NEMA SUBMISSION

PROPOSED CONSTRUCTION OF A HOSPITAL ON PARCEL NO. NAIROBI/BLOCK 196/986 ALONG LIMURU ROAD, IN ROSSLYN AREA, NAIROBI CITY COUNTY

PROJECT PROPONENT:

Columbia Africa Healthcare Limited

REPORT PREPARED BY:

Christine Muchiri

Maca Plan Consulting

CERTIFICATION

CERTIFICATION BY EIA EXPERT

I hereby certify that the content of this Environmental and Social Impact Assessment/ Full Study Report for the proposed construction of a tertiary level multispecialty hospital located on parcel no. NAIROBI/BLOCK 196/986 along Limuru Road, in Rosslyn area, Nairobi City County, conforms to the guidelines contained the Environmental Management and Coordination (Amendment) Act 2015 (Cap 387) and the Environmental Impact Assessment and Audit Regulations, 2003

Signature: .....

Date…….

Name: Christine Muchiri

Designation: Lead Expert

Maca Plan Consulting

CERTIFICATION BY PROJECT PROPONENT

I ……..…… on behalf of Columbia Africa Healthcare Limited submit this Environmental and Social Impact Assessment Project Report for the proposed construction of a tertiary level multispecialty hospital located on parcel no. NAIROBI/BLOCK 196/986 along Limuru road, in Rosslyn area, Nairobi City County. I declare that the information contained here is true to the best of my knowledge and I shall ensure the implementation of the Environmental and Social Management and Mitigation Plan contained in this report. I further assure that we shall adhere to any recommendations or conditions issued by NEMA and other relevant Authorities with regard to the proposed project

Sign……..……..……

Date: ……..…….

Designation: ……..…….

Tel: ……..……...……

LIST OF ABBREVIATIONS/ACRONYMS

EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
ERP	Emergency Response Plans
ESIA	Environmental and Social Impact Assessment
ESMMP	Environmental and Social Management and Mitigation Plan
GoK	Government of Kenya
GPS	Global Positioning System
HDU	High Dependency Unit
ICU	Intensive Care Unit
IEA	Initial Environmental Audit
KURA	Kenya Urban Roads Authority
NEMA	National Environment Management Authority
NICU	Neonatal Intensive Care Unit
OPD	Outpatient Departments
OSHA	Occupational Safety and Health Act
PPE	Personal Protective Equipment
SWM	Solid Waste Management
ToR	Terms of Reference
STP	Sewage Treatment Plant

EXECUTIVE SUMMARY

Introduction

This report documents the findings of a Full Environmental and Social Impact Assessment Study (ESIA) for the proposed construction of Columbia Africa Hospital.

Project Location

The project is located on land parcel no. NAIROBI/BLOCK 196/986 along Limuru Road, in Rosslyn area, Nairobi City County. The project lies on GPS coordinates -1.220216 S, 36.802238 E. The parcel of land measures approximately 1.416 Ha.

Project Description

The facility is a state-of-the-art hospital comprising 152 beds, providing comprehensive outpatient and inpatient services. It features a wide range of amenities, including 25 outpatient departments (OPDs), a dedicated center for preventive health with master health checkup services, specialized units for dialysis, chemotherapy, and birthing. Moreover, it houses well-equipped inpatient accommodations, including an intensive care unit (ICU), a neonatal intensive care unit (NICU), a high dependency unit (HDU), 5-bed wards, twin patient rooms, and single patient rooms. In addition, the hospital offers essential supporting services such as blood banking and advanced medical data management

Legal Framework

The assessment has been commissioned in accordance with the Environmental Management and Coordination Act (EMCA) Cap 387 section 58 and the amended regulation 7(4) of the Environmental (Impact Assessment and Audit) regulations, 2003, vide legal notice 32 of 2019 which require that such a project is preceded by environmental impact assessment principally to identify the likely negative impacts and propose appropriate mitigation measures at the early stages of project planning. As per Legal Notice No. 31 of 2019 of the Environmental Management and Coordination Act (No. 8 of 1999), the project falls under the category of 'high risk projects'*: 3(e) establishment of hospitals.*

The Principal Act, Environmental Management and Co-ordination Act (EMCA) Cap 387, provides a legal and institutional framework for the protection and conservation of the environment, environmental impact assessment, and environmental auditing and monitoring. The relevant regulations operationalizing the Principle Act include; Environmental Management and Co-ordination {Environmental (Impact Assessment and Audit)} Regulations, 2003, Environmental Management and Co-ordination (Water Quality) Regulations, 2006; Environmental Management and Co-ordination (Waste Management) Regulations, 2006; and Environmental Management and Co-ordination (Air Quality) Regulations.

Methodology

The methodology used in the assessment consisted of the following:

a. Desktop review of all the relevant available documents on the project activities and components from the proponent and the project team;
b. Field studies on the project site at Rosslyn area to obtain further data through visual surveys to determine the baseline information of the project area, scoping the positive and negative impacts;
c. Public consultation; holding several preliminary meetings with various categories of identified stakeholders, administration of questionnaires to collect data and convening a public consultative meeting with the affected persons to discuss the anticipated environmental issues and their corresponding mitigation measures;
d. Data synthesis; the data collected was used to prepare this ESIA report.

Anticipated Environmental and Social Impacts

Both positive and negative impacts are anticipated as they relate to the project during the construction, operation and decommissioning phases. The ESIA project report established the following significant issues:

i. Wastewater management and disposal
ii. Hazardous waste management
iii. Increased water and power demand
iv. Oil spills during construction
v. Dust emissions
vi. Increased traffic along the main roads
vii. Air pollution
viii. Health and safety of workers
ix. Accessibility to the existing road network
x. Soil compaction, erosion and pollution
xi. Safety concerns
xii. Noise and vibrations
xiii. Population density
xiv. Creation of job opportunities
xv. Improvement of health services
xvi. Improving growth of the economy

Project Activities

The project will consist of four distinct stages:

- Pre-construction stage: This phase will involve the preparation of architectural and structural drawings by professional consultants. This will be followed by other approvals from the relevant lead agencies such as Nairobi City County Government, KURA among others.

- Construction stage: This will commence with hoarding at the project site. A masonry perimeter wall will be constructed surrounding the site to boost security. This will be followed by the excavation of the ground, laying of the foundations and construction works to the completion of the development.
- Operation stage: The proposed project scope of works as contained in the project components include construction and renovation of a 152 beds capacity two-storied hospital with a mandate of offering specialized health care at the highest possible quality and standards.
- Decommissioning: The decommissioning of the project will be determined at the expiry of its economic use estimated at over 100 years from commissioning. This will involve changing of the current use to other uses depending on the needs at that time by the planning regulations and authorities.

Conclusions and Recommendations

It is evident from this ESIA study that the construction and operation of the proposed hospital at Rosslyn area within Nairobi County will bring positive effects in the project area including; creation of employment, availability of social amenities, improved infrastructure, improved medical services and increase in government revenue among others. The negative impacts of this project will include: increased generation of biomedical waste, pressure on available infrastructural facilities and services such as water, electricity and road network, noise and dust during construction phase, environmental degradation among others - hence the need to establish an effective mitigation plan. On the basis of the above and taking cognizance of the fact that the proponent intends to ensure environmental integrity, it is our recommendation that the project be allowed to go on provided the mitigation measures outlined in this report are adhered to and the Environmental and Social Management Plan (ESMMP) is implemented. The proposed project is well conceived and is in line with the country's sustainability strategy in adhering to Sustainable Development Goals (SDGs) and Vision 2030. The proponent has incorporated environmental management concepts in his project and all adverse impacts have adequate mitigation measures. The project is therefore recommended for implementation subject to observance of mitigation measures, the ESMMP, the adherence to the National and County Government Regulations as well as the NEMA licensing conditions.

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CHAPTER ONE: INTRODUCTION

1.1 Background

Cities and communities globally are facing environment-related shockers and stressors. This is augmented by anthropogenic activities that lead to the deterioration of natural resources. Nations are therefore responding to the urgent need to conserve and preserve the environment through international declarations, regional treaties and nationally intended commitments. Kenya has made significant steps to spearhead pro-environmental behaviors and mainstream environmental consciousness in programmes, plans and projects. As a result, construction projects are mandated to undertake an environmental and social impact assessment prior to implementation.

1.2 Project Objectives

To contribute to the provision of quality and adequate healthcare services while safeguarding the well-being of neighboring communities and protecting the environment.

1.3 Background of ESIA

To remain compliant and work within the confines of the existing legislative provisions, the project proponent subjected the project to an Environmental Impact Assessment. Provisions on Environmental Management and Coordination Act (EMCA) Cap 387 section 58 and the amended regulation 7(4) of the Environmental (Impact Assessment and Audit) regulations, 2003, vide legal notice 32 of 2019 require that such a project is preceded by environmental impact assessment to identify the likely negative impacts and propose appropriate mitigation measures at the early stages of project planning.

1.4 ESIA Objectives

The objective of this assessment is the production of an ESIA report to address the effects and impacts (both positive and negative) during the construction, operation and decommissioning phases of the hospital.

1.5 Scope of the ESIA and the Terms of Reference

The scope of this report covers the cradle to grave of the project's life cycle with a focus on the environmental and social impacts. The terms of reference include:

a. The proposed location of the hospital and scope of works;
b. A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the proposed project;
c. The technology, procedures and processes to be used, in the implementation of the project;
d. The products, by-products and waste to be generated by the project;
e. A description of the natural and physical environment;
f. The environmental effects of the project including; the social and cultural effects, and the anticipated direct and indirect, irreversible, short-term and long-term effects;

g. Recommending a specific environmentally sound and affordable wastewater management system;
h. Providing alternative technologies and processes available and reasons for preferring the chosen technology and processes;
i. Analysis of alternatives including project site, design and technologies;
j. An Environmental and Social Management Plan (ESMMP) proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, timeframe and responsibility to implement the measures;
k. Providing an action plan for the prevention and management of the foreseeable accidents and hazardous activities in the cause of carrying out development activities.
l. Proposing measures to prevent health hazards and to ensure security in the working environment for the visitors, employees and for the management in case of emergencies.
m. An economic and social analysis of the project, and such other matters as the authority may require.

1.6 Methodology

1.6.1 Desktop Review

This included the review of legislative and policy documents framing and guiding this assignment, including relevant documents that pertain to the operations of a hospital facility. The review of secondary data was also critical in obtaining baseline information.

1.6.2 Site Visit

Several site visits were carried out on the project site and within the project area in the scoping and screening phases. The visits and desktop reviews informed the situational analysis of the ESIA.

1.6.3 Public Consultation

Public consultation involved direct interviews, administration of questionnaires and convening public consultative meetings to further discuss the anticipated environmental issues and their corresponding mitigation measures.

1.6.4 Data Synthesis

The data collected was used to prepare the Environmental and Social Management and Monitoring Plan (ESMMP) encompassing the potential impacts, mitigation measures and monitoring indicators which form part of this report.

1.6.5 Reporting

The main output is an ESIA report comprising of executive summary, assessment methodology, project description, study area, legal and institutional framework, anticipated impacts, and an Environmental and Social Management and Monitoring Plan (ESMMP).

CHAPTER TWO: PROJECT DESCRIPTION, DESIGN AND CONSTRUCTION

2.1 Introduction

This EIA study report is based on information and consultations with the project proponent, the project team of experts, the members of the public and the details contained in the architectural plans and drawings. The proposed hospital will be constructed and managed by Columbia Africa Healthcare Limited. The hospital will offer high quality and diverse health services to the growing population of Nairobi County and other neighboring regions.

2.3 Ownership and Location of The Project

The Proposed hospital is located at Rosslyn area approximately in Westland Sub- County of Nairobi County, off Limuru road. The proposed plot size area is approximately 1.416 Ha and it was registered under Columbia Africa Healthcare Limited. The proposed project is located on GPS Coordinates -1.220216 S, 36.802238 E.

