ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDY REPORT

PROPOSED MINING AND TAILINGS/ORE PROCESSING PLANT FOR LAKESIDE LIMITED IN BONDO SUB-COUNTY

LOCATION:

PLOT L.R NO. BONDO/NYANGOMA/2405, AT NYANGOMA SUB-LOCATION, BONDO SUB-COUNTY, SIAYA COUNTY

Proponent:

Lakeside Limited
P. O. Box 28711- 00100, Nairobi,
Kenya

SEPTEMBER, 2021

DECLARATION

Proposed mining & tailings processing plant for Lakeside Limited *Sept 2021*

DECLARATION

EIA/EA EXPERTS' DECLARATION

We the undersigned consultants, on behalf of the proponent, **Lakeside Limited of P.O. Box 28711-00100, Nairobi,** submit the following Environmental and Social Impact Assessment Report, for the proposed mining and tailings processing plant on plot L.R no. Bondo/Nyangoma/2405, Bondo sub-county, Siaya county. The Environmental and Social Impact Assessment has been carried out in accordance with the Environmental Management and Coordination Act of 1999, (Amended in 2015) and Environmental (Impact Assessment and Audit) Regulations, 2003; Revised in 2018. While undertaking the ESIA for the above-mentioned project, we adhered to the legal requirements, institutional frameworks and international best guidelines. The professional code of conducts, practices and standards were observed in carrying out the ESIA study. To the best of our knowledge; we declare that all the information contained in this report is accurate to the best of our knowledge and a truthful representation of all findings relating to this project.

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PROPONENT'S DECLARATION

I. DIMITRI KANAKARIS .....on behalf of **Lakeside Limited** submit this Environmental and Social Impact Assessment Study Report for the proposed mining and tailings processing plant on plot L.R no. Bondo/Nyangoma/2405, Bondo sub-county, Siaya county to NEMA in compliance with EMCA of 1999 (Amended in 2015) and Environmental (Impact Assessment and Audit) Regulations, 2003 (Reviewed in 2018). To the best of my knowledge, the information contained in this report is accurate and a truthful representation of all findings as relating to the project.

Signature. ..... Date. 23 September 2021

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LIST OF ACCRONYMS AND ABBREVIATIONS

ASM	Artisanal and Small-Scale Miners
BMUs	Beach Management Units
CEC	County Environment Committee
CIP	Carbon in Pulp
CPP	Consultation and Public Participation / consultative public participation
CSR	Corporate Social Responsibility
EA	Environmental Audit
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Co-ordination Act
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
GPS	Global Position System
HDPE	High Density Polythene Sheet
HCN	Hydrogen Cyanide Gas
LM	Lower Midland Zones
LSM	Large-Scale Mining Companies
ML	Mining License
MOA	Memorandum of Agreement
MRB	Mineral Rights Board
MTP	Medium-Term Plan
NEMA	National Environment Management Authority
NEAP	National Environmental Action Plan
NET	National Environment Tribunal
OSHA	The Occupational Safety and Health Act
PA	Participatory Approach
PPE	Personal Protective Equipment
PPM	Parts Per Million
SOP	Standard Operating Procedures
REEs	Rare Earth Experts
TPH	Ton per Hour

DEFINITIONS OF OPERATIONAL TERMS

Authority: Refers to NEMA established under section 7 of EMCA, 1999.

Act: A law which has been approved by the parliament.

Biological diversity/bio-diversity: The variability among living organisms from all sources including terrestrial ecosystems, aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, among species and of ecosystems.

Carbon in Pulp Plant: This is a machine designed to leach gold from the ore and tailings using cyanide and liberate gold from the cyanide solution using activated carbon.

Decommissioning: This is the permanent withdrawal from a site or close down of a facility for restoration.

Developer/Proponent: Means a person proposing or executing a project which is subjected to an EIA or undertaking an activity specified in the second schedule of EMCA, 1999.

EA: The systematic, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing in conservation or preservation of the environment.

EIA: A systematic evaluation of activities and processes of an upcoming project/facility to determine how far these activities and programs conform to the approved environmental management plan of that specific project and sound environmental management practices.

ESMP: Means all details of project activities, impacts, mitigation measure, time, schedule, costs, impact or activities, including monitoring and environmental audit during implementation and decommissioning phase of a project.

Environment: Physical factors of surroundings of human beings including land, water, atmosphere, climate, sound, odor, taste, the biological factors of animals and plants and social factor of aesthetics, culture and includes both the natural and the built environment.

Mining: Process of extracting useful minerals or other geological materials from the surface or sub-surface of the earth.

Mine: Include systems of excavations made for the purpose of extraction of minerals and mineral products, it includes open cast pit, quarry and any other area where mineral is won by dredging brine pumping, evaporation or other means.

Mining Right: Any governmental or other approval, authorization, claim, concession, lease, license, surface rights, sub-surface rights or other rights to conduct mining.

Mitigation: Measures which include engineering works, technology improvement management ways and means of minimizing negative aspects, including socio-economic and cultural losses suffered by communities and individuals, whilst enhancing positive aspects of the project.

Ore: Any mineral or mixture of minerals of intrinsic economic interest located in or on the Earth's crust at a concentration above background level.

Project: Means any undertaking that may have an impact on the environment.

Scoping: Is the process of determining the content and extent of the matters which should be covered in the environmental information to be submitted to a competent authority for projects which are subject to EIA.

Screening: It is a coarse analysis of the possible impacts of an action with a view to identifying those impacts which are worthy of detailed study for a project to be considered for an EIA process or not.

Slurry: Semi-liquid mixture of water and small particles of solid substance such as soil.

Standards: Means the limit of discharge or emission established under the Act or under Regulations.

Tailings: The waste materials left after a target mineral is extracted from ore.

Waste: Any matter whether liquid, solid, gaseous or radioactive, which is discharged, emitted or disposed in the environmental in such a volume composition or manner likely to cause an alteration of the environment.

Water reservoir: Includes drinking water, river, stream, watercourse, reservoir, well, dam, canal, channel, lake, swamp, open drain or underground water.

EXECUTIVE SUMMARY

The proponent of the proposed project (Lakeside Limited) is a registered company in Kenya. The company was created on September 1st, 2016, to hold the mining permit for the proposed Project. The Company is owned at 100% by Avana Resources Limited. The company has acquired a mineral rights board (MRB) approval for their mining license No. ML/2017/0012 in Nyangoma division of Bondo sub-county in Siaya county of the republic of Kenya. The company intends to undertake a mineral ore mining operation as well as putting up a 12 TPH CIP gold leaching plant on plot L.R no. Bondo/Nyangoma/2405, Nyangoma division, Bondo sub-county, Siaya county. The plant will use tailings as well as mineral ore as the main raw material. Tailings will be acquired from the remains of the colonial gold mines while mineral ore will be mined in a section of the same plot and elsewhere within the said Mining License area. The Nyangoma area of Bondo Sub-County has a history of gold mining which dates back to the Kenya's colonial era. The gold ore will be mined using semi-mechanized methods with drilling and blasting. The laboratory analysis of the mineral content of the colonial gold mining tailings and the new mining site show that they are predominantly composed of quartz (>50%), with fairly abundant amounts of mica and plagioclase (10-20%). Other minerals, namely; smectite, magnetite, chloritoid, calcite and chlorite were present in trace abundances. The gold deportment study indicated that the gold occurred in three phases, native gold (which was the main gold-bearing phase at 98%), AuAgHg and as petzite. The colonial gold tailings have already been purchased and transported to plot L.R no. Bondo/Nyangoma/2405where the CIP gold leaching plant will be set. The parcel of land where the project will be sited has already been leased for a period of 10 years 3 months. The size of the leased land is about 21.63Ha although the area where the proponent is expected to set up the CIP gold leaching plant is about 2.1 Ha which has already been fenced out. The other area on the same plot where new gold ore have been found and will be mined too is approximately 5Ha. The development on the plot will consist of a concrete base where the CIP gold leaching plant will be mounted, crusher plant, CIP plant, tailings storage area, temporary structures for offices, warehouse, general store, laboratory, engineering workshop, light fuel storage system, power sub-station, shade for security guards, kitchen and washrooms. The main project activities will revolve around procuring and transportation of tailings to storage site, excavations and blasting of mineral ore, loading and transportation of the ore to the crusher, crushing and grinding, leaching of gold using cyanide and other chemicals, use and recycling of waste water as well as waste generation, storage and disposal. Some of the stated project activities if not well managed have a potential negative impact on the environment. One of the most dangerous substance from gold leaching is sodium cyanide component which if allowed into the environment can have cumulative negative impacts. However, it is important to note that this particular CIP plant will recycle water used in the cyanidation process. All other elements such as carbon, sodium cyanide and lime will also be recycled. Therefore, now discharge will be released into the environment. Used tailings will also be cleaned off cyanide remains.

The proposed project falls under the mining category which is among the projects listed under the second schedule of section 58 (1), (5) of EMCA, 1999 (reviewed in 2015) requiring an ESIA to be carried out before it is implemented. Reference is also made to Part VI, Section 31 (3) (a) (i) and (ii), of the Environmental (Impact Assessment and Audit) Regulations, 2003 which require all upcoming projects to have environmental assessments carried out for them. Based on this requirement, the ESIA was undertaken on the proposed project. The ESIA entailed:

i. Assessment of the baseline conditions of the project area;
ii. Development of the Terms of Reference for approval by NEMA, the ToR were approved on 16th September, 2021
iii. Obtaining the views and opinions of the interested and affected persons;
iv. Analysis of the legislations and regulations relevant to the proposed project and how the project will comply with the specified legislations and policies;
v. Description of the potential positive and negative impacts of the proposed project and their mitigation measures;

vi. Analysis of alternatives to the proposed project including the proposed site, designs, technologies, processes and the reasons for preferring the proposed projects' alternative;
vii. Generation of comprehensive environmental and social management and monitoring plans upon which all mitigation/enhancement measures will be carried out.

A brief analysis of the potential impacts from the mining and tailings processing activities and their mitigation measures is highlighted in table 1.

Table 1: Summary of potential negative environmental impacts and proposed mitigation

Potential Adverse Impact	**Recommended Mitigation Measures**
Loss of biodiversity /Loss of Vegetation Cover and alteration of habitat	• Properly demarcate the project area to be affected by the construction and operation of mining activities to avoid spillover effects to neighbouring areas. • Re-establish vegetation in some parts of the disturbed areas through implementation of a well-designed landscaping programme by planting of appropriate plants. • The blasting, drilling and transportation will be carried out during the day time only minimizing the impact on the wild fauna movement.
Excavations and soil erosion	• The loosened soil to be used in the foundation floor, leveling the ground and landscaping. • Introduce suitable and well-managed vegetation to generate surface covers on the open areas; to control soil erosion
Extraction and usage of consumable materials	• The project and material requirements will be evaluated and quantified to ensure that the design optimizes the use of materials. • Have a procurement plan based on the Bill of Quantities prepared by a Quantity surveyor to avoid potential oversupply of materials and wastage.
Security and safety at the project site	• Fence the construction site to ensure no intruders access the site. • Security guards to always guard the gate to the site to keep away intruders and to control movement within the site. • Lighting as well as security alarms to be installed in strategic positions all over the site during construction and after the completion of the project. • The guards stationed at the gate to document movements in and out of the site.
Risk associated with transportation, handling and storage of mining chemicals and explosives	• Permits to procure, handle and transportation of cyanide and blasting explosives to be sought from the relevant government authorities. • The company to have a qualified person who will be handling chemicals at the plant. • No unauthorized persons shall be allowed into the storage room for these chemicals. • Safety material datasheet and reagents issues and storage protocol should be put in place and adhered to.
Conflicting interest between the project and illegal gold leachers	• Consultation and engagement of the illegal gold leachers on property rights of the mineral resource. • Engage local provisional administration to solve the conflicts on tailings rights. • Support some community empowerment initiatives that are geared towards reducing poverty levels. • Offer employment opportunity to some of the illegal gold leachers. • Transport the tailings to a secured storage facility.

Potential Adverse Impact	**Recommended Mitigation Measures**
Impacts of blasting	• A zone around the mine periphery for safe blasting is proposed and the area shall be suitably fenced. • Daily requisition of explosives will be as per the same day requirement. • A daily register will be maintained for total use and refund of explosives. • All loading and firing shall be directed and supervised by competent person(s) • Inform the local community prior to blasting. • Providing and enforcing the use of earmuffs, dust masks and other PPEs to all workers and visitors to the facility. • Increasing the number of delay detonators used in a round of blasting. • At the end of the blasting surplus explosives will be refunded to the dealer.
Ground and surface Water pollution (through Cyanide leakage and rock blasting)	• Undertake a hydrogeological survey to ensure that blasting and drilling do not interfere with the water table. • All water from the leaching process and tailing washing should be discharged to the mixing/barren tank for recycling and reuse in the leaching process hence should not be released into the environment. • Storm water from the processing section and tailing storage area should be controlled by having a drainage channels all-round the place such that all the storm water from this section is collected and discharged into a pond where it should be monitored for quality. This water should be treated and then pumped back into feeder tanks for reuse in the leaching process. • The tailing storage area should be provided with a base with lining or concreted to prevent percolation of the leachate from the tailings into the soil. This is to prevent soil and underground water contamination. • Leaching tanks shall be designed to offer safe leaching practices without any solutions overflowing
Impact of Chemical fumes from leach tanks	• Every person handling cyanide on site must wear a face mask. • Processing environment should be maintained in basic condition to avoid evolvement of HCN gas which is poison. The plant should use lime to suppress cyanide from being emitted as a fume into the environment.
Increased Traffic	• The local rural roads should be expanded and rehabilitated. • Use construction and warning signs to warn the public on the traffic. • Only needed vehicles to be mobilized to the site, those that are not temporarily in need to be kept off from the project site and area. • Parking to be provide for vehicles within the confines of the project area.
Air Pollution	• Personal protective equipment (PPE) such as dust masks must be worn by those working in the mining site. • Adopt the wet crushing technology to minimize amount of dust generated during crushing of tailings and rock ore. • Sprinkling water during dry season on the road to the mining site to suppress dust.
Noise and Vibration	• Limited mining operations at night. • Drilling with sharp bits and control blasting to minimize the noise pollution from blasting exercise. • workers should be equipped with standard noise attenuation features.

Increase in Water Use	• Water used in leaching plant should be recycled and re-used in the plant. • Harvest rain water to compliment. • Fixing and using self-closing taps with shorter hand-wash cycles at some points of the site and buildings.
Solid Waste/Debris	• Provide waste handling facilities such as waste bins for temporarily holding of wastes generated. • Install double bins for separate collection of recyclable and non-recyclable wastes. • Ensure that the collection and disposal of the wastes is done regularly and appropriately. • Re-use mining waste and soil materials piled at the site to refill (restore) the excavated areas that exist as a result of mining.
Sewage/Human waste from the Personnel at the project site	• When constructing pit latrines, preference should be made to modern pit latrines that can easily be dislodged. • Sanitary facilities should be cleaned every day. • Pit latrines to be de-sludge whenever they near filling up.
Use of energy (electricity and fuel)	• Use of energy efficient night time lighting only at the site. • All energy using equipment used should be switched off when not in use. • Keep records and analyze Kenya Power bills to identify areas of unnecessary use. • Consider installing alternative energy sources such as solar panels and automatic generators not only for power back up but also to reduce dependency on electricity.
Fire	• Places with flammable materials should be declared "NO SMOKING ZONES" and clear notices of the same be displayed. • Fire extinguishers should be installed at strategic locations within and outside specific rooms such as light fuel storage area, offices and in areas where food is prepared. • The "FIRE EXITS" from the buildings should be clearly marked. • "FIRE ASSEMBLY POINTS" at specific points at the site should be established and marked. • Facilitate regular inspection of the firefighting equipment, the period will not exceed six months.
Increased storm water flow	• Run-off to be handled by construction and designing of curbs, channels, side inlets and road side ditches to channel water into existing drainage lines so as to prevent ponding and flooding. • Install gutters and construct tanks to harvest and store rain water for use and thus reducing surface run-off. • Regular repair and open up of drainage channels to be kept them open.
Impacts related to occupational health and safety	• Provide equipped first aid kits and other facilities and services. • Dangerous working areas such as mining site should be protected, fenced, demarcated and cordoned off from the general public. • Leaching tanks, barren tanks and laboratory area should be enclosed to prevent accidents that may result from unauthorized persons entering the area. • Ensure adequate water supply to ensure high standards of sanitation that keeps to the minimum chances of disease outbreaks. • Provide hazard notifications, signage and warnings to warn visitors and staff of potential dangers that may exist in different areas of the facility. • Ensure chemicals are stored in a designated enclosed area, and material safety data sheets are within easy reach.
Sexually Transmitted Infections and HIV / AIDS	• Institute HIV/AIDS awareness and prevention campaign amongst workers e.g., erect and maintain HIV/AIDS information posters at prominent locations within the project site. • provision of condoms and monthly educational video presentation and

	discussions.
Social crime risks	• Adopt strict hiring guidelines to lock out the bad elements. • Workers should not be housed at the project site. • No worker should be allowed to enter the project site or operate project machine when under the influence of alcohol or drug and substance abuse.
Oil leaks and spills	• Maintenance of project vehicles should only take place at a designated garage. • Any wash off from the oil/grease handling area or workshop should be drained through impervious drains. • All machinery must be keenly observed not to leak oils on the ground. This can be affected through regular maintenance of the machinery.
Creation of an ecologically vulnerable land	• Rehabilitation of mines through back filling. • Re-vegetation to increase soil stability
Job losses and insecurity	• Train employees on alternative livelihoods prior to decommissioning. • Pay terminal benefits to all employees.
Hazardous waste disposal, Safety and health risk	• Laboratory analysis of the tailings should be done to establish if sodium cyanide traces are still present. • Any cyanide contaminated material will be re-introduced into the plant to fully utilize the available cyanide. • The tailing should be analyzed further to determine and ensure complete flush out and neutralization of cyanide. • When completely free from cyanide, tailings should be compacted to ensure they are not carried away by storm water, vegetation can be allowed to grow. • Tailings free from cyanide can be used to make bricks or fill open pits.

CHAPTER ONE: INTRODUCTION

1.1 Background information of the proposed project

The proponent of the proposed project, Lakeside Limited intends to put up a CIP gold leaching plant on plot L.R no. Bondo/Nyangoma/2405, Nyangoma division, Bondo sub-county, Siaya county. The plant will process gold from tailings remains from colonial gold mining as well as from the ore that will be mined on the same plot and elsewhere within the Mining License area. The Nyangoma area of Bondo Sub-County has a history of gold mining which dates back to the Kenya's colonial era. The gold ore will be mined using semi-mechanized methods with drilling and blasting. The laboratory analysis of the mineral content of the colonial gold mining tailings and the new mining site show that they are predominantly composed of quartz (>50%), with fairly abundant amounts of mica and plagioclase (10-20%). Other minerals, namely; smectite, magnetite, chloritoid, calcite and chlorite were present in trace abundances. The gold deportment study indicated that the gold occurred in three phases, native gold (which was the main gold-bearing phase at 98%), AuAgHg and as petzite. The colonial gold tailings have already been purchased and transported to plot L.R no. Bondo/Nyangoma/2405where the CIP gold leaching plant will be set. The parcel of land where the project will be sited has already been leased for a period of 10 years 3 months. *(Lease document is attached in this report)*.

