Green By Choice Limited
Seasoned Woman Centre, No. 246A
O'Washika Rd, Off Isaac Gathanju Road
P.O Box 21212-00505, Nairobi, Kenya
Tel: +254 (0) 20 2424114,
Cell: +254 (0)722 510 485,
E-mail: info@greeneastafrica.com
Webmail: www.greeneastafrica.com

ENVIRONMENTAL IMPACT ASSESSMENT FULL STUDY REPORT

Proposed Refurbishment and Redevelopment
Orbit Products Africa Limited (OPAL)
L. R. No. 14817
Off Mombasa Road, Mlolongo
Mavoko Sub-county - Machakos County

Prepared on behalf of:
Stellar Warehousing and Logistics Limited
Orbit Complex, off Mombasa Road, Mlolongo
P. O. Box 48870
G.P.O Nairobi, Kenya

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ACRONYMS

CBD	Central Business District
COD	Chemical Oxygen Demand
CEMMP	Construction Environmental Management and Monitoring Plan
CIDP	County Integrated Development Plan
EA	Environmental Audit
EHS	Environment Health and Safety
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EMP	Environmental Management Plan
EMS	Environmental Management System
ESMS	Environmental and Social Management Systems
GHGs	Green House Gases
ISO	International Organization for Standardization
MAVWASCO	Mavoko Water and Sewerage Company
KEBS	Kenya Bureau of Standards
KPLC	Kenya Power and Lighting Company
KPC	Kenya Pipeline Company
KPHC	Kenya Population and Housing Census
L. R. No.	Land Registration Number
NEAP	National Environmental Action Plan
NEC	National Environment Council
NEMA	National Environmental Management Authority
NCA	National Construction Authority
OSHA	Occupational Safety and Health Act
OPAL	Orbit Products Africa Limited
PCC	Public Complaints Committee
PPE	Personal Protective Equipment
QEHS	Quality, Environmental, Health and Safety
SWLL	Stellar Warehousing and Logistics Limited
WRA	Water Resources Authority
VAT	Value Added Tax

SUBMISSION

This Environmental Impact Assessment Full Study Report has been prepared by Green By Choice Ltd., a NEMA certified EIA/EA firm of experts and associates. We, the undersigned, wish to certify that the particulars in this report are correct and true to the best of our knowledge. This report has been done with reasonable skill, care and diligence in accordance with the Environmental Management and Coordination Act, 1999 and the Environmental Impact Assessment and Audit Regulations, 2003 (amended 2015).

PROPONENT: STELLAR WAREHOUSING AND LOGISTICS LIMITED

Designation: .....

Name: .....

Signature: .....

Date: .....

EIA/EA LEAD EXPERT

Elizabeth N'zani Wachira

NEMA Reg. No. : 0848

Signature: .....

Date: .....

EIA/EA ASSOCIATE EXPERT

Simon Muthami Nyakweya

NEMA Reg. No. : 9513

Signature: .....

Date: .....

EXECUTIVESUMMARY

The Proponent, **Stellar Warehousing and Logistics Limited (SWLL)** has proposed to carry out, at the existing Orbit Products Africa Limited (OPAL) plant, redevelopment and the refurbishment of the internal and external structures to achieve optimum plant productivity and high efficiency. The proposed site is located on **L.R. No. 14817** off Mombasa Road, in Mlolongo, Mavoko Sub-county, Machakos County. The proposed redevelopment will be a three phased project.

This study was commissioned by the Proponent, to establish the potential environmental impacts of the proposed project and provide baseline information on the project area for the purposes of decision making during the project's evaluation process. The Environmental Impact Assessment Full Study Report is expected to identify possible impacts of the proposed project (refurbishment of existing facilities and construction of new facilities within the existing project boundary) on the environment, predict likely changes, and propose mitigation measures for significant negative environmental impacts on the environment. It is also intended to highlight environmental issues with a view to guide policy makers and planners, stakeholders, and government agencies to make environmentally and economically sustainable decisions.

The refurbishment shall be limited to the existing buildings: production and blow moulders, high value goods store, engineering, production and the sulphonation plant measuring approximately 29,243m². The refurbishment will comprise the removal and disposal of the existing asbestos roof, replacement of the asbestos roof with a new industry standard steel roof with associated roof insulation and repairs to the existing steel roof structure to support the new roof. ***A separate EIA is being prepared concurrently for removal, replacement and disposal of asbestos at OPAL by a NEMA licensed asbestos handling company. This EIA Full Study will only accommodate all works stated for refurbishment apart from the asbestos removal, replacement and disposal.***

Further to this, the refurbishment shall address repairs to the various structural elements, repairs to the boundary wall, repairs to external hardstand areas, making good to stormwater drainage/rainwater catchment installations in addition rectification of services to ensure compliance with various provisions of the Kenyan Nation Building Regulations of 2009. The Rational Fire Design has been pursued in terms of the Occupational Safety and Health Act No. 15 of 2007 and Legal Notice No. 59 - Fire Reduction Rules under OSHA 2007.

The redevelopment shall relate to the construction of two separate industrial facilities (northern and southern facilities) in addition to the required bulk services and roadworks upgrades to service the above-mentioned facilities. The Northern Facility

shall measure 2,123m² comprising of open plan office fitted out to a 'white box specification', warehouse floor and an isolated area for the chlorine mixing area located within the warehouse. A summary of areas associated with The Northern Facility is described below:-

- Ground floor offices – 410m²
- First floor offices – 383m²
- Warehouse – 1,050m²
- Chlorine mixing area – 250m²
- Ablutions, kitchens and staircases - 30m²
- Total area – 2,123m²
- Total pallet @ 4 pallets high and 3m aisle width- 424pallets

The Southern Facility will measure 12,618m² comprising of additional production area, warehouse floor and provision for ablutions and showers. A summary of areas associated with The Southern Facility is described below:-

- Warehouse – 9,222m²
- Production area – 3,310m²
- Showers and ablutions – 86m²
- Total area – 12,618m²
- Total pallets @ 6 pallets high and 2m aisle width – 19,458 pallets

The proposed redevelopment works will allow OPAL to have more storage/ warehousing space for the production materials/finished goods and expansion of the current production facilities to cover liquid filling lines, plastics blow moulding work and soap production.

This Full study is undertaken under requirements of Environmental Management Coordination Act of 1999 (revised 2015) schedule II, as stipulated by National Environment Management Authority that requires all development projects to do so in order to elucidate the potential adverse impacts of a project and thereby devise appropriate mitigation measures. The proposed project has since gone through the Scoping phase and has been granted NEMA TOR Approval Reference No. **NEMA/TOR/5/2/426**. The Environmental Management Coordination Act of 1999 (revised 2015) Second Schedule Legal Notice No. 31 of 2019 lists and categorizes projects under low risk, medium risk and high risk projects. High risk projects under the category of Processing and manufacturing industries, and of applicability to this Project and EIA, include the following:-

a. Any other chemical works and processing plants.

The major objective of the study is to evaluate the effects/impacts of the proposed redevelopment and refurbishment in relation to the general environmental aspects i.e. physical, biological, and social-economic environments. It aims at influencing the protection and co-existence of the development with the surroundings as well as the compatibility of the proposed development to the area, to ensure and enhance sustainable environmental management during implementation and operational phases.

This study was carried out based on field assessments and public consultations with the community neighbouring the proposed Project site, relevant stakeholders and the proponent. Relevant document reviews also took place. The Project Proponent provided the proposed Project design details. The data collection was carried out through structured questionnaires, sampling and testing of environmental parameters, interviews and observations during site visits where necessary in the manner specified in Part V (Regulation 35) of the Environmental (Impact Assessment and Audit) Regulations, 2003. Potential negative impacts and mitigation measures during construction, operation and decommissioning of the proposed project have been taken into consideration during the study.

This study has broken down the proposed project's activities into four (4) phases, namely:-

- Design phase
- Construction phase
- Operational phase, and
- Decommissioning phase

Key Environmental/Social Issues and Impacts

i. The likely significant environmental impacts expected to arise at the construction stage are on aspects like noise, air pollution, solid waste and health and safety of workers. Mitigation of these potential adverse impacts has been addressed in the proposed Environmental Management Plan (EMP).

ii. Noise will arise out of construction equipment (vehicles plant and tools) when in operation and the construction process itself. To mitigate noise levels, the contractor will see to it that all equipment used on the site is mechanically sound and regularly serviced for optimal performance.

iii. The levels of dust loading on the environment will depend on prevailing weather conditions. Should the construction be done during the dry season, all point sources of dust will be identified and appropriate mitigation measures employed. Source points such as roads, materials stock pile and concrete mixing yard will be wet regularly. In other areas with sources of dust

emissions and where wetting as a control measure is not practical, such as in the workshop and cement store, workers will be made to wear dust control kits.

iv. Solid waste will be generated from left over materials. Most of these materials will be used by the time the construction is complete. Some of it will be disposed of at the local County Government designated sites. The EMMP advises the sorting of this waste before disposal. Solid waste will be removed regularly to avoid accumulation at the site.

v. Workers at the construction site are exposed to a higher risk of work related injuries. To safeguard the workers from potential injuries during the construction process, the EMMP requires that the contractor provides safety gear for all his workers as per the provisions of the Occupational Safety and Health Act, 2007. To take care of the workers in the event that they suffer injuries at work the contractor will provide training in respect to the nature of work and a cover for his workers as per the provisions of the Workmen's Compensation Act.

vi. Public safety will be taken care of by securing the site and posting warning signage at strategic places around the site. This will warn the public about the ongoing construction activities and the likely dangers such as heavy trucks turning and falling objects.

vii. During the operation phase, the significant likely environmental factors are solid waste and waste water, noise, air pollution, thermal pollution, vibration within the project site and increased traffic to the area. Of great significance is pollution of air through SPM, SO_2 and NOx emitted during the manufacturing process. The environmental impact categories identified include:-

a) abiotic resource depletion (exhaust)
b) greenhouse effect (global warming)
c) human toxicity
d) acidification
e) ozone depletion
f) eutrophication/oxygen demand
g) photochemical oxidation (smog)
h) ecotoxicity
i) landscape demolition (and ecology)
j) use of energy (renewable and non-renewable)
k) nuisance
l) solid waste

OPAL already has in place Health, Safety and Environment (HSE) systems and procedures that outline the necessary mitigations measures to be implemented following a negative impact or emergency. The proposed project activities will be managed (and mitigated) through the existing QHSE management system and the EMP shall be in line with the below listed documents. The standard operating procedures and policy documents include:-

- Emergency Preparedness and Response Plan
- Hazard Identification, Risk Assessment and Determination of Controls Procedure
- Quality, Environmental, Health and Safety (QEHS) Management System Manual
- Occupational Health and Safety Policy
- Spillage Control Guidelines
- Waste Management Procedures

Table 1: Summary of potential project impacts and proposed mitigation measures

Project Phase	Potential Environmental Impact	Proposed Mitigation
Construction and Machinery Installation Phase	Noise	✓ Restrict activities to daytime ✓ Provide ear muffs for employees exposed to high noise levels ✓ Construct a buffer wall around the property
	Water pollution	✓ Ensure proper oil handling to avoid spills ✓ Prepare an oil spill management plan ✓ Include a training programme for all construction workers on the EMP and spill prevention measures. ✓ Promote awareness on water conservation measures
	Health and Safety Hazards	✓ Contractors to have HSE clauses included in their contracts ✓ Document Emergency Response Procedures ✓ H&S training procedures ✓ Provide necessary safety signages ✓ Document all Operational Procedures ✓ Provide PPEs ✓ Ensure work safety procedures are implemented ✓ Seek out work permits before commencement of any works. ✓ Ensure lockout/tagout (LOTO) procedures are implemented during equipment relocation, service or

		maintenance.
	Waste management	✓ Provide for a waste segregation and collection point and regularly collect waste ✓ Re-use as much waste as possible
Operational Phase	Air pollution, e.g. RSPM, SPM, SO_2 &NOx	✓ Install all required pollution control equipment ✓ Regular monitoring of stack emissions ✓ Regularly water the pavements and earth roads ✓ Servicing of equipment and machinery ✓ Complete combustion in all motor machines and boilers
	Energy use	✓ Regularly monitor energy consumption and prepare an Energy Management Plan
	Water use	✓ Regularly monitor water consumption and prepare a Water Management Plan

The proposed project will also have many positive impacts due its objectives, scope, details, site and other baseline conditions. These can be summarized by the following which are the most significant positive impacts:-

- Creation of employment throughout all of its phases and indirect employment creation from businesses that may service the people working at the offices
- Economic benefits that include the capital project cost investment that will be injected into the economy
- Stimulation of development through revenue and taxes that will be levied by the government
- Creation of market for goods and services that will be utilized in the entire project such as raw materials, plumbing services, electrical fittings, transport and landscaping
- Creation of business opportunities for various companies and individuals which is in line with Vision 2030 and the Big 4 Agenda.
- Optimum plant utilization, high productivity and high efficiency at OPAL
- Optimum utilization of space and land within OPAL premises

In addition to the existing QHSE management system that OPAL has in place, the EMP developed for the proposed project will ensure that environmental pollution and or degradation does not occur as a result of implementation and operation of any of the components of the proposed redevelopment. EMPs will be updated to cover the following management plans among others:-

- Air Pollution Management Plan;
- Noise Management Plan;

- Traffic Management Plan;
- Occupational Hazards Management Plan, and
- Waste Management plan.
- Protection of biological diversity and resources

Environmental Monitoring Plan

This plan provides for both active and reactive monitoring of various environmental parameters including:-

i. Monitoring of the achievements of specific plans of the Environmental Management Plan, performance criteria and fulfilment of objectives;
ii. Systematic inspection of workplace;
iii. Surveillance and monitoring of the work environment, including the organization of work and activities involved;
iv. Monitoring of workers' health;
v. Monitoring of compliance with laws, regulations and requirements;
vi. Environmental conservation and related activities in the area;
vii. Work related injuries, ill health (including record keeping and monitoring of sickness/absence), disease and accidents, and
viii. Deficient safety and health performance including OHSMS failures.

Monitoring is included in OPAL's existing ESMS; the monitoring plan will need to be updated to include the new areas and activities, to ensure monitoring of EHS risks remains relevant and applicable to the new activities on site, including for construction and operation.

In conclusion, this study has found that construction of the proposed project will be viable with minimal adverse impacts. Most of the negative impacts will be short term and will occur during the construction/refurbishment phase. The project will be sustainable if the proposed mitigation measures are implemented. Under the Operations phase the activities and management of impacts will be incorporated into the existing OPALs ESMS. Lastly, it should be borne in mind that this is an existing project, and the intervention being proposed is intended simply to enhance what is already in place.

1. INTRODUCTION

1.1 Background and rationale for Environmental and Social Impact Assessment

Section 58 (2) of the Environmental Management and Coordination (Amendment) Act, 2015 requires that the Proponent of a project shall undertake or cause to be undertaken at his own expense an EIA study before implementing the project and prepare a report thereof for submission to the National Environment Management Authority (NEMA).

Regulation 4 (1) of the Environmental (Impact Assessment and Audit) Regulations issued under Legal Notice No. 101 of 13th June 2003 states that no Proponent shall implement a project likely to have a negative environmental impact, or for which an EIA Full Study is required, unless an EIA has been concluded and approved under these regulations.

The EIA Full Study helps to minimize land use conflicts within surrounding areas and to ensure environmental sustainability. This study has been prepared in line with NEMA's Legal Notice No. 31 of 2019 and IFC Performance Standards (IFC PS). The proposed project has gone through the scoping phase and has been granted NEMA TOR Approval Reference No. **NEMA/TOR/5/2/426**. *The NEMA TOR approval letter is appended to this report as* ***Appendix 6***. In compliance with these legislations and in application for an EIA licence for the proposed development, the project Proponent has cause to undertake an Environmental Impact Assessment (EIA) full study of this project.

1.2 Background Information about the Proponent - Stellar Warehousing and Logistics Limited (SWLL)

Stellar Warehousing and Logistics Limited (SWLL) has recently taken transfer of the property currently occupied and leased by Orbit Products Africa Ltd. (OPAL). SWLL has entered into an agreement to develop and lease with OPAL whereby SWLL will develop a new facility and refurbish the current facility in order to enhance OPAL's manufacturing operations.

OPAL incorporated in 1972 as a trading organization dealing in various products with a view to importing the right products at right prices. In 1991, the company diversified into the manufacturing field with a view to provide quality products, competitive prices and a source of materials for the East African Community. OPAL is one of the primary producers of Sulphonic acid, Sulphuric acid and Sodium Lauryl Ether Sulphate in the East African region. The company has over 500 permanent members of staff based in Kenya. This number fluctuates between 600 and 900, depending on the amount of orders received.

The proposed redevelopment works will allow OPAL to have more storage/ warehousing space for the production materials/finished goods and expansion of the current production facilities to cover liquid filling lines, plastics blow moulding work and soap production. The proposed investment towards redevelopment and refurbishment will enable OPAL to meet consumer demand for their portfolio of fast growing brands and continue to localize production of their brands. It represents significant Foreign Direct Investment into the country which aligns to the government's Big 4 agenda, and is a vote of confidence in their brands and the positive outlook in the Kenyan and regional market.

1.3 Objectives of the Study

The overall objective of the study is to carry out an assessment of redeveloping and refurbishment of OPAL to determine whether the construction and operation and associated activities will have any adverse impacts on the environment, taking into account biophysical, social, cultural, legal and economic considerations.

The specific objectives of the study are:-

- To identify the likely negative impacts of the proposed project
- To assist decision makers arrive at a decision whether to grant a license to the proposed project
- Verify compliance with environmental laws, policies and regulations as well as industry best practice and standards
- Identify and analyse alternatives to the envisaged project
- Identify, analyse and propose mitigation measures for negative impacts and enhancement measures for positive impacts to be undertaken during and after the implementation of the project including recommending cost effective measures to be used to mitigate against the anticipated negative impacts
- Seek the views of affected persons in consultation with NEMA
- Prepare an Environmental Management Plan (EMP) report compliant with the Environmental Management and Coordination Act (1999). The EMP for the proposed project will be combined with the existing ESMS for OPAL. A separate ESMP specific to construction (a C-ESMP) will be drafted and appended to the Contractor's contract; ensuring compliance to this C-ESMP becomes a contractual condition.

This study was undertaken in full compliance with the Environmental Management and Coordination Act 1999 (revised 2015), the Environmental (Impact Assessment and Audit) Regulations 2003 and the IFC Performance Standards (IFC PS).

1.4 Terms of Reference

The Terms of Reference for the study of the proposed project are: -

- To provide a detailed description of the proposed project in terms of location, objectives, design, activities, material inputs, outputs, products and waste
- To provide a detailed description of the baseline environmental and socio-economic conditions of the project area
- To review the relevant legal, policy and institutional framework applicable in the implementation of the proposed project
- To provide a detailed description of the potentially affected environment
- To identify, predict and analyse the environmental and social impacts of the project, including seeking neighbours and public views and concerns
- To provide an analysis of project alternatives in terms of site, design and implementation technologies and provide reasons for preferred options
- To provide a detailed Environmental Management Plan (EMP) proposing measures for mitigating negative environmental impacts, including the cost, timeframe, responsibility and monitoring indicators to implement the measures.

1.5 Scope of the study

The study approach was structured to cover the requirements under EMCA, 1999 (revised 2015) as well as the Environmental Management and Coordination (Environmental Impact Assessment and Audit) Regulations, 2003, amended 2009. The approach involved developing an understanding of the project background, implementation plan and operation activities. In addition, baseline information was obtained through detailed physical and biological investigation of the proposed construction project and its surrounding areas, stakeholder consultations (which included discussions with local communities, traders, local administration, private sector and private organizations), photography and continuous discussions with the proponent. The key activities undertaken during the various stages of the study were as follows:-

- Describing the project and establishing environmental baseline conditions;
- Scoping the issues and establishing the boundaries of the assessment;
- Assessing the potential environmental effects of the project, including residual and cumulative effects;
- Identifying potential mitigation measures to eliminate or minimize potential adverse effects, and
- Developing an environmental management and monitoring plan.

1.6 Study Methodology

This study was carried out in accordance with the procedures and protocols in the Legal Notice No. 101 of Environmental (Impact Assessment and Audit) Regulations, 2003. The assessment involved the following:-

- Environmental screening - during which the project was identified as among those requiring EIA study under Schedule 2 of EMCA, CAP. 387. The proposed project operations (Any other chemical works and processing plants) falls within those activities listed as high risk projects under Legal Notice No. 31.
- Environmental scoping that identified the key environmental issues. The proposed project has since gone through the Scoping phase and has been granted NEMA TOR Approval Reference No. NEMA/TOR/5/2/426 (refer to ***Appendix 6***).
- Site surveys and Photography. Extensive site tours to physically inspect and document existing facilities on and adjacent to the site, natural and socio-economic features of importance through direct observation;
- Comparative study of the project with existing land uses in the neighbourhood;
- Desktop studies. This involved the review of relevant documents relating to the project;
- Seeking public views via the use of questionnaires and interviews with the project proponent, staff and other parties of interest, including residents in the vicinity of the project site through a public baraza;
- Impacts Identification. Impact identification will be based on definitions of nature of impact, type of impact, duration, geographic extent, frequency, likelihood and resource/receptor vulnerability/sensitivity; and
- Analysis of alternatives and production of the study report.