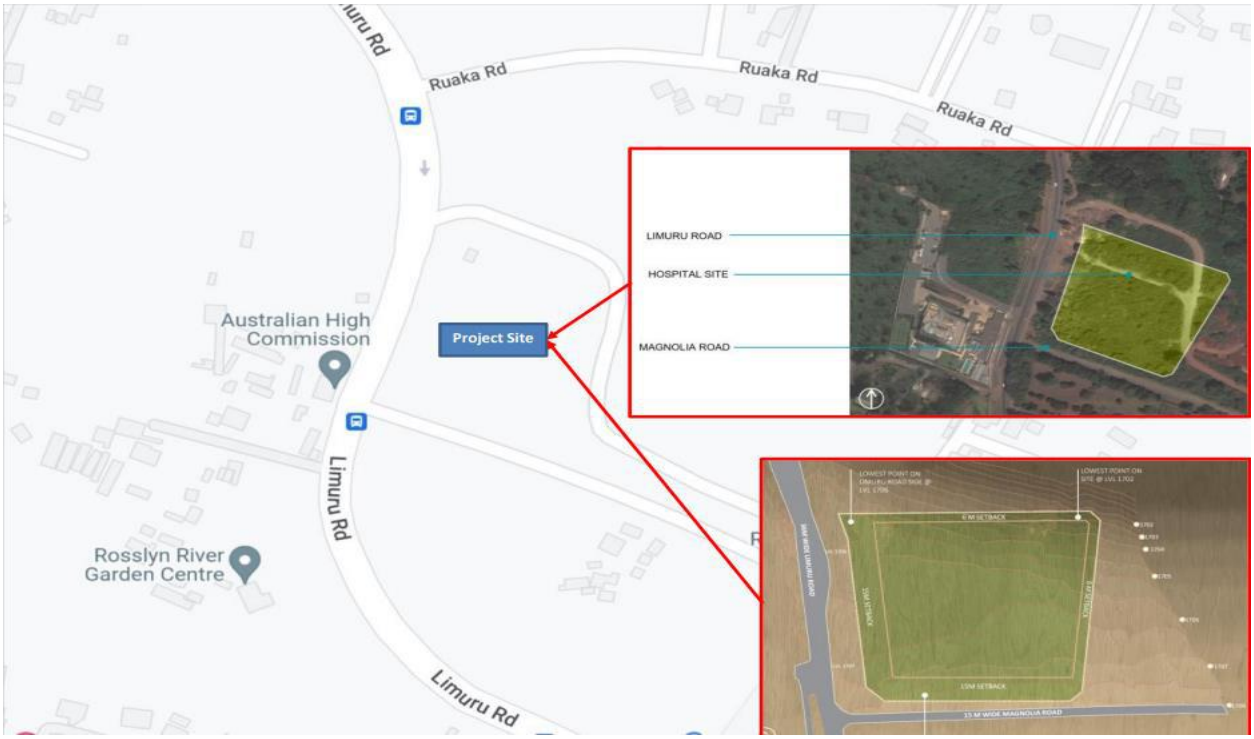

Figure 2.1-Project Location and Site Plan

2.4 Planning Concept of The Proposed Project

The project's decisions were influenced by the following factors:

a. The masterplan was developed in conjunction with the functional aspects of healthcare planning, the Kenyan standards for traffic flow and the neighborhood developments.
b. Consideration was given to the project's 360-degrees view from the Limuru road, Magnolia Close, Rosslyn Grove and the Ruaka Road, which influenced the strategies employed to determine the overall height and position of the main building and the functions within the facility.
c. The traffic management plan took into account the upgrade of Limuru road to a dual carriageway. The internal circulation within the project site was carefully planned and designated for the public, ambulance, and service vehicles, ensuring efficient and separate pathways for each.
d. Height restrictions were also influenced by security concerns expressed by the Australian embassy. This necessitated careful consideration of the site's topography, resulting in strategic placement of the building mass.

2.5 Project Description

The proposed development will consist of one block that provides a capacity for 152 inpatient beds and additional support services essential for the hospital's operations such as the kitchen, workshop, trash collection, patient rooms, medical gas manifold, and other services. The proposed buildings bear a height of G+ 2L. The ground floor bears two levels, an upper ground floor and lower ground floor deduced from the basement. The building heights resonate with surrounding developments. Concerning the adherence to zoning parameters, adequate set backs are provided and the premise is well within the recommended plot ratio and ground coverage.

2.6 Detailed Design Description

The facility features a wide range of amenities, including 25 outpatient departments (OPDs), a dedicated center for preventive health with master health checkup services, specialized units for dialysis, chemotherapy, and birthing. Moreover, it houses well-equipped inpatient accommodations, including an intensive care unit (ICU), a neonatal intensive care unit (NICU), a high dependency unit (HDU), 5-bed wards, twin patient rooms, and single patient rooms. In addition, the hospital offers essential supporting services such as blood banking and advanced medical data management.

CA FACILITIES PROPOSED		
No	Area	Beds/ Area
1	Emergency	8+2
2	OPD Clinics	25
3	Radiology	
3,1	X-Ray	2
3.2	Ultrasound	4
3.3	Mammography	1
3.4	CT Scan	1
3.5	MRI	1
3.6	OPG	1
4	Laboratory	2300 Sq.ft
5	Endoscopy Procedure Room	2
6	Dialysis	6
7	Physiotherapy	450 Sq.ft
8	LDR Complex (Delivery suite+ Induction)	3+2
9	NICU	4+4+2
10	ICU	10+10
11	HDU	8+8
12	CCU	4
13	CATH Lab	1
14	Major OTs	6
15	CSSD	1260 Sq.ft
16	Single Bed	33
17	Double Bed	24
18	Multi Bed Ward - 5 Bed	25
19	Suite Rooms	10
20	Day Care Bed	10

Figure 2.2-Department Allocation and Capacity per Floor

2.8 Current Zoning Regulations

The current development ordinance and zoning for this area allows for proposed development after a change of use from agricultural to health facility (hospital) was obtained from Nairobi County Planning Committee on 20th September, 2020. Subsequently, the certificate of lease was registered and issued on 8th November, 2022. The proponent has complied with all the conditions required in accordance with the nature of such a development. (A copy of change of user approval is annexed).

AREA STATEMENT					
LEVELS				TOTAL FAR AREA	TOTAL
	HOSPITAL AREA	SERVICES	CAR PARKING		
	SQ.M	SQ.M	SQ.M	SQ.M	SQ.M
BASEMENT	1,680	1,820	5,112	2,890	8,612
LOWER GROUND FLOOR	4,048	1,057	1,050	4,048	6,155
GROUND FLOOR	3,541			3,541	3,541
FIRST FLOOR [L1]	4,200			4,200	4,200
SECOND FLOOR [L2]	3,340			3,340	3,340
TOTAL	**16,809**	**2,877**	**6,162**	**18,019**	**25,848**

GROUND COVERAGE: 24% (0.24)

PLOT RATIO: 102% (1.02)

Figure 2.3-Area Statement

2.9 Project Justifications

There are quite a number of factors which would justify the existence of the proposed development in this particular zone, these include:

a. Road Network: The proposed site is located at a strategic area with good connectivity to the wider Nairobi Metropolitan area. Main class A road that can be used to access the site include Limuru Road, the Western and Northern Bypass, Redhill Link Road, Ring Road Parklands Road, Kiambu Road among others
b. Electricity and telecommunication infrastructure: The area is connected to the National Grid by the Kenya Power Company. The area is also well covered by all the mobile phone communication networks and radio signals. Street lights are available along both roads.
c. Solid waste disposal: The area is served by Nairobi City County Government and private garbage collection companies. The contractor will make use of proper waste management practices by recycling any reusable materials, decommissioned structures and excavations. The management of the hospital will contract a NEMA licensed hazardous/medical waste handler for disposal purposes during the occupational phase of the proposed project.
d. Water: Several water sources have been considered for this project. First is the main water source for the City of Nairobi, the Nairobi Water and Sewerage Company; the proponent shall endeavor to explore the possibility of a direct supply independent from the line serving the neighborhood. To augment water supply from the NWSC, the building is designed with a rainwater harvesting system and a high-tech sewage treatment plant to produce water that is fit for irrigation and to avoid overdependence on the fresh water supply sources.
e. Wastewater: The proposed hospital development will be connected to the conventional trunk sewer network that is just about 200 meters from the project site. As earlier mentioned, the project design includes an advanced Sewage Treatment Plant (STP) that will process all liquid waste to high quality levels for re-use or discharge to the environment.

2.10 Construction activities and inputs

2.10.1 Input During Construction

Typical inputs which will be used in the construction phase are land, labor, machinery and construction materials such as building sand, aggregates, construction stones, metal, roofing material, timber for making structural formwork and interior design. Others include concrete blocks for constructing selected internal and external pavements, precast units for drains, HDPE pipes (High Density Polyethylene) using butt fusion jointing for sewage and water reticulation, alternative to HDPE pipes, PP" pipes with 6 bar working pressure

and press type fittings with rubber seal will be considered, paints, electrical wiring and fitting, barbed wires, wire mesh and water tanks, window casement and glass.

2.10.2 Construction Activities and Timetable

The construction activities should begin from the time NEMA grants approval of the ESIA project report and issues an EIA License.

2.11 Project Implementation Sequencing

Table 2.1 Project Implementation Sequencing

1.Pre-construction stage	a. Plan preparation and seeking of the appropriate approvals from the relevant authorities such as the approval for the building/architectural plans. b. ESIA Project Report preparation to seek EIA License.
2.Construction stage	**Excavation and landfilling works** In preparing the site for the construction, the use of heavy earthmoving machinery such as excavators, backhoe and bulldozers will be required.
	Establishment of related works and all support infrastructures that are significant for the construction work This will involve the transportation of machinery and deployment of the contracted workers to the construction site. The machinery will be used for ground breaking and transportation of materials from the sources to the site. The contractor will also mobilize human workforce including casual, permanent, skilled and unskilled.
	Acquisition and transportation of building materials The contractor shall source for construction materials from various available suppliers. Supply of materials will be a continuous activity throughout the project life since different materials will be needed during future phases of the construction. Such materials include building stones, sand, ballast, cement, timber, reinforced concrete frame, steel, bars, G.I pipes, PVC pipes, pavement blocks, concrete slabs, murram, hardcore, insulated electrical cables and timber among others.
	Masonry, Concrete Work and Related Activities The engineering designs and site layout plans that have been approved shall be implemented. The setting will comply with the specifications set out by the client to the contractor under the supervision of qualified engineers. In accordance with the designs and the layout plans, the construction of the proposed project and associated

	infrastructure will begin immediately NEMA approves this EIA report. The contractor will then be supplied with all the approved documents including the EIA report. The construction of the building walls, foundations, floors, pavements and drainage systems among other components of the project will involve a lot of masonry work and related activities.
	Structural Steel Works The building will be reinforced with structural steel for stability. Structural steel works will involve steel cutting, welding and erection.
	Transportation of the construction wastes from the site for disposal. Construction waste that cannot be used for landscaping work at the site will be deposited offsite in approved dump sites by the contractor.
	Mechanical, Electrical and Plumbing MEP works during construction of the premises will include installation of electrical gadgets and appliances including electrical cables, lighting apparatus and sockets etc. A reliable BMS will also be installed. Installation of pipe work for water supply and distribution will be carried out within the building and associated facilities. In addition, pipe work will be done to direct sewage to the on-site STP and for drainage of stormwater.
3. Timeframe	The expected construction period is about 2 years.

2.12 Project Budget

The budget for the whole proposed project is approximated at about KES 3.5 Billion, where direct labor option may be adopted. The proponent shall remit the required NEMA statutory fees.

CHAPTER THREE: BASELINE INFORMATION AND METHODOLOGY

3.1 Methodology

The preparation of an Environmental Impact Assessment full study report is a multidisciplinary process that requires the use of various approaches and data collection methods. In this particular survey, public participation and consultation was widely used and the bottom-top approach of participation applied. Both scientific and social data collection methods were used and they included the following:

3.1.1 Questionnaires

Two types of survey forms were prepared; one for the leaders of residents' associations, another for neighboring institutions and one more that targeted the individuals within the project proximity. The questionnaires were widely shared during the preliminary stakeholder engagements at the physical meeting and via the use of email and other virtual exchange alternatives. Sample questionnaires are attached.

3.1.1.1 Residents Questionnaire

Social Impact Assessment
Residents Questionnaire
Project Proponent: Columbia Africa Healthcare Ltd.

Pursuant to the provisions of the Environmental Management and Coordination Act, 1999, the Environmental Impact Assessment and Audit Regulations, 2003 and in pursuance of sustainability and harmony, we request your views, opinions and recommendations regarding the proposed development to construct the Columbia Africa Hospital on the property registered as NAIROBI BLOCK 196/986 in Rosslyn area, Nairobi City County.

Name of Respondent:
Brief description of your location in relation to the proposed development site:
Mobile Number:
Date:

1. What is your **general opinion** regarding the proposed construction of the Columbia Africa Hospital?
2. What are the likely impacts **(either positive or negative)** of the proposed development on the following?
    a) Effect on neighbors
    b) Effect on water and other utility services
    c) Effect on traffic and the road infrastructure
    d) Effect on the natural environment
    e) Effect on the security of the area
3. Please state the key **adverse impacts** that may arise from the construction and operationalization of the hospital.

4. Please suggest ways in which the adverse impacts stated in question 3 above could be **mitigated**.

5. Do you support the proposed development?
   Yes No
6. Briefly state the reasons for your answer in question 5 above.

3.1.1.2 Resident Association Leadership/Institutions Questionnaire

Social Impact Assessment
Institution/Resident Association Leadership Questionnaire
Project Proponent: Columbia Africa Healthcare Ltd.

Pursuant to the provisions of the Environmental Management and Coordination Act, 1999, the Environmental Impact Assessment and Audit Regulations, 2003, and in pursuance of sustainability and harmony, we request your views, opinions, and recommendations regarding the proposed development to construct the Columbia Africa Hospital on the property registered as NAIROBI BLOCK 196/986 in Rosslyn area, Nairobi City County.

Name of Resident Association:
Name of the Person Filling:
Position held In Association:
Phone Number:
Date:

1. What is your opinion about the proposed hospital's construction?

2. Do you think the proposed development aligns with the development standards and general guidelines proposed by the resident association/Institution?

   a. Yes No

   b. If no, what standards are contravened

   c. What changes can you propose to the proponent to ensure conformity and compliance?

3. Are there any perceived negative impacts the proposed development is likely to create?

4. What should the relevant Government/Regulatory Agencies do to alleviate any adverse effects on the locality, taking into consideration this development

5. What benefits will the proposed development bring to this neighborhood?
6. Is the resident association leadership/Institution in any way opposing the proposed development?

   Yes……. No…….

7. If yes, give your reasons and the changes you suggest to gain your approval.

3.1.2 Observations

Field observations formed an integral part of the report as the experts gathered considerable information through observations. This involved site visits and recording the situation on the ground. Observations were also used as a tool for verifying the facts that were gathered through interviews and questionnaires.

3.1.3 Photography

Photos were taken to show the actual site of the proposed development, resources on site and the character of the neighboring developments.

