the area among others. It also included review of previous assessment reports.

1.2.6.4 Site Assessment and Public Participation

Field visits were meant for physical inspections of the site characteristics and the environmental status of the surrounding areas to determine the anticipated impacts. To ensure adequate public participation in the EIA process, questionnaires were administered to the site's neighbours within a 1 km radius and the information gathered was subsequently synthesised and incorporated into the EIA project report. In addition to the sites public participation, adverts will also be done on the newspaper and Kenya Gazette as a way of capturing a wider number of people for comments and views regarding the project.

1.2.6.5 Reporting

In addition to constant briefing of the client, this EIA Study report was prepared. The contents will be presented for submission to NEMA as required by law.

2.0 PROPOSED PROJECT DESCRIPTION

2.1 Location and Access of the Project Site

The site for the proposed project is located in Mwiki area within the Kasarani region. The Project will be on 4No adjoining plots that are located at a distance of about 1Km from the Mwiki- Kasarani road. The plot is located in an area dominated by multi-dwelling units (flats and apartments). The key salient developments near the site include HACO industries, the DHL Logistics Company, Stardom hotel and the Ongata construction yard.

Plate 1: Project Site with some neighbouring developments.



Site for the proposed residential units.

STARDOM Hotel neighbouring the site

**The site is located between Haco Brands and The Stardom Hotel*



LOCATION OF THE SITE FOR THE PROPOSED AFFORDABLE HOUSING PROJECT

2.2 Design of the project

The proposed development will involve construction of three adjoining blocks of apartments which will sit on 4 No Plots numbered as 12430/34, 35, 38 and 39. The three blocks will comprise of ground plus 7 floors (G+7). With a total of 268 Units. The composition of the individual apartment's blocks will include Studio units, One bedroom, Two bedroom with window bay, Two bedroom with Balcony and Studio lofts. Interm of distribution, the units will be as follows:-

- ✓ Studio units- -----42 units
- ✓ One bedroom-----84 units
- ✓ Two bedrooms(BAY WINDOW)-----24UNITS

✓ TWO BEDROOM(BALCONY)-----	94UNITS
✓ STUDIO LOFTS-----	24 UNITS
TOTAL NUMBER OF UNITS -----	268

The affordable residential apartments will also have services, amenities and features that are exceptional and very luxurious. These include: adequate parking for residents; 24 hour security including CCTV as well as controlled access; reliable and portable Borehole water supply; Reliable power source plus back-up generators; High-speed internet access; sustainable and well landscaped environment. There will also be some indoor game courts and a residents lounge at the rooftop of the three blocks.

The development would be on an area of **0.496Ha** (Total land area) with the development occupying an area of **16,573 M²**

The development will take into account the orientation and environmental considerations through maximising the utilization of natural light and adopting an orientation that creates a serene environment for comfortable working as well as living. The apartments will also be developed using green building initiatives in order to create a sustainable design. Some of the components to be utilized to promote this will be; Renewable solar energy generation, harnessing of rainwater, promoting water conservation, incorporating occupation sensors in order to control lighting among other initiatives.

The developers will also ensure that the development is in character with the surrounding thus creating a proper blend with the general environment in which the property exists. The project will ensure that it provides facilities for the disabled persons. Shared facilities will be availed and this will include indoor games courts, common landscaped areas, parking slots, a guard house at the main entrance etc.

The proposed apartment is termed sustainable because its construction will ensure that several aspects are considered in the general development. Some of these components include: Availability of a centrally located information technology; proper ventilation comprising of natural air conditioning; Efficient lighting that relies on natural lighting for the day as well as providing emergency lighting; Provision for a reliable power supply consisting of acoustic backup generator, solar power etc. In addition, there will be an easy and safe access to the roofs; dependable water supply and adequate water storage facilities; enhancing security through controlled access together with use of other equipment such as the CCTV, anti-vehicle intrusion system among others. Other aspects to be incorporated include; environmental control measures such as use of solar screens; enhancement of vertical circulation which will include medium speed lifts, airy main staircase and a fire escape staircases; sound fire safety components that will comprise of sprinkler system, fire hydrants & extinguishers, fire detection

and alarm system among others. The design is oriented towards providing for a building management and control systems in place for; air conditioning, fire sprinkler, alarm & lighting control, water & power supply and their subsequent fault detection systems. Lastly, ensuring that the external areas within and those adjacent to the property are in good condition such as pedestrian walkways, perimeter fence and the general landscaping.

2.2.1 Electrical system

The building will be connected to the electricity main line of the Kenya Power and Lighting Company, which will be used in all phases of the project. The discharge of this task will aim at providing adequate energy efficient lighting levels incorporating lighting controls. Lighting controls will be in use as part of a high quality energy efficient lighting system that integrates daylight and electric light sources to produce a comfortable and visually interesting environment for the occupants.

Lighting fittings will be carefully selected to match the proposed ceiling plans and architectural aesthetics. Ablution areas and corridors will be fitted with Circular Opal diffuser while bulkheads on walls will be used for external security lighting. Lighting in the units will consist largely of pendant fittings with ceiling roses; this is because occupiers usually change fittings they find to their own specifications.

All wiring to light fittings will comply with IEE regulations and KPLC by-laws and Regulations.

2.2.2 Waste water/ Solid waste

Waste water from the project site will be discharged through the drainage systems into the public sewer line. Solid waste management will consist of house collections using garbage bags; the bags are then taken to the solid waste cubicle to await collection and disposal by private refuse collectors.

2.2.3 Storm water run-off

The flat roofs of the proposed building will have an outlet leading to a vertical pipe usually cast in columns for this sort of building. The pipes take the water to the ground and the water will be collected in water tanks.

2.2.4 Fire protection

A fire alarm system to detect and warn of fires will be provided. This will consist generally of a control panel located at the manned security point. Within the buildings portable fire extinguishers will be provided. A fire sprinkler installation should be set up in the area. This installation has mechanisms that detect fire and automatically spray the area with water to reduce the chances of fire spreading to other parts.

2.2.5 Standby generator

The proposed automatic generator is to serve the units' power and lighting requirements in cases of blackouts. The proposed generator is supplied in a sound proof canopy.

2.3 Description of the project's construction activities

2.3.1 Excavation and foundation works

Excavation will be carried out to prepare the site for construction of foundations, pavements and drainage systems. These involve; clearing of the all vegetation, shrubs, small trees and allow for removal of ant nests. The excavation should be free from all water including spring and running water.

2.3.2 Storage of materials

Building materials will be stored on site. Bulky materials such as rough stones, ballast, sand and steel will be carefully piled on site. Materials such as cement, paints and glasses among others will be stored in temporary storage structures built for this purpose.

2.3.3 Masonry, concrete work and related activities

The construction of the building walls, foundations, floors, pavements, drainage systems, perimeter wall among other components of the project involves a lot of masonry work and related activities. General masonry and related activities include stone shaping, concrete mixing, plastering, slab construction, construction of foundations, and erection of building walls and curing of fresh concrete surfaces. These activities are known to be labour intensive and are supplemented by machinery such as concrete mixers.

2.3.4 Structural steel works

The houses will be reinforced with structural steel for stability. Structural steel works involve steel cutting, welding and erection.

2.3.5 Roofing works

The roofing design for this apartments will be flat roof (made of concrete) this is to enable the users access the roofs and utilize the indoor courts situated on top of the buildings.

2.3.6 Electrical work

Electrical work during construction of the apartment will include installation of electrical gadgets and appliances including electrical cables, lighting apparatus, sockets etc. In addition, there will be other activities involving the use of electricity such as welding and metal cutting.

2.3.7 Plumbing

Installation of pipe-work will be done to connect sewage from the sanitary facilities to a sewer system. Plumbing and drainage activities will be carried out by an approved sub-contractor, in accordance with specifications to the satisfaction of the electrical and mechanical engineers.

2.4 Description of the project's operational activities

2.4.1 Solid waste and waste water management

The proponent will provide facilities for handling solid waste generated within the facility. These will include a solid waste cubicle for temporarily holding waste within the premises before final disposal at designated sites. Sewage generated from the houses will be discharged into the sewer trunk within the site locality, while storm water from the buildings' roof will be collected as rain water into water tanks.

2.4.2 Cleaning

The proponent will be responsible for ensuring regular washing and cleaning of the pavements, the car park areas, staircases etc. Cleaning operations will involve the use of water, disinfectants and detergents.

2.4.3 General repairs and maintenance

The apartment buildings will be repaired and maintained regularly during the operational phase of the project. Such activities will include repair of building walls and floors, repair and maintenance of electrical gadgets, painting and replacement of worn out materials among others.

2.5 Description of the project's decommissioning activities

2.5.1 Demolition works

Upon decommissioning, the project components including buildings, pavements, drainage systems and associated facilities will be demolished. This will produce a lot of solid waste, which will be re-used for other construction works or if not re-usable, disposed of appropriately by a licensed waste disposal company.

2.5.2 Dismantling of equipment and fixtures

All equipment including electrical installations, finishing fixtures, 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 these 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.

2.5.3 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 top soil and re-vegetation using indigenous plant species.

2.6 Project Budget.

The proposed project is estimated to cost approximately 629,500,000.00 (-Six Hundred and Twenty Nine Millions, Five Hundred Thousands. These include the actual cost of purchasing materials, labour cost and all miscellaneous expenses expected to be incurred in the implementation process of the residential apartment.

3.0 BASELINE INFORMATION OF THE STUDY AREA

3.1 Geographical Location

The Nairobi city is the capital of the Republic of Kenya and also a centre of administration, politics, economy and culture of Kenya. It accounts for 50% of formal employment in Kenya and generates over 50% of the GDP. It is situated in the southern part of the country at an altitude of 1,660metres above sea level. It borders Kiambu County to the North West, North and North East, Machakos County to the East and South East and Kajiado County to the South, South West and West.

3.2 Population

According to the 2009 Kenya Population and Housing Census the population was 3,138,369 with a population density of 4,515 people per Km² and an annual growth rate of 4.1%. Age Distribution was 0-14 years 30.3%, 15-64 years 68.5 % and over 65 years 1.2%.