This approach emphasized key elements of the EIA Full Study i.e.: scoping, stakeholder engagement, baseline data collection, project description, identification and assessment of impacts and identification of mitigation measures.

1.7 Environmental Management Plan

The table below is a summary of the EMP for this project. A detailed EMP is given in another section of this report. This EMP will be integrated into OPAL's ESMS before the start of the construction phase.

Table 2: Summarised Environmental Management Plan

Proposed site clearing and preparation stage	
Potential Impacts	**Mitigation measures**
Loss of vegetation	▪ Maintaining vegetation in areas not affected by the proposed development ▪ Preservation of as much vegetation/green space as possible ▪ Landscaping to restore vegetation and where possible, plant new indigenous trees on approved space to replace the lost vegetation
Noise	▪ Provide appropriate and adequate Personal Protective Equipment (PPE) for all workers on site ▪ Ensure plant (machines) are in good working condition ▪ Ensure use of plant/machines with noise abatement devices. Ensure that all works are carried out during the day time only from 08:00 a.m. to 05:00 p.m. hours.
Dust pollution	▪ Sprinkling of water on dusty areas/access roads to minimize dust ▪ Hoard the entire construction site especially in areas of deep excavation ▪ Provide workers with dust masks as part of PPEs ▪ Install a truck wash to wash the dirt from trucks as they leave the site. This will be beneficial during the site preparation, excavation and construction phases
Solid waste	▪ Contractor to collect and dispose of solid waste through authorized sites ▪ Properly dispose of the construction debris ▪ Use excavated soil for back filling. The excavated soil or material should be reused when tested to a broad suite of

	parameters to show it is chemically and physically inert
Disturbance of soil structure and destruction of habitat	▪ Maintain specified routes for construction vehicles ▪ Controlled earthworks ▪ Use of light machinery and equipment during construction ▪ Protect and maintain the vegetation in areas not affected by the proposed development
Excavation Stage	
Noise from excavation machines	▪ Use barriers to shield compressors and other stationary equipment where necessary
Waste from excavation	▪ Proper disposal of dismantled construction materials at authorised disposal sites
Dust from excavation	▪ Provide workers with adequate PPE ▪ Hoarding of the project site ▪ Minimize dust by sprinkling the ground with water
Soil erosion	▪ Control earthworks ▪ Management of excavation works ▪ Construction of appropriate drainage structures
Construction Stage	
Noise from construction machines and activities	▪ Erect signs indicating construction activities ▪ Ensure maintenance of all equipment ▪ Use of attenuated equipment
Dust from construction activities	▪ Provide workers with appropriate PPE ▪ Sprinkling water to control dust ▪ Use of dust screens where appropriate

Occupational health and safety	▪ Provide appropriate PPE and training for all workers ▪ Use trained workers for all the tasks at the site ▪ Ensure that a crew member is trained in first aid administration and basic fire fighting ▪ Continually place a fully equipped first aid tool box in the project site ▪ Ensure toolbox talks are held prior to commencement of daily works ▪ Implement safety work procedures and LOTO procedures ▪ Contractor HSE compliance and abiding to the existing OPAL systems must be in all contracts. ▪ The contractor shall provide training to the workers and the H&S Officer on site, ample warning signs, guard rails, warning tape, etc., around open excavations, stacks of material, debris, etc. and shall be held liable for all claims as a result of neglect of such precautions and provisions ▪ Proper access control shall be enforced to ensure that no unauthorised persons enter the site
Site cleanliness and sanitary facilities	▪ Sanitary facilities to be provided on site ▪ Maintain the project site in an orderly and organized manner, and dispose of garbage regularly to prevent build-up and to aid pest control
Solid waste	▪ Agreeing on contracts with licensed waste collectors. OPAL have a WMP and already uses licensed NEMA waste contractor
Increase in traffic density	▪ Construction vehicles to transport materials to the construction site during off peak traffic hours ▪ Put adequate signage on the construction site
Operation Stage	

NB: OPAL are already operating under a QHSE Management System thus majority of the recommendations in the EMP are in line with the existing QHSE and ESMS	
Socio-economic impacts	▪ Employment of people from the neighbouring areas ▪ Potentially develop a Corporate Social Responsibility (CSR) programme for the community
Solid waste	▪ Engaging licensed waste collectors ▪ Practise waste segregation and recycling of recyclable waste ▪ Separation of waste and refuse at the source ▪ Using recycling bins with clear separation in public areas. For example different coloured bins for different types of waste
Surface and ground water contamination from wastewater	▪ Proper measures to be taken to avoid surface and ground water pollution

2. DESCRIPTION OF THE PROPOSED PROJECT

2.1 Project Site Description

The proposed redevelopment and refurbishment project will be undertaken on Plot **L.R. No. 14817** off Mombasa Road, Mlolongo, Mavoko Sub-county, Machakos County. The geo-reference points are **Latitude -1.38891** and **Longitude 36.93340**, at an elevation of 1582m above sea level. The site is held under Land Reference No. 14,817 on 99-year land lease term initiated on 01 July 1988; according to Deed Plan No. 135,794 the site measures **8.057Ha** or 80,570m² and is rectangular in shape (see Figure 1) The site currently accommodates approximately 29,243m² of existing facilities and supporting yard areas built to accommodate the needs of OPAL. The proposed project site is located 24.8 kms from the Nairobi CBD via Mombasa Road. The site is located 11.2 km from Jomo Kenyatta International Airport and 12.2km from the Inland Container Depot.There are two boreholes on site and the area is supplied by electricity from the National Grid.

2.2 Surrounding Land Uses Neighbourhood Conditions

The dominant land uses within the neighbourhood are light industrial and commercial. Several residential developments exist within the neighbourhood. The nearest residential property from the site boundary is 900m. Several neighbouring structures include light industrial warehouses with office space. To the west, the project site is adjacent to an already developed and functioning packaging (cartons) production plant. To the north of the site is Mombasa Road, to the east is the New Mlolongo weigh bridge and an undeveloped piece of land, to the southern extent the site is adjacent to the Nairobi National Park. The KPC pipeline by-passes the plot site on the southern end of the site. Access to the site will be through Mombasa Road.

The site area to be redeveloped has a few acacia trees mainly the white-thorn acacia (*Acacia seyal, Acacia brevispica, Acacia gerrardii*); pine trees namely the whistling pine (*Casuarinaequisetifolia*) and shrubs. It is highly recommended that vegetation in the areas that will not be affected be left intact.

Figure 1: Google earth showing an aerial view of the project site at OPAL

Figure 2: Existing site conditions at OPAL

2.3 Project Description

The refurbishment

The refurbishment shall be limited to the existing buildings: production and blow moulders, high value goods store, engineering, production and the sulphonation plant measuring approximately 29,243m². The refurbishment will comprise the removal and disposal of the existing asbestos roof, replacement of the asbestos roof with a new industry standard steel roof with associated roof insulation and repairs to the existing steel roof structure to support the new roof. ***A separate EIA is being prepared concurrently for removal, replacement and disposal of asbestos by a NEMA licensed asbestos handling company. This EIA Full Study will only accommodate all works stated for refurbishment apart from the asbestos removal, replacement and disposal.***

Further to this, the refurbishment shall address repairs to the various structural elements, repairs to the boundary wall, repairs to external hardstand areas, repairing the stormwater drainage/rainwater catchment installations and in addition rectification of services to ensure compliance with various Kenya National Building Regulations of 2009. The Rational Fire Design has been pursued in terms of the Occupational Safety and Health Act No. 15 of 2007 and Legal Notice No. 59 – Fire Reduction Rules under the OSHA 2007.

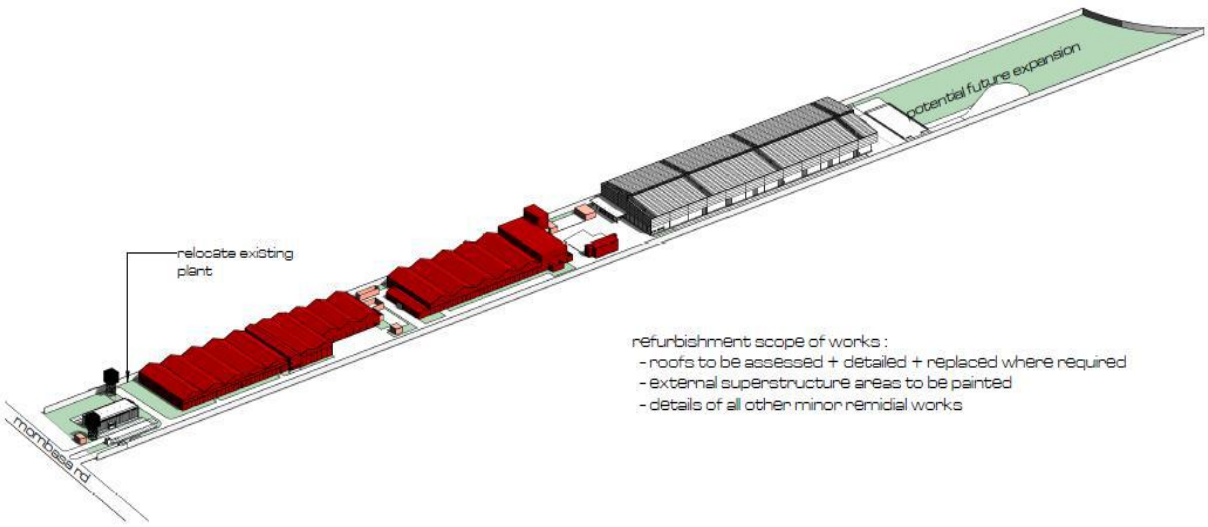

Figure 3: Refurbishment scope of works

The redevelopment

The redevelopment shall relate to the development of two separate industrial facilities (northern and southern facilities) in addition to the required bulk services and road-works upgrades to service the above-mentioned facilities. The new facilities will be used for internal reorganization of existing production machines, creating additional storage space and to create more office space for staff.

The Northern Facility

The Northern Facility shall measure 1,100m² comprising of open plan office fitted out to a 'white box specification', warehouse floor and an isolated area for the chlorine liquid mixing area located within the warehouse. The warehouse structure will be constructed as a steel portal frame structure measured to a height of 8.13m to the underside of the roof truss with infill blockwork placed on an on-grade surface bed to a height of 3m with sheeting above to roof height. The office structure will be constructed as a reinforced

concrete frame, with infill blockwork to the east and western elevations with a feature aluminium glass façade on the northern elevation providing natural light to the office environment and serving as an aesthetic feature to the entrance of the building. The floor to underside of slab/roof height of the office areas will be 3.1m with provision for a services void of 400mm resulting in a ceiling height of 2.7m. The building will be founded on concrete strip footings and ground beams, with imported layer works supporting the surface beds. A summary of areas associated with the Northern Facility are listed below:-

- Ground floor offices – 410m²
- First floor offices – 383m²
- Warehouse – 1,100m²
- Chlorine mixing area – 640m²
- Chlorine storage – 85m²
- 19 staff parking bays
- 35 parking bays
- Ablutions, kitchens and staircases - 30m²
- Total area – 2,123m²

The Southern Facility

The Southern Facility will measure 12,988m² comprising of additional production area, warehouse floor and provision for ablutions and showers. The structure will be constructed as a steel portal frame structure measured to a height of 10.5m to the underside of the roof truss at its lowest point with infill blockwork placed on an on-grade surface bed. The building will be founded on concrete strip footings and ground beams, with imported layer works supporting the surface beds. A summary of areas associated with The Southern Facility are listed below:-

- Warehouse – 9,222m²
- Production area – 3,310m²
- Showers and ablutions – 86m²
- Total area – 12,988m²
- Total pallets @ 6 pallets high and 2m aisle width – 19,458 pallets

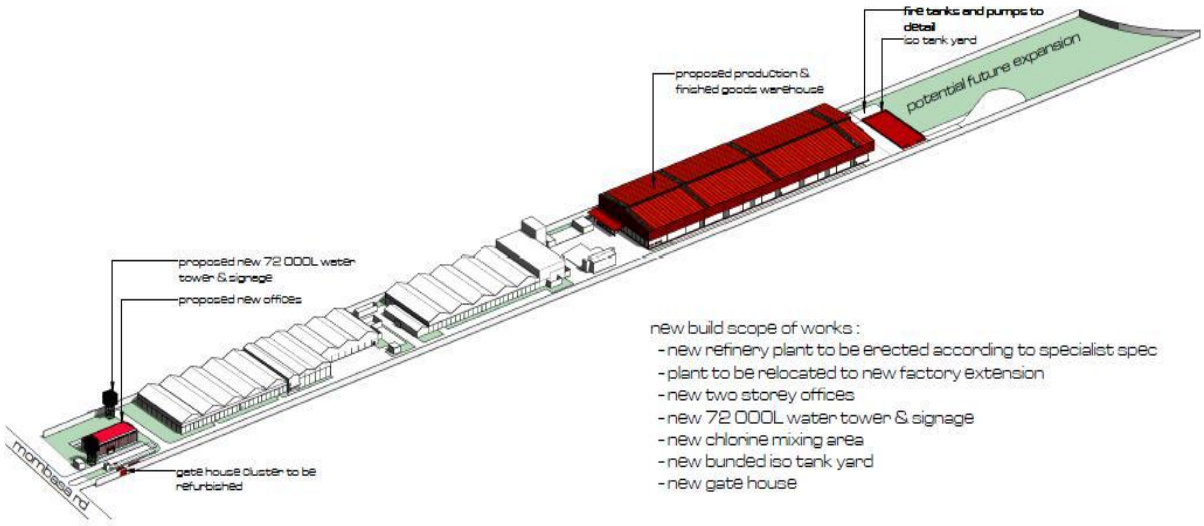

Figure 4: Redevelopment scope of works

2.4 Project design

The proposed redevelopment will be a three phased project. The various design components for the proposed production project is as described below; these include embedded mitigation measures as part of the initial design, where possible.

Table 3: Project design standards

Orbit Products Africa Ltd		
Design Standards		
Trade	**Primary Design Standard**	**Secondary Design Standard**
Zoning Scheme	Republic of Kenya, County Government of Machakos, Industrial, Form No. 616131692016, Reg No. 6161/06/2016	n/a
Architectural	Kenya Planning and Building Code 2009, Kenya Planning and Building Code 1968, BS Standards	Standard warehouse extensions with soft roof providing natural light and ventilation.
Structural	B.S. 8110: Parts 1, 2 and 3: Structural use of concrete; 1997; B.S. 5950: Structural use of steelwork in buildings; B.S. 4449: Specification for carbon steel bars for the reinforcement of concrete;	**Design Loads** Warehouse Floor - 30kN/m² Sheeting - 0.15 kN/m² Purlins - 0.1 kN/m² Insulation & Fixings - 0.1 kN/m² Services - 0.4 kN/m² Total Dead Load: 0.75 kN/m²

	CP 3: Chapter 5: Part 2: Basic data for design of buildings, wind loads. B.S. 6399 Part 1. 1996- Loadings for buildings. TR34 3rd edition – Concrete industrial ground floors Eurocode 7: Geotechnical Design	Live loads - 0.25 kN/m² Wind Speed – 30 m/s
Civil	BS 8005: Part 1:1987 Guide to New Sewer Construction KS 06-217 – Specification for uPVC Pipes for Buried Drains and Sewer Pipes The Traffic Act, Chapter 403, Laws of Kenya Road Design Manual, Parts I & III, Ministry of Public Works & Housing (MOPW&H), Kenya, Jan. 1979 and May 1987 respectively BS EN 752: Drain and Sewers outside Buildings BS 5911: Precast Concrete Pipes MOPW&H manual for civil works Detail - 1983 Rainfall Frequency Atlas of Kenya, Ministry of Water Development, 1978 BS EN 1871: Road Marking Technical Report 66: Concrete Pavements	**Stormwater** A suitably sized new retention pond is to be constructed prior to demolition of the existing one to ensure stormwater management is in place at all times during the Refurbishment and Redevelopment. The new retention pond will be constructed on the southern extent of the site, between the KPC wayleave and site boundary. Provision to be made for a storm outlet across KPC oil pipeline wayleave and drainage point to be located on the southern boundary of the site. **Sewer** OPAL does not produce industrial effluent. The company runs a dry production process (closed loop). Only domestic effluent (toilet and kitchen wastewater) is produced at OPAL. The domestic effluent for the existing and new facility will be connected to the existing bulk sewer connection owned by MAVWASCO.
Mechanical	Kenya Planning and Building Code 2009	**Ventilation** Natural ventilation to all warehouse spaces, offices and other spaces naturally ventilated through openable windows, mechanical ventilation to ablution areas and mechanical ventilation to specialist areas i.e. chlorine

		mixing
Electrical	Occupational Health and Safety and Kenya Factories Act (Chapter 514). Kenya National Standard where applicable. DIN or British Standard Specifications. The current edition of the 'Regulations for the Electrical Equipment of Buildings' issued by the Institute of Electrical Engineers of Great Britain. Kenya Power and Lighting Company (KPLC) Relevant British Standard Specifications and Codes of Practice published by the British Institution (hereinafter referred to as B.S. and C.P. respectively). Relevant International Electrotechnical Commission Specifications (hereinafter referred to as IEC). Relevant National Fire Protection Association Specifications (hereinafter referred to as NFPA). Regulations of the Government of Kenya.	**Power Distribution** The Electrical service shall typically be received from the existing supply at Medium Voltage 11kV and stepped down to 415V at a single location (Utility Room) and distributed to the various sections through metallic or non-metallic raceway systems throughout the facility on a customer-owned distribution system. The distribution system design choice is based on the facility's layout, loads, etc. Power for emergency and standby systems shall be provided from a centrally located generator serving the facility as well as a common automatic voltage regulator to serve the entire facility. **Lighting Design** The lighting design shall be practical, energy-efficient, easy to maintain, and appropriate for the intended function of the space. In general, the designed lighting levels shall be based on the Illuminating Engineering Society (IES) lighting handbook (latest version) and Chartered Institution of Building Services Engineers (CIBSE) Lighting Design Guide. All fittings shall have LED lamps where applicable. • Fire Alarm Design: - The

		system shall comprise components capable of providing the following features when appropriate • Floor above/floor below notification. • Private alarm notification. • Positive alarm sequence. • Voice alarm notification. • Smoke control/fan shutdown. • Alarm Verification. • Monitor non-water-based fire suppression systems. • Multiple channel digital voice. Provide audible notification throughout the building in accordance with NFPA 72. Provide an individually silenceable 10 inch, 24 VDC general alarm bell on the building exterior. Visual notification shall be provided throughout the building. Smoke detectors shall be provided at all lobbies, equipment rooms, storage and offices to perform capture/recall functions. Beam detectors and reflectors shall be provided in the warehouse to perform capture /recall functions. All systems shall be designed to provide manual means of alarm initiation at every exit from every level. **Redundancy** A 150kVA generator has been allowed for the northern facility and a 330kVA generator for the southern facility. The above load has been designed on a low load situation only providing redundancy to the warehousing

		(given 24 hour operation) and office functions.
Fire	Occupation Safety and Health Act 15 of 2007 Legal Notice No. 59 – Fire Reduction Rules under the OSHA 2007	**Rational Fire Design** Meets tenant insurer requirements
Wet Services	BS 6700:2006: Water storage and distribution. BS EN 12056-2: Foul water drainage. NEMA Regulations 2006: Wastewater treatment	**Domestic Water** Given the intermittent supply of water potable by MAVWASCO, water will be supplied via the two boreholes located onsite. This will be fed into two separate storage facilities: 1. Elevated pressed steel water storage tank (potable water and servicing chlorine mixing area) and 2. A pressed steel fire water storage tank located at ground level which will feed into the pump and hydrant system. **Rainwater Harvesting** The National Environmental Management Agency (NEMA) will usually ask that rainwater harvesting be incorporated into the design of the facility to reduce consumption of domestic water. The stormwater retention pond will be used as a storage point for rainwater, a simple installation of a pump hose will provide untreated water to the facility for washing down of buildings and external yard areas. **Wastewater** See Civil/Sewer **Containment Tank / Bunded Area** The containment of the effluent from the ISO tank and chlorine

		storage area will be treated with a bunded area for storage of ISO tanks and chlorine solution storage in addition to a containment tank that will prevent any effluent from draining into the greater municipal sewer line network should a spillage be suspected.

NB: The development of the oil pipeline in Kenya began when the Government established the Kenya Pipeline Company (KPC) in 1973 with the task of transporting petroleum products from Mombasa to the hinterland. The pipeline system currently consists of a network of 1,792 km of pipelines running from Mombasa through Nairobi to the Western Kenya towns of Nakuru, Eldoret and Kisumu. The pipeline throughput has increased from 800m^3 in 1978 to 8.1million m^3 in 2020/21. The current KPC system integrates preventive, corrective and remotely reactive measures to curtail any emergency. The extensive devices installed within the KPC operation system attest to enhanced existing emergency preparedness. KPC has in place a comprehensive HSE system, designs, policies, procedures, work instructions and authorization that incorporate fire detection, prevention and control systems both in fixed, mobile and portable units. KPC has an environment protection system which includes leak detection and containment devices to ensure that no product is lost into the environment.