3.1.4 Secondary Data

Various sources of literature were used in aiding the successful completion of the report. These include: The Environmental Management and Coordination Act No.8 of 2015, Environmental Impact Assessment Audit Regulations 2003, Physical and Land Use Planning Act, 2019, Kenya Gazette supplement No.56, Nairobi Integrated Urban Development Plan, Environmental Management and Coordination (Waste Management) regulations, Legal Notice No.12 of 2006, the Public Health Act, Cap 242, the Factories and other places of Work Act and Water Act 2016, Wetlands Policy 2008, among others.

3.2 Baseline Information

The proposed project site is located on Parcel No. NAIROBI/BLOCK 196/986 along Limuru road, in Rosslyn area, Nairobi City County. The project site is in an urban setup characterized by developed neighborhoods of mixed character such as commercial (Rosslyn Riviera Mall), diplomatic premises (Australian High Commission), Residential (Rosslyn Ridge & Rosslyn Grove Apartments) and Schools (Rosslyn Academy). No fragile environmental ecosystem was noted on the project site and the proposed development was found to blend well with the existing projects in the area. The figure below shows the comparative height elevations along two cross-sections.

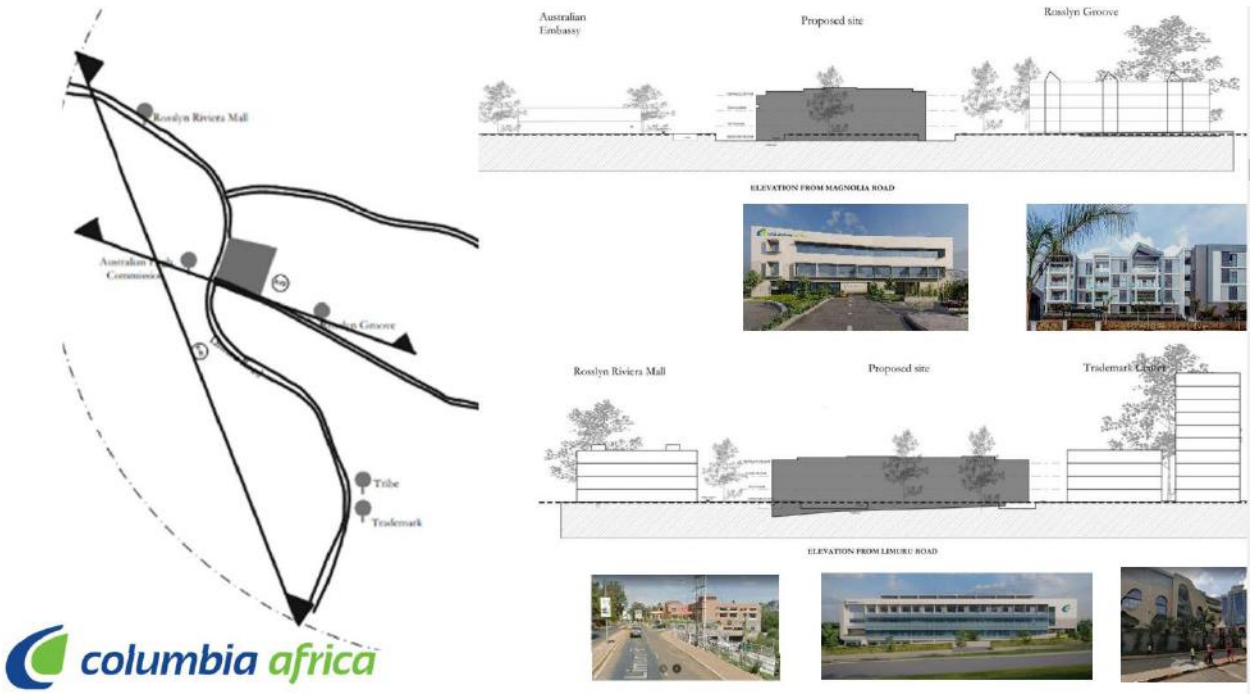

Figure 3.1- Neighborhood Character

3.2.1 Climate

The general area where the proposed project site is situated enjoys bi-modal rainfall seasons. This section of Nairobi is cooler and wetter as opposed to the Nairobi plains to the south-east that are drier and hotter. The area receives a high rainfall season between the months of April to May and moderate rainfall season between the months of November to December. The rainfall peaks during the month of April and November annually. The average rainfall is normally above the range of 1000mm per annum and the distribution is fair and reliable. The temperature averages 18.8 °C | 65.8 °F. The warmest month of the year is February, with an average temperature of 20.5 °C | 68.9 °F. July has the lowest average temperature of the year at about 17.0 °C|62.7 °F.

3.2.2 Topography

The project site is situated on the North Western side of Nairobi City. Generally, the geography of this area is dominated by low lying terrain of undulating ridges and shallow stream valleys with an eastern gently sloping ground which characterize the project site topography. The micro topography of the upcoming hospital project site generally slopes from the southern end adjacent to the junction between Limuru Road and Magnolia Close, which is the highest point.

3.2.3 Soils

The major soil type in this part of Nairobi area includes vertisols and lithosols derived from the weathering of volcanic rocks underlying the area. The County area has three broad categories of soil types. These are soils found on high – level uplands, soils found on volcanic footbridges and soils covering the plateau terrains. The

proposed site falls in the soil category of volcanic plateaus; these are soils of moderate to high fertility and are also found in parts of Kiambu County. These are well drained soils, extremely deep, grey/red in color with dark brown friable clays deposits.

3.2.4 Water Resources

The two principal water sources in the County are reticulated water and sub – surface water resources. The reticulated water is sourced from surface water sources such as the few rivers, and even dams in neighboring counties from where water serving Nairobi County is sourced. The riverine ecosystem in the area is Rui Ruaka. Several boreholes and wells have been sunk in various areas to supplement the surface running streams. The dependency on both reticulated water from NWSC and sub-surface water is very high in the area since the adjacent stream is seasonal. Since some of the boreholes sunk in the area do not produce a high yield for domestic and other commercial activities, the reliance on multiple sources, including water from NSWC, rain harvesting and recycled wastewater provides a reprieve.

3.2.5 Flora and Fauna

The target project site is undeveloped. Mainly, the site is covered by short herbaceous vegetation of the lantana camara species. The proponent will re-vegetate flora through soft landscaping to replace any that was affected during construction. No significant fauna was noted during the site visit. There are no threatened, rare or endangered species on the project site.

3.2.6 Sanitation

The trunk sewerage system infrastructure has been laid down but is yet to be commissioned for use. Residents rely on onsite STPs such as biodigesters and septic tanks. Once completed, the proposed development will be connected to the sewer line operated by the NWSC since the design of the proposed project includes provision for this connection to dispose of the effluents from sanitation facilities. Before then, an efficient STP will be installed to facilitate effluent waste management.

3.2.7 Infrastructure

The zone where this project is located has adequate infrastructural facilities. The site is located at the junction between Limuru Road and Magnolia Close. The two access roads to the site, Limuru Road and Magnolia close exist in good condition in terms of level of service and drainage of stormwater, allowing the two roads to be considered as the main access avenues. Power lines and communication masts are available in the project site area. However, the proposed project will rely on an onsite installed transformer and generator to avoid overdependence on the service power lines serving the neighborhood.

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CHAPTER FOUR: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

4.1 Introduction

Over the past few decades, growing recognition of the environment and public health issues associated with anthropogenic activities has prompted the development and application of methods and technologies to reduce the adverse impacts. In this context, governments have adopted regulatory and other policy interventions to minimize negative effects and to ensure environmental quality standards are achieved. Under this ESIA, the proposed development is liable to the following key statutory Acts regulations and policies:

Table 4.1: Policy, Legal and Institutional Framework

Legislation	Relevant sections of the Legislation	Trigger of Legislation	Project fulfilment Legislation
Environmental Management and Coordination Act, Cap 387	Mandates National Environment Management Authority (NEMA) as the principal institution which exercises general supervision and coordination over all matters relating to the environment in accordance to the Act. ● The second schedule of this Act provides guidance on project impact categorization into low, medium and high risks and implementation of appropriate environmental and social impact assessments. ● The project falls under the category of 'High risk projects (e) establishment of hospitals. ● Section 58. Requires preparation of an Environmental Impact Assessment (ESIA) for proposed projects before the commencement of the project in order to obtain a license. ● The authority, Director general is supposed to respond to applications on EIA license within six months. ● Section 60 of EMCA gives power to NEMA to require lead agencies to comment on an ESIA Report. Considering the nature of the Project, NEMA may require bodies/agencies to also comment on the ESIA Report before issuance of an EIA license.	Project has the potential to affect the physical environment including soil, water & air during the construction phase.	Commissioning of this ESIA

EMCA (Environmental Impact Assessment and Audit) Regulations, 2003	These regulations stipulate how an ESIA full study report should be prepared and specifies all the requirements that must be complied with. The regulations highlight the stages to be followed, information to be made available, role of every stakeholder and rules to be observed during the whole ESIA report making process. ● Regulation 18 of the regulations provide the contents of a full EIA study report. ● Part IV section 31 of the 2003 regulations requires an environmental audit to be done after completion of a project based on the Environmental Management plan of the EIA report.	Project has the potential to affect the physical environment including soil, water & air during construction phase and operation phase. Therefore, the Need for an ESIA	This EIA report is prepared pursuant to the guidelines of these regulations. The Environmental Management and monitoring Plan (ESMMP) provides guidelines for the contractor during the construction phase. An audit study shall follow after project completion through licensed Environmental experts
EMCA (Waste Management) Regulations, 2006	These regulations streamline handling, transportation and disposal of various types of waste, with an aim of protecting human health and the environment. The regulations advocate for cleaner production principles, waste reduction, and segregation at source. ● Regulation 1-3. The mode of transporting waste shall be in an environmentally acceptable manner, no littering while transporting or emission of noxious smells. ● Rule 4 (1) prohibits disposal of waste in any other place except designated waste receptacles. ● Rule 4(2) and 5 require segregation of hazardous waste and non-hazardous waste, and disposal in facilities provided by the relevant local authority. ● Rule 7 requires use of licensed waste handlers for collection, transport and disposal.	Construction and operation phase will generate various types of solid waste.	The contractor and proponent will take the responsibility to ensure that solid waste is properly handled, stored, transported and disposed as per the procedures provided in these regulations.

<table>
<tr>
<td>EMCA (Water Quality) Regulations, 2006)</td>
<td>These regulations apply to sustainable water use for a variety of purposes. They protect lakes, rivers, streams, springs, wells and other water sources whereby contravening the regulations is an offense that attracts a fine not exceeding five hundred thousand shillings.
• Part II section 4 gives a provision for prevention of pollution. It states that; - Every person shall refrain from any act which directly or indirectly causes or may cause immediate or subsequent water pollution, and it shall be immaterial whether or not the water resource was polluted before the enactment of the Act.
• Further prohibits throwing or causing to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, so as to cause pollution.</td>
<td>Construction and operation phase will generate various types of liquid waste.

This waster will be managed by an STP until the time the sewer line under construction is complete
The expected waste water is mainly domestic type.</td>
<td>The contractor and proponent will take the responsibility to ensure that liquid waste is properly managed and treated. The contractor shall take measures as per the ESMMP to prevent any discharge of water into the environment</td>
</tr>
<tr>
<td>L.N. 61: Noise and Excessive Vibration Control Regulations, 2009</td>
<td>The general prohibition states that no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.
In this case permissible levels applicable to public utility construction should be in line with the table below.
<table>
<tr><th colspan="3">Maximum permissible Noise levels for construction sites (measurements taken within the facility)</th></tr>
<tr><td>Facility</td><td>Day</td><td>Night</td></tr>
<tr><td>Health facilities, educational</td><td>60</td><td>35</td></tr>
<tr><td>Residential</td><td>60</td><td>35</td></tr>
<tr><td>Areas other than those</td><td>75</td><td>65</td></tr>
</table>
Time frame: Day: 6.01 a.m. – 6.00 p.m. (Leq, 14h) Night: 6.01 p.m. – 6.00 a.m. (Leq, 14h)</td>
<td>Noise nuisance is likely to emanate from construction activities</td>
<td>The contractor shall adhere to ESMMP to abate noise nuisance</td>
</tr>
</table>

EMCA (Air Quality) Regulations, 2014	These regulations are to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. The overall aim is to protect human health and safety. ● Regulation 5, 6, 7 and 8 prohibit any person from causing the emission of air pollutants (such as liquid and gaseous substances) and suspended particulate matter listed under Second Schedule (Priority air pollutants) to exceed the ambient air quality levels as stipulated under the First schedule (Ambient air quality tolerance limits) and Third Schedule (Emission limits for controlled and noncontrolled facilities).	The project has the potential to impact on air quality in the form of adding Particulate dust and gasses emissions from construction machinery.	The contractor is therefore required to keep particulates, especially dust, within acceptable limits. During operation this impact is not expected
Sustainable Waste Management Act, 2022	With the enactment of the Sustainable Waste Management Act, 2022, Kenya has demonstrated its commitment to promote sustainable waste management and circular economy practices for green growth. The Act imposes several obligations on both public and private entities, which will demand an environmentally friendly and sustainable approach to economic development and business practices. Some key highlights of the Act include: a. Scope of the Act: The Act covers: domestic waste, waste electronic equipment, extended producer responsibility, hazardous waste, industrial waste, organic and non-organic waste, payment for environmental service, pollution, private sector entity, producer, public entity, recycle, re-use, recovery, sustainable waste management, waste management facility. b. Sustainable Waste Management-Part 1 (d) of the act defines sustainable waste management "as a means of using material resources efficiently as prioritized by waste hierarchy, circular economy, and clean production to reduce the amount of waste that is generated, deposited or discarded in the environment including the management of materials that would otherwise have been dumped or wasted in a way that contributes to environmental, social and economic goals of sustainable development. Extended Producer Responsibility- Section 13 (clauses 1 and 2) requires every waste producer to bear responsibility obligations to reduce pollution and environmental impacts of the products they introduce into the Kenyan Market and waste arising therefrom. Likewise, every producer shall fulfill their extended producer responsibility obligations individually or collectively in a compliance scheme	The project has the potential to generate domestic and hospital waste.	The proponent should segregate the waste at the source in accordance with the provisions of this Act; and dispose of the waste to only licensed waste service providers or at collection points designated in accordance with the provisions of this Act.