3.3 Climate

The climate of the proposed project site compares to that of the wider Nairobi City. Below is a summary of the climatic conditions of Nairobi where the proposed project is to be situated.

a) Nairobi Climate and Weather

The climate in Nairobi City is usually dry and cool between July and August but hot and dry in January and February. The average annual rainfall in Nairobi is about 900mm. The first peak of monthly rainfall occurs in April and the second peak takes place in November. The mean daily maximum temperature by month ranges from 280C to 220C and the minimum ranges from 140C to 120C.

b) Nairobi Winds

The wind near the ground is predominantly easterly throughout the year, generally between north-east and east from October to April, and between east and south-east from May to September. The strongest winds occur during the dry season just prior to the “Long Rains” when speeds of 20 to 25 M.P.H. are common from mid-morning to early afternoon; at other times of the year wind speeds are usually 10 to 15 m.p.h. During the night the wind is usually light. In the squalls sometimes associated with thunderstorms, short-lived winds of up to 7m.p.h. have been known to occur (*Source www.meteo.go.ke*).

c) Precipitation

Nairobi has a bimodal rainfall pattern, in which the maxima occur in March-April (long rains) and November-December (short rains). The simple rainfall regime is complicated by the uncertainty of rainfall from year to year.

Thunderstorms may occur, nearly always during the afternoon or evening, during most months of the year but they are rare during the period June/August.

Hail is comparatively rare in Nairobi, being reported at any station on average less than once a year unlike other areas such as the western part of Kenya.

d) Sunshine and Solar Radiation

Nairobi experiences a total of about 2,500 hours of bright sunshine per annum, which is equivalent to an annual mean of approximately 6.8 hours of sunshine per day. July and August are characterized by cloudiness and during these months the average daily sunshine in

Nairobi is 4 hours. Often there are several days in succession when the sun fails to penetrate the thick stratocumulus cover, although on other days the cloud cover does break for a short period.

There is about 30% more sunshine in the afternoon than in the morning, and it follows that westerly exposures receive more insulation than easterly ones.

e) Evaporation

Given temperature and sunshine factors, the annual variation of evaporation is as expected. The mean annual evaporation as measured by the pan is seen slightly to exceed the mean rainfall at the altitude of Nairobi, but it would be expected that at higher altitudes this position would be reversed.

f) Smog

Smog is common during the rainy season. Most common hazards to flying occur during this period. This is mostly associated with the development of towering cumulus and cumulonimbus clouds. A further hazard common in Nairobi is the formation of low stratus clouds during the early morning.

3.4 Economic Activities

3.4.1 Industries

Nairobi is also the largest industrial center. The principal products include processed food, beer, vehicles, soaps, construction material, engineering, textiles, and chemicals. There is also a thriving sector that provides employment to carpenters, metal workers, furniture makers, vehicle repairmen, and retailers. The proposed site has a few industries around it, this include HACO INDUSTRIES, Tropical brands and other service industries like DHL

3.4.2 Financial Services

There are over 40 Commercial Banks which have their headquarters and branches all over the city with some International banks having their regional headquarters here. There are also over 45 Micro-Finance Institutions which also have their country and regional bases here.

3.4.3 Tourism

The major attraction in the city is The Nairobi National Park. The first national park established in Kenya in 1946, the 117km² park is the only wildlife park in the world where free ranging lions and rhinos share a city with humans. It is the only protected wildlife area in the world bordering a capital city and dubbed “The World’s only wildlife capital’.

The park’s main gate is 10km from the city-centre and the fence runs parallel to the city.

Major wildlife attractions are the black rhino and the white rhino (not indigenous), lion, leopard, cheetah, hyena, buffaloes, giraffe, zebra, wildebeest, elands and 400 species of birds. Other attractions include the Ivory burning site Monument, Nairobi Safari Walk, the Orphanage and the walking trails at hippo pools.

Other attractions are; The Nairobi National Museum, Uhuru Gardens, Uhuru Park, City Park, Nairobi Arboretum, Kenya National Archives, Karen Blixen Museum, Ostrich Farm, Giraffe centre, Daphne Sheldrick Elephant Orphanage, Prof. Murumbi Peace and Memorial Centre.

Landmarks in the City include but are not limited to; The KICC which is the only building with a helipad in the City, Tom Mboya Monument, Dedan Kimathi Monument, Ngong Hills among others.

3.5 Health

Nairobi City has 782 health facilities with 2 Referral Hospitals, 4 District Hospitals, 176 Dispensaries, 75 Health Centres, 401 Medical Clinics and 14 maternity homes, 21 Nursing homes, 49 VCTs and 40 others.

Notable institutions: The Kenyatta National Hospital, The Nairobi Hospital, The Aga Khan Hospital Gertrude’s Children’s hospital, Mater Hospital, Kenya University Teaching and Referral Hospital, The Karen Hospital among others.

3.6 Education.

As at 2007, the County had 1,241 Primary schools with an enrolment of 335,056 pupils and a teacher to pupil ratio of 1:39 and 335 Secondary schools with an enrolment of 49,728 pupils and a teacher to pupil ratio of 1:15.

Tertiary institutions in the county are over 60. These include universities; Nairobi University, Kenyatta University, USIU, University Satellite Campuses, Youth Polytechnics, Medical Colleges, Teacher Training Colleges, Technical Colleges, Aviation Colleges, Hospitality Colleges, and Commercial Colleges among others.

4.0 RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORK

4.1 Introduction

It is part of Legal requirements within the Laws of Kenya that such developments adheres to certain legal parameters. This section therefore describes the Policy, Legal, and Institutional framework pertaining to the proposed development. The policy, legal and institutional frameworks have been put in place to ensure that development projects adhere to environmental conservation at all times. As development activities have the potential to damage the environment, it is a challenge today to ensure that development efforts are sustainable.

The proposed development will change the landscape and among the environmental changes to be observed include opening up of land, exposure of the soils and soil erosion etc. It is these issues amongst others that legislation sets to address. Through recognizing the importance of environmental conservation in all development endeavours, the Kenya government put in place a wide range of policy, institutional and legislative frameworks to guide developments in Kenya in the process of minimizing environmental degradation.

4.2 Environmental policy

In order to achieve economic development goals while safeguarding environmental integrity, the Kenya Government put in place the EMCA, 1999 to coordinate environmental activities in the country. The broad objectives of the national environmental policy include;

- Optimal use of natural resources while improving environmental quality;
- To conserve resources such that the resources meet the needs of the present without jeopardizing future generations in enjoying the same;
- Develop awareness that inculcate environmental stewardship among the citizenship of the country;
- Integrate environmental conservation and economic activities in the development process;
- Ensure that national environmental goals contribute to international obligations on environmental management.

To achieve this, it is a policy direction that appropriate reviews and evaluations of developmental plans and operations are checked to ensure compliance with the environmental policy.

4.3 Institutional arrangements

At present, there are over twenty (20) institutions and departments, which deal with environmental issues in Kenya. Some of the key institutions include the National Environmental Council (NEC), National Environmental Management Authority (NEMA), the

Kenya Forest Service, Kenya Wildlife Services (KWS), Environment Departments within the Counties and others. There are also local and international NGOs involved in environmental issues in the country. From the above institutions, NEMA plays the regulatory role in the management of environment in Kenya.

4.4 Legal Framework

There are several legal provisions on environmental protection, which touch on and regulate the development of infrastructure like the one under this proposal. A summary of the various legislations relevant to the development is given hereunder. The following pieces of legislation and regulations are applicable to the proposed development.

4.4.1 The Environmental Management and Coordination Act, 1999

The act defines the legal and administrative co-ordination of the diverse sectoral initiatives in the field of environment. The act harmonizes the sector specific legislations touching on the environment in a manner designed to ensure greater protection of the environment. This act is guided policy wise by the National Environmental Council, while the day-to-day enforcement falls under the Director General of the National Environmental Management Authority. Thus NEMA enforces the Act on behalf of the Cabinet Secretary for Environment. Its functions include:-

- The coordination of various environmental management activities;
- Advise the Government on legislative and other measures for the management of the environment ;
- Research, investigations, and surveys on the field of environment.
- Creation of environmental education and awareness programmes;
- Advise the government on regional and international agreements to which Kenya is party to;
- Executing the Environmental Impact Assessment (EIA) under the Environmental Impact (Assessment and Auditing) regulations, 2003, among other duties.

This Project falls within Schedule 2 of EMCA 1999 and therefore requires an EIA. The Proponent has commissioned the EIA Study in compliance with the Act. The Proponent shall be required to commit to implementing the environmental management plan laid out in this report and any other conditions laid out by NEMA, prior to being issued an EIA license.

4.4.1.1 The Environmental Impact (Assessment and Auditing) Regulations, 2003

Environmental Impact Assessment under the act is guided by the Environmental Impact Assessment (Assessment and Auditing) Regulations of the year 2003, which is given under legal notice no. 101. The regulations stipulate the ways in which environment impact assessment and audits should be conducted. The project falls under the second schedule of EMCA, 1999 section 58 (1), (4) that require an Environmental Impact study. As stipulated by

the legal notice No. 101, 2003, PART V, Section 31 (3) (a) (i) and (ii) it is required that an environmental assessment be undertaken to provide baseline information upon which subsequent environmental control audit shall be based.

This report complies with the requirements of the Environmental regulations in the coverage of environmental issues, project details, impacts, legislation, mitigation measures, management plans and procedures. The Proponent shall be required to commit to implementing the environmental management plan laid out in this report and any other conditions laid out by NEMA.

4.4.1.2 Water Quality Regulations, 2006 (Legal notice No. 121)

Water Quality Regulations apply to water used for domestic, industrial, agricultural, and recreational purposes; water used for fisheries and wildlife purposes, and water used for any other purposes. Different standards apply to different modes of usage. These regulations provide for the protection of lakes, rivers, streams, springs, wells and other water sources. The objective of the regulations is to protect human health and the environment. The effective enforcement of the water quality regulations will lead to a marked reduction of water-borne diseases and hence a reduction in the health budget. The regulations also provide guidelines and standards for the discharge of poisons, toxins, noxious, radioactive waste or other pollutants into the aquatic environment in line with the Third Schedule of the regulations. The regulations have standards for discharge of effluent into the sewer and aquatic environment. While it is the responsibility of the sewerage service providers to regulate discharges into sewer lines based on the given specifications, NEMA regulates discharge of all effluent into the aquatic environment.

Everyone is required to refrain from any actions, which directly or indirectly cause water pollution, whether or not the water resource was polluted before the enactment of the Environmental Management and Coordination Act (EMCA) Gazetted in 1999. It is an offence to contravene the provisions of these regulations with a fine not exceeding five hundred thousand shillings.

4.4.1.3 Waste Management Regulations, 2006 (Legal notice No. 121)

The Minister for Environment and Natural Resources gazetted these regulations in 2006. These Regulations may be cited as the Environmental Management and Coordination (Waste Management) Regulations, 2006. Waste Management Regulations are meant to streamline the handling, transportation and disposal of various types of waste. The aim of the Waste Management Regulations is to protect human health and the environment. Currently, different types of waste are dumped haphazardly posing serious environmental and health concerns. The regulations place emphasis on waste minimization, cleaner production and separation of waste at source.