2.4.1 Materials and Equipment during Construction Phase

Table 4: Summary of equipment and materials used during construction

Materials	Equipment
• Stones/building blocks • Common burnt clay bricks • Sand • Concrete • Steel reinforcement bars • Cement • Tiles • Roofing material • Electrical wires etc. • Prefabricated steel structures	• Cranes • Excavator • Vibrators • Welding machines, cranes, wheelbarrows • Transportation vehicles • Concrete mixer etc.

All materials that will be used shall be as per Kenya Bureau of Standards (KEBS) specifications, and materials will be sourced from local manufacturers in the surrounding area where possible.

2.3.2 Solid Waste Management

The proponent takes cognizance of a significant volume of waste that will be generated during the land preparation, construction, and operation of the project i.e. from the manufacturing process, offices and other premises. An integrated solid waste management system will be applied at all phases of the project. First, the proponent will give priority to *Reduction at Source* of the waste materials. Under this option, the proponent will implement a solid waste management awareness programme for the management and all the staff. Secondly, *Recycling, Reuse and compositing* of the waste will be the second alternative in priority. Under these options the proponent plans to adopt a management system of separating waste at the source. The recyclables will be sold to waste buyers in the City. Finally, *sanitary land-filling* in legally designated sites will be the last option for the proponent to consider.

Solid waste management will also entail specially designated waste separation areas, dustbins positioned in enclosed areas for protection from rain. The waste will then be separated into different waste types and collected by the existing NEMA approved waste collection and disposal company that is contracted with OPAL.

2.3.3 Sewerage

There is an existing sewer line which has been installed by Mavoko Water and Sanitation Company (MAVWASCO).

Sewer

OPAL does not produce industrial effluent. The company runs a dry production process (closed loop). Only domestic effluent (toilet and kitchen wastewater) is produced at OPAL. The domestic effluent for the existing and new facility will be connected to the existing bulk sewer connection owned by MAVWASCO.

Stormwater

Stormwater open and piped drain reticulation connected to extend existing main storm reticulation to rear of the site. A new retention pond will be constructed to ensure stormwater management is in place at all times during the Refurbishment and Redevelopment.

Within the surface water / storm sewer system on site there will be a penstock valve to prevent any uncontrolled spills entering surface water. There will be also oil/water separators as a matter of good practice if oil is stored on site.

Table 5: Project design specifications for bulk services

Orbit Products Africa Limited		
Bulk Services		
Trade	**Element**	**Description**
Civil	Roads &Traffic	No alterations to be made to the access and egress to site, the extent of Refurbishment and Redevelopment is within the permissible bulk. Accordingly, no upgrades or bulk contributions are expected by the local authority.
Civil	Stormwater Attenuation	A suitably sized new retention pond is to be constructed prior to demolition of the existing one to ensure stormwater management is in place at all times during the Refurbishment and Redevelopment. The new retention pond will be constructed on the southern extent of the site, between the KPC wayleave and site boundary. Provision to be made for a storm outlet across KPC oil pipeline wayleave and drainage point to be located on the southern boundary of the site.
Civil	Stormwater Reticulation	An extension of the existing open cast concrete culvert system running on the east and western boundaries of the site, drainage to a suitably sized stormwater attenuation pond located on the southern extreme of the site.
Civil / Wet Services	Water	The existing domestic water connection is supplemented by two borehole connections onsite. The boreholes connection feed into two separate storage facilities: 1. Elevated pressed steel water storage tank (potable water and servicing chlorine mixing area) and 2. A pressed steel fire water storage tank located at ground level which will feed into the pump and hydrant system. Potable water is tested for potable parameters on an annual basis.
Civil / Wet Services	Bulk Sewer Connection	Domestic effluent (toilets and kitchen wastewater) from the existing and new facility to be connected to the existing MAVWASCO sewer connection.

Civil / Wet Services	Rainwater Harvesting	The stormwater retention pond will be used as a storage point for rainwater, a simple installation of a pump hose will provide untreated water to the facility for washing down of buildings and external yard areas
Electrical	Bulk Electrical Supply	The supply authority, Kenya Power and Lighting Company (KPLC) has given a 5000kVA supply to the site from 2 locations. The tariff structure for this facility will be Commercial/Industrial 1 (CI4) as indicated in the Energy Regulatory Commission Approved Energy Non-Fuel Electricity Retail Tariffs for Tariff Period (2018/19). The Refurbishment 1500 kVA supply will be provided to the facility by way of the utility owned transmission line and transformers. This will feed directly to the section transformers and the individual main distribution boards. Two sections, detergent and CPL will be rationalized and combined to optimize the use of the transformers. The decommissioned transformer shall be serviced and repurposed for the Redevelopment. The North Redevelopment shall be supplied by 75 kVA supply will be provided to the facility by way of the client owned transmission line and transformer fed directly into the main incoming DB. The South Redevelopment shall be supplied by 480 kVA. The supply will be provided to the facility by way of the client owned transmission line and transformers. This will feed directly to the section transformers and the individual main distribution boards.
Electrical	Automatic voltage regulator / power factor correction	The Low Voltage main incoming distribution boards in the Refurbishment and Redevelopment shall come complete with a power factor correction system to ensure the system conforms to the Utility requirement of a power factor of 0.93 or better. An automatic voltage regulator (AVR/Stabilizer) shall be sized upon Client

		instruction to accommodate the specific requirements to ensure a constant voltage of 415V to reduce damage from under and over voltage.
Fire	Bulk Fire Installation	The domestic connection and existing borehole on site will service a new 90,000l pressed steel fire water storage tank (sized according the Alpha Risk Managers report). The above-mentioned tanks connect to the pump and valve system which in turn service the hydrant and firehose reel system. The above-mentioned report indicated that the existing systems pressure and flow rates were acceptable but noted the storage capacity was to be increased. A similar design philosophy shall be applied to the Redevelopment with provision only for a hydrant system, firehose reels with the requisite pumps and valves.

2.5Project Activities

Project activities will be carried out systematically. The phases in implementation of a development project include project planning, site preparation and clearing, construction, refurbishment, operation and decommissioning of the project.

2.5.1 Planning and design activity phase

This phase entails planning, site zoning and preparation of the proposed project taking into consideration type and nature of materials to be used, while bearing in mind the physical conditions of the plot in line with total costs as well as economic value of the project.

2.5.2Excavation and foundation works

Excavation will be carried out to prepare the site for laying of foundations, pavements and drainage systems. The excavation will involve the use of heavy earthmoving machinery such as tractors and bulldozers.

2.5.3Construction and refurbishment phase

Construction activities include site preparation by clearing the vegetation, excavation work, setting foundations, filling works construction, masonry, roofing, electrical, plumbing and civil works. During this stage, landscaping and drainage works, clearing

the site of construction debris, and connection to the existing sewer line will also be carried out. It is intended that the construction will be carried out by a registered NCA class A contractor.

2.5.4Operational phase

In general, the design of the project will essentially optimize the use of best available technology as part of embedded mitigation measures to minimise water consumption and prevent or minimize potentially significant environmental impacts associated with the project. The appropriate project design will also incorporate efficient operational controls together with trained staff, to ensure high level efficiency and environmental performance.

Solid waste and waste water management

The proponent will provide facilities for sorting and handling solid waste generated within the facility. These will include sorting areas, dust bins/skips for temporarily holding waste within the premises before final disposal at designated sites. Waste will be handled as explained above in this chapter.

General repairs and maintenance

The proposed development and associated facilities will be repaired and maintained regularly during the operational phase of the project. Such activities will include repair of building walls and floors, repair and maintenance of electrical systems, painting and replacement of worn out materials among others.

2.5.5Decommissioning Phase

Demolition works

Upon decommissioning, the project components including the main structure, pavements, drainage systems, parking areas and perimeter fence will be demolished. This will generate a lot of solid waste, which will be recycled or re-used for this or other construction works or if not re-usable, disposed of appropriately by a licensed waste disposal company.

Dismantling of equipment and fixtures

All equipment including electrical installations, production equipment, furniture, finishings, fixtures, partitions, pipe-work and sinks among others will be dismantled and removed from the site on decommissioning of the project. Priority will be given to reuse of this equipment in other projects. This will be achieved through resale of equipment to

other manufacturing facilities, building owners or contractors or donation of this equipment to schools, churches and charitable institutions.

Site restoration

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

3. BASELINE INFORMATION

This section describes the area where the proposed project is to be established. It describes the physical, biological and socio-economic environment of the project area.

3.1 Site Location

The site is situated in Mlolongo on Plot L. R. No. 14817, off Mombasa Road, Mavoko Sub-County in Machakos County. Mlolongo is a small, dusty and bustling town south of Nairobi. Site coordinates are -1.38891, 36.93340 and the site is about 24.8 kms from Nairobi CBD via Mombasa Road

3.2 Physical Environment

3.2.1 Climate and Rainfall

Mavoko is generally hot and dry, with two rainy seasons: the long and the short rains. The long rains start at the end of March and continue to the end of May, and the short rains start at the end of October and continue to the end of December. The average rainfall varies from 500mm to 1300mm with high altitude areas receiving more rains. Mlolongo lies in region IV-4 of the Agro Climatic Zone.

The project area is a geographically dry region of Kenya known as the Arid and Semi-Arid Lands. The Arid and Semi-Arid land (ASAL) areas of Kenya constitute over 80% of the country's total land surface and carry over 25% of the total human population. ASAL zones are characterised by low and variable annual rainfall amounts and high rates of evapo-transpiration. These climatic factors affect the adaptive strategies of the ASAL communities and their subsequent livelihoods.

Relevance to the Project: Rainfall in the Project area can be of high intensity short duration, and hence the design of appropriate stormwater drains and the separation of rainwater from dirty water, is essential.

Source: *https://en.climate-data.org/africa/kenya/machakos/machakos-918/*

Figure 5: Climatic conditions of Machakos County

3.3 Drainage

This study area is drained by a system of seasonal streams which flow during some parts of the year and are deeply incised down to the bedrock with many sand deposits along their beds and between rock edges.

In general groundwater in volcanic rocks is limited to fractures and erosion levels within the volcanic succession. Fresh lavas are usually not water bearing because of their massive and impervious nature. The most significant aquifer system west of the project area is the Upper Athi Series aquifer system. This is the main aquifer for boreholes in Upper Machakos, Nairobi and Kiambu areas and is composed of tuffs, lakebeds and sediments.

The drainage pattern is from West to East feeding into River Athi. The main stream that drains Mlolongo is located on the Northern Eastern side, which forms the boundary for the entire of the Mlolongo settlement and drains into River Athi which is to the East of Mlolongo. River Athi is 11.5km away from the site. The water table is very high. This has led to drilling of boreholes for water supply for domestic use.

Spatial scarcity of permanent water is the salient feature of this area's hydrology. Lack of water availability is the key limiting factor in the ecosystem. There are no perennial rivers in Mavoko area, only numerous seasonal streams that flow for short periods during the rains.

Relevance to the Project: The project area is underlain by a shallow groundwater table hence groundwater is susceptible to pollution from spills.

3.4 Geology and soils

ASAL soils are variable and have generally low organic matter and hence low fertility due to reduced vegetation cover. These soils have low water holding capacities. Another physical characteristic of the ASAL soils is their tendency to form surface capping or sealing which reduces infiltration rates, thereby increasing overland flow and soil erosion. This leads to land degradation and reduction in the effectiveness of livelihood systems in the ASALs.

The main type of geological rock formation is the Mbagathi phonolites, which are characterized as being strong for providing good foundation for building. Vertisols and Redzinas – poorly drained black cotton soils are evident here. These soils are developed on quartz – feldspar gneisses.

The area is occupied by rocks of basement system which are generally of tertiary and Achaean Age. The rocks in the Upper Machakos regions such as Mavoko, Syokimau and Mlolongo area mainly comprise a succession of lavas and Pyroclastics of the Cainozoic age and overlying the foundation of folded Precambrian schists and gneisses of the Mozambique basement rock which traverses the entire lower eastern region up to Kilimambogo area .The crystalline rocks are rarely exposed but occasionally fragments are found as agglomerates derived from former Ngong volcano.

Relevance to the Project: Soils have poor drainage, meaning ponding of rainwater, meaning potential for surface contamination of soils and rainfall water. There is a need to ensure site has good stormwater drainage.

3.5 Topography

The topography of the region is typical of the Athi River System consisting of a distinct high undulating plateau, bound by Rift wall to the west. Mlolongo area stands at an

altitude of 1509m. It is characterized by a rolling terrain and the catchment drains in a south-easterly direction. The terrain can be described as generally flat to rolling.

Relevance to the project: The project site is generally flat and therefore with heavy rains flooding might result. For the new developments, the proponent is advised to construct a strong floor slab that is well raised to avoid any water surges to the project development. It is also recommended that the storm water drainage systems installed be in line with the stochastic and deterministic models of flood estimation. In addition, the size of the drains should be calculated according to the amount of water they would be expected to carry in a storm.

3.6 Biological Environment

3.6.1 Flora and Fauna

The vegetation in this region is dry woodland and bushland, as well as savannah plains (grasslands). Natural vegetation in Upper Machakos region (Syokimau, Mlolongo and Athi River) has been cleared to pave way for the establishment of both residential and commercial developments. The natural vegetation in the area has thus been greatly modified. Mlolongo area has no great vegetation cover and it is predominantly dry savannah, open grass plains with scattered acacia bushes. The region also has a seasonal stream which supplies water to a nearby wetland.

The site has very minimal vegetation. The remnants of the natural vegetation of the site and its environs are a few scattered grasses.The site area to be redeveloped has a few acacia trees mainly the white-thorn acacia (*Acacia seyal*, *Acacia brevispica, Acacia gerrardii*), pine trees namely the whistling pine (*Casuarinaequisetifolia*) and shrubs. The tree species at the site are not listed as vulnerable on the IUCN Red List. The overall site is home to a number of landscaped exotic plant species, mostly the Duranta Sheena's gold and the Italian cypress (*Cupressussempervirens*).

Figure 6: Flora on site. This will only be cleared when and if necessary

There are no large fauna except for the occasional rodents, birds and herperto-fauna such as frogs and lizards. The proposed site is not a protected area nor is it inhabited by any endangered species. The site is highly modified habitat with low ecological value. Trees will be kept for aesthetics but will also help in noise abatement and in dust control.

3.7 Socio-economic environment

3.7.1 Demography and Population

According to the 2019 Kenya population census report by Kenya Population and Housing Census (KPHC), Machakos County had a population of 1,421,932 people consisting of 710,707 males, 711,191 females and 34 intersex persons respectively. On the other hand, based on the 2019 census report Athi River Sub-county had a population of 322,449 people.

During the 2017 general elections the Independent Electoral and Boundaries Commission (IEBC) showed that Mavoko Constituency had a population of 118,180 people and Mlolongo/Syokimau sub-location had a population of 42,154 people.

The general land use trends in the area include migration of people from high density cities to the ASALs. This is mainly due to pressure on land, and more affordable housing further away from the CBD.

3.7.2 Housing

The housing typologies in Mlolongo settlement are a mixture of single storey, double storey and multi-storeyed buildings. Other major buildings in the project area include high capacity industrial warehouses. The uses for the houses are mixed residential with shops and other commercial activities. The buildings have been constructed beacon to beacon, leaving no frontages or setbacks. Most buildings have canopies and overhangs along the inner access roads that block the smooth flow of traffic thus inhibiting accessibility.

3.7.3 Land use

Land use within Mavoko Constituency is divided into residential, commercial, industrial, recreational, educational, public purpose and public utility uses. According to the 1970 land use plan residential use was divided into three sub-categorizes namely low, medium and high density and allocated approximately 2722 Ha of land comprising approximately 27% of total land area. There has been a lot of development since 1970 that did not entirely conform to the planned land use.

Mlolongo area is primarily industrial in character with factories employing three quarters of the town's residents. There are several factories such as Kenya Meat Commission, E.A Portland Cement, Bamburi Cement, Blowpast Limited, Kapa Oil Refinery, KOTO, EPZA, Imperial Logistics, Nation Media, Mabati Rolling Mills, Devki Steel Works Company, Athi River steel rolling plant, Sun-Rose, African cotton, OPAL, SWLL and Primarosa flower companies among others. In total there are over sixty factories. The factories are mainly steel, cement manufacturing, flower farms and textile manufacturers. The Export Processing Zone employs a majority of the women population.

Mlolongo area is characterized by a number of wholesale and retail businesses, small and medium scale enterprises and commercial service providers. According to the 1970 land use plan, commercial use was allocated approximately 102 Ha comprising 1% of the total land area.

Relevance to Project: Surrounding landuse is predominantly industrial so the landuses surrounding the site have a lower sensitivity and higher tolerance to noise/ traffic / air quality.

3.7.4 Infrastructure

Roads - The site is accessible through Mombasa Road slip-road. The project site lies at a

distance of approximately 4km from the railway line, 10km from the SGR train station and 17km from JKIA.

Electricity - The project site is well served with power supply by the Kenya Power. The facility will also have standby generators to cover the power requirements should Kenya power fail.

Sewerage -OPAL does not produce industrial effluent. The company runs a dry production process (closed loop). Only domestic effluent (toilet and kitchen wastewater) is produced at OPAL. The domestic effluent for the existing and new facility will be connected to the existing bulk sewer connection owned by MAVWASCO.

Stormwater - Stormwater open and piped drain reticulation connected to extended existing main storm reticulation to rear of site. A new retention pond to be constructed to suit.

Refuse disposal -A waste collection and disposal system will be established with the engagement of a NEMA licenced waste collector.

Safety and Security -Mlolongo area has maintained security over time and this has improved due to the establishment of the Standard Gauge Railway Nairobi Terminus that is near the project site. In addition, the compound is well secured with an electric perimeter wall and CCTV cameras. For fire protection the project development will have suitably designed automatic fire sprinklers with backup water storage tanks and pumps, fire hose reels, fire hydrants and fire extinguishers**.** The design will also consider the need for fire detection systems and smoke retention facilities.

Water -Connection from MAVWASCO mains to be supplemented by two boreholes on site. The project will also explore the use of rainwater harvesting.

4 LEGISLATIVE ANDREGULATORY FRAMEWORK

4.1 Introduction

In this section the institutional and legal frameworks that govern a development of this nature in Kenya and some of the international legislations that may apply will be discussed. The redevelopment of the project will be guided by a number of laws and policies governing environmental management and land use in Kenya, and at the global level.

According to Sections 58 and 138 of the Environmental Management and Coordination Act (EMCA) No. 8 of 1999 (revised 2015),and Section 3 of the Environmental (Impact Assessment and Audit) Regulations 2003 (Legal No. 101), all new projects require that an Environmental Impact Assessment project/study report be prepared and submitted to NEMA for review and eventual licensing before the development commences. This was necessary as many forms of developmental activities cause damage to the environment and hence the greatest challenge today is to maintain sustainable development through sustainable use of natural resources without impacting negatively on the environment.

NEMA is the national body charged with coordinating matters and implementing policies relating to the environment. This body was established under the Environmental Management and Coordination Act (EMCA) CAP. 387 (revised 2015). The National Environmental Council (NEC), the National Environmental Tribunal (NET) and the Public Complaints Committee (PCC) were also set up under the same Act.

The Kenyan law has made provisions for the establishment of the National Environment Management Authority (NEMA), which has the statutory mandate to supervise and co-ordinate all environmental activities. Policies and legislation highlighting the legal and administrative requirements pertinent to this report are presented below. An EIA is a legal requirement in Kenya for all development projects. The Environmental Management and Co-ordination Act 1999, is the legislation that governs EIA studies. This project falls under the Second Schedule that lists the type of projects that are required to undergo EIA studies in accordance with section 58 (1-4) of the Act. Projects under the Second Schedule comprise those considered to pose potential negative environmental impacts. This EIA Full Study has been prepared to fully comply with environmental legislations for projects with impacts and as per various NEMA Regulations. The key environmental benchmark instruments used in the policy, legal and institutional framework for the proposed OPAL EIA Study are highlighted below. These laws and Regulations are also listed in OPAL's Legal Register which they have in place

as part of their ESMS. This legal register will be checked and updated if needed, to include any new laws/regulations and permit requirements that would be needed as part of this expansion.

4.2 National, county and international requirements

The EIA Full Study for the proposed redevelopment and refurbishment project at Mlolongo Location, Mavoko Sub County, Machakos County was undertaken in accordance with the environmental regulatory frameworks highlighted below.