Climate Change Act, 2016	This Act is applied for the development, management, implementation, and regulation of mechanisms to enhance climate change resilience and low carbon development for the sustainable development of Kenya. The Act places duties on the national government and county governments to mainstream climate change responses into development planning, decision making, and implementation and to respond in various other ways to climate change. The Act sets out principles of climate change planning and implementation of measures. Per the Act, every development undertaken by the public and private sectors is required to act in the best interests that protects the environment. The act establishes an institutional framework to govern climate change matters to ensure compliance. Such a framework includes the following stakeholders. 1. National Climate Change Council- Tasked with the responsibility of providing an overarching national climate change coordination mechanism by ensuring that the legislative and policy-making functions 2. Cabinet Secretary Climate Change Response Function-Coordinates negotiations on climate change related issues 3. Climate Change Directorate- Lead agency of the government on national climate change plans and actions to deliver operational coordination. 4. National Environmental Management Authority (NEMA)- Tasked with monitoring, investigating, and reporting on whether public and private entities are in compliance with the assigned climate change duties in addition to regulating, enforcing, and monitoring compliance on levels of greenhouse gas emissions as set by the Council under the Climate Change Act.	Every development possesses climate change risks. Critical functions of the hospitals will either act as climate stressors or enablers. Such associated risks, if unmitigated, might contribute to costly climatic damages or disruptions, either currently or in future	Per the provisions of this act and the Climate Change Measures and Actions enlisted in the National Climate Change Action Plan, the proponent will establish a framework to consistently monitor any climate change risk and vulnerability induced by the proposed project. The proponent will further develop adaptation strategies to reduce identified climate variability and change risks.
Occupational Safety and Health Act (2007)	The Act makes provision for the health, safety and welfare of persons employed. The provision requires that all practicable measures be taken to protect persons employed from any injury. The provisions of the act are also relevant to the management of hazardous and non- hazardous wastes, which may arise at the project site during construction and operation. The act provides that all measures should be taken to ensure safety, health and welfare of all the stakeholders in the workplace. It shall be the duty of the proponent and contractor to ensure workers safety is given priority during construction. This should be achieved in several ways: ● According to section 44. The construction site(s) shall be registered as a construction site with the directorate of occupational safety and health services	The construction phase of project will have activities taking place which pose occupational health and safety risks	This ESIA provides recommendations with regards to compliance with Safety and Health provisions.

	(DOSHS) under the Ministry of Labour, Social Security and Services as stipulated in Part V. ● As highlighted in Section 6, by undertaking risk assessments and adopting preventive and protective measures. ● Ensure all dangerous situations and accidents are reported within time and appropriate action taken. ● Similarly, all plants and machinery in use shall be subjected to periodical plant examinations as provided by law to ensure safety according to Part VII. ● General welfare issues are dealt with under Part X. These include provision of drinking water, washing facilities, and first aid facilities ● Section 125 requires building plans to be approved by the director, DOSHS prior to building.		
Fire Risk Reduction Rules, 2007	Rule 17 requires a Proponent to clearly delineate fire escape exits. The regulation provides for the minimum standards to be applied in marking out all fire escape exits. Rules 29 – 31 refer to the installation and maintenance of firefighting systems in workplaces. Fire extinguishers are to be mounted at least 60cm above ground while a fire hose reel must be located within a radius of 30m. ● The firefighting system shall be installed and maintained annually by a competent person and records maintained by the Proponent.	To promote fire safety	The project features fire exits and water for firefighting including firefighting equipment. The proponent is advised to adhere to the provisions of these rules.
Physical and Land Use Planning Act, 2019	Section 192 and 191 prohibits voluntary fouling air and water into the environment which affects the health of the persons. It states "Any person who voluntarily vitiates the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carrying on business in the neighborhood or passing along a public way is guilty of a misdemeanor"	Construction activities have a potential of fouling air and water	The contractor/ proponent shall refrain from polluting the environment.

The National Building Regulations (NBR) 2015	An Act of Parliament to provide for the establishment, powers and functions of the National Construction Authority and for connected purposes. ● The act requires that a person shall not carry on the business of a contractor unless the person is registered by the Board under this Act. ● The NBR,2015 is a set of rules to be used by professionals in the building industry to guide design, construction and maintenance of buildings in Kenya. It is one among a set of key legislative and policy documents that have resulted from an extensive review of building laws and policies in Kenya. ● The regulations take one through all the stages of development from land planning through the design of the building, approval of the same to construction, inspection to completion of the building. It also gives procedures for issuance of occupation certificates and maintenance. ● The contractor who will be selected must adhere to the provisions of the regulation in terms of Structure, Foundations and Excavations, Materials and Workmanship, Floors, Walls and Roofs, Lighting, Ventilation, Water Service, Drainage, Water Disposal and Storm Water, Electrical Installations, Fire Safety and Installations, refuse disposal and construction risk management.	For development Regulation and streamlining	During project implementation, there is need to register project site and use registered professionals by the National Construction Authority (NCA) and methods as guided
The public Health Act Cap 242	Under this Act, every local authority or health authority is mandated to take all lawful, necessary and reasonably practicable measures to prevent all injurious conditions in premises, construction condition or manner of use of any trade premises. Nuisances under this Act include any noxious matter or waste water, flowing or discharged from any premises wherever situated, into any public street, or into the gutter or side channel of any street or water course, or any accumulation or deposit of refuse or other offensive matter. Every council and every urban area council (now County Governments) may make by-laws as to buildings and sanitation. ● Part IX section 115 of the Public Health Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Any noxious matter or waste water flowing or discharged into a watercourse is deemed as a nuisance. Part XII Section 136 states that all collections of water, sewage, rubbish, refuse and other fluids which permits or facilitate the breeding or multiplication of pests shall be deemed nuisances. The	The project site has a potential to cause nuisance from wastes generated. During operation, the hospital is required to provide waste receptacles, cleaning service for common areas and washrooms, and maintaining drains	This ESIA proposed abatement measures for preventing nuisance and promoting health. The proponent shall maintain a clean environment by properly disposing any wastes generated during the project operations. Adhering to the Environmental Management Plan

	Act addresses matters of sanitation, hygiene and general environmental health and safety.		developed in this report will help in preventing nuisance during all phases of the project implementation.
Radiation Protection Act, Chapter 243	An Act of Parliament to provide for the protection of the public and radiation workers from the dangers arising from the use of devices or material capable of producing ionizing radiation e.g. X- ray machines and for other connected purposes		Compliance with this act will be a main objective by the proponent to ensure proper use of radiation emitting equipment and therefore protect patients and other employees from the harmful effects occurring from overexposure to radiation
The Nurses Act, Chapter 257	This is an Act of Parliament that makes provision for the training, registration, enrolment and licensing of nurses, to regulate their conduct and to ensure their maximum participation in the health care of the community and for connected purposes.		The proponent has complied with the same in order to achieve the required set standards when it comes to the provision of medical care.
The Medical Practitioners and Dentists Act, Chapter 253	An Act of Parliament to consolidate and amend the law to make provision for the registration of medical practitioners and dentists and for purposes connected therewith and incidental thereto.		This Act should act as guidance to the proponent on the requirements of hiring of doctors to avoid cases of mal-practice.

CHAPTER FIVE: ENVIRONMENTAL IMPACTS, ISSUES OF CONCERN AND MITIGATION MEASURES

Impacts can be positive and negative, direct or indirect. Environmental impacts for the project are determined by breaking down the project into its activity components and examining the tasks in each component. Once the environmental impacts have been identified, mitigating measures are then prescribed and subsequently, an Environmental Management Plan (EMP) is formulated for the project. The Environmental Impacts of the project and the mitigation measures of the negative impacts are listed below:

5.1 Positive Impacts

The proposed development will have positive impacts to the society and the environment in general. Some of benefits include the following:

- Improved access to quality health care services
- Contribution of the project towards attainment of Vision 2030
- Through construction of the proposed development, the project will ensure optimal use of the land to the great benefit of the country and its people with land being a scarce resource in Kenya.
- The proposed development will provide the necessary health facilities for providing adequate healthcare services to Westland Sub- County residents and adjacent counties at large.
- Creation of market for goods and services and especially construction inputs which include raw materials, construction machinery and labor. Secondary businesses are also likely to spring up during the construction phase especially those providing food and beverages to the construction workers.
- Massive job opportunities for Kenyans both during planning, construction and operational phases. They include building contractors, architects, structural engineers, mechanical engineers, surveyors, environmentalists, security agents, transporters, construction workers, site managers and foremen, doctors, nurses and hospital administrators.
- Revenue to the County and National Government from taxation.
- Development of area through increased business opportunities and infrastructural development.

5.2 Potential Adverse Environmental Impacts

Against the background of the above positive impacts, there will be negative impacts emanating from the establishment and operation of the facility throughout the project cycle i.e., at construction, operation and possible decommissioning phase. Once the environmental impacts were identified, mitigating measures are then prescribed and subsequently an Environmental and Social Management Plan (ESMMP) has been formulated for the project. The environmental impacts of the project and the mitigation measures of the negative impacts are listed below:

5.2.1 Soil Erosion

Ground surface alterations during the project site preparation and the transportation of construction materials and equipment, using heavy trucks will disturb the soil surface, making it highly susceptible to soil erosion occurrence. The disturbed soil could easily be transported by surface runoff, causing clogging of nearby drains and sewer pipes. This is likely to be temporary impacts, ceasing after the project construction stage is completed. It is anticipated that the proposed project will not have a significant soil erosion impact if preventive measures are undertaken during the project design and construction stages.

Mitigation measures:

The soil erosion problem will be addressed during the project design and construction stages when the necessary control measures would be considered and incorporated in the project design and implementation. The soil on site will be investigated prior to site preparation for building construction and appropriate safety procedures developed to reduce the occurrence of increased soil erosion. Measures taken to control erosion will include:

- Avoid unnecessary movement of soil materials from the site.
- Provide soil conservation structures on the areas prone to soil erosion mostly to reduce impact by the run-off.
- Control construction activities especially during rainy conditions.
- Introduce appropriate plant species to revegetate open areas after construction.
- Provide suitable storm water drainage channels to effectively discharge water to safe areas. Channels need to be regularly maintained and repaired to avoid point discharge in case of breakages or blockages.
- Excavated soil to be used for landscaping or to be disposed of in designated sites.

5.2.2 Land/Soil Pollution

Land pollution is likely to occur due to accumulation of solid waste during the project construction stage that will mainly be composed of debris containing bits of wood, bricks, stone and metal pieces, replaced machinery parts; plastics, broken glass, and ceramics. The waste could also contain hazardous lead-based paint residues, paints and solvents, cement, diesel fuel and oil, heavy metals, and other products that could be considered as hazardous waste material such as from the site backup generator containing spillages of fuel and oil. Site pollution could also occur during the project operation stage, due to the generation and accumulation of hazardous medical waste containing used bandages, tested medical specimens, expired drugs, used syringes and needles and human waste.

Mitigation measures:

- The management of hazardous waste materials will be done in accordance with Compliance of solid waste management legal notice No. 121 safety guidelines. This includes identifying, labeling, keeping datasheets, knowing the exact location, proper storage, and using recommended safe work practices to handle hazardous waste.
- Also, fuel storage systems will be placed within concrete containment areas so that any oil spills would be contained. A lined containment basin should be constructed for the generator to sit in, so that the released oil does not leak into the ground to cause pollution of underground water resources.
- In addition, any hazardous waste material will be safely stored until proper disposal can be done. The hospital institutes proper hazardous waste handling processes before collection by the contracted waste handlers for the safe disposal.

5.2.3 Hydrology and Water Resources Impact

Site construction activities will cause increased surface run-off, since the area surrounding the hospital building structure will be paved, causing changes in local drainage characteristics and possible flooding in nearby areas. This is likely to increase the transportation of pollutants from the hospital surroundings to surface and underground water resources. During the project operation stage, there will be considerable increase in local volume of effluent discharge because of the additional people attracted by the hospital. Likewise, hospital operations are water reliant and this will occasion an increase in the demand for fresh water. Overall, the hospital will generate an estimated water demand of 3243 cum/month, with 108 cum/day and 49 cum/day needed for domestic use and flushing respectively.

Mitigation measures:

- Storm water will be managed according to guidelines for surface runoff controls that include having construction of site draining systems connected to the existing storm water control structures, allowing for cross drainage diversion structures and a site-specific drainage plan for the new project construction. Specifically, surface drainage water will not be collected for any intended reuse per project design. Instead, it will be directly channeled to the nearby river through RCC box drain without percolation.
- The potential increase in local volume of effluent discharge will be investigated thoroughly during the project planning and design phase so that appropriate and reliable liquid waste handling treatment plant is designed. A sufficient and adequate STP will be installed to manage such effluent waste to a level that the resultant water is safe for reuse (landscaping) and discharge to the environment. The expected quality of water released from the STP after treatment to the sump -for temporal storage before

discharge to the environment or release to community members in need of it, is expected to be PH-6.5 -8.5, BOD (3-day 27˚C) < 10mg/ ltr, COD<50 mg/ ltr, TSS < 10 mg/ltr, Ammonia Nitrogen <5 mg/ ltr, Total Nitrgen <10mg/ ltr, Feca Coliform (MPN/100mL) <100.

