ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY REPORT

PROPOSED GOLD ORE MINING AND PROCESSING PROJECT

LOCATION

Plot L.R Nos. Kabuoch/Kaguria//Kamenya/Koguta/708 and Kabuoch/K/K/Koguta/2197 in Kabuoch South/Pala Ward, Koguta Sub-Location, Pala Location, Pala Division, Ndhiwa Sub-County, Homa Bay County, Kenya

Coordinates: Latitude 0.815772 ^{0}S and Longitude 34.386489 ^{0}E

Proponent

Spirit Mining Kenya Ltd.

P.O. Box 7374-00100 Nairobi, Kenya

Prepared for submission to the National Environment Management Authority
Head Office South C Nairobi

By

Rose Odula and Silas O. Rakama (EIA/EA Lead Experts)

September, 2024

CERTIFICATION

This Environmental Social Impact Assessment (ESIA) study report was prepared in compliance with the Environmental Management and Coordination Act (EMCA) 1999 (Revised 2015) and the legal notice 31&32 of (2019).

I, the undersigned, therefore certify that the information contained in this report accurately reflects the ESIA procedure and findings for the proposed gold ore mining and processing project on plots L.R numbers Kabuoch/Kaguria/Kamenya/Koguta/708 & Kabuoch/Kabuoch/K/K/Koguta/2197 in Kabuoch South/Pala Ward, Koguta Sub-Location, Pala Location, Pala Division, Ndhiwa Sub-County, Homabay County, Kenya**.**

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ABBREVIATIONS AND ACRONYMS

°C	Degrees Celsius
°F	Degrees Fahrenheit
^{0}E	Degree East
^{0}S	Degree South
AIDS	Acquired Immunodeficiency Syndrome
App	Application
Cap	Chapter
CBOs	Community Based organizations
CIDP	County Integrated Development Plan
CIL	Carbon in Leach
CIP	Carbon in Pulp
CPP	Consultation and Public Participation
EA	Environmental Audit
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
ESIA	Environmental and Social Impact Assessment
ESMP	Environment and Social Management Plan
GPS	Global Position System
HCN	Hydrogen Cyanide
HDPE	High-Density Polyethylene Element
HIV	Human Immunodeficiency Virus
Kg	Kilogram
Km²	Square Kilometer
L.R	Land Registration
LM	Lower Midland
LTD	Limited
M	Metres
M²	Square Metre
M³	Cubic Metres
Mm	Millimetre
MTP	Medium-Term Plan
NEMA	National Environment Management Authority
NGOs	Non-Governmental Organizations
No.	Number
Nos.	Numbers
OSHA	Occupational Safety and Health Act
P.O	Post Office
PPE	Personal Protective Equipment
REREC	Rural Electrification and Renewable Energy Corporation
TOR	Terms of Reference
TSF	Tailings Storage Facility
UM	Upper Midland

EXECUTIVE SUMMARY

Spirit Kenya Mining LTD plans to undertake gold ore mining and processing in Kabuoch South Ward, Koguta Sub-Location, Pala Location, Ndhiwa Sub-County, Homabay County, Kenya. The area has a history of small-scale mining activities and is known for its rich mineral deposits. Exploration work by the proponent in the project area failed to outline any medium scale mineralization, but succeeded in identifying a number of small high-grade quartz veins, which are sufficient to justify a viable small-scale mining project.

Spirit Mining Kenya Limited, a private limited company registered in Kenya under the Companies Act 2015, is the proponent of the proposed gold ore mining and processing project. The company's special licence application No. 4583 grants it a 12-square-kilometer mining licence area in Homabay County, which includes the proposed project location.

The project area is relatively densely populated, although the small size of the ore bodies allows an integration of mining activities within the community without any major disruption or need for relocations. In the project area, land is owned by private individuals, with most properties being registered and accompanied by title deeds. Spirit Mining Kenya Limited has lease two plots measuring 2.64 hectares for the mining site and 7.14 hectares for the processing site.

The proposed project costs Ksh. 24,538,429.90, including expenses for CIP leaching plant, jaw crusher, fine ore hopper, milling, concentration, classification, elusion, tailings storage facility, labour, and other contingencies.

The processing site will consists of a crushing module, mill, Kendall Concentrator, gold room/smelting furnace, CIL System, elution plant, fire assay laboratory, office and workshop block, water storage and supply system, latrines, light fuel storage facility, tailings storage facility, tailing/sludge dam, emergency sludge dam, security setup, and a high-security area. The processing site has already been secured by an electric fence with some of the infrastructure already established, most of the infrastructure were made of temporary structures of iron sheet and timber with some such as latrine made of brick and mortar.

Underground mining will require specialized equipment and infrastructure, including shaft head gear, electric winch, compressor, drilling gear, water pumps, and ventilation system. The explosives magazine, surrounded by earth mounds and a perimeter fence, will be guarded 24/7.

There two main methods of extraction ore from the ground; Surface mining/ Open pit mining which is suitable for shallow lying deposits and Underground mining which is most suited for steeply dipping and narrow deposits. During the mining process, the ore will be loosened using explosives in a process known as drilling and blasting and the loosened ore will be transported to the processing site.

Ore processing will entail crushing and milling to liberate the gold from the ore, concentration which will include gravity concentration, cyanidation where ore is treated using cyanide solution to dissolve the gold will be used, smelting and refining will be the final process to refine the raw gold.

Decommissioning is a crucial stage in the mine life cycle, aiming to restore mining sites to their natural or economically usable state through various stages, for this particular project

decommissioning of the mine will entail safely dismantling and removal of mining equipment, machinery, and infrastructure; disposal of hazardous materials in compliance with environmental regulations; re-contouring the land to its natural or intended post-mining topography as well as replacing the topsoil removed during mining to support vegetation growth.

Mining projects are classified as High-Risk Projects under Legal Notice No. 31, Legislative Supplement No. 16, published in Kenya Gazette Supplement No. 62 on 30th April, 2019. The project was subjected to high risk ESIA.

The ESIA aimed to assess the project's environmental impact, discuss corrective measures, and propose an ESMP for mitigation and monitoring of adverse impacts during its implementation.

The assessment was carried out between July and August 2024 in compliance with the guidelines and procedures outlined in the Environmental (Impact evaluation and Audit) Regulations, 2003 (Amendment 2019). The assessment entailed:

(a) Proposed project screening: The proposed gold ore mining and processing project was screened to determine its Environmental Impact Assessment (ESIA) level. It was categorized as high-risk according to Legal Notice No. 31, Legislative Supplement No. 16, and the nature of the receiving environment, existing social amenities, and anticipated environmental and social concerns.
(b) Site visits: Extensive site visits were conducted on July 10th and August 20th, 2024, to physically examine and record the location's amenities, natural and socioeconomic aspects, noise levels, air quality analysis, water and soil samples collection for analysis.
(c) Scoping: The scoping process identified key environmental assessment areas, including physical, social, economic, ecological, and cultural, to address key issues and stakeholders. The EIA team developed a Terms of Reference for the assessment during the scoping exercise, the TOR was approved by NEMA on 9th August 2024 (NEMA/TOR/5/2/773).
(d) Public participation: Public participation was achieved through questionnaires, public meetings, and interviews with opinion leaders, which were then incorporated into the ESIA report.
(e) Literature review: The ESIA team thoroughly reviewed various documents related to the proposed project, including feasibility study reports, project design, geological survey reports, and relevant legislations, to gain a comprehensive understanding of the project's context.
(f) Reporting and documentation: NEMA guidelines through the NEMA legal Notice No. 32 Environmental Impact Assessment and Audit (Amendment) Regulations, 2019 was used as a guide in compiling this ESIA report. The Consultant ensured constant briefing of the client during the exercise. Description plans and sketches showing various activities are part of the Appendices of the report.

Impact identification and evaluation were based on the project design and characteristics as well as the environmental baseline information of the proposed project area. The scope and scale of the proposed gold mining and processing project, as well as the kinds of environmental control measures envisioned in the project proposal, all influenced the

analysis of the impacts. 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 and decommissioning phase (Table 1).

Table 1: Summary of Key Significant Impacts and Mitigation Measures

Environmental/ social impact	**Recommended Mitigation measures**
Grievances/conflicts	• The proponent should put in place a pre-emptive community liaison structure aimed at identifying potential issues arising from project-related impacts and addressing them before they become grievances, the proponent should also have mechanisms of escalating grievances to relevant mandated agencies in case the grievances cannot be handle at the community level. • Put a barrier between the electric fence and the public road/ homesteads to prevent easy access by the community members and livestock.
Landform and Geological Change, Soil Erosion, Quality Deterioration	• Implement phased mining to minimize the area disturbed at any one time. • Use techniques such as terracing, retaining walls, and geo-fabrics to stabilize disturbed areas and reduce landform changes. • Soil conservation measures would be taken to the stockpiles to prevent erosion. This can include the use of erosion control fabric. • Design and implement effective drainage systems to manage surface water and prevent erosion.
Air Pollution and Dust	• Personal protective equipment (PPE) such as dust masks must be worn by those working in the mining and ore crushing site. • Adopt the wet crushing technology to minimize amount of dust generated during crushing of tailings and rock ore. • Slow down speed of vehicle on site and access road to the site to minimize dust generation. • Sprinkling water during dry season on the road to the mining site to suppress dust. • Care should be taken to prevent spillage of transported ore by covering the carrying vehicles with tarpaulin and sprinkling of water, if dry.
Vibration and Noise	• Select and maintain mining equipment with lower noise levels. Utilize noise-reducing technologies such as mufflers, silencers, and noise enclosures. • Schedule noisy activities during daytime hours when they are less likely to disturb nearby residents. Implement quiet periods during the night. • Use controlled blasting techniques such as pre-splitting, cushion blasting, and electronic detonators to minimize noise. Conduct blasting at fixed times with prior notification to local communities.

	• Set up continuous noise monitoring stations around the mine site to measure noise levels and ensure compliance with regulations.
Fire Risk	• 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. • “FIRE ASSEMBLY POINTS” at specific points at the site should be established and marked. • The company should on regular basis train personnel concerning emergencies including those involving fire out-breaks. • Spirit Mining limited should facilitate regular inspection of the fire fighting equipment.
Mining Operations related Accidents	• Underground mining and ore processing works to be undertaken by qualified and experienced experts. • Personal protective equipment to be provided and used by those working in high risk areas such as the mines and the processing plant. • Provide equipped first aid kits and train personnel on emergency response on site. • 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. • Dangerous working areas such as mining and ore processing sites will be protected, fenced, demarcated and cordoned off from the general public.
Risk associated with transportation, handling and storage of mining chemicals and explosives	• Obtain a license for transporting hazardous materials from NEMA, ensuring that the vehicle used for transportation is certified for carrying hazardous chemicals including proper labelling and safety features. In the event of an accident or spill, immediately report to NEMA and other relevant authorities. • Ensure that hazardous chemicals are packaged in containers that are leak-proof and resistant to the chemicals being transported. • Ensure that Safety Data Sheets (SDS) for all hazardous chemicals are available and accessible. SDS provide detailed information on handling, storage, and emergency measures. • Have a qualified person to handle the storage and monitor usage of hazardous chemicals and explosives at the company’s site. No unauthorized persons should be allowed into the storage room or to use the chemicals.

Risks associated with blasting	• Conduct thorough geological surveys to understand the rock structure and potential hazards. • Establish safety zones and ensure all personnel are clear of the blast area. • Those working in the mine should use PPEs and mats to contain flyrock, dust and noise. Ensure proper handling, storage, and disposal of explosives. • All loading and firing shall be directed and supervised by competent person(s) thoroughly experienced in this field and accredited accordingly. • Increase the number of delay detonators used in a round of blasting. • Inform local communities about blasting schedules and potential impacts prior to blasting. • Adhere to local regulations and industry standards for blasting operations (Explosives Act of Kenya, 2012).
Impact on Ground and Surface Water Quality (by rock blasting and cyanide leaks)	• Conduct a hydrogeological assessment to guarantee that drilling and blasting operations do not disrupt the water table. • Construct containment systems such as double-lined tailings ponds and leach pads to prevent cyanide leakage into the soil and groundwater. Use high-density polyethylene (HDPE) liners for additional protection. • Ensure proper handling and mixing of cyanide solutions to minimize spills and exposure. Use closed leaching systems where possible to reduce the risk of accidental releases. • Implement cyanide recycling systems to reduce the amount of cyanide used and disposed of, minimizing the risk of leakage. • Regularly monitor groundwater and surface water quality around the mine site for cyanide levels. The comparison should be based on baseline data before mining operations. • Equip the site with cyanide spill containment and neutralization materials, such as spill kits and neutralizing agents (e.g., sodium hypochlorite or hydrogen peroxide).
Effects of cyanide vapours from leach tanks	• Processing environment should be maintained in basic condition to avoid evolvement of HCN gas which is poisonous, to achieve this, the plant should use lime to suppress cyanide from being emitted as a fume into the environment. • Install and maintain effective ventilation systems in areas where cyanide is used to disperse and dilute HCN fumes. Ensure proper air exchange rates to keep HCN concentrations below harmful levels. • Utilize closed systems for cyanide processing to minimize the release of fumes into the workplace. • Train workers on the safe handling of cyanide, recognizing the signs of HCN exposure, and emergency response procedures. • Equip workers with protective clothing, gloves, respirators and goggles

	to prevent skin and eye contact with cyanide solutions and fumes.
Impacts related to Natural Disasters	• All workers need to undertake emergency response drills. • Construct surface water diversion facilities: security dam/barrier, drainage and ditches around open pit, social structure and waste rock dumps to prevent from flooding. • Emergency dam should be constructed at the project site based on the slope of the area to collect water that might overflow from the tailing dam during flooding.
Increased Traffic	• Sensitize the drivers to control and reduce speed of vehicles on the road. • Expand and rehabilitate the local access roads to be used by the trucks.
Alterations to Social Community Norms and Structure	• Involve local communities in decision-making processes to ensure their needs and concerns are addressed. • 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. • Through the CSR, support local community income generating projects especially for members not working in the mining industry.
Impacts from mines and plant closure	• A decommissioning report will be prepared and submitted to NEMA at least three months before decommissioning takes place (NEMA will advise accordingly on the decommissioning process and possible ways to mitigate the decommissioning impacts). • Mitigation for decommissioning phase impacts will follow general guidelines in the decommissioning report developed and approved by NEMA before decommissioning.

1 INTRODUCTION

1.1 Background

Spirit Kenya Mining LTD plans to undertake gold ore mining and processing in Kabuoch South/Pala Ward, Koguta Sub-Location, Pala Location, Pala Division, Ndhiwa Sub-County, Homabay County, Kenya. The area has a history of small-scale mining activities and is known for its rich mineral deposits. Exploration work by the proponent in the project area failed to outline any medium scale mineralization, but succeeded in identifying a number of small high-grade quartz veins, which are sufficient to justify a viable small-scale mining project. Table 1.1 summarizes the background information of the proposed project.

Table 1.1: Summary of the proposed gold ore mining and processing project by Spirit mining Kenya LTD in Ndhiwa

Item	Description
Project Name	Proposed gold ore mining and processing project
Specific objectives and scope of development	The primary objectives of the project are: • To extract gold ore from identified deposits using environmentally responsible methods. • To process the ore on-site to produce gold for sale in local and international markets. • To implement sustainable mining practices that minimize environmental impact and promote socio-economic development.
Proponent	Spirit Mining Kenya Ltd. P.O. Box 7374-00100 Nairobi, Kenya
Location	Plot L.R Nos. Kabuoch/Kaguria//Kamenya/Koguta/708 and Kabuoch/K/K/Koguta/2197 in Ndhiwa Sub-County, Homa Bay County, Kenya. The two plots are less than 500 metres from each other.
Site GPS coordinates	Latitude 0.815772 ^{0}S and Longitude 34.386489 ^{0}E
Land area and ownership	The parcels for the proposed project have been leased by the proponent (lease documents and title deeds attached).

1.2 The project Proponent

The proponent of the proposed gold ore mining and processing project is Spirit Mining Kenya Limited. The company is private limited, legally registered in Kenya under the companies Act 2015 (Certificate of incorporation attached as annex 01).

The area was previously held by Pinsapo Kenya ltd who carried out exploration works and defined the resource Spirit Mining intends to mine.

The entire prospecting license area in Homabay county, which the proposed project fall has been given a special name ‘’Atieli’’. The area was previously held by Pinsapo Kenya ltd who carried out exploration works and defined the resource Spirit Mining intends to mine (Special License 209). Spirit Mining made a mining license application No/4583 over an area of approximately 12 square kilometers.

1.3 Rationale for the Environmental and Social Impact Assessment

The proposed gold ore mining and processing project is categorized as a High-Risk Project under the Legal Notice No. 31, Legislative Supplement No. 16 published in the Kenya Gazette Supplement No. 62 on 30th April, 2019 i.e. Amendment of the Second Schedule which lists the projects to undergo EIA [Section 58 (1) of EMCA, 1999 (Cap. 387) (Amendment 2015)].