The Proponent shall observe the guidelines as set out in the environmental management plan laid out in this report as well as the recommendation provided for mitigation /minimization /avoidance of adverse impacts arising from the project activities.

4.4.1.4 Air Quality Regulations, 2008

The objective of these regulations is to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. It provides for the establishment of emission standards for various sources, including as mobile sources (e.g. motor vehicles) and stationary sources (e.g. industries) as outlined in the Environmental Management and Coordination Act, 1999. It also covers any other air pollution source as may be determined by the Minister in consultation with the Authority. Emission limits for various areas and facilities have been set. The regulations provide the procedure for designating controlled areas, and the objectives of air quality management plans for these areas.

The Proponent shall observe policy and regulatory requirements and implement the mitigation measures proposed in this document in an effort to comply with the provisions of these Regulations on abatement of air pollution.

4.4.1.5 Noise and Excessive Vibration Pollution Control Regulations, 2009

These regulations were published as legal Notice No. 61 being a subsidiary legislation to the Environmental Management and Co-ordination Act, 1999. The regulations provide information on the following: -

- Prohibition of excessive noise and vibration
- Provisions relating to noise from certain sources
- Provisions relating to licensing procedures for certain activities with a potential of emitting excessive noise and/or vibrations and
- Noise and excessive vibrations mapping

According to regulation 3 (1), 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. Regulation 4 prohibits any person to (a) make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or (b) cause to be made excessive vibrations which exceed 0.5 centimeters per second beyond any source property boundary or 30metres from any moving source. Regulation 5 further makes it an offence for any person to make, continue or cause to be made or continued any noise in excess of the noise levels set in the First Schedule to these Regulations, unless such noise is reasonably necessary to the preservation of life, health, safety or property.

The Proponent shall observe policy and regulatory requirements and implement the measures proposed in this documenting an effort to comply with the provisions of the Regulations.

4.4.2 The Physical and Land use Planning Act; 2019.

The PLPA (2019) stipulates under clause 56 and 57 that:

56) Subject to the provisions of this Act, the Urban Areas and Cities Act, 2011, and the County Governments Act, 2012, the County Governments shall have the power within their areas of jurisdiction to –

- (a) Prohibit or control the use and development of land and buildings in the interests of proper and orderly development of its area;
- (b) Control or prohibit the subdivision of land;
- (c) Consider and approve all development applications and grant all development permissions;
- (d) Ensure the proper execution and implementation of approved physical and land use development plans;
- (e) Formulate by-laws to regulate zoning in respect of use and density of development;
- (f) reserve and maintain all the land planned for open spaces, parks, urban forests and green belts in accordance with the approved physical and land use development plans; and
- (g) Consider and determine development planning applications made in respect of land adjoining or within reasonable vicinity of safeguarding areas. Power to undertake development control

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 both.

This act provide for the preparation and implementation of physical development plans and for connected purposes enacted by the Parliament of Kenya Under this Act, no person shall carry out development within the area of a local authority without a development permission granted by the local authority under section 33. The local authority concerned shall require the developer to restore the land on which such development has taken place to its original condition within a period of not more than ninety days. If on the expiry of the ninety days' notice given to the developer such restoration has not been effected the concerned local authority shall restore the site to its original condition and recover the cost incurred thereto from the developer.

The Proponent shall secure all mandatory approvals and permits as required by the law. These should be obtained before the ground breaking.

4.4.3 Building Code 2000

Section 194 requires that where sewer exists, the occupants of the nearby premises shall apply to the local authority for a permit to connect to the sewer line and all the wastewater must be discharged into sewers. The code also prohibits construction of structures or buildings on sewer lines.

4.4.4 Electricity Power Act No. 11 of 1997

The Electric Power Act No. 11 enacted in 1997 deals with generation, transmission, distribution, supply and use of electrical energy as well as the legal basis for establishing the systems associated with these purposes. In this respect, the following environmental issues will be considered before approval is granted:

- The need to protect and manage the environment, and conserve natural resources;
- The ability to operate in a manner designated to protect the health and safety of the project employees; the local and other potentially affected communities.

Under schedule 3 of the Electric Power (licensing) Regulations 2003, it is mandatory to comply with all safety, health, and environmental laws. Moreover, schedule 2 (regulation 9) of the Electric Power (licensing) Regulations 2003 stipulates that licensing and authorisation to generate and transmit electrical power must be supported by the following documents which are approved by NEMA.

- Environmental Impact Assessment Report (EIA) or
- Initial Environmental Audit Report (IEA) and
- Environmental Management Plan (EMP)

4.4.5 The Land Registration Act, 2012

The Land Registration Act is in place to revise, consolidate and rationalize the registration of titles to land, to give effect to the principles and objects of devolved government in land registration, and for connected purposes. This Act applies to Subject to section 4, this Act shall apply to:

- Registration of interests in all public land as declared by Article 62 of the Constitution;
- Registration of interests in all private land as declared by Article 64 of the Constitution;
- and
- Registration and recording of community interests in land.

Section 24 states that:(a) the registration of a person as the proprietor of land shall vest in that person the absolute ownership of that land together with all rights and privileges belonging or appurtenant thereto; and (b) the registration of a person as the proprietor of a lease shall vest in that person the leasehold interest described in the lease, together with all implied and expressed rights and privileges belonging or appurtenant thereto and subject to all implied or expressed agreements, liabilities or incidents of the lease.

4.4.6 The Environment and Land Court Act, 2011

This Act is in place to give effect to Article 162(2) (b) of the Constitution; to establish a superior court to hear and determine disputes relating to the environment and the use and occupation of, and title to, land, and to make provision for its jurisdiction functions and powers, and for connected purposes.

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

Section 5 of the Act outlines the Functions of the Commission, pursuant to Article 67(2) of the Constitution as follows 5(1):-

- To manage public land on behalf of the national and county governments;
- To recommend a national land policy to the national government;
- To advise the national government on a comprehensive programme for the registration of title in land throughout Kenya;
- To conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities;
- To initiate investigations, on its own initiative .or on a complaint, into present or historical land injustices, and recommend appropriate redress;
- To encourage the application of traditional dispute resolution mechanisms in land conflicts;
- To assess tax on land and premiums on immovable property in any area designated by law; and
- To monitor and have oversight responsibilities over land use planning throughout the country.

4.4.8 The Land Act, 2012

This is an Act of Parliament to give effect to Article 68 of the Constitution, to revise, consolidate and rationalize land laws; to provide for the sustainable administration and management of land and land based resources, and for connected purposes. Part viii of this Act provides procedures for compulsory acquisition of interests in land. Section 111 (1) States that if land is acquired compulsorily under this Act, just compensation shall be paid promptly in full to all persons whose interests in the land have been determined. The Act also provides for settlement programs. Any dispute arising out of any matter provided for under this Act may be referred to the Land and Environment Court for determination.

4.4.9 Land Adjudication Act, 2010

This Act applies to any area of Trust land where the County in whom the land is vested so requests; and the Minister considers it expedient that the rights and interests of persons in the land should be ascertained and registered; and where the Land Consolidation Act does not apply to the area.

4.4.10 Forestry Act (Cap 385)

This forestry Act is implemented by the Ministry of Environment and Natural Resources and its provisions for the establishment, control, and regulation of central forest and other forests of Kenya. It encourages sustainable conservation of all types of vegetation. The Act is enforced by the conservator of forests while research issues are undertaken by the Kenya Forestry Research Institute.

4.4.11 The Public Health Act; Laws of Kenya, chapter 242

The act prohibits activities that may be injurious to human health. It then becomes the responsibility of the local authority to maintain clean and sanitary conditions. This Act:

- Calls for cleanliness of premises;
- Calls for supply of potable water for human purposes;
- Offers guidelines on waste water disposal and management; and
- Prohibits the discharge of emissions that may be injurious to health.

4.4.12 The Occupational Safety and Health Act, 2007

This Act applies to all workplaces where any person is at work, whether temporarily or permanently. 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. Some of the areas addressed here are machinery safety, chemical safety and health and safety. Failure to comply with the OSHA, 2007 attracts penalties of up to Ksh 300,000 or 3 months jail term or both or penalties of Ksh 1,000,000 or 12 months jail term or both for cases where death occurs and is in consequence of the employer.

The report advises the Proponent on safety and health aspects, potential impacts, personnel responsible for implementation and monitoring, frequency of monitoring, and estimated cost, as a basic guideline for the management of Health and Safety issues in the proposed project.

4.4.13 The Water Act 2016

The Water Act, 2016 provides the legal framework for the management, conservation, use and control of water resources and for the acquisition and regulation of right to use water in Kenya. It also provides for the regulation and management of water supply and sewerage services. In general, the Act gives provisions regarding ownership of water, institutional framework, national water resources and management strategies, requirements for permits, state schemes and community projects. Part IV of the Act addresses the issues of water supply and sewerage. Observation of the requirements of the Act shall be observed by the proponent especially during the construction and even during the operation stages.

5 PUBLIC PARTICIPATION

5.1 Introduction

This chapter describes the process of the public consultation/participation followed to identify the key issues and impacts of the proposed project. Views from the general public, local leaders, surrounding institutions and development partners who in one way or the other would be affected by the proposed project were sought. Door to door public consultations were conducted for the stakeholders neighbouring the project site and the findings were comprehensively analysed. The proposed mitigation measures suggested by the public, neighbours and other stakeholders have been integrated in the report.

5.2 Objectives of the consultation and public participation

The objective of the Consultation and Public Participation (CPP) as required in EMCA, 1999 was to:-

1. Disseminate and inform the public and other stakeholders about the proposed project with special reference to its key components, location and expected impacts.
2. Create awareness among the public on the need for the EIA for the proposed project.
3. Gather comments, concerns and suggestions of the interested and, would be affected/interested parties.
4. Ensure that the concerns of the interested and, would be affected/interested parties were known to the decision-making bodies and the proponent at an early phase of project development planning.
5. Establish a communication channel between the interested, would be affected/interested parties, the team of consultants and the Government.
6. Incorporate the information collected in the project by EIA Experts.

The purpose for such a process was to identify the positive and negative impacts of the project and subsequently suggest mitigation measures. It also helped in identifying other miscellaneous issues which may bring conflicts during project implementation phase.

5.3 Methodology used in the CPP

The Consultation and Public Participation (CPP) Process is a policy requirement by the Government of Kenya and a mandatory procedure as stipulated by EMCA 1999 section 58, on Environmental Impact Assessment for the purpose of achieving the fundamental principles of sustainable development. In general, the following Steps were followed in carrying out the entire CPP process:-

- I. Identification of institutions and individuals interested in the process.
- II. Administration of questionnaires to the different target groups and local community members along and around the proposed project Site.