- In the future, such waste should be channeled to the sewer line currently under construction.

Figure 5.1-Sewer line Under Construction

- The STP and liquid waste reticulation system will be effectively designed to prevent any leakage of untreated liquid waste when the project becomes operational.
- To lessen the reliance on fresh water supply lines serving the neighborhood, the hospital seeks to source fresh water from multiple avenues; borehole, rain water, and NWSC. Where possible, the proponent will apply for a direct water supply line from NWSC to avoid the reliance on the line serving the neighborhood. As per design, 200cum rain water will be harvested, filtered and stored at a sump located at the Lower Ground Floor (LFG) level. Sinking and drawing of water from the proposed boreholes will also depend on the hydrological survey findings to avoid overreliance on the underground water sources and allow for a seamless aquifer recharge. Overall, the multiple sources of water, will cumulatively provide 3583.75 cum/month of water to meet the water demand of 3243 cum/month.

5.2.4 Impact on Biodiversity (Flora and Fauna)

The proposed project site has a very limited value as wildlife habitat and vegetation cover is minimal. There are no threatened or endangered biodiversity (flora and fauna) species that are known to exist within the affected areas, and there are no protected areas within the project site. For these reasons it is expected that any activities

for vegetation removal, ground excavations and leveling are likely to cause minimal or no biodiversity impacts in the proposed project site.

Mitigation measures:

- Measures taken to control loss of biodiversity will include clearing and grading the ground surface within approved work limits, stripping the topsoil layer from the subsoil, stockpiling the removed soil in approved areas to be retrievable for landscaping and site restoration around the building structure and replanting the original vegetation after construction is completed.
- The soil removed from the building site will be used in landscaping around the paved areas for enhancement of environmental quality.
- The surrounding areas will be replanted with grass and flowers, and other suitable plants. The hospital administration staff will be required to monitor the recovery of the planted natural vegetation.

5.2.5 Traffic Density

The proposed project will generate traffic during the construction and occupation phase. After completion, simulations as per recommendations from the Institution of Transportation Engineers (ITE) Trip Generation Manual 10th Edition indicate the following hourly trip generation scenario by the hospital:

Floor use	Generated Trips (Vph)			
	AM Peak Hour		PM Peak Hour	
	AM In	AM Out	PM In	PM Out
Hospital (ITE Code 610)	238	92	117	238

Recommendations from the Institution of Transportation Engineers (ITE) Trip Generation Manual 10th Edition applied during computation of the above projected traffic generation rates and the current traffic scenarios/existing traffic conditions demonstrates the traffic increase rate is significant but manageable through provision of appropriate mitigation measures. Notably, mitigations proposed based on the Highway Capacity Manual (HCM) approach will also facilitate the realization of better Levels of Service (LOS

5.2.5.1. Future Levels of Service

Traffic generated from the development during the occupation phase will have an impact on the road network's LOS. Currently, analysis results from the TIA, undertaken on 19th – 25th November 2022 show that the Limuru Rd / Ruaka Rd and Limuru Rd/ Magnolia close intersections are currently operating at LOS A (0-10

Average Control Delay-seconds/vehicle) during the AM peak hour which is acceptable. To determine the impact of the development on the current LOS, two scenarios were considered.

Scenario 1-Traffic Conditions WITHOUT Development.

This scenario applies to when the development is not constructed. The findings from the intersection analysis indicate that there will be a decline in the Level of Service (LOS) at both intersections in the upcoming period, even without the implementation of the development project. However, it's worth noting that both intersections will continue to function at or above LOS C, which remains within the acceptable range. The primary factor behind these reduced levels of service is the heightened delays that will be encountered at both intersections, a consequence of the amplified traffic volumes within the road network.

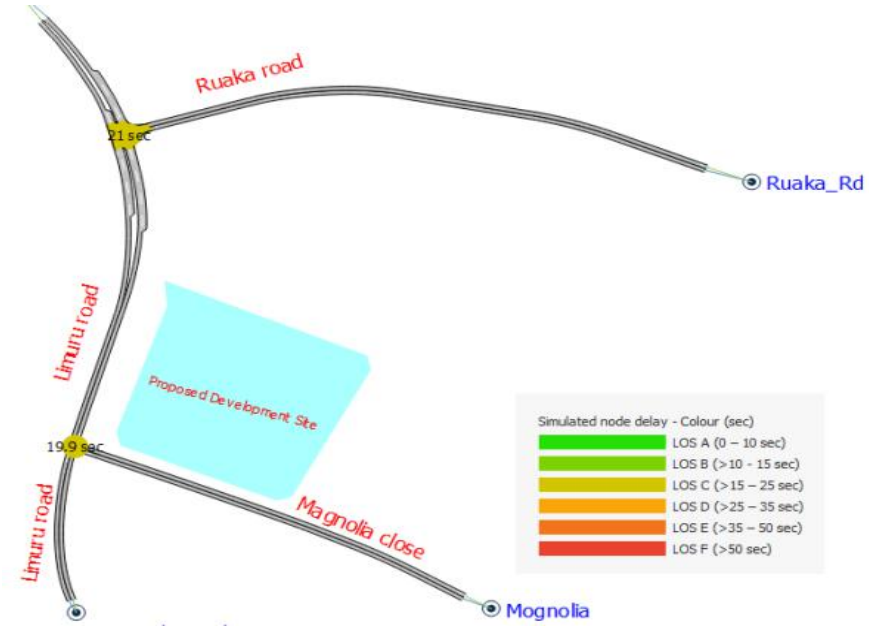

Figure 5.2- Scenario 1– Future Traffic Conditions (WITHOUT Development)

Scenario 2-Traffic Condition WITH development + WITH Access Improvements

The results of the intersection analysis indicate that the forthcoming development will have a slight influence on the Level of Service (LOS), as the two primary intersections will continue to function at LOS C and lower – a satisfactory level. The introduction of a slip lane on Limuru Road, along with the separated exit and entrance points to the hospital, will effectively mitigate the effects of the increased traffic generated by the development.

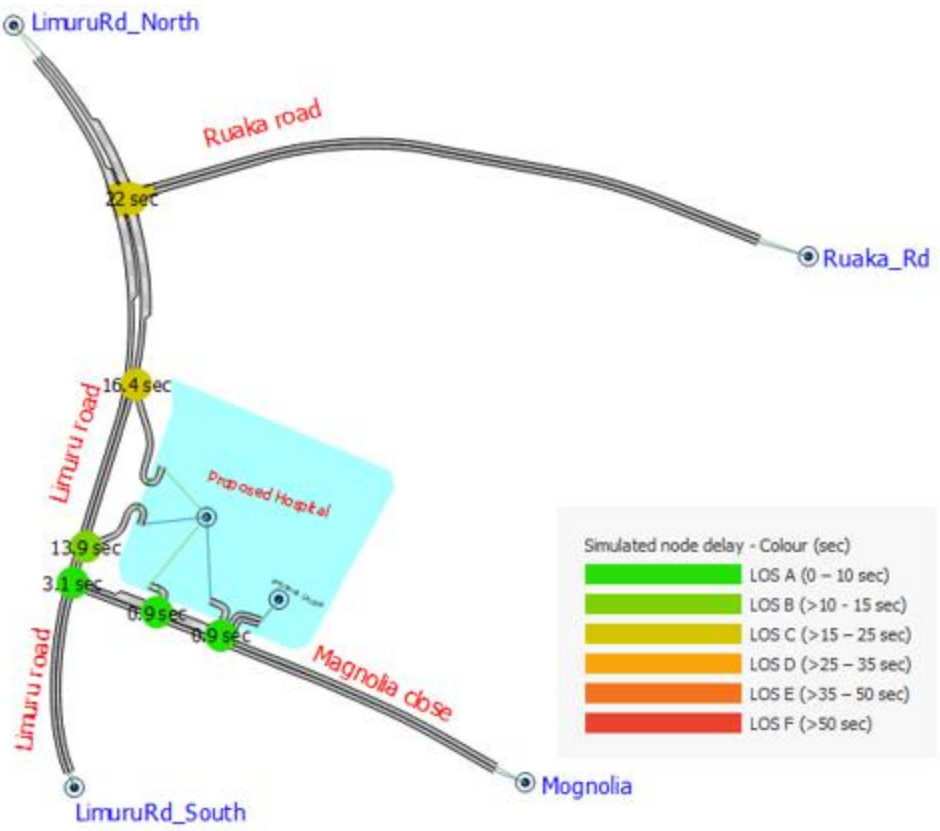

Figure 5.3- Scenario 2– Future Traffic Conditions (WITH Development)

Mitigation measures:

Implementation of the TMP developed after the completion of the traffic impact assessment. Following recommendations are provided in the TMP.

- Provision of 242 car park spaces to accommodate the projected trips.
- Facilitating access through both Limuru Road and Magnolia Close. Despite encountering concerns and objections from a segment of the residents, it is imperative to acknowledge that the legal avenue for project access is primarily through Magnolia Close, owing to Limuru Road's designation as an arterial route. Nonetheless, the possibility of access via Limuru Road exists since the a no-objection access permission was granted by KURA. This has the potential to ameliorate the impact on Magnolia Close.
- Provision of adequate pedestrian facilities within the project area of influence to connect to the existing NMT network Direct external NMT route from the bus bay to the hospital are provided
- Reduction of trip frequencies through the provision of tack shops for small purchases and coffee lounges. Bicycle parking areas have been designated

- The developer has provided a drop-off zone for taxis within the development
- The hospital shall consider travel demands such as working from home, car-pooling, peak spreading etc, which help reduce over-reliance on personal cars and overload the network.
- Prior to the commencement of construction, the contractor will mobilize adequate personnel for traffic management including traffic wardens.
- Enforcement of traffic control measures during construction and occupation phase. Such measures include:
    a. Traffic wardens shall be assigned to various strategic locations and they shall work in two (2) shifts i.e., during the day and night;
    b. Adequate and well visible nonstandard traffic signs such as "Under Construction", "Drive Slowly", "20KMPH", and "No Overtaking" etc. shall be placed in buffer zones at both ends of the construction sections;
    c. Safety awareness seminars shall be regularly undertaken to educate the construction workers on the safety measures.
    d. During construction, all workers shall wear reflective uniforms and other personal protective gears, and stick to their posts without jaywalking onto the roads.
    e. During construction, the detours shall be kept free of construction material, equipment and machinery to ensure that they are continually operational.
- The implementation of proposed traffic management projects by KURA along Limuru road will also be beneficial during the project's occupation phase. The notable projects include
    a. Dualling of Limuru Road. Phase 1: Wangari Maathai Road / Limuru Road intersection to Muthaiga / Limuru Road intersection (3.2 km) – presently undergoing construction. Phase 2: Muthaiga / Limuru Road intersection to Ruaka (Northern Bypass / Limuru Road intersection) (6.8 km) – procurement upcoming.
    b. Nairobi ITS Project by KURA: Enhancing 25 key intersections through intelligent transport systems (ITS) implementation.
    c. UN Avenue Dualling: Transforming UN Avenue / Limuru Road Junction to Northern Bypass into a dual carriageway.

5.2.6 Air Pollution

Project construction activities involving ground excavations and leveling are likely to generate dust and gaseous emissions due to the operation of heavy construction machinery that could cause breathing problems to the project personnel and nearby residents. Also, occasional odors resulting from construction activities (welding, hot roofing, paving, etc.) and odors caused by possible accumulation of medical waste during project operation could contribute to air pollution. These impacts would cease after the project construction activities are completed, and after the incineration of generated medical waste.

Mitigation measures:

- A part of the contractor's plan will be to provide protective equipment, such as gas masks, to the project personnel. The construction material should be handled in a way that minimizes the occurrence of fugitive dust to the extent possible. The population density around the project area ranges from low to moderate, and most residential premises are located far away from the project construction site.
- Appropriate dust control measures, such as minimizing the amount of ground disturbance, material handling, and water use for dust suppression will be used to reduce the amount of dust and particulate matter produced during the construction activities.
- Incineration of solid medical waste will be encouraged to reduce impacts associated with open burning such as smoke.

5.2.7 Noise Pollution Impact

The project construction activities involving operation of heavy equipment for ground preparation, construction of building structure and movement of heavy machinery during the transportation of construction materials and medical equipment will cause temporary increase of noise levels in the project site. During the project construction stage the noise levels at the project site and adjacent areas would be expected to be higher than those normally occurring in the project area. Likewise, during the operation phase, noise from the backup generator, ambulances and human activities is also anticipated. However, the noise levels experienced during the construction phase should return to the normal level after completion of project construction activities.

Mitigation measures:

- Machinery should be maintained regularly to reduce noise resulting from friction.
- There should not be unnecessary horning of the involved machinery.
- Sensitize drivers of construction machinery on effects of noise.
- Maintain operation equipment.
- Operation activities to be restricted to day time (0800hrs to 1700hrs on weekdays and 0800hrs – 1300hrs on Saturdays).
- Workers in the vicinity of high-level noise to wear safety and protective gears
- Provide barriers such as walls around site boundaries to provide some buffer against noise propagation.
- The proponent should endeavor to comply with Noise Regulations (Legal Notice No. 61 of 2009).
- The proponent should register the site as a workplace with the Directorate of Occupational Safety and Health (DOSH).
- Insulation against noise should be applied where applicable.
- Locate noisy machineries away from residential areas.
- Use of noise barriers where appropriate.