4.3 National environmental policies

a. The Constitution of Kenya
b. Sessional Paper No. 6 of 1999 on Environment and Development
c. National Environment Policy (2013)
d. National Land Policy (2009)
e. National Water Policy (2012 Draft)
f. Draft National Policy on Wetlands Conservation and Management (2013)
g. Draft Wildlife Policy (2011)
h. National Policy for Disaster Management, 2009
i. National Gender and Development Policy, 2000
j. National HIV Policy (GoK, 1997)
k. National Environmental Sanitation and Hygiene Policy (2007)

4.4 National Legal frameworks

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

a. Environmental Management and Coordination Act (EMCA) No. 8 of 1999 and Amendment, 2015
b. Relevant EMCA Regulations

i. Environmental Management and Coordination (Impact assessment and audit) Regulations, 2003
ii. Environment Management and Co-ordination (Noise and excessive vibration Pollution Control) Regulations, 2009
iii. Environmental Management and Coordination (Wetlands, riverbanks, lakeshores, and seashores management) Regulations 2009
iv. Environmental Management and Coordination (Water quality) Regulations, 2006 (Legal Notice 121)
v. Environmental Management and Coordination (Controlled substances) Regulations, 2007
vi. Environmental Management and Coordination (Conservation of biological diversity and resources, and access to genetic resources and benefits sharing) Regulations, 2006
vii. Environmental Management and Coordination (Air quality) Regulations, 2009
viii. Environmental Management and Coordination (Waste management) Regulations, 2006

c. Food, Drugs and Chemical Substances Act Cap(254)
d. Physical Planning Act, CAP 286, of 1998
e. Water Act, CAP 372 of 2002
f. Wildlife (Conservation and Management) Act CAP 376 of 1976, 1989 & Bill, 2013
g. Energy Act of 2006
h. Public Health Act, CAP 242
i. Registered Land act (CAP. 300) k) Employment Act
j. Occupational Safety and Health Act, 2007
k. Safety and Health Committee Rules
l. Work Injury Benefits Act
m. Use of Poisonous Substances Act Rev. 1983, Cap 247
n. The Standards Act Cap 496
o. Building Code, 1997
p. Penal Code Cap 63
q. County By-Laws
r. The Employment Act, 2007

4.5National Plans and Strategies

a. Vision 2030 – Second and Third Medium Term Plans
b. Machakos County Integrated Development Plan

c. National Environment Action Plan
d. National Biodiversity Strategy and Action Plan (2000)
e. National Climate Change Response Strategy (2009)

4.6 Regional and international multinational environmental agreements

a. East African Community (EAC) Protocol on Environment and Natural Resources (EAC, 1999)
b. EAC Climate Change Policy (EACCCP) (EAC, 2011)
c. Convention on Biological Diversity (CBD Secretariat, 1992)
d. United Nations Framework on Combating Climate Change (UN, 1992)
e. Ramsar Convention (UN, 1971)
f. African Development Bank Policy on Stakeholder Consultations and Participation
g. IFC Performance Standards on Environmental and Social Sustainability (IFC, 2012)

The roles of the above instruments in the proposed project are highlighted below as follows:-

I. Table 6: National policies
II. Table 7: Legal frameworks, relevant regulations
III. Table 8: Permits and licenses
IV. Table 9: Applicability of the International Finance Cooperation Performance Standards to the Project

Table 6: National Policies

Policy	Relevant environmental obligations	Linkages with the project
The Constitution of Kenya (GoK 2010)	**Article 42** – Supporting public involvement in ensuring the rights to a clean and healthy environment **Article 43** – Supporting public involvement in ensuring the need for every person to have access to clean and safe water in adequate quantities **Article 69** - Environment and natural resources (1) (d) Encouraging public participation in the management, protection and conservation of the environment (f) Supporting environmental impact assessment, environmental audit and monitoring of the environment (g) Eliminating processes and activities that are likely to endanger the environment **Article 66** – Regulating use of any land or any interest or right over any land, in the interest of public health or public planning **Article 185: 22** - Protection of the environment and natural resources with a view to establishing a durable and sustainable system of development	• Stakeholders engagement was undertaken during the pre-project implementation stage of the OPAL project in Mlolongo • OPAL project will contribute to social and economic development at national level and also in Machakos and other neighboring Counties • OPAL will ensure the sustainable use of natural resources during construction and operational stages
Sessional Paper No. 6 of 1999 on Environment and Development (GoK, 1999)	**Human settlements** • Regulating urban development to only those areas which are suitable, avoiding ecologically fragile areas **Other policy goals** • Encouraging sustainable use of resources and ecosystems • Undertaking EIA for all private and public projects • Increase public awareness on environment	• Stakeholder engagement was undertaken during the pre-project implementation stage of the OPAL project • Environmental awareness was undertaken during the stakeholder engagement process

Policy	Relevant environmental obligations	Linkages with the project
Draft Environment Policy (2012) (GoK, 2012)	• Adopting measures, incentives and disincentives to promote the re-use, recycling and reclamation of re-usable packaging material and combat pollution of the environment • Promoting application of sound environmental management tools, in particular; strategic environmental assessment, EIA, environmental audits, environmental management systems, risk assessment/management and environmental reporting • Working with private sector, NGOs and CBOs to enhance corporate social responsibility and accountability	• Effort will be made to minimize the solid waste generation by OPAL • Stakeholder engagement was undertaken during the pre-project implementation stage of the project and capacity building continues
National Land Policy (2009) (GoK, 2009)	2(a) Supporting community land management and dispute resolution; 5. Supporting the implementation of environmental assessments and audits **Other policy goals:** Ensuring sustainable utilization and management of land and its resources d) Enhancing storm water management and rainwater harvesting f) Enhancing pollution control	• Stakeholder engagement during the OPAL project EIA study ensured that any public concerns associated with the project are captured • The implementation of the OPAL project will ensure adequate rainwater harvesting to minimise water abstraction for the project. • The implementation of the project will ensure that water pollution will not occur at any time during construction and operational phases
Draft National Policy on Wetlands Conservation and Management (2013) (GoK,2013)	2.0: Wetland conservation and management Policy Statement 2: Ensuring that any alteration of a wetland for public interest will be subject to Environmental Impact Assessment (EIA), cost benefit analysis, and wide stakeholder consultations	The project proponent will ensure that the implementation does not affect the state of wetlands during construction and operational phases

Policy	Relevant environmental obligations	Linkages with the project
Draft Wildlife Policy (2011) (GoK, 2011)	**8.5.3: Wildlife Security** 1. Strengthening wildlife security in wildlife conservation areas **Other policy goals** i. Decentralization of wildlife planning to constituency level ii. Educating the public and raising awareness on the critical role of wetlands, rivers and lake ecosystems iii. Ensuring good governance in the management of wildlife conservation areas and sanctuaries iv. Incorporating or domesticating the provisions of the relevant wildlife related Multi-lateral Environment Agreements (MEAs) to which Kenya is Party to v. Putting in place mechanisms to identify, control and eradicate invasive alien species in wildlife conservation areas in collaboration with relevant lead agencies. vi. Supporting the conservation and management of wetlands	• Measures will be undertaken to ensure construction and operations of the OPAL project in such a manner that it will not increase the risk of wildlife poaching and spread of invasive species in the neighboring Nairobi National Park • Stakeholder engagement in the OPAL project EIA study was undertaken in order to promote the level of environmental awareness
National Policy for Disaster Management, 2009 (GoK, 2009)	2.1: Promoting the mainstreaming of disaster management and climate change into development planning and management for sustainability 3.1: Providing for well-structured participation of society in disaster management by integrating traditional coping strategies into the DM systems **Other policy goals:** Supporting climate change disaster risk reduction initiatives	OPAL has an Emergency Preparedness and Response Plan in place; this will be implemented for the proposed project and as such, will comply with the national policy.

Policy	Relevant environmental obligations	Linkages with the OPAL project
National Policy for the Sustainable Development of Arid and Semi-Arid Lands of Kenya, 2012 (GoK, 2012)	**3.4.2 Natural resource management** Promoting low-maintenance water technologies, with an emphasis on water harvesting	• OPAL project implementation will ensure adequate us of water conservation equipment (taps and flushing systems)
National Gender and Development Policy, 2000 (GoK, 2000)	• Considering the needs and aspirations of all Kenyan men, women, boys and girls across economic, social and cultural lines • Ensuring the empowerment of women	• The project will create employment and business opportunities for all people including women within the project area. • OPAL is an equal opportunity employer
National HIV Policy (GoK, 1997)	Ensuring that new development projects especially in the rural areas encourage preventive and responsible behaviour both for the workers involved in such projects and also the local people within which projects are taking place as a goal towards curtailing the spread of the disease	• OPAL shall make efforts to ensure that the project during both the construction and operation stages will not escalate the risk of HIV transmission due to the involvement of workers from other areas
National Environmental Sanitation and Hygiene Policy (2007) (GoK, 2007)	**4.3: Sanitation and the environment** • Protection of the environment from pollution and its negative effect on human health • Ensuring use of technologies that uphold the right of present and future generations to a healthy and pollution-free environment. • Ensuring the use of sanitation systems that are environmentally sound • Preventing environmental pollution from liquid and solid waste	• The proponent will ensure the project especially during the operational phase will maintain high standards of sanitation and environmental hygiene

Table 7: Legal and Regulatory Framework

Legal Framework	Relevant environmental obligations	Linkages with the project
Environmental Management and Coordination Act (EMCA) No. 8 of 1999 (GoK, 1999), Amendment 2015 (CAP 387)	**Section 42** – Supporting the protection of rivers and wetlands **Section 50** – Supporting the conservation of biological diversity **Section 51** – Supporting the conservation of biological resources in situ **Specific compliance obligations** • Prohibiting and controlling the introduction of alien species into natural habitats • Controlling and prevention of environmental pollution • Carrying out EIA for all proposed projects with a potential for adverse impacts • Carrying out environmental audit and monitoring of all activities that are likely to have significant effect on the environment • Ensuring compliance with all other relevant EMCA (1999) Regulations including the following: ▸ Environmental Impact Assessment and Audit Regulations, 2003 ▸ The Environmental management and coordination (Noise And Excessive vibration Pollution Control) Regulation, 2008 ▸ Water Quality Regulations, 2006 (Legal Notice No. 121) ▸ Waste Management Regulations, 2006 (Legal Notice No.121) ▸ Air Quality, Regulations, 2008 ▸ Controlled Substances Regulations, 2007 (Legal Notice No.73 of 2007) ▸ Fossil Fuel Emission Control Regulations (2006) ▸ Conservation of Biodiversity Regulations 2006	• The project will result in short-term effects to the environment during the construction phase. Adequate mitigation measures for this have been proposed • The project should not increase the risk of invasive species to the environment in the project site • The implementation of the project will ensure water pollution will not occur at site during construction and operational phases • The proponent will use proper technology and strategies to ensure minimum noise and vibration as well as low carbon emission levels both during construction and operational stages • The proponent will avoid the use of chemical materials or substances that deplete or have the potential to deplete the ozone layer. • The proponent will undertake the obligatory environmental monitoring audits throughout the life cycle of the project • The proponent will observe and comply with all the relevant EMCA regulations as listed in Column 2 • The Project proponent will meet all the costs and pay for the entire EIA Full Study process

	▸ Wetlands, River Banks, Lake Shores and Sea Shore Management Regulation, 2009	
The Factories and other places of Work Act	• The Act is applicable to any factory using power and employing 10 or more workers and if not using power, employing 20 or more workers on any day of the preceding twelve months, and in any part of which a manufacturing process is being carried on with the aid of power, or is ordinarily so carried on • The factories should have proper drainage system, adequate lighting, ventilation, temperature etc. Adequate arrangements for drinking water should be made. Sufficient latrine and urinals should be provided at convenient places. These should be easily accessible to workers and must be kept clean	The proponent will observe and comply with all the relevant regulations of the Act
Food, Drugs and Chemical Substances Act (Cap 254)	• This Act provides rules for the placing on the market of food, drugs for man and animals, and chemical substances, establishes the Public Health (Standards) Board and makes otherwise provision for the control of the quality and safety of food, drugs and chemical substances to be placed on the Kenyan market. • Prohibits the labelling, packaging, sale, treatment and processing of food/drug/chemical that is presented to the public in a false or deceptive manner or that does not meet a prescribed standard and handling of food/drug/chemical in unsanitary conditions.	The proponent will observe and comply with all the relevant regulations of the Act.
The Lands Act (2012) (GoK) 2012	Under this Act, any Land such as that for which OPAL has a lease is under the custody of the County Government. The Act also mandates the National Land Commission to adjudicate all land matters.	The provisions of the Act shall apply in all the land parcels acquired by the proponent in the project site.

Legal Framework	Relevant environmental obligations	Linkages with the project
Physical Planning Act, Cap 286, of 1998 (GoK, 1998)	**Section 29:** Ensures that developers properly execute and implement approved physical development plans. Other legal obligations:- • Ensuring that subsidiary area plans are recognized and integrated in the Regional Physical Development Plans • The local authority concerned shall require the developer to restore the land on which such development has taken place to its original condition within a period of not more than ninety days **Section 36:** The Local Authority Act may if deemed necessary require a submission of Environment Impact Assessment report together with development application if they feel the project has some injurious effects on the environment	• The proposed project should not contradict the overall goals of physical planning in the implementation areas • The proponent will ensure quick restoration of all the disturbed environments after the construction phase
Water Act, Cap 372 of 2002 (GoK, 2002)	**Article 20. (1)** Ensures that state schemes shall take precedence over all other schemes for the use of water or the drainage of land **Part IV:** Addresses the issues of water supply and sewerage **Other legal obligations** • Promotes the conservation and proper use of water resources • Protects any water resource, its source or catchment	• The project will apply for water abstraction permits from WRA and comply with all water management plans • The proponent will observe and comply with all the relevant regulations of the Act
Energy Act of 2006	The Act provides for the establishment of the Energy Regulatory Commission (ERC) and the Rural Electrification Authority (REA). The ERC is responsible for the regulation of importation, exportation, generation, transmission, distribution, supply and use of electrical energy; and importation, exportation, transportation, refining, storage and sale of petroleum products. The commission also protects the interests of consumer, investor and other stakeholders.	The proponent will observe and comply with all the relevant regulations of the Act

Legal Framework	Relevant environmental obligations	Linkages with the project
Public Health Act, Cap 242 (GoK, 1986)	**Article 129:** Support the protection of public water supplies **Article 117:** Support the prevention or remedy danger to health from unsuitable activities including dust and noise The Act also prohibits bathing, washing clothes, watering animals, erecting dwellings, sanitary conveniences, stables and cattle kraals, dipping tanks, factories and other works that may pollute water supply. The haphazard disposal of manure, and filth or noxious offensive matter is also covered by the Act	• The proponent will observe and comply with all the relevant regulations as listed in Column 2 • The proposed project should not interfere with public water supply systems both during construction and operational phases
Occupational Safety and Health Act, 2007	This Act applies to all workplaces where any person is at work, whether temporarily or permanently. The provisions of the Act are to ensure that workplaces maintain a safe working environment. Among the requirements are the adequate and sufficient ventilation, lighting and good housekeeping. **Other requirements include:-** • Provision of wholesome drinking water. • Provision of suitable personal protective equipment and clothing. • The requirement that workstations suit and fit the worker. • Provision of adequate fire-fighting equipment and precautions against fire. Workplaces should ensure machinery safety, chemical safety and electrical safety.	OPAL already has a QHSE system aligned to ISO 45001 which means the project site has an operational H&S Management System; this will be extended to include the proposed expansion development.
Use of Poisonous Substances Act Rev. 1983, Cap 247	Sections 3,4,6,8 imposes restrictions and conditions on the use of poisonous substances and requires that persons concerned with storage, transportation and disposal or use of poisonous substances be registered or licensed	The proponent shall adhere to the provisions especially during the operation stage

Legal Framework	Relevant environmental obligations	Linkages with the project
Safety and health committee rules (LN 31)	**Safety and health** The Rules require the creation and management of OHS Committees. The Rules require that the project proponent must have in place an OHS Committee if there are a minimum of 20 persons employed in a work place. The Rules also require that the proponent complies with the following measures:- a) Post an abstract of the Act in key sections of the exchange. b) Provide adequately stocked First Aid Kits in various sections of the service station c) Ensure that there is an appropriate number of certified first aid staff trained by recognized institution such as the St. John's Ambulance or Kenya Red Cross Society. d) Provide a general register for recording all incidents and accidents. e) Formation of an S&H Committee of five members from management and five from the workers. All members of the S&H Committee to undergo a DOHSS approved 40 hour induction course. f) Nominate and formalize an S&H management representative. g) The S& H Committee must meet at least quarterly, take minutes, circulate key action items on bulletin boards and send a copy of minutes to the DOHSS head office in Nairobi. h) Appropriate record -keeping including maintenance of all current certificates related to inspection of critical equipment such as air compressors, lifts and pulleys. Such inspections need to be undertaken by a competent person certified by the Director of the DOHSS.	The provisions of the Rules shall apply

Legal Framework	Relevant environmental obligations	Linkages with the project
Employment Act, 2007	The Employment Act declare and define the fundamental rights of employees, to provide basic conditions of employment of employees, to regulate employment of children and to provide for matters connected with the foregoing. The Act declares that: - Priority will be given to the local community in terms of employment opportunities.	• Priority for employment shall be given to the local community. • Equal opportunity shall be provided to all genders
Work Injury Benefits Act (WIBA)	The Work Injury Compensation Benefit Act provides guidelines for compensating employees on work related injuries and diseases contacted in the course of employment and for connected purposes. The Act includes compulsory insurance for employees. The Act defines an employee as any worker on contract of service with employer. The Act requires the contractor to provide medical cover for all his employees during construction phase.	The Provisions of the Act shall apply
The Standards Act Cap 496	The Act is meant to promote the standardization of the specification of commodities, and to provide for the standardization of commodities and codes of practice; to establish a Kenya Bureau of Standards, to define its functions and provide for its management and control.	OPAL shall ensure that all its commodities and codes of practice utilized in the project adhere to the provisions of this Act
Building Code 1997	The Act mandates County Governments the powers to approve building plans.	OPAL shall duly comply
Machakos County Government By Laws	Every County has its own Environmental By-Laws	The Proponent shall observe all the relevant County By-Laws
Climate Change Act (No. 11 of 2016)	The law requires that the Act shall be 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. **According to subsection (1):** this Act should be applied in all sectors of the	The proponent is expected to abide by the guiding values and principles of low carbon climate change resilient in the proposed project redevelopment when enacting, applying or interpreting any provisions of this Act; and making or implementing public policy decisions on climate

	economy by the national, county governments and private developers to:- • Mainstream climate change responses into development planning, decision making and implementation • Promote low carbon technologies, improve efficiency and reduce emissions intensity by facilitating approaches and uptake of technologies that support low carbon, and climate resilient development • Facilitate capacity development for public participation in climate change responses through awareness creation, consultation, representation and access to information; • Provide mechanisms for, and facilitate climate change research and development, training and capacity building • Integrate climate change into the exercise of power and functions of all levels of management, and to enhance cooperative climate change governance between the national government, county governments and the private sector	change
Penal Code Cap 63	**Section 191** - States that if any person or institution that voluntarily corrupts or foils water from public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence **Section 192** – States that a person who makes or vitiates the atmosphere in any place to make it noxious to health of persons /institution, dwelling or business premises in the neighbourhood or those passing along public way, commits an offence.	OPAL shall observe all the environmental management and monitoring plans stipulated in the report as well as the recommendation provided for mitigation/ minimization/ avoidance of adverse impacts arising from project activities

Table 8: Permits and Licenses

No.	Legislation	Required Permit
1.	Environmental Management and Coordination Act (EMCA, 1999), Revision 2015 (CAP 387)	• EIA License • Emission licenses • Effluent discharge • Operation of waste disposal • License to generate hazardous waste
2.	Food, Drugs and Chemical Substances Act (Cap 254)	• Food, Drugs and Chemical Substances License
3.	Water Act, 2002 Water Resource User Association (WRUAs) is established to manage and conserve water at the lowest level WRMA licenses water abstraction from river and ground water	• Water Permit
4.	Standard Act, Cap 496	• Standardization permits from KeBS
5.	Public Health Act, Cap 242	• Licenses eating places such as restaurants and canteens
6.	Occupational Safety and Health Act of 2007	• Registration of Workplace • Respective H&S Audits
7.	Physical Planning Act, Cap 286	• Development approval
8.	Machakos County Government By Laws	• Business permits

Table 9: Applicability of the International Finance Cooperation Performance Standards to the OPAL Project