The proposed project falls under the category of mining and other associated industries, such as the extraction of precious metals; [Sub clause 3.(6)(a)] Furthermore, it is important to consider both the positive and negative environmental effects of the proposed project. According to Section 58 of the Act and Part VI, Section 31 (3) (a) (i) and (ii) of its legislative supplement, the Environmental (Impact Assessment and Audit) Regulations, 2003 (Amendment 2019), the project needs an ESIA study report completed for it before it is executed. The primary goal of an ESIA study report is to help the proponent, NEMA, and all other stakeholders comprehend the possible environmental effects of the proposed project and to provide them with a foundation upon which to make informed decision.

1.4 Objectives of the ESIA

The ESIA main goal is to provide reviewers, the Authority, and any other stakeholders a foundation upon which to make informed decisions on the proposed project. The following are the specific goals of the ESIA project:

a. To determine the project site's baseline environmental condition;

b. Determine the project's possible effects on the environment, both good and bad;

c. Discuss suggested corrective actions for the project's substantial adverse effects on the environment and the community;

d. Provide a proposal for an Environmental and Social Management Plan (ESMP) to direct the implementation of mitigation actions of adverse impacts and monitoring during the project’s implementation.

1.5 Terms of Reference for the ESIA Project

In compliance with the Environmental (Impact Assessment and Audit) Regulations, 2003, (Amendment 2019), the ESIA team in consultation with the project proponent and NEMA, developed the Terms of Reference for the study, the TOR was approved by NEMA on 9th August 2024 (Ref:NEMA/TOR/5/2/773). The proponent and the ESIA team accomplished the following tasks in order to satisfy the assessment's TOR:

i. Established the project area's baseline environmental conditions;

ii. Clearly explained the proposed project’s location, design, construction and operation processes, materials to be used, products and by-products, including waste to be generated in all phases and the disposal techniques for them, as well as the anticipated environmental impacts of such wastes;

iii. Obtained the views and opinions of the interested and affected persons through administration of questionnaires as well as public meeting;

iv. Reviewed and demonstrated the applicability of applicable laws and regulations to the proposed project;

v. Described and examined alternatives to the proposed project in light of its intended location, design, technology, and procedures, as well as the arguments in favour of the suggested alternatives;

vi. Identified priority areas for environmental, health, and safety concerns emphasizing both the positive and negative in relation to the biophysical, social, economic and cultural elements of the environment;

vii. Suggested potential mitigation actions to lessen negative project impacts and enhancement measures for the positive impacts;

viii. Developed a comprehensive Environmental and Social Management Plan (ESMP) of the proposed project, the (ESMP) outline the schedule for implementation, the parties (individuals or organisations) in charge of carrying out these measures, the parameters to be monitored, the frequency of monitoring, performance indicators, the parties in charge of monitoring, and the associated costs.

ix. Produced a thorough ESIA project report in compliance with the Environmental Impact Assessment and Audit regulation, 2003 (Amended 2019), to be submitted to NEMA in both soft and hard copy along with required attachments for approval or further guidance.

1.6 ESIA Procedure and Methodology

The assessment was carried out between July and August 2024 in compliance with the guidelines and procedures outlined in the Environmental (Impact evaluation and Audit) Regulations, 2003 (Amendment 2019). The ESIA study entailed:

a) **Project Screening**: Screening was done to determine the level of ESIA to which the proposed project was subjected to. The proposed gold ore mining and processing project is categorized as High-Risk in according with the Legal Notice No. 31, Legislative Supplement No. 16 published in the Kenya Gazette Supplement No. 62 on the 30th of April 2019 i.e., Amendment of the Second Schedule which lists the projects to undergo Environmental Impact Assessment (EIA) [Section 58 (1) of EMCA, 1999 (Revised 2015)] and, therefore, requires to be subjected to ESIA study. Other parameters used in the screening was the nature of the receiving environment in the project area, existing social amenities as well as the anticipated social concerns because of the proposed project.

b) **Site visit**: extensive site visits were done on 10th of July and 20th August, 2024 to physically examine and record the location's current amenities as well as significant natural and socioeconomic aspects. Other baseline assessments such as noise levels, air quality analysis was done during the site visit, water and soil samples for baseline quality analysis were also collected. Key photographs acquired during site visits are attached in this document.

c) **Scoping**: Scoping was carried out to pinpoint the most important issues that needed to be addressed throughout the evaluation and to pinpoint the stakeholders who would be impacted by and interested in the project. The scoping process led to the

identification and classification of the following important environmental assessment areas: physical, social, economic, ecological, and cultural. Greater emphasis was placed on the effects that were determined to be most likely significant. During the scoping exercise, Terms of Reference (TOR) for the study was developed and submitted to NEMA for approval.

d) **Public participation**: Views of the interested and affected parties were collected through administration of questionnaires to the project neighbouring households, public meeting as well as key informant interviews with opinion leaders. The information gathered was subsequently synthesized and incorporated into the ESIA report.

e) **Review of relevant literature**: to understand the project background and its context and legislations relevant to the proposed project, the ESIA team reviewed documents related to the proposed project including project feasibility study report, project design, geological survey report, CIDP Homabay County, relevant pieces of legislations and other similar studies.

f) **Reporting and documentation**: NEMA guidelines through the NEMA legal Notice No. 32 Environmental Impact Assessment and Audit (Amendment) Regulations, 2019 was used as a guide in compiling this ESIA study report. The Consultant ensured constant briefing of the client during the exercise. Description plans and sketches showing various activities are part of the Appendices of the report.

2 PROJECT DESCRIPTION

2.1 Introduction

This chapter provides detailed information on the location, design, nature, and site layout/plans of the mining activities. It outlines the activities involved at each stage of the project, including ore extraction, ore processing, and waste management, as well as the supporting infrastructure such as utility requirements and access roads.

2.2 Project Location and Route Map

The Project is located in Kabuoch South/Pala Ward, Koguta Sub-Location, Pala Location, Pala Division, Ndhiwa sub-county of Homa Bay County. From Nairobi, the project area is accessed by driving North-West along the Nakuru highway, taking a left turn down the Rift Valley escarpment towards Maai-Mahiu, proceeding to Narok and then to Kisii. From Kisii one proceeds southwards along the Migori road (which crosses the Tanzania border at Isabenia) and turn right at Rongo, then on Rongo-Homabay road one turns left at Rodi-Kopany to Ndhiwa. The project area can be accessed from Ndhiwa through earth road that passes through Riat market centre near Ndhiwa sugar mill (Figure 2.1& 2.2).

The area is relatively densely populated, although the small size of the ore bodies allows an integration of mining activities within the community without any major disruption or need for relocations.

Figure 2.1: Map of Kenya showing the project location (red pin)

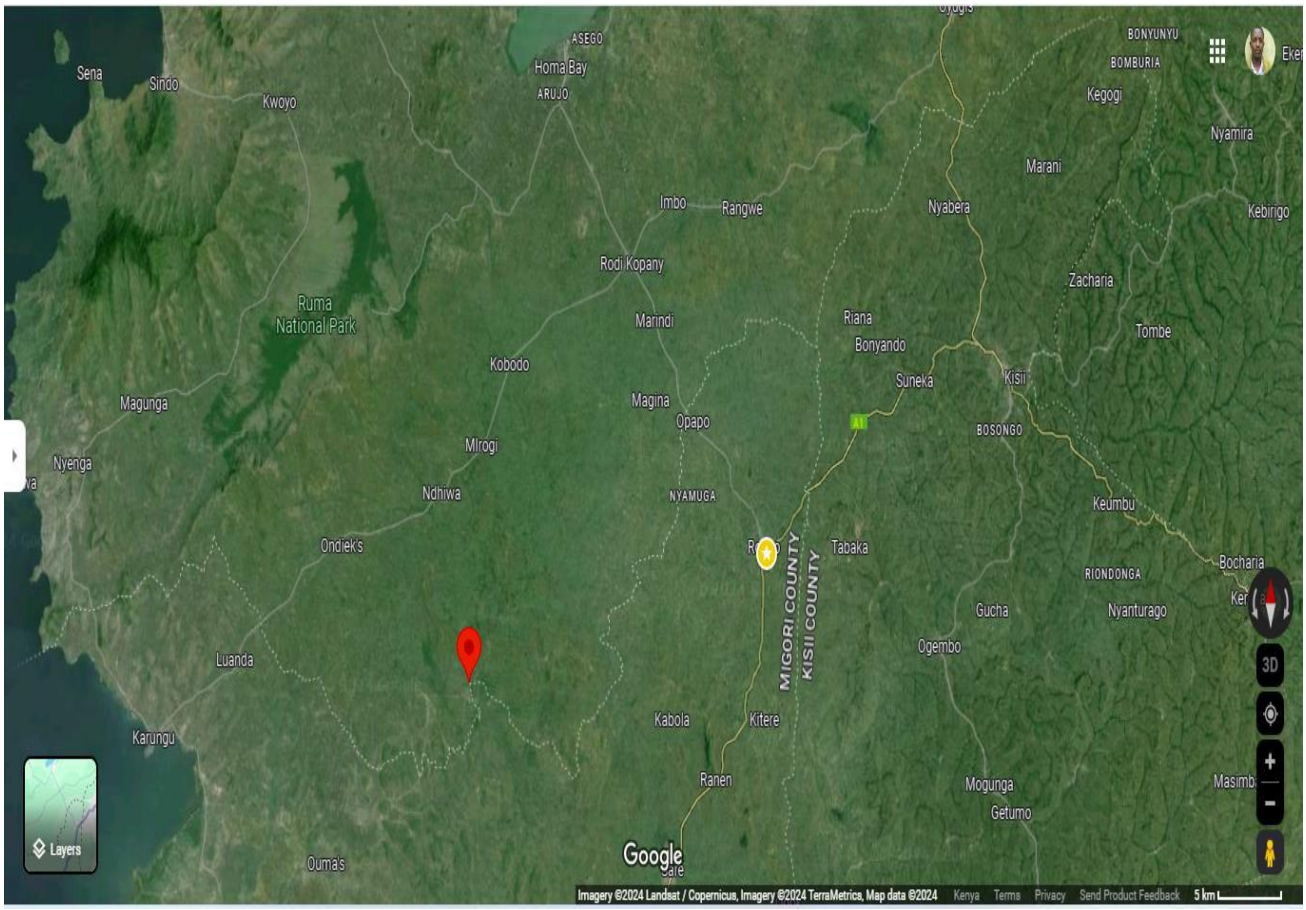

Figure 2.2: Route map to the project site

2.3 Mining License Area

Spirit Mining Kenya Limited applied for a mining licence (App No. 4583) covering about 12 square kilometres (Figure 2.3). The two sites for this particular ESIA study are marked in red and pink in the figure below.

It is important to note that whereas this EIA study will as well facilitate the completion of the mining licensing process as its one of the requirements for granting of the license, EIA is site specific thus independent EIA will be required in the near future as the proponent expand mining operations to other sites within the mining license area, the proponent will be advised accordingly based of the environmental and socio-economic characteristics of the sites.

Within the mining license area there is potential for alluvial gold prospecting and mining activities targeting area along the Kuja River's meanders, oxbows, and the confluence with smaller tributaries covering approximately 0.8 km². The anticipated alluvial gold prospecting and mining will also be screened and proponent advised on the scope of EIA required based on the second schedule of EMCA 1999 (reviewed 2015); Legal Notice 31 & 32 of 2019 on EIA.

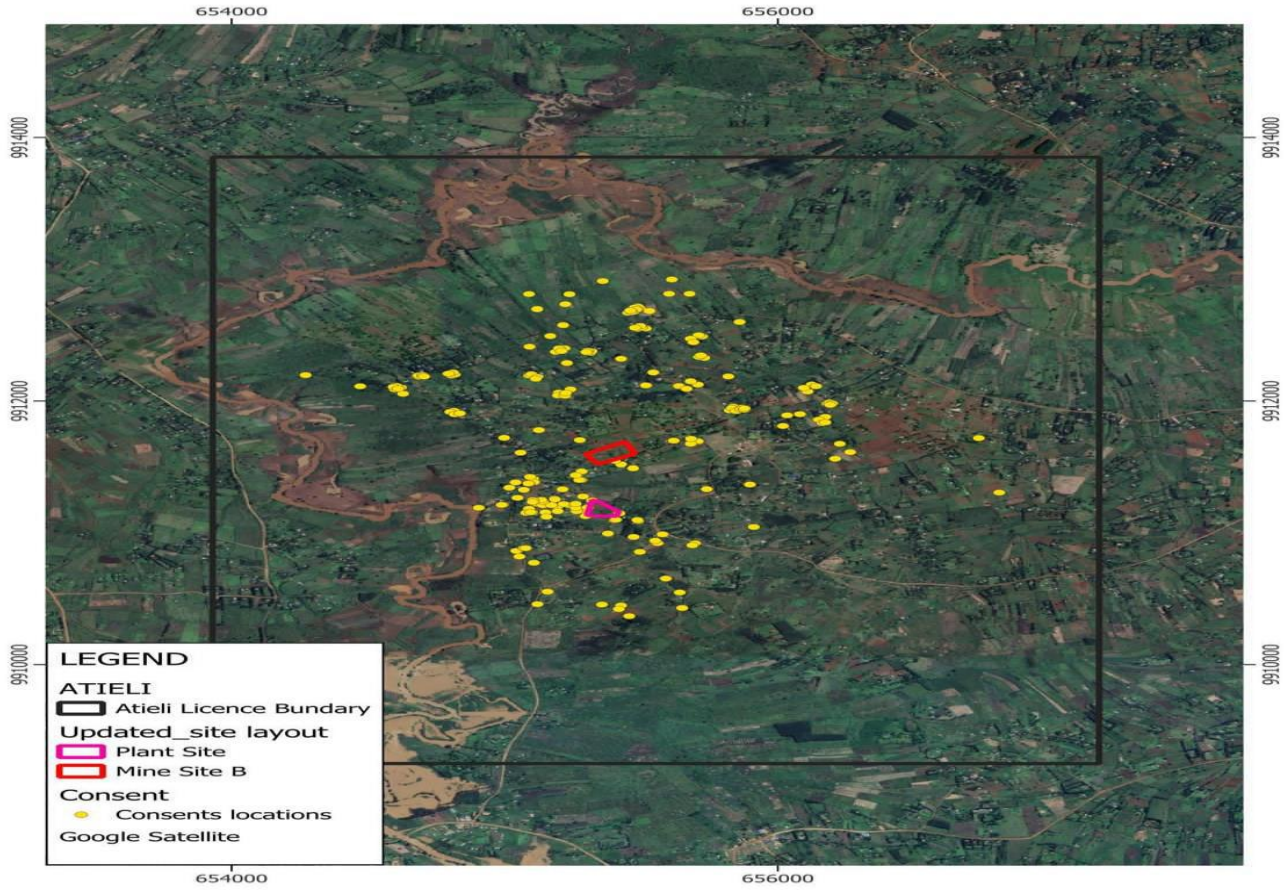

Figure 2.3: Mining License Boundary Area

2.4 Land Ownership

In the project area, land is owned by private individuals, with most properties being registered and accompanied by title deeds. According to mining law, consents from landowners are required to carry out mining operations. The law prohibits payment based on the value of extracted ore (such as royalties) since land rights do not include mineral rights. Instead, it mandates compensation for damages (to crops, buildings, etc.) and for the use of surface rights.

For this project, Spirit Mining Kenya Limited has lease land from the relevant landowners (lease documents and mother title deeds attached as annexes 03, 04, 05 & 06). The lease agreements cover:

- Mining consent
- Sufficient duration to allow for the completion of mining operations
- Monthly or annual rent payment
- Conditions for the return of the land to its owner upon termination of the lease.

2.5 The Mining and Processing Sites/Project Sites under Study

The proponent has leased two sites for this specific project, site (B) will be used to setup the processing plant while mining will take place in site (A), the two sites are less than 500 M from each other and have already been secured by a fence. Figure 2.4, 2.5 and 2.6 below

depicts the project site. Site B measures 7.14 hectares while site A measures 2.64 hectares.