- Forbid the siren from ambulances when approaching the hospital
- Generator will be located at Lower ground level with room acoustic, 1Mtr from the DG room and 75 db sound level is proposed.

5.2.8 Human Health and Safety Impact

The construction, operational and decommissioning activities of the project has the potential to compromise with the health and safety of both the employees and the patients within the hospital development and the neighboring residents.

Mitigation measures:

- The project construction personnel will be issued with personal safety equipment including steel toed boots, impermeable coveralls and gloves, safety hats, dust and gas masks.
- First aid kits will be included in every project office and vehicle.
- Hazardous waste will be stored in the hospital until it can be safely disposed of in an environmentally sound manner. This will be done in accordance with the Compliance of solid waste management Legal Notice No. 121 guidelines for handling and disposal of hazardous waste.

5.2.9 Solid Medical Waste Generation

During the project operation stage, the hospital is likely to generate large amounts of hazardous solid medical waste (used cotton and bandages, tested medical specimens, expired drugs, used syringes and needles, human waste, etc) and soil contamination due to accidental chemical spills.

Mitigation measures:

- The proper procedures for handling hazardous medical waste will include identifying, labeling, keeping data sheets, knowing the exact location, proper storage, and using recommended safe work practices for handling hazardous medical waste material.
- The waste material should be stored safely before it is disposed of in a safe manner to prevent potential harm to the neighboring residents.
- The hospital administration will organize the facility for safe management and disposal of hazardous medical waste in accordance with WHO standards.
- Medical and hazardous wastes will be collected by an externally contracted waste handler. No waste will be processed on site other than the temporal holding procedures before collection.

5.3 Anticipated Negative Impacts and Proposed Mitigation Measures During the Operation Phase of the Hospital Development.

Major impacts are associated with hospitals as a result of dealing with the sick, handling of corpses and the use of preservation chemicals. The human body is host to various organisms, most of which are pathogenic. There is a risk of disease spreading from the patients to the employees and to persons attending the hospital thus appropriate measures should be taken to avoid these. Death is inevitable especially in hospitals which constantly handle sick people. When the body dies, the environment in which the pathogens live can no longer sustain them. However, this does not happen immediately, and transmission of infectious agents from a corpse to a living person may occur. Infectious hazards for individuals who routinely handle corpses include tuberculosis, gastroenteritis, transmissible spongiform, Hepatitis B, Hepatitis C, HIV infection and possibly meningitis and septicemia (especially meningococcal).

5.3.1 Handling Remains

The occupational risks for medical staff that routinely get into contact with dead bodies are well known. The most likely types of infections are those produced by blood borne viruses, enteric pathogens and Mycobacterium tuberculosis. The hospital has been designed to have a temporal hold for temporarily keeping not more than 4 bodies for a period not exceeding 24 hours in case of an eventuality prior to transfer to convenient morgues. Within 24 hours, the hospital will make necessary arrangements in handling and transporting dead bodies to other registered mortuary facilities. Staff should also be trained on how to handle dead bodies in case of such eventuality.

5.3.2 Blood Borne Viruses

The risk of infection from blood borne viruses depends on the infection status of the victim (similar to the general population), likelihood and mode of exposure, and in the case of Hepatitis B, the vaccination status of the exposed individual. Exposure to blood borne viruses can occur due to direct contact with non-intact skin, injury from bone fragments and needles, and mucous membrane exposure from splashes of blood or body fluid to the eyes, nose or mouth. Infectious HIV can survive in corpses for a considerable amount of time (up to 16 days after death, if stored at 200C).

5.4 Mitigation Measures to be Adhered to by the Staff

5.4.1 Workplace Controls

5.4.1.1 Practice universal precautions

- Treat all human blood and Other Potentially Infectious Materials (OPIM) as if contaminated with blood-borne pathogens

- Wear appropriate Personal Protective Equipment (PPE).
- Wash hands and skin with warm water and soap immediately after; Any contact with blood or OPIM. Removing gloves, even if gloves appear to be intact.
- Use waterless antiseptic hand cleansers when hand washing facilities are not available, and wash hands immediately when warm water and soap do become available.

5.4.1.2 Manage sharps properly

- Be alert for sharp objects, such as bones, broken glass, metal, knives, etc.
- Store reusable sharps in a manner to prevent lacerations or puncture wounds.
- Use mechanical means to clean up broken glass and other sharp objects.

5.4.1.3 Disinfect contaminated equipment, environment and working surfaces

- Use protective covers on equipment and work surfaces that are difficult to decontaminate.
- Disinfect all interior and exterior surfaces of reusable equipment and Regulated Medical Waste (RMW) containers between uses.
- Maintain a cleaning schedule, which requires the cleaning of work surfaces, equipment surfaces and waste containers: after completion of procedures, immediately or as soon as possible when surfaces become overtly contaminated, after any spill of blood or OPIM, at the end of the work shifts.

5.4.1.4 Contain and confine blood and OPIM

- Place human remains and disassociated portions in plastic burial pouches or zip lock bags.
- Avoid, or at least keep to a minimum, splashing, splattering, and generation of aerosols.

5.4.1.5 Handling of contaminated PPEs and clothing

- Wear protective gloves and other appropriate PPE, including gowns, aprons, eye protection, disposable head covers, disposable shoe covers as needed to prevent exposure when handling contaminated PPE.
- Never wear contaminated PPE and clothing outside of the work area.
- Remove and replace PPE and replace underlying clothing immediately or as soon as possible when they become damaged or penetrated by blood or OPIM.
- Remove contaminated PPE and clothing in a manner to avoid contact with skin, mucous membranes, and underlying clothing.

- Place contaminated reusable PPE and clothing into leak-resistant bags or containers immediately upon removing the articles.
- Use bags and containers that are either color-coded red or labeled with the fluorescent orange or orange-red biohazard warning symbol.
- Never wash contaminated PPE and clothing with personal laundry.
- Wash and dry reusable PPE and clothing according to the instructions on their labels, in hot water at least 16000 F and detergent for 25minutes, or with chemicals at the proper concentration for low temperature washing.
- Place contaminated disposable PPE and clothing that is saturated, dripping or caked with dried blood into a RMW container.
- Use an approved disinfectant to decontaminate reusable gloves, protective eyewear, face shields and similar PPE. Follow the manufacturer's recommendations for disinfectant concentrations and contact times.
- Brush-scrub contaminated boots and leather goods with soap and hot water. 5.4.1.6 Clean up spills of potentially infectious materials
- Clean up spills immediately. Remove visible material with absorbent disposable towels. Decontaminate the area using clean towels and an appropriate disinfectant. Allow area to dry. Dispose of absorbed towels and other waste in an appropriate RMW container.
- Wear appropriate PPE: Wear disposable latex, Polyvinyl chloride (PVC) or vinyl gloves. Wear face and eye protection, and an impervious gown or apron if splashing is likely. Wear shoe covers when cleaning up large spills.
- Keep a commercial or domestic spill kit available, containing; One pair of splash-proof safety goggles, One disposable face mask, Two pairs of disposable latex gloves, One disposable apron, One pair of disposable shoe covers, Absorbent disposable towels, Disinfectant (and its material safety data sheet), Two red plastic bags with twist ties, A scoop or scraper, Waterless antiseptic hand cleanser.

5.4.1.7 Practice good personal hygiene

- Never consume food or beverages in areas where exposure to blood or OPIM exists
- Never store food and beverages in an area where they or their containers may become contaminated with blood or OPIM
- Refrain from handling personal items, such as pens and combs, to prevent soiling or contamination.

5.4.1.8 Use chemicals safely

- Follow the chemical manufacturer's directions on the chemical's warning label and material safety data sheet for safe handling, storage and use.
- N/B Supervisors must whenever possible, provide hand washing facilities stocked with soap, tepid water and paper towels, make provisions for laundering contaminated clothing and disinfecting PPE, ensure adequate supplies such as RMW container, laundry bags, disposable PPE, disinfectants and spill clean-up materials are readily available, oversee that personnel adhere to recommended safe work practices.

5.4.1.9 Decontamination procedures for chemical disinfectants Chemical Disinfection

- Always wear appropriate personal protective equipment (PPE) to avoid contact with hands, eyes, face etc. when using a chemical disinfectant.
- Use disinfectants in well-ventilated areas.
- Thoroughly remove visible contamination (blood, body fluids, and other potentially infectious materials) with soap and water before using a chemical disinfectant.
- Select disinfectants most suited to the activity and always read the disinfectant's label and Material Safety Data Sheet (MSDS).
- Follow the manufacturer's directions on the disinfectant's warning label and MSDS for safe handling, storage and use
- Open, disassemble and completely submerge instruments to ensure direct contact between all surfaces and disinfectant.
- Thoroughly rinse and dry all items after disinfecting, taking care not to re-contaminate items.

5.4.1.10 Personal Protective Equipment (PPE)

Select PPE types and characteristics based on;

- The procedures that will be performed
- The type of exposure anticipated
- The quality of blood or other potentially infectious materials (OPIM) anticipated to be encountered, and
- Other safety and health hazards that may pose a risk to personnel.

5.4.1.11 Body protection

- Wear impervious disposable gowns, aprons which will prevent blood or OPIM from penetrating and contaminating the PPE"s inner surfaces and subsequently underlying clothing and skin
- Keep an extra change of work clothing on hand at all times.

5.4.1.12 Hand protection

- Wear polyvinyl chloride (PVC) or vinyl gloves when handling corpses.
- Select gloves that fit tightly around the wrists to prevent contamination of the hands for situations where large amounts of blood or other contaminants are likely to be encountered. 5.4.1.13 Eye and face protection
- Wear a surgical mask (unless respiratory protection is required, then substitute with required respirator) and safety glasses or a face shield where there is potential for splashing or spattering of blood or OPIM or for the generation of airborne particles from dried blood.
- Wear a face shield or splash-resistant goggles over eyeglasses.

5.4.1.13 Foot protection

- Wear rubber boots or appropriate shoe covers where there is potential for footwear to become grossly contaminated.

5.4.1.14 Head protection

- Wear head covers when contact with large quantities of blood or OPIM is anticipated.

5.4.1.15 Respiratory protection

- Respiratory protection may be worn to protect personnel from bio-hazardous materials.
- Wear a surgical mask or respirator.
- Work in well ventilated environments.

5.4.1.16 Repair and replacement

Supervisor's must: -

- Provide all PPE that is expected to be needed. PPE must be: readily accessible, appropriate for the specific tasks or procedures, available in the correct sizes and, durable under normal conditions of use

- Require all exposed personnel to use and wear appropriate PPE and to repair or replace PPE as needed to maintain its effectiveness.
- Define work area boundaries and require personnel to remove PPE before leaving the work area
- Provide designated areas or containers for the storage of contaminated PPE.
- Permit only trained personnel to handle contaminated PPE
- Remove PPE and underlying clothing immediately or as soon as possible when PPE is penetrated by blood or OPIM.
- Repair or replace damaged PPE as needed to maintain its effectiveness.

5.4.1.17 Standard immunization

Immunization for medical affairs personnel should include, as a minimum –Hepatitis b which is 70% to 80% effective within one week of exposure, and Tetanus

5.4.1.18 Medical surveillance for staff

The medical surveillance practices include, screening for tuberculosis by tuberculin skin test, screening and testing for other communicable diseases and offering the right treatment

5.5 Handling Waste

All medical waste, both hazardous and non-hazardous will be collected by contracted waste handlers. None of the waste will be disposed of on site. Before collection for disposal, all wastes will be properly collected and handled as per the recommended procedures.

Table 5.1: Waste Management Matrix

S/N	Type of waste	Definition	Proposed management/ treatment technique
1	**Pathological waste/Anatomical waste**	This waste includes tissues, body parts, organs, human fetuses, bodily fluids, and blood.	Will be collected and segregated at the generation source in red colored non chlorinated bags, which will have address and license of the common waste treatment facility provider and will be stored in Biomed waste storage room for further disposal as per NEMA guidelines. **Treatment:** Incineration or Plasma Pyrolysis or deep burial. As per local guidelines and norms.
2	**Infectious and Potentially Infectious waste**	Cultures and stocks of infectious agents from laboratory work, waste from infected patients in isolation wards, waste that has been in contact with infected patients undergoing hemodialysis, waste that has been in contact with animals inoculated and suffering from an infectious disease, and waste from surgery and autopsies on patients with infectious diseases. Infectious waste includes sufficient concentration or quantities that exposure to it could cause disease.	Will be collected and segregated at generation /source in red colored non chlorinated bags, which will have address and license number of the common waste treatment facility provider and will be stored in Biomed waste storage room for further disposable as per NEMA guidelines. **Treatment:** Pre-treat to sterilize with non-chlorinated chemicals on-site as per World Health Organisation guidelines thereafter transfer for Incineration.
3	**Chemical waste**	discarded chemicals in solid, liquid, and gaseous forms, for instance, from diagnostic and experimental work, housekeeping, disinfecting procedures and cleaning.	Will be collected and segregated at generation /source in yellow colored non chlorinated bags, which will have address and license number of the common waste treatment and will be stored in Biomed waste storage room for further disposal as per NEMA guidelines. **Treatment:** Disposed of by incineration or Plasma Pyrolysis or Encapsulation in hazardous waste treatment, storage and disposal facility. As per local guidelines and norms.