IFC PS	Scope/Objective	Linkages with the project
Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts	Performance Standard 1 establishes the importance of:- ▪ Integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; ▪ Effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and ▪ The client's management of environmental and social performance throughout the life of the project.	OPAL has a QHSE management system described in a QHSE Manual that is aligned with ISO 14001 and ISO 45001; therefore the project is being undertaken in line with IFC PS 1. • Furthermore, this Full EIA Study will identify the relevant risks: To identify, predict and analyse the environmental and social impacts of the project. Impact identification will be based on definitions of nature of impact, type of impact, duration, geographic extent, frequency, likelihood and resource/receptor vulnerability/sensitivity • To provide an analysis of project alternatives in terms of site, design and implementation technologies and provide reasons for preferred options • Community engagement and seeking public views via the use of questionnaires and interviews with the project proponent, staff and other parties of interest, including community residents in the vicinity of the project site; • To provide a detailed Environmental Management Plan (EMP) proposing measures for mitigating negative environmental

		impacts, including the cost, timeframe, responsibility and monitoring indicators to implement the measures. The EMP will be in line with OPALs QHSE Management System that is aligned with ISO14001 and ISO45001.
Performance Standard 2: Labor and Working Conditions	Performance Standard 2 objectives are:- ▪ To promote the fair treatment, nondiscrimination, and equal opportunity of workers. ▪ To establish, maintain, and improve the worker-management relationship. ▪ To promote compliance with national employment and labor laws. ▪ To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain. ▪ To promote safe and healthy working conditions, and the health of workers. ▪ To avoid the use of forced labor.	This study complies with the Employment Act, 2007 and Occupational Safety and Health Act, 2007 of Kenya Project shall give priority for employment to the local community. Equal employment opportunities and rights shall be provided to all genders OPAL has a HR Manager so a functioning HR Management System addressing labour and working conditions will apply during project operation phase
Performance Standard 3: Resource Efficiency and Pollution Prevention	Performance Standard 3 objectives are:- ▪ To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities. ▪ To promote more sustainable use of resources, including energy and water. ▪ To reduce project-related GHG emissions.	Project shall complies with the Climate Change Act (No. 11 of 2016) of Kenya The proposed project has been designed to meet the criteria for sustainable use of resources, including energy and water. This study provides mitigation measures to avoid or minimize potential adverse impacts on human health and the environment

Performance Standard 4: Community Health, Safety, and Security	Performance Standard 4 objectives are:- ▪ To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances. ▪ To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.	The Project will use the existing QHSE management system which addresses potential impacts on the health and safety of the construction workers, staff and affected community throughout the project life cycle
Performance Standard 5: Land Acquisition and Involuntary Resettlement	Performance Standard 5 objectives are:- ▪ To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs. ▪ To avoid forced eviction. ▪ To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use. ▪ To improve, or restore, the livelihoods and standards of living of displaced persons. ▪ To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure5 at resettlement sites.	The site is held under Land Reference No. 14,817 on 99-year land lease term initiated on 01 July 1988. No new land acquisition and involuntary resettlement shall take place so as to implement the project. PS5 is not applicable to the proposed project. The works involved in the proposed project involve refurbishment of the already existing structures at the current location at OPAL, hence no displacement or eviction of persons The site measures 80,570m² and only 29,243m² have been built up. This means that the site is under-utilized and has enough space to accommodate the proposed redevelopment. As such, PS5 is not fully relevant to this Project.
Performance Standard 6:	Performance Standard 6 objectives	Project shall ensure the

Biodiversity Conservation and Sustainable Management of Living Natural Resources	are:- ▪ To protect and conserve biodiversity. ▪ To maintain the benefits from ecosystem services. ▪ To promote the sustainable management of living natural resources through the adoption of practices that integrates conservation needs and development priorities.	sustainable use of natural resources during construction and operational stages. The project site contains already a modified habitat under PS6 criteria and therefore PS6 is only marginally applicable. The project shall be guided by the Environmental Management and Coordination (Conservation of biological diversity and resources, and access to genetic resources and benefits sharing) Regulations, 2006

NB: *PS7 and PS8 are not applicable to the proposed project*

5 CONSULTATION AND PUBLIC PARTICIPATION

This chapter describes the process of public consultation that was followed to identify the key issues and impacts of the proposed redevelopment and refurbishment in Mlolongo, Mavoko Sub-county, Machakos County, for SWLL.

Stakeholder Engagement was completed in line with the Stakeholder Engagement Plan (SEP) which is already submitted to NEMA, and approved, as part of the TOR Scoping report for the proposed project.

The CPP stakeholder engagement process was carried out in line with EMCA 1999 and the International Finance Cooperation (IFC) Performance Standard 1. Stakeholder engagement based on IFC PS1 is guided by the following elements: stakeholder analysis and planning, disclosure and dissemination of information, consultation and participation, grievance mechanism, and ongoing reporting to Affected Communities.

A number of site visits have been made in a bid to interview residents and neighbours. The purpose for such interviews was to identify the positive and negative impacts and subsequently promote and mitigate them respectively. It also helped in identifying any other issues which may create conflict in case project implementation proceeds as planned. Neighbours and residents participated freely by giving some of their views and concerns as discussed below. *The feedback forms are appended to this report*. This is in addition to the public baraza that was held on 26th May 2022, undertaken in line with NEMA's requirements, and as part of the Scoping phase of this Project.

5.1 Methodology used in the Consultation and Public Participation (CPP)

In general, the following steps are followed in carrying out the entire CPP process:-

1. Stakeholder Mapping - Identification of institutions and individuals interested in the process- database of the interested and affected parties. A stakeholder engagement plan (SEP) was developed for this Project, submitted to NEMA, and approved. The stakeholder engagement process followed for the project depended substantially on community representatives and business entities within the vicinity of the project site (*see table 10 below*).
2. Administration of questionnaires to the different target groups and local community members in the vicinity of the proposed project site. Oral interviews and administering of questionnaires was undertaken. Door to door public

consultations were conducted for the stakeholders neighbouring the project site. This was conducted to solicit the opinion of the neighbouring community and also ensure comprehensiveness in the EIA study report as stipulated in the Environment Management and Coordination Act, 1999. It is also a way of informing the community of proposed future developments in their neighbourhood.

3. Hold a meeting/baraza with the public. The various concerns and proposed mitigation measures suggested by the public, neighbours and other stakeholders have been integrated in the report. (Annexed are the minutes of the meeting, and the attendance list).

Table 10: Stakeholder mapping table that shows identified and consulted stakeholders

Stakeholder Category	Stakeholder	Connection to the Project
Community	Amos Mutua	Resident in the vicinity of the project site to the west
Community	Michael Kimbiiti	Resident in the vicinity of the project site to the north
Business	Megvel Cartons Limited	Immediate neighbour to the project site to the east
Business	Gypsum and Cornice Ltd	Business in the vicinity of the project site to the west
Community	Alma Mumbe	Resident in the vicinity of the project site to the west
Community	Ken Mutuma	Resident in the vicinity of the project site to the west
Community	John Munya	Resident in the vicinity of the project site to the north
Community	Ruth Muthoni	Resident in the vicinity of the project site to the west
Community	Gabriel Kyalo	Resident in the vicinity of the project site to the west
Church	St. Joseph's Catholic Church	Nearest church to the project site to the west
Business	Hotel Connections Limited	Business in the vicinity of the project site to the west

Community	Lilian Njogu	Resident in the vicinity of the project site to the west
Business	Jafamu Micro-finance	Business in the vicinity of the project site to the west

5.2 Objectives of the consultation and public participation

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

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

The purpose for such a process is to identify the positive and negative impacts of the project and subsequently suggest mitigation measures.

5.3 Public Meeting/Baraza

Public participation during the EIA Study process took the form of an open public meeting with local community members, business neighbours around the project site, the project proponent, and the environmental consultant. An open public meeting was carried out on 26thMay 2022 from 10.00 am to 11.30 am. This was done to seek the neighbours views and opinions regarding the proposed development.

Public notices to inform the public were placed along major roads and centres within Mlolongo seven (7) days prior to the date of the public baraza. Major business owners and church representatives within the project area were also sent individual invitation letters to the public baraza. There was good representation among those who attended the meeting, with residential neighbours, business neighbours, and the project proponent representatives. The project was presented to meeting attendees after which the floor was opened for questions, observations and comments. A wide range of views were expressed which reflected different interests and positions in the community. (*The minutes of the meeting are appended to this report*).

Figure 7: Public notices along the roads and public centres within Mlolongo

Figure 8: Attendees of the public baraza filling their registration details as they arrive

Figure 9: Public baraza meeting

5.4 Issues raised by the affected community

While carrying out the public participation exercise, neighbours expressed a variety of comments, concerns and suggestions with the proposed project.

Positive Issues

a. Creation of Employment Opportunities

The local community was optimistic that the construction of the proposed project will open up new fields of employment. Community members expressed hope that they will be able to access employment once the project commences mostly as casual workers. However, they wanted assurance that the locals (and in particular those who had taken the trouble to attend the baraza) will be given the first priority for employment once the construction of the project begins. This will be a source of income for several individuals and households and hence is expected to boost the GDP and improve the living standards of the local people.

b. Potential growth of the economy

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

to the government hence increasing government revenue while the cost of these raw materials will be payable directly to the producers.

c. Provision of market for supply of building materials

During the construction phase of the proposed project, it was found out that the neighbouring businesses and locals interviewed who dealt with supply of building materials will benefit from supplying the materials and this will improve their business opportunities. Among the identified materials which can be supplied included cement, steel, pipes, sand, ballast iron sheets, nails glasses among others.

d. Increase in government revenue

The public and the various stakeholders interviewed expressed their optimism that there will be an increase in revenue collection due to the fact that there will be an increase in business opportunities within the project area and beyond.

e. Optimal use of land

The public interviewed were optimistic that the construction of the proposed project will lead to optimum use of the land within SWLL as a huge chunk of the land is still under-developed.

Negative Issues

The attendees raised several concerns that they would wish to be addressed by the proposed project developers. Some of these included:

a. Noise pollution

The residents and neighbours expressed their fears over noise pollution that would emanate from the construction works and the vehicles during the operation phase.

The lead expert indicated that appropriate measures to minimize noise impacts will be put in place. Construction activities that produce too much noise will be limited to daytime. Appropriate protective equipment will be issued to construction workers to protect them from construction noise. Proper planning will also minimize the frequency of materials transportation. The contractor and/or the proponent should ensure that works are carried out during daytime i.e. from 8 a.m. to 5 p.m.

b. Solid waste management challenges

Residents in the neighbourhood expressed their concerns about the large amounts of solid waste that will be generated during construction of the project. These include metal cuttings, rejected materials, surplus materials, surplus spoil, excavated materials, paper bags, empty cartons, empty paints and solvent containers, broken glass among others.

The lead expert reaffirmed that EHS officers will be stationed on site to ensure the EMP and all the recommendations are adhered to during construction and operation phases.

c. Dust emissions

Neighbouring businesses and residents expressed concern over possibility of generation of large amounts of dust and fumes within the project site and surrounding areas as a result of excavation works and transportation of construction materials.

The lead expert indicated that measures will be put in place to ensure that dust levels at the site are minimized through sprinkling water in areas being excavated and along routes used by the transport trucks and diversions within the site and use of dust nets. These measures will be supervised by the on-site EHS officers.

d. Traffic snarl-ups

Traffic snarl-ups may emerge as a result of the project construction activities especially access roads due to diversion of traffic and delivery of construction materials especially during traffic peak hours.

e. Wastewater management

The residents were concerned the existing MAVWASCO sewer connection might not be able to accommodate more discharge.

Suggestions to the Proponent

Those interviewed and consulted made the following suggestions to the proponent:-

- The desire to be involved in the development by way of jobs and supply of materials.
- Proponent to ensure that workers are provided with necessary PPE and their public health and general well-being is protected.

- Traffic control - the need to control traffic during delivery of construction materials to the site.
- Corporate social responsibility to neighbouring residents – the Proponent should come up with initiatives to give back to the neighbouring communities.
- Give priority to local youths and women in employment opportunities.
- Re-planting of any trees and/or vegetation that have been cut down.

(*See attached questionnaires in Appendixes for detailed responses*)

The community members expressed no objections towards the proposed project since there are similar projects in Mavoko Sub-County that have benefitted the residents. Moreover this is not a new project, but a redevelopment which will serve to enhance existing operations and create better and more favourable working conditions. Aesthetically the redeveloped project will create better ambience and a more conducive working environment.

Consequently, the proponent is putting sustainable development into practice as much as possible to ensure minimal air pollution and conservative use of energy and water. Some of the measures that will be undertaken include:-

- Project will optimize use of natural light as much as possible. This will promote energy efficiency.
- Rainwater harvesting for flushing of toilets, watering of gardens, wash bay area among others.
- Landscaping will be done after the construction phase on the project site. This includes but is not limited to planting suitable trees, shrubs and maintenance of lawns.

Generally, all stakeholders consulted had no objections to the proposed project. They however requested the Proponent to implement the appropriate mitigation measures outlined in the EIA Full Study report to minimize negative impacts of the proposed project. To fully address stakeholder concerns, SWLL will include all the required mitigation measures into an updated and applicable ESMP, which will be updated to include all the new Project activities, and incorporated into OPAL's already functioning ESMS.

6 IMPACT IDENTIFICATION, ANALYSIS AND MITIGATION MEASURES OF THE PROPOSED PROJECT

The environmental baseline information and the project characteristics discussed earlier form the basis for impact identification and evaluation. The impacts that are expected to arise from the project could either be termed as positive, negative, direct, indirect, short-term, long-term, temporary, and permanent depending on their area of cover. This assessment is done for all project phases namely construction, operational and decommissioning phases.

Impact identification was based on definitions of nature of impact, type of impact, duration, geographic extent, frequency, likelihood and resource/receptor vulnerability/sensitivity. In addition, a checklist was employed to identify the possible impacts from the project development. A questionnaire with structured questions was used to get public opinions and concerns regarding the proposed project. Lastly through literature review, professional knowledge, engagements with the proponent and engagements with stakeholders, mitigation measures were developed commensurate to the significance of impacts. This facilitated the development of the report.

Impact Assessment Methodology

An impact assessment methodology was conducted following the risk matrix provided below to determine potential significant impacts within OPAL.

Impact/Risk is a product of likelihood of the emergency occurring and the severity associated with such an occurrence.

Thus;

RISK OF IMPACT=LIKELIHOOD X SEVERITY/IMPACT

		LIKELIHOOD		
		Remote (1)	Occasional (2)	Frequent (3)
SEVERITY/ IMPACT	Minor (1)	Low risk (1) 1x1	Low risk (2) 2x1	Medium risk (3) 3x1
	Moderate (2)	Low risk (2) 1x2	Medium risk (4) 2x2	High risk (6) 3x2
	Major (3)	Medium risk (3) 1x3	High risk (6) 2x3	High risk (9) 3x3

Impacts with risk rating of 6-9 are High Risk (Preventive/corrective measures are put in place)

Impacts with risk of 3-4 are medium Risk whereas those with a risk of 1-2 are Low.

Guidelines in determination of the level of likelihood/severity

LIKELIHOOD RATING

Remote 1	The probability of the impact occurring is very low (The chances of the impact occurring are about once in 5 years).
Occasional (2)	The probability of the impact occurring is moderate (The chances of the impact occurring is about once in 3 years).
Frequent (3)	The probability of the impact occurring is high (The chances of the impact occurring is once in 1 year).

SEVERITY/IMPACT RATING

Minor (1)	Impact will not have adverse damage/loss
Moderate (2)	Impact may cause a moderate adverse damage/loss
Major (3)	Impact can cause a major severe damage/loss including fatalities.

Potential negative impacts	**Likelihood**	**Severity**	**Risk LXS**	**Significant Yes/No**
Loss of flora and fauna	1	3	3	No
Air pollution (Dust and Exhausts emissions)	2	2	4	Yes
Increased demand for natural resources	2	2	4	Yes
Occupational hazards	2	3	6	Yes
Soil contamination and compaction	1	3	3	No
Surface and ground water contamination	1	3	3	No
Traffic congestion	1	3	3	No
Solid waste generation	2	2	4	Yes

Wastewater generation	2	2	4	Yes
Noise pollution and vibrations	2	2	4	Yes
Insecurity and population influx from construction workers	2	2	3	Yes

NB: OPAL already has in place Health, Safety and Environment (HSE) systems and procedures that outline the necessary mitigations measures to be implemented following a negative impact or emergency. The standard operating procedures and policy documents include:-

- Emergency Preparedness and Response
- Hazard Identification, Risk Assessment and Determination of Controls Procedure
- Quality, Environmental, Health and Safety (QEHS) Management System Manual
- Occupational Health and Safety Policy
- Spillage Control
- Waste Management Procedures

In addition, OPAL already has in place a Hazards and Impacts Register, as part of their already functioning ESMS. This register will be updated to include any new or modified impacts that result from this EIA process. The following possible impacts and mitigation measures were identified below:

6.1 Positive Impacts

6.1.1 Design Phase

6.1.1.1 Employment

The design phase of the project will create employment and business opportunities for various professionals/consultants who will be involved in the planning stages of the project. They will include: project managers, engineers, architects, building economists, land surveyors, environmentalists, economists, urban planners among others. These professionals may be employed directly in the project or be consultants whose services will be procured.

6.1.1.2 Generation of income and source of Government Revenue

Income generated from the consultancies and services undertaken will provide income which will be taxed and generate revenue for the state. In addition, fees levied for the submission of plans to the local authorities and state agencies for approval and application for services will generate revenue that is used to meet the various governmental goals and objectives. These include NEMA, NCC, KPLC and MAVWASCO amongst others.

In addition, in order to operationalize the proposed project, financial resources will have to be mobilized and these will be injected into the economy. This includes both professional services and the cost of materials for the project.

6.1.1.3 Environmental opportunities

The design phase of the project will also present opportunities for green/sustainable designing of the project, which supports minimizing environmental impacts while fortifying the project to achieve its intended objectives. In the design phase measures that will bring about sustainable development are discovered, explored and integrated into the project. The choice of environmentally friendly and sustainable materials will also be considered. *The project design parameters showing all project aspects have been appended to this report.*

6.1.1.4 Improved infrastructure

The redevelopment and refurbishment of OPAL will enable provision of better services and products for their business partners in Kenya and the rest of the East African region. In addition, the refurbishment will improve the aesthetics and working conditions of staff.

6.1.2 Construction Phase

6.1.2.1 Employment

The construction of the proposed project will generate short term employment, i.e. employees involved in earthworks, masons, suppliers of building materials will benefit. The project will also create indirect employment through on-site demand of goods and services e.g. food for the casual labourers involved in construction.

6.1.2.2 Market for goods and services

For construction works to run smoothly, an effective supply of goods and services such as cement, building blocks and transportation services should be present. This therefore offers a market for the goods and services thus promoting a variety of sectors.

6.1.2.3 Economic growth

Through the use of locally available materials during the construction phase of the project including cement, structural steel, concrete, ballast and sand, the project will be contributing towards the gross domestic product (GDP) of the country. The consumption of these materials, fuel oil and others will attract taxes including Value Added Tax (VAT) which will be payable to the government hence increasing government revenue while the cost of these raw materials will be payable directly to the producers.

6.1.3 Operation Phase

6.1.3.1Creation of Employment Opportunities

The proposed project will create employment in three tiers, with the first being the staff that will be primarily involved in its implementation, supervision and maintenance. The second tier will be staff for the businesses that will result in the vicinity of the site (e.g. food vendors selling food to construction workers at the construction phase) and those involved in these businesses supply and value chains. The third tier of employment creation will be for the people who will take the opportunities presented to service the increased population and the population's amenities.

Through these three tiers the project will create employment for high level staff, middle level staff and low level staff in line with all development policies in the country and county. Also through the third tier and low level staff, the project will inadvertently create jobs for locals since this has always been the case with projects of similar nature due to the fact that the locals are readily available and have the shortest access time to the site.

It is also important to note that all these employees will be taxed and generate revenue for the taxman thereby contributing to more state implemented development projects.

6.1.3.2Increased Economic Activities and Government Revenue

The project will increase economic activities that will be carried out in the area through those that will be primarily as a result of the project's internal and ancillary activities, its supply chain, its value chain, and those that will be formed as a result of the project to support its occupants. The latter includes businesses that may from around the project site such as shops, kiosks and transport.

All these business activities will be taxed and generate revenue for the central government in addition to providing a market for their supply and value chains.

6.1.3.3Aesthetic Enhancements

The proposed project will result in beautification of the Project Site. This will include establishment and maintenance of landscaping.

6.1.4 Decommissioning Phase

6.1.4.1 Environmental conservation

There will be recycling of waste materials (building bricks and rubble)generated during the decommissioning phase. These materials will be used as raw materials in other construction processes hence reducing the demand for raw materials. This in turn will reduce the potential impact on the environment that would have been felt if the demand for the raw materials had not reduced.

6.1.4.2 Income generation

The sale of debris and materials arising from decommissioning of the existing structure will generate additional income for the Proponent.

6.1.4.3 Rehabilitation of the project site

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

6.2 Negative Impacts

6.2.1 Construction Phase

6.2.1.1 Loss of Flora and Fauna

Trees and vegetation act as habitats for various animals, birds and insects. They also serve as a source of food for these organisms. Therefore, clearance of vegetation will result in the destruction of fauna due to loss of food and habitat. Construction earthworks for access roads (to project site) and foundation laying (for building facilities) will release dust particles into the ambient air. When a lot of dust settles on the leaves, it is bound to have negative effects on flora as it covers leaf stomata thus reducing their photosynthetic activity. In addition, dust coated leaves are less attractive and preferred by respective fauna consumers. Limited vegetation removal and clearing will complement the efforts on screen planting and landscaping through re-vegetation, which will lead to improved visual quality of the area.