The size of the leased land is about 21.63Ha although the area where the proponent is expected to set up the CIP gold leaching plant is about 2.1 Ha which has already been fenced out. The other area on the same plot where new gold ore have been found and will be mined too is approximately 5Ha. The development on the plot will consist of a concrete base where the CIP gold leaching plant will be mounted, crusher plant, CIP plant, tailings storage area, temporary structures for offices, warehouse, general store, laboratory, engineering workshop, light fuel storage system, power sub-station, shade for security guards, kitchen and washrooms. Table 2 summarizes the background information of the proposed project.

Table 2: Summary of the proposed gold mining and leaching project

Item	Description
Name	Proposed mining and tailings/ore processing plant
Specific objectives and scope of development	The project entails: i. Setting up a 12TPH carbon in pulp (CIP) gold extraction plant; ii. Process the existing colonial tailings to extract gold deposits; iii. Mining of the mineral ore in the underground rocks on the same plot; iv. Processing the mineral ore to extract gold deposits
Proponent	Lakeside Limited, P.O. Box 28711- 00100, Nairobi, Kenya
Location	Plot L.R no. Bondo/Nyangoma/2405, Bondo sub-county, Siaya county
Land area and ownership	The parcel of land where the project is expected to be located is about 21.63 Ha. The land is a private land leased to Lakeside limited for the project for a period of 10 years and 3 months. The CIP plant operation area is 2.1 Ha while the area where the mining is expected to take place is about 5 Ha. *The lease documents are attached in this report.*
Project estimated cost	1,855,276 USD i.e., the non-recurrent expenditure

1.2 Project proponent

Lakeside Limited is a registered company in Kenya. The company was created on September 1st, 2016, to hold the mining permit for the proposed Project. The Company is owned at 100% by Avana Resources Limited. The company has acquired a mineral rights board (MRB) approval for their mining license in Nyangoma division of Bondo sub-county in Siaya county of the republic of Kenya. (*Company registration details and the mining and prospecting licenses attached in this report*).

1.3 Rationale for the ESIA

The purpose of the Environmental and Social Impact Assessment (ESIA) study is to ensure that all impacts whether direct or indirect and particularly environmental, social and economic impacts are fully examined and addressed. The proposed project which falls under the mining category is among the projects listed under the second schedule of section 58 (1), (5) of EMCA, 1999 (reviewed in 2015) requiring an ESIA to be carried out before it is implemented. Reference is also made to Part VI, Section 31 (3) (a) (i) and (ii), of the Environmental (Impact Assessment and Audit) Regulations, 2003 which require all upcoming projects to have environmental assessments carried out for them. ESIA provides baseline information upon which subsequent environmental assessments are based upon and addresses mitigation options for potential impacts. The main purpose of an ESIA is therefore to assist the proponent, NEMA and all other stakeholders in understanding potential environmental consequences of the proposed gold mining and leaching project and thus provide a basis for making informed decisions on the proposed project.

1.4 Objectives of ESIA

The overall objective of this ESIA is to ensure that the proposed mining and gold processing project integrate environmental concerns during construction, operation and decommissioning phases of their project; this is to ensure sustainable development. The specific objectives of undertaking the ESIA are to:

a) To establish the baseline environmental status of the project site;
b) Identify potential environmental impacts of proposed project; both positive and negative;
c) Assess the significance of these impacts to the environment and other stakeholders;
d) Assess the relative importance of the impacts of alternative plans to the proposed project;
e) Address proposed mitigation measures for the significant negative impacts of the proposed project on the environment and all involved stakeholders;
f) Propose an Environmental and Social Management Plan (ESMP) to guide the implementation of mitigatory measures and monitoring throughout the implementation of the project and contribute to the overall process of project monitoring and auditing. This will enable the project developer to take timely action to prevent negative environmental and social impacts before they become irreversible;
g) To prepare an ESIA Study Report compliant with EMCA, Cap 387.

1.5 Terms of reference for the ESIA

The TOR developed for this study covered the following:

viii. Generate environmental baseline conditions of the project area;
ix. Obtain the views and opinions of the interested and affected persons;
x. Outline the legislations and regulations relevant to the proposed project, review the relevant legislative frameworks and show how the proposed project will comply with the specified legislations and policies;

xi. Describe the potential positive and negative impacts of the proposed project and the potentially affected environments;

xii. Recommend potential mitigation measures for the adverse impacts and enhancement measures for the positive impacts;

xiii. Describe and analyse alternatives to the proposed project including the proposed site, designs, technologies, processes and the reasons for preferring the proposed projects' alternative;

xiv. Generate comprehensive environmental management and monitoring plans for the proposed project covering the construction, operation and decommissioning phases upon which all mitigation/enhancement measures will be carried out;

xv. Generate a comprehensive ESIA report in accordance with the EIA regulations as outlined in the Environmental (Impact Assessment and Audit) Regulations, 2003 for submission to NEMA and for further instructions and/or approval.

The ToR for this study; (NEMA/TOR/5/2/329) was approved by NEMA on 16th September, 2021.

1.6 Scope of the ESIA

Guided by the terms of reference, the scope of this ESIA study revolved around the following key areas of assessment:

a) Collection of baseline information relevant to the proposed mining project;
b) Describing the design of the proposed mining operations and gold leaching as well as location of the proposed project;
c) Providing a clear description of the proposed project activities during construction, operation and decommissioning phases;
d) Undertaking a public consultation process by means of administering questionnaires, key informants' interviews and public consultation forums in order to obtain views and comments from interested and affected persons;
e) Identifying and evaluating the economic and socio-cultural impacts of the proposed project to the local community and the nation in general;
f) Identifying mitigation measures to the identified impacts, developing action plans that ensure the health and safety of the workers and neighbours in the project cycle;
g) Developing environmental and social management and monitoring plans for effective management of the environment and for future monitoring of the environment.

1.7 Study approach and method

This assessment was carried out in accordance with the procedures and protocols in the Environmental (Impact Assessment and Audit) Regulations, 2003. The assessment involved:

a) Environment screening in which the project was identified as among those requiring Environmental Impact Assessment under schedule 2 of EMCA, 1999;
b) Environmental scoping that provided the key environmental issues to be covered and the level of the ESIA process;
c) Extensive site tours to physically inspect and document existing facilities at the site and natural and socio-economic features of importance;
d) Interviews with the interested and affected persons including the proponent, his project management team, officers from the Siaya county NEMA and county environment committee, and local artisanal miners among other groups in the neighborhood regarding the proposed project. Three public participation forums were held in the ESIA study.

e) Desktop studies for documentary review on the nature of the activities of the proposed project, proposed project related documents, plans, designs, policy and legislative frameworks as well as the environmental setting of the area amongst other things**.**

1.7.1 Environment screening

The project was screen with reference to the second schedule of section 58 (1), (5) of EMCA, 1999 (reviewed in 2015). The screening of the mining and gold extraction project showed the project is categorized under the mining projects which are high risk projects.

1.7.2 Environment scoping

Scoping was done to identify the most critical issues requiring attention during the assessment. From the scoping, key environmental area of assessment was identified and categorized as: physical, natural/ecological, social, economic and cultural. The scoping exercise was done in consultation with the project developer, and environmental field officers from NEMA. The most likely significant impacts were identified and more attention was focused on those impacts.

1.7.3 Site visits and public participation

Site visits were done to evaluate the environmental setting around the proposed site. Some of the key aspects observed during the site visits include: topography, land tenure, surface and ground water sources, public amenities, land cover, climate, flora and fauna, soils, among others. Interviews were done with the local public offices including environment, water, provisional administration, lands and health to seek their views, concerns and opinions concerning the proposed project.

In order to reach a large section of the residents as well as other interested and affected parties, a comprehensive consultative public participation exercise was undertaken. This was organized through the office of the local chiefs of Nyangoma and Uyawi sub-locations. The public participation was conducted in a participatory and consultative manner to establish if the local residents foresee any positive or negative environmental effects from the project. To further understand how the residents would wish the perceived impacts to be addressed, informal interview sessions and structured questionnaires were administered to the project area residents, (*See attached household questionnaires).*

1.7.4 Review of relevant literature

A desk study was done to review the existing institutional and legislation frameworks on mining and related activities, the documented baseline data of the study area, and other similar studies reports on gold extraction process and related impacts.

1.7.5 Data analysis and evaluation of alternatives

Data collected was analyzed mainly through expert judgement informed by checklists and threshold limits based on set environmental standards. The main components analyzed include:

i. The potential environmental impacts from the projects and their magnitude during construction, operation and decommissioning phases;
ii. Technologies used to mine the gold ore and extract gold from the tailings and mineral ore;
iii. Explosives and other chemicals used in the mining process, their handling, storage, and disposal of the waste products;
iv. Rehabilitation options of the open pit mines after extraction of mineral ore.

CHAPTER TWO: PROPOSED PROJECT DESCRIPTION

2.1 Project location

The proposed project is located in Nyangoma area of Bondo Sub-County in Siaya County. The site is 20 km from Bondo Town on dirt road off Bondo-Usenge road. The main entry to the project site along Bondo-Usenge road is at Maranda junction. The Project area is characterized by relatively flat terrain sloping gently towards Lake Victoria to the north. Vegetation consists mostly of light scrub and seasonal grass. The project is situated in Nyangoma Sub-Location, Central Sakwa location on plot L.R no. Bondo/Nyangoma/2405, Bondo sub-county, Siaya county. The proposed project site has no zoning restriction for specific land use. Figure 1 below shows the location of the project site; Figure 2 shows the satellite imagery of the proposed project site and the surrounding environment; Table 3 shows the coordinates of the project site.

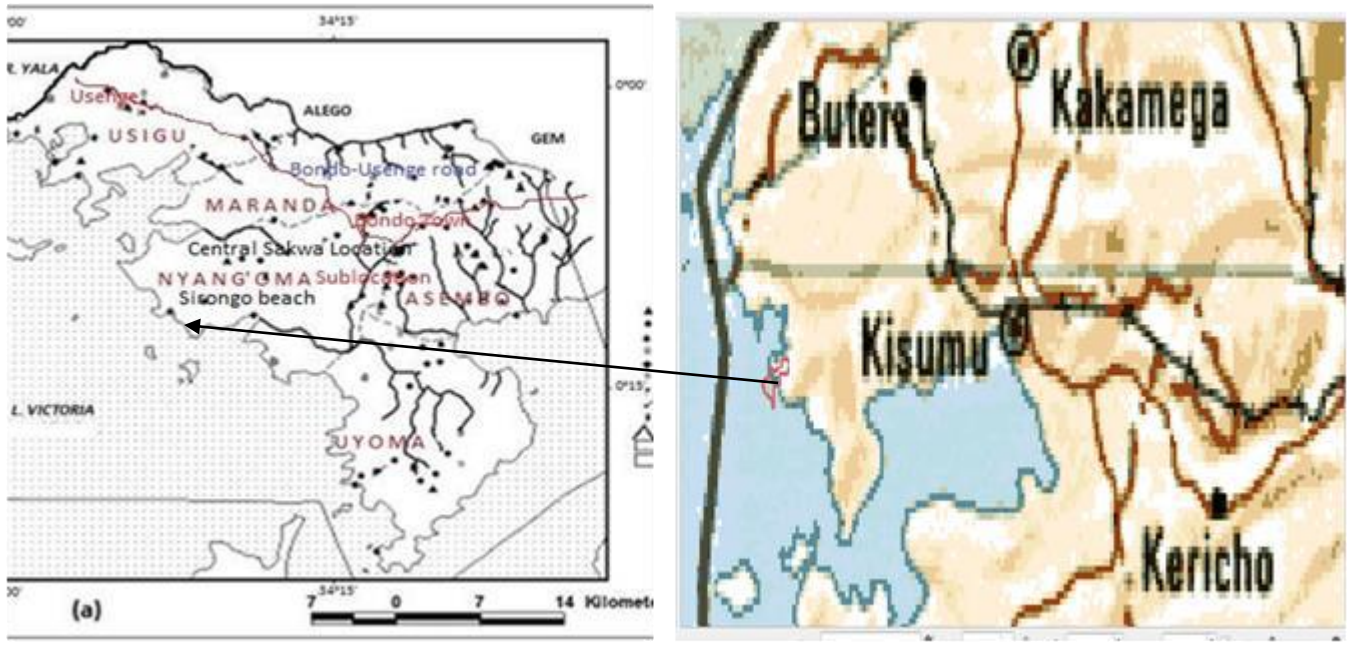

Figure 1: Map showing the location of the project area in Nyangoma sub location, Bondo sub-county

Figure 2: A satellite imagery showing the project site with the neighbouring areas.

Table 3: Coordinates of the project site.

Order	N/S	LATITUDE	E/W	LONGITUDE
2405 A	SOUTH	-0.15092941	EAST	34.10559998
2405 B	SOUTH	-0.149254454	EAST	34.10296664
2405 C	SOUTH	-0.14884592	EAST	34.10205896
2405 D	SOUTH	-0.148548782	EAST	34.10066413
2405 E	SOUTH	-0.147248665	EAST	34.10023606
2405 F	SOUTH	-0.146728568	EAST	34.1003467
2405 G	SOUTH	-0.146542825	EAST	34.10123963
2405 H	SOUTH	-0.146308718	EAST	34.10191488
2405 I	SOUTH	-0.146241831	EAST	34.10254586
2405 J	SOUTH	-0.146249291	EAST	34.10292959
2405 K	SOUTH	-0.146289608	EAST	34.10314685
2405 L	SOUTH	-0.14618366	EAST	34.10346854
2405 M	SOUTH	-0.145738162	EAST	34.1041018
2405 N	SOUTH	-0.144277783	EAST	34.10486774
2405 O	SOUTH	-0.1445626	EAST	34.10573384
2405 P	SOUTH	-0.14599272	EAST	34.1066416
2405 Q	SOUTH	-0.147719309	EAST	34.10636324
2405 R	SOUTH	-0.14926929	EAST	34.10594406
2405 S	SOUTH	-0.149757033	EAST	34.10573853

2.2 Project design and components

The proposed project will entail mining of gold ore, setting up of a CIP gold processing plant and processing gold from the mined gold ore as well as from existing tailings that were mined and processed during colonial era. The project will be implemented on the plot L.R no. Bondo/Nyangoma/2405, Bondo sub-county, Siaya county. The land parcel measure 21.63 hectares and it is located within a sparsely populated neighborhood. Technical drawings for the proposed tailings processing and gold leaching plant show that it will have the following compartments:

a) A chute feeder which feeds the tailings into the coarse and fine crushers.

b) Crushers for grinding the rocks and tailings.
c) Vibrating screen which sorts the crushed ore.
d) Fine ore storage bin for storage of the crushed ore.
e) Vibrating feeder for feeding the fine ore into the ball mill.
f) Ball mill for grinding and blending the ore further.
g) Water pumps for pumping recycled water back to the ball mill.
h) Hydro cyclone; separates fine from coarse particles and produce an underflow slurry of a consistency that induces efficient grinding in the mill to which the slurry is recycled.
i) Thickener; for dewatering the slurry, separating the liquid from the solid particles.
j) Flocculant system; this will be used to remove suspended solid particles in liquid solutions.
k) Leaching tank, this is where the leaching of gold from mineral ore will take place, the tanks will be constructed using leak proof materials.
l) Water recycling dam, this is a well-constructed leak proof water dam. Solutions from the filter press machines will be discharged into this dam then pumped back to the water tank feeding the ball mill (reused). The dam for this project will measure 30m x 30m x 2m.
m) Emergency water spill way measuring 10m x 10m, this part will have a lining that will not allow water seepage into the ground or into surface run-off.
n) Desorption electrolysis system; allows recovery of gold from activated carbon. (*Drawing design of the plant is attached in this report*).

Chemicals to be used in the CIP leaching plant will include:

i. Cyanide will be used for leaching gold from the ore. It is important to note that cyanide is highly toxic and can result in substantial environmental impacts and public health risks if released into the environment. There are evidential cases where cyanide spills have resulted in major fish kills, contaminated water supplies and harmed agricultural land.
ii. Hydrochloric acid for treating carbon used to extract gold from cyanide solution.
iii. Lime for raising pH that will be maintained above 11 in the leaching system.
iv. Carbon used to trap the gold from the solution, separating it with other impurities.

Other materials will include water, diesel and electricity

The following facilities will be established at the project site:

a) Temporary office structures;
b) Temporary warehouse structure;
c) general storage structure;
d) Laboratory structure which will be a permanent building constructed out of masonry work; The main role of the laboratory will be to test the content of cyanide in the processed tailings as well as storage of chemical reagents.
e) Engineering workshop;
f) Light fuel storage system;
g) Power sub-station;
h) Shades for security guards;
i) Kitchen facility;
j) Pit latrine for both male and female;
k) Security lighting will be provided outside to enhance security at night at the proposed site;
l) Water storage facility; the project will have the common above ground water tanks that will be feeding water into the leaching tanks.
m) Tailing's storage facility.

2.3 Raw material and mining technology

The proposed project will utilize the existing tailings from the colonial gold mines as well as mine new gold ore at the project site. Machinery, equipment and tools will include; excavators, tipper trucks, water pumps, electrical fitments, wheel barrows, spades, hammers, chisels and water hose pipes etc. Safety equipment will include: fire extinguisher, safety gears for staff, PH control equipment, special purpose lab masks, complete package first aid kit, safety protective equipment's. Other inputs are work force; both skilled and unskilled, land, energy and machineries.

2.3.1 The colonial tailings

Tailings to be used by the proposed CIP gold processing plant are from mining operations in the colonial era by the colonial mines. During those days, the existing mining technology could not extract gold fully from the ore. However, with the current innovations in mining technology, more gold can be extracted from the ore. The gold deportment study of the tailings indicated that the gold occurred in three phases, native gold (which was the main gold-bearing phase at 98%), AuAgHg and as petzite. The tailings were transported from the site where they were dumped to the proposed project site for storage before the extraction work begin. The tailings are stored in a fenced secure place to curb stealing by the illegal gold leachers (plate 1 shows the tailings stored at the proposed project site).

Plate 1: The taillings stored at the project site

2.3.2 Gold ore and mining technique

The proposed project site is within the area where the ministry of Petroleum and Mining allowed Lakeside Limited exclusive right to prospect and mine the precious metal (gold). The geological investigation revealed existence of some gold ore in underground rocks on a section of plot L.R no. Bondo/Nyangoma/2405, Bondo sub-county, Siaya county. Based on this evidence, the proponent intents to mine the gold ore in the section of the plot shown in figure 3.