4	**Radioactive waste**	Radioactive waste comprises solid, liquid, and gaseous material contaminated with radionuclides generated from in vitro analysis of body tissues and fluid, in vivo body organ imaging, tumor localization, and therapeutic process. All radioactive waste can be considered to be hazardous.	Radioactive waste to be stored in approved bags and containers. The waste to be handed over to authorized common treatment facility for further disposal. Bags to store such waste (item #12788 or 11237), Boxes (item #17775) and Carboys (item# 65863W) are available from Lab Safety Supply (www.labsafety.com) Storage is by means of Radioactive decay by storing for a longer period & to be handed over to authorized storage companies. **Treatment:** At the time of Release into the Sanitary Sewerage system it will ensure that the waste is readily soluble or dispersible in water. Other treatment options will include Incineration, Shallow burial and Deep burial and transfer to authorized vendors for further treatment per local guidelines. Appropriate design and detailing of the radiology and imaging premises to avoid leakages
5	**Pharmaceutical/medicinal waste**	This kind of waste contains pharmaceutical products, chemicals, drugs that have been returned from wards, have been spilled, are contaminated or out-dated, and many items which are to be discarded because they are no longer required.	A) To be collected and segregated at generation /source in Yellow colored non chlorinated bags, which will have the address of the common waste treatment facility provider and the license number and will be stored in the Biomed waste storage room. For further disposable as per NEMA guidelines. B) Near expiry medicines will be returned to the Pharma & poisonous board, which will be destroyed as per the regulations. **Treatment:** Expired `cytotoxic drugs and items contaminated with cytotoxic drugs to be returned to the manufacturer or supplier for incineration at temperature >1200 0C or to common bio-medical

			waste treatment facility or hazardous waste treatment, storage and disposal facility for incineration at >12000C Or Encapsulation or Plasma Pyrolysis at >12000C. All other discarded medicines shall be either sent back to the manufacturer or disposed by incineration.
6	**Sharps**	Sharps include syringes, needles, saws, scalpels, blades, broken glass, nails, and other items that could cause a cut or puncture to human skin.	To be collected in Yellow coloured Puncture proof, Leak proof, tamper proof containers and will be stored in Biomed waste storage room for further disposal as per NEMA guidelines. **Treatment:** Incineration
7	**Pressurized containers**	Include inert gas or innocuous aerosol cans that probably explode if incinerated or accidentally punctured	Will be collected and stored and destroyed as per Pharma and poisonous board regulations. The safest way to dispose of empty or partially full hazardous waste aerosol cans is to bring them to an approved collection site for hazardous waste. All cans to be handed over to the waste disposer to empty and sent for recycling.
8	**Waste with heavy metal content**	This category includes waste containing Mercury, Cadmium, Lead, and drugs containing arsenic among others.	The proposed hospital is non-mercury The lead aprons no longer used in the hospital will be handed over to the original supplier with proper documentation for further treatment after their life span. To have MoU with the vendor & hand it over to the environmental board identified/authorized vendor for further process.
9	**General solid waste**	Refers to waste generated from offices, kitchens, packaging material and from stores. It is similar to domestic waste.	General waste to be collected in Black colored bags and to be stored and handed over to a local municipal authorized vendor for further disposal.

			Kitchen wet waste: All kitchen waste will be collected & shall be treated in Organic Waste Converter (OWC), and the compost can be used for landscape/gardening purposes.
10	**Liquid waste**	Consists of sewage and domestic wastewater	Waste will be collected in a separate tank, there Pretreatment will be done by means of Effluent treatment plant (ETP) – by adding Sodium-hypochlorite and neutralizing before discharging into regular Sewage treatment plant for normal process.

CHAPTER SIX: PUBLIC PARTICIPATION

As per the Terms of reference undertaken for this full study, stakeholder engagement was conducted on the following levels;

a. Initial meeting with project team and proponent held on 18.10.2022 via both physical and virtual attendance. This was meant to discuss the proposed project and to introduce the team of experts to the proponent. The expert also took the proponent through the ESIA process and the need for a public stakeholder consultation meeting with the project neighbors.

b. 1st Preliminary meeting held on 20th June, 2023 at Trademark Hotel, Gigiri-Nairobi, with the leadership of various resident associations and neighboring institutions and the project team. This meeting brought together esteemed leaders from various resident associations and neighboring institutions, in conjunction with the project team. Among the entities represented were Rosslyn Ridge, Runda, Australian High Commission, Gigiri, Rosslyn Academy, and Karura Community Chapel. The primary objective of this meeting was the dissemination of pertinent information concerning the proposed hospital, as well as soliciting insights on the forward trajectory for engaging the entire resident body of the represented associations and institutions. Furthermore, the forum served as a platform to solicit valuable feedback and recommendations from stakeholders, which will be instrumental in informing the project's design. Throughout the proceedings, several salient observations were collected from the stakeholders. These included considerations pertaining to the hospital's access, measures to handle hazardous hospital waste and holding of bodies, any future plans to expand the hospital to include a doctor's plaza, proposed interventions to mitigate the proliferation of informal developments and activities influenced by the hospital, and the existence of a comprehensive feasibility study assessing the imperative for the hospital within a neighborhood with other healthcare facilities in the vicinity.

Figure 6.1- First Preliminary Stakeholders meeting held at Trademark Hotel, Gigiri-Nairobi at 20th June, 2023

c. On the 11th of July 2023, the second Preliminary Meeting was convened. The primary aim of this meeting was to further engage the leadership of various resident associations and institutions, addressing concerns raised during the initial gathering. Additionally, this meeting sought to involve leaders and associations who were not in attendance during the first encounter. Several additional concerns were articulated by the leaders. These encompassed objections regarding the use of Magnolia Close for access, strategies for managing resultant stormwater, inquiries about the installation of backup generators with potentially high noise levels, and the hospital's contemplation of utilizing renewable energy sources such as solar power to alleviate strain on the KPLC mains supply. Further inquiries were made regarding the source of freshwater for the hospital, the condition and protocol followed for obtaining the change of use, measures for handling hazardous hospital waste and the temporary holding of bodies. Stakeholders also sought clarification on whether a hydrological survey had been conducted to validate the drilling of the proposed borehole, the projected water demands of the hospital, and the plans in place to meet such demand. Additionally, considerations regarding traffic management to accommodate the anticipated increase in vehicle and pedestrian traffic generated by the hospital were discussed.

   In response to concerns raised by stakeholders in previous meetings, it was communicated that a needs assessment had been conducted. This assessment revealed a pressing demand for high-quality healthcare services at an affordable rate in Kenya, particularly due to the substantial number of

individuals seeking treatment abroad. It was also clarified that hospital waste would be managed by external waste handlers, and the hospital would provide temporary storage for up to 24 hours for a maximum of four bodies. Regarding the issue of expansion, it was confirmed that there were no intentions to exceed the parameters previously disclosed to the stakeholders. Instead, any future developments would be geared towards enhancing complexity rather than capacity, with a focus on specialized services within the facility.

It was agreed that the leaders will invite and communicate to various residents when a future date for public participation is set. Likewise, the stakeholders requested for the inclusion of residents from Ruaka in the process since any impacts associated with the hospital also extends to them.

d. The 3rd Preliminary stakeholder engagement meeting targeted leaders of Ruaka Resident Association and available institutions. Held on 18th July 2023, at Holiday inn@ Two Rivers, Ruaka, the purpose of the meeting was to appraise the stakeholders on the nature of the proposed project. Furthermore, stakeholders were briefed on the preceding interactions held with diverse parties, along with the perspectives and insights garnered from them. The leaders expressed a favorable reception of the project, acknowledging the positive impacts it would bring to the neighborhood. They also emphasized the necessity of implementing appropriate measures to manage resulting stormwater. It was noted that the area currently lacks proper drainage channels, leading to occasional flooding in the lower sections of Limuru Road. Moreover, the leaders highlighted potential avenues for the hospital to engage in Corporate Social Responsibility (CSR) activities. This could entail collaborating with various community organizations, such as the Gachie Rotary Club Branch and the Youth Training and Empowerment Network. Additionally, to address stormwater management, it was proposed that treated and purified stormwater, as well as water from effluent, could be made available for residents and interested community members for purposes of irrigation and other applicable uses. Furthermore, the leaders committed to advocating for and inviting residents to the forthcoming public participation meeting. This collective effort aimed to ensure that the wider community is actively involved and informed about the project.

Figure 6.2- Third Preliminary Stakeholders meeting held at Holiday inn@ Two Rivers, Ruaka

e. Public Participation Meeting Held on 2nd September, 2023 at the proposed project Site. This forum brought together residents from various Resident Associations, the project team, and pertinent stakeholders, including the Westland Business Association, of which the proponent is a member. The proceedings were presided over by the Area Chief, duly appointed by NEMA for such a role.

   The primary objective of this meeting was to appraise the attending residents about the project, and to solicit their perspectives both in favor of and in opposition to it. Additionally, the stakeholders were briefed on the incorporation of recommendations and concerns previously raised in stakeholder engagements.

   Several key issues were deliberated upon during the meeting, encompassing matters pertaining to accessibility to the hospital, the source of freshwater for the facility, protocols for managing hospital waste, adherence to area zoning regulations, and the examination of viable alternatives for the

proponent, beyond proposing a new development. Primarily, the discussion revolved around the significant impacts of the project and the corresponding measures for mitigation.

The minutes of this meeting, alongside those of the preliminary engagements, are appended to this report for your reference and consideration.

Figure 6.3-Public Participation Meeting Held ON 2nd Sep, 2023 at the proposed project Site

CHAPTER SEVEN: ANALYSIS OF PROJECT ALTERNATIVE

7.1 Introduction

This section analyses the project's alternatives with regards to the physical location, technology and waste management options.

7.2 The Proposed Development Alternative

In this development proposal, the proponent will develop the hospital as planned after receiving the EIA License from the Authority. The project will be implemented thereby, realizing the proponent's goal. However, the development has to ensure that all environmental measures are complied with during the implementation and operation period. The proposed development alternative is composed of the proponent's final proposal, with the inclusion of the NEMA guidelines and regulations and procedures as stipulated in the Environmental Management and Co-ordination Act (EMCA) act CAP 387.

7.3 Relocation Option

The property under consideration is registered under the ownership of Columbia Africa Healthcare Limited and was set aside in anticipation for the hospital development. Relocation calls for the proponent to look for a different plot to establish the proposed development. The proponent has been granted a Change of Use and the necessary approvals from Nairobi City County Government for construction. The facility will be a key point where residents can obtain their medical services; this means that the proponent can only do the construction of the hospital at the proposed site. Searching for land to accommodate this nature of development and completing official transactions may take a long time. There is no guarantee that such suitable land, from the various perspectives, could be available elsewhere. Project design and planning before the stage of implementation has cost the developer a large sum of money. Whatever has been done and paid up to this level would be a heavy loss to the developer. Any circumstances leading to this option would discourage local/private investors especially in this sector that has been shunned by many private investors. From the above statements, relocation of the project to a different site is not viable.

7.4 No Project Alternative

The NO project alternative option in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from the extreme environmental perspective as it ensures non-interference with the existing natural conditions. This option would mean that the land would remain undeveloped and underutilized. There would be no need to seek any development approvals from the government agencies. This option will however involve several losses both to the land owner, various stakeholders and the community as a whole. The community will continue seeking for medical services from

the existing facilities which are insufficient. The populace would remain underserved with regards to health services. The no project option is the least preferred from the socio-economic perspective.

7.5. Proposed/Preferred Alternative

Under the proposed Development Alternative, the project will provide short term jobs for the workers during construction and ensure maximum utilization of the plot. There would be more benefits from the site and the anticipated negative environmental impacts will be minimal. Provided the Environmental Impact mitigation measures are implemented as well as adaptation of sound construction management practices, there will be no major, long term irreversible negative environment impacts

CHAPTER EIGHT: ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN (ESMMP)

Environmental management is a crucial segment of any development in view of sustainable development. Therefore, the preparation of an Environmental Management and Monitoring Plan (EMMP) is a must to fulfill the multiple facets of the statutory compliance, social and economic concern. The EMMP involves the protection, conservation and sustainable use of the various elements of the environment. The EMMP for the project provides all the details of its activities, impacts, mitigation measures and expected costs during construction phase and operation phase in a quick reference table. With proper environmental management procedures in place and adhered to, there should be minimal negative impacts of concern emanating from it.