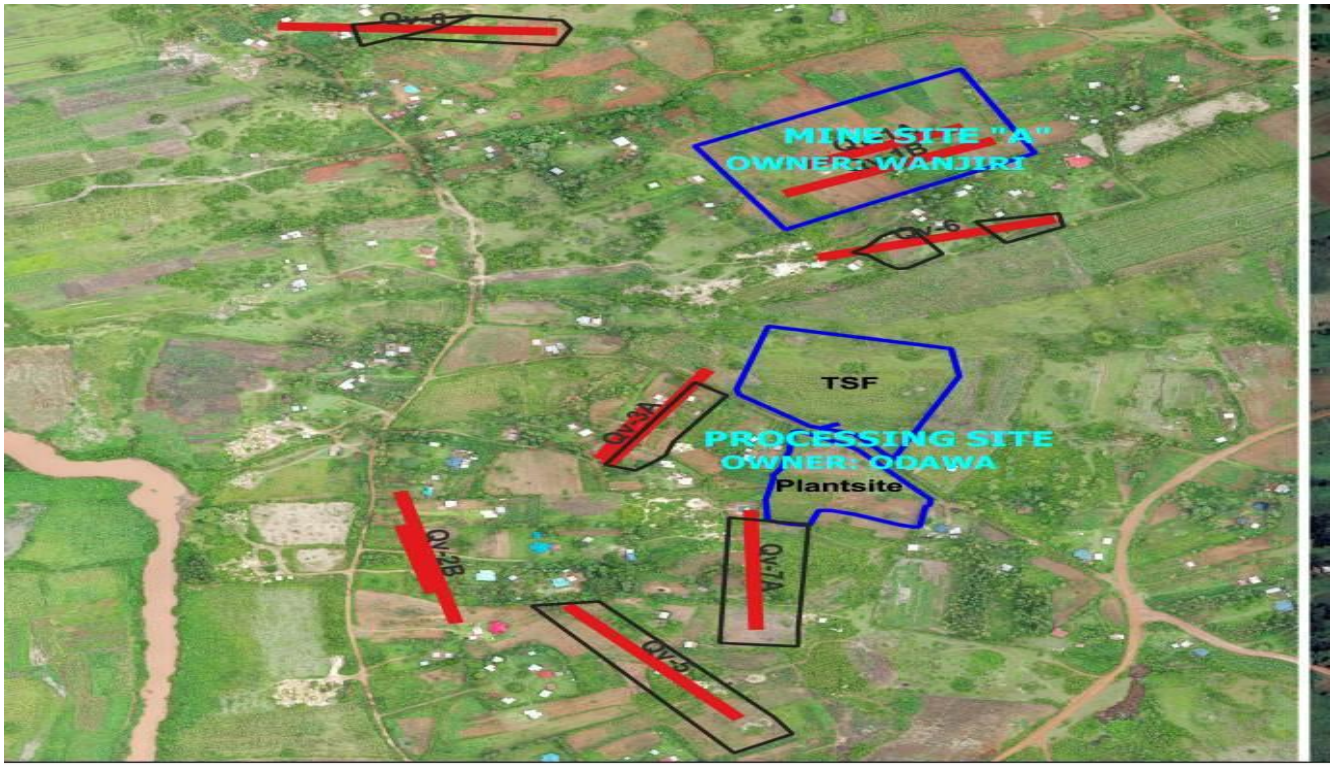

Figure 2.4: A map showing the two project sites (Mining site and processing plant site with TSF)

Figure 2.5: The proposed project mine site (A)

Figure 2.6: The site (B), for the proposed processing plant

2.6 Facilities, Utilities, Amenities and Services to Facilitate Mining and Processing Activities

2.6.1 Processing Plant Location and Facilities

The plant will be situated on its own land parcel, separate from the mining sites. The plant site will be fenced, and access will be controlled.

Processing Plant Components

- Crushing Module: Includes both primary and secondary crushing.
- Mill: 0.9 x 1.8 meters.
- Knelson Concentrator: CD10 model with continuous discharge.
- Gold Room: Equipped with a Gemini shaking table for concentrate upgrade and a smelting furnace.
- Carbon in Leach (CIL) System: 80 m^3 capacity.
- Elution Plant: 500 kg capacity.
- Fire Assay Laboratory: For precise gold content analysis.
- Office and Workshop Block: For administrative and maintenance activities.
- Water Supply: Borehole for fresh water.
- Tailings Storage Facility (TSF): Includes a re-circulation pump.
- Security Setup: Electric fence surrounding the plant site.
- High-Security Area; the Elution plant, smelting room, and chemical storage (ventilated containers) will be located within an inner perimeter designated as a high-security area with enhanced access control. Chemicals will be purchased and stored dry, in their original containers, until used in the plant. Figure 2.7 shows the processing plant layout.

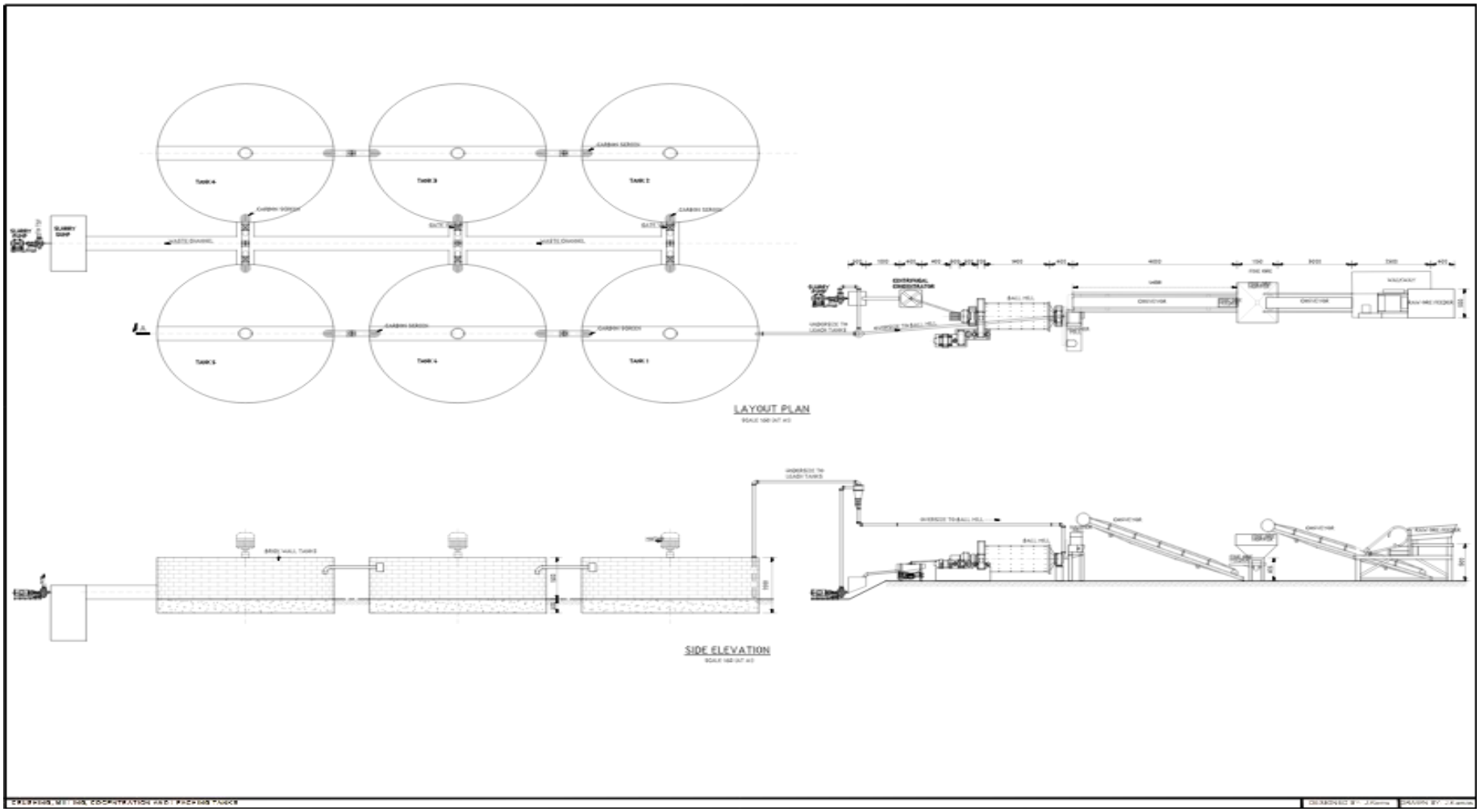

Figure 2.7: ***Processing plant layout***

2.6.2 Equipment and Infrastructure for underground mining

Underground mining requires specialized equipment and infrastructure to ensure the safety, efficiency, and productivity of the operation. Below are the essential equipment and infrastructure components needed for the underground mining operations.

- Shaft head gear and electric winch
- Compressor and drilling gear
- Water pumps
- Ventilation system

The explosives magazine will be located at a suitable site in one of the mining sites, in line with applicable regulations, and will be surrounded by earth mounds and a perimeter fence. The magazine will be guarded on a 24/7 basis.

2.6.3 Tailings (Waste) Storage Facility

An area within the plant site will be designated to store processed tailings in a permanent manner. The Tailings Storage Facility (TSF) will be located next to the plant and downslope. Slurry from the plant will be initially gravity fed to the TSF, which will be designed to be of self-riser type.

The TSF will have a surface area of about 6,400 m^2, which is sufficient to store 100,000 tons of tailings to a height of 10.42 m above surface level.

The inner structure of the TSF is shown on the cross-section of figure 2.8. The TSF will include a drainage system which will collect water in a concrete-built recycling pond. A pump will enable the recycling of water from the pond to the plant. Surface water is collected through a different system.

A piezometer of a sufficient diameter to allow sampling of ground water below the downstream edge of the TSF will be drilled and cased.

A run off dam will be constructed immediately downslope of the TSF in order to contain any possible spill in case of heavy rains. The run off dam will be maintained empty at all times by ways of pumping out (clean) rain water and releasing it into the environment.

The run off dam will have a capacity of about 3,000 m^3 and will be lined with 0.5 mm thick HDPE (Figure 2.8 shows the structural plan of the tailings storage facility).

2.6.3.1 Disaster Response Management

Common disasters such as floods may overwhelm the tailing storage facility causing a leakage of water from the tailing dams which might contain traces of cyanide. It is important therefore to have a response and management plan in case of such leakage. The existing management options to neutralize cyanide that has leakage into the environment the following:

a) Chemical Treatment

- **Oxidation:** Cyanide can be chemically oxidized to less harmful compounds. Common oxidants include chlorine, hydrogen peroxide, and ozone.
    - **Chlorination:** Cyanide reacts with chlorine to form cyanate, which can be further broken down.
    - **Peroxide Treatment:** Hydrogen peroxide can oxidize cyanide to cyanate and further to carbon dioxide and nitrogen.
    - **Ozonation:** Ozone can be used to oxidize cyanide to cyanate and eventually to carbon dioxide and nitrogen.

b) Biological Treatment

- **Activated Sludge Process:** This process uses microorganisms to degrade cyanide and other organic contaminants.
- **Bio-augmentation:** Involves the addition of specialized cyanide-degrading bacteria to the wastewater to enhance the breakdown of cyanide.

c) Physical Treatment

- **Activated Carbon Adsorption:** Activated carbon can adsorb cyanide from the wastewater, though this method requires regeneration or disposal of the spent carbon.
- **Reverse Osmosis (RO):** RO can be used to remove cyanide, but it is generally more expensive and generates a concentrated waste stream that needs further treatment.

d) Natural Attenuation

- **Constructed Wetlands:** These use natural processes involving wetland vegetation, soils, and their associated microbial assemblages to degrade contaminants, including cyanide.

e) Advanced Oxidation Processes (AOPs)

- **Fenton's Reagent:** A combination of hydrogen peroxide and iron salts that generates hydroxyl radicals to oxidize cyanide.
- **UV/H2O2:** Ultraviolet light combined with hydrogen peroxide generates hydroxyl radicals for cyanide degradation.

f) Physical-Chemical Treatment

- **Ion Exchange**: This process can remove cyanide ions from wastewater, but it requires regeneration of the ion exchange resins.

- **Precipitation**: Cyanide can be precipitated out of solution using various chemical agents like iron salts to form insoluble iron cyanide complexes.

g) In Situ Treatment

- **Heap Leaching Pads:** Applying detoxification solutions to the heap leach pads to neutralize cyanide in the residual leach solutions.

2.6.3.2 Monitoring and Compliance after Disaster

- **Regular Monitoring:** Regular sampling and analysis of wastewater to monitor cyanide concentrations.
- **Compliance with Regulations:** Ensuring the treated wastewater meets local and international environmental standards before discharge.

Implementing a combination of these methods can effectively manage and treat wastewater containing cyanide from a gold leaching plant. Each plant may require a tailored approach based on specific site conditions, cyanide concentrations, and regulatory requirements.

The advantages and disadvantages of the cyanide neutralization measures are discussed in detail in the analysis of project alternatives of this report.

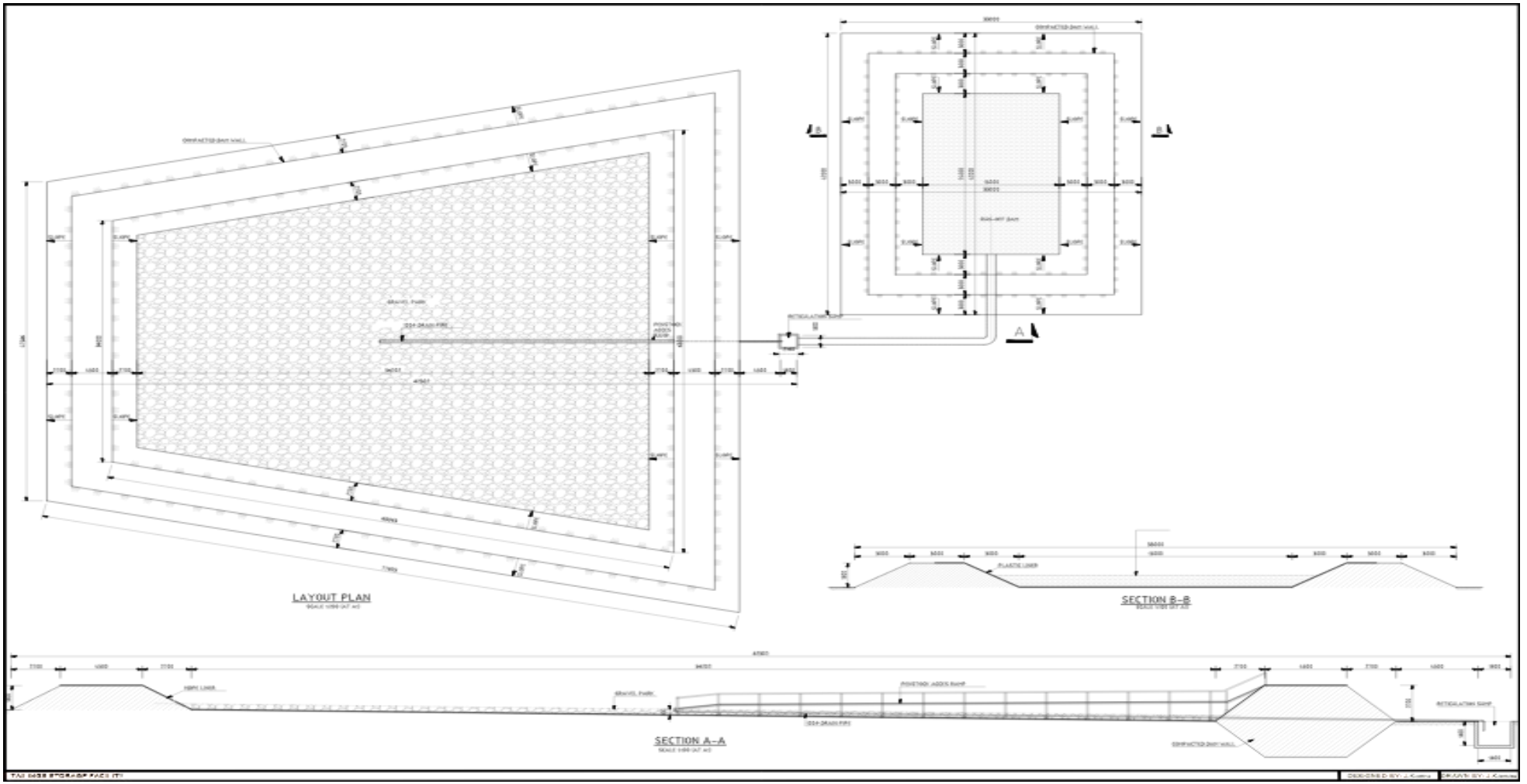

Figure 2.8: ***Tailings Storage Facility Drawing***

2.7 Other Infrastructure and Amenities

In addition to the primary equipment and infrastructure required for the mining and processing of gold, the project sites will also have various other infrastructure and amenities to support the operations and ensure the well-being of the workforce, some of the infrastructure and amenities include:

- Temporary accommodation facilities
- Water Supply and storage system (The proponent will drill a borehole to supply water for both domestic and light industrial use at the mining and processing site).
- sanitation facilities, including toilets, showers
- power supply facility
- Management Offices
- Security posts at entry and exit points
- Facilities for preparing and providing meals and snacks to the workforce
- Storage facility for chemicals and explosives
- Laboratory facility
- Fuel storage facility
- Designated parking spaces for vehicles
- Warehouses for storing spare parts, equipment, and supplies

Investing in these infrastructures not only improves the quality of life for employees but also contributes to the overall sustainability and success of the mining project, most of the facilities will be made of temporary structure of wood, iron sheet, steel as well as brick and mortar. Figure 2.9 shows the plant site with the some of the anticipated infrastructure.