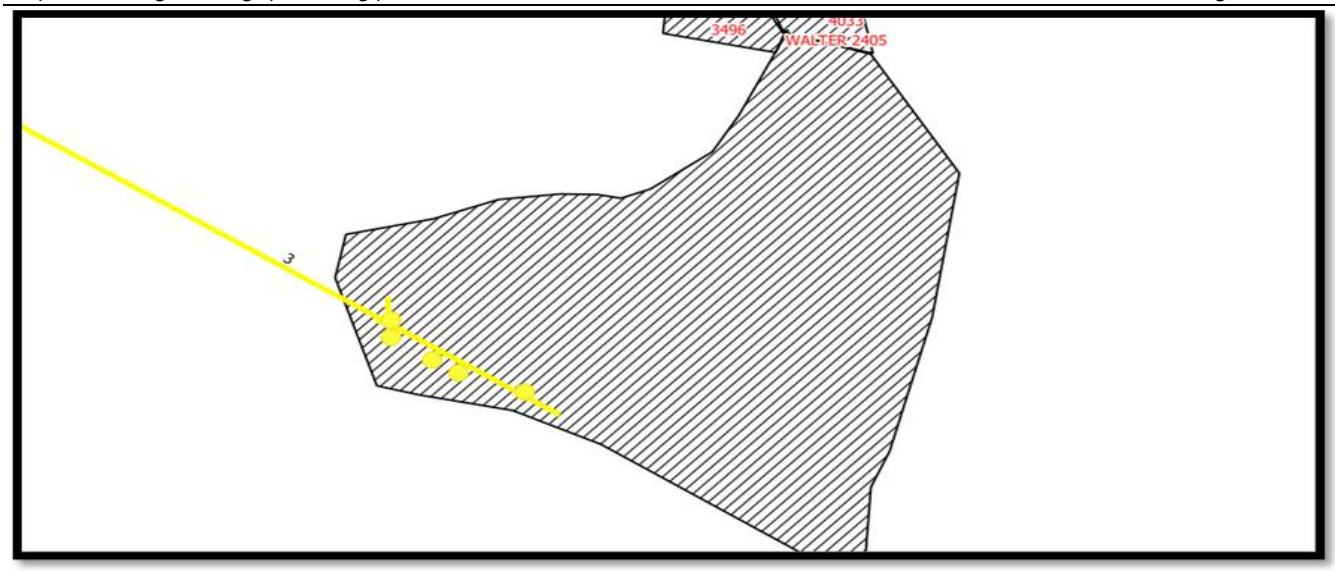

Figure 3: Map of the project site with the area shown in yellow where mining is going to take place

The proposed project will employ an open cast mining technique, four main processes will occur during mining i.e., excavation, blasting, loading and transportation of boulders to the crushers. Primary blasting will be undertaken for the purposes of breaking rock boulders into acceptable sizes for onward transportation to the crushers. Secondary blasting will not be needed. Bench height will be 6 m and width not more than 6 m, bench slope will be 45°. Tipper trucks will transport the extracted material to the crusher which is about 400m from the mining site.

2.3.2.1 Blasting technique

Blasting will involve drilling holes in the rocks, charging them with explosives and detonating the holes in a planned sequence. The blasting is needed to excavate the gold ore bearing rocks. The safe blasting is proposed by adopting all the safety measures as per Explosives Act' and with the permission from the state department of mining. The blasting will incorporate both deep hole as well as short hole blasting techniques. Equipment to be used consist of Air compressor, Jack hammer drills, exploder and water pump.

2.3.2.2 Explosives to be used

Blasting will be done by various types of explosives. Generally, the following conventional types of explosives are used in mining. Slurry explosive (AN based) viz. power gel, Acquadyne, Superdyne etc. are proposed as primer. Blasting agent is proposed as ammonium nitrate fuel oil (ANFO) mixture. The ANFO mixture will be readily produced at site by mixing ammonium nitrate (94.5%) with diesel oil (5.5%). Initiation is proposed by half second delay detonators.

2.4 proposed project activities

The proposed project has three main overlapping phases: construction, operation and decommissioning phases. A summary of the main activities under each phase of the proposed project is presented in the Table 4.

Table 4: Description of main project activities

Phase	Main activities
Construction	a) Fencing of the project site b) Site preparation and mobilization of construction personnel, equipment and construction material c) Removal of vegetation, rubbish and unwanted materials from the construction site d) Excavation and building concrete base where CIP will be mounted, construction of laboratory, warehouse, office, store, light fuel storage facility, latrines, kitchen and security room e) Buying and transportation of tailings to the site f) Metallurgical testing of tailings sample to analyse the gold content g) Sourcing and transportation of gold recovery materials involved in the proposed project which include cyanide, carbon, limes and hydrochloric acid. h) Sourcing and transportation of blasting materials i) Installation of CIP gold leaching plant
Operation	i. Excavations and blasting of rocks ii. Loading and transportation of rocks to the crusher iii. Tailings and rock ore crushing iv. Grinding of the ore into fine particles v. Leaching of the tailings using cyanide vi. Use of water and energy resources vii. Disposal of solid waste materials viii. Recycling of water ix. Repair and maintenance of machines, trucks, electricity system and CIP plant parts
Decommissioning	i. preparation of decommissioning plan ii. ceasing all the operation of the facility iii. removal of any machinery of the site and laying off employees iv. dismantling of all the equipment's and any other thing that can be dismantled for reuse, recycle or sale v. filling up of excavations vi. removal of processed tailings from the site

2.5 The process of gold extraction from tailings and run of mine material (feed) in a CIP plant

The mining method is envisaged as a front-end loader picking up the tailings and depositing in the plant either directly or to a surge stockpile situated by the plant. The processing of feed and leaching of gold will entail the following procedure:

a) The plant is fed via a front-end loader through a feed hopper. A static grizzly will remove any oversize material or vegetation. A feeder will control the tonnage of feed onto a conveyor which feeds a ball mill together with water so that the correct density is achieved in the mill. The objective of the mill is to ensure that the tailings are reduced in size to 80 percent passing 75 microns.

b) The material discharging from the mill is pumping to a hydro cyclone. The underflow of the cyclone (Coarse material) is recycled back to the mill, whilst the overflow reports to a thickener.

c) The thickener controls the density of the slurry feed to the leach section whilst recovering water that will be recycled back to the mill. The thickener underflow material reports to a series of leach tanks to which a cyanide solution is added and the pH adjusted with calcium hydroxide.
d) The slurry from the leach tanks reports to a series of tanks containing activated carbon. Fresh activated carbon is added to the last tank (Where the gold concentration would be the lowest) and gold loaded carbon is removed from the last tank.
e) The gold is removed from the loaded carbon into solution via an elution process.
f) The gold is then recovered from the solution via an electrolysis process.
g) Gold is then generated by smelting the electrodes from the electrolysis process.

2.6 End product and waste product management

The anticipated end product for this project is Gold. The by-products will include: barren water and used tailing. The solid and liquid waste management will follow the following process:

a) The tailings from the leach process will report to a filter press which will remove most of the solution.
b) The solid tailings will then be stacked on a concrete line pad to ensure further drainage.
c) Any fluids that drain from this pad will be re-routed into a return water pond.
d) The solution from the filter press will be collected in a small concrete lined settling pond to remove more solids.
e) This pond will overflow into the lined return water dam.
f) This water will then be pumped into the water tank at the start of the process, where it will be combined with fresh water from the lake. The return water pond will have a concrete spillway to a lined emergency dam.

The design of the plant is such that from a water perspective it is a closed system.

2.7 Project time frame

Generally, it is proposed that since the project does not need a lot of structures to start, site preparation will take 6 months to set up. Operation of the site will depend on the market demand and availability of feed material.

Table 5: The project schedule

Time Period in months	**Project Activities**
Month 1	• Design mine site location and layout • Design processing plant location and layout • Design settlement pond and water recycling dam location and layout • Place purchase orders with manufacturers of 12tph leach processing plant and equipment • Place purchase orders for dam construction materials Sign contracts for hire of heavy earth moving equipment to do dam construction (bulldozer, compactor, and excavator) • Construct camp with staff accommodation, central kitchen, ablution facilities, office and storage. (Already complete). • Apply for permit to import sodium cyanate cyanide
Month 2	• Construct two settlement ponds, 30m x 30m x 2m • Construct water recycling dam, 30m x 30m x 2m • Construct emergency water spill way 10m x 10m • Construct civil works to receive processing plant

	• Place purchase orders for all mine consumables (diesel, gasoline, lime, carbon, HCL, sulphuric acid and cyanide), blasting agents
Month 3	• Construct processing plant • Do hot commissioning of processing plant • Calibrate processing plant
Month 4	Start of commercial production running one full eight hour shift per day. 1997 tons of head feed per month 97 ounces of gold recovered per month
Month 5	Introduce a second full eight hour shift. 3994 tons of head feed per month 193ounces of gold recovered per month
Month 6	Introduce a third full eight hour shift. 5990 tons of head feed per month 290 ounces of gold recovered per month

2.8 Estimated project investment cost

The proposed gold recovery plant development is estimated to cost approximately 1,855,276 USD i.e., the non-recurrent expenditure.

2.9 Project justification

The project will provide employment during both construction and operation phases. The proposed project will create market for goods and services especially construction input which include raw materials, it will create employment opportunity and the government will benefit in terms of revenue through taxes which will be levied on goods and services purchased during the entire project period. Many secondary businesses are also likely to come up during the construction phase especially those providing foods and beverages to the construction workers and it will put into use the economic value of unused tailing by extraction of gold.

CHAPTER THREE: BASELINE INFORMATION OF THE STUDY AREA

3.1 Introduction

This chapter provides a description of the existing environmental status at the proposed project site, which constitutes the baseline for the study. Emphasis is placed on describing, flora and fauna, land-use patterns, socio-economic activities, population, topography, climate and geology among others so as to provide information from which the potential impacts of the proposed project can be predicted.

3.2 Physical environment

3.2.1 Climate

The proposed project area is in Bondo Sub-County which lies between 0° 26° to 0° 90° and from longitude 33° 58° E and 34° 35° W. The sub-county has a modified equatorial climate with strong influence from local relief and the expansive Lake Victoria, which influence rainfall amounts and distribution. Predominantly, Bondo has warm, dry and humid climate with mean annual rainfall ranging between 800- 1600 mm on bi-modal rainfall pattern of long rains occurring between March and May and short rains occurring between October and November. Temperatures too vary with mean of 22.5ºC and evaporation varies between 2000 mm and 2200 mm annually.

3.2.2 Ecological conditions

Ecologically, Siaya County spreads across agro-ecological zones Lower Midland Zone 1 (LM1) to LM 5. The project site which is in Sakwa Bondo is in the lower central parts of the County, covering the whole of Sakwa and Asembo in Bondo and Rarieda Sub-counties respectively and the lower parts of Boro Division are classified as the midland zone LM3.

3.2.3 Geology

The Nyanzian and Kavirondian systems forming the Nyanza Craton are the oldest archaean rocks in the region where the proposed project site lies, the rocks ages over 2,500 million years. The Nyanzian system is mainly composed of lavas and pyroclastics with minor sediments and banded ironstones while the Kavirondian System comprises alternating layers of sandstone and shales (including grits, conglomerates, mudstones and greywackes) which are slightly metamorphosed.

Both the Nyanzian and Kavirondian systems are isoclinally folded about axes that have an east-westerly trend. Kavirondian, is only slightly younger than Nyanzian but folding in the two systems has similar orientation. Numerous granitic bosses and batholiths have intruded the Nyanzian and Kavirondian. The Kavirondian intrusions are more but the pre-Kavirondian were also widespread and the two systems are discernible.

The proposed project site is within the area where the ministry of Petroleum and Mining allowed Lakeside Limited exclusive right to prospect for precious metal (gold). The geological investigation revealed existence of some gold ore in underground rocks on a section of plot L.R no. Bondo/Nyangoma/2405, Bondo sub-county, Siaya county, figure 4 is the available geological map of the project site.

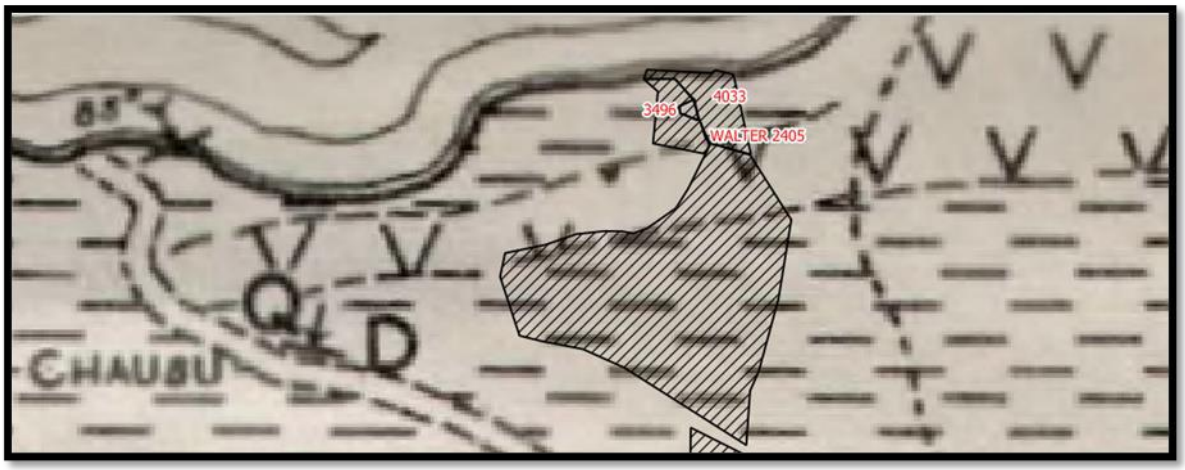

Figure 4: Geological data of the underground rocks at the project site i.e., the map was the only one existing which date back to 1937

The areas with a (V) are mapped as Andesite and trachyandesites with intercalated tuffs, the areas with (–) are mapped as Rhyolite lavas. Information from the mapping works of the project geologist gave similar results with the one captured in figure 4. However, the geological structure which belong to Nyanzian group were found to be complicated with the presence of basalts and mineralised quartz zones. The mapping also revealed the presence of a number of shafts, which could be of colonial age and a number of cross-cutting quartz vein. Apparently, the quartz vein gets more competent with depth. The mineralised quartz zones will therefore require blasting in order to generate sufficient volume for the plant production.

3.2.4 Soils

From the geological coverage, the soil types found range between black-cotton, sandy loams and laterites including red volcanic soils in the north. The Black cotton soils are mainly found around the wetlands near Lake Victoria. The sandy loams and laterites including the red volcanic soils are mainly found as you move away from the Lake Victoria. The project site is located in Nyang'oma which is very close to the Utonga Bay of Lake Victoria.

3.2.5 Air quality and noise levels

Air quality is becoming deteriorated due to the presence of dust particles and vehicle exhaust emissions in the air that are accelerated mainly by vehicles moving on dry and dusty roads. This is especially high during the dry season due to the drying effect of the road. Noise levels are high sometimes even at night, this is attributed to the activities of illegal small scale gold leaching operators who use modified diesel engines fitted with a grinder that produces too much noise. Plate 2 shows a machine used by the illegal leachers which produces too much noise.

Plate 2: Modified machine run on diesel engine used by artisanal miners to grind tailings near the project site

3.3 Biodiversity

3.3.1 Flora

Acacia is the most common tree species found sparsely distributed around the project area. from the key informant interviews, it was noted that the number of these Acacia tree species was reducing due to charcoal burning in the area. *Balamites aegyptica* which is known as "otho" in local Dholuo language was also observed mainly in areas with black cotton soils. Other common tree species around the project area include: *Albezia coriava, Ficus tonmingii sycomora, Marthamia lutea, Chlorophora excelesa, Lamea SPP* and *Euphoria trichi callii*. *Chlorophora excelesa:* is linked to cultural beliefs among the Luo community and people fear felling it. It has prime timber and also used for medicinal purposes. *Lamea SPP* is used for medicinal purposes and conserved in the homesteads for shade. Plate 3 shows vegetation characteristic of the project site.

Plate 3: Vegetation characteristics at the project site

3.3.2 Fauna

Different animal species exist such as crocodile, hippos (in the lake), terrestrial ones include antelopes, wild pigs exist in Bondo Sub- County. There are no protected areas and the available species roam subjecting them to illegal poaching as well as causing human-wildlife conflicts. Cases of hippos killing people, destroying crops and causing injuries have been reported in past years; crocodiles have caused deaths of fishermen and community members who get water for domestic use directly from the Lake.

3.3.3 Invasive species

Water hyacinth is the main invasive plant species around the project area, the species invaded Lake Victoria and has becomes a nuisance on the landing beaches.

3.3.4 Species conservation Status

The most conserved tree species is *Chlorophora excelesa* and *Euphoria trichi callii* species due to their cultural linkages which people fear to use them. Tree species in homesteads are also conserved due to social aspects; farmers/individuals who have established commercial woodlots, are well conserved. Also trees and other plants planted in the institutions such as schools, churches and administrative offices are well conserved and managed well.

3.4 Socio-economic aspects

3.4.1 population

Population densities are high in urban centres, shopping centres and beaches where there are considerable economic activities and better infrastructural development. In other areas around the project location, population is sparsely distributed. Nyang'oma is a rural area and according to the Siaya CIDP (2018-2022), the area population density is estimated at186 persons/km².

3.4.2 Socio Economic activities

(a) Agriculture

Agriculture contributes 79% to the household incomes. As a result of massive unemployment experienced, particularly among the energetic youth, many people are turning to farming as a way of livelihood. Agriculture is a top priority sector in Bondo because it is largely rural and the bulk of the population relies on farming and fisheries as their main source of livelihood. Farming is however carried out for subsistence and the main food crops produced include maize, sorghum, beans, green grams, cowpeas, groundnuts, simsim, cassava, sweet potatoes, kales, bananas and mangoes. The potential exists for high income crops like groundnuts, simsim, maize and legumes through irrigation to ensure that they are available throughout the year. Grain Amaranth production was introduced as a cash crop in Bondo in 2005 in a bid to alleviate poverty. These crops are grown in both pure and mixed cropping systems depending on biological and socio- economic factors. Agricultural production has been affected by land degradation and climatic variability including prolonged droughts. Has affected standard of living and created unemployment.

(b) Livestock Keeping

The vast land in Bondo has a high potential of livestock production. Unchecked keeping of livestock has resulted to overgrazing which has increased the loss of soil cover, through soil erosion. Livestock include: cattle, sheep, goats, poultry, local domestic birds including turkeys, ducks and geese which are kept under free range. Some households engage in commercial poultry farming which mainly include keeping broilers breed of chicken for meat and layers for eggs.

(c) Fishing

Bondo is endowed with an estimate of 1000 km² of water area, making fishing to be one of the major economic activities in Bondo. However, it is imperative to note that over-fishing in breeding grounds in bays along the lakeshore and trawler fishing has negatively impacted on sustainable exploitation in the industry.

Bondo has about 67 landing beaches which are being run by Beach Management Units (BMUs) whose membership includes only the local community (primary stakeholders), this has ensured public participation. BMUs are some of the institutional structures created by Fisheries Department to oversee activities at the fish landing beaches. The BMUs have also established environmental management committees charged with the ensuring good sanitation at the beaches.

(d) industry and trade

Types of industries in Bondo (as classified by Ministry of Industry, Trade & Services) are:

i. Agro-based; meat & dairy products, feed mill, confectionary, hides & skins (rural tanning), honey processing, wood products, furniture & fixtures, juice processing. Cottage industry in this case include honey processing, juice processing, milk processing, bread & confectionary and pottery;

ii. Artisan/jua kali; carpentry, tailoring & dress making, metal fabrication (welding), blacksmith & tinsmith;
iii. Service industry; garages, bicycle transport "boda boda";
iv. Building & mining; brick making, sand harvesting and gold mining.

(e) Mining and quarrying

Mining and quarrying also generates income in number of households. In Bondo, there is artesian (small-scale) mining, which is not legal and mainly done for subsistence purposes. The method used is crude, manual and very slow. Areas where this activity is ongoing are Wagusu, Abom, Opoda and Ramba. There is also a multinational company AfriOre that came in early 2006 to explore where they drill and/or cut trenches and later backfill once they are through. It may not be easy to develop the trend of gold mining in Bondo since the only known firm that was licensed to undertake mining in Bondo known as San Martins operated up to 2003 and no documentation on the quantity of gold exists. Being a multinational company that is interested in the economic benefits from the activity, they pulled out when the gold deposits reduced or did not have economic value to them, though if more deposits are explored there is a high possibility of more investors coming in. In Nyangoma area, small scale gold mining and washing is the main socio-economic activity among majority of the households. Plate 4 shows artisanal gold washing site around the project area.