Table 8.1: ESMMP

Expected Negative Impact	Recommended Mitigation Measures	Actor	Time Frame
Phase	**Construction Phase**		
	Objective: Minimize adverse impacts to the environment and people		
De-vegetation resulting from the clearing of site	✓ Design and implement an appropriate landscaping and tree planting program to help revegetate part of the project area after construction using potential natural vegetation. ✓ Ensure proper demarcation and delineation of the project area to be affected by construction works. ✓ Preserve trees/vegetation inside the plot where possible ✓ Plant appropriate locally adapted species outside the built-up areas ✓ Introduction and maintenance of appropriate vegetation (trees and grass) in open spaces and around the site	Proponent, Contractor, and Workers	Throughout construction period
Increased solid waste and liquid waste generation	✓ Segregate the waste at the site ✓ Construct different waste disposal pits for biodegradable organic waste and another for non-biodegradable waste with appropriate shed/cover to prevent accumulation of rain/flood water ✓ Ensure proper disposal and separation of construction waste (pieces of wood, glass etc.) in the contractor's yard (off the site) ✓ Engage services of a registered NEMA waste handler to dispose of the waste at designated disposal sites	Proponent, Contractor, Workers & NEMA Inspectors	Throughout construction period

	✓ During the transportation of building materials and waste, trucks should be covered to prevent littering on the road ✓ Sensitize workers on the reuse of materials where appropriate ✓ Accurate estimation of the required materials, order materials in the sizes and quantities needed to avoid large quantities of residual materials. ✓ Ensure that construction materials left over at the end of construction work is used in other projects rather than being disposed of as waste. ✓ 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 ✓ Donate recyclable/reusable or residual materials to local community groups and institutions for repurposing. ✓ 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. ✓ Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to biophysical elements. ✓ Use building materials that have minimal or no need for packaging to avoid the generation of excessive packaging waste. ✓ As provided for by the Building Code, a portable toilet/pit latrine will be provided on site to be used by construction workers		
Exposure to public and occupational	✓ Implement all necessary measures to ensure health and safety of workers and the general public during the construction phase as stipulated in OSHA, 2007	Proponent, Contractor, and Workers	Throughout construction period

safety and health risks **a. Injuries** **b. Fires** **c. Accidents** **d. Hazardous materials handling** **e. Security concerns**	✓ Initiate annual occupational safety audits and risk assessments through DOSHS approved auditors. ✓ Undertake Planned maintenance (PPM) schedules for construction machines, tools, and equipment. E.g., hoists, ladders ✓ Register the construction site with DOSHS ✓ Use signage to warn staff and/ or visitors that are not involved in construction activities around risk areas. ✓ Clear marking of work site hazards and training in recognizing hazard symbols. ✓ Hold talks to discuss safety and health aspects. ✓ Subject the workers to basic first-aid skills ✓ Keep the site cordoned off from unauthorized persons. ✓ Provide full first aid kits at the construction site office. Provide matching Personal protective equipment for the hazards on site ✓ Supervision of works shall be done regularly to ensure that safety conditions are met while any deviation from safety regulations is immediately reclaimed following the best practices regarding safety at work. ✓ Staff working in dust generating activities, e.g., site preparation, excavation, concrete mixing, stone dressing, should be provided with personal protective equipment (PPE). The use of PPE shall be enforced.		
Dust Emissions	✓ Site Hoarding/netting to contain dust within site ✓ Ensure strict enforcement of on-site speed limit regulations ✓ Dust suppression with water-sprays during the construction phase on dusty areas	Proponent, Contractor, and Workers	Throughout construction period

	✓ Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles ✓ Careful screening of construction site to contain and arrest construction-related dust. ✓ Personal Protective Equipment to be worn at all times ✓ Construction materials on site to be covered to prevent them from being blown off by the wind		
Exhaust Emission	✓ Vehicle idling time shall be minimized ✓ Alternatively fueled construction equipment shall be used where feasible. ✓ Equipment shall be properly tuned and maintained ✓ Sensitize truck drivers to avoid unnecessary racing of vehicle engines at loading/offloading points and parking areas, and to switch off or keep vehicle engines off at these points	Proponent, Contractor, and Workers	Throughout construction period
Noise nuisance and vibration	✓ Construction is restricted to between 8 am to 5 pm on weekdays and 8 am – 1 pm on Saturdays. Noise is limited to 60 Db during the day as stipulated in the Second Schedule– Maximum Permissible Noise Levels for Construction Sites of EMCA (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009. ✓ The use of hearing protection gears by workers when exposed to noise levels above 85 dB(A) ✓ Ensure that all generators and heavy-duty equipment are insulated or placed in enclosures to ensure ambient noise levels.	Proponent, Contractor, and Workers	Throughout construction period
Increased storm water runoff, soil	✓ Roof water shall be harvested and stored in a reservoir for reuse. ✓ Proper installation of the storm water drainage system	Proponent, Contractor, and	Throughout construction period

erosion and flood risks	✓ Ensure efficiency of drainage structures through proper design and maintenance ✓ Provide gratings to the drainage channels ✓ Ensure management of excavation activities ✓ Control activities especially during rainy seasons ✓ Provide soil erosion control and conservation structures where necessary ✓ Install cascades to break the impact of water flowing in the drains ✓ Compact loose soils to minimize wind erosion ✓ A storm water management plan that minimizes impervious area infiltration by use of recharge areas	Workers	
Traffic disruption along Limuru Road	✓ Schedule delivery of materials during non-peak hours. ✓ Adhere to load carrying capacity stipulated by the traffic act Cap 403 ✓ Reliance and implementation of the Traffic Management Plan	Proponent, Contractor, and Workers	Throughout construction period
Phase	**Operation Phase**		
	Objective: Develop a hospital operation's safety plan to promote staff and visitors' safety, and to minimize adverse effects on the environs		
Exposure to occupational safety and health risks associated with a hospital environment	✓ All workers and staff should be provided with appropriate protective gears. ✓ Place sharps in sealable, puncture resistant leak proof containers, replace sharp containers when they are ¾ full. ✓ Place blood soaked, dripping, blood caked disposable PPE and waste materials in leak proof bags or impervious containers. ✓ Close and seal containers and bags prior to removal or replacement to prevent spillage or protrusion of contents during handling, transport, or storage.	Staff, and Proponent	Continuous

	✓ Avoid excessive or rough handling to prevent rupture of containers and bags. ✓ Treat all human blood and Other Potentially Infectious Materials (OPIM) as if contaminated with blood-borne pathogens ✓ Contain and confine blood and OPIM. ✓ Wash hands and skin with warm water and soap immediately after any contact with blood or OPIM and remove gloves, even if gloves appear to be intact. ✓ Use waterless antiseptic hand cleansers when hand washing facilities such as warm water and soap are not available ✓ Maintain a cleaning schedule, which requires the cleaning of work surfaces, equipment surfaces and waste containers ✓ Sensitize hospital management on social issues such as increased incidences of reported Hospital Acquired Infections ✓ Practice good personal hygiene. ✓ Institute and implement a first aid provision process and readily available emergency response plan ✓ Hospital equipment and apparatus requiring additional safety measures should be managed and operated by qualified persons. ✓ Install fire fighting equipment and maintain fire fighting equipment regularly ✓ Provide emergency numbers at strategic points ✓ Adequate sanitary facilities should be provided and standard cleanliness maintained ✓ Hospital management should be provided with evacuation procedures in case of fire.		

	✓ The hospital management should practice fire drills at least once a month to ensure that they have the knowledge to act accordingly in case of fire. ✓ Members of staff to be given the correct tools and equipment for the jobs assigned ✓ Members of staff to be trained in the use of all equipment that they will be required to operate ✓ The proponent to implement the provisions of the Occupational Safety and Health Act, No. 15 of 2007.		
Generation of hazardous hospital waste	✓ See attached separate waste management Matrix	Staff, Proponent and external contracted Hospital Waste Handlers	Continuous
Traffic Disruption	✓ To reduce queue time and lengths, provide an acceleration and deceleration lane along Limuru road ✓ Implementation of the traffic management plan ✓ No parking along the external roads. Adequate parking spaces provided on site ✓ Dropping and pickups to occur on site	Staff, Traffic officers & Proponent	Continuous
Noise Nuisance	✓ Hospitals are generally quiet places ✓ Ambulances to silence sirens when approaching hospital ✓ Increased vegetation cover and available perimeter wall will act as containment for noise	Staff and Proponent	Continuous

	✓ Convenient location of backup generator, away from residential neighborhoods vicinity ✓ Use sound deflectors to minimize noise from the generator ✓ Routine service of the back-up generator to increase the efficiency of fuel burning Installation of signage in appropriate places such as high human activity points to remind people to observe silence		
Pressure on utilities-water and electricity	✓ Utilization of natural light as much as possible during the day ✓ Consideration of water harvesting and alternative sources such as bore holes to reduce the overreliance of NCWSC water. ✓ Timely repair of any leaking water faucets ✓ Install appropriate Building Management Systems to minimize energy use or demand	Staff and Proponent	Continuous
Exposure and increased security vulnerability due to increased human traffic frequency and density	✓ Engage services of security guards ✓ Install CCTV cameras ✓ Place hotline numbers on strategic places ✓ Sensitize the staff on security precautions ✓ Install security lights in strategic places around the compound preferably with automatic on/off sensors ✓ Secure the site with a perimeter wall and screening of all people visiting the hospital at all points of entry and exit ✓ Discourage idling activities at points of entry or exit	Staff and Proponent	Continuous

CHAPTER NINE: PROJECT DECOMMISSIONING

9.1 Introduction

Decommissioning is an important phase in the project cycle and comes last to wind up the operational activities of a particular project. It refers to the final disposal of the project and associated materials at the expiry of the project lifespan. If such a stage is reached for the upcoming development, the proponent will need to remove all materials resulting from the demolition/ decommissioning from the site.

9.2 Purpose and Objectives of Decommissioning

The generally accepted purpose of decommissioning is to allow for release of valuable assets such as buildings and sites for alternative use, recycling and reuse of materials and the restoration of environmental assets. In all cases, the basic objective is to achieve an endpoint that is sensible in technical, social and financial terms. The process has to observe the basic principles of sustainable development and to protect the well-being of the staff/workers, the public and the environment.

9.3 Positive Impacts of Decommissioning

Rehabilitation/ Site restoration

Upon decommissioning of the proposed project, rehabilitation of the project site will be carried out to restore the site to near to its' original state or better.

Employment Opportunities

For decommissioning to take place properly and in good time, several people will be involved. As a result, employment opportunities will be created for the demolition.

9.4 Negative Impacts of Decommissioning

Noise and Vibration

The decommissioning related activities such as demolition works will lead to significant deterioration of the acoustic environment within the project site and the surrounding areas. This will be as a result of the noise and vibration that will be experienced during the demolition of the buildings and related components using excavators and bulldozers.

Solid Waste Generation

Demolition of the project 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 and glass. Although demolition waste is generally considered as less harmful to the environment since it is composed of inert materials, there is growing evidence that large quantities of such waste may lead to release of toxic chemicals into the environment.

Loss of hospital infrastructure

Decommissioning will mean the loss of hospital infrastructure. Accustomed patients will have to look for alternative health care providers.

Dust and Exhaust Emissions

Large quantities of dust will be generated during demolition works. Particulate matter pollution is likely to occur during demolition and transportation of the construction waste. There is a possibility of suspended and settle-able particles affecting the site workers and the surrounding neighbors' health. Exhaust emissions are likely to be generated during the demolition period by the various machinery and equipment to be used as well as motor vehicles used for the exercise.

Occupational /Public Health and Safety Hazards

Demolition works will inevitably expose workers and the public to occupational health and public safety risks. In particular, working with heavy equipment, handling and use of tools evokes certain risks. The construction workers are also likely to be exposed to risk of accidents and injuries resulting from accidental falls, falling objects, and injuries from hand tools and other equipment.

Table 9.1: Decommissioning Plan

Issue	Action Required	Responsibility
Generation of solid waste	✓ All demolition waste to be collected at a central location, and be stored temporarily until removal by a licensed solid waste handler; ✓ Adopt the method of selective demolition as far as practicable to enable the removal of wastes of the same category one at a time thus facilitating recycling of wastes for beneficial reuse and minimizing the burden on dumpsites; ✓ No dumping within the surrounding area is to be permitted. ✓ All rubble must be removed from the site to an approved disposal site as approved by the Engineer. ✓ The contractor shall maintain the site in a clean state within a radius of 10m. ✓ Ensure that no litter, refuse, wastes, rubbish, rubble, debris and builders wastes generated on the premises is placed, dumped or deposited on adjacent/surrounding properties during or after the decommissioning period of the project.	Contractor/ Proponent
Loss of hospital infrastructure	✓ It should be announced in good time, so as patients can look for alternative solutions	Contractor/ Proponent
Airborne emissions	✓ Demolition site to be fenced off using tarpaulins; ✓ Friable loads of demolition debris being transported must be watered or covered to reduce dust	Contractor/ Proponent

Noise and vibrations nuisance	✓ All areas disturbed during closure of the site that are not required for a specific activity must be revegetated; ✓ Diesel exhaust emissions from heavy machinery on site (excavators, front end loaders and hauling trucks) must be controlled and minimized by regular checks and servicing of vehicles. ✓ Construction machinery shall be kept in good condition e.g., greasing to reduce noise generation from friction of movable parts; ✓ Heavy-duty equipment be insulated or placed in enclosures to minimize noise levels during demolition works; ✓ Ensure that noise & vibration from construction activities are within permissible levels as per the provision of the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009. ✓ Notify nearby residents of the intention to demolish and the expected impacts and time frame.	Contractor/ Proponent
Safety and Health risks	✓ Decommissioning works workers be issued with appropriate PPEs and the decommissioning contractor to enforce their use; ✓ Restrict scavengers from the site; ✓ Develop safe work procedures for demolition works	Contractor/ Proponent

CHAPTER TEN: CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

The proposed project is considered important and beneficial to the proponent, local community, County and National Governments in general. The negative impacts expected to arise during all the phases of the project can be managed to satisfactory levels using the derived ESMMP without causing irreversible environmental degradation. The proponent is also committed to implementing the Environmental and Social Management Plan developed for the project. Additionally, regular monitoring of the development will be conducted to audit the environmental performance.

10.2 Recommendations

It is our recommendation that the project be approved for implementation subject to adherence to the stipulated mitigation measures in this report. Proactive precautionary measures should be taken to safeguard the natural environment and the well-being of persons within and around the hospital facility. In addition to the implementation of the ESMMP, the traffic management plan and the NEMA licensing conditions, the proponent should also conduct statutory Environmental Audits, Fire Risk Assessments, and Occupational Safety and Health Audits annually through licensed professionals during the construction and operation phases of the project.

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