5.4 Major Environmental concerns raised

This Sub-Section highlights both positive and negative socio-economic and environmental impacts anticipated during the construction and operational phases of the project. This is followed by suggested mitigation measures that the developer should incorporate to minimize environmental degradation and promote sustainable development. This section ends by highlighting the opinions and expectations of the stakeholders.

5.4.1 Positive Issues

5.4.1.1 Creation of Employment

The respondents were optimistic that the construction of the proposed apartment building will open up new job of opportunities. The respondents expressed hope that other people especially the youth will be able to access employment once the project commences mostly as casual workers. This will be a source of income for several individuals and households and hence is expected to boost the GDP and improve the living standards of the local people.

5.4.1.2 Improving Growth of the Economy

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

5.4.1.3 Increased housing

The introduction of County Governments has led to the increased demand of house units due to increases populations looking for job opportunities. Therefore construction of the proposed Affordable houses within Nairobi County will effectively deal with the increased demand. The target market for the units will be; consultants, middle class aiming to own a first home, newly employed graduates, small scale business people and retirees with some disposable amount to spend on an urban home.

5.4.1.4 Improved Security

The local residents were optimistic that the establishment of the housing project will lead to improved security in the neighbourhood. This is due to the fact that the empty plot will be developed preventing the possibility of the plot being used as a criminal hide out.

5.4.2 Negative Issues

5.4.2.1 Increase of traffic during construction

The stakeholders raised concerns of the possibility of the place attracting more traffic caused by heavy trucks transporting construction materials to the site. This will inconvenience other road users. The increased traffic of heavy duty vehicles would also damage the roads leading to the site. The safety of children on the roads with the increased traffic especially of heavy duty vehicles was also a concern to the residents.

5.4.2.2 Dust emissions

The neighbours expressed concern over possibility of generation of large amount of dust and fumes within the project site and surrounding areas as a result of excavation works and transportation of construction materials. They requested the proponent to keep dust levels within the required limits and be mindful of the neighbourhood by sprinkling water and covering the site till the project is complete.

5.4.2.3 Noise pollution and Vibrations

The construction works on site will most likely have noise pollution due to the moving machines to be used in the excavation and construction, incoming vehicles to deliver construction materials, workers on site and other normal construction activities. This may prove to be a potential source of disturbance to the surrounding neighbours and a health hazard to the workers themselves. The use of machinery including bulldozers, generators, metal grinders and concrete mixers will contribute high levels of noise and vibration within the construction site and the surrounding area. Elevated noise levels within the site can affect project workers, passers-by and other persons within the vicinity of the project site.

5.4.2.4 Waste Generation

Some of the consulted stakeholders were concerned about the unsightly scenarios associated with construction sites due to the presence of waste scattered all over e.g. empty cement bags, rejected metals, wrappings (plastic bags), glass among others. These wastes pollute the area creating a filthy environment which will be an eye-sore to residents. Suggestions were made to the proponent to manage all the waste resulting from the project in an environmentally accepted manner.

5.4.2.5 Increased water and Electricity demand

It is expected that both the workers and the construction works will create an increased demand for water and electricity in addition to the existing demand. Water will mostly be used in the creation of aggregates for construction works and for wetting surfaces for softening or hardening after creating the formworks, watering dusty roads and active construction sites. The stakeholders would want to be notified of any water closure schedules that would be occasioned by the construction.

6.0 POTENTIAL ENVIRONMENTAL IMPACTS

6.1 Introduction

This Section identifies both positive and negative impacts associated with the proposed development. These impacts are hereby identified at three distinct phases of the project i.e. Construction Phase, Operation Phase and Decommissioning Phase.

A separate study should be carried out during the project decommissioning phase.

6.2 Construction Phase

6.1.1 Positive Impacts

6.1.1.1 Employment Opportunities

One of the main positive impacts during projects construction phase is the availability of employment opportunities especially to casual workers (unskilled workers) and several other skilled workers such as building and construction engineers. Employment opportunities are of benefit both economically and socially. Several workers including casual labourers, masons, carpenters, joiners, electricians, and plumbers are expected to work on the site during the construction phase. Generally, employment during the construction phase will lead to multidimensional development in the area and improve several people's living standards.

6.1.1.2 Economic Growth

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

6.1.1.3 Improvement of the Informal Sector

There are usually several informal businesses, which come up during the construction periods of such projects. These include food vendors who benefit directly from the construction workers buying food and other commodities from them. This will promote the informal sector in securing some temporary revenue and hence improve their livelihood.

6.1.1.4 Provision of Market for Supply of Building Materials

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

6.1.2 Negative Impacts

6.1.2.1 Redundant Excavation Materials

Some of the excavation tools and equipment will be rendered redundant and thus will have to be disposed-off. This also applies to some of the soil/ rocks which may not be reusable after excavation processes are complete. All these materials need to be collected, transported and disposed-off appropriately in approved designated areas. It is encouraged that other alternative uses of these materials should be found so that they can be turned into economic value and use.

6.1.2.2 Soil Erosion

The excavation and construction activities are likely to loosen the soil particles making them prone to soil erosion. Such problems become serious when the topsoil is left bare and agents of erosion become active.

6.1.2.3 Water Quality Degradation

Project related excavation operations could lead to ground water quality degradation. Contaminated soil or ground water in the path of the project could be disturbed by excavation resulting in a potential transfer of the contamination to such waters. The excavated area, if linear could act as a conduit to extend groundwater contamination to new areas. Spills of hazardous materials in excavated areas during construction could introduce contaminants to ground water.

6.1.2.4 Noise Pollution

The construction works on site will most likely produce noise from the moving machines, communicating workers, incoming vehicles to deliver construction materials and other normal construction activities. This may prove to be a potential source of disturbance to the surrounding neighbours and a health hazard to the workers themselves. Such noise emissions should be minimised as much as possible from the source point while workers should be provided with appropriate personal protective gear.

6.1.2.5 Dust Emissions

Particulate matter pollution is likely to occur during the site clearance, demolitions, excavation, loading and transportation of the construction waste. There is a possibility of PM₁₀ suspension and heavier particles that settle affecting the site workers' and even neighbours' health.

6.1.2.6 Increased Water Demand

Construction works will create an increased demand for water in addition to the existing demand. Water will be mostly used in the creation of aggregates for construction works and

for wetting surfaces for softening or hardening after creating the formworks. Water will also be used to sprinkle the roads and construction site to reduce dust pollution.

6.1.2.7 Generation of Exhaust Emissions

Exhaust emissions are likely to be generated during the construction period by the various construction machinery and equipment. Motor vehicles used to ferry construction materials will cause a significant air quality impact by emitting pollutants through gaseous exhaust emissions.

6.1.2.8 Solid Waste generation

Large amounts of solid waste will be generated during construction of the project. These will include metal cuttings, rejected materials, surplus materials, surplus soil, excavated materials, paper bags, empty cartons, empty paint and solvent containers, broken glass among others. Solid waste if not well managed has the potential of posing great risks e.g. injuries. They can also cause disease outbreaks due to the availability of suitable breeding areas for vectors e.g. rodents and mosquitoes that cause malaria.

The construction workers will also generate human waste during their day-to-day operations. This waste needs proper disposal to prevent the spread of diseases for example cholera and diarrhoea outbreak on the site. Unless this is addressed, it can prove to be an environmental/health disaster. A pit latrine(s) or mobile toilets should be established on site to avoid such health risks.

6.1.2.9 Accidents and Hazards to Workers

During the construction of the proposed project, it is expected that construction workers are likely to be exposed to hazards and injuries as a result of accidental occurrences, handling of hazardous waste, lack or neglect of the use of protective gears etc. All necessary health and safety guidelines should be adhered to so as to avoid such circumstances.

Workers are also likely to be exposed to diseases from contact with potentially harmful building materials. It is therefore recommended that before the construction activities, there is need for the materials to be well inspected and harmonised to the occupational health and safety standards.

6.1.2.10 Oil spills

The machines on site contain moving parts which will require continuous oiling to minimise the usual corrosion or wear and tear. There is the possibility of oils spilling and contaminating the soil and water on site. But these dangers are curbed by maintaining the machinery in specific areas designed for this purpose.

6.1.2.11 Increased energy consumption

The main sources of energy that will be required for construction of the project will include main grid electricity and fossil fuels e.g. diesel. The electricity is supplied by Kenya Power & Lighting Company (KPLC) Ltd and will be used for welding, metal cutting/grinding and provision of light. Electricity in Kenya is generated mainly through natural resources, namely, water and geothermal resources. In this regard, there will be need to use electricity sparingly since high consumption of electricity negatively impacts on these natural resources and their sustainability. Diesel will run transportation vehicles and building equipment/machinery. The proponent should promote efficient use of energy through proper planning to reduce economic and environmental costs of construction activities.

6.2 Operation Phase

6.2.1 Positive Impacts

6.2.1.1 Employment Opportunities

Employment opportunities are one of the long term impacts of the proposed project that will be realised after during the operation and maintenance of the building. This will include caretakers, housekeepers, waste collectors and cleaners.

6.2.1.2 Increase in Revenue

There will be positive gain for the proponent arising from renting out the units or selling the development.

6.2.2 Negative Impacts

6.2.2.1 Increased Pressure on Infrastructure

The proposed development project will lead to increased pressure on existing infrastructure such as roads, service lines etc. due to the increased number of people who will be using these facilities to access services in the area.

6.2.2.2 Increased water use

The residential building activities during the operation phase of the project will involve the use of large quantities of water as a result of household activities. This may create a strain in water supply considering the fact that there will be an increase in the number of residents in the area.

6.2.2.3 Solid and liquid waste generation

Solid waste will be generated from the proposed developments once they are occupied with tenants. Improper disposal of solid waste can lead bad odors and create an unfriendly sight

(eyesore). A proper management system should be put in place to deal with the issue of solid waste management. Any Liquid waste (gray water) generated will be released into the existing drainage system which will be channeled to the existing sewer line infrastructure.

6.3 Decommissioning Phase

6.3.1 Positive Impacts

6.3.1.1 Rehabilitation

Upon decommissioning of the proposed project, rehabilitation of the project site will be carried out to restore the site to its original status or to a better state than it was originally. This will include replacement of topsoil and re-vegetation, which will lead to improved visual quality of the area.

6.3.1.2 Employment Opportunities

Employment opportunities will be created for the demolition staff during the demolition phase of the proposed project.

6.3.2 Negative Impacts

6.3.2.1 Noise and Vibration

The demolition works will lead to significant deterioration of the acoustic environment within the project site and the surrounding areas. This will be because of the noise and vibration that will be experienced as a result of demolishing the proposed project.