Plate 4: Artisanal gold washing site round the project area

It is important to note that during the site visits around the project area, quite a number of illegal gold leaching plants were observed. The illegal leachers were buying their tailings from the locals and then leach these tailings in their leach vats. The most risky part of it is that they were simply dumping the contaminated solid and liquid waste from the leaching plants on the ground. This is an area that the enforcement department should investigate.

Sand mining is also one of economic activities in Bondo. Most of the activity takes place along the shore of Lake Victoria or along River Yala. Water tides and run off after heavy rains pile a lot of sand

along the lakeshore or along the river. The harvesting is done by local communities as Community Based Organizations or individuals and has been faced with management problems especially on funds use. The extent of sand harvesting has been on increase, which is being attributed to increasing population that has to provide for the basic needs for its households. Many widows who are bread winners have resorted to the activity as their source of livelihood. Sites have been damaged and, in some cases, Bondo Environment Committee has intervened and in extreme cases, the groups have ordered to stop their activity to allow for healing up.

3.4.3 Poverty Level

Poverty level in Bondo is slightly above the national level of 53%. The most vulnerable groups are women headed households, orphans and persons of old age. The HIV pandemic is one factor that has led to many widows, orphans who are in most cases taken care of by their old aged grandparents.

Geographically, population distribution statistics shows that poverty levels are higher in rural areas (70.6%) compared to the urban centers (67.5%). This is mainly attributed to the availability of formal employment opportunities in urban centers compared to unprofitable farming which is the major economic activity in rural areas.

Faced with unreliable farming due harsh climate and also declined fishing activities, many people in rural areas look for other ways of earning a living. These include selling firewood, charcoal, quarrying and mining which leads to environmental degradation.

3.4.4 Infrastructural Facilities and Services

(a) water and sanitation

In Bondo sub-county, major water sources are Lake Victoria, river Yala, pans and dams. Others are piped water, wells and boreholes are very few. About 35% of the total population have access to portable and clean water, the rest depend on water from pans, wells, dams or from the lake. Water pollution includes agro-chemicals, defecation in bushes due to lack of pit latrines and waste water that end into water points during surface run off. In Nyang'oma area, the main source of water for household use and small-scale irrigation is the Lake. The area has no boreholes or piped water system.

(b) Transport and communication

Most of the roads in the sub-county are unpaved and dry weather roads. These roads join to the Bondo – Usenge Road and the Bondo-Kisian highway. Other feeder roads connect rural areas to the town and to the major roads. However, these feeder roads are dry weather roads and most of them become impassable during the rainy seasons. Communication network in the area is a bit stable for mobile reception from Safaricom and Airtel service providers.

(c) Schools and Hospitals

The project area has both public and private health facilities. However, for people in rural areas, the average distance to the nearest facility is 3-4 kilometers. Bondo Sub- County Hospital is about 22 kilometres from Nyang'oma.

The nearest national school is Maranda in Bondo. Nyagoma Division has 3 secondary schools, namely Serawongo Mixed Day Secondary School, Mbeka Girls Day Secondary School and Nyangoma Boys Day High School. The area has 7 primary schools namely: Lenya Primary, Serawongo, Olago, Mbeka, St. Lawrence Mission, Nyangoma Mixed Day, Nyangoma Girls Boarding Primary school. There is also a school for the disabled at the Nyangoma Mission, open to children from entire Bondo Sub-County. On

average a primary school going child covers a distance of between one to three kilometres in a day to reach to the nearest school while a secondary school going child covers an average of two to four kilometres a day to reach the nearest day school.

(d) Electricity and energy

Most people depend on firewood with a total number of 51, 928 households; charcoal follows with a total number of 4,568 and paraffin with a total number of 571 households. Other sources of energy (electricity, solar, biogas and wind) are not used for cooking.

High voltage electric line passes through the project site along the dirt road that heads to other rural parts of Nyangoma. The nearest transformer is 2Km away the project site making it difficult for the households around the area to be connected to electricity. The project will require high voltage electricity to run the CIP plant. This will require establishment of sub-station to be connected to the Kenya power grid.

CHAPTER FOUR: LEGISLATIVE, POLICY AND INSTITUTIONAL FRAMEWORK

4.1 Introduction

Kenya has several policies, legal instruments and regulatory frameworks that deal with environmental issues. In this chapter, a detailed review of the relevant policies, legal and regulatory frameworks that bear significance to this proposed mining and reprocessing of colonial gold tailings and mineral ore Project is presented.

4.2 Kenya legislation frameworks

There are several pieces of legislation related to this kind of development in Kenya. These include, but are not limited to the Mining Act, Explosives Act, Physical Planning Act (Cap. 286), the Penal Code (Cap 63), the Environmental Management and Coordination Act (No. 8 of 1999), the Public Health Act (Cap. 242), the Local Government Act (Cap.265), the Building Code, the Factories and Places of Work Act (Cap. 514), Sessional Paper No. 9 of 1999 on Environment and Development, National Environmental Action Plan (NEAP). The relevance of the aforementioned legislations as well as policy papers (national and international) and institutional framework related to the proposed development are discussed in the following sections.

4.2.1 The Constitution of Kenya, 2010

The Constitution of Kenya is the supreme law of the Republic and binds all persons and all state organ at all levels of government. It provides a broad framework regulating all existence and development aspects of interest to the people of Kenya, and along which all national and sectoral legislative documents are drawn. Article 42 of the chapter 4, "The Bill of Rights", confers to every person the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generation through legislative measures, particularly those contemplated in Article 69, and to have obligations relating to the environment fulfilled under Article 70.

Part 2 of Chapter 5 of the constitution directs focus on the environment and natural resources. It provides a clear outline of the state's obligation with respect to the environment. It also states that every person has a duty to cooperate with state organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

Compliance

The proponent of the project will ensure that every activity of gold mining and processing is in tandem with the constitutional provision of adherence to the right of every individual to a clean and healthy environment, protect and conserve the environment and ensure sustainable

developments. This is be achieved by developing and adhering to the spelt out environmental management plan to curb probable adverse effects of gold mining and processing on environment.

4.2.2 The Environmental Management and Coordination Act No. 8 of 1999

The Environmental Management and Coordination Act (EMCA) of 1999, and its addendum Environmental (Impact Assessment and Audit) Regulations of 2003 provides for the establishment of an appropriate legal and institutional framework for the management of the environment in Kenya.

The Act introduces two important aspects of environmental management, which are directly related to the proposed project: Environmental Impact Assessment (EIA) and Environmental Audit (EA). Section 58 (1) has underscored that any person being a Proponent of a project, shall, before financing, commencing or proceeding, submit an EIA report to the National Environmental Management Authority (NEMA) of Kenya.

Section 68 (1) gives NEMA the mandate for carrying out all environmental audits of all activities that are likely to have significant impacts on the environment. It authorizes environmental inspectors, as appointed by NEMA to enter any development and determine how far the activities carried out conform to statements in the EIA study.

Part VIII, section 72 of the Act prohibits discharging or applying poisonous, toxic, noxious or obstructing matter, radioactive or any other pollutants into the aquatic environment. Section 73 requires that operators of projects which discharge effluent or other pollutants submit to NEMA accurate information about the quantities and quality of the effluent. Section 74 demands that all effluent generated from point sources are discharged only into the existing sewerage system upon issuance of prescribed permit from the Local Authorities.

Compliance

The proponent has complied to the EMCA Act by undertaking an Environmental Impact Assessment of the proposed project. The proponent will allow annual audit of the facility after it starts to operate. The CIP plant is a closed system that allows recycling of waste water; therefore, no effluent will be released into the surface or underground water system.

4.2.3 Mining Act, 2016 Cap 306

Part 2 of the Act specifies that a project of this nature requires a mining permit. Sections 19 and 42 provides for disclosure of information as required by the Act. Giving false or withholding information required by this Act is guilty of an offence. Section 57 (1) requires any person to apply to the Commissioner leave to lease and treat and remove any tailings. If the tailings are in private land, Section 26 requires that the mining company lease the land and pay the owner or occupier fair and reasonable compensation according to their respective rights or interests (if any) in the property concerned.

Compliance to this provision

The proponent applied and paid for the mineral prospecting license, (evidence attached in the appendix of this report). The proponent has also fulfilled the requirement of leasing the land from the landowner where he is going to do the mining work, (Lease documents are also attached in this document). The proponent has adhered to all the requirements stipulated in the Act. After receiving the EIA license from NEMA, the proponent will apply for a blasting permit from the state department of mining and geology.

4.2.4 The Explosives Act Cap. 115

The Act regulates the purchase, assemblage, manufacture and use of explosive materials. Explosives are used routinely in many mining operations for blasting and lessening of rocks. It also stipulates conditions for use, precautionary measures and storage requirements. The Act requires one to seek authority to acquire, transport and use blasting materials. It furthers makes it an offence liable for penalties to any person causing an explosion where life or property is endangered. The Act also requires blasting to be done with a specialized blast expert.

Compliance

The proponent will seek for a blast permit which will allow purchasing, transportation and storge of explosives as guided by the experts from the state department of mining. All precautionary measures will be undertaken such as fencing the blasting sites to prevent movement and injury of animals and people. The proponent will employ a certified blast expert to undertake the blasting exercise. The geological stability of underground rock has been assessed and there are no homes near the proposed mining site, thus there is no risk of damage of properties.

4.2.5 The Physical and Land Use Planning Act, 2019

The Act provides for the planning, use, regulation and development of land and for connected purposes. It was enacted to ensure that every person engaged in physical and land use planning shall promote sustainable use of land and livable communities which integrates human needs in any locality. The Act allows the County Government to prepare a local physical and land use development plan in respect of a County, Sub-County, or unclassified urban area.

Compliance

From the land lease document, the project site has not yet been zoned for specific land use. However, in case of any adjustment in the physical planning of the area, the proponent will comply to the provisions of this Act.

4.2.6 The Water Act, 2016

This is an Act that replaces the old water Act of 2002. It provides for the regulation, management and development of water resources, water and sewerage services; and for other connected purposes. It is meant to align the water sector with the new Constitution's primary objective of devolution. The Act recognizes that water related functions are a shared responsibility between the national government and the County government.

Relevant to this study is from section 22(l) of the Water Act 2016 which states that, on establishment of protected areas and ground water conservation areas, section 22(l) of the Water Act 2016 provides that where the Authority is satisfied that in order to conserve a vulnerable water resource, special measures are necessary for the protection of a catchment area or a part thereof, it may by Order published in the Gazette declare such catchment area to be a protected area. Section 23(l) of the Water Act provides that the Authority may declare an area to be a ground water conservation area, where it is satisfied that, in any area, special measures for the conservation of ground water are necessary in the public interest for- the protection of public water or water supplies used for industry, agriculture or other private purposes; the conservation of the water resources of the aquifer of the ground water resources; or ecological reasons. Section 24(l) requires the Water Resources Authority, in consultation with the Cabinet Secretary, may designate a defined area from which rain water flows into a watercourse to be a basin area for the purposes of this Act.

On operational permits, Section 36 of the Water Act 2016 provides that a permit is required for any of the following purposes:

a) Any use of water from a water resource, except as provided by section 37 of the Act;
b) The drainage of any swamp or other land;
c) The discharge of a pollutant into any water resource; and
d) Any other purpose, to be carried out in or in relation to a water resource, which is prescribed by Regulations made under this Act to be a purpose for which a permit is required.

Further, Section 42(1) provides that the conditions on a permit may require that on the issue of the permit and at prescribed intervals thereafter, the permit holder shall pay charges to the Authority for the use of water in accordance with the terms of the permit and the Regulations prescribed by the Authority. The charges are to be determined by reference to a schedule of charges published in the Gazette by the Authority following public consultation.

Section 43(1) provides that in issuing a permit, and in fixing any conditions to be imposed on a permit, the Authority shall take into account such factors as it considers relevant, including:

i. Existing lawful uses of the water;
ii. Efficient and beneficial use of water in the public interest;
iii. Any basin area water resources management strategy applicable to the relevant water resource;
iv. The likely effect of the proposed water uses on the water resource and on other water users;
v. The classification and the resource quality objectives of the water resource;
vi. The investments already made and to be made by the water user in respect of the water use in question;
vii. The strategic importance of the proposed water use;
viii. The quality of water in the water resource which may be required for the reserve; and
ix. The probable duration of the activity or undertaking for which a water use is to be authorized.

Section 43(2) of the Water Act provides that the use of water for domestic purposes shall take precedence over the use of water for any other purpose, and the Authority may, in granting any permit, reserve such part of the quantity of water in a water resource as in its opinion is required for domestic purposes.

Section 37(l) provides that a permit is not required:

a. For the abstraction or use of water, without the employment of works, from any water resource for domestic purposes by any person having lawful access to the water resource;
b. For the abstraction of water in a spring which is situated wholly within the boundaries of the land owned by any one landholder and does not naturally discharge into a watercourse abutting on or extending beyond the boundaries of that land; or
c. For the storage of water in or the abstraction of water from a reservoir constructed for the purpose of such storage and which does not constitute a water course for the purposes of this Act (The Act defines a watercourse as any natural channel or depression in which water flows regularly or intermittently).

Compliance

The proponent will apply for a permit to use the water resources in the project area. The proponent will also ensure that appropriate measures to prevent pollution of underground and surface water sources are implemented throughout the project cycle.

4.2.7 Fisheries Act Cap 378

Fisheries (General) Regulations a Subsidiary of the Fisheries Act: Part X on Prevention of Pollution and Protection and Conservation of Fishery Waters, Section 59 (Pollution prevention zone) states that for purposes of protecting the aquatic environment and ecology the Kenya fishery waters are hereby declared to be a pollution prevention zone.

Section 60(1) (a) forbids intentional or negligent placing or discharge into Kenya fishery water, any article, including abandoned fishing gear (except for emergency reasons), or pollutant which may cause harm to any fisheries resource or marine mammal.

Compliance

The proposed project will not discharge any untreated waste water into the lake.

4.2.8 The Public Health Act (Cap. 242)

The Public Health Act outlines how different aspects of a project have to be undertaken to ensure the safety and health of users and neighbours. The Act gives guidelines on construction, maintenance and inspection of drainage system, septic tanks or latrines. **Part IX, section 115** of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. **Section 116** requires that County Authorities take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be injurious or dangerous to human health.

Section 118 Such nuisances as waste pipes, sewers, drainers or refuse pits in such state, situated or constructed as in the opinion of the Medical Officer of Health to be offensive or injurious to health. Any noxious matter or waste water flowing or discharged from any premises into the public street or into the gutter or side channel or watercourse, irrigation channel, or bed not approved for discharge is also deemed as nuisance. Other nuisances are accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbor rats or other vermin.

Compliance

Under this Act the proponent will adapt practicable measure to prevent injurious and nuisance conditions on the project site. The proponent will ensure the latrines are provided at the site and cleanliness maintained. Human food and water will be stored separately with other mining chemicals to avoid contamination.

4.2.9 Occupational Safety and Health Act, 2007 (Cap 514)

This Act makes provision for the health, safety and welfare of persons employed in all places of work. The provision requires that all practicable measures to be taken protect persons employed in a factory from dust, fumes or impurities originating from any process within the facility. The provisions of the Act are also relevant to the management of hazardous and non-hazardous wastes, which may arise at a project site.

Compliance

The proponent will ensure:

- *Compliance to all the provision of the Act;*
- *Prevention of accidents at the workplace and provision of Personal Protective Equipment to all workers and ensuring their use;*
- *That the management keep a general register of all persons within the facility all day.*

4.2.10 Work Injuries Benefits Act 2007

According to this Act, an employee who is involved in an accident resulting in the employee's disablement or death is subject to the provisions of this Act, and entitled to the benefits provided for under the Act. Subsection 3 of section 10 of the Act however states that no employee shall be entitled to compensation if an accident, not resulting in serious disablement or death, is caused by the deliberate and willful misconduct of the employee. Section 12 of the act stipulates that if an employee is injured in an occupational accident or contracts an occupational disease while the employee, with the consent of the employer, is engaged in any organized first aid, ambulance or rescue work, or firefighting or other emergency services, the accident or disease is for the purpose of this Act, deemed to have arisen out of an in the course of the employee's employment.

A written or verbal notice of any accident shall be given by or on behalf of the employee concerned to the employer and a copy to the Director of occupational health and Safety within twenty-four hours of its occurrence in case of fatal accident. A right to benefits in accordance with this Act shall lapse if the accident is not reported to the employer within twelve months after the date of such accident. However, it shall not bar compensation if it is proved that the employer had knowledge of the accident from any other source. Section 30 of the Act states that compensation for permanent disablement shall be calculated on the basis of ninety-six months earnings subject to the minimum and maximum amounts determined by the minister after consultation with the board. In case of a fatal accident compensation shall be paid to the dependants of the employee in accordance with the set provisions in the third schedule. The employer shall further be liable to pay reasonable expenses for the funeral of the deceased employee subject to the maximum amount determined by the minister, after consultation with the National council for occupational Health and Safety.

Compliance

The proponent will try his level best to ensure accidents that can be preventable do not happen at the project site. However, in case of an accident, the proponent will comply with the stipulations in the Act.

4.2.11 The Penal Code (Cap. 63)

The chapter on "Offences against Health and Conveniences" contained in the Penal Code enacted in 1930, section 191 strictly prohibits the release of foul air into the environment, which affects the health of other persons, it also states that if any person or institution that voluntary corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence. Section 192, any person who voluntarily violates the atmosphere at any place, to make it noxious to health of persons in general dwellings or carrying out business in the neighborhood or passing along public ways is guilty of misdemeanor, i.e., imprisonment not exceeding two years with no option of fine. Under this code, any person who for the purpose of trade or otherwise makes loud noise or offensive awful smell in such places and circumstances as to annoy any considerable number of persons in the exercise of their rights, commits an offence, and is liable to be punished for a common nuisance, i.e., imprisonment not exceeding one year with no option of a fine.

Compliance

The proponent will ensure strict adherence to the Environmental Management Plan throughout the project cycle in order to mitigate against any possible negative impacts that are related to the provisions of this Act.

4.2.12 National Construction Authority Act, 2011

To clamp down on illegal builders in Kenya and in an effort to prompt responsible and quality construction, proponent shall display at construction sites project board, which must carry the file number showing the building work registered with the County including names of professionals undertaking the work.

Compliance

The Proponent shall comply with this and has selected qualified professionals to undertake the job, which will be posted on the board at the construction site.

4.2.13 Agriculture Act, Cap 318 (Rev. 2012)

The Agriculture Act, 2012 controls over soil conservation and land development and many of the provisions can be generally applied beyond those lands suitable for agriculture. Part XII Section 184 provides general rules for the preservation, utilization and development of agricultural land. Sub-section 2(e) provides for controlling the erection of buildings and other works on agricultural land. Section 204 allows any authorized officer at all reasonable times and on giving reasonable notice, without a search warrant to inspect compliance with the provisions of this Act.

Compliance

The proposed project site is not zoned for specific land use, it has a mixed type of land use among which include artisanal gold mining. The project will not interfere with any agricultural activity in the area.