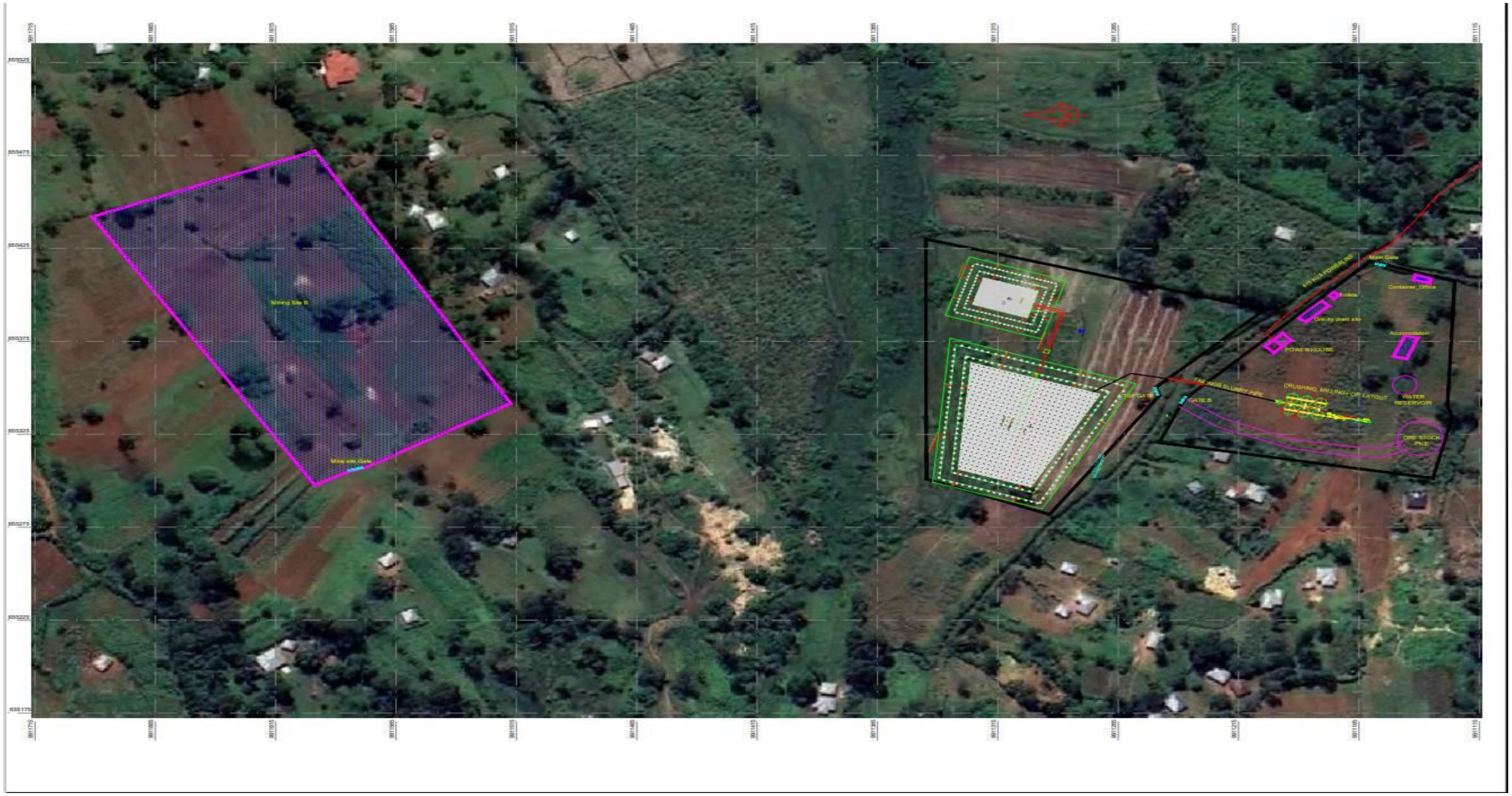

Figure 2.9: Map showing Project site with the two plots for mining and the processing plant site with TSF and some infrastructure

2.8 Anticipated Project activities

2.8.1 Site Preparation and Planning

The preconstruction and construction phases of a gold mining and processing project will involve extensive planning, regulatory compliance, and coordination of various activities, the following are some of the key activities:

a) Design of the overall site layout, including mine, processing plant, waste disposal areas, and infrastructure.

b) Planning for access roads, power supply, water supply, sanitation facility and communication systems.

c) Levelling the site and excavating for foundations and structures.

d) Setting up temporary offices, worker accommodations, and storage areas.

e) Excavating and preparing the open pit for surface mines.

f) Installing crushers, mills, conveyors, flotation cells, leaching tanks, and other processing equipment and amenities.

2.8.2 Ore Extraction

There two main methods of extraction ore from the ground; Surface mining/ Open pit mining which is suitable for shallow lying deposits and Underground mining which is most suited for steeply dipping and narrow deposits. During the mining process, the ore will be loosened using explosives in a process known as drilling and blasting and the loosened ore will be transported to the processing site.

2.8.2.1 Open Pit Mining

Mining operations will commence with open-pit mining down to a depth of 10 meters below the surface, overseen by an experienced miner. The process involves:

- **Topsoil Management:** Topsoil will be removed and stored within a fenced area for future use during rehabilitation.
- **Waste and Ore Extraction:**
    - Waste will be extracted using a rented track-mounted excavator (CAT325 or equivalent) and a dump truck.
    - Ore will be extracted using the company's backhoe and heavy-duty trailer attached to a tractor, with the assistance of five qualified workers when necessary, to ensure minimal ore dilution or loss.
- **Mining Campaigns:** Open pit mining will be conducted in campaigns synchronized with the dry seasons. The CAT325 and dump truck setup will have a minimum earth-moving capacity of about 400 tons per day.

2.8.2.2 Underground Mining

Underground development will commence immediately upon completion of the open pit phase for the respective sites. Key activities include:

Shaft Sinking: The shaft will be sunk either on one of the veins or between the two veins, depending on ground conditions and observations made during the open pit phase. Initially, the shaft will be sunk to the first level at 30 meters below the surface.

2.8.3 Gold Ore Processing

This stage involves crushing and milling to liberate the gold from the waste, concentration which may include gravity concentration, cyanidation where ore is treated using cyanide solution to dissolve the gold and finally smelting and refining.

2.8.4 Mine closure and reclamation

This stage is meant to restore the mining sites to its natural state of to an economically usable state. Decommissioning is a critical phase of the mine life cycle aimed at restoring the site to a safe and environmental stable condition. The process involves the following stages.

a) Decommissioning Activities

- Equipment Removal: Safely dismantle and remove mining equipment, machinery, and infrastructure.
- Hazardous Material Management: Identify, handle, and dispose of hazardous materials in compliance with environmental regulations.
- Demolition: Demolish structures that are no longer needed, such as processing plants, offices, and storage facilities.

b) Site Rehabilitation

- Land Re-contouring: Re-contour the land to its natural or intended post-mining topography.
- Soil Replacement: Replace topsoil removed during mining to support vegetation growth.
- Re-vegetation: Plant native vegetation to restore the ecosystem and prevent erosion.

c) Water Management

- Water Treatment: Treat any contaminated water to meet regulatory standards before release.
- Reestablishment of Natural Drainage: Restore natural watercourses and drainage patterns disrupted by mining activities.

d) Waste Management

- Tailings and Waste Rock Management: Ensure tailings and waste rock are stored in a stable and environmentally safe manner. This may include covering tailings with soil and vegetation.
- Contaminant Containment: Implement measures to contain and control any remaining contaminants to prevent environmental harm.

e) Monitoring and Maintenance

- Post-Closure Monitoring: Conduct ongoing environmental monitoring to ensure the effectiveness of reclamation efforts and compliance with regulatory requirements.
- Maintenance Activities: Perform necessary maintenance on any remaining infrastructure to ensure environmental stability and safety.

2.9 Explosives Management

- **Explosives Magazine:** Located at a suitable site within one of the mining areas, in accordance with applicable regulations, and surrounded by earth mounds and a perimeter fence. The magazine will be guarded 24/7.
- **Storage of Explosives:**
    - Gel cartridges and detonators will be stored separately.
    - Gel cartridges will be stored in a ventilated 20-foot container, entirely lined with plywood inside, ensuring no metal pieces come into contact with the explosives.
    - Detonators will be stored in a separate explosives magazine.
- **Safety Distances:** The explosives magazine will be situated approximately 160 meters from the nearest dwelling, allowing for a storage capacity of 3,500 kg with the consent of the occupier. This capacity is sufficient to cover the project's explosives supplies for one and a half months.

2.10 Solid and liquid waste management

Waste bins will be provided to collect and manage solid wastes at the site, the bins will be separate for different waste such as hazardous, non-hazardous, and recyclable materials. Implement practices to reduce waste generation, such as optimizing material use, recycling, and reusing materials. Hazardous waste will be stored in leak-proof containers to prevent contamination of soil and water and consult licensed waste handlers for their disposal.

Major effluent/human waste will be managed in a pit latrine, liquid waste from the leaching plant will be managed in the tailing dam already illustrated in sub-heading (2.6.3).

2.11 Project cost

The estimated cost of the proposed project is Ksh. 24,538,429.90 covering expenses related to purchasing and installation of CIP leaching plant, jaw crusher module, fine ore hopper module, milling module, concentration module, classification module, elusion module, tailings storage facility, labour and other contingencies (Attached BOQ).

In adherence to Section 58 (1) of EMCA, 1999 (Cap. 387), amended 2015, the Proponent will fulfil the NEMA-prescribed fee requirement. The fee, currently set at 0.1% of the project cost, is determined by the Authority. The minimum payable fee to NEMA is KES 10,000.00.

3 BASELINE ENVIRONMENTAL AND SOCIAL CONDITIONS

3.1 Introduction

In this chapter, the focus is on detailing the proposed project area concerning its resources, vegetation, land-use patterns, socio-economic activities, population, topography, climate, geology, and other relevant factors. The aim is to present comprehensive information that allows for the anticipation of potential impacts arising from the proposed project.

3.2 Project site characteristics

The project site is in a relatively densely populated area where both crop farming and livestock rearing is practised (Figure 3.1 shows the satellite imagery of the project area). By the time of the study, the ore and tailings processing site had been secured with an electric fence and a gate, the property had temporary structures made of timber, iron sheets and mortar.

The site had 4 single rooms for accommodation, mess and kitchen area, fuel storage area, store, plastic water tank storage facility, office with solar installation, security house, toilet, and power house with a generator as well as a shade for the processing equipment. The tailing storage facility (TSF) site had sugarcane plantation.

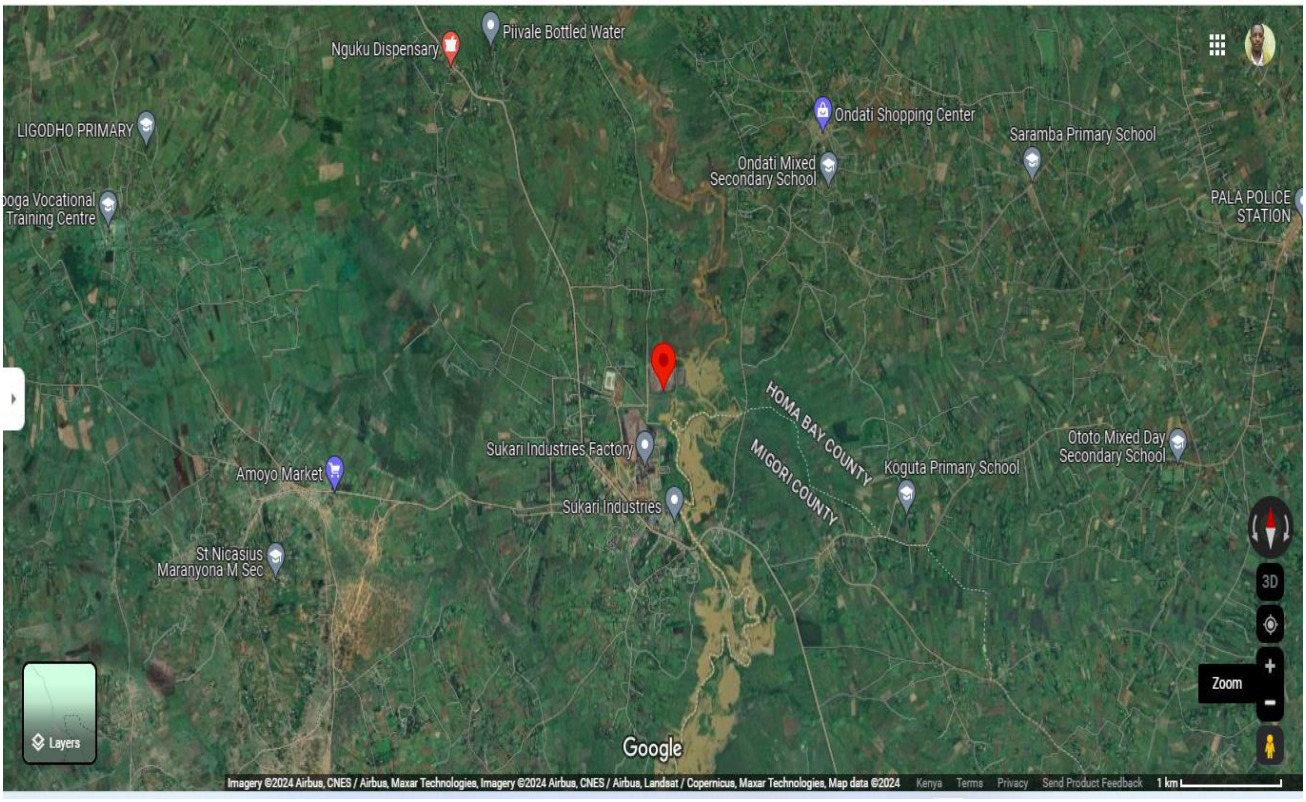

Figure 3.1: Landsat map of the project area and neighbourhood, the project area is marked in red mark

Plate 3.1: Temporary office with solar panel installed at the project site

Plate 3.2: proposed tailings storage area, fenced with sugarcane plantation within

Plate 3.3: The proposed project site secured with an electric fence

3.3 Physical Environment

3.3.1 Climate

The project area is in Ndhiwa Sub-County which generally experiences a tropical climate. The area typically has warm temperatures throughout the year, with averages ranging between 20°C to 30°C (68°F to 86°F). Ndhiwa has two main rainy seasons; long rains: Occur from March to May while Short rains occur from October to December. The region receives a moderate to high amount of rainfall, which is vital for agricultural activities. The dry seasons in Ndhiwa occur from June to September and January to February. During these periods, rainfall is minimal, and temperatures can be higher. Humidity levels in Ndhiwa can be relatively high due to its proximity to Lake Victoria, which influences the local climate. The climate supports diverse agricultural activities, including the cultivation of crops such as maize, beans, sugarcane, cassava, and sorghum, as well as livestock farming.

3.3.2 Ecological Conditions

Ndhiwa sub-county has two ecological conditions namely:

a) Upper Midland (UM4): Covers Ndhiwa and Nyarongi areas of Ndhiwa sub-county. It supports maize, cassava, millet, sorghum, beans, soya beans and pineapples among others.

b) Lower Midland (LM2): these are marginal sugar zone occupying parts of Ndhiwa sub-county.

3.3.3 Geology

The project area is in Nyanza region which is characterised by the Nyanzian and Kavirondian systems forming the Nyanza Craton, the oldest rocks in the country with ages over 2,500 million years. The Nyanzian is mainly composed of lavas and pyroclasts with minor sediments and banded ironstones. Kavirondian rests uncomfortably on the Nyanzian mainly consists of conglomerates, greywackes, grits and sandstone. Both series are iso-clinically 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. The investigate area rests on Nyanzian and Kavirondian type of rock systems. Ruma hills which are part of Homa hills covers part of Magunga region. The Homa hills are known to host precious minerals i.e., iron ore, limestone, sandstone, soda ash around the hot spring in Homa hills, nioubium and phosphates in Homa hills. The Nyanzian system consists of folded lavas: basalts, andesites, diorites, rhyolites and rhyolitic tuffs. Rhyolitic rocks are by far the most widespread. Ground water potential is good and aquifers are expected in the weathered and fractured zones, at various levels of inter-bedded zones and unconformities at greater depths.

There are two major tertiary faults in the region; Kanyamwa and Mfangano, Kanyamwa is a normal fault down-throwing to the north-west. Mfangano and Lambwe faults have the same trend. In Homa Bay, Kent (1944) mentioned how Homa is positioned on the line of Kendu fault. The Samanga fault also passes to the south east of the mountain where it has disturbed the phonolite lavas at Homa Bay the north westerly throw of the fault must be small as no prominent features are apparent. The location of the mountain is a

destabilized/weakened zone near the intersection of the two sets of fractures. Nyanzian rift is closely associated with the formation of the Homa Mountain and the Crater Lake Simbi. Generally, the area is superimposed with Kanyamwa fault line and fractures which forms the channel through which groundwater percolates. In the investigated site, minor fractures and joints plays major influence, in which the groundwater occurs.