6.2.1.2 Dust and exhaust emissions

Vehicles bringing in materials to the site are expected to emit particulate matter into the atmosphere. Construction works will also result in the emission of dust and particulate matter into the surrounding air. Dust and particulate matter may also increase the risk of contracting respiratory diseases both by workers onsite and the surrounding community. This will however depend on the weather conditions during the construction period. This is a negative impact expected to last during the construction period which can be mitigated.

6.2.1.3 Noise pollution

There will be an increase in noise levels around the construction site owing to the nature of machinery in use, workers and vehicles involved in material transportation to the site. Construction activities will add to background noise of the project location.

6.2.1.4 Soil compaction

Heavy machinery used will cause compaction of the soil thus increasing soil bulk density, reducing the infiltration rate of storm water and consequently affecting ground-water recharge.

6.2.1.5 Changes in soil characteristics

Several changes in the characteristics of the soil may result due to the excavation and compaction of soil for the foundation. The excavation may lead to losses in the accumulated soil carbon and this is a known source of GHGs i.e. CO^2. In addition this excavation can also alter the soil's structural stability and reduce its structural integrity.
Compacting the soil to lay the foundation, erecting temporary structures, and movement of heavy vehicles (trucks, tractors etc.) can reduce the soil's percolative ability thereby increasing run-off either on the specific routes or large area.

6.2.1.6 Soil and surface water contamination

Moving vehicles at the site may require oil and lubrication changes. Possibilities of such oils spilling and contaminating the soil and water within the project site are likely. The excavated area, if linear, can act as a conduit to extend groundwater contamination to new areas. Spills of hazardous materials in excavated areas during construction could introduce contaminants to ground water.

6.2.1.7 Destruction of roads

Movement of trucks laden with heavy building materials in and out of the site might damage access roads in this area. These could create depressions that may contribute to the formation of road ridges and pot-holes.

6.2.1.8 Traffic congestion

During the construction phase, the main roads leading to the proposed project site will serve additional vehicles used for transportation of materials to the site interfering with traffic along the roads leading to the project site.

Heavy trucks, when used, will impact on infrastructure through the destruction of the operational road network especially near the project site and turning points. The contractor or developer should ensure that access roads are properly rehabilitated after construction work.

6.2.1.9 Occupational hazards

Construction 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 entails certain risks. The construction workers are also likely to be exposed to the risk of accidents and injuries resulting from accidental falls, falling objects, injuries from hand tools and other equipment.

6.2.1.10 Increased demand for resources

Building materials such as hard core, ballast, cement, building blocks and sand required for construction of the project will be obtained from quarries, hardware shops and sand harvesters who extract such materials from natural resource banks such as rivers and the land. Since substantial quantities of these materials will be required for construction of the proposed project, the availability and sustainability of such resources at the extraction sites will be negatively affected as they are not renewable in the short term.

6.2.1.11 Solid waste generation

The excavation stage will result in large amounts of soil, murram and rock. If these materials are not disposed of according to the law, then the resulting stockpiles can be visually intrusive.

Other solid waste likely to be generated during the construction phase includes metal cuttings, rejected materials, surplus materials, surplus soil and cement bags. These materials will require disposal, in cases where they cannot be reused.

6.2.1.12 Population Influx

During the construction phase there will be an influx of people seeking jobs on site, comprising mainly unskilled and semi-skilled labour. There will also be food retailers and vendors of other commodities. Waste from such commodities has potential to pollute the area if a designated dumping place is not allocated.

This increase in population will create pressure on utilities as well as present social risks through the interaction of people. Also it may present a security risk since people with ill intentions may see an opportunity for theft.

6.2.1.13 Increased water demand

The presence of all workers on site will create an additional demand for water. More water will be used in the making of concrete for construction works, wetting surfaces and cleaning construction equipment and completed structures.

6.2.2 Operation Phase

6.2.2.1 Waste water generation

Wastewater will comprise of domestic water from washrooms, toilets and washing operations and stormwater.

6.2.2.2Increased energy consumption

During the operation phase more electricity will be used for lighting the proposed warehouse facility and offices.

6.2.2.3Increased Traffic

From the increased population, the demand for goods and services, and ancillary project operations, more vehicles will be plying the roads in the area around the project. This may lead to increased traffic jams in the area.

6.2.3 Decommissioning Phase

6.2.3.1 Solid waste generation

In the event that the project is demolished, large quantities of solid waste would result. The waste is expected to comprise materials used in construction including concrete, metal, building blocks etc. which will either be recycled or require disposal.

6.2.3.2 Noise pollution

Decommissioning related activities will lead to significant deterioration of the sound environment within the project site and the surrounding area. This will be as a result of noise and vibration that will be experienced during the demolition of the buildings.

6.2.3.3 Air pollution

Large quantities of dust will be generated during demolition works. Particulate matter

pollution is likely to occur during demolition and transportation of the waste debris from site. There is a possibility of suspended and settle-able particles affecting the site workers and surrounding neighbours' 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. The impact will be short term and will last during the duration of the demolition process.

6.3 Mitigation of negative impacts

The following mitigation measures should be employed to ameliorate any potential anticipated negative impacts from the project activities. Many of the mitigation measures suggested can be referred back to the existing Health, Safety and Environment (HSE) systems and procedures at OPAL.

6.3.1 Flora and Fauna (Impact on vegetation clearing)

- The contractor should minimize vegetation disturbance by excavating necessary areas only;
- Trees that are not in areas designated for proposed construction should be left intact;
- Map out ecologically sensitive areas at the site and make them known to the engineers and contractor;
- It is desirable to re-vegetate disturbed areas along roads, and pavements and other construction sites;

6.3.2 Increased Energy Consumption

Proposed mitigation measures include:-

- Ensure planning of transportation of materials to ensure that fossil fuels (diesel, petrol) is not consumed in excessive amounts;
- Monitor energy use during the operations of the facilities within the proposed development and set targets for reduction of energy use and develop an energy management plan;
- Conduct annual energy audits;
- Use of natural lighting as much as possible, and
- Using others sources of renewable energy.
- The proposed project should explore the option of installing PV panels on the roof to power lights and other items within the facility.

6.3.3 Increased water demand

- The contractor should ensure that they maintain water consumption records in order to monitor water use and develop a water management plan;
- Reducing the amount of water used during the project activities can be done through recycling water at the construction phase where possible, and
- The contractor and the proponent should put in place water storage facilities to store water in case of water shortages or rationing.

6.3.4 Waste generation (Solid and Liquid)

Mitigation measures for solid waste management:

- The project contractor will adhere to the existing OPAL site Waste Management Plan during all project phases.

- Preparation and implementation of the plan must be made the responsibility of the building contractor with the system being monitored independently;

- Special attention should be given to minimizing and reducing the quantities of solid waste produced during site preparation and construction;

- Any vegetation and combustible waste should not be burned on site;

- Reusable inorganic waste (e.g. excavated sand/soils) should be stockpiled away from drainage features and used for in-filling where necessary and/or possible;

- Unusable construction waste, such as damaged pipes, formwork and other construction material, must be disposed of at an approved dumpsite;

- Provide solid waste receptacles and storage containers, particularly for the disposal of plastic bags, boxes, so as not to block drainage system and to prevent littering of the site;

- Make arrangements for the daily collection of litter from the site and appoint a licensed solid waste transporter to collect and transport it for dumping at approved site with waste inventories provided;
- Disposing construction debris and excavated materials at sites approved by the town engineer and in accordance with Waste Management Regulations (2006);

- Reuse cement bags for carrying small quantities of concrete around the site;
- Minimizing waste to avoid unsustainable construction practices;
- Ensuring all waste is sorted before proceeding with disposal, and
- Providing adequate sanitary convenience for construction workers

Mitigation Measures for Liquid Waste management:

- Provide workers with appropriate sanitary facilities which can be in the form of exhaustible mobile toilets or toilets connected to septic tanks;
- Alternatively effluent from mobile toilets should be disposed of by a registered NEMA wastewater handler;
- Wastewater from concrete batching and aggregate screening should be discharged into nearby sedimentation pools and clean water re-used;
- A specific area for washing of cement trucks and equipment should be identified
- All equipment must be fuelled at properly designated fuelling stations.

6.3.5 Soil Erosion

Site clearing or disturbance of the natural vegetation will be planned and approved as part of project management process. Areas cleared, excavated, and/or exposed during construction will be re-vegetated using native vegetation species. Presence of well rooted vegetation will act as soil stabilization for the area.

6.3.6 Air pollution

Air management plan can be achieved through:-

- Limiting the traffic movement and operations to efficient and necessary activities during construction;
- Carrying out routine maintenance of vehicles and other machinery to ensure minimized emission of nitrogen and sulphur oxides from vehicles and other machinery exhaust systems;
- Setting a reasonable maximum on-site speed for construction vehicles;
- Ensuring strict enforcement of onsite speed limit regulation;
- Sprinkling water on graded access roads each day to reduce dust generation by construction vehicles;
- Providing a truck wash for washing trucks to remove dirt before they leave site and appropriate dust screens around construction site to reduce dust exposure;
- Providing dust masks for workers in extreme dust producing operations;
- Maximizing the use of manual labour and hand tools;

- Avoiding spillage of loose soil on the road where it will be disturbed and blown away by traffic, and
- Educating drivers to avoid off-road driving.

6.3.7 Noise pollution

Noise management plan can be achieved through:-

- Limiting the construction activities to day time only;
- Replacing noisy machinery with attenuated machinery;
- Lubricating and servicing machinery;
- Providing ear muffs for workers that operate noisy machinery;
- Displaying noise hazard signs where necessary, and
- Cordoning off the site from neighbouring plots.

6.3.8 Soil and water contamination

Reduction of soil and water contamination can be achieved through:-

- Properly storing, handling and disposing of new oil and used oil waste, and
- Maintenance of construction vehicles and equipment should be carried out in the contractors' yard (away from the project site).

6.3.9 Occupational Health and Safety Issues

The following mitigation measures are recommended to control effects of health and safety:-

- Ensure all equipment is inspected before use for appropriate safe guards and that the machine operators are trained in machine safety;
- Ensure tight precautionary measures during any excavation works and work at height;
- Ensure the working hours are controlled and that employees are not allowed to extend the working hours beyond an acceptable limit for purposes of gaining extra pay. Moreover, fatigue and loss of concentration can lead to accidents and injuries;
- Ensure appropriate road safety signage is strategically placed and drivers adhere to the requirements of such signage;
- Erect speed breaks where human and vehicular traffic has high interaction opportunities;
- Provide adequate manual labour to meet the requirements of the tasks, and

- Comply with the provisions of OSHA 2007 and its subsidiary legislation.

6.3.10 Visual intrusion

Mitigation against visual intrusion can be achieved through site hoarding and speeding up construction as far as is technically viable.

6.3.11Risk of Leaks and Spills

Apart from implementing the Spillage Control Procedures already in place at OPAL, the following mitigation measures are recommended to control the risk of leaks and spills on the project site:-

- Conduct regular maintenance of site equipment and machinery to ensure leakages are controlled or detected early;
- Project vehicles and equipment should be serviced according to manufacturer's requirements to limit release of exhaust emissions;
- Investigate the possibility of fitting catalytic converters in machines with engines so as to convert harmful substances in the exhaust fumes to less harmful substances;
- Safety procedures for fuel storage and re-fuelling should be well understood and implemented by site staff. Oil residuals including waste oil, lubricants, used filters, should be carefully collected and stored for safe disposal, in order to prevent spills of contaminant hydrocarbons into storm water or groundwater resources;
- Protect project area from fire by posting warning signs in area where hydrocarbon fuels are used, and
- Observe the requirements of the emission control regulations.

6.3.13Increased ground water abstraction

Mitigation measures include: Compliance with the Water Resources Management Authority (WRMA) Rules, 2007 on approval, authorization and permits for ground water abstraction, including:-

- No person shall construct or begin to construct a well or abstract any water from a well if such well is situated within half a mile of another well, without first having

obtained the written authority of WRA, and upon payment of prescribed permit fees;

- Recording all water abstracted, diverted, stored or discharged, giving the date, time, quality and quantity and methods of such abstraction, diversion, storage or discharge;
- A permit may, at the request of the permit holder, be varied by the Authority if the Authority is satisfied that the variation is not contrary to public interest or the rights of others; where the variation results in a change of the category of water use, the permit holder shall be required to re-apply for another permit;
- Borehole status monitoring data – abstraction rate, water levels, water quality, etc.;
- Where two or more operators have a common interest in the employment of water, a statement of the terms and objects of the association, and the rules under which the association proposes to exercise the permit is drawn up;
- The management should ensure that ways of recycling waste water are explored for use in the washrooms which will in turn reduce the water consumption rates;
- The management should explore alternatives for harvesting rainwater which can be stored and used later, which will then reduce pressure on the borehole water, and
- The management should ensure that they maintain water consumption records in order to monitor the usage of water.

6.3.14Occupational Health and Safety Hazards

Mitigation measures include:-

1. The Contractor should ensure registration of all workplaces by the Director, Directorate of Occupational Health and Safety (DOHSS) forming the basis of existing QHSE Management system ISO45001 at OPAL;

2. The Contractor should ensure provision of appropriate Personal Protective Equipment (PPE) and training on use of PPE for staff such as:-
    - Earmuffs for ear protection;
    - Helmets for head protection;
    - Dust masks for dust protection for all project works;
    - Goggles with good visibility for eye protection;

- Overalls and dust coats to protect the skin;
- High-visibility retro-reflective fluorescent yellow-green, fluorescent orange/ fluorescent red jackets with 360° visibility;
- Safety boots for protection of the feet;

3. Provision of gloves of different types according to specific works in relation to:-
    - Puncture resistance;
    - Sharps resistance;
    - Cut resistance;
    - Flexibility;
    - Abrasion resistance, and
    - Grip.
4. The Health and Safety Officer on site should ensure that the contractor complies with all standard and legally required health and safety regulations as set out by the Occupational Safety and Health Act (Part XI: Section 96) as pertains to construction activities, and

5. The Contractor should provide a standard First Aid Kit on site. Recommendations for Employees exceeding fifty (50) [as per the first Aid Rules section 2 (c)] and Fourth Schedule of the Factories (Building Operations and Works of Engineering Construction) Rules 1984 part III.

7 ENVIRONMENT, HEALTH AND SAFETY

7.1 Construction Phase

A Construction phase ESMP (C-ESMP) will be drafted specifically for use by the Contractor in charge of, and overseeing construction. This C-ESMP will ensure all aspects covered in this section, are included, to ensure appropriate management of EHS. The C-ESMP will also form part of the Contractor's contract, to ensure compliance to this C-ESMP is a contractual condition.

7.1.1 Commitment to Environment Health and Safety Best Practices

The proposed project shall be committed to implementing the best practices in Environment, Health and Safety (EHS). The Contractor will be required to incorporate an EHS system in the entire process. The Contractor and senior management of the company shall demonstrate the EHS policy as stipulated by the company and the need for OPAL to include HSE clauses in contractor's contracts. The foreman shall ensure that no reused water is left to flow and the mixer is not left on when not in use. The company shall ensure efficient use of resources at all stages of the construction phase is observed.

7.1.2 Provision of Protective Personal Equipment (PPE)

The contracting firm shall ensure that both casual and permanent employees on the construction site are provided with adequate PPE such as safety hats, safety boots, dust masks, ear muffs, gum boots, hand gloves and safety harnesses.

7.1.3 Provision of employee facilities

The requisite facilities for employees will be provided. These facilities will be temporary and shall be demolished during the operational phase. Such facilities include latrines, shower room, changing areas, a dining area and store.

7.1.4 Efficient use of resources

The Contractor will ensure efficient use of renewable and non-renewable resources. Use of natural lighting is encouraged wherever practical, to reduce pollution and high energy consumption. Resources such as water and construction materials will be used efficiently to reduce strain on the available resources.

7.1.5 Proper Disposal of Waste

Some of the waste that will be generated includes excavated soil, food waste, waste water, used oil and timber off-cuts. The Contractor shall institute the following measures to manage waste on the construction site:-

a. Minimise waste;
b. Maximise reuse and recycling of reusable construction materials, and
c. Promote environmentally sound waste disposal, while being mindful of the neighbours.

7.1.6 Health and Safety of Workers

The Contractor will ensure all the workers are sensitized in safety procedures and precautions. The site shall have at least one trained first aider, one trained health and safety officer and a fully stocked first aid kit.

7.2 Operation Phase

7.2.1 Resource use efficiency

Upon completion, the project will ensure use of natural light as much as possible. Alternative sources such as solar energy shall be considered. All the light fittings will have LED lamps and will be selected to suit the requirements of the area/zone.

Toilets will be fitted with modern flushing systems that will ensure water conservation. Notices will be displayed bearing information on the conservative use of resources, for example, water conservation, switching off lights when not in use and using electrical equipment that is in good working condition.

7.2.2 Cleaning Materials and Equipment

The administration shall ensure that all purchases observe green policy. Only biodegradable detergents shall be used for cleaning and disinfection activities for the facility. Disinfectants will be selected based on environmental standards. All waste will be disposed of appropriately in accordance with the Laws of Kenya.

7.2.3 Maintenance of Fire Fighting Equipment

The proponent shall ensure installation of adequate fire-fighting equipment and periodic maintenance of the equipment. Emergency evacuation procedures will be laid down. Fire drills shall be conducted periodically to determine emergency response and preparedness. The proponent intends to install a Fire detection system in the building. This will include smoke and heat detectors in all rooms. Break Glass Units or Manual Call Points will be positioned at all fire exits on all floors. Sounders and Flashing lights will be included on all floors to provide evacuation warnings.

8 ENVIRONMENTAL MANAGEMENT & MONITORING PLAN (EMMP)

This chapter presents the EMMP that will need to be implemented by the Proponent to prevent or reduce significant negative impacts to acceptable levels. All the project components had been considered when this comprehensive EMMP was developed. This EMMP will be integrated into OPAL's overall ESMS to ensure all mitigation and management measures, are adequately implemented.

8.1 Overview

The measures presented here summarize the key impacts identified, the remedial measures to be taken, responsible person(s) for execution, and the monitoring activities to be undertaken. An indication of the timing for implementation and the cost involved is also provided. The EMMP table can be further expanded with documented procedures and guidelines for work practices in order to be responsive to the situations that various Contract Parties will encounter. Implementation of the EMMP shall be done within the provisions of the law and for the ultimate benefit of the stakeholders in the area. The effectiveness of the EMMP shall be monitored and assessed regularly through inspections and reporting throughout construction and during operation.

8.2 Construction Environmental Management and Monitoring Plans

A Construction Environmental Management and Monitoring Plan (CEMMP) is a practical and achievable plan of management to ensure that any environmental impacts during the design, planning and construction phase are minimized. CEMMPs have been proposed to deal with the following issues during construction:-

- Biodiversity (flora and fauna);
- Noise and vibrations;
- Water resources;
- Energy resources;
- Air quality;
- Traffic Management;
- Waste management, and
- Occupational/public health and safety

Contractor Environmental Management Plan

A Construction phase ESMP (C-ESMP) will be drafted specifically for use by the Contractor in charge of and overseeing construction. This C-ESMP will ensure all aspects covered in this section, are included, to ensure appropriate management of EHS. The C-ESMP will also form part of the Contractor's contract, to ensure compliance to this C-ESMP is a contractual condition.

The C-ESMP will address the following:-

- Policy
- Planning and training
- Implementation and Operation

8.2.1 Policy

The contractor will develop an environmental, health and safety policy that includes, at a minimum, the following:-

- A commitment to comply with applicable regulations and other requirements that the company subscribes to;
- A commitment to provide a safe work environment;
- A commitment to provide the training and equipment necessary for employees to conduct their work safely;
- A commitment to continuously improve performance, and pollution prevention, and
- A commitment to communicate the policy to all persons working for and on behalf of the company.

8.2.2 Planning

Environmental, health and safety issues and the legal and other requirements in construction and refurbishment of OPAL have been identified in this study. The Contractor must demonstrate within his plan that he has read and understood the study report and its provisions for environmental management and monitoring.

8.2.3 Implementation and Operation

Roles, responsibilities and authorities should be defined, documented and communicated to ensure effective environmental management. A specific management representative should be assigned that is responsible for ensuring that the EMP is established, implemented and maintained and is responsible for reporting performance, reviewing the Plan and making recommendations for improvement. Documented confirmation is required that the training needs of all persons working for or on the company's behalf whose work poses significant hazards to their health and safety and / or may create a significant impact on the environment has been identified. Records of all training must be maintained.

Management, Supervisory, and Employee responsibilities must be communicated to all employees through training, formal job descriptions, work experience, hiring practices, etc. Awareness training should be provided that includes the importance of conforming to the policy and procedures, the significant environmental issues, and the roles and responsibilities of management and staff.

Records shall be legible, identifiable and traceable to the activity. Records shall be stored and maintained in such a way that they are retrievable and protected against damage, deterioration or loss.

The Contractor will establish, implement and maintain procedures to identify potential emergency situations and potential accidents that can have an impact on the environment, surrounding communities, the employees, and/or the public.

The contractor should be prepared to respond to actual emergency situations and accidents and prevent or mitigate associated adverse environmental or social impacts. The EMP must also address how the contractor will receive, document and respond to external interested parties.