4.2.14 Employment Act, 2007

Employment Act, Chapter 226 and the Regulation of Wages and Condition of Employment Act Chapter 229 of the Laws of Kenya deal with employee rights. The Employment Act fixes minimum standards of employment, while regulation of wages and conditions of Employment Act creates wages fixing institutions like the wages board and councils to continuously review the human standards of employment on a sector basis. These Acts effectively deal with issues such as prohibition of forced labour, child labour, and discrimination on the following grounds; race, colour, sex, language, religion, political or other opinion, nationality, ethnic or social origin, disability, pregnancy, mental status or HIV status. An employer shall pay his employees equal remuneration for work of equal value.

The provisions of part IV and VI constitute basic minimum and conditions of contract of service. The employer shall regulate the hours of work of each employee in accordance with provisions of this Act and any other written law. Subsection (2) of section 27 states that an employee shall be entitles to at least one rest day in every period of seven days. An employee shall be entitled to not less that twenty-one working days of leave after every twelve consecutive months. Section 29 of the Act stipulates that a female employee shall be entitled to three months maternity leave with full pay. Subsection 8 of section 29 further states that no female employee shall sacrifice her annual leave entitlement on account of having taken her maternity leave. Section 37 (conversion of casual employment to term contract) Where a casual employee works for a period or a number of continuous working days which amount in the aggregate to the equivalent of not less than one month; or performs work which cannot reasonably be expected to be completed within a period, or a number of working days amounting in the aggregate to the equivalent of three months or more. The contract of service of the casual employee shall be deemed to be one where wages are paid monthly. In calculating wages and the continuous working days, a casual employee shall be deemed to be entitled to one paid rest day after a continuous six days working period and such rest day or public holiday which falls during the period under consideration shall be counted as part of continuous working days.

Compliance

The proponent shall comply with all the provisions of the Act among which include: prohibiting child labour, equal employment opportunity from people from different segments of the society and creation of a good working environment for the employees among which will include provision of free lunch on daily basis.

4.2.15 County Government by Laws Bills

Project will operate within Siaya County thus under jurisdiction of Siya County Government by laws. The government operates by laws to govern all aspects of management. It is also liberty to use the various pieces of legislation to enforce conservation and pollution control within the County.

Compliance

The proponent shall ensure that the facility is in compliance to all by laws and bills enacted and those to be enacted by the Siaya County Government (County Assembly). This includes getting business permits and paying relevant fees to the county government.

4.2.16 Environment and Land Court Act, Cap 12A, 2015

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

Any person aggrieved by a decision or order of the National Environment Tribunal may within thirty days of such decision or order, appeal against such decision or order to the Environment and Land Court. The jurisdiction of the Environment and Land Court is provided under section 13 of the Act. The Court has original and appellate jurisdiction to hear and determine all disputes in accordance with Article 162(2)(b) of the Constitution and with the provisions of Act or any other written law relating to environment and land.

In exercise of its jurisdiction under Article 162 (2) (b) of the Constitution, the Court has power to hear and determine disputes relating to environment and land, including disputes relating to environmental planning and protection, trade, climate issues, land use planning, title, tenure, boundaries, rates, rents, valuations, mining, minerals and other natural resources or disputes relating to compulsory acquisition of land.

Section 13 (2) - The Court has jurisdiction to deal with disputes relating to land administration and management. The court is also empowered to hear cases relating to public, private and community land and contracts, choses in action or other instruments granting any enforceable interests in land. In this regard one will say that all disputes relating securities and in particular any dispute dealing with the statutory power of sale by financial institutions. Further the Act states that the court has jurisdiction to hear any other dispute relating to environment and land.

The proponent shall use this court to solve disputes that may emerge concerning land and environment.

4.3 Kenya Policies and Regulations under EMCA

4.3.1 Kenya Vision 2030

The Kenya Vision 2030 is a policy document outlining Kenya‘s development programme covering the period between the years 2008 to the year 2030. The objective of Vision 2030 is to help transform Kenya as a newly industrializing, middle-income country providing a high quality of life to all its citizens in a clean and secure environment by 2030. According to the Kenyan Vision 2030, Oils and

Other Mineral Resources is a new priority sector under the economic pillar of this plan given the continued discovery of oil and other minerals in Kenya.

Additionally, the Kenya Vision 2030 also has environmental goals outlined under the social pillar. According to the pillar, Kenya aims to be a clean, safe and sustainable environment by 2030. The country aims to achieve this goal by for example improving pollution and waste management strategies.

The proposed gold mining and processing project is going to have significant economic impact in the country. The project is going to provide employment opportunities, spur development of infrastructure and act as a catalyst for business opportunities in the project area. The project will implement the environmental management and monitoring plan recommended in the EIA report to the latter to safeguard against any adverse impact on the environment.

4.3.2 National Environment Policy, 2013

The National Environment Policy of 2013 proposes a broad range of measures and actions responding to key environmental issues and challenges. It seeks to provide the framework for an integrated approach to planning and sustainable management of natural resources in the country. It proposes various policy measures not only to mainstream sound environmental management practices in all sectors of society throughout the country and recommends strong institutional and governance measures to support the achievement of the desired objectives and goal.

For the mining sector the Policy notes increased mining activity, including quarrying and harvesting of sand, may result in environmental degradation unless measures are taken to guide and control operations in the mining sub-sector. It therefore encourages equitable exploitation and sound management of mineral resources while ensuring local participation and involvement of indigenous enterprises for investment in mining sector.

The proposed gold ore mining and processing project will ensure that the environment will not be degraded and local participation will be enhanced throughout the project cycle. The local community will benefit from the project through benefit sharing in corporate social responsibility initiatives.

4.3.3 Regulations Under EMCA

NEMA has developed several regulations to facilitate effective implementation of EMCA and those with reference to this project are discussed here below:

4.3.3.1 Environmental Impact Assessment & Audit Regulations, 2003

The EIA / EA Regulations are meant to ensure the implementation of Section. 58 of EMCA. It makes it illegal for anyone to undertake development without an EIA license and stipulates the ways in which environmental experts should conduct the EIA/EA study and structure of the reports. To ensure the Regulations 31 to 41 provides for Environmental Auditing and Monitoring and sets out procedures of conducting both self-Auditing and Control Auditing and will be required by the Environment Management Authority NEMA. Regulation 31 (3) states that the Authority shall require the proponent to undertake, in the case of an ongoing project, an Environmental Impact Assessment study followed by subsequent Environmental Control Audit studies as may be necessary at such times as shall be agreed upon by the Authority and the proponent; and an Environmental Impact Assessment study to provide baseline information upon which subsequent Environmental Control Audit studies shall be based.

Compliance

The proponent will undertake Environmental Impact Assessment and submit it to NEMA for approval before commencing the project. The proponent will ensure compliance to provision of this Environmental Impact Assessment.

4.3.3.2 Water Quality Regulations, 2006

The regulations protect all water resources. Relevant section of this regulation to this study include:

a) Every person shall refrain from any act which will directly or indirectly cause pollution and it shall be immaterial whether or not the water resource was polluted before the enactment of these regulations;
b) No person shall throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance as to cause pollution;
c) Discharge of effluent from sewer must be licensed according to the act; and the carry out daily effluent discharge quality and quantity monitoring and shall comply with the standard set in the fifth Schedule of the act.
d) Water abstraction must only be done after approval of an Environmental Impact Assessment study;
e) No person shall be permitted to use waste water for irrigation purposes unless such water complies with the quality guidelines set out in the 8th Schedule of the Act;
f) No person shall use or allow to be used any natural water body for recreational purposes unless the water body meets the quality standards for recreational standards as set out in the tenth schedule of the regulation

The proponent will adhere to the provisions of this regulation.

4.3.3.3 Waste Management Regulations, 2006

The waste Management Regulation are meant to streamline the handling, transportation and disposal of various types of waste. The aim of Waste Management Regulation is to protect human health and the environment. The regulation place emphasis on waste minimization, cleaner production and segregation of waste at source. The proponent should minimize the waste he generates by adopting the 3R principle of Reduce, Reuse and Recycle and incorporation environmental concerns in the design and disposal of a product. Regulation No 4 (1) makes it an offence for any person to dispose of any waste on public highway, street, road, recreational area or in any public place except in a designated waste receptacle. Regulation 5 (1) provides categories of cleaner production methods that should be adopted by waste generators in order to minimize the amount of waste generated and Improve production process through:

i. Conserving raw materials and energy;
ii. Eliminating the use of toxic raw materials and waste;
iii. Reducing toxic emissions and waste;
iv. Monitoring the product cycle from beginning to end;
v. Identifying and eliminating potential negative impacts of the products;
vi. Enabling the recovery and re-use of the product where possible, and
vii. Incorporation of environmental concerns in the design and disposal of a product.

Compliance

The most sensitive waste from this specific gold mining and processing project will include remains from the explosive's substances and detonators, processed tailings will also form bulk of waste

material. The proponent will ensure the waste products do not contain harmful chemicals before they are disposed. The proponent will employ the integrated solid waste management strategy to manage the normal waste generated from the daily human activities at the project site and the surrounding environment.

4.3.3.4 Noise and Excessive Vibration Pollution Control Regulations, 2009

Part II of the general prohibition of this regulation state that except as otherwise provided for in this regulation, no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. The part states that in determining whether noise is loud, unreasonable, unnecessary or unusual the following factors may be considered:

a) Time of the day;
b) Proximity to residential area;
c) Whether the noise is recurrent, intermitted or constant;
d) The level and intensity of the noise;
e) Whether the noise has been enhanced in level or range by any type of electronic or mechanical means; and
f) Whether the noise can be controlled without much effort or expense to the person making the noise.

Section III of the regulation states that any person wishing to operate or repair any machinery, motor vehicle, construction equipment or other equipment, pump, fan, air-conditioning apparatus or similar mechanical device or engage in industrial activity which is likely to emit noise or excessive vibrations shall carry out the activity or activities within relevant levels prescribed in the first schedule to these regulations.

Compliance

The proponent and his contractors will ensure noise and vibration generated from construction machinery, the blasting and crushing of rocks will be within the limits set out in this regulation. The construction, blasting and crushing of rocks and tailings will be done during the day. Furthermore, the contractor and their subcontractors will ensure that their equipment is serviced properly and/or use equipment that complies with the threshold noise values given above.

4.3.3.5 Wetlands, Riverbanks, Lakeshore and Seashore Management Regulations, 2006

The following principles shall be observed in the management and conservation of river banks, lake shores and the seashore;

(a) The resource on river banks, lake shores and the sea shore shall be utilized in a sustainable manner;

(b) Environmental Impact Assessment as required under the Act shall be mandatory for all major activities on the river banks, lake shores and the seashore;

(c) Special measures, including prevention of soil erosion, siltation and water pollution are essential for the protection of river banks, lake shores and the seashore.

Water drawn from the local water sources will be used in a sustainable manner. The gold processing plant will have mechanism of recycling water.

4.3.3.6 Air Quality Regulations, 2008

The objective of this Regulation is to provide for prevention, control, and abatement of air pollution to ensure clean and healthy ambient air. The general prohibitions state that no person shall cause the emissions of air pollutants listed under First Schedule (Priority air pollutants) to exceed the ambient air quality levels as required stipulated under the provision of the Seventh Schedule (Emissions limits for controlled and non-controlled facilities) and Second Schedule (Ambient air quality tolerance limits).

Compliance

The proponent and management of the facility shall implement the measures provided in the EMP to prevent air pollution especially during construction, operation and decommissioning phases of the project.

4.4 Institutional Framework

EMCA (1999) Revised in 2015 has established various Institutional structures for sustainable management of the environment and natural resources. Those relevant to this project include:

4.4.1 The National Environment Management Authority

The National Environment Management Authority (NEMA): NEMA is the organ that has been established to exercise general supervision and coordination over all matters relating to the environment in Kenya. Further NEMA is the Government's principal instrument in the implementation of all polices relating to the environment.

NEMA administers the EIA/EA on behalf of the Cabinet Secretary responsible for the environment. EIA/EA is applicable to both public and private sector development projects and programmes. NEMA also provides a framework for dispute resolution.

4.4.2 National Environment Tribunal (NET)

Part XII Section 125 (1) of the EMCA Act establishes NET to review administrative decisions made by NEMA relating to issuance, revocation or denial of licenses and conditions of license. It also provides legal opinion to NEMA on complex matters where the Authority seeks such advice. In addition, the Tribunal has powers to change or give an order and direction regarding environmental issues in dispute.

4.4.3 Environment and Land Court

The Environment and Land Court shall determine disputes on the leased land if any.

4.4.4 National Environmental Department

The National Environmental Department consist of: (a) a Chairperson appointed by the Cabinet Secretary and who shall be a person qualified for appointment as a judge of the Environment and Land Court of Kenya; (b) a representative of the Attorney-General; (c) a representative of the Law Society of Kenya; (d) one person who has demonstrated competence in environmental matters, nominated by the Council of County Governors and who shall be secretary to the Department; (e) a representative of the business community appointed by the Cabinet Secretary; (f) two members appointed by the Cabinet Secretary for their active role in environmental management.

The functions of the National Environmental Department are as follows:

a) To investigate any allegations or complaints against any person or against the Authority in relation to the condition of the environment in Kenya;

b) Investigate any suspected case of environmental degradation, and to make a report of its findings together with its recommendations thereon to the Cabinet Secretary;
c) To prepare and submit to the Cabinet Secretary, periodic reports of its activities which report shall form part of the annual report on the state of the environment under section 9(3);
d) Undertake public interest litigation on behalf of the citizens in environmental matters; and
e) To perform such other functions and exercise such powers as may be assigned to it by the Cabinet Secretary.

4.4.5 County Environment Committee

The Siaya County Environment Committee appointed by the Governor by notice in the Gazette whose membership consists of:

i. The member of the county executive committee in charge of environmental matters who shall be the chairperson;
ii. An officer of the Authority whose area of jurisdiction falls wholly or partially within the county who shall be the Secretary to the County Environmental Committee;
iii. One representative for each of the Ministries responsible for the matters specified in the First Schedule at the county level;
iv. Two representatives of farmers or pastoralists within the county;
v. Two representatives of the business community operating within the concerned county appointed by the governor;
vi. Two representatives of the public benefits organizations engaged in environmental management programmes within the county appointed in consultation with the National Federation of Public Benefit Organizations; and
vii. A representative of every regional development authority whose area of jurisdiction falls wholly or partially within the county.

The County Environment Committee is responsible for the proper management of the environment within the county among other duties. It therefore also monitors the activities of the proposed project to ensure the protection of the environment.

4.4.6 Other relevant institution

Other relevant institutions for this specific mining project will include:

(a) Ministry of mining who will issue the mining license
(b) Ministry of lands Land control board
(c) Water resource Authority
(d) Department of physical planning Siaya county
(e) State department of fisheries
(f) County government of Siaya public health and environment department

4.5. Binding multilateral agreements/ conventions

4.5.1The Rio Declaration on Environment and Development

Agenda 21is a programme of action for sustainable development worldwide, the Rio Declaration on Environment and Development was adopted by more than 178 governments at the United Nations Conference on Environment and Development, known as the Earth Summit, held in Rio de Janeiro, Brazil, 3rd -14th June 1992.

Principle No. 10 of the Declaration underscored those Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided.

The foregoing discussion is relevant to the proposed development because EMCA demands that the public must be involved before any development project that is likely to have adverse impacts on the environment is implemented by a Proponent. The Act has further established a Public Complaints Committee (PCC) where issues raised by the public in regard to any proposed development can be addressed.

Compliance

The proponent initiated an ESIA which incorporated public participation where the interested and affected parties were given opportunity to share their concerns, views, worries and recommendations concerning the proposed project. The views of the public are well captured in the report to aid in decision making.

4.5.2 Convention on Biological Diversity (CBD) ratified in 1992

Commonly known as the Bio-diversity Treaty, this is one of the treaties that was open for signature at UNCED, 1992. This convention is a practical tool for translating the principles of Agenda 21 (Rio Earth Summit) into reality. The Convention is dedicated to promoting sustainable development. Parties to the treaty solemnly affirm sovereign rights over their biological sources, while accepting responsibility for conserving biological diversity and using biological resources in a sustainable manner.

Developers need to ensure operations of their projects put up mitigation measures against loss of biodiversity within their property.

CHAPTER FIVE: CONSULTATION AND PUBLIC PARTICIPATION (CPP)

5.1 Introduction

Public consultation in the EIA process is undertaken during the project design, implementation and initial operation. The aim is to disseminate information to interested parties, solicit their views and consult on sensitive issues. Pursuant to the provisions of the Environmental Impact Assessment and Environmental Audit Regulations, carrying out of EIAs requires seeking of views of stakeholders in relation to the activities and operations of the proposed project. Public Participation enables the evaluation of the public and neighbours' views. Consultation with stakeholders that are likely to be affected and those that are likely to have an interest in the proposed project was conducted as provided for in Regulation 17 of the Environmental (Impact Assessment and Audit) Regulations, 2003. The consultation was vital and served to:

i. Inform the public of the details of the proposed mining and gold processing project;
ii. Create awareness among the public on the EIA process;
iii. Solicit for comments and/or opinion from stakeholders for incorporation into the EIA statement (report);
iv. Promote social acceptance of the project in the local community so as to avoid costly modifications or abandonment of the project at a later stage, and

v. Obtain suggestions from the local community and other stakeholders on possible ways potential negative impacts can be effectively mitigated and how the local community can be part of the proposed project.

5.2 Methods used to consult with stakeholders

To get the views of the community members around the project site as well as that of the key stakeholders, the EIA study employed used of key informants' interviews, questionnaires to targeted community members as well as public consultation meetings. Due to the prevailing Covid-19 challenges and having to adhere to restrictions on social distancing, a distance of 1.5 metres apart was maintained during the public participation. In the public consultation forum, the local chiefs aided in enforcing the restriction. Key informants included representative from:

a) NEMA Siaya county office;
b) County government of Siaya physical planning department and the ministry of environment;
c) State department of mining;
d) Fisheries department and
e) The surveying department at the ministry of lands.

The questionnaires with both close-ended as well as open ended questions were randomly distributed around the local community members to get their specific views concerning the proposed gold mining and tailings processing project in their area. to get the views of the general public, a consultative public consultation meeting was held through the support of the local chief of Central Sakwa location and his counterpart of Uyawi sub-location, the public consultation meetings were successfully held on 23rd of April 2021 at the proposed project site, 12th of July 2021 at Serawongo dispensary grounds and on 21st September 2021 at the project site. The meetings were well attended by the community members including representation from every gender. The youth were also present. Various groups were present, these included representation from:

i. Beach community and beach management unit (BMU);
ii. Teachers' union of the local schools;
iii. Local union of churches;
iv. Retired public servants;
v. The landlord who leased the land to the Lakeside limited.

5.3 Findings from the Public Participation forums

Generally, findings from the key informants, the questionnaires distributed as well as the public consultative meetings showed that the project was well welcomed in the area with the view that it would uplift the living standard of the local community. However, they were cautious about the impact of cyanide leakage on the environment. The project proponent was able to explain the design of his plant which incorporate all mitigation measures against cyanide leakage into the environment even in the worst-case scenario. He stated that his gold processing plant is a closed system which recycles the used water and does not discharge the used waster into the environment. The used tailings were as well to be dried and cyanide content tasted before stored in a lined concrete base facility. From his explanation, members of the public were now comfortable with the project. Below are some of the major comments from the members of the public:

a) Employment opportunities: Members of the community were happy that the project would partly solve the problems of unemployment. It was recommended that in case of employment, the Proponent should give first priority to the members of the host communities;

b) Economic benefits through the multiplier effect. Local traders will have access to the market and women will also be able to prepare food like making porridge, maize and beans to sell to those employed at the gold mineral processing plant;
c) Access/improvement of agricultural land – the area occupied by tailings is not productive and nothing can grow on it. Once the tailings have been removed, the area will once more be suitable for agricultural purposes which in turn will enhance food security for owner of the land in particular and the whole community in general;
d) Development in the area: The people were happy that the proposed gold tailings processing plant is a major development in the area and therefore will enhance land value in the area. This will open the area to other new developments alongside calling for improvement in road network and other infrastructure;
e) The community members were happy that through the corporate social responsibility, some of the needy homes will benefit from the project through education sponsorships;
f) The community members were happy that the Lakeside Limited will be able to pump water from the Lake closer to some of their homes;
g) The proposed project if not well managed may lead to water/air/soil pollution;
h) The proposed project may lead to sound pollution to residents;
i) The proposed project will help improve security in the area.