6.3.2.2 Solid Waste Generation

Demolition of the residential buildings and related infrastructure will result in large quantities of solid waste. The waste will contain the materials used in construction including concrete, metal, wood, glass etc. Although demolition waste is generally considered as less harmful to the environment since they are composed of inert materials, there is growing evidence that large quantities of such waste may lead to release of certain hazardous chemicals into the environment. In addition, even generally non-toxic chemicals such as chloride, sodium, sulphates and ammonia, which may be released because of leaching of demolition waste, are known to lead to degradation of groundwater quality.

6.3.2.3 Dust

Large quantities of dust will be generated during demolition works. This will affect demolition workers as well as the neighborhood in general.

7 MITIGATION & MONITORING MEASURES.

This section highlights the mitigation measures for the expected negative impacts of the proposed development project. The potential impacts and the possible mitigation measures have herein been analysed under two categories: Construction and Operational.

7.1 Mitigation of Construction Related Impacts

7.1.1 Air Quality

Controlling dust during construction is useful in minimizing pollution. It is recommended that a standard set of feasible dust control measures be implemented for all construction activities. Emissions of other contaminants (greenhouse gases, and diesel related PMB_{10B}) that would occur in the exhaust from heavy equipment are also included. The proponent is committed to implementing measures that shall reduce air quality impacts associated with construction. All personnel working on the project will be trained prior to starting construction on methods for minimizing air quality impacts during construction. Specific training will be focused on minimizing dust and exhaust gas emissions.

Exhaust gas emissions will be controlled by the following measures:

- Construction vehicles drivers will be under strict instructions to minimize unnecessary trips.
- All vehicles and machines should be switched off if not in use.
- Equipment shall be properly serviced and maintained.
- Carry out proper planning of transportation of materials to ensure that vehicle fills are increased in order to reduce the number of trips done or the number of vehicles on the road.

Dust emissions will be controlled by the following measures:

- Watering all active construction areas as and when necessary to minimize dust.
- Cover all trucks hauling soil, sand and other loose materials.
- Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.
- Carry out visual screening/ covering of the building under construction to contain the dust within the site.

7.1.2 Minimise the Effects of Noise Emitted from the Site

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

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

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

- Install portable barriers to shield compressors and other small stationary equipment where necessary.
- Use quiet equipment (i.e. equipment designed with noise control elements).
- Install sound barriers for pile driving activity.
- Limit pickup trucks and other small equipment to a minimum idling time and observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible.
- Construction/Demolition works should be done during the day when people are away and the outside environment is noisy.
- Workers should avoid making unnecessary loud noise on site during conversations with each other.
- Adhere to the provisions of Noise Prevention and Control Rules 2005, Legal notice no. 24 regarding noise limits at the workplace.

7.1.3 Hydrology and Water Quality Degradation

Several measures shall be put in place to mitigate the impacts that are likely to lead to water quality degradation. The proponent will prepare a hazardous substance control and emergency response plan that will include preparations for quick and safe clean-up of accidental spills. It will prescribe hazardous-material handling procedures to reduce the potential for a spill during construction, and will include an emergency response programme to ensure quick and safe clean-up of accidental spills. The plan will identify areas where refuelling and vehicle maintenance activities and storage of hazardous materials, if any, will be permitted.

Soil sampling and trial holes-digging will be conducted before construction begins and soil information will be provided to construction crews to inform them about soil conditions and potential hazards. If hazardous substances are unexpectedly

encountered during trenching, work will be stopped until the material is properly characterised and appropriate measures are taken to protect human health and the environment. If excavation of hazardous materials is required, they will be handled in accordance with applicable regulations. If suspected contaminated groundwater is encountered in the depths of the proposed construction area, samples will be collected and submitted for laboratory analysis of petroleum hydrocarbons, metals, volatile organic compounds and semi-volatile organic compounds. Appropriate personal protective equipment will be used and waste management will be done in accordance with applicable regulations. Oil absorbent material and storage drums will be used to contain and control any minor releases of engine and other equipment oil.

7.1.4 Work accidents and hazards during construction activities

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

Construction solid waste that cannot be reused can be hazardous and may lead to a number of injuries on site hence adequate collection and storage of waste on site and safe transportation to the disposal sites and disposal methods at designated area shall be provided. In addition the proponent is committed to adherence to the occupational health and safety rules and regulations stipulated in Occupational Health and Safety Act, 2007. In this regard, the proponent is committed to provision of appropriate personal protective equipment, as well as ensuring a safe and healthy environment for construction workers as outlined in the EMP.

7.1.5 Increased Vector diseases

Disease vectors such as rats, flies, and cockroaches increase where refuse is exposed or uncollected and can be a hazard. Complete refuse collection and handling service will be provided by the proponent so that this is not a hazard in compliance with the Public Health Act and as also required in the Occupational Safety and Health Act, 2007 regarding hygiene at the workplace.

7.1.6 Possible exposure of workers to diseases

Possible exposure of workers to diseases attributed to working at the construction site shall be mitigated by occupational health and safety standards enforcement as required in the OSHA, 2007.

7.1.7 Reduction of impacts at Raw material extraction Sites.

The proponent will source building materials such as sand, ballast and hard core from registered quarry and sand mining firms, whose projects have undergone satisfactory environmental impact assessment/audit and received NEMA approval. Since such firms are expected to apply acceptable environmental performance standards, the negative impacts of their activities at the extraction sites are considerably well mitigated.

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. Moreover, the proponent will ensure that wastage, damage or loss of materials at the construction site is kept minimal. In addition to the above measures, the proponent shall consider reuse of building materials and use of recycled building materials. This will lead to reduction in the amount of raw materials extracted from natural resources as well as reducing impacts at the extraction sites.

7.1.8 Minimization of Soil erosion and storm water management

The proponent will put in place some measures aimed at minimizing soil erosion at the project site during construction. These measures will include the use of excavated soil in construction, landscaping and infilling of damaged roads. Drainages can be dug to manage storm water and avoid flooding on site. Rain harvesting through the use of roof gutters to storage tanks will reduce storm water flow on the site. In addition, construction vehicles will be restricted to designated areas to avoid soil compaction within the project site.

7.1.9 Minimization of Construction Waste

It is recommended that demolition and construction waste be recycled or reused to ensure that materials that would otherwise be disposed-off as waste are diverted for productive uses. In this regard, the proponent is committed to ensuring that construction materials left over at the end of construction will be used in other projects rather than being disposed-off. In addition, damaged or wasted construction materials including cabinets, doors, plumbing and lighting fixtures, marbles and glass will be recovered for refurbishing and use in other projects. Such measures will involve the sale or donation of such recyclable/reusable materials to construction companies, local community groups, institutions and individual residents or home owners.

The proponent shall put in place measures to ensure that construction materials requirements are carefully budgeted and to ensure that the amount of construction

materials left on site after construction is kept minimal. It is further recommended that the proponent should consider the use of recycled or refurbished construction materials. Purchasing and using once-used or recovered construction materials will lead to financial savings and reduction of the amount of construction debris disposed of as waste.

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

- i. Use of durable, long- lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time
- ii. Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements
- iii. Purchase of perishable construction materials such as paints incrementally to ensure reduced spoilage of unused materials
- iv. Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste
- v. Use of construction materials containing recycled content when possible and in accordance with accepted standards.

7.1.10 Reduction of Energy Consumption

The proponent shall ensure responsible electricity use at the construction site through sensitization of staff to conserve electricity by switching off electrical equipment or appliances when they are not being used. In addition, proper planning of transportation of materials will ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts. Complementary to these measures, the proponent shall monitor energy use during construction and set targets for reduction of energy use.

7.1.11 Minimization of Water Use

The proponent shall ensure that water is used efficiently at the site by sensitizing construction staff to avoid irresponsible water use. Moreover, any water leaks through damaged pipes and faulty taps will be fixed promptly by qualified staff.

7.1.12 Controlling Oil Spills during Construction Phase

The proponent will control the dangers of oil, grease and fuel spills during construction by maintaining the machinery in specific areas designed for this purpose. Machinery repair on site is discouraged and repair works restricted to garages to avoid pollution from oil, grease and fuel.

7.1.13 Public Health, Safety and Awareness

- i. The contractor should provide a small section of the construction site with a shed and a water stand where the food can be served to the construction workers to promote hygiene and health of the employees.
- ii. A fully equipped first aid kit should be provided at the site.
- iii. The contractor must have workmen's compensation cover as required by law (The Workmen's Compensation Act), as well as relevant ordinances, regulation and union's agreements.
- iv. The workers, immediate neighbours and other stakeholders should be sensitized on the dangers and risk associated with the construction works for enhanced responsibility on personal safety.
- v. The proponent should ensure that the completed buildings are fitted with safety facilities including fire detectors, fire fighting equipment, fire exits and fire assembly point.
- vi. The site should be completely shield off to control in and out movement of people.
- vii. Access features for persons with disabilities and safety signage should be placed strategically around and within the buildings.
- viii. Appropriate sanitation conveniences should be provided at the site as required in the OSHA, 2007 and echoed in the Public Health Act.

7.2 Mitigation of Impacts during Operation Phase

7.2.1 Ensuring Efficient Solid Waste Management

The proponent will be responsible for efficient management of solid waste generated by the project during its operation. A lot of solid waste will be generated and an Integrated Solid Waste Management System (ISWMS) is recommended.

To necessitate its' success, the ISWMS will require a solid waste management awareness programme for the residents. First, the proponent will give priority to Reduction of materials at source. Reuse, Recycling and compositing of the waste will be the second step to prioritize. This will call for a source separation programme to be put in place. The recyclables will be sold to waste buyers within Nairobi City. The third step is the combustion of the wastes that are not recyclable in order to reduce their volume. Finally, sanitary land filling will be the last step in the process where all the waste that has been combusted, unrecyclable and useless are disposed-off.

The proponent will adhere to the Environmental Management and Coordination (Waste Management) Regulations 2006. In addition, the proponent will ensure that waste is disposed of regularly and appropriately.

7.2.2 Wastewater Management

The proponent will ensure that there are adequate means for handling large quantities of sewage generated from the facility. It will also be important to ensure that sewage pipes are not blocked or damaged so that the waste can be directed to the public sewer line infrastructure since such vices can lead to release of the effluent, resulting in land and water contamination. Such blockages or damages will be fixed expeditiously. Waste water shall be disposed-off in compliance with the provisions of the Environmental Management and Coordination (Water Quality), Regulations 2006.

7.2.3 Ensure Efficient Energy Consumption

The proponent plans to install an energy-efficient lighting system in all the houses incorporating lighting controls. This will contribute immensely to energy saving during the operational phase of the project. In addition, occupants of the facility should be sensitized to ensure energy efficiency in their domestic operations. To complement these measures, it will be important to monitor energy use during the operation of the proposed development and set targets for efficient energy use. Use of solar power is highly recommended as an alternative source of energy especially for water.