8.4 Environmental Monitoring

An Environmental Monitor will be identified and contracted to perform the following:-

- Verify that all project approvals and permits are in place prior to the start of construction;

- Evaluate contractor plans (e.g., EMP, Spill Response and Waste Management) and monitor implementation;
- Develop inspection checklists to ensure site inspections are focused and useful;
- Conduct environmental monitoring of construction works. The environmental monitor will ensure the protection of the environment, that mitigation measures are appropriately implemented and facilitate communication between the Contractor(s), the Project Team and NEMA, and
- Prepare regular written reports for the Project Team, Contractor(s) and, where need be, NEMA on an agreed schedule.

Detailed CEMMP is presented below.

Table 11: Construction Environmental Management and Monitoring Plan (CEMMP) for the proposed OPAL redevelopment and refurbishment

8.3Construction Phase and Operation CEMMP

Possible Environmental Impact	Recommended Mitigation Measures	Responsibility	Frequency
Air Quality			
Dust	• Side enclosure and covering, by impervious sheeting where practicable, of any fill, aggregate or other dusty material stockpiles to stop dust generation and resource loss. Stockpiled materials can also be dampened with water if it is regularly being worked, as applicable • Stockpiles will be placed in sheltered or covered areas, with temporary wind screens erected around stockpiles exposed to wind effects where necessary • Stockpiled material will ideally only be handled when moist • Trucks transporting bulk materials (e.g. dry earth) to, from and within the project	• Project Manager • Contractor • Environmental Manager • Site Engineer • Site Foreman • All Staff	• Throughout construction phase • Operation phase

	site shall be covered with a suitable impermeable tarpaulin sheet or similar when travelling on public roads and should not be overloaded • Temporary access and haul roads will be dampened down with water to minimize dust from vehicular traffic where necessary • Vehicle speeds will be regulated on all un-surfaced roads to 30 km/h or less, as appropriate • Work areas should be fenced, with the fence lined with cloth or fabric (such as shade netting) to minimize dust migration and generation off site • Land clearing will be kept to a minimum so as to keep vegetation cover that will stabilize the ground and reduce dusty environments • Movement of vehicles should be restricted to defined access routes to minimize dust emissions • Consider the use of dust suppression		

	materials where active construction has ceased. This could include concreting areas of the site that are not developed immediately or covering with sub-grade to stabilize the area. Landscaping of bare areas (including seeding and mulching) should be prioritized where it is unlikely to be damaged by later development • Construction activities (such as excavation and transfer of surface materials) to be minimized on windy days, particularly when blowing in the direction of sensitive receptors • Drop height of excavated materials (on to the ground or into vehicles) should be controlled to a minimum to limit fugitive dust generation from unloading as far as practicable • Appropriately site any concrete batching plants out of prevailing high winds and at a considerable buffer distance of not less than 100 meters away from sensitive receivers • Implementation of a construction phase		

	dust-monitoring program on and adjacent to the project site (incorporating use of a dust monitor such as a dust deposition gauge or volumetric air sampler) to monitor respirable dust and nuisance dust. This can provide trigger data to justify alteration of work practices during periods of high dust generation (such as strong winds).		
Exhaust emission and gaseous pollutants	• All vehicles and plants used during the works will be maintained in good working order to ensure optimum performance and no excess smoke is emitted. A maintenance record shall be kept • If equipment or vehicles are seen to have excessive amounts of emissions, they will be given defect notices and taken out of service until repaired and approved for re-deployment • Emissions from stationary equipment shall be visually inspected for the presence of black smoke (CO) and maintenance measures will be made to rectify burner efficiency issues as necessary	• Project Manager • Contractor • Environmental Manager • Site Engineer • Site Foreman • All Staff	• Throughout construction phase • Operation phase

	• Equipment that is idle or being used intermittently (such as a parked car) will be shut down when not in use • Minimize unnecessary operation of construction machinery, including efficiency of trip times and reduction of double handling through appropriate placement of stockpiles, haul roads, works depots and work areas. This will also aid in fuel efficiency and will assist in reducing overall costs associated with unnecessary fuel consumption • Use of modern machinery, with adequate pollution control devices (such as catalytic converters). A list of all machinery used on site (including date of manufacture, hours of operation, maintenance dates, fuel type and emissions control devices installed) should be kept on site • Vehicle and fuels will be compliant with manufacturer's instructions and specifications approved in the region – specifically in relation to low-sulphur content		

	• Proper and efficient use and operation of construction machinery and vehicles by qualified and skilled personnel (as per manufacturer's instructions) • Encourage residents and commercial workers to use alternatives modes of transport to their own personal vehicles when travelling to and from the Project site and within the Project site.		
Odour	• Proper staging of construction activities to minimise impact of construction odours (from paint, welding or grinding) in areas already occupied or neighbouring properties. This may involve proper timing of activities to avoid unfavorable wind conditions • Proper timing of activities – this is a common sense approach that can avoid potential odour impacts by controlling the timing of certain high-risk activities. Some examples include:- i. Stopping open air painting during high winds; ii. Cleaning commercial grease traps outside	• Project Manager • Contractor • Environmental Manager • Site Engineer • Site Foreman • All Staff	• Throughout construction phase • Operation phase

	normal opening hours, and iii. Carrying out site sewage and maintenance works at appropriate low-use times; • Control of potential odours emissions at the source – this can be done through appropriate stack venting or filtration of odorous emissions from:- i. Enclosed painting facilities; ii. Catering facilities; iii. Sewage lines, and Wastewater lines. • Organic waste (food) containers will be sealed using a metal or hard plastic lid at all times to ensure that odours do not emanate from the putrefying organic waste • Long-term storage of waste will not be permitted onsite. In addition, for short-term storage, no waste is to be stored outside designated areas • Pipe networks and similar that transfer wastewater will be monitored for any leaks that could cause foul odour water to escape		

	or the build-up of a stagnant water pond • Smoke generated by bonfires (often when burning waste) is a recognized problem on demolition and construction sites, and the practice is strictly prohibited; • Work areas should be well ventilated to avoid impacts on the employees; • Workers should be supplied with appropriate personal protective equipment (such as respiratory equipment) when working with odours, dust and volatile emissions; • Provision of suitable workers' amenities, located within the construction area and, if possible, downwind from residential and educational areas, and • Regular maintenance of workers' amenities, including emptying of effluent storage tanks.		
Volatile Emissions	• The number of fuel and chemical storage areas should be minimised and properly managed. Closed fuel and chemical storage areas will be adequately ventilated and	• Project Manager • Contractor • Environmental	• Throughout construction phase • Operation phase

	confined; • Ensure proper on site storage of volatile fuels and chemicals in appropriately sealed containers, in cool, covered areas with adequate ventilation; • All containers used for the storage of volatile materials (e.g. fuels, solvents) shall be kept closed when not in use; • Leakage of gases from gas bottles should be controlled through proper dangerous goods storage; • A full list of all volatile fuels and chemicals stored on site should be kept, including accompanying volumes, locations and Material Safety Data Sheets (MSDS); • Avoid on site storage of highly volatile fuels such as unleaded petrol and volatile chemicals such as solvents and oil-based paints; • Ensure all machinery is in good order and repair and not leaking fuel or volatile emissions from fuel tanks or fuel lines;	Manager • Site Engineer • Site Foreman • All Staff	

	• Vehicles are to go off-site for refueling, with on-site refueling limited to landscaping equipment (such as lawnmowers), and • Volatile emissions should also be controlled through minimizing unnecessary leaks, spills and over-filling of fuel driven engines		
Noise and Vibration Impact			
Noise	• All works and ancillary activities (such as heavy vehicle movement and material deliveries) that are audible at the site boundary will be carried out during designated daytime hours only unless approval has been granted by regulatory authority • Phase construction activities to take into account potential impacts on visitors and employees in adjoining properties and adjacent areas; • Avoid simultaneous use/operation of noisy equipment, if possible	• Project Manager • Contractor • Environmental Manager • Site Engineer • Site Foreman • All Staff	• Throughout construction phase • Operation phase

	• Require operators to shut down all plant and equipment in intermittent use between work periods or throttled down to minimum idling speed; • Remove stockpiles and perform excavation works on the side that is furthest away from the noise sensitive receiver (NSR) to allow earth materials to shield NSRs from noise sources; • Equipment known to emit noise strongly in more than one direction is oriented to direct noise away from the noise sensitive receptors; • Noisy equipment and plant (generators and water pumps, etc.) be sited as far away from noise sensitive receptors as practically possible; • Access roads to the site shall be positioned such that vehicular movements cause minimum disturbance to any neighbouring residential buildings; • Access to the site is designed so that the need for vehicles to reverse (and thus use		

	their reversing alarm) is minimized; • Erect appropriate buffers (such as fencing, mounds, material stockpiles, site accommodation, building walls or a row of trees or other suitable vegetation) between the source and receptor to absorb the noise; • Use at-source noise controls, so that any noisy equipment is suitably enclosed with an acoustic barrier or other noise reducing method, such as an exhaust muffler; • Select attenuated equipment that produces the lowest noise level whenever possible, and • Discourage raised voices or radios/music at high volumes, particularly at the start of shift or after normal business hours.		
Vibration	• To reduce the potential of impacts from noise and vibration to sensitive receptors, earth compaction is suggested to be carried out mainly with the use of water, rather than via vibro-compaction technique; • If elevated noise/vibration levels are	• Project Manager • Environmental Manager • Site Engineer	• Throughout construction phase • Operation phase

	encountered, the source of noise or vibration is to be identified and alternative methods or additional control measures are to be implemented; • In the event of vibration becoming a concern, an assessment will be undertaken in accordance with local regulations and standards; • Where reasonably practicable, vibrating equipment should be located as far from sensitive premises as possible, and if on a structure, not on one which is contiguous with that of the sensitive premises; • In some instances it may be possible to reduce transmitted vibration by separating site work from sensitive premises. It is important to take account of safety and structural issues before carrying out any separation work; • All vehicles and plants used during the works will be maintained in good working order to ensure optimum performance. A maintenance record shall be kept. If equipment or vehicles are seen to have an	• Site Foreman • All Staff	

	excessive amount of vibration, they will be given defect notices and taken out of service until repaired and approved for re-deployment; • Minimise unnecessary operation of construction machinery (which cause vibrations), including efficiency of trip times and reduction of double handling through appropriate placement of stockpiles, haul roads, works depots and work areas, and • Proper and efficient use and operation of construction machinery and vehicles by qualified and skilled personnel (as per manufacturer's instructions).		
Light and Visual Impact			
Light Pollution	• Schedule works that would be light-intensive during day-time; • Position lighting (especially construction floodlights) properly and directing their light more efficiently towards where it is needed; • Use only the necessary amount of lighting to accomplish the light's purpose;	• Project Manager • Contractor • Environmental Manager • Site Engineer	• Throughout construction phase • Operation phase

	• Install fencing, appropriate landscaping (such as earth mounds) or similar measures to minimise escape of light from construction area; • Use energy efficient bulbs and lights in all public areas throughout the Project site; • Turn lights (particularly decorative flood-lighting and advertising lighting) off using a timer or occupancy sensor or manually when not needed, and • Evaluate existing lighting plans, and re-designing some or all of the plans depending on whether existing light is actually needed. For instance, light pollution can be reduced by turning off unnecessary outdoor lights, and only lighting buildings when there are people inside. Timers are especially valuable for this purpose	• Site Foreman • All Staff	
Visual Impact	• In general, construction activities should be contained within the Project site as much as practical • Conspicuous and frequent small-vehicle traffic for worker access and frequent large-equipment (trucks, graders, excavators, and	• Project Manager • Environmental Manager • Site Engineer	• Throughout construction phase • Operation phase

	cranes) traffic for road construction and site preparation that could produce visible activity and dust in dry soils will be minimized; • Vehicles leaving site will not spread mud, soil or dirt onto public roads. Any mud, soil or dirt which has been spread onto public roads will be removed and cleaned promptly; • The choice of materials for boundary fencing will take into account the surrounding land use. For sites in more remote areas away from sensitive neighbours, or adjacent to other construction sites – a chain link or similar fencing may be sufficient; • The height of material stockpiles will be controlled so that they are not visually intrusive and prone to tipping over; • Loose material stockpiles will be covered or sprayed with water to minimize the amount of dust generated, especially on windy days; • Solid waste piles will be minimized on site, covered with netting or tarpaulin and bound by hoarding to minimize visual impact; • Soil scars and exposed slope faces that would	• Site Foreman • All Staff	

	result from excavation, levelling, and equipment movement will be minimized; • Ground disturbance and vegetation removal that could result in visual impacts that produce contrasts of colour, form, texture, and line will be minimized, and • Construction easements on parcels outside the Project site, where required, would be managed to minimize potential visual impact. Following construction, the use of ground cover, landscaping, or related materials would restore areas to pre-construction conditions or better.		
Waste Management			
Waste Prevention	• Maintain a tidy site by implementing good housekeeping, which can reduce waste generation; • Store construction material on site in a safe and responsible manner to preserve the quality and in turn minimize waste; • Where possible, materials will be ordered in bulk – to reduce packaging;	• Project Manager • Contractor • Environmental Manager • Site Engineer • Site Foreman • All Staff	• Throughout construction phase • Operation phase

	• Materials should be purchased with minimum packaging waste to dispose of; • Plastic drums, empty plastic bottles, scrap metal, batteries, waste paper and waste oil will be segregated on site and sent to recycling; • Bricks and concrete can be crushed by an onsite crusher or transported to an existing crusher. The resulting material can then be used as granular fill or aggregate either within the Project site or elsewhere; • Excavated soils can be used as a subsoil for landscaping; • Excess concrete from pours can be re-used as formwork (e.g. paving slabs) instead of being sent for recycling or disposal; • Consider whether existing products (such as wooden pallets) can be reused instead of purchasing new products, and • Implementation of a management plan to help reduce surplus material.		
Waste Collection	Waste Chutes - are often used to transfer waste from vertical constructions to the ground level.	• Project Manager	• Throughout construction phase

	• Provide enclosed chutes of wood or metal where materials are dropped more than 5 m. They usually consist of a plastic or metal tube (about 1 m in diameter) through which waste is dropped; • The area onto which the material is dropped shall be provided with suitable enclosed protection barriers and warning signs of the hazard of falling materials; • Waste materials shall not be removed from the lower area until handling of materials above has ceased; • Dust netting or similar should be placed around the skip and along the length of the chute to contain any dust clouds upon impact and also to stop any loose waste escaping. Waste Piles • Pile only contains passive waste (e.g. wood, metal, plastic, dry concrete) and no food waste, hazardous waste or wastewater; • Waste pile is controlled so that it does not spread and start to impede other activities, and stays at a height that it does not become a	• Contractor • Environmental Manager • Site Engineer • Site Foreman • All Staff • Sub-contractors	• Operation phase

	safety hazard. Barricades may also be placed around the pile to delineate the safe distance for workers; • Waste piles are positioned so that they are not visible to the general public where they could have a negative visual impact. Hoardings may aid in this; • If the waste pile contains plastic, paper or other light-weight material it needs to be covered with a net/tarpaulin or similar to stop waste from blowing around, and • Liquid waste, such as grey-water, sewage, slurry and other wastewater will be collected from source (typically a Glass Reinforced Plastic – GRP tank or similar such as a septic tank) by a designated tanker and taken off-site for disposal at a Regulatory Authority-approved facility.		
Waste Segregation	Whenever possible, clearly identify which waste should go into which skip and/or bin, either with signs/pictures or by colour-coding the skips and/or bins. The main solid and hazardous segregation types are:-	• Project Manager • Environmental Manager • Site Engineer	• Throughout construction phase • Operation phase

	• Food waste; • General waste (e.g. non-recyclable items); • Recyclable waste (e.g. glass, paper, cans); • Hazardous waste (e.g. paint/fuel/oil cans,oily rags, contaminated soil); • Concrete waste (dry concrete - breezeblocks or spilled concrete material); • Metal waste (e.g. rebar, girders or similar) has a good re-sale value hence should be segregated into separate skip or fenced off area; • Timber waste (e.g. from formwork or crates); and • Green waste (typically vegetation cuttings).	• Site Foreman • All Staff • Contractor and all Sub-contractors	
Waste Storage	• Adequate number of containers (skips, bins or similar) will be strategically placed throughout the construction areas and all temporary facilities; • The waste containers will be regularly collected and taken to the main waste storage	• Project Manager • Contractor • Environmental Manager • Site Engineer	• Throughout construction phase • Operation phase

	area; • Remove waste containers from the Project Site as soon as they are full. Waste containers shall not be allowed to overflow; • Waste containers will be regularly inspected. Waste receptacles will be kept securely closed during accumulation (except for open-topped trash skips) and storage, except when it is necessary to add waste, and will be tightly sealed prior to transportation from the generation area; • Waste containers will not be opened, handled or stored in a manner, which may rupture the container or cause it to leak; • The storage containers will be of sufficient size and number to contain all solid waste generated between collections; • All food waste will be properly stored in containers with closed metal or hard plastic tops to minimize the possibility of vermin infestation or odour emanating; • All light-weight waste skips (particularly those for plastic/cardboard) should have covers	• Site Foreman • All Staff • Sub-contractors	

	(tarpaulin/netting) in order to stop light waste being blown around site by wind; • Place a bucket with sand near staff canteen or mess halls, for safe disposal of cigarette butts. Cigarette butts contain toxins and must not be left on the ground; • Inert construction waste will be segregated into combustible and non-combustible waste, and • Flammable substances will be kept away from sources of ignition.		

Waste Disposal	• Transfer and transportation of waste consignments will be done by a Regulatory Authority (NEMA) approved/licensed Waste Management Contractor (WMC). Before transportation takes place the contents, packing, labelling and documentation of the waste must be checked; • The Contractor will not release the waste if there is concern about the standard of transport or destination of the waste. No waste will be disposed of or removed from the construction site without the knowledge and approval of the Project Manager or Contractor; • No waste shall be transported from the site without the Contractor obtaining a license to transport waste, as issued by the Regulatory Authority, NEMA; • Any vehicle used for the transportation of waste must be labelled in such a manner as directed by NEMA; • Waste will be transported to a Regulatory Authority-approved disposal facility; • Vehicles delivering waste to the disposal area will be covered where necessary, to prevent	• Project Manager • Contractor • Environmental Manager • Site Engineer • Site Foreman • All Staff • Sub-contractors	• Throughout construction phase • Operation phase

	dropping, leaking, sifting or blowing of solid waste from the vehicle; • Domestic and biodegradable waste from offices, canteens and welfare facilities shall be removed daily from the Project Site; • The Contractor shall not dump or bury waste on the Project Site; • No waste shall be burnt on site, and • Hazardous waste will be disposed of in the area designated by the Regulatory Authority, NEMA. It will remain segregated and in the labelled storage containers.		