Plate 5 shows one of the public consultation forums for the proposed gold mining and tailings/ore processing project.

Plate 5: Ongoing public participation forum for the proposed project

5.4 Recommendations as given by key informants

a) The proponent must have a proper mechanism for treatment of waste water. Waste water from gold processing plant is hazardous and should not be allowed into the Lake or any other water body around;

b) The proponent must have waste water discharge permit from the WRA if the water will be released into the lake. This will ensure that the released water will meet waste water regulations;

c) Liquid and solid waste should be disposed-off in a well designated disposal point to avoid contamination of surface and ground water;

d) The proponent must clean the waste water to the standard required by NEMA and based on the water regulations before releasing it back to the environment;

e) Water resources need to be protected at all times by disposing off the solid and liquid waste appropriately;

f) Upon completion of the mining, the proponent should refill the excavated pits to curtail soil erosion;

g) The proponent should undertake appropriate measures to control dust e.g., watering the dusty areas during the works;

h) The proponent should not touch the riparian land (60 meters from the lakeshore);

i) Project layout and siting must be clear and the proponent must have precautionary measures on dangers of spill over;

j) There must be compliance to the Mining Act 2016 including licensing, consent from landowners and owners of mining rights;

k) Compliance with occupational and health regulations;

l) Compliance with Fisheries regulation;

m) If the land is zoned for specific land use, change of use should be undertaken in compliance with Physical Planning law;

n) In the project decommissioning phase, the project should initiate sustainable livelihood practices such as supporting local groups undertake cage fish farming in Lake Victoria;

o) Enhance good relationship with the local community and undertake the corporate social responsibility as agreed;

The public participation comment sheets are attached on this report.

CHAPTER SIX: ANALYSIS OF PROPOSED PROJECT ALTERNATIVES

6.1 introduction

The purpose of this section is to examine feasible alternatives to the project. The benefits of the proposed project will be considered against any potential environmental cost. The general principle involved in identifying alternative option(s) to a proposed development is to ensure that the option chosen would result in optimal social, environmental and capital benefits not only for the developer, but also for the environment and stakeholders in the area. The proposed project alternatives include:

i. No project alternative
ii. Alterative site for the project
iii. Alternative project design and technology
iv. Alternative land uses
v. Project development with mitigation measures as described in the EIA report.

6.2 The no project alternative

The selection of the "No-project" alternative would mean the discontinuation of the proposed project. Thus, the site is retained in its existing form. If this alternative is selected, the site is unlikely to undergo

any major changes from its present condition and the vegetation present at the site will not be affected. This option may be based on the principles that the proposed:

a) Site is found on a land parcel not belonging to the proponent and there is no clear land agreement between the proponent and the land owner;
b) Site is environmentally sensitive such as having one or more threatened, rare, endangered, endemic or key stone plant or animal species or any other flora or fauna that is considered for preservation under an Act of Parliament;
c) Site is found in an archaeological or historical site or is found to have a historically or archaeologically important material; and/or
d) Project will have severe implications on the environment if implemented.

Assessment

During the assessment the team of EIA experts found out that:

a) The proposed site is found on a land parcel belonging to an individual who leased it to the proponent. Copies of land ownership documents and lease agreement have been attached. Therefore, there are no major issues relating to land ownership of the proposed site.
b) The proposed development will not be an impediment to any other developments in the area.
c) The cyanide component used to extract gold will not be disposed into the environment as the CIP plant for the proposed project is a closed system that recycles and reuse the water; thus, the products of the proposed project will not have serious implications on the environment.
d) There are no physical, biological, cultural and socio-economic features of concern at/or near the proposed site.

Implications of "no project option"

a) The proponent would be at a loss in terms of financial commitments already made in designing and planning for the project. These commitments include application fees for mineral exploration and prospecting, mining license, professional fees to the project managers, architects, quantity surveyors, land surveyors, EIA experts, among other cost already incurred.
b) A significant investment to be spent in building material, employment e.t.c including mining technology transfer opportunities besides the potential of the project stimulating development in the area will not be realized.
c) It would discourage the proponent and any other local and international investors from investing in the area.

Recommendation

Generally, the no project option will be counter-productive in view of the current government's effort to expand mining as an important aspect to spur economic growth as envisaged in Vision 2030. From the analysis, it becomes apparent that the No Project Alternative is not the appropriate alternative.

6.3 Alterative site for the proposed project

This option would mean transfer of the proposed development to another site. If this option is selected the proponent is required to look for an alternative site either within or outside the zone. This option may be based on the principles that the proposed development:

a) Is found on a land parcel not belonging to the proponent and there is no clear land lease agreement between the proponent and the land owner;
b) Is to be sited in a zone planned for other developments;
c) Is not compatible with other developments in the area;

d) The project site is ecologically sensitive area.

Assessment

During the assessment the team of EIA experts found out that:

a) There existed a lease agreement between the land owner and the proponent including benefits sharing by landlord (land owner) to extract the tailings;
b) Exploration works, testing of tailings and geological surveys showed the minerals to be processed existed near the area where the proposed project is sited;
c) The proposed project site has not been zoned for specific land use thus the project is compatible with other land uses in the area the main one being artisanal gold mining;

Implications of alternative project location

a) Colonial tailings existed near the proposed project site, transporting the tailings to a further place will be more costly;
b) The resultant effect of changing the site would be increase in timeframe and resources required to realize the development;
c) Changing the site would mean the proponent will go at a loss for the cost incurred in leasing the current land;
d) Relocating the project would mean the gold ore existing in the current land will not be mined.

Recommendation

The proponent has no Alternative option to the proposed project. With the gap existing in artisanal mining where the artisanal miners use improper mining thereby not extracting whole of gold ore. Processing gold tailings is the most suitable alternative from extreme environmental and economic perspectives.

6.4 Alternative project design and technology

This involves considering alternative designs for mining and gold recovery process. The major mining techniques include the open cast pit mining as well as mining by dredging and pumping. Even though dredging and pumping is more environmentally friendly, it is limited to ore with less tough rocks. Open cast mining will be used for this particular project, this is informed by the geological structure of underground rocks which is surrounded by ballast. The ballast always gets tough with depth. On the other hand, the best gold extraction process is the one that is safer and more environment friendly. Although new processes are being proposed on a regular basis, there have been no dramatic changes in the metallurgical techniques for gold extraction. The major categories of commercially viable recovery processes include the following:

i. Amalgamation (with mercury); however, it is important to note that mercury is no longer an option in current times, it is banned and refineries do not accept gold recovered using mercury.
ii. Gravity Concentration (using jogs, tables, spirals, Reichert cone, moving belt separator, etc.);
iii. Flotation (as free particles or contained in base metal sulfide concentrates);
iv. Hydrometallurgy (direct cyanidation, cyanidation with carbon adsorption, heap-leach and Chlorination-leach)

6.4.1 Amalgamation Technique

This is an ancient process which involves the alloying of the gold particles with metallic mercury to form amalgam and then the separation of the gold from the mercury by heating in retorts until the mercury is distilled off. This process is strongly out of favor with the major mining companies, due to the extremely toxic nature and the processes inferior performance when compared to the available alternatives. The process is still used extensively in artisanal mining in third world countries and at small mines, due to its simplicity.

6.4.2 Gravity Concentration

Gravity concentration processes rely on the principal that gold contained within an ore body is higher in specific gravity than the host rocks that contain the gold. Elemental gold has a specific gravity of 19. 3 and typical ore has a specific gravity of about 2.6. All gravity concentration devices create movement between the gold and host rock particles in a manner to separate the heavy pieces from the lighter pieces of material. Panning is probably the oldest technique used for the recovery of gold. Panning is a type of gravity concentration used by prospectors for the recovery of gold from river beds. It concentrates the heavy gold particles at the bottom of the pan while the light gangue is washed off on top**.**

6.4.3 Flotation

The flotation process consists of producing a mineral concentrate through the use of chemical Conditioning agents followed by intense agitation and air sparging of the agitated ore slurry to produce mineral rich foam concentrate. The process is said to have been invented by a miner who watched the process happening while washing dirty work clothing in his home washing machine. Specific chemicals are added to either float (foam off) specific minerals or to depress the flotation of products being subjected to additional flotation steps to increase product purity. The flotation process in general does not float free gold particles but is particularly effective when gold is associated with sulfide minerals such as pyrites. In a typical pyrytic gold ore, the gold is encapsulated within an iron sulfide crystal structure. Highly oxidized ores generally do not respond well to flotation. Advantages of the flotation process are that gold values are generally liberated at a fairly coarse particle size (28 mesh) which means that ore grinding costs are minimized. The reagents used for flotation are generally not toxic, which means that tailings disposal costs are low. Flotation will frequently be used when gold is recovered in conjunction with other metals such as copper, lead, or zinc. Flotation concentrates are usually sent to an off-site smelting facility for recovery of gold and base metals. Cyanide leaching is frequently used in conjunction with flotation. Cyanidation of flotation concentrates or flotation tailings is done depending upon the specific mineralogy and flow sheet economics.

6.4.4 Hydrometallurgy

It is the most common used process for gold extraction. This process involves the dissolution of gold from the ground ore in a dilute cyanide solution (usually NaCN or KCN) in the presence of lime and oxygen according to the reactions optimum cyanide concentration (about 0.05% NaCN), clean gold particles dissolve at a rate of 3.25 mg per sq cm per hour. Therefore, coarse gold particles (larger than 100 mesh) are usually removed by gravity concentration methods before cyanidation. In general, cyanidation process consists of percolation or agitation leaching of gold ores with dilute cyanide solution, generally less than 0.3 percent sodium cyanide. In plant practice the addition of lime to a cyanide pulp is universal to prevent hydrolysis and to neutralize any acidic constituents present in the ore. Additional advantages of lime addition include decomposition of bicarbonates in mill water, improvement in settling rate in counter current decantation thickeners and improvement in extraction rates for certain types of ores.

Heap leaching was introduced in the 1970’s as a means to drastically reduce gold recovery costs. This process has literally made many mines by taking low grade geological resources and transforming them to the proven ore category. Ore grades as low as 0.01 oz Au per ton have been economically processed by heap leaching. Heap leaching involves placing crushed or run of mine ore in a pile built upon an impervious liner. Cyanide solution is distributed across the top of the pile and the solution percolates down through the pile and leaches out the gold. The gold laden pregnant solution drains out from the bottom of the pile and is collected for gold recovery by either carbon adsorption or zinc precipitation.

The barren solution is then recycled to the pile. Heap leaching generally requires 60 to 90 days for processing ore that could be leached in 24 hours in a conventional agitated leach process. Gold recovery is typically 60-80% as compared with 85-95% in an agitated leach plant. Even with this inferior performance, the process has found wide favor, due to the vastly reduced processing costs compared with agitated leaching.

6.5 Alternative land uses

This option allows the developer to explore other alternative land uses for the site other than the proposed gold ore mining and processing. From the expert's assessment, the alternative land uses would be subsistence crop farming and livestock rearing. At the moment, given the terrain, and harsh weather conditions, this alternative is not viable at a commercial level. In fact, even the locals in Sirongo area have abandoned farming for artisanal gold leaching.

6.6 Project development with mitigation measures as described in the ESIA report

This alternative allows the project to be implemented with strict adherence to mitigation measures proposed in the ESIA report. The advantages of this alternative include:

a) The community will have a potential source of income through the supply of materials, self-sustainability, employment opportunities and better service delivery.

b) The local and national economies will improve from the revenue to be collected from the facility.

c) Sustainable development will be realized whereby the project spur economic growth and at the same time conserve the environment;

d) Creation of business opportunities within the local economy through the multiplier effect which will improve the livelihoods.

CHAPTER SEVEN: ANTICIPATED ENVIRONMENTAL, ECONOMIC AND SOCIAL IMPACTS

7.1 Introduction

The environmental baseline information of the proposed project area and the project design and characteristics formed the basis for impact identification and evaluation. Analysis of impacts depended on the nature and magnitude of the activities that will be undertaken by the proposed gold mining and tailing processing project as well as the type of environmental control measures that are envisaged as part of the project proposal. The impacts that are expected to arise from the proposed project could either be termed as positive or negative, direct or indirect, short-term or long-term, temporary or permanent depending on their nature, area of coverage and their duration in the environment. Impacts have been identified and discussed in all phases of the proposed project cycle; construction, operational those cutting across phases of the project cycle and decommissioning phase.

7.2 Anticipated positive impacts

Potential positive impacts that the proposed gold mining and tailings processing project is likely to have include: economic impacts such as livelihoods improvement, social impacts, and technological transfers. Measures to enhance positive impacts were proposed.

7.2.1 Employment Creation

The proposed gold mining and tailings processing Project will require labour. This will translate to creation of employment to local community hence improvement of local economic empowerment. From

the estimated project budget, it is likely to employ over 20 casual workers and 11 permanent staff when it becomes fully operational.

7.2.2 Business spill-offs

Numerous business opportunities are anticipated around the site to serve the increased number of people visiting and working at the site. The work force at the gold extraction and processing Plant will also require more service providers hence increased business. The result will be more business opportunities created within the local economy through the multiplier effect which local people will be expected to tap into to improve their livelihoods.

7.2.3 Improved Road and other Infrastructures and services

It is anticipated that once the Lakeside Limited implements their proposed project, they will realize more income some of which the company will plough back into the local community in the form of corporate social responsibility. The company may contribute to development and maintenance of local access road, upgrade local schools, health centres and supply of water to the local community.

7.2.4 Skill development and technology transfer

People from the local community who will have the opportunity to work in the gold extraction plant will have their skills developed and learn the technologies used in gold extraction and processing through on job training.

7.2.5 Development of the nearby Sirongo trading centre and Siaya county at large

It is anticipated that the proposed gold extraction and processing project if implemented will contribute directly to further development of the neighbouring Sirongo and Nango trading centres and to a large extend Bondo town and Siaya county. The development will be as a result of proposed development attracting new investments from both local and outside the region. The investments will be geared towards providing facilities and services that will cater for the needs of increased population of people who will be moving into the area to render their services either directly to the gold extraction Plant or indirectly to people working at the Plant. Modern hotels, accommodation areas, schools, hospitals, recreation facilities may be some of the potential investments in the area to cater for the needs of the population.

7.2.6 Tax revenue

Tax revenue to government will be realized from implementation of the proposed project through licenses fees, permits and other statutory deductions.

7.3 Potential adverse impacts and mitigation during the construction phase of the project cycle

During the construction phase, vegetation, water and soil will be affected by construction activities. The extraction and/or usage of materials will have both onsite and offsite effects. Construction works are likely to become sources of accidents if measures are not put in place to prevent them.

7.3.1 Removal and disturbance of flora and Fauna

The project site is essentially a barren land with no forest area involved. The flora in the vicinity of the project site is limited to sparsely distributed trees, shrubs and grasses. The mining activities such as excavations, blasting and transportation of mining materials will result in additional damage to plants because pressure will be exerted on the plants by the heavy vehicles, machines and people and will interfere with biological processes in the plants and could also lead to death of the plants. Noise and

vibrations due to blasting and operation of the machines is likely to drive away the wild animals and birds from the nearby habitats.

Potential mitigation measure

a) Properly demarcate the project area to be affected by the construction and operation of mining activities to avoid spillover effects to neighbouring areas.

b) Strictly controlling movement of vehicles to ensure that they operate judiciously and over designated areas to minimize destruction of vegetation.

c) Re-establish vegetation in some parts of the disturbed areas through implementation of a well-designed landscaping programme by planting of appropriate plants.

d) Access roads will not encroach into the riparian zones and if any riparian vegetation cleared off for the mining activity will be restored at the end of closure of mine.

e) The blasting, drilling and transportation will be carried out during the day time only minimizing the impact on the wild fauna movement.

7.3.2 Excavations and soil erosion

Excavations if not well managed will result into loose soil which is prone to both water and wind erosion. The source of loose soil will be form excavation work to level the site, for below ground tanks and foundation works. Loose soil generate during excavation works may lead to increased soil erosion and dust at the project site and neighborhood. This may lead to release of sediment into surface water drainages within the project area hence siltation and water pollution of Lake Victoria which is the main water body in the project area.

Potential Mitigation Measures

a) The loosened soil will be used in the foundation floor, leveling the ground and landscaping.

b) Soil conservation measures would be taken to the stockpiles to prevent erosion. This can include the use of erosion control fabric.

c) Introduce suitable and well-managed vegetation to generate surface covers on the open areas; to control soil movement by erosion agents i.e., water, animals and wind.

7.3.3 Extraction and usage of consumable materials

The proposed project will require significant amounts of materials including hardcore, bricks, building stones, ballast, cement, rough stones, and sand. Fuel will be consumed indirectly through machines. The overall environmental impacts become significant if the amounts required are so large. Many construction materials are components of natural resources and their extraction has an effect of depleting land resources alongside subsequent off-site degradation of the environment.

Potential Mitigation Measures

a) The project and material requirements will be evaluated and quantified to ensure that the design optimizes the use of materials.

b) Have a procurement plan based on the Bill of Quantities prepared by a Quantity surveyor to avoid potential oversupply of materials and wastage.

c) Sensitize site personnel on wastage of construction materials. Remnants should be collected and recycled as much as practical.

d) Proper planning of transportation of materials will ensure that products of fossil fuels (diesel and petrol) are not excessively consumed.

7.3.4 Security and safety at the project site

Security is a prerequisite for any development. During construction, security is very important on the site. This will ensure that materials are in order and minimal cases of material loss are reported on the

site. It would also control movement within the site especially for the intruders who might be injured by the materials and other hazardous features available within the site. The project site will have a store and ware house for storage of the equipment before they are assembled. Given the expensive nature of the equipment and the high poverty level in the project site, this equipment is likely to be stolen in not well secured. During operation phase, security of the site will be maintained to ensure only those authorized are allowed into the site.

Potential mitigation Measures

- **a)** Fence the construction site to ensure no intruders access the site.
- **b)** Security guards will always guard the gate to the site to keep away intruders and to control movement within the site.
- **c)** Lighting as well as security alarms will be installed in strategic positions all over the site during construction and after the completion of the project.
- **d)** The guards stationed at the gate will document movements in and out of the site.

7.3.5 Risk associated with transportation, handling and storage of mining chemicals and explosives

Before the operationalization of the project, specific gold leching chemicals such as cyanide and explosive chemicals will have to be procured. Given the hazardous nature of these chemical substances, if poorly handled, they are likely to cause harm to the environment and those handling them.

Potential mitigation Measures

(a) Permits to procure, handle and transportation of cyanide and blasting explosives will be sought from the relevant government authorities.

(b) The company shall have a qualified person who will be handling chemicals at the plant.

(c) No unauthorized persons will be allowed into the storage room for these chemicals.