7.2.4 Ensure General Safety within the Premises

A perimeter wall will be erected round the plots and a security lighting system installed. A competent security firm may be engaged to ensure the general safety and security at all times within and around the premises.

7.2.5 Ensure Efficient Water Use

Any water leaks through damaged pipes and faulty taps will be fixed promptly by qualified staff. In addition, the occupants of the facility will be sensitized to use water efficiently. Rain water harvesting will be used as an alternative source of water to save on costs related to water payment charges. Rain water harvesting prevents surface run-off and avoids wastage of clean rain water that ends up in drainages.

7.3 Mitigation of Impacts during Decommissioning Phase

7.3.1 Efficient solid waste management

Solid waste resulting from demolition or dismantling works will be managed as described in Section 7.2.1.

7.3.2 Reduction of Dust Concentration

High levels of dust concentration resulting from demolition or dismantling works will be minimized as described in Section 7.1.1.

7.3.3 Minimization of Noise and Vibration

Significant impacts on the acoustic environment will be mitigated as described in Section 7.2.1.

8 ANALYSIS OF PROJECT ALTERNATIVES

This section analyses the project alternatives in terms of site, technology and waste management options.

8.1 Relocation Option

Relocation option to a different site is an option available for the project implementation. At present the landowner (HACO INDUSTRIES)/developer does not have an alternative site. This means that they have to look for another land. Looking for land to accommodate the scale and size of the project and completing official transaction on it may take up to three (3) years although there is no guarantee that the land would be available. The developer will spend another two years on design and approvals since design and planning has to be according to site conditions. Project design and planning before the stage of implementation will cost the developer millions of Kenya shillings. Whatever has been done and paid to date will be counted as a loss to the developer. Assuming the project will be given a positive response by the relevant authorities including NEMA, this project would have been delayed for about two (2) years before implementation. This is a delay that our economy cannot afford. This would also lead to a situation like No Project Alternative option. The other consequence of this is that it would be a discouragement for private/local investors especially in the business sector. In consideration of the above concerns and assessment of the current proposed site, relocation of the project is not a viable option.

8.2 No Project Alternative

The No Project option in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. This option will however, involve several losses both to the landowner and the community as a whole. The landowner will continue to pay rates for the plot while the plot remains idle hence no income to the owner. The No-Project Option is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

- The economic status of the country and the local people would remain unchanged.
- The local skills would remain underutilized.
- Reduced interaction both at local and national level.
- No employment opportunities will be created for locals who will work in the proposed residential building.
- Increased urban poverty and crime.
- Discouragement for investors.

From the analysis above, it becomes apparent that the No Project alternative is not an option to the proponent, local people and the Government of Kenya.

8.3 The proposed development alternative

Under the proposed development alternative, the developer of the proposed residential development project would be issued with an EIA License. In issuing the license, NEMA would approve the proponent's proposed development, provided all environmental measures are complied with during the construction and operational phases. This alternative consists of the applicant's final proposal with the inclusion of the NEMA regulations and procedures as stipulated in the Environmental Impacts Assessment to the maximum extent practicable.

8.4 Analysis of Alternative Construction Materials and Technology

The proposed project will be constructed using modern, locally and internationally-accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment that saves energy and water will be given first priority without compromising on cost or availability factors. The concrete pillars and walls will be made using locally sourced stones, cement, sand, metal bars and fittings that meet the Kenya Bureau of Standards (KEBS) requirements.

Heavy use of timber during construction is discouraged because of destruction of forests. The exotic species would be preferred to indigenous species in the construction where need will arise.

8.5. Solid waste management alternatives

A lot of solid waste will be generated from the proposed development. An integrated solid waste management system is recommended. First, the proponent will give priority to Reduction at source of the waste materials. This option will demand a solid waste management awareness programme for the management and the workers. Secondly, Recycling, Reuse and compositing of the waste will be the second alternative. This will call for a source separation programme to be put in place especially in the kitchen section. The recyclables will be sold to waste buyers within Nairobi City. The third priority in the hierarchy of options is combustion of the wastes that are not recyclable. Finally, sanitary land filling will be the last option for the proponent to consider.

8.6 EIA WITH/WITHOUT EMP

8.6.1 Without

This scenario was based upon the assumption that the proposed development would go ahead without any Environmental Management Plan/options being implemented. The total project impact for the scenario is on the potentially adverse side. This means that if the project goes ahead without EMP, the adverse impact on the existing

environment would be several times more than if the project goes ahead with EMP. Thus, this assumption is disqualified and not applicable since the greatest challenge worldwide presently is geared towards sustainable development and sustainable use of natural resources.

8.6.2 With

If the Environmental Management Strategies discussed in Chapter 9 are fully implemented, the adverse impact of the project would be reduced, and there will be an overall improvement in physical, chemical, biological and socioeconomic environment of the region. Therefore, the proposed development will be beneficial for the environment of the area, provided the EMP is in place. It is clear from the above, that the proposed project would have negative effects without implementation of certain Environmental Management Strategies. This remains a preferred option.

9 ENVIRONMENTAL MANAGEMENT/MONITORING PLAN

9.1 Introduction

The proponent of the proposed project acknowledges the fact that the proposed project activities will have some impacts on the biophysical environment, health and safety of its employees, stakeholders, interested parties and socio-economic well-being of other members of the public. Thus, the main focus will be on reducing the negative impacts and maximizing the positive impacts associated with the project activities through a programme of continuous improvement.

An Environmental Management/Monitoring Plan has been developed to assist the proponent in mitigating and managing environmental impacts associated with the life cycle of the project. The EMP has been developed to provide a basis for an Environmental Management System (EMS; ISO 14001 principles) for the project. It is noteworthy that key factors and processes may change through the life of the project and considerable provisions have been made for dynamism and flexibility of the EMP. As such, the EMP will be subject to a regular regime of periodic review.

Tables 1, 2 and 3 form the core of this EMP for the construction, operation and decommissioning phases of the proposed project respectively. In general, the Tables outline the potential safety, health and environmental risks associated with the project and detail all the necessary mitigation measures, their financial costs, as well as the persons responsible for their implementation and monitoring. The EMP will be used as checklist in future Environmental Audits.

9.2 Construction Phase Environmental Management Plan

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the construction phase the proposed project are outlined in Table 1 below.

Table 1: Construction Phase Environmental Management Plan for the proposed affordable housing project.

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. PROJECT ASSOCIATED CONFLICTS. E.G. DISPUTES WITH NEIGHBOURHOODS, AUTHORITIES ETC.				
Project implementation disputes	Community support mobilization and sensitization through consultative forums, public meetings & questionnaire methods	Proponent & EIA Experts	Project Planning Phase	-
	Land transfer agreements should be formalized before the project start as per the laws of the land	Proponent/Government of Kenya	Project Planning Phase	Done
	All required approvals must be obtained before beginning the project.	Proponent & Contractor	Project Planning Phase	As per the gazetted fees
2. Minimize extraction site impacts and ensure efficient use of raw materials in construction				
High Demand of Raw material	Source building materials from local suppliers who use environmentally friendly processes in their operations	Project Manager & Contractor	Throughout construction period	0
	Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered	Project Manager & Contractor	Throughout construction period	85,000
	Ensure that damage or loss of materials at the construction site is kept minimal through proper storage.	Project Manager & Contractor	Throughout construction period	55,000
	Use at least 5%-10% recycled, refurbished or salvaged materials to reduce the use of raw materials	Project Manager & Contractor	Throughout construction period	0
3. MINIMIZE VEGETATION DISTURBANCE AT AND OR AROUND CONSTRUCTION SITE				
Vegetation disturbance	Ensure proper demarcation and delineation of the project area to be affected by construction works.	Contractor, Civil engineer & Project Manager	1 month	50,000
	Specify locations for Vehicles and equipment's, and areas of the site which should be kept free of traffic, equipment, and storage of materials.	Civil Engineer, Architect and Project Manager	1 month	
	Designate access routes and parking within the site	Civil Engineer, Architect and Project Manager	1 month	65,000
	Introduction of vegetation (trees, shrubs and grass) on open spaces and their maintenance	Architect & Landscape specialist	Monthly to Annually	80,000

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	Design and implement an appropriate landscaping programme to help in re-vegetation of part of the project area after construction	Architect & Landscape specialist	2 months	75,000
4. REDUCE STORM-WATER, RUNOFF AND SOIL EROSION				
Increased storm water, runoff and soil erosion	A storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structure will be designed	The Civil Engineer, Mechanical Engineer and Project Manager	1 month	70,400
	Apply soil erosion control measures such as levelling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil.	The Civil Engineer, Mechanical Engineer and Project Manager	1 months	
	Ensure that construction vehicles are restricted to existing graded roads to avoid soil compaction within the project site.	The Civil Engineer, Mechanical Engineer and Project Manager	Throughout construction period	
	Ensure that any compacted areas are ripped to reduce run-off.	The Civil Engineer, Mechanical Engineer and Project Manager	4 months	
	Open drains (interconnected) will be provided on site	Civil Engineer	Throughout construction period	As per the BQ estimates.
5. MINIMIZE SOLID WASTE GENERATION AND ENSURE EFFICIENT SOLID WASTE MANAGEMENT DURING CONSTRUCTION				
Increased solid waste generation	Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling and reuse 3. Composting 4. Combustion 5. Sanitary land filling	Project Manager & Contractor	Throughout construction period	100,000
	Through accurate estimation of the sizes and quantities of materials required, order materials in the sizes and quantities they will be needed rather than having large quantities of residual materials	Project Manager & Contractor	One-off	0
	Ensure that construction materials left over at the end of construction will be used in other projects rather than being disposed-off.	Project Manager & Contractor	One-off	0
	Ensure that damaged or wasted construction materials including cabinets, doors, plumbing and lighting fixtures, marbles and glass will be recovered for refurbishing and use in other projects	Project Manager & Contractor	One-off	30,000
	Donate recyclable/reusable or residual materials to local community groups, institutions and individual local residents or homeowners.	Project Manager & Contractor	One-off	0
	Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time	Project Manager & Contractor	Throughout construction period	-
	Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements	Project Manager & Contractor	One-off	38,000