Hazardous Waste	• Fire prevention systems and pollution control equipment will be provided to prevent fires or the release of hazardous materials to the environment; • Containers intended for hazardous waste disposal will not be used for other purposes unless explicitly stated. Rusty, dented or defective containers for waste accumulation or storage will not be used; • Hazardous waste will be retained in a secure area with an impervious bunded base; • Different types of hazardous waste will be stored separately to avoid adverse chemical reactions and facilitate eventual treatment; • Drain used oil or fuel filters of the residual liquids by placing them on a mesh rack in a tray or drum. The drained filter can then be disposed of as scrap metal. The drained oil or fuel must be collected by a waste oil recycling Contractor; • Unused liquid paint cannot be disposed of with general waste. Only completely dried-out paint residue tins/drums may be disposed of with	• Project Manager • Contractor • Environmental Manager • Site Engineer • Site Foreman • All Staff • Sub-contractors	• Throughout construction phase • Operation phase

	solid waste; • Hazardous waste will be stored separately from non-hazardous waste and away from sources of ignition; • Hazardous waste will be stored in tightly closed, leak-proof containers made of or lined with materials that are compatible with the hazardous waste being stored. Containers will be clearly marked with appropriate warning labels to accurately describe their contents and detailed safety precautions. Labels will be waterproof, securely attached, and written in Kiswahili and English. Wherever possible, chemicals will be kept in their original container; • Hazardous chemicals will be stored and handled in accordance with the manufacturers Material Safety Data Sheet (MSDS); • Spill prevention measures will be adhered to, and • The Contractor will maintain a register of all hazardous waste and disposal methods.		
Erosion and Sediment			

	• Land clearing will be kept to a minimum so as to keep vegetation cover that will stabilize the ground and reduce dusty environments**;** • Consider the use of dust suppression materials where active construction has ceased. This could include concreting areas of the site that are not developed immediately or covering with subgrade to stabilize the area. Landscaping of bare areas (including seeding and mulching) should be prioritized where it is unlikely to be damaged by later development; • Existing vegetation is to be maintained whenever possible and the area of disturbance minimized; • Appropriate erosion and sediment control structures (such as geotextile fabric and hay bales) should be provided by the Contractor where necessary; • For on-going works or operations: installation of vegetation buffers i.e. turf stripping, down gradient of works or operations; • Immediate re-vegetation (wherever needed) following completion of works;	• Project Manager • Contractor • Environmental Manager • Site Engineer • Site Foreman • All Staff	• Throughout construction phase • Operation phase

	• Progressively compact (stabilize) the ground to minimize the erosion of unconsolidated and un-vegetated material; • Activities on site and on soils that are susceptible to erosion by wind will be minimized; • Construction activities to be timed, in so far as is possible, so that the area of exposed soil is minimised during times of the year when the potential for erosion is high, such as periods of heavy rainfall; • Minimising the area of land to be disturbed at any one time by staging of construction activities and the progressive implementation of the works. The Contractor will be responsible for inspections and maintenance on the site, maintain documentation for review, and undertake inspections as follows:- • Once every 7 days in exposed soil areas; • Within 24 hours after a one-half inch rain event over 24 hours;		

	• Once every 30 days in stabilized areas, and • As soon as runoff occurs.		
Storm Water			
	• Investigate the existing site hydrology at the Project site, to confirm the need and location for culverts and other drainage structures; • To ensure minimal impact, construction activities should not be scheduled when there is significant potential for heavy rainfall; backfilling activities should be undertaken in horizontal layers with dampened soil; and in situ soil compaction undertaken immediately; • Contractors who will be working closer to water bodies shall maintain a ditch (suggested dimensions of 30 cm deep × 30 cm wide) along the side of the water body as a minimum control measure to catch any runoff from reaching the water body; • Storm water collection drains should be provided all along the stock piles and drained water will be allowed to pass through a pit/sump to collect the silt prior to disposing the storm water into the water bodies and/or	• Project Manager • Environmental Manager • Site Engineer • Site Foreman • All Staff	• Throughout construction phase • Operation phase

	flooded areas; • Storm water run-off controls (bunds) to be installed around soil stockpiles near the water body shoreline.		
Wastewater			
	• Contractor shall note that direct discharge to the ground or surface water is not permitted; • Wastewater quality shall conform to the standards set out in the Third Schedule of the Environmental Management and Coordination (Water Quality) Regulations (2006); • Wastewater shall be disposed of to sewer, either directly or via tanker. Company must hold a permit for the disposal of such wastewater issued in accordance with the Environmental Management and Coordination (Waste Management) Regulations, 2006; • Where wastewater is discharged to the environment, discharge flows will be reduced to prevent scour and, where necessary, edge protection measures will be employed; • Contractor shall provide sufficient welfare	• Project Manager • Contractor • Environmental Manager • Site Engineer • Site Foreman • All Staff	• Throughout construction phase • Operation phase

	facilities (both at the site offices and in the field) to cater for their employees; • Contractors will instruct employees and sub-contractors not to urinate or defecate in the open or in any water body within the Project site; • It is prohibited to discharge sewage onto the open ground or into drains that discharge directly to water courses; • Sewage wastewater must be transferred and disposed of in an appropriate manner; • It is prohibited to use open ground for sanitary purposes including bathing; • Wastewater from the wash basins, shower units etc. on site should be directed to a grey water storage tank. Consideration will be given to the re-use of grey water where possible (e.g. dust suppression), and • Grey water and sewage from construction site temporary facilities and office blocks must be discharged as per the standards outlined in the Environmental Management and Coordination (Water Quality) Regulations (2006).		

Fuel and Chemical Storage			
	All hazardous material, including chemicals and fuels, shall be stored at a designated site. A site plan, showing the layout of these areas shall be displayed in the site offices. • Fuel, oil and chemical stores will be kept away from busy vehicle routes to minimize the likelihood of collision; • All chemicals and hazardous materials will be stored in designated areas away from drains; • Hazardous materials should not be stored in significant risk locations (e.g. within 50 meters of a water surface, waterway or 50 metres of a well, borehole or any drains that may ultimately drain into the sea or other surface water); • Tanks shall be protected to minimize the potential for collision. Placement of cone or hard barrier delineators may be used to identify the tank position, and • Fuel, oil and chemicals will only be stored on impermeable bases and within a bund to contain at least 110% of the maximum	• Project Manager • Contractor • Environmental Manager • Site Engineer • Site Foreman • All Staff • Sub-contractors	• Throughout construction phase • Operation phase

	capacity of the storage facility. Hazardous materials to be handled only by operators trained in the relevant handling and spill response procedures. Hazardous materials are to be handled in accordance with Contractor's Project Instruction for Hazardous Materials Management:- • Chemicals associated with the plant shall be stored, handled and disposed of in accordance with Regulatory Authority standards and as per the Material Safety Data Sheet (MSDS) of each chemical; • All sub-contractors shall comply with all legislation with regard to the safe storage and handling of hazardous substances; • Spilt materials will be collected and treated as hazardous waste; • Hazardous materials will only be handled by trained personnel, and • Relevant staff will be trained in spill response, containment procedures, material handling and storage procedures. The quantities of fuel, oil and chemical that pose		

	environmental hazards will be minimized. Prior to any chemicals being brought to the site, alternatives will be sought, to ensure only those with the least potential to impact the environment are stored on site. Permission shall be sought from the PMC and The Client's Environmental Representative prior to bringing any hazardous chemicals or substances on site. A list of all hazardous substances present on site and the material safety data sheets (MSDS) for these substances shall be readily available at required locations/sites:- • All materials and chemicals will be stored in a manner that conforms to their MSDS requirements and manufacturer's instructions; • All containers of oil, fuel or chemicals shall be labelled and identified with contents and capacity and stored appropriately; • Adequate signage will be put in place identifying hazardous materials and the nature of hazard; • Each receptacle containing dangerous goods		

	shall be marked with the correct technical name of the substance it contains; • Inappropriate storage of incompatible materials will not be permitted; • Incompatible materials shall not be placed in common containment and different class of chemicals will be stored separately; • Combustible materials will be stored in fire proof containers; • All flammable liquids shall be stored under cover and in well ventilated areas, and • All volatile chemicals and fuels to be stored in closed containers and properly stored to minimize VOC emissions. If the Contractor stores liquid chemicals on site, it is necessary to maintain spill containment and clean-up kit including emergency booms and chemicals to soak up any accidental spillage:- • A spill response procedure will be implemented at the site; • Adequate spill response kits and fire prevention system will be situated throughout		

	the site at high risk areas; • Appropriate emergency response equipment and medical equipment will be stored adjacent to hazardous materials; • Ensure there is adequate fire-fighting equipment at the fuel storage area, and • All sub-contractors handling hazardous materials shall keep appropriate spill clean-up material adjacent to storage and maintenance areas. A secondary containment will be installed for storage tanks containing oil or fuel in accordance with best international practices to accommodate spills:- • Contractor shall ensure that any fuel to be used on site (e.g. for generators) is stored in a container (tank or drum) which is of sufficient strength and structural integrity, and has been installed so as to ensure that it is unlikely to burst or leak in its ordinary use; • It is recommended that fuel quantities in excess of 100 litres should not be stored in plastic barrels. They should be stored in		

	horizontal steel tanks and bunded; • All drums and barrels will be fitted with appropriate flow control devices and will be clearly labelled; • All ancillary equipment such as valves and hoses will be contained securely within the bund when not in use, and • Bags and sacks of material shall be kept off the ground on pallets and covered or stored indoors. Any leaking drums or containers will be removed immediately and appropriately. In addition, should the leak result in contamination of the underlying soils, these will be remediated. Used or waste fuel or other waste chemicals shall be stored in an adequately bunded area, or an impervious storeroom or other transport vessels until collected.		
Occupational Health and Safety			
Occupational Health and Safety	• Well-equipped first aid box shall be placed on site. • Site safety officer emergency contacts and site	• Project Manager • Contractor	• Throughout construction phase • Operation phase

	safety policy shall be displayed. • Appropriate signage shall be placed in strategic places providing health and safety information. • Health and safety tool box meetings shall be carried out on a regular basis. • Use of suitable personal protective equipment (helmet, ear muffs, vest, safety shoes). • Full-time availability of dedicated safety officer to manage EHS on the site and one first aider • Organized incident register • Fire assembly points shall be clearly demarcated and displayed at the site • Use of scaffolds, stable ladders and other climbing/support structures • Workers shall be sensitized on occupational safety • Ensure proper maintenance of cleanliness and organization at the construction site • Ensure proper tape barricading of dangerous	• Safety Officer • Site Foreman • All Staff • Sub-contractors	

	areas within the site • Engagement of skilled labourers • Ensure construction of a shaded eatery for workers • Ensure that COVID 19 protocols are keenly observed. Hand washing points, temperature gun and hand sanitizer should be placed at entry of the site office. • Ensure that Covid-19 guidelines are properly displayed • Ensure that all the persons cooking and handling the workers food have valid health clearance certificates from MOH • Ensure there is restricted site access. Every visitor should sign the visitor's book during entry to and exit from the site.		

8.4 Decommissioning Phase CEMMP

Environmental Impact	Mitigation measures	Responsibility	Time-frame
Solid waste management	• All removed materials that will not be used for other purposes must be removed	Contractor	One-off

	and recycled/reused as much as possible • Where recycling/reuse of materials and other demolition waste is not possible, the materials should be transported to a licensed waste disposal site or arrangement made with Machakos County • Ensure NO oil spillage occurs during equipment removal and ensure the use of serviceable machinery		
Degeneration of vegetation at the construction site	• Implement an appropriate programme to restore the site to a better status • Consider the use of indigenous plant species in re-vegetation	Contractor	One-off

8.5Health, Safety and Accident Prevention Plan

In order to ensure public health and safety, and to prevent accidents or emergency situations at construction, operation or decommissioning phases, the following action plan shall be incorporated in the project cycle.

Table 12: Health, Safety and Accident Prevention Action Plan

Issue	Specific measures	Responsibility	Timing
Project design	• Incorporation of health and safety measures in project design	• Project architect • Structural and civil engineers	Design stage
Site organization and cleanliness	• Keep construction materials in correct place • Maintain cleanliness at the construction site	• Contractor • Project Proponent	Construction stage
Fire safety	• No storage of inflammables • Fire safety awareness • Keep fire-fighting facilities at the site • Safe handling of fire • No smoking on site	• Contractor • Project Proponent • Visitors	All stages of project cycle
Accident prevention	• Safe handling of tools and machinery • Use of appropriate personal protection equipment • Engagement of qualified personnel • Controlling visitor entry onto the site	• Contractor • Project Proponent • Visitors • Security company	Construction stage
Waste disposal	• Provision of adequate waste disposal facilities at the site • Engagement of licenced waste company • Reuse of certain waste materials	• Contractor • Contracted waste disposal company • Building occupants	All stages of project cycle

Issue	Specific measures	Responsibility	Timing
Tools and machinery safety	• Use of tools and machines for designated job • Regular servicing of machinery • Proper storage of tools	• Contractor	Construction stage
Emergency preparedness	• Keeping passages clear • Marking emergency exits • Training staff in emergency preparedness and response • Keeping a well-equipped first aid kit on site	• Contractor • Project Proponent	All stages of project cycle
Insurance	• Insuring all workers on the construction site	• Contractor	Construction stage
Site security	• 24-hour security on site • Control of visitor entry onto site	• Contractor • Security company	Construction and operation stage

9 ANALYSIS OF PROJECT ALTERNATIVES

This section analyses the project alternatives in terms of site, materials and technology scale, solid waste and wastewater management options and shall involve studying design alternatives and analyzing them based on the environmental costs and benefits.

9.1 Relocation Option

Relocation option to a different site is an option available for the project implementation. At the moment, there are no alternative sites for the proposed development (i.e. the project proponent does not have an alternative site). The proposed project site is already within a zoned industrial area, and is already an up-and-running concern. The proponent would have to source for alternative land if relocation is proposed. Looking for the land to accommodate the scale and size of the project and completing official transaction on it may take a long period. In addition, it is no guarantee that such land would be available. In addition works involved in the proposed project involve refurbishment of the already existing structures at the current location at OPAL. Thus, relocation of the proposed project is not a viable option.

The project proponent would spend a long period of time on design and approvals of the plans by the relevant departments. The Project design and planning before the implementation stage would call for extra cost, already encountered in the proposed development.. Whatever has been done and paid to date would be counted as a loss to the proponent. Another consequence of this is that it would discourage both foreign and local investors especially in the industrial sector. In consideration of the above concerns and assessment of the current proposed site, relocation of the project is not a viable option.

9.2 No Action Alternative

The No Action Alternative in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. This option will however, involve several losses both to the project proponent/land owner and the Kenyan society and the Government. The property would remain under-utilized.

The No Action Alternative is the least preferred from the socio-economic and partly environmental perspectives since if the project is not implemented:-

- The economic benefits especially during construction and operation i.e. provision of much needed jobs for skilled and non-skilled workers would not be realized
- There would be no generation of income by the developer and the Government.
- The Government's development policy may not be realized
- The socio-economic status of Kenyans and the local people would remain unchanged.
- Local skills would remain under utilized
- No employment opportunities would be created for Kenyans who would work in the project area.
- Discouragement for investors to produce this level and standard of developments.

From the analysis above, it becomes apparent that the No Project Alternative is not the appropriate alternative for the local people, Kenyans, and the Government of Kenya.

9.3 The comparison of Alternatives

Under the proposed redevelopment alternative, the project would have higher production capacity, improved efficiency and would provide employment directly and indirectly to the Kenyan population. It would provide jobs for the workers during construction. After completion more jobs would be generated by the production operations. Under the No Action Alternative, there would be no development at all. There would be no benefits from the site.

9.4 Alternative construction materials and technology

The proposed project will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment that saves energy and water will be given first priority without compromising on cost or availability factors. The columns and walls will be made using locally sourced stones, cement, sand (washed and clean), and metal rods that meet KEBS requirements. Heavy use of timber during construction is discouraged because of destruction of forests. Exotic species would be preferred to indigenous species in the construction where need will arise.

9.5 Domestic waste water management alternatives

The following locally available technologies are discussed below:-

Alternative one - Use of stabilization ponds/lagoons

This refers to the use of a series of ponds/lagoons which allow several biological processes to take place, before the water is discharged to the environment. The lagoons

can be used for aquaculture purposes and irrigation. However, they occupy a lot of space, even though they are less costly. No chemicals are used/heavy metals sink and decomposition processes take place. They are usually a nuisance to the public because of odour from the lagoons/ponds.

Alternative two - Use of Constructed/Artificial wetland

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

Alternative three - Use of septic tanks

This involves the construction of underground concrete tanks to store the sludge with soak pits. It is expensive to construct and requires regular emptying in large discharge points. Given the kind of liquid waste emanating from the proposed project this option is not preferred since it will be uneconomical.

Alternative four - Waste water treatment plant

This involves the construction/installation of a plant and use of chemicals to treat the effluent to locally/internationally accepted environmental standards before it is discharged into a water body nearby. It is usually expensive to construct and maintain, but it is reliable, efficient and cost-effective in the long term.

Alternative five - Connection to the sewer line system

Connection to the sewer line option is a viable option since the proposed project site area is served by an existing functional sewer line managed by MAVWASCO.

Alternative six: Use of Bio-digester

Bio digester is an on-site sanitation unit that utilizes anaerobic technology for the disposal of toilet (black) wastewater as well as of kitchen and bathroom (grey) water, in a closed system. This is an ethical sanitation technology which treats wastewater in an environmentally friendly manner, facilitating its use for irrigation or its return to water bodies without polluting them. The process also generates organic fertilizer and biogas (a form of fuel) by allowing naturally occurring bacteria to break down solid waste. From an economic as well as environmental analysis, use of a bio digester system is a viable

option for the proponent to adopt in order to supplement connection to the sewer system.

9.6 Solid waste management alternatives

A lot of solid waste will be generated from the proposed development. An integrated solid waste management system is recommendable. First, the proponent will give priority to Reduction at Source of the waste materials. This option will demand a solid waste management awareness programme for both the management and the workers. Notices for proper waste management/handling may be posted at strategic places for the sake of visitors. Secondly, Recycling, Reuse and Compositing of the waste will be the second alternative in priority. This will call for a source separation programme to be put in place especially in the kitchen section. The recyclables will be sold to waste buyers within Mavoko, Machakos and Nairobi City. The third priority in the hierarchy of options is incineration/combustion of the waste that is not recyclable. Finally, sanitary land filling will be the last option for the proponent to consider.

9.7Water Supply alternatives

Water is becoming a scarce resource day by day in most parts of the country. Therefore, the proponent will look into methods of sustaining water supply.

Alternative one - Rain Water Harvesting

Rain water flowing into drainage systems during wet seasons will be harvested and used for various purposes. In addition, a lot of water can also be harvested from roofs of buildings that will be put up in the project site. This water can be used for landscaping, flushing toilets and in general cleaning.

Alternative two – Tanker/Bowsers Water Supply

Several commercial water supply companies operate in Machakos County. These are licensed by Water Resources Authority (WRA) to supply water to clients when normal MAVWASCO water supply system is cut-off. The proponent can use these services as a supply option. However, this option is not sustainable since it is expensive and there is no guarantee of being supplied with clean water.

Alternative three – Drilling of a Borehole

To drill a borehole the proponent would need to undertake hydro-geological studies of the proposed project site and obtain permits from the Water Resource Authority (WRA). An EIA would be conducted for purposes of obtaining a NEMA licence to sink a borehole within the development. Water supply from the borehole will cover the water

supply deficits experienced from other water supply sources. Proposed site already has two boreholes.

Alternative four – Combined Water Supply

This is the option preferred by the proponent. A dedicated mains water infrastructure system is to be provided for the development. It is proposed that there be a water connection to serve the development from the existing Mavoko Water and Sewerage Company (MAVWASCO). Additional water sources to supplement that from MAVWASCO will comprise two onsite boreholes. The water will be pumped to a central storage comprising of elevated and ground storage tanks to balance the fluctuating water supply and for fire emergencies.

9.8 Mitigation for the proposed Action

Mitigation measures include proper handling of the waste material as generated especially during clearing and preparation of the site. The application or adaptation of standard construction management practices is fundamental. Conflicts arising from the foreseen negative impacts will be solved through consultation with the neighbours/public; by explaining the mitigation measures prescribed for the impacts. In addition, the mitigation measures would be appropriately designed and implemented to protect the environment and especially water, soil, drainage, flora and fauna of the area/site. The environmental statutory certificate that would be issued and the project (environmental) aspects included in the report would help to control damage to the environment. This is in accordance with the Environmental Management and Co-ordination Act (EMCA), 1999.

10. CONCLUSION AND RECOMMENDATIONS

A major recommendation is the need for a Construction phase Environmental and Social Management Plan (C-ESMP) which will be drafted prior to construction, and will be included as part of the Contractor's contract, to ensure the mitigation and management measures listed in this C-ESMP becomes a contractual condition. As part of the C-ESMP, the following comprehensive stand-alone documents will be provided:-

- Waste (solid and liquid) Management Plan;
- Emergency Preparedness and Response Plan, and
- Occupational Health and Safety Plan.

To prevent duplication, these plans will be adapted from the already existing OPAL's plans that form part of their existing ESMS, but will be adapted specifically for the construction phase and the C-ESMP.

The proponent and the contractor will also be required to update internal environmental and social policies and plans to ensure all activities associated with this Project, including for the construction phase, are included in their existing ESMS.

In addition to the study, the proponent is required to meet the following:-

- Regular Environmental Monitoring and Evaluation during the construction phase;
- An annual Environmental Audit (after one year in operation of the proposed project and thereafter annually);
- Fire audit, risk assessment and safety and health audit has to be conducted for the site at least once every year.

This Environmental and Social Impact Assessment Full study identifies the environmental and social issues that are likely to be significant (scoping) and thereafter their assessment in detail. In the screening and scoping process it has been determined that the project meets a threshold requirement of a finding of significant impacts under established environmental examination procedures, and as stipulated under EMCA (1999) and (Amendment) 2015 and the EIA regulations (2003).

All of the impacts and mitigation and monitoring measures identified in this EIA, will be fully incorporated into OPAL's existing ESMS, to ensure such measures and requirements are all fully implemented.

REFERENCES

1. Government of Kenya (1994), *The National Environment Action Plan, Government printer, Nairobi*
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5. Kenya Gazette Supplement number 56, *Environmental Impact Assessment and Audit Regulations 2003. Government printer, Nairobi*
6. Kenya Gazette Supplement Acts, *Occupational Safety and Health Act, 2007government printer, Nairobi*
7. Kenya Gazette Supplement, *Sessional Paper No. 6 on Environment and Development (1999) government printer, Nairobi.*
8. UN Habitat (2008), *State of The World's Cities 2010/2011 :Bridging the Urban Divide*
9. Machakos County Integrated Development Plan 2013

APPENDICES

Appendix 1: Public Participation and Neighbours' Consultation Forms

Appendix 2: Attendance List of the Attendees at the Public Meeting

Appendix 3: Minutes of the Public Meeting/Baraza

Appendix 4: Project Architectural Drawings (Refurbishment and Redevelopment)

Appendix 5: Land Registration/Ownership Documents

Appendix 6: NEMA TOR Approval Letter for Full Study EIA

Appendix 6: EIA/EA Lead Expert/Firm 2022 License

Appendix 7: Bill of Quantities

Appendix 8: Letter indicating the change of the proponent from the one that submitted the ToR