(d) Safety material datasheet and reagents issues and storage protocol will be put in place and adhered to.

7.3.6 Conflicting interest between the project and illegal gold leachers

Small scale gold leching is among the main socio-economic activities in the project area. However, their activities are unregulated. They operate anywhere they find tailings around the area even without the consent of the property owner. Lakeside limited have purchased some tailings in the area, initially the illegal lechers used to steal the tailings which made the company to secure their storage facility. Given the case, if not well managed, such scenarios can lead into conflict between the illegal gold leachers and the project.

Potential mitigation Measures

a) Consultation and engagement of the illegal gold leachers on property rights of the mineral resource.

b) Engage local provisional administration to solve the conflicts on tailings rights.

c) Support some community empowerment initiatives that are geared towards reducing poverty levels.

d) Offer employment opportunity to some of the illegal gold leachers.

e) Transport the tailings to a secured storage facility.

7.4 Potential adverse impacts and mitigation during the operation phase

The operation phase of the project will consist of activities that are based on mineral extraction and processing to get the final product which is gold. Potential adverse impacts expected at this project phase are connected to blasting operations, crushing of tailings as well as leaching operations.

7.4.1 Impacts of blasting

Blasting employs the use of explosive chemicals and detonators, if not well managed, they have safety and health concerns. The explosives expose workers to airborne hazards from naturally occurring gases and chemical vapors. Blasting has in the past led to serious injuries and property damage from flying stones.

Potential mitigation measures

a) A zone around the mine periphery for safe blasting is proposed and the area shall be suitably fenced.
b) Daily requisition of explosives will be as per the same day requirement.
c) A daily register will be maintained for total use and refund of explosives.
d) All loading and firing shall be directed and supervised by competent person(s) thoroughly experienced in this field and accredited accordingly.
e) Employing qualified personnel to handle and store the explosives.
f) Use of recommended amount of explosive chemicals to minimize waste.
g) Inform the local community prior to blasting.
h) Providing and enforcing the use of earmuffs, dust masks and other PPEs to all workers and visitors to the facility.
i) Increasing the number of delay detonators used in a round of blasting.
j) At the end of the blasting surplus explosives will be refunded to the dealer.
k) Adhere to the provisions of the Explosives Act, 2012

7.4.2 Ground and surface Water pollution (through Cyanide leakage and rock blasting)

Gold mining and processing activities present potential ground and surface water pollution. If not well managed, mining works can affect the hydrogeology regime especially when surface rock is extracted. Removal of the rock strata can cause the floor to heave and allow for water seepage. Sometimes mines are dug below the water table and hence toxic materials could seep into the ground water. Surface water pollution can be caused by cyanide leakage washed away by surface runoff.

It is important to note that, the proposed leching plant will have a mechanism of recycling waste water thus cyanide will not be discharge into the environment. the tailing dam will have an impermeable lining boundary wall to prevent leakage of cyanide into the ground or surface water.

Potential Mitigation measures

a) Undertake a hydrogeological survey to ensure that blasting and drilling do not interfere with the water table.
b) Tailings shall be held on locations of the site not susceptible to storm water runoff awaiting reuse or collection for disposal.
c) All water from the leaching process and tailing washing shall be discharged to the mixing/barren tank for recycling and reuse in the leaching process hence will not be released into the environment.
d) Storm water from the processing section and tailing storage area shall be controlled by having a drainage channel all-round the place such that all the storm water from this section is collected

and discharged into a pond where it shall be monitored for quality. This water will be treated and then pumped back into feeder tanks for reuse in the leaching process.

e) The tailing storage area shall be provided with a base with lining or concreted to prevent percolation of the leachate from the tailings into the soil. This is to prevent soil and underground water contamination.
f) Any cyanide contaminated material will be re-introduced into the plant to fully utilize the available cyanide.
g) Chemicals to be used shall be issued by superintendent who is knowledgeable enough and experienced in handling of poisonous industrial chemicals without causing spillage to the environment.
h) Transportation of chemical reagents shall be done in accordance with the requirement provided by the environmental authority.
i) Leaching tanks shall be designed to offer safe leaching practices without any solutions overflowing. Leaking proof cement shall be applied in the internal part of the tank walls. Tanks will be built out of bricks and reinforced with iron bars to minimize risk of collapse.

7.4.3 Impact of Chemical fumes from leach tanks

The leaching processes lead to release of chemical fumes into the environment. These fumes if inhaled by those at the site can affect their health. The area is sparsely populated and therefore those at a risk to be affected by air impairment (if any) will be employees and therefore every person dealing with cyanide on site should wear face masks. In such a plant, if pH and FS is well controlled, no fumes are emitted. The plant has mechanisms in place to manage pH and FS.

Potential mitigation measures

a) Every person handling cyanide on site must wear a face mask.
b) Processing environment will be maintained in basic condition to avoid evolvement of HCN gas which is poison, to achieve this, the plant will use lime to suppress cyanide from being emitted as a fume into the environment. Monitoring will be undertaken throughout the operation to ensure that the PH is maintained.
c) The cyanide fumes/ smell that may be emitted from the top of the leach tanks (since they are open) will be minimal; not more than 5ppm, and therefore it will naturally be killed by sun ray hence harmless.
d) Re-processed tailings will be flashed/ washed with clean water containing neutralizing agents (lime) twice before it is removed from the leach tanks. This is to clean and neutralize any trace of cyanide that might remain in it so that once the tailing is disposed; it doesn't end up generating any fume.

7.5 Potential adverse Impacts cutting across phases and their mitigation measures

The following impacts will adversely affect the environment in two or all of the project phases i.e., they can occur during construction, operation as well as the decommissioning phases of the proposed project.

7.5.1 Increased Traffic

During construction and operation phase the road to the site will serve additional traffic transporting materials to site and those visiting the site for various reasons. Vehicles include those to be used in facilitating the construction work for example transportation of construction materials and/or construction workers or supervisors to the site, transportation of tailings to the site as well as trucks transporting mined ore to the crushing plant at the project site. Though increased traffic during

construction is a short-term impact, it has the effect of causing congestion on the rural road that may subsequently results in accidents and damage the road especially during wet seasons.

Potential Mitigation Measures

a) Sensitize the drivers to control and reduce speed of vehicles on the road.
b) Road expansion and rehabilitation.
c) Use construction and warning signs to warn the public on the traffic.
d) Only needed vehicles will be mobilized to the site, those that are not temporarily in need shall be kept off from the project site and area.
e) Proponent to provide for parking of the vehicles within the confines of the project area.

7.5.2 Air Pollution

The major sources of air pollution in the proposed gold mining and leaching plant is dust and exhaust fumes generated as a result of excavations, blasting of rocks, loading, transportation of mined materials, unloading of the materials as well as crushing of the ore and tailings. The impact on ambient air quality in the area surrounding the mining area depends upon the pollutant emission rate and prevailing meteorological conditions.

Potential Mitigation Measures

a) Personal protective equipment (PPE) such as dust masks must be worn by those working in the mining site.
b) Adopt the wet crushing technology to minimize amount of dust generated during crushing of tailings and rock ore.
c) Slow down speed of vehicle on site and access road to the site to minimize dust generation.
d) Sprinkling water during dry season on the road to the mining site to suppress dust.
e) Care will be taken to prevent spillage of transported ore by covering the carrying vehicles with tarpaulin and sprinkling of water, if dry.

7.5.3 Noise and Vibration

The main source of noise during construction will be the concrete mixer drum as well as lorry traffic carrying construction materials to the site. During operational; phase of the project, the main sources of noise will be from the drilling, blasting, transportation and crushing of the tailings and rock ore. The noise level from the site will be of minimal consequences as blasting noise will be short lived, there are no structures or homes near the blasting area or the crushing site and those working at the site will have noise attenuation gadget.

Potential Mitigation Measures

a) In order to meet noise level requirements, the works will be equipped with standard noise attenuation features.
b) Inform neighborhood of any abnormal noise generating construction activities to minimize disruption to local residents.
c) The contraction shall comply with the Environmental Management and Coordination (noise and excessive vibration pollution control) regulation of 2009 where he will ensure that only noise permitted level of 75dB (A) is emitted.
d) No discretionary use of noisy machinery.
e) No construction work at night.
f) Drilling with sharp bits and control blasting will minimize the noise pollution.

7.5.4 Increase in Water Use

During the construction phase, both the workers and the construction works will use water. Water will be mostly used by the workers in cleaning, in the concrete mixing for construction works and for wetting surfaces or cleaning completed structures. During operation, both workers and activities at the site will require water for: general cleaning; preparation of meals and in discharge of wastes. A bulk of the water used will be for dust suppression at the quarry area and the access road as well as used in the leaching plant. The Water Act, 2002 and EMCA, 1999 govern water abstraction and use and require permits for abstraction of large volumes of water for commercial use.

Potential mitigation measures

a) Water used in leaching plant shall be recycled and re-used in the plant.
b) The construction shall ensure that water is used efficiently and reused where necessary at the site by sensitizing construction staff to avoid irresponsible water usage.
c) Harvest rain water to compliment.
d) Constructing or installing bigger storage facilities to help cope with likely stresses in supply; and
e) Fixing and using self-closing taps with shorter hand-wash cycles at some points of the site and buildings.

7.5.5 Solid Waste/Debris

Solid waste generated at the site during the construction works will consist of metal cutting, rejected materials, surplus material, surplus spoil, excavated materials, paper bags, solvent containers, among others. During project operation the mining facility will generate solid waste mostly in form of explosives packaging, oil and grease containers used for maintenance of machinery and overburden among others. These have a potential of pollution if not disposed appropriately. The proponent will therefore ensure proper management of solid waste during the operation of the facility through the following measures.

Potential Mitigation Measures

a) Provide waste handling facilities such as waste bins for temporarily holding of wastes generated.
b) Install double bins for separate collection of recyclable and non-recyclable wastes.
c) Put in place an efficient waste management scheme that will prevent the accumulation of wastes.
d) Ensure that the collection and disposal of the wastes is done regularly and appropriately.
e) Re-use mining waste and soil materials piled at the site to refill (restore) the excavated areas that exist as a result of mining.

7.5.6 Sewage/Human waste from the Personnel at the project site

The wastewater could arise from water used in cleaning. Workers and visitors will respond to calls of nature. Accidental flooding of the sewerage system can flush into the storm drainage system thereby creating biological hazards. Sewage and wastewater have associated problems when they leak into the environment. Such problems include poor sanitation, nuisance and associated diarrhea diseases. Poor surface drain management or large amounts of effluents may lead to blockage of drains that in turn could result to flooding and unsanitary conditions within the neighborhood. Blocked drains produce bad odour and are a threat to general health, hence are environmentally unfriendly.

Potential Mitigation Measures

a) When constructing pit latrines, preference should be made to modern pit latrines that can easily be dislodged.
b) Sanitary facilities will be cleaned every day.
c) Pit latrines to be de-sludge whenever they near filling up.

7.5.7 Use of energy (electricity and fuel)

During the construction phase electricity will be required to run machines such as soil compacting machines and drills. Fuel will be required to run generators and construction vehicles. On completion, the project shall consume large amount of electricity for lighting and running of machines and equipment. More energy will be consumed by equipment such as television sets, radios and other electricity depended appliances in the buildings. Since electric and fuel in Kenya are generated mainly through natural resources, namely water and geothermal resources, increased use of electricity has adverse impacts on these natural resource bases and their sustainability. It is the government policy to minimize energy consumption. Use of electricity and fuel is also associated with other adverse impacts. Improper handling of electricity may lead to shocks, electrocution and damage to electrical appliances. On the other hand, fuels are usually inflammable and could result into fires. Leaks and spills of fuels may lead to explosions and fires leading to destruction of property injuries and deaths.

Potential Mitigation Measures

Possible options for minimization of energy include:

(a) Use of energy efficient night time lighting only at the site.
(b) Light sensor switches are to be provided to ensure outdoor lights are not used in daytime.
(c) All energy using equipment used should be switched off when not in use.
(d) Keep records and analyze Kenya Power bills to identify areas of unnecessary use.
(e) Consider installing alternative energy sources such as solar panels and automatic generators not only for power back up but also to reduce dependency on electricity**.**

7.5.8 Fire

Fires are unpredictable during the construction phase but are realities during the operation phase of the proposed project. Fires may start from lightening, leaking methane gas cylinders, poor handling of electrical appliances, leaving flammable material near fire points and careless disposal of lighting matchsticks or cigarette stabs among others. If appropriate measures are not put in place, a fire outbreak can occur and cause great damage to property and even lead to death.

Potential Mitigation Measures

a) Places with flammable materials will be declared "NO SMOKING ZONES" and clear notices of the same be displayed.
b) Fire extinguishers will be installed at strategic locations within and outside specific rooms such as light fuel storage area, offices and in areas where food is prepared.
c) An inventory will be made detailing all fire protection measures.
d) The "FIRE EXITS" from the buildings will be clearly marked.
e) "FIRE ASSEMBLY POINTS" at specific points at the site will be established and marked.
f) The company will on regular basis train personnel concerning emergencies including those involving fire out-breaks.
g) Lakeside limited will facilitate regular inspection of the firefighting equipment, the period will not exceed six months.
h) Provide adequate parking spaces for emergency management vehicles.

7.5.9 Increased storm water flow

Run-off is often high after construction especially because of the increased ground surface sealing which inhibits percolation and consequent infiltration. If the project commences with no well-designed storm drains, the rainwater may end up stagnating and hence creating conducive breeding areas for water-based vectors leading to transmission of human diseases like malaria and cholera**.**

Potential Mitigation measures

- **a)** Run-off to be handled by construction and designing of curbs, channels, side inlets and road side ditches to channel water into existing drainage lines so as to prevent ponding and flooding.
- **b)** Use pervious materials such as stones and/or spaced concrete slabs in parking areas and on pavements and/or abandoning concrete sidewalks in favor of grass verges to facilitate percolation.
- **c)** Install gutters and construct tanks to harvest and store rain water for use and thus reduce run-off.
- **d)** Regular repair and open up of drainage channels to be kept them open and no obstructions will be built within these lines to prevent stagnation of water.

7.5.10 Impacts related to occupational health and safety

There are three main types of occupational health and safety hazards. These are physical, chemical and biological. Potential physical hazards at the proposed development during the construction and operational phases will ordinarily include noise, accidents and accidental occurrences. Chemical hazards will involve exposure to harmful gases and chemicals either by inhalation, ingestion or by skin contact especially of volatile chemicals that penetrate the body. Biological hazards involve exposure to pathogenic organisms that may cause diseases.

Potential Mitigation Measures

Mitigation options to most of the occupational health and safety impacts: noise and vibrations; fires and dust and exhaust emissions have been discussed. Additional mitigation measures to other impacts are:

a) Provide appropriate PPE that must be worn in all situations where the body and skin are potentially exposed to hazards such as chemicals, dusts, highly infectious wastes, sharp objects, burns and extreme temperature or are working in areas that present threatening experiences.
b) Provide equipped first aid kits and other facilities and services.
c) Dangerous working areas such as mining site will be protected, fenced, demarcated and cordoned off from the general public.
d) Leaching tanks, barren tanks and laboratory area shall be enclosed to prevent accidents that may result from unauthorized persons entering the area.
e) Ensure adequate water supply to ensure high standards of sanitation that keeps to the minimum chances of disease outbreaks.
f) Ensure that trained first aid personnel are available on site at all times to handle emergencies.
g) Induction policy to all visitors and new employees shall be developed.
h) Provide hazard notifications, signage and warnings to warn visitors and staff of potential dangers that may exist in different areas of the facility, or warn the persons on potential consequences of their actions should be put in place.
i) Frequently train personnel in order to make them have a basic understanding of the tasks they handle, the hazards involved and how to manage them.
j) Ensure chemicals are stored in a designated enclosed area, and material safety data sheets that provide advice on storage, emergency and first aid of these chemicals are within easy reach.
k) Training shall be provided for all staff to ensure adequate knowledge of safe manual handling and correct use of equipment and vehicles by covering all safety procedures to ensure that general work safety exists at the site.
l) The proponent shall develop site Health and Safety guidelines which are to be adhered to by construction workers, those working at the site and visitors to the project site.

7.5.11 Sexually Transmitted Infections and HIV / AIDS

Laborers from the surrounding areas will come and work at the site. Though majority of population would be recruited locally, limited labour with specific skills will be recruited from outside the project area. Therefore, there is chance for increased disease risk to occur due to social interaction between immigrant workers working on the project and the local population. Therefore, necessary measures to make workers and the local population aware of the risk of transmitting and contracting HIV/AIDs and STIs need to be implemented by the proponent.

Potential Mitigation Measures

a) The proponent will have to institute HIV/AIDS awareness and prevention campaign amongst workers e.g., erect and maintain HIV/AIDS information posters at prominent locations within the project site.

b) Provision of condoms and monthly educational video presentation and discussions.

7.5.12 Social crime risks

Due to the influx of workers on site, there are chances of introduction of individuals with potentially anti-social behaviour such as thieves/thugs or drug users and this may pose a risk to the local residents during the implementation and occupational phases of the project.

Potential Mitigation measures

a) Adopt strict hiring guidelines to lock out the bad elements.
b) The proponent has a responsibly of sensitizing the workers on social issues such as drug abuse, robbery and other social issues through regular training, social gatherings and strict monitoring.
c) Workers will not be housed at the project site.
d) No worker will be allowed to enter the project site or operate project machine when under the influence of alcohol.

7.5.13 Oil leaks and spills

Oil is another dangerous substance in the environment and especially in the aquatic biosphere. During construction phase, some of the site's construction equipment will require diesel and/or oil. It is also important to note that oil/grease spills are prevalent in construction sites and in most areas that make use of petroleum products. Such products contain detrimental elements to the environment. Though this may not be common at the project site, it is wise to control and observe the little that could occur especially during maintenance of the involved machinery.

Potential Mitigation Measures

a) Maintenance of project vehicles will only take place at a designated garage.
b) No solid waste, fuels or oils shall be discharged on land surface or into drains.
c) Any wash off from the oil/grease handling area or workshop shall be drained through impervious drains.
d) All machinery must be keenly observed not to leak oils on the ground. This can be affected through regular maintenance of the machinery.

7.6 Potential adverse impacts and mitigation during the decommissioning phase

The lifespan of the gold mining and processing project will dependent on the quantities of the gold ore deposit, technology used to mine and financial sustainability of the business. Circumstances that may warrant decommissioning include withdrawal or expiry of mining licenses issued by government agencies, closure by government agencies, court orders and natural calamities. Most of the structures put up by the proponent are temporary thus during decommissioning, they can be dismantled and used

somewhere else. However, during the public consultation forum, it was clear that during decommissioning of the project, most structures will be left for community use. Before decommissioning, the proponent will prepare and submit a due diligence decommissioning audit report to NEMA for approval at least three (3) months in advance. The impact at this phase will include the following:

(a) Creation of an ecologically vulnerable land
(b) Economic decline
(c) Insecurity
(d) Safety and health risks
(e) Waste disposal

7.6.1 Creation of an ecologically vulnerable land

The mining activities such as excavations and blasting of rocks have a direct impact on the land by leaving pits and heaps of waste material. Excavation, drilling and blasting will tamper with the soil structure exposing the site to possible soil erosion.

Mitigation measures

a) Rehabilitation of mines through back filling.
b) re-vegetation to increase soil stability.

7.6.2 Job losses and insecurity

Decommissioning of the proposed project will lead to loss of employment opportunities for the workers. This will most likely increase insecurity in the area as people try to survive with no employment.