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	Purchase of perishable construction materials such as paints should be done incrementally to ensure reduced spoilage of unused materials	Project Manager & Contractor	Throughout construction period	0
	Use building materials that have minimal or no packaging to avoid the generation of excessive packaging waste	Project Manager & Contractor	Throughout construction period	0
	Use construction materials containing recycled content when possible and in accordance with accepted standards.	Project Manager & Contractor	Throughout construction period	0
	Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce waste at the site	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	0
	Dispose waste more responsibly by dumping at designated dumping sites or landfills only.	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	50,000/ Month
	Waste collection bins to be provided at designated points on site	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	100,000
6. REDUCE DUST EMISSIONS				
Dust emission	Ensure strict enforcement of on-site speed limit regulations	Project Manager & Contractor	Throughout construction period	50,000
	Avoid excavation works in extremely dry weather	Project Manager & Contractor	Throughout construction period	
	Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles.	Project Manager & Contractor	Throughout construction period	
	Personal Protective Equipment to be worn	Project Manager	Throughout construction period	
7. MINIMIZATION OF EXHAUST EMISSIONS				
Exhaust emission	Vehicle idling time shall be minimized	Project Manager & Contractor	Throughout construction period	0
	All construction equipment shall be properly tuned and maintained	Project Manager & Contractor	Throughout construction period	0
	Sensitise truck drivers to avoid unnecessary racing of vehicle engines at loading/offloading points and parking areas, and to switch off or keep vehicle engines at these points	Project Manager & Contractor	Throughout construction period	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
8. MINIMIZATION OF NOISE AND VIBRATION				
Noise and vibration	Sensitise construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.	Project Manager & Contractor	Throughout construction period	65,000
	Sensitise construction drivers to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as churches, residential areas and hospitals.	Project Manager & Contractor	Throughout construction period	30,000
	Ensure that construction machinery are kept in good condition to reduce noise generation.	Project Manager & Contractor	Throughout construction period	70,000
	Ensure that all generators and heavy-duty equipment are insulated or placed in enclosures to minimize ambient noise levels.	Project Manager & Contractor	Throughout construction period	90,000
	The noisy construction works will entirely be planned to be during daytime when most of the neighbours will be at work	Project Manager & all site foremen	Throughout construction period	0
	Comply with the provisions of the Noise and Excessive Vibration Pollution Control Regulations, 2009 regarding noise limits at the workplace.	Project Manager & all site foremen	Throughout construction period	0
9. MINIMIZATION OF ENERGY CONSUMPTION				
Increased energy consumption	Ensure electrical equipment, appliances and lights are switched off when not being used.	Project Manager & Contractor	Throughout construction period	0
	Install energy saving fluorescent tubes at all lighting points instead of bulbs which consume higher electric energy	Project Manager & Contractor	Throughout construction period	55,000
	Ensure planning of transportation of materials to ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts	Project Manager & Contractor	Throughout construction period	-
	Monitor energy use during construction and set targets for reduction of energy use.	Project Manager & Contractor	Throughout construction period	30,000
10. MINIMIZE WATER CONSUMPTION AND ENSURE MORE EFFICIENT AND SAFE WATER USE				
High water demand	Install water conserving taps that turn-off automatically when water is not being used.	Project Manager & Contractor	One-off	10-40 % higher
	Promote recycling and reuse of water as much as possible.	Project Manager & Contractor	Throughout construction period	25,500
	Install a discharge meter at water outlets to determine and monitor total water usage.	Project Manager & Contractor	One-off	25,000

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	Promptly detect and repair water pipes and tank leakages.	Project Manager & Contractor	Throughout construction period	24,000 per month
	Sensitise staff to conserve water by avoiding unnecessary water use.	Project Manager & Contractor	Throughout construction period	-
	Ensure taps are not running when not in use.	Project Manager & Contractor	Throughout construction period	-
11. MINIMIZE RELEASE OF LIQUID EFFLUENT				
Generation of wastewater	Provide means for handling waste water generated by construction workers.	Mechanical Engineer & Project Manager	One-off	25,000 per Month
	Conduct regular checks for pipe blockages or damages since such vices can lead to release of the effluent into the land and water bodies.	Mechanical Engineer & Project Manager	Throughout construction period	10,000 per month
	Monitor effluent quality regularly to ensure that the stipulated discharge rules and standards are not violated.	Mechanical Engineer & Project Manager	Throughout construction period	10,000 per month
12. Minimize occupational health and safety risks				
Approval of building plans	Ensure that all building plans are approved by the County Government and the local Occupational Health and Safety Office.	Developer	One-off	As per the Gazetted fee
Registration of the premises	Registration of the premises under the Occupational Safety and Health Act, 2007 Laws of Kenya is mandatory.	Developer	One-off	10,000
General register	A general register should be kept within the facility as stipulated in Sec 122&123 of the Occupational Safety and Health Act, 2007.	Project Manager & Contractor	One-off	-
Posting of abstract of Act, rules and notices	There shall be displayed at prominent places within the site the prescribed abstract of the OSHA and the relevant notices as stipulated in section 121 of the OSHA, 2007.	Project Manager & Contractor	One-off	2,500
Incidents, accidents and dangerous occurrences.	Ensure that provisions for reporting incidents, accidents and dangerous occurrences during construction using prescribed forms obtainable from the local Occupational Health and Safety Office (OHSO) are in place.	Project Manager, Developer & Contractor	Continuous	2000 per month
	Enforcing adherence to safety procedures and preparing contingency plan for accident response in addition to safety education and training shall be emphasized.	The Contractor, Project Manager & Site Safety Officer	Continuous	40,000
Insurance	Ensure that the premises are insured as per statutory requirements (third party and workman's compensation)	Developer	Annually	-
Environment, Health and Safety (EHS) policy	Develop, document and display prominently an appropriate EHS policy for construction works.	Project Manager, Developer & Contractor	One-off	7,500
Health and safety committee	Provisions must be put in place for the formation of a Health and Safety Committee, in which the employer and the workers are represented.	Project Manager	One-off	-

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Sanitary conveniences	Suitable, efficient, clean, well-lit and adequate sanitary conveniences should be provided for construction workers	Project Manager	One-off	55,000
Medical examination	Arrangements must be in place for the medical examination of all construction employees before, during and after termination of employment.	Project Manager, Developer & Contractor	Continuous	2,500 per examination
Machinery/equipment safety	Ensure that machinery, equipment, Personal Protective Equipment, appliances and hand tools used in construction do comply with the prescribed safety and health standards and be appropriately installed, maintained and safeguarded.	Project Manager, Developer & Contractor	One-off	–
	Ensure that equipment and work tasks are adapted to fit workers and their ability including protection against mental strain.	Project Manager, Developer & Contractor	Continuous	–
	All machines and other moving parts of equipment must be enclosed or guarded to protect all workers from injury.	Project Manager	One-off	–
	Arrangements must be in place to train and supervise inexperienced workers regarding construction machinery use and other procedures/operations.	Project Manager	Continuous	5,000 per training
	Equipment such as fire extinguishers must be examined by a government authorized person. The equipment may only be used if a certificate of examination has been issued.	Project Manager	Continuous	5,000 per examination
	Reports of such examinations must be presented in prescribed forms, signed by the examiner and attached to the general register.	Project Manager	Continuous	3,000 per examination
Storage of materials	Ensure that materials are stored or stacked in such a manner as to ensure their stability and prevent any fall or collapse.	Project Manager	Continuous	70,000
	Ensure that items are not stored/stacked against weak walls and partitions.	Project Manager	Continuous	–
Safe means of access and safe place of employment	All floors, steps, stairs and passages of the premises must be of sound construction and properly maintained.	Project Manager & Contractor	Continuous	–
	Provide all staircases within the premises with suitable handrails on both sides.	Project Manager & Contractor	One-off	–
	Provide emergency exits for construction workers.	Project Manager & Contractor	Continuous	–
	All ladders used in construction works must be of good construction and sound material of adequate strength and be properly maintained.	Project Manager & Contractor	One-off	–
Emergency preparedness and evacuation procedures	Design suitable documented emergency preparedness and evacuation procedures to be used during any emergency.	Project Manager & Contractor	One-off	20,000
	Such procedures must be tested at regular intervals.	Project Manager & Contractor	Every 3 months	10,000
	Ensure that adequate provisions are in place to immediately stop any operations where there is an imminent and serious danger to health and safety	Project Manager & Contractor	One-off	30,000

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	Ensure that the most current emergency telephone numbers are prominently and strategically displayed within the construction site.	Project Manager & Contractor	One-off	8,000
	Provide measures to deal with emergencies and accidents including adequate first aid arrangements.	Project Manager & Contractor	Continuous	10,500
First Aid	Well stocked first aid box which is easily available and accessible should be provided within the premises.	Project Manager & Contractor	One-off	5,800
	Provision must be made for persons to be trained in first aid, with a certificate issued by a recognized body.	Project Manager & Contractor	One-off	20,000
13. Ensure the general safety and security of the site and surrounding areas				
Increased Pressure on Infrastructure	Coordinate with other planning goals and objectives for the region.	Architect, Project Manager, Contactor and the Developer	Continuous	110,000
	Upgrade existing infrastructure and services, if and where feasible.	Architect, Project Manager, Contactor and the Developer	Continuous	
Insecurity	Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the construction site.	Security Officer, Project Manager & Police	Continuous	120,000
	Body-search the workers on entry, to avoid getting weapons on site, and when leaving the site to ensure nothing is stolen.	Security Officer	Continuous	
	Ensure only authorised personnel get enter the site.	Security Officer	Continuous	
	Security alarms will be installed.	Security Officer	Continuous	
14. Environmental monitoring of the project				
Environmental concern during the construction phase	Due to the magnitude of the project the proponent will liaise with the environmental consultants throughout the construction phase and ensure that the conditions of approval are adhered to.	Proponent, Contractor and EIA experts	Throughout construction phase	

9.3 Operational Phase EMP

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the operational phase of the office project are outlined in Table 2.

Table 2: Operation Phase Environmental Management Plan for the Affordable Housing project.

Expected Negative impact	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1 Minimization of solid waste generation and ensuring more efficient solid waste management				
Solid waste generation	Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling and reuse 3.Composting 4. Combustion 5. Sanitary land filling.	Proponent/Property Managers	One-off	60,000 per Month
	Provide solid waste handling facilities such as waste bins and skips.	Proponent/Property Managers	One-off	100,000
	Ensure that solid waste generated is regularly disposed-off appropriately at authorised dumping sites.	Proponent/Property Managers	Continuous	85,000/month
	Donate redundant but serviceable equipment to charities and institutions.	Proponent/Property Managers	Continuous	0
	Comply with the provisions of Solid Waste Regulations, 2006.	Proponent/Property Managers	Continuous	0
2 Minimise risks of liquid waste release into environment				
Liquid waste release into the environment	Provide adequate and safe means of handling liquid waste at the premise.	Proponent/Property Managers	One-off	-
	Conduct regular inspections for pipe blockages or damages and fix them appropriately.	Proponent/Property Managers	Continuous	2000 per inspection
	Ensure regular monitoring of the sewage discharged from the project to ensure that the stipulated sewage/effluent discharge rules and standards are not violated.	Proponent/Property Managers	Continuous	500 per parameter
	Comply with the provisions of Environmental Management and Co-ordination (Water Quality) Regulations 2006.	Proponent/Property Managers	Continuous	0
3 Minimize energy consumption				
Energy Use	Switch off electrical equipment, appliances and lights when not in use.	Proponent/Property Managers	Continuous	-
	Install sensory lighting at various locations which are not in use all the time such as the parking areas.	Proponent/Property Managers	One-off	10-40 % higher than ordinary lighting
	Install energy saving fluorescent tubes at all lighting points within the building instead of bulbs which consume higher electric energy	Proponent/Property Managers	One-off	10-40 % higher than ordinary lighting
	Monitor energy use during the operation of the project and set targets for efficient energy use.	Proponent/Property Managers	Continuous	5,000 per month

Expected Negative impact	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	Sensitise workers and the Housing Units occupants to use energy efficiently.	Proponent/Property Managers	Continuous	-
4 Minimize water consumption and ensure more efficient and safe water use				
Water management	Prompt detection and repair of water pipes and tank leakages.	Proponent/Property Managers	Continuous	5,000 per month
	Occupants to conserve water e.g. by avoiding unnecessary toilet flushing.	Proponent/Property Managers	Continuous	
	Ensure taps are not running when not in use.	Proponent/Property Managers	Continuous	3000 per month
	Install water conserving taps that turn-off automatically when water is not being used.	Proponent/Property Managers	One-off	10-40 % higher than ordinary taps
	Install a discharge meter at water outlets to determine and monitor total water usage.	Proponent/Property Managers	One-off	10,000
5 Minimization of health and safety impacts				
Implement all necessary measures to ensure health and safety of workers, housing units occupants and the general public during operation of the residential units as stipulated in the Occupational Safety and Health Act, 2007.		Proponent/Property Managers	Continuous	-
6 Ensure the general safety and security of the premises and surrounding areas				
Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises.		Proponent/Property Managers	Continuous	60,000 per month
7 Control of informal activities around the project site				
Mushrooming of Informal Settlement.		Local Administration, County Governments.	Continuous	0

9.4 Decommissioning Phase

In addition to the mitigation measures provided in Tables 3 and 4, it is necessary to outline some basic mitigation measures that will be required to be undertaken once all operational activities of the project have ceased. The necessary objectives, mitigation measures, allocation of responsibilities, time frames and costs pertaining to prevention, minimization and monitoring of all potential impacts associated with the decommissioning and closure phase of the project are outlined in Table 5 below.

Table 3: Decommissioning Phase EMP for the proposed AFFORDABLE Housing project

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Demolition waste management				
Demolition waste	Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling and reuse 3.Composting 4. Combustion 5. Sanitary land filling.	Project Manager & Contractor	Once-off	200,000
	All buildings, machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as much as possible.	Project Manager & Contractor	Once-off	105,000
	All foundations must be removed and recycled, reused or disposed of at a licensed disposal site.	Project Manager & Contractor	Once-off	100,000
	Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials should be taken to a licensed waste disposal site.	Project Manager & Contractor	Once-off	0
	Donate reusable demolition waste to charitable organizations, individuals and institutions.	Project Manager & Contractor	Once-off	0
2. Rehabilitation of project site				
Site degradation	Implement an appropriate re-vegetation programme to restore the site to its original status.	Project Manager & Contractor	Once-off	0
	Consider use of indigenous plant species in re-vegetation.	Project Manager & Contractor	Once-off	0
	Trees should be planted at suitable locations so as to interrupt sight lines (screen planting), between the adjacent area and the development.	Project Manager & Contractor	Once-off	0

10.0 CONCLUSION AND RECOMMENDATION

The EIA study has established that the proposed development project is a worthy investment by the proponent and will no doubt contribute significantly to the improvement of living standards and by extension spur economic development. This will be achieved through the prior discussed positive impacts namely; growth of the economy, provision of affordable housing units, boosting of the informal sector during the construction phase, provision of market for supply of building materials, employment generation, increase in government revenue, optimal use of land and more importantly fulfilling the Government agenda of providing residential houses.

However, the EIA project has established that the proposed project will also come along with some negative impacts. The negative environmental impacts that will result from establishment of the proposed project include; hydrology and water quality degradation, noise pollution, dust emissions, solid waste generation, increased water demand, increased energy consumption, generation of exhaust emissions, workers accidents and hazards during construction, possible exposure of workers to diseases among others. These negative impacts can however be sufficiently mitigated.

The proponent of the proposed project shall be committed to putting in place several measures to mitigate the negative environmental, safety, health and social impacts associated with the life cycle of the project. It is recommended that in addition to this commitment, the proponent shall focus on implementing the measures outlined in the EMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects. It is expected that the positive impacts that emanate from such activities shall be maximised as much as possible as exhaustively outlined within the report. These measures will go a long way in ensuring the best possible environmental compliance and performance standards.

It is our recommendation that the project be allowed to go on provided the mitigation measures outlined in the report are adhered to, Environmental Management Plan (EMP) is implemented and the developer adhere to the conditions of approval of the project.

Site Photographs

Plate 2: Vegetation Existing On the Project Site.



Plate 3: Existing Developments similar to the Proposed Project.

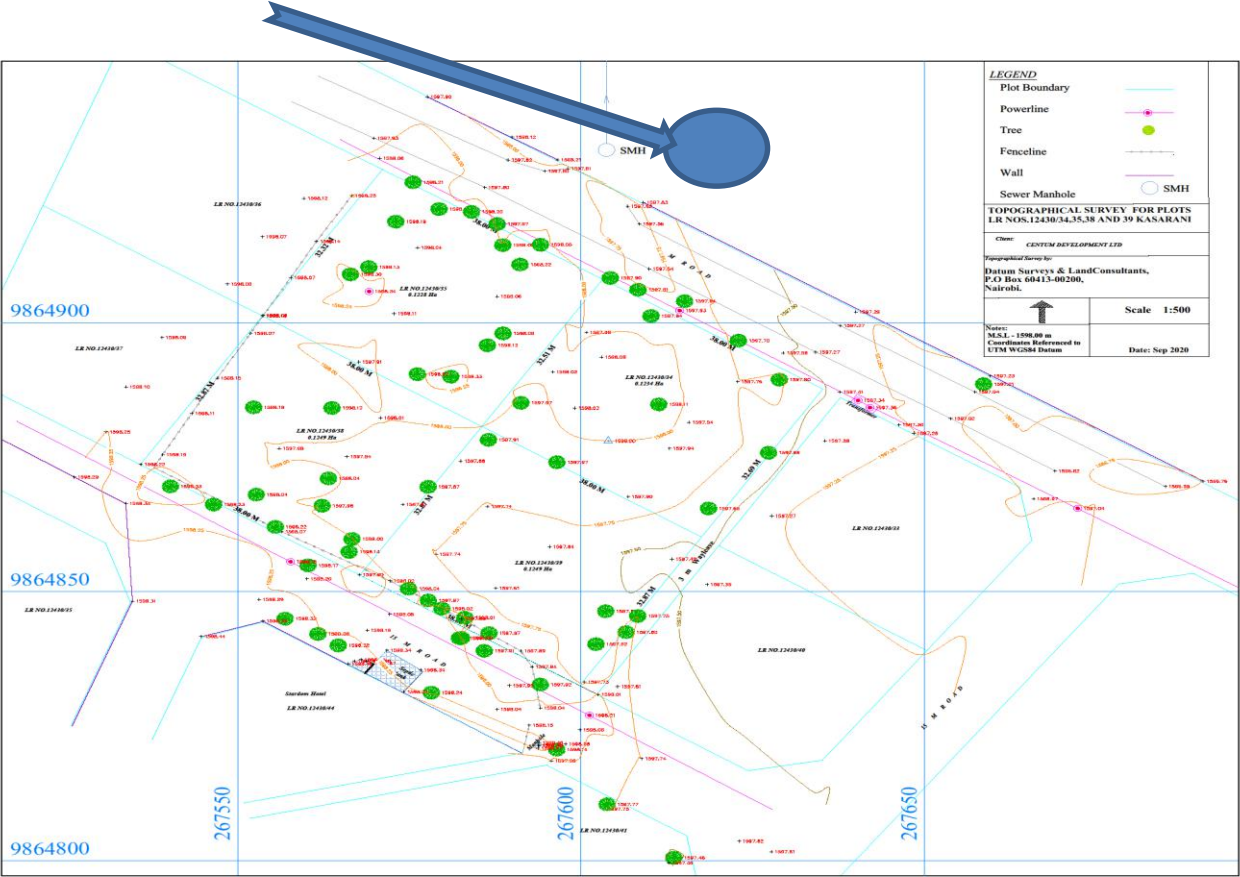


Plate 4: Existing road accessing the site.



A TOPOGRAPHICAL SURVEY MAP SHOWING ALL THE UTILITIES AND FEATURES ONSITE WHICH INCLUDE:-
SEWER MANHOLE: Where all the waste water from the project would be directed, POWERLINES, FENCES & PLOT BOUNDARIES, WALLS, TREES, ETC

SEWER MANHOLE next to the site for TERMINATING the sewer line from the proposed development.



REFERENCES

Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009, government printer, Nairobi

Kenya gazette supplement Acts 2000, Environmental Management and Coordination Act Number 8 of 1999. Government printer, Nairobi

Kenya gazette supplement number 56. Environmental Impact Assessment and Audit Regulations 2003, Government Printers, Nairobi

Kenya gazette supplement Acts Building Code 2000, Government Printers, Nairobi

Kenya gazette supplement Acts Penal Code Act (Cap.63) Government Printers, Nairobi

Kenya gazette supplement Acts Water Act, 2002, Government Printers, Nairobi

Kenya gazette supplement Acts Public Health Act (Cap. 242) government printer, Nairobi

Kenya gazette supplement number 57, Environmental Management and Coordination (Controlled Substances) Regulations, 2007, Government printer, Nairobi

Kenya gazette supplement number 68, Environmental Management and Coordination (Water Quality) Regulations, 2006, Government printer, Nairobi

Kenya gazette supplement number 69, Environmental Management and Coordination (Waste management) Regulations, 2006, Government printer, Nairobi

Noise Prevention and Control Rules 2005, Legal Notice no. 24, Government Printers, Nairobi

APPENDICES

- Copy of Land Ownership Documents/Lease Documents.
- Architectural Drawings and site plans
- Summary of cost estimates
- Sample of Public Consultation Questionnaires
- Gazette notices and the newspaper advert.