3.3.4 Soil Type and Quality

The types of soils commonly found in the project area include:

- Black Cotton Soils (Vertisols): These are clay-rich soils that retain moisture well and are found in low-lying areas.
- Red Loamy Soils (Nitisols): These soils are well-drained and found in higher elevation areas, suitable for various crops.
- Sandy Soils: these soils are lighter in texture, with larger particles that allow for good drainage but may have lower nutrient content, often found in areas with higher erosion rates and near riverbanks.

Gold mining often involves the use of chemicals such as mercury and cyanide to extract gold from ore. These chemicals can leach into the soil, contaminating it with toxic substances like mercury, lead, and arsenic. Soil quality analysis of heavy metals including mercury and cyanide was done around the project site to determine the baseline soil quality.

The laboratory analysis of the soil samples indicated that concentrations of heavy metals, including lead, cadmium, nickel, zinc, and copper, were within tolerance limits. Additionally, there were no traces of chromium, arsenic, cyanide and mercury detected in the soil sample (refer to annex 12 for baseline soil analysis report).

3.3.5 Gold Exploration in the project area

There are no records of mining activity during the colonial period within the project area, although Kenya Consolidated Goldfields was operating 3 mines in the nearby Gucha area (namely Lloyd, Curwen and Sakwa) in the 1930s and 1940s. Records for this area for the period 1939 to 1949 indicates a declared production of 39,000 ounces. Underground gold mining is believed to have taken place in the project area on a very limited scale in the 1970s or 1980s, as evidenced by the presence of a shaft and a concrete mill slab on site. No production records are available. Currently there is some limited artisan mining activity happening in the project area, with 3-5 mining sites active at any one time, involving a total population of about 50 people. Note that some of the ore bodies discovered during exploration have not been touched yet by artisan miners.

3.3.6 Mineral Right by the Proponent

Spirit Mining made a mining licence application App No/4583 over an area of approximately 12 square kilometres. This EIA survey is to facilitate the completion of the mining licencing process as its one of the requirements for granting of the licence. The area was previously held by Pinsapo Kenya ltd who carried out exploration works and defined the resource Spirit Mining intends to mine.

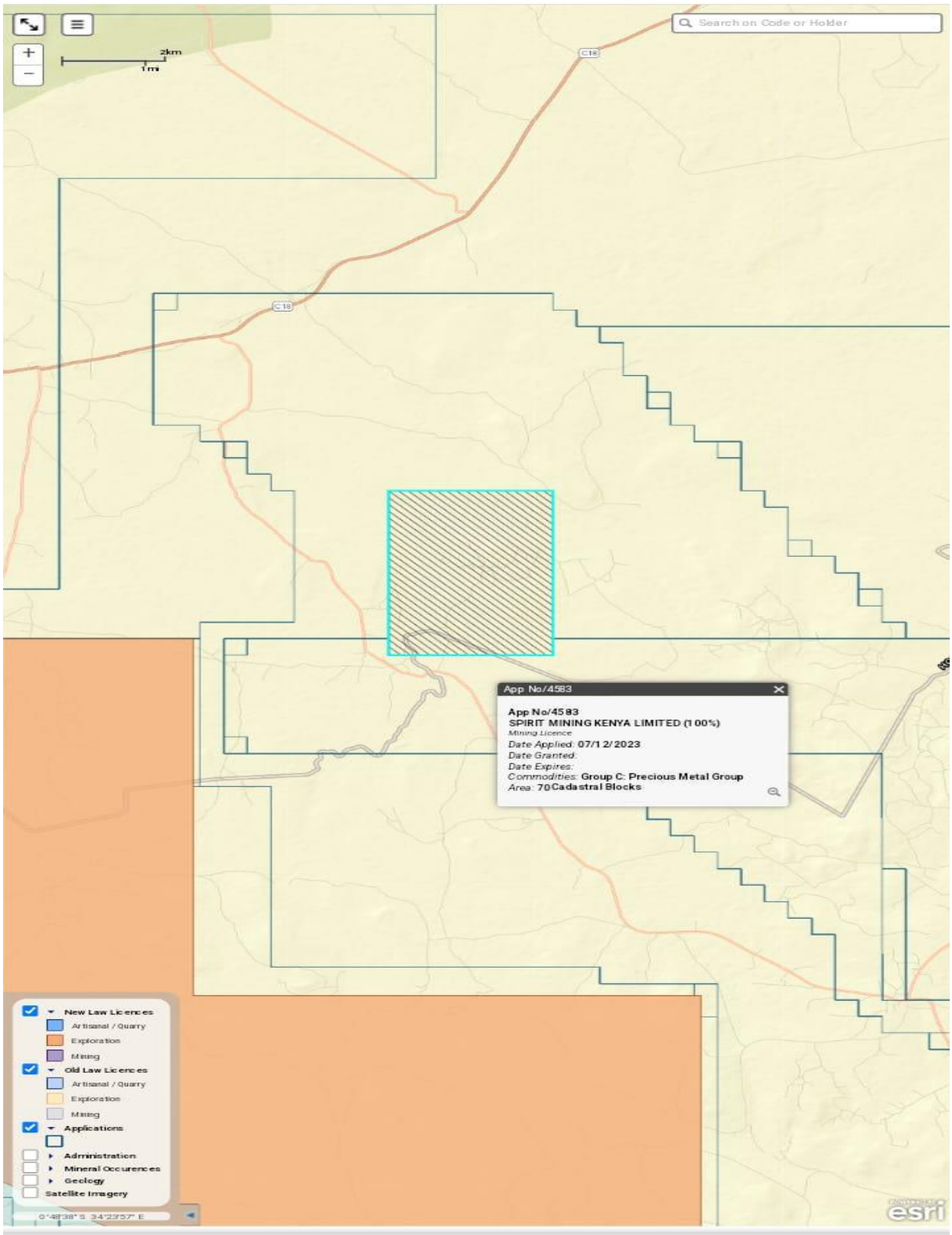

Figure 3.2: Extract from the Kenya Mining Cadaster Map

Spirit Mining holds all required County Government licenses and permits including an annual business license for purposes of the mining operation. Land owners consents (Mining) and land leases from land owners have already been obtained by the company.

3.3.7 Topography and drainage

The project site and surrounding neighbourhood landscape is generally undulating, with a mix of gentle hills and valleys. The elevation varies, but it is relatively moderate compared to the highlands of Kenya. The project area is well-drained by numerous rivers and streams that flow towards Lake Victoria. Key rivers in the area include river Kuja and numerous smaller tributaries and seasonal streams contributing to the drainage network in the area, especially during the rainy seasons.

3.3.8 Water Resources and Quality

The main water resources in the project area include River Kuja and numerous smaller streams and rivers, rain water harvesting as well as wells and boreholes. Water from these sources is mainly used for irrigation, domestic use, and supporting local ecosystems. The ground water table is fairly high thus underground mines will require dewatering.

Water quality in the project area is mainly affected by the use of fertilizers and pesticides in agriculture, contamination with heavy metals and other toxic substances from gold mining as well as inadequate sanitation facilities.

Baseline water quality analysis for heavy metals in the project area was done to understand the pre-mining conditions of the water quality in the area and to monitor the potential impacts of mining activities on water resources. An analysis of water samples collected from a stream in the lower part of the site's neighbourhood revealed that concentrations of heavy metals, including copper, nickel, and zinc, were within tolerance limits (Annex 11).

3.3.9 Noise Level and Air Quality

The project area is in rural set-up with main sources of noise being domestic animals, people, artisanal gold ore processing, social events, tractors transporting sugarcane to Ndhiwa sugar mill, motorbikes and light vehicles. During the study baseline noise level measurements were recorded at:

- **Daytime (06:01am – 8:00pm):** 38.7 to 50.3 decibels (dB)
- **Night-time (8:01pm – 6:00am):** 24.6 to 50.2 decibels (dB)

The noise level assessment report is attached in the document (Annex 13).

The project area is primarily a rural area, so the air quality is generally expected to be better than in urban centers due to lower levels of industrial activity, traffic emissions, and other sources of pollution (Baseline Air Quality Report attached as Annex 17).

3.4 Biological Environment

Ndhiwa Sub-County in Homa Bay County, Kenya, boasts a diverse range of flora and fauna, influenced by its varied topography, climate, and proximity to Lake Victoria.

3.4.1 Flora

Ndhiwa's diverse flora plays a vital role in supporting the local economy, providing food, medicine, and materials, and maintaining ecological balance. The region's vegetation includes indigenous trees, shrubs, grasses, and agricultural crops.

Although rare, common indigenous tree species in the project area include: Acacia Species, Fig Trees (Ficus spp.), African Olive (Olea africana) and Croton Species (Croton spp.).Common planted trees include: Eucalyptus, Grevillea, Cypress and pine. Eucalyptus is the dominant tree planted in the project area. Native grass species like Themeda triandra (Red Oat Grass) and Pennisetum spp. are prevalent in the project area, supporting livestock grazing and maintaining soil structure.

Papyrus (Cyperus papyrus) dominate in wetland areas and play a crucial role in water filtration and provide habitat for numerous species. Main agricultural crops grown in the project area include: maize, beans, sorghum, millet, sugarcane, sweet potato, cassava, kales, avocado and banana. However, there is little presence of vegetation in the site where the gold leaching plant will be set, the extended part of the land where the proponent intent to store the tailings was under sugarcane plantation; the mining site too had no significant vegetation apart from one mango tree which the proponent intents to protect.

3.4.2 Fauna

Common wild small mammals in the project area include hares, rodents, and mongooses. Water bird Species such as African fish eagle as well as terrestrial bird species including Weaver birds, sunbirds, and doves are common in both wild and agricultural areas around the project site.

Bees, butterflies, and other pollinating insects as well as aquatic Insects such as Dragonflies, water beetles, and mosquito larvae are common around the project area. During the site visit, there was also evidence of frogs and toads around the riparian areas.

3.5 Socio-Economic Environment

Ndhiwa Sub-County in Homa Bay County, Kenya, has a diverse socio-economic profile shaped by its demographic characteristics, economic activities, education, health services, and infrastructure.

3.5.1 Population and Household Structure

According to the 2019 Kenya Population and Housing Census, the Homabay county population was 1,131,950 persons consisting of 539,560 males, 592,367 females, and 23 intersexes. Among the eight sub-counties in Homabay County, Ndhiwa Sub-county had the highest projected population of 232,868 people at the start of the planning period in 2022, Table 3.1 shows the population of Homabay County as per the 2009 census.

Koguta area in Ndhiwa Sub-County has a population predominantly composed of the Luo ethnic group, however due to sugarcane farming and presence of the Ndhiwa sugar industry in the adjacent sub-location, the area has attracted people from different ethnic groups including the Maasai, the Kisii, the Somalis, the Luhyas, the Kurias and even people from the neighbouring countries of Uganda and Tanzania. The population is largely rural, with a significant portion engaged in agriculture and related activities. Traditional extended families

are common, although nuclear families are increasingly prevalent. Household sizes tend to be large, with many dependents.

Table 3.1: Population of Homabay County as per the 2019 Census

SUB COUNTY	CENSUS 2019		
	M	F	T
Homabay	55,756	61,681	117,439
Ndhiwa	103,706	114,422	218,136
Rachuonyo North	85,403	93,273	178,686
Rachuonyo East	57,709	64,111	121,822
Rachuonyo South	61,663	69,151	130,814
Rangwe	55,404	62,325	117,732
Suba North	60,530	64,406	124,938
Suba South	59,383	62,998	122,383

3.5.2 Economic Activities

Ndhiwa is a rural area in Homa Bay County, Kenya. The economy there is primarily based on agriculture, small scale business, Crafts and Handicrafts as well as employment in agricultural related industries, with the exploration and proposed mining work by Spirit Kenya Limited, it is anticipated that mining and employment in the mining industry is going to become an important source of income to the households in Koguta and the entire Ndhiwa sub-county.

3.5.2.1 Agriculture

Most households engage in subsistence farming, growing crops like maize, beans, sorghum, millet, sweet potato and various vegetables. Sugarcane, and horticultural crops such as tomatoes, onions, and fruits (mangoes, bananas, and avocados) are grown for income. Cattle, goats, sheep, and poultry are raised for both subsistence and commercial purposes.

Plate 3.4: Maize plantation in the project's neighbourhood and a woman passing by the project site with livestock for grazing

3.5.2.2 Small-Scale Businesses

Local markets are hubs for trade in agricultural produce, livestock, fish, and household goods. Small-scale enterprises such as retail shops, tailoring, carpentry, and food vendors contribute to the local economy.

3.5.2.3 Artisanal Mining

Artisanal mining in Ndhiwa, like in many other regions of Kenya, involves small-scale, informal mining activities. This typically includes the extraction of minerals such as:

Gold: There have been reports of gold mining activities in the broader Homa Bay County area, including Ndhiwa. Gold mining is usually done on a small scale using rudimentary tools and methods.

Stone and Gravel: Extraction of building stones and gravel for construction purposes is also common.

3.5.2.4 Employment

Employment opportunities are limited in Koguta, with many people engaged in informal sector jobs and agricultural and transport based sector, Ndhiwa sugar mill is the main employer in the sub-county with locals employed as cane truck drivers, cane cutters, and in the milling plant. Some residents work in the public sector, including education, security, county government of Homabay sub-county offices and health services.

3.5.3 Education

There are numerous primary and secondary schools, both public and private, providing basic education. Specific schools around the project area include; Ondati primary and secondary schools, Ototo mixed day secondary school, Saramba primary school, Ober Kabuoch primary school and Wanjawa primary school. Challenges include inadequate infrastructure, high pupil-teacher ratios, and occasional shortages of teaching materials.

Access to tertiary education is limited, with few institutions such as the KMTC within the sub-county. Many students pursue higher education in nearby towns or cities. Literacy rates are improving but still face challenges, particularly among older generations and in rural areas.

3.5.4 Health Services

The sub-county has several health centers, dispensaries, and a few hospitals providing primary and secondary healthcare services. The main level 4 hospital is the Ndhiwa district hospital. Common health issues include malaria, HIV/AIDS, respiratory infections, and waterborne diseases.

Access to healthcare is improving but remains a challenge in remote areas due to distance and inadequate facilities. Government and NGOs run health programs focusing on maternal and child health, immunization, HIV/AIDS awareness, and water and sanitation improvements.

3.5.5 Infrastructure

3.5.5.1 Roads and Transportation

The road network is a mix of tarmac, gravel, and dirt roads. Poor road conditions, especially during the rainy season, hinder transportation. Public transport includes buses, matatus (minibuses), motorbikes (boda bodas), and bicycles.

3.5.5.2 Water and Sanitation

Access to clean water is variable, with many relying on rivers, wells, and boreholes. Efforts by the county government of Homabay and development partners are ongoing to improve water supply and sanitation facilities, including rainwater harvesting and construction of latrines.

3.5.5.3 Electricity and Communication

Electricity coverage is expanding in Ndhiwa sub-county but still limited, especially in rural areas. By the time of the ESIA study the project site and adjacent neighbourhood was not connected to the national grid, however, there were efforts in place to expand connection in the area through the Kenyan government rural electrification program under the Rural Electrification and Renewable Energy Corporation (REREC). Mobile phone coverage is widespread in Ndhiwa, facilitating communication and access to mobile banking and information services.

3.5.6 Social Services and Community Life

3.5.6.1 Community Organizations

Numerous community-based organizations (CBOs) and self-help groups focus on development projects, health, education, and environmental conservation. Women's groups, youth groups, and farmer cooperatives play significant roles in community development.

3.5.6.2 Cultural Practices

The Luo culture strongly influences social life, with traditional practices and ceremonies such as weddings, funerals, and initiation rites being important. Music, dance, and storytelling are integral to cultural expression.

3.5.6.3 Community Challenges

Poverty, unemployment, and food insecurity are persistent issues. Access to quality education and healthcare remains a challenge for many residents. Infrastructure development and economic diversification is needed to support economic growth and improve living standards.

3.5.7 Climate Change Risk and Vulnerability

The project area is in Ndhiwa Sub-county of Homabay County which is prone to climate change related disasters such as floods, changes in weather patterns affecting planting season, increased incidents of crops and animal pests as well as drought.

Factors contributing to climate change vulnerability in the project area include:

a. **Subsistence Farming:** The majority of the population relies on subsistence farming, making them highly sensitive to climate variability.

b. **Crop Sensitivity:** Main crops such as maize, sorghum, and beans are sensitive to changes in temperature and rainfall.

c. **Limited Water Infrastructure:** Dependence on rain-fed agriculture and limited access to irrigation makes the community vulnerable to drought.

d. **Water Quality:** Flooding contaminate water sources, posing health risks.

e. **Poverty:** High poverty levels limit the capacity of households to adapt to climate change impacts.

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4 RELEVANT POLICY, LEGISLATIVE, REGULATORY AND INSTITUTIONAL FRAMEWORK

4.1 Introduction

This chapter gives a detailed review of the relevant policies, legal and regulatory frameworks that bear significance to this Proposed Gold ore mining and processing project. It also shows how the Proponent will comply with these policies, legal and institutional framework.

4.2 National Policy Provisions

4.2.1 Kenya Vision 2030

The Vision 2030 is a long term development framework for Kenya. It aims to transform the Country into a newly industrializing, middle-income economy that provides a high quality of life to all citizens by 2030 in a clean and secure environment.

The Vision rests on three pillars: Economic, Social and Political Pillars. The economic pillar aims at economic growth rate of 10% per annum. The social pillar seeks just, cohesive and equitable social development in a clean and secure environment; and the political pillar aims at installing an issue-based, people-centred, result-oriented and accountable political system that respects rule of law and protects the rights and freedoms of every Kenyan. The pillars are anchored on infrastructure development, public sector reform and macroeconomic stability.

The Vision is implemented through successive 5-year Medium Term Plans. The implementation of the first Medium-Term Plan (MTP 2008 to 2012) realized mixed results with moderate growth rate averaging 3.7%, but with positive results in the social and political pillars. In 2013, Kenya adopted the second 5-year Medium Term Plan (MTP II 2013-17) to implement the second phase of the Vision 2030. The MTP II aims at a high-growth trajectory, reaching 10% in 2017/18.

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. In the plan period, the government will develop the policy, legal, and institutional framework for the exploitation and management of Kenya's natural resources (oil, gas and other minerals) for the maximum economic benefit of the country and local communities, done in a transparent and accountable manner. It will also ensure that legislation for transparency and fair sharing of the revenue generated is enacted, and safeguards erected to protect the environment and to avoid risks usually associated with huge inflows of resource based external earnings.

The proposed gold ore mining and processing project is going to share benefits with the locals as part of royalty and also proposing to undertake corporate social responsibility. It will also ensure strict leaching procedure to protect the environment.

4.2.2 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 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 mining project will ensure that the environment will not be degraded and also is involving local participation through benefit sharing and corporate social responsibility.

4.3 Legal and Regulatory Framework

4.3.1 The Constitution of Kenya 2010

The promulgation of the Kenya Constitution, August 2010 marked an important chapter in Kenya's sustainable development. Hailed as a green Constitution, it embodies elaborate provisions with considerable implications for sustainable development. It guarantees rights and fundamental freedoms in the bill of rights among which is the right to clean and healthy environment. The constitution further guarantees the right to have the environment protected for the benefit of present and future generations through legislative and other measures. The law requires every person to cooperate with state organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources. The obligations of the state in respect to the environment are provided in Chapter Five subsection 69 as follows:

i) To ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits
ii) To work to achieve and maintain a tree cover of at least ten per cent of the total land area of Kenya
iii) To protect and enhance intellectual property in, and indigenous knowledge of biodiversity and the genetic resources of the communities
iv) To encourage public participation in the management, protection and conservation of the environment
v) To protect genetic resources and biological diversity
vi) To establish systems of environmental impact assessment, environmental audits and monitoring of the environment
vii) To eliminate processes and activities that are likely to endanger the environment
viii) To utilize the environment and natural resources for the benefit of the people of Kenya

The Constitution also came up with the devolved system including the devolved county governments in the management and use of natural resources which every project should respect and comply to.

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 will be achieved by developing and adhering to the spelt out

environmental and social management plan to curb probable adverse effects of gold mining and processing on environment.

4.3.2 Environmental Management and Co-ordination Act (EMCA 1999), Cap 387(Revised Edition 2015)

The Environmental Management and Co-ordination EMCA 1999 was amended in 2015 to include the provisions of the constitution and other emerging issues. It provides the Legal and Institutional framework for the management of the environment and for matters connected therewith and incidental thereto. Section 3 of the Act, provides for the entitlement of a clean and healthy environment for every citizen. It is also the duty of the citizens to safeguard and enhance the environment in accordance with the Constitution and sectoral laws. The Act is intended to ensure that our activities do not compromise the capacity of the resource base to meet the needs of the present generation as well as those of future generations.

Section 58 (2) requires the proponent of any project specified in the Second Schedule of EMCA shall undertake a full Environmental Impact Assessment study and submit an environmental impact assessment study report to NEMA for approval prior to being issued with any licence to undertake the project. Part (7) of this Section states that Environmental Impact Assessment shall be conducted in accordance with the Environmental Impact Assessment Regulations, Guidelines and Procedures issued under this Act.

Section 63 of the Act, provides for the environmental Impact Assessment Licence which states that; NEMA after being satisfied to the adequacy of an Environmental Impact Assessment Study, evaluation and review report, issue an Environmental Impact Assessment Licence on such terms and conditions or may be appropriate and necessary to facilitate Sustainable Development and sound Environmental Management. The proponent has developed this report for the issuance of the EIA licence.

The proposed “gold ore mining and processing” project is listed in Schedule 2 of this Act and also as a high risk project with anticipated environmental impacts implications at Construction, Operation and Decommissioning Phases.

The proponent has complied with 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.

4.3.3 Regulations under the Environmental Management and Co-ordination Act

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 The Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019

The regulation gives a guidance on different projects based on their risk levels and the category of EIA to be done, under the regulation, the projects are categorised as either low risk, medium risk or medium risk projects.

The regulation states that, every proponent undertaking a project specified in the Second Schedule of the Act as being a low risk project or a medium risk project, shall submit to the Authority a summary project report of the likely environmental effect of the project.

A proponent undertaking a high risk project specified in the Second Schedule of EMCA 1999 (reviewed 2015) shall submit to the Authority a study report of the likely environmental effect of the project. The regulation through the Legal notice no. 31 & 32 of 2019, outlines guidance on the procedure of conducting an EIA and what is required.

The proposed project is a high risk project categorized under mining of precious metal as per the second schedule of EMCA. The proponent therefore initiated a full ESIA study which was conducted based on the EIA/EA regulation of 2019.

4.3.3.2 Water Quality Regulations, 2006 (Legal Notice 120)

These Regulations were published in the Kenya Gazette Supplement No. 68, Legislative Supplement No. 36, and Legal Notice No. 120 of 29th September 2006. The Regulations provides for sustainable management of water resources including prevention of water pollution and protection of water sources (lakes, rivers, streams, springs, wells and other water sources). It is an offence under Regulation No. 4 (2), for any person to throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, as to cause pollution.

Regulation 6 (a) prohibits discharge, any effluent from sewage treatment works, industry or other point sources into the aquatic environment without a valid effluent discharge license issued in accordance with the provisions of the Act. (b) forbids abstraction of ground water or carry out any activity near any lakes, rivers, streams, springs and wells that is likely to have any adverse impact on the quantity and quality of the water, without an Environmental Impact Assessment license issued in accordance with the provisions of the Act. (c) further forbids cultivation or undertaking any development activity within a minimum of six meters and a maximum of thirty meters from the highest ever recorded flood level, on either side of a river or stream, and as may be determined by the Authority from time to time.

Regulation No. 11 further makes it an offence for any person to discharge or apply any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or permit the dumping or discharge of such matter into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards for effluent discharge into the environment.

The proponent will have to ensure that waste water from the gold leaching plant is not released into the water sources, the tailing dams should be designed with containment systems such as double-lined tailings ponds and leach pads to prevent cyanide leakage into the soil and groundwater, the plant will recycle cyanide in waste water to avoid leakage into the environment.

4.3.3.3 Waste Management Regulations, 2006 (Legal Notice No. 121)

The regulations are formed under sections 92 and 147 of the Environmental Management and Coordination Act, 1999 (reviewed 2015). They were published in the Kenya Gazette Supplement No. 69, Legislative Supplement No. 37, and Legal Notice No. 121 of 29th September 2006. Under the regulations, a waste generator is defined as any person whose activities produces waste while waste management is the administration or operation used in handling, packaging, treatment, conditioning, storage and disposal of waste. The regulations require a waste generator to collect, segregate and dispose each category of waste in such manners and facilities as provided by relevant authorities. Regarding transportation, licensed

persons shall operate transportation vehicles approved by NEMA and will collect waste from designated areas and deliver to designated disposal sites.

Regulation No. 4 (1) makes it an offence for any person to dispose of any waste on a 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 they include:
Improvement of production process through:

a. Conserving raw materials and energy
b. Eliminating the use of toxic raw materials and wastes
c. Reducing toxic emissions and wastes

Monitoring the product cycle from beginning to end by:

a) Identifying and eliminating potential negative impacts of the product
b) Enabling the recovery and re-use of the product where possible, and
c) Reclamation and recycling
d) Incorporating environmental concerns in the design and disposal of a product

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 regulation sets the levels of noise that may be provided during the day and at night as shown in Table 4.1.

Table 4.1: Noise Levels Allowed by Noise Regulations

Zone		Sound dB(A)(Level Limits Leq, 14h)		Noise Rating Level (NR) (Leq,14h)	
		Day	Night	Day	Night
A	Silent Zone	40	35	30	25
B	Places of worship	40	35	30	25
C	Residential: Indoor	45	35	35	25
	Outdoor	50	35	40	25
D	Mixed residential (with some commercial and places of entertainment)	55	35	50	25
E	Commercial	60	35	55	25

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 in table 4.1.

4.3.3.5 Air Quality Regulations, 2010

Under the general prohibitions (Part II), section 5 states that no person shall act in a way that directly or indirectly causes immediate or subsequent air pollution. Among the prohibitions are priority air pollutants (as listed under schedule 2 of the regulations) that include general pollutants, mobile sources and greenhouse gases. Odours are also prohibited under section 9 of the regulations (offensive emissions). Emissions into controlled areas such as schools, hospitals, residential areas and populated urban centers are also prohibited.

The anticipated sources of air pollution from the proposed project will be dust from moving vehicles, mining works as well as crushing of ore.The contractor on site should utilize dust suppressors (water sprays), cover the trucks carrying tailings and sand with canvass, and practice wet-crushing of the ore.

4.3.3.6 Environmental Management and Coordination (Conservation of Biological Diversity and resources to Genetic Resources and Benefits haring) Regulation, 2006

This legislation aims at enhancing preservation of biodiversity and safeguarding of endangered and rare plant and animal species within any human activity area. Section 4 of the legislation expressly prohibits any activity which may have adverse effects on any ecosystem, lead to introduction of alien species in a given area or result in unsustainable utilization of available ecosystem resources.

The proponent shall not cut any of the few remaining tree at the project site and rehabilitate the area with indigenous vegetation in collaboration with KFS.

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

According to the regulation, 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.

The proponent is advised that any further undertaking along riverbanks will require an Environmental Impact Assessment and approval by the Authority.

4.3.4 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 the that the a lessee shall be liable, on demand duly made, to pay to such owner or occupier fair and reasonable compensation for any disturbance or nuisance or damage, as the case may be, according to their respective rights or interests (if any) in the property concerned. Sub-section (a) If such a person or his successor in title fails to pay compensation when demanded under subsection (1), or if an owner or occupier is dissatisfied with the compensation offered, such an owner or occupier may, within one month of such a demand having been made, refer the matter to the Court.

The Act states that the holder of a permit or license under this Act shall use the land in accordance with the terms of the permit or license and will ensure the following:

a) Sustainable use of land through restoration of abandoned mines and quarries;

b) The seepage of toxic waste into streams, rivers, lakes and wetlands is avoided;

c) Disposal of any toxic waste is done in the approved areas only;

d) Blasting and all works that cause massive vibration is properly carried out and muffled with the EMCA, 1999 (Cap. 387), Amendment 2015; and

e) Upon completion of prospecting or mining, the land in question is restored to its original status or to an acceptable and reasonable condition as close as possible to its original state.

Royalty Obligation: Holders of mining licenses are required to pay royalties to the government on minerals extracted.

Royalty Rates: The rates are determined by the Cabinet Secretary and vary depending on the type of mineral. The rates are typically expressed as a percentage of the gross sales value of the mineral.

Royalty rate for Gold: 5% of the gross sales value.

Non-Compliance Penalties: Failure to pay royalties or submit accurate returns can result in penalties, including fines, interest on overdue amounts, and potential suspension or revocation of mining licenses.

The proponent has fulfilled the requirement of leasing the land from the landowner where he is going to do the mining work, (Lease documents are attached in this document). After receiving the EIA license from NEMA, the proponent will apply for the Mining and blasting permit from the state department of mining and geology. The Proponent will rehabilitate the affected areas after gold exploration n activities.

4.3.5 Explosives Act No.11 of 2017

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.

The proponent will seek for a blast permit which will allow purchasing, transportation and storage 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.

4.3.6 Employment Act, Cap 226

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 in employment as provided for in the respective International Labour Organizations conventions which Kenya has since ratified.

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.

4.3.7 The Occupational Safety and Health Act (OSHA) 2007

This is an act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The Act was published in the Kenya Gazette Supplement No. 111 (Acts No.15). It received presidential assent on 22nd October, 2007 and became operational on 26th October, 2007.
The key areas addressed by the Act include:
General duties including duties of occupiers, self-employed persons and employees

i. Enforcement of the act including powers of an occupational safety and health officer Registration of workplaces
ii. Health General Provisions including cleanliness, ventilation, lighting and sanitary conveniences
iii. Machinery safety including safe handling of transmission machinery, hand held and portable power tools, self-acting machines, hoists and lifts, chains, ropes & lifting tackle, cranes and other lifting machines, steam boilers, air receivers, refrigeration plants and compressed air receiver
iv. Safety General Provisions including safe storage of dangerous liquids, fire safety, evacuation procedures, precautions with respect to explosives or inflammable dust or gas
v. Chemical safety including the use of material safety data sheets, control of air pollution, noise and vibration, the handling, transportation and disposal of chemicals and other hazardous substances materials

vi. Welfare general provisions including supply of drinking water, washing facilities, and first aid
vii. Offences, penalties and legal proceedings

Under section 6 of this act, every occupier is obliged to ensure safety, health and welfare of all persons working in his workplace. The occupier shall achieve this objective by preparing and as often as may be appropriate, revising a written statement of his general policy with respect to the safety and health at work of his employees and the organization and arrangements for the time being in force for carrying out that policy (Section 7).

According to section 44, potential occupiers are required to obtain a registration certificate from the Director for all premises intended for use as workplaces. Such places shall be maintained in a clean state during the operation phase (section 47).

In relation to fire safety, section 78 (3) requires spillage or leaks of any flammable liquid to be contained or immediately drained off to a suitable container or to a safe place, or otherwise treated to make it safe. Furthermore, a clear and bold notice indicating that smoking is prohibited should be conspicuously displayed in any place in which explosive, highly flammable or highly combustible substances, are manufactured, used, handled or stored-section 78 (5). In addition, necessary precautions for dealing with fire incidents should be implemented including provision of means for extinguishing fire and means for escape, in case of fire, for the persons employed in any workplace or workroom – section 81. As far as disaster preparedness and emergency response program is concerned, section 82 (1) makes it a mandatory requirement for every occupier of a workplace to design evacuation procedures to be used during any emergency situation and to have them tested at regular intervals.

The employers' positive contribution towards the welfare of the employees include provision and maintenance of adequate supply of wholesome drinking water - section 91 and a first aid box or cupboard of the prescribed standard – section 95 at suitable point (s) conveniently accessible to all employees.

Other precautionary measures include: issuance of a permit to work to any employee, likely to be exposed to hazardous work processes or hazardous working environment, including such work processes as the maintenance and repair of boilers, dock work, confined spaces, and the maintenance of machinery and equipment, electrical energy installations, indicating the necessary precautions to be taken – section 96 (1); provision and maintenance for the use of employees, adequate, effective and suitable protective clothing including suitable gloves, footwear, goggle and head coverings in any workplace where employees are likely to be exposed to wet, injurious or offensive substance – section 101 (1).

Throughout the whole project, the contractor(s) and the proponent will guarantee the health and safety of everyone who works at the site. In addition, they shall be accountable for any additional violations of this Act. The ESMP offered provides fundamental guidelines for handling health and safety-related matters.

4.3.8 Work Injury Compensation Benefit Act (WIBA), 2007

This Act provides for compensation for employees on work related injuries and diseases contacted in the course of employment and for connected purposes. The Act includes

compulsory insurance for employees. The Act defines an employee as any worker on contract of service with employer.

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 wilful 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 fire fighting 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.

The proponent will put in place the precautionary measures 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. Those working in risky sites such as the underground mining sites should be insured.

4.3.9 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 neighbourhood or passing along public ways is guilty of misdemeanour, 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.

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

4.3.10 Public Health Act 1986 (Cap. 242) Revised 2012

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 harbour rats or other vermin.

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.

4.3.11 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 liveable 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.

The project area, while not officially zoned, is in Homabay County's rural setup. Agriculture is the primary land use in the area. In order to comply with the provisions of this Act, the proponent initiated a change of land use from agricultural to light mining industry (approved change of use attached).

4.3.12 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.

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 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.

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).

In order to drill a borehole to supply water to the facility, the proponent will apply for a permit. Throughout the course of the project, the proponent will also see to it that the necessary safeguards are put in place to prevent contamination of sources of surface and subsurface water.

4.3.13 Sustainable Waste Management Act, 2022

Sub-section 12 (1) states that all public and private sector entities shall segregate non-hazardous waste into organic and non-organic fractions. Sub-section 12 (2) requires the segregated waste to be placed in properly labelled and colour coded receptacles, bins, containers, and bags.

At each collection station, the proponent will supply branded trash collection bins so that wastes can be sorted according to the proper categories, such as organic, non-organic, hazardous, etc.

4.3.14 Climate Change Act, 2016 (Cap. 378A), amended in 2023

The Act provide for a regulatory framework for enhanced response to climate change; to provide for mechanism and measures to achieve low carbon climate development, enhance climate change resilience and for sustainable development of Kenya.

Under Section 20 (i.e., Integration of climate change risk), the Authority (NEMA) is required to integrate climate risk and vulnerability assessment into all forms of assessment, and for that purpose liaise with relevant lead agencies for their technical advice.

In accordance with the Act and NEMA's guidelines, the ESIA study integrated a Climate Change Risks and Vulnerability Assessment and integrated its conclusions into this ESIA report. In addition, as a proactive step towards resolving climate-related issues, the Proponent promises to put the mitigation strategies suggested in the assessment report into action.

4.3.15 County Government Act 2012, Amendment 2020

This Act makes provisions for county governments' powers, functions and responsibilities to deliver services and for connected purposes. Part VIII of the act on Citizen Participation (87) (b) emphasizes on the right of citizens to participate to any development projects prior to their implementation. section 135 (1) states that the Cabinet Secretary may make regulations for the better carrying out of the purposes and provisions of this Act and such Regulations may be made in respect of all county governments and further units of decentralization generally or for any class of county governments and further units of decentralization comply to the set regulations and by laws. This is the primary law governing the development of counties and thereby will be vital during implementation of the proposed project.

All organs established under this law in Homabay County will be consulted and approvals sought from the relevant authorities in relation to the proposed "mining" project.

4.3.16 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 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 will use this court to resolve any disputes that may arise about the environment or land.

4.4 Institutional Framework

4.4.1 EMCA Institutions

In order to make the Act operational, the EMCA (1999) Revised in 21012 has established various Institutional structures for sustainable management of the environment and natural resources. Those relevant to this project include:

i) The Cabinet Secretary

The Cabinet Secretary is the authority under the Act, which amongst other things is charged with the responsibility:

a) policy formulation and directions for purposes of environment
b) set national goals and objectives and determine policies and priorities for the protection of the environment;
c) promote co-operation among public departments, local authorities, private sector, Public Benefit Organizations (Non-Governmental Organizations) and such other organizations engaged in environmental protection programmes; provide evidence of public participation in the formulation of the policy and the environmental action plan; and
d) Perform such other functions as are assigned under this Act.

ii) 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.

iii) National Environnement Tribunal (NET).

Part XII Section 125 (1) of the Act establishes NET to review administrative decisions made by NEMA relating to issuance, revocation or denial of licence and conditions of licence. 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.

iv) County Environment Committee

The Homa Bay 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 Governor makes this appoint in consultation with the relevant county organs that are in charge environment and also ensure:

i. Equal opportunities for persons with disabilities and other marginalized groups; and
ii. That not more than two-thirds of the members are of the same gender.

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.

4.4.2 Other Key stakeholders for the project

4.4.2.1 Project Proponent

All project proponents must comply with the following administrative requirements:

i. The projects to be subjected to EIA/EA are specified in the second schedule of the Environmental Management and Coordination Act. Besides the scheduled activities, the Act empowers the Cabinet Secretary to prescribe for EIA/EA appraisal of any other activity, which in his view carries significant environmental impacts.
ii. A scheduled activity cannot receive the necessary authorization from NEMA to proceed or continue operating, until all EIA/EA requirements have been fulfilled and accepted by NEMA and its lead agencies.
iii. EIA/EA licenses are granted when NEMA and the Cabinet Secretary are satisfied that EIA has been satisfactorily conducted and realistic and achievable Environmental Management Plan of an activity has been sufficiently developed.
iv. All formal submissions under the EIA guidelines are made to NEMA. NEMA keeps a register of all projects and programmes currently being appraised under the EIA/EA guidelines.
v. The undertaking of all EIA/EA and subsequent reporting are the responsibility of the project proponent. NEMA on behalf of the Government, provide the procedures and technical advice to project proponents on how to comply with the EIA/EA requirements.
vi. The EIA/EA studies are carried out by experts or teams of experts recognized and registered by NEMA.
vii. Implement the Environmental Management Plan (EMP) in consultations with other relevant institutions.

4.4.2.2 Devolved System under the Constitution

The promulgated Constitution has put in place roles and responsibilities of both National and County Governments, including public participation. At the local level, the County has greater role in controlling the resources while the public have a right to a clean and healthy environment including benefit sharing of the local resources. The County has provided required licenses and will monitor that the proponents comply with all the regulations. The proponent through corporate responsibility will ensure that local communities also share in the benefits which include access to water and power.

4.4.2.3 Environnent and Land Court

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

4.4.2.4 Ministry of Mining

The Ministry of Mining is responsible for formulation and articulation of mining policies through which it provides an enabling environment for all stakeholders. Ministry is the principle authority to advise the government on all mining activities. It will therefore monitor and ensure that the proposed project complies with the provisions of the Mining Act. The proposed project will have to obtain approvals from the Ministry of Mines and comply with the ministry requirements.

4.4.2.5 Land Control Board

The Proponent has reached an agreement to lease land from the owners and also share the benefits with them. The proponent has to make sure it does not breach any part of Land Control Act during the land leasing process.

4.4.2.6 Multi Stakeholder Monitoring Committee

It is hereby recommended that a multi stakeholder monitoring committee be established to ensure the implementation of the ESMP as stated in this EIA project Report.

5 CONSULTATION AND PUBLIC PARTICIPATION

5.1 Introduction

Effective and meaningful public consultation and participation is an important element of EIA. Public involvement at early stages of project planning helps to manage public expectations concerning impacts of a project and expected benefits. It is a useful tool for gathering environmental data, understanding the likely impacts from locals who understand their environment better, determining community and individual preferences, selecting project alternatives and designing viable and sustainable mitigation and compensation plans. This exercise is best carried out during the project design to disseminate information to interested and affected parties (stakeholders) and to solicit their views and consult on sensitive areas. This is a requirement according to the Constitution of Kenya 2010, EMCA 1999 ((Amendment 2015) and EIA/EA Regulations of 2003 (reviewed 2019).

This chapter outlines key concerns and suggestions of stakeholders mainly in, Ondati Area, Koguta Sub-Location, Pala Location, Pala Division, Ndhiwa Sub-County, Homabay County which is the core impact area of the project. List of stakeholders consulted is attached, (Annex 09).

5.2 Goal and objectives of Public Participation

The goal of public participation is to ensure adequate information is provided to all stakeholders in a clear and timely manner and to present sufficient opportunity to these groups to voice their concerns and opinion so that their views can be integrated in the project design and development in order to promote good working relationship with the community.

The objectives of the consultation and public participation (CPP) envisaged under EMCA (1999) are to:

i. Inform the public of the details of the proposed 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.
v. The consultation helped in to obtaining additional information known to the local community and in giving them a chance to contribute to the management of their environment

5.3 Methodology for public participation and stakeholder consultation

Public participation and stakeholder consultations were conducted in the following ways:

a) Consultation with relevant key stakeholders e.g., the Proponent, NEMA's Homabay County officers, and the local leaders i.e., area chief.

b) Interviews through the administration of a questionnaire to individuals in the project area.

c) A public meeting held on July 10, 2024, at Ondati market, close to the proposed project site. The forum was organized through the office of the Chief, Pala Location and assistant chief Koguta Sub-location. Members of the public were duly informed about the meeting in advance to facilitate their participation in the event; (refer to plate 5.1, 5.2 and 5.3 for the public participation forum).

Plate 5.1: Ms. Rose Odula (EIA Expert) presenting during the public participation forum (photo by Silas Omondi, 10th July, 2024 at Ondati market centre

Plate 5.2: Area chief presenting during the public meeting forum at Ondati market centre

Plate 5.3: Community members at the public participation forum in Ondati market centre

5.4 Findings from the Public Participation forums

Public participation and consultations yielded feedback on a range of issues associated with the proposed project. Majority of the people welcomed and supported the proposed project with some saying that it is a major development in the area. Below is a summary of the key issues raised during public participation and the responses.

a. **Employment**; locals were happy that the company was operating in their area and wanted to be given first priority on employment opportunities at the company.

Response: First priority will be given to the locals, 2nd priority to those from Homabay County and 3rd priority from Kenya at large. Employment in the company would continue as its operations grew and would be contingent upon the need for workers.

b. **Corporate social responsibility/support to the local community by the company;** members requested the company to support the local community in terms of: education, electrification of the area, improve local roads, build chief's office near Ondati market.

Response: After the business turns a profit, it will think about funding some of the projects that the community has suggested. The community's leaders to prepare a formal letter to the company outlining some of the community's top priorities. The members to be reasonable in their expectations made to the company.

Through the rural electrification program by the government of Kenya and the company's intervention, 100KVA transformer will be setup near the project site and community members can get electricity supplied to their homes at their own cost.

c. **Effect of electric fence at the site**; the proponent had already secured the project site with an electric fence which is usually live at night thus posing risk to children and domestic animals.

Response; The issue of the electric fence to be resolved by building a buffer fence at the far end to prevent the community from simply interacting with the electric fence.

d. **Anticipated Noise and dust pollution;** the site of the proposed project is near homes, thus they anticipate to experience noise and dust pollution in the area.

Response; The matter will be taken into account in the ESIA report and practical mitigation strategies suggested for the expected noise and dust impacts.

e. **Anticipated mining method and associated geological impacts**; the company planned mining method i.e. the across or down-cast mining method and the associated impacts.

Response: The mining procedure to follow the geologist's recommendations.

f. **Chemicals used in mining and gold processing effect on crops, livestock and properties**; potential effects of cyanide and related mining chemicals on the plants, livestock.

Response: chemicals to be utilised during the operation phase to blast the ore and remove gold sediments from the ore and tailings are hazardous thus mitigating measures to be presented in the EIA report for the proponent to follow.

g. **Occupational and safety related accidents**; concern on how the company was going to deal with the potential work related accidents at their facility, especially accidents that can lead to fatality.

Response: The Company to follow all safety protocols in their operations to ensure accidents are minimized and even when they occur they are not fatal.

h. **Skill Transfer and partnership with local artisanal miners**; Representative from the local artisanal gold miners wanted to know whether the company will allow them to lease some of their mining equipment on need basis, they also wanted to know whether the company will be buying gold from them especially given the fact that currently they sell their gold in Migori county which is far from the area.

Response: The artisanal miners to always have open engagement with the company through the official company structures.

i. **Enforcement mechanism by NEMA;** concerns on whether there will be monitoring of the project to mitigate the violations by the company.

Response: The ESMP to be developed and enforced by relevant Government Departments and Lead Agencies through continuous monitoring, consultation and feedback from the management of Spirit Kenya Mining Limited, neighbours and the general public.

Detail of the minutes and questionnaires the public participation forum are attached (Annexes 08, 09 and 10).

5.5 Public Disclosure

This ESIA report will undergo public disclosure in accordance with EMCA, 1999 (Cap. 387), amended in 2015, and its subsidiary legislation, the Environmental (Impact Assessment and Audit) Regulations, 2003, revised in 2019. This process will involve advertising the proposed project for public comments in both the Kenya Gazette and a national newspapers as well as local radio stations with extensive coverage. Throughout the disclosure period, all affected stakeholders will be encouraged to provide their suggestions, comments, and objections regarding the project. This inclusive approach ensures that the concerns and perspectives of the local community and other stakeholders are thoroughly considered in the decision-making process.

6 ANALYSIS OF PROPOSED PROJECT ALTERNATIVES

6.1 Introduction

Legal notice 32 specifies the basic content of an Environmental Impact Assessment Report subsequent to which, subsection (i) requires an analysis of alternatives including Site, design, technology and processes. 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.

6.2 Project Siting

There is alterative sittings for the proposed project because Spirit mining license area covers 12 KM^2. Some of the reasons that can lead to alternative project siting include:

a) Conflicts with neighbours,
b) Environmental sensitivity of the current project site
c) Land related conflicts between stakeholders of the leased land

However, during the ESIA study, it was clear that:

i. The proponent had legally leased the project site (attached lease agreement).
ii. There were no objections from the community members concerning the proposed project siting.
iii. The local community will not be displaced
iv. The tailings and gold ore available have been tested and economic value known
v. Restoration of the land is one important results of extraction of the tailings and mineral ore. Once the excavations and mining have been completed the land will be restored back for agricultural purposes, after decommissioning.

6.3 Relocation Alternative

Relocation of the site to a different location is an option that is available for the project, the project has a scope of 12 km^2 in the project area. This is a project that requires a big piece of land and being that the locals have entered into leasing agreement and further donated the land, the whole process would require new approvals from different government agencies and approvals. Besides the project would design and planning would before stage of implementation is costly, added to the costs already incurred in the development so far. Whatever has been done and paid for so far would be a great loss to the proponent. The project activities will not affect the surrounding environment if all mitigation and recommendation processes are followed.

6.4 Alternative land use

The alternative land use would be agriculture or livestock rearing. At the moment, given the terrain and harsh weather conditions, this alternative is not viable at a commercial level.

6.5 Alternative Materials, Design, Layout and Technology

The proposed leaching technology processing the tailings has been carefully considered from an engineering perspective to be most feasible and effective. It is more economical and will control pollution than the one used by the local artisans which releases more pollution into the river. Electricity from the national grid is recommended as opposed to using generators for the processing site. The proponent will maintain a generator standby for power backup for occasional use during power outages.

The materials used would be cement, steel, corrugated iron sheet, glass and wooden structures. There is no other alternative to these materials. These materials are readily available locally from the local manufacturing.

6.6 Alternative land use

The alternative land use would be agriculture or livestock rearing. At the moment, given the terrain and harsh weather conditions, this alternative is not viable at a commercial level.

6.7 No Project Alternative

The 'No Project Alternative' means the status quo is maintained. This alternative is not favourable as it does not consider the many benefits of the project including community private partnership. Furthermore, the impacts of the project are so minimal to warrant a no project action.

6.8 Analysis of Alternative Mining Technology

6.8.1 Extraction of Gold

Although new processes are being proposed on a regular basis, there have been no dramatic changes in the meturllugicall techniques for gold extraction. The major categories of commercially viable recovery processes include the following:

i. Amalgamation (with mercury)
ii. Gravity Concentration (using jogs, tables, spirals, Reichett cone, moving belt separator etc.)
iii. Flotation (as free particles or contained in base metal sulphide concentrates)
iv. VAT leaching method using cyanide.

6.8.2 Gold Recovery

Amagam is heated with blow torchers or over an open flame to evaporate the mercury, leaves small gold pieces. The gaseous mercury is inhaled by miners and often by their immediate family, including their children. This transforms elemental mercury into methtyl mercury which is one of the most dangerous neurotoxins that contaminate the food chain through bioaccumulation and bio magnification.

An alternative to this would be introduction of a mercury retort device, which limits the amount of fugitive mercury emissions and also allows miners to recapture and reuse mercury. Retorts are built by local craftsmen using locally available materials. This technology is simple and economical, allowing the miners to save money while reducing health risks.

6.9 Solid Waste Management Alternatives

i. Management should consider entering into formal and structured contract with respective handlers of the different more so used in plastic bags and containers. Refuse handles should also be required to declare the destination of the wastes removed from the premises.
ii. Waste materials should be segregated/separated i.e. hazardous wastes, scrap metals, wood, biodegradables, tins, cans, etc. and disposed as appropriate in a legal manner.
iii. Non-harmful chemical containers/plastics can be used for other purposes

6.10 Sewerage and Waste water management alternatives

There is prospected generation of waste during all the phases of the project. Effluent and sewage resulting from sanitary facilities and wastewater from washrooms is of significant concern with respect to the environment. The waste disposed of into the sewerage system will contain nitrogen and phosphorus from excrement and phosphorus from detergents. This waste has the potential of polluting the ground water and cause water borne diseases as well if not properly handled. Six locally available technologies for waste water management are discussed below: -

6.10.1 Alternative One – Use of Stabilization Ponds/Lagoons

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

6.10.2 Alternative Two – Use of Constructed/Artificial Wetland

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

6.10.3 Alternative Three – Connection to the Sewer Line System

This involves channelling the liquid wastes to the public sewerage system for treatment. However, in this case connection to the sewer line option is not viable for the proposed project since it will not solve the waste water management problem at the project site. This is because there is no existing sewer line within the vicinity of the project site.

6.10.4 Alternative Four – Use of Communal Septic Tanks

This involves the construction of underground concrete-made tanks to store the sludge. The wastewater from the septic tanks is then channelled to soak pits. It is not expensive to construct septic tanks. It is the most reliable, efficient and cost-effective in the long term.

This is justified given that there is no existing sewer line near the project site. Nevertheless, this option sounds and remains to be the most appropriate for the project in the future when the number of employees has increased.

It is expected that there will be no contact between the waste water and groundwater if mitigation measures are followed. It is important that the quality of the groundwater is maintained as it is a major source of clean water to the residents. It is therefore the experts' recommendation that this alternative be employed in the long run however it is not economically viable at the moment since the employees are still few.

6.10.5 Alternative Five – Waste Water Treatment Plant

This involves the construction of a wastewater treatment plant that uses chemicals to treat the effluents to acceptable standards. It is the most reliable, efficient, and cost-effective in the long term. However, it is expensive to construct and maintain a wastewater treatment plant; they also require a large space. Nevertheless, this option sounds and remains to be the most appropriate for the project in the future when the number of employees has increased.

It is expected that there will be no contact between the waste water and groundwater if mitigation measures are followed. It is important that the quality of the groundwater is maintained as it is a major source of clean water to the residents. It is therefore the experts' recommendation that this alternative be employed in the long run however it is not economically viable at the moment since employees are still few.

6.10.6 Alternative Six – The improved ventilated pit latrines

This involves digging a pit latrine and fitting it with the vents for ventilation and also to keep away flies from getting into the pit. This option requires a small space relative to the above discussed methods, cheaper, and adequate for the population that is expected to work at the facility. Periodic emptying will be done by approved firms/individuals in a manner that is compliant to the law. This option was therefore considered the most appropriate given the small population of permanent employees. Besides, waste water from the hand washing stations will be directed to soak a pit.

6.11 Waste water from the leaching plant management alternatives

Managing wastewater with traces of cyanide in a gold leaching plant requires a combination of treatment methods to ensure the removal of cyanide to safe levels and compliance with environmental regulations. The table (6.1) shows some common options for managing such wastewater.

Table 6.1: Liquid Waste/Waste Water From gold Leaching Plant Management Alternative

Management options	Description	Advantages	Disadvantages
Chemical Treatment **(Oxidation)**	Cyanide can be chemically oxidized to less harmful compounds. Common oxidants include	Effective at breaking down cyanide quickly. Widely used and well understood.	Can produce harmful by-products like chloramines Requires careful

	chlorine, hydrogen peroxide, and ozone.		handling and storage of chlorine gas or hypochlorite.
Biological Treatment **(Activated Sludge Process and Bioaugmentation)**	Activated Sludge Process and bioaugumentation uses microorganisms to degrade cyanide and other organic contaminants.	Effective for degrading cyanide and other organics. Can be cost-effective with proper management.	Sensitive to changes in wastewater composition. Requires a longer retention time and large footprint.
Physical Treatment **(Activated Carbon Adsorption and** **Reverse Osmosis)**	Activated carbon can adsorb cyanide from the wastewater,	Can be cost-effective with proper management.	generally more expensive and generates a concentrated waste stream that needs further treatment

7 ANTICIPATED ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION MEASURES

7.1 Introduction

Impact identification and evaluation were based on the project design and characteristics as well as the environmental baseline information of the proposed project area. The scope and scale of the proposed gold mining and processing project, as well as the kinds of environmental control measures envisioned in the project proposal, all influenced the analysis of the impacts. 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 and decommissioning phase.

7.2 Anticipated Impacts during Project's Planning and construction Phases

7.2.1 Positive Impacts and their enhancement measure

7.2.1.1 Employment Creation

One of the main positive impacts during the construction phase will be the availability of employment opportunities especially to casual workers and several other specialized workers. It is anticipated that based on need basis, the company will offer employment to the locals. Employment opportunities have both economic and social benefit.

Enhancement measures

a) At least 90% of the planned 87 positions will be filled from the local community as a priority, and from the greater Homa Bay County as a second priority; People from the larger Kenya and from outside Kenya will be given third and fourth priority respectively.

b) Only skilled human resource that is not available in the local community, the county and the country will be sourced from outside.

c) During recruitment of employees, the Proponent needs to consider distribution of the opportunities in gender equality proportion.

7.2.1.2 Improved Road Infrastructure

By the time of the ESIA study, the proposed project proponent had upgraded the local feeder dirt road leading to the project site to enable regular car and truck traffic for easy transportation of equipment and machineries. This will also benefit the local community who will be able to transport their agricultural products to outside markets.

Enhancement measures

a) Based on need basis and in consultation with the local community, the proponent should consider supporting the local community infrastructure and projects especially during the project's operation phase.

7.2.1.3 Increased Economic Activities

There will be increased economic activity around the project area during construction. The construction workers would require various items that are supplied by the retail shop outlets. These are opportunities which entrepreneurs in the nearby Markets could take advantage of.

Enhancement measures

a) The Proponent should procure most of the readily available construction materials and other consumables from suppliers within the locality.

7.2.2 Negative Impacts and Mitigation Measures

It is important to note that for this specific gold ore mining and processing project, adverse impacts during construction phase will be short-term and of much less consequence to the environment and the community. This is because most facilities at the processing plant will be temporary, mostly made of timber, iron sheets and mortar.

7.2.2.1 Loss of Biodiversity /Loss of Vegetation Cover and Alteration of Habitat

During the CPP there was concern that that that the project might interfere with the local tree species and shrubs attributed to site clearance for the construction of the processing plant and improvement of the road. It was concluded that there were no endangered species on the site and that some of the natural vegetation will as much as possible be preserved. The track road already existing, hence the loss of vegetation will be insignificant. The construction activities will be purely restricted to the project site.

Mitigation Measures

i. Properly demarcate the project area to be affected by the construction activities to avoid spill over effects to neighbouring areas.

ii. Strictly control movement of vehicles to ensure that they operate judiciously and over designated areas to minimize destruction of vegetation.

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

7.2.2.2 Risk of Oil Spillage

Machinery and equipment that would be used during construction have movable parts which would require regular oiling and greasing to minimize wear and tear. Possibility of oil spillage contaminating the soil and water within the project areas is therefore quite real.

Mitigation Measures

i. The proponent shall take into account safety procedures to minimise cases of oil spillage. Such procedures might include maintaining the machinery in specific designated areas designed for such purposes.

ii. Construct an oil interceptor at the machine and equipment service station to separate oil and wastewater before the wastewater joins the natural drainages.

7.2.2.3 Noise and Vibrations

Site inspection visits revealed a quiet and peaceful environment with noise emanating only from the birds and domesticated animals. It is expected, that during construction phase, noise will emanate from moving machines and equipment.

Mitigation Measures

i. The proponent shall properly maintain the equipment and machinery and restriction of construction activities to daylight hours.

ii. Providing ear protective devices to workers and visitors in noisy environments to prevent high frequency noise emitted by the high frequency machines.

7.2.2.4 Dust Emissions

Dust might be generated by excavation, transport of construction materials and earth moving operations. The law requires that best management practices are adopted during construction activities. Ideally, no visible dust should be created nor should exhaust from any equipment be visible for more than 10 seconds.

Mitigation Measures

i. The contractor on site should utilize dust suppressors (water sprays), cover the trucks carrying tailings and sand with canvass, and pre-start inspection of dust control equipment should be undertaken.

ii. Provide construction workers with Personal Protective Equipment (PPE) such as dust masks.

7.2.2.5 Risk of Construction Related Accidents

During gold ore and tailings processing plant construction, it is expected that construction workers are likely to encounter occupational health hazards as a result of coming into contact and handling machines, equipment and hazardous waste.

Mitigation Measures

i. The contractor must put into place effective health and safety procedures to minimise accidents on site.

ii. Construction workers must be provided with appropriate personal protective gears, especially while working in risky conditions.

iii. Drivers transporting construction materials to the site should be advised on the speed limit to minimize risk of accidents on the local roads.

iv. The construction site to be safely secured with a clear entry and exit gates that are manned to control unauthorized access to the construction site including children playing and stray animals.

v. There will be no tolerance for drunkenness or intoxication during working hours, and no alcohol will be permitted at the project site.

7.2.2.6 Solid and Liquid Waste

Construction activities will generate both solid and liquid wastes. These will include waste materials, excavated materials and cleared vegetation among others. The workers at the site will also generate faecal wastes during their day to day operations. The generated waste needs proper handling to prevent diseases, such as cholera, typhoid and diarrhoea outbreak on the site. Unless this is addressed, it can prove to be an environmental/health hazard.

Mitigation Measures

i. The contractor must put in place proper waste management mechanism for solid and liquid wastes disposal.

ii. Toilet and/latrine should be provided on site and the necessary sanitary arrangements made.

iii. Food left overs and waste paper will also generate solid waste which must be separated and be disposed at designated sites.

7.2.2.7 Grievances/conflicts

Common grievances expected to arise during the proposed project construction include: grievances as a result of negative project impacts which may include physical harm and nuisance from construction activities; health and safety risks; socially unacceptable staff relations with the communities and other stakeholders; conflicts over shared resources such as water and facilities such as public access roads.

During the public participation forum, major concern was on the impact of electric fence that the proponent had already used to secure the project site, there were concerns that the fence posed a risk to children and livestock.

Mitigation Measures

i. The proponent should put in place a pre-emptive community liaison structure aimed at identifying potential issues arising from project-related impacts and addressing them before they become grievances, the proponent should also have mechanisms of escalating grievances to relevant mandated agencies in case the grievances cannot be handle at the community level.

ii. Put a barrier between the electric fence and the public road/ homesteads to prevent easy access by the community members and livestock.

7.3 Anticipated Impacts during Project's Operation Phase

7.3.1 Anticipated Positive Impacts

7.3.1.1 Increased Employment Opportunities/Economic Empowerment

The Consultative Public Participation (CPP) revealed that one of the major challenges in the project area is unemployment for the youth. Employment opportunities is one of the major impacts of the proposed project that will be realized during the at operation phase.

7.3.1.2 Better Opportunities for Business

In order to accommodate the growing number of visitors and employees at the site, a multitude of business opportunities are anticipated in the vicinity. There will be a greater need for service providers due to the workforce at the gold extraction and processing plant, which will result in more business. As a result, the multiplier effect will provide additional business opportunities within the local economy, which the local population will be expected to take advantage of in order to better their standard of living. Likely opportunities for the local businesses will include catering services for mine staff, tree nurseries, and possibly other agro-businesses (fish farming in particular).

7.3.1.3 Better roads as well as other Services and Infrastructure

It is projected that Spirit Mining Kenya Limited will see increased revenue following the implementation of their proposed project, a portion of which the company will return to the community through corporate social responsibility as a share of royalties. CSR activities by the company may include support in access to water, education, health services, and support to local infrastructures (local roads in particular).

7.3.1.4 Technological Transfer and Skill Development

Through on-the-job training, members of the local community who will have the chance to work in the gold extraction facility will improve their abilities and gain knowledge of the technologies used in the extraction and processing of gold. In addition, the company will provide internship opportunities on site for students of reputable institutions with a focus on geology, EHS engineering, mine engineering and plant engineering.

7.3.1.5 Revenue to Government

Through licence fees, permits, and other statutory deductions, the proposed project will generate tax money for both the county and national government.

7.3.1.6 Development of the nearby Ondati trading centre and Ndhiwa Sub-county at large

If carried out, it is projected that the proposed gold ore mining and processing project will directly support the growth of the nearby Ondati commercial centres and, to a greater extent, the Ndhiwa sub-county. The anticipated development will bring in new investments from both domestic and foreign sources, leading to the development. The money invested will go towards building amenities and services to meet the demands of the growing population who will be arriving to work on the gold mining and processing operation, either directly or indirectly.

7.3.1.7 Benefit Sharing Between the landlords and the Company

The land lords whose parcels of land will be used for the project will get monthly income from the company as part of land lease rent, this will increase incomes for the landlords and their families which can be used in investment for long-term income generating opportunities. Benefits from the leasing of land is far greater than what they are getting from other activities like agriculture.

7.3.2 Anticipated Negative Impacts

7.3.2.1 Landform and Geological Change, Soil Erosion, Quality Deterioration

The anticipated open-pit mining down to a depth of 10 meters below the surface and underground mining will lead to landform change, land cover deterioration and soil erosion. Blasting and excavation can create new fractures in rock formations or extend existing ones, altering the structural integrity of the surrounding rock mass. Exposure of certain minerals, like sulphides, to air and water can lead to oxidation, changing the chemical composition of rock formations and potentially leading to acid mine drainage.

Mitigation Measures

i. Implement phased mining to minimize the area disturbed at any one time.

ii. Use techniques such as terracing, retaining walls, and geo-fabrics to stabilize disturbed areas and reduce landform changes.

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

iv. Design and implement effective drainage systems to manage surface water and prevent erosion.

7.3.2.2 Air Pollution and Dust

Dust will be generated primarily from mine blasting, material transportation on dirt road, topsoil loading and stockpiling as well as crushing of the ore and tailings at the processing plant.

Mitigation Measures

i. Personal protective equipment (PPE) such as dust masks must be worn by those working in the mining and ore crushing site.

ii. Adopt the wet crushing technology to minimize amount of dust generated during crushing of tailings and rock ore.

iii. Slow down speed of vehicle on site and access road to the site to minimize dust generation.

iv. Sprinkling water during dry season on the road to the mining site to suppress dust.

v. Care should be taken to prevent spillage of transported ore by covering the carrying vehicles with tarpaulin and sprinkling of water, if dry.

7.3.2.3 Vibration and Noise

Vibrations and noise is expected to be generated as a result of blasting and ore and tailings processing machinery operations. There are settlements in close proximity to the project site thus, it is concluded there will be noise impact to the general public.

Mitigation Measures

i. Select and maintain mining equipment with lower noise levels. Utilize noise-reducing technologies such as mufflers, silencers, and noise enclosures.

ii. Schedule noisy activities during daytime hours when they are less likely to disturb nearby residents. Implement quiet periods during the night.

iii. Use controlled blasting techniques such as pre-splitting, cushion blasting, and electronic detonators to minimize noise. Conduct blasting at fixed times with prior notification to local communities.

iv. Set up continuous noise monitoring stations around the mine site to measure noise levels and ensure compliance with regulations.

7.3.2.4 Fire Risk

The project site has a storage tank for fuel to be used in the generator and other mining machineries and vehicle. Existence of the fuel storage facility thus pose serious fire risk at the site. If appropriate measures are not put in place, a fire outbreak can occur and cause great damage to property and even lead to death.

Mitigation Measures

i. Places with flammable materials should be declared “NO SMOKING ZONES” and clear notices of the same be displayed.

ii. 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.

iii. “FIRE ASSEMBLY POINTS” at specific points at the site should be established and marked.

iv. The company should on regular basis train personnel concerning emergencies including those involving fire out-breaks.

v. Spirit Mining limited should facilitate regular inspection of the fire fighting equipment.

7.3.2.5 Mining Operations related Accidents

Mines collapse and related processing accidents are a common phenomenon in underground mines operations in Kenya, such accidents normally leads to casualties and injuries to those affected. It is therefore necessary for the proponent to consider safeguard mechanisms against such accidents.

Mitigation Measures

i. Underground mining and ore processing works to be undertaken by qualified and experienced experts.

ii. Personal protective equipment to be provided and used by those working in high risk areas such as the mines and the processing plant.

iii. Provide equipped first aid kits and train personnel on emergency response on site.

iv. 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.

v. Dangerous working areas such as mining and ore processing sites will be protected, fenced, demarcated and cordoned off from the general public.

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

The mining of the gold ore will require explosives and related equipment while extraction of the gold sediments from the ore will be done by use of cyanide and related reagents. Given the hazardous nature of these chemical substances, if poorly handled, or accidentally leaks into the environment especially during transportation, they are likely to cause serious harm to the environment and those in contact with them.

Mitigation Measures

i. Obtain a license for transporting hazardous materials from NEMA, ensuring that the vehicle used for transportation is certified for carrying hazardous chemicals including proper labelling and safety features. In the event of an accident or spill, immediately report to NEMA and other relevant authorities.

ii. Ensure that hazardous chemicals are packaged in containers that are leak-proof and resistant to the chemicals being transported.

iii. Ensure that Safety Data Sheets (SDS) for all hazardous chemicals are available and accessible. SDS provide detailed information on handling, storage, and emergency measures.

iv. Have a qualified person to handle the storage and monitor usage of hazardous chemicals and explosives at the company's site. No unauthorized persons should be allowed into the storage room or to use the chemicals.

v. Gel cartridges will be stored in a ventilated 20 ft container which will be entirely lined with plywood on the inside with no metal piece being susceptible to be in contact with explosives. Detonators will be stored in a separate explosives magazine. The magazine will be guarded on a 24/7 basis.

7.3.2.7 Risks connected with Blasting

Primary risks associated with blasting include:

a) Seismic waves generated by blasting can cause damage to nearby buildings, infrastructure, and