Mitigation measures

a) Train employees on alternative livelihoods prior to decommissioning.
b) Pay terminal benefits to all employees.
c) Comply with the Labor laws.

7.6.3 Hazardous waste disposal, Safety and health risk

The disposal of tailings is commonly identified as the single most important source of environmental impact for many mining operations. This is not surprising when considering that the volume of tailings requiring storage can often exceed the in-situ total volume of the ore being mined and processed. If not well cleaned and neutralized, Sodium cyanide, a toxic chemical used during reprocessing of tailings to extract the gold from the tailings is likely to remain in the tailings at the end of the process. Depending on where and how it will be stored, cyanide may leach out into ground water thus contaminating rivers, lake water, soils, vegetation and aquatic life among others. Cyanide reacts readily in the environment and degrades or forms complexes and salts of varying stabilities.

Mitigation measures against presence of cyanide in the processed tailings

i. The cyanide level in solution in the last leaching tank before press filtration will be kept at less than 20 parts per million (20 ppm). Samples from the stream will be tested every 30 minutes to determine the cyanide level, and take corrective measures if necessary.
ii. On exiting the last leaching tank ferrous sulphate will be added to drop the cyanide level to trace. Slurry samples will be collected and tested to confirm the level of cyanide before passing on.
iii. The slurry will then be pumped to filter press where 95% of the water/solution will be filtered out and drain to an 800m^3 solution tailings pond to be pumped back for re-use in the processing plant.

iv. The solid briquettes from the filter press will be dried in the sun on a banded concrete pad, drying to 100% solids.
v. During drying, any residual cyanide if any is expected to be destroyed by the sun.
vi. The dried briquettes will then be transported to an HDPE plastic lined storage area.
vii. Four boreholes will be drilled two up-stream the plant and two down-stream after the plant. Weekly samples of ground water from these boreholes will be drawn and titrated to check for cyanide if any. A once per month sample from all the four boreholes will be send to an independent water analysis laboratory in Kenya for complete metal analysis and results tabulated to check trends in metal concentration and deviations.
viii. The tailings storage will have grass and local tress planted on it to avoid dust and wash away. Grass planting will commence as soon as the tailings deposition starts.

The plant is completely bunded, all the solution contained will not escape to the environment.

CHAPTER EIGHT: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 Introduction

This section is intended to provide a concise structure of actions with specific priority level of action for the management of the environment during the construction, operation and decommissioning of the proposed project. Environmental and Social Management Plan (ESMP) for developing projects provide a framework within which identified negative environmental impacts can be mitigated and monitored. The ESMP also assigns responsibilities of actions to various actors and provides a timeframe within which mitigation measures and monitoring can be done. The ESMP is a vital output of an Environmental and Social Impact Assessment as it provides a checklist for project monitoring and evaluation for sound environmental planning at entire life of the project. There is need to entrench within the working operations of the proposed gold mining and processing project a sound Environmental and Social Management Plan (ESMP) that will ensure no significant environmental pollution occurs as a result of the proposed development.

8.2 Enforcement mechanism of ESMP

The EMP will be enforced by relevant Government Departments and Lead Agencies by continuous monitoring, consultation and feedback from the management of Lakeside Limited, neighbours and the general public and improvement on environmental performance. To ensure adherence to the set conditions:

i. The proponent shall develop and document Environmental Management Procedures that will guide the installation and operational phases of the mining and gold leaching Plant. The procedures should address environmental conservation measures to be put in place, occupational and safety matters of the employees, and management of waste.
ii. The project proponent shall avail necessary finance for implementation of ESMP.
iii. The proponent to ensure employees carries out their work within Environmental and Occupational, Health and Safety requirements.

Table 6 shows the Environmental and Social Management Plan (ESMP) for the proposed mining and tailings/ore processing project in Nyangoma Sub-location in Bondo sub-county, Siaya county.

Table 6: Environmental and social management plan for the proposed mining and gold tailings processing plant

CONSTRUCTION PHASE					
Area of concern	**Recommended Measures**	**Responsibility**	**Time Frame**	**Monitoring Indicators**	**Estimated cost in Kenya Shillings**
Loss of biodiversity /Loss of Vegetation Cover and alteration of habitat	• Properly demarcate the project area to be affected by the construction and operation of mining activities to avoid spillover effects to neighbouring areas. • Re-establish vegetation in some parts of the disturbed areas through implementation of a well-designed landscaping programme by planting of appropriate plants. • The blasting, drilling and transportation will be carried out during the day time only minimizing the impact on the wild fauna movement.	Proponent with assistance from EIA Expert	Continuous monitoring throughout the project cycle	Observation of ground vegetation cover	100,000
Excavations and soil erosion	• The loosened soil to be used in the foundation floor, leveling the ground and landscaping. • Introduce suitable and well-managed vegetation to generate surface covers on the open areas; to control soil erosion	Proponent	During establishment and operational phases of the project	Monitoring the soil erosion management techniques	100000
Extraction and usage of consumable materials	• The project and material requirements will be evaluated and quantified to ensure that the design optimizes the use of materials.	Project Contractor	During the construction phase of the project cycle	Observe the materials used in construction	……..

	• Have a procurement plan based on the Bill of Quantities prepared by a Quantity surveyor to avoid potential oversupply of materials and wastage.				
Security and safety at the project site	• Fence the construction site to ensure no intruders access the site. • Security guards to always guard the gate to the site to keep away intruders and to control movement within the site. • Lighting as well as security alarms to be installed in strategic positions all over the site during construction and after the completion of the project. • The guards stationed at the gate to document movements in and out of the site.	Proponent	Continuous monitoring throughout the project cycle	The security protocols at the project site	Recurrent expenditure
Risk associated with transportation, handling and storage of mining chemicals and explosives	• Permits to procure, handle and transportation of cyanide and blasting explosives to be sought from the relevant government authorities. • The company to have a qualified person who will be handling chemicals at the plant. • No unauthorized persons shall be allowed into the storage room for these chemicals. • Safety material datasheet and reagents issues and storage protocol should be put in place and adhered to.	Proponent	Continuous monitoring throughout the project cycle	Monitor chemical storage facility, permit to procure, transport and store as well as documented expert experience and knowledge of persons handling the chemicals	Recurrent expenditure

Conflicting interest between the project and illegal gold leachers	• Consultation and engagement of the illegal gold leachers on property rights of the mineral resource. • Engage local provisional administration to solve the conflicts on tailings rights. • Support some community empowerment initiatives that are geared towards reducing poverty levels. • Offer employment opportunity to some of the illegal gold leachers. • Transport the tailings to a secured storage facility.	The proponent and his public relations team	During the construction phase of the project	Monitoring the activities of the illegal leachers and their relationship with Lakeside Limited	To be determined by Lakeside Limited based on their budget

OPERATION PHASE					
Area of concern	**Recommended Measures**	**Responsibility**	**Time Frame**	**Monitoring Indicators**	**Estimated Cost (in Ksh)**
Impacts of blasting	• A zone around the mine periphery for safe blasting is proposed and the area shall be suitably fenced. • Daily requisition of explosives will be as per the same day requirement. • A daily register will be maintained for total use and refund of explosives. • All loading and firing shall be directed and supervised by competent person(s) • Inform the local community prior to blasting. • Providing and enforcing the use of earmuffs, dust masks and other PPEs to all workers and visitors to the facility. • Increasing the number of delay detonators used in a round of blasting. • At the end of the blasting surplus explosives will be refunded to the dealer.	Proponent and the blasting experts	During mining operations	Record of explosives used,	2,000,000
Ground and surface Water pollution (through Cyanide leakage and rock blasting)	• Undertake a hydrogeological survey to ensure that blasting and drilling do not interfere with the water table. • All water from the leaching process and tailing washing should	Proponent and the plant operators	During the operation and closure of the plant	Chemical content of waste generated	……..

	be discharged to the recycle dam for recycling and reuse in the leaching process hence should not be released into the environment. • Storm water from the processing section and tailing storage area should be controlled by having a drainage channels all-round the place such that all the storm water from this section is collected and discharged into a pond where it should be monitored for quality. This water should be treated and then pumped back into feeder tanks for reuse in the leaching process. • The tailing storage area should be provided with a base with lining or concreted to prevent percolation of the leachate from the tailings into the soil. This is to prevent soil and underground water contamination. • Leaching tanks shall be designed to offer safe leaching practices without any solutions overflowing				
Impact of Chemical fumes from leach tanks	• Every person handling cyanide on site must wear a face mask. • Processing environment should be maintained in basic condition to avoid evolvement of HCN gas which is poison. The plant should use lime to suppress cyanide from being emitted as a fume into the environment.	Proponent and plant operators	During the plant operation	Working condition for those at the plant	……
Increased Traffic	• The local rural roads should be	Proponent and project drivers	regularly	The road status	2,000,000

	expanded and rehabilitated. • Use construction and warning signs to warn the public on the traffic. • Only needed vehicles to be mobilized to the site, those that are not temporarily in need to be kept off from the project site and area. • Parking to be provide for vehicles within the confines of the project area.				
Air Pollution	• Personal protective equipment (PPE) such as dust masks must be worn by those working in the mining site. • Adopt the wet crushing technology to minimize amount of dust generated during crushing of tailings and rock ore. • Sprinkling water during dry season on the road to the mining site to suppress dust.	Proponent, crushing engineers, project workers	During the operation of the mining works and during dry weather	Air quality	1,000,000
Noise and Vibration	• No mining operations at night. • Drilling with sharp bits and control blasting to minimize the noise pollution from blasting exercise. • works should be equipped with standard noise attenuation features.	Proponent and blasting experts	Throughout the project cycle	Noise levels	1,000,000
Increase in Water Use	• Water used in leaching plant should be recycled and re-used in the plant. • Harvest rain water to	Proponent and the plant operators	Throughout the project cycle	Water conservation initiatives, water consumption rate	800,000

	compliment. • Fixing and using self-closing taps with shorter hand-wash cycles at some points of the site and buildings.				
Solid Waste/Debris	• Provide waste handling facilities such as waste bins for temporarily holding of wastes generated. • Install double bins for separate collection of recyclable and non-recyclable wastes. • Ensure that the collection and disposal of the wastes is done regularly and appropriately. • Re-use mining waste and soil materials piled at the site to refill (restore) the excavated areas that exist as a result of mining.	Proponent and those working at the site	Throughout the project cycle	Solid waste generation rate and management practices	2,000,000
Sewage/Human waste from the Personnel at the project site	• When constructing pit latrines, preference should be made to modern pit latrines that can easily be dislodged. • Sanitary facilities should be cleaned every day. • Pit latrines to be de-sludge whenever they near filling up.	Proponent and those working at the site	Cut across different project phases	Status of the latrines	1,500,000
Use of energy (electricity and fuel)	• Use of energy efficient night time lighting only at the site. • All energy using equipment used should be switched off when not in use. • Keep records and analyze Kenya Power bills to identify areas of unnecessary use.	Proponent and those working at the site	Throughout the project cycle	Electricity bills, amount of fuel used in generators	……

	• Consider installing alternative energy sources such as solar panels and automatic generators not only for power back up but also to reduce dependency on electricity.				
Fire	• Places with flammable materials should be declared "NO SMOKING ZONES" and clear notices of the same be displayed. • Fire extinguishers should be installed at strategic locations within and outside specific rooms such as light fuel storage area, offices and in areas where food is prepared. • The "FIRE EXITS" from the buildings should be clearly marked. • "FIRE ASSEMBLY POINTS" at specific points at the site should be established and marked. • Facilitate regular inspection of the firefighting equipment, the period will not exceed six months.	Proponent	Throughout the project cycle	Fire fighting equipment and their status	5,000,000
Increased storm water flow	• Run-off to be handled by construction and designing of curbs, channels, side inlets and road side ditches to channel water into existing drainage lines so as to prevent ponding and flooding. • Install gutters and construct tanks to harvest and store rain	Proponent and the Siaya county government	Regularly, especially during rainy season	Drainage status	1,000,000

	water for use and thus reducing surface run-off. • Regular repair and open up of drainage channels to be kept them open.				
Impacts related to occupational health and safety	• Provide equipped first aid kits and other facilities and services. • Dangerous working areas such as mining site should be protected, fenced, demarcated and cordoned off from the general public. • Leaching tanks, barren tanks and laboratory area should be enclosed to prevent accidents that may result from unauthorized persons entering the area. • Ensure adequate water supply to ensure high standards of sanitation that keeps to the minimum chances of disease outbreaks. • Provide hazard notifications, signage and warnings to warn visitors and staff of potential dangers that may exist in different areas of the facility. • Ensure chemicals are stored in a designated enclosed area, and material safety data sheets are within easy reach.	Proponent and those working and visiting the site	Throughout the project cycle	Working status and health records of the workers	3,000,000
Sexually Transmitted Infections and HIV / AIDS	• Institute HIV/AIDS awareness and prevention campaign amongst workers e.g., erect and	Proponent in collaboration with the ministry of health	Throughout the project cycle	HIV awareness program	900,000

	maintain HIV/AIDS information posters at prominent locations within the project site. • provision of condoms and monthly educational video presentation and discussions.				
Social crime risks	• Adopt strict hiring guidelines to lock out the bad elements. • Workers should not be housed at the project site. • No worker should be allowed to enter the project site or operate project machine when under the influence of alcohol or drug and substance abuse.	Proponent in collaboration with the local chiefs and the police	During the construction phase and operation of the project	The criminal record of those employed or seeking to be employed	……..
Oil leaks and spills	• Maintenance of project vehicles should only take place at a designated garage. • Any wash off from the oil/grease handling area or workshop should be drained through impervious drains. • All machinery must be keenly observed not to leak oils on the ground. This can be affected through regular maintenance of the machinery.	Proponent, project drivers and plant engineers	Throughout the project cycle	Oil handling and storage facilities	300,000

DECOMMISSIONING PHASE					
Area of concern	**Recommended Measures**	**Responsibility**	**Time Frame**	**Monitoring Indicators**	**Estimated cost**
Creation of an ecologically vulnerable land	• Rehabilitation mines through filling. • Re-vegetation to increase soil stability	Proponent and Mining Engineers	During decommissioning	Filled mines	1,000,000
Job losses and insecurity	• Train employees on alternative livelihoods prior to decommissioning. • Pay terminal benefits to all employees.	Proponent and Mining Engineers	Continuous monitoring	Number of employees trained	1,000,000
Hazardous waste disposal, Safety and health risk	• Laboratory analysis of the tailings should be done to establish if sodium cyanide traces are still present. • In case of presence of Sodium Cyanide, a treatment should then follow where a cyanide neutralization solution containing hydrogen peroxide should be applied (mixed with water then flushed). • The tailing should be analyzed further to determine and ensure complete flush out and neutralization of cyanide. • When completely free from cyanide, tailings should be compacted to ensure they are not carried away by storm water, vegetation can be allowed to	Proponent and mining Engineers	Follow up	Tailings chemical content	1,000,000

	grow. • Tailings free from cyanide can be used to make bricks or fill open pits.				

CHAPTER NINE: ENVIRONMENTAL MONITORING, EVALUATION,AND REPORTING

9.1Introduction

Monitoring, evaluation and reporting is vital for any plan. The purpose is to ensure compliance to the Environmental and Social Management Plan (ESMP). The monitoring and evaluation system ensure that mitigation measures or strategies are implemented effectively. It also allows response to new and developing issues of concern in a timely manner and provide feedback on significant environmental changes for remedial actions. This chapter presents the monitoring, evaluation and reporting arrangements for the ESMP developed in Chapter 9 of this ESIA report.

9.2 Monitoring

Environment monitoring will be implemented in a participatory and all-inclusive manner. Monitoring will be a continuous process covering planning, operation and decommissioning phases. The overall objective of environmental monitoring including social-economic issues is to ensure that all construction, operation and decommissioning activities comply with legal and regulatory requirements so that all mitigation measures are implemented effectively. The items to be monitored for this ESIA will include but not limited to: Water and soil resources, Air quality, Noise Quality, Socio-economic aspects, Vegetation and Biodiversity, Wastes including management of reprocessed tailings, Occupational Health and Safety. The key measurement indicators for these aspects are contained in the ESMP. These indicators will form simple checklist to record information relating to these mentioned environmental aspects. Indicators will inform any improvement or change of strategy.

9.3 Environmental Auditing

Annual Environmental Audits should be carried out as provided for in the Environmental (Impact Assessment and Audit) Regulations of 2003. The Audits will serve to confirm the efficacy and adequacy of the proposed Environmental Management Plan.

The audits will include but not limited to the following;

(a) Plant operations;
(b) Occupational health and safety concerns;
(c) Views and comments from the surrounding community;
(d) Air quality assessment;
(e) Noise assessment;
(f) Water and soil quality assessment;
(g) Management of hazardous chemicals and substances;
(h) The design and security of the mining site;
(i) Waste generation and management and
(j) General progress in implementation of Environmental and Social Management Plan.

CHAPTER TEN: CONCLUSION AND RECOMMENDATIONS

This report comprehensively identifies and assesses potential impacts, their severity and the scope of Lakeside Limited surface gold mining and leaching operations on environment, ecosystem components, regional socio-economy. The proposed mining project is considered important and beneficial as it expands the mining sector in Kenya which has remained under-explored for decades. Kenyan gold mining is mainly characterized under artisanal which doesn't have enough capacity to extract gold fully from the ore. This particular project by Lakeside limited will use modern technology to extract over 95% of gold in the ore. The project is considered as a stimulus to industrial and economic growth and development not just in Bondo but the country at large. The project is going to offer employment opportunities, enable technology transfer, support communities under corporate social responsibility and pay taxes to both county and national government. However, if not well managed, some of the project's activities can result environmental pollution and degradation. The main concern of a gold mining and leaching plant is always leakage of sodium cyanide into the environment as well as use of explosive chemicals and devices to blast rocks.

Based on scientific analysis of the impacts stated, they were found to be mitigatable and hence the ESIA for this particular study recommended implementation of Environmental and Social Management and Monitoring plans to improve the environmental performance during the entire project cycle. If all the suggested mitigation measures are put in place, the proposed project will not adversely affect the environment; furthermore: -

i. The proposed project actively involved the key neighborhood and other interested and affected stakeholders who did not object the development.

ii. The project has sufficient public support who want the developer to even expand more his mining activities in the area in the near future, in fact some proposed offering him land for free so that he can develop the area.

iii. The state department of mining has fully approved the project by offering the required licenses and approvals.

Based on the above stated justifications and commitment by the proponent to implement the proposed mitigation measures, Lakeside Limited should therefore be licensed to implement the project subject to adherence to the Environmental and Social Management Plan proposed in this report and the statutory requirements.

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APPENDICES

A. Certificate of Incorporation;

B. Lakeside Limited Company PIN Document;

C. Land Lease Document;

D. Title Deed of the Leased Land;

E. Mineral Prospecting License;

F. Map of the Mineral prospecting Licensed Area;

G. Acceptance Letter of the Offer on the Grant of Mineral Right Mining License;

H. Change of Land Use;

I. EIA Expert License Associate Expert: 9976;

J. EIA Expert License Lead Expert: 6443;

K. Minutes of Public Consultation meeting;

L. List of those who Attended the CPP 1;

M. Minutes of Public Consultation meeting 2;

N. List of those who Attended the CPP 2;

O. Minutes of Public Consultation meeting 3;

P. List of those who Attended the CPP 3;

Q. Questionnaire Filled During CPP;

R. Foundation Drawing of the Gold CIP Processing Plant;

S. The CIP Gold Processing Plant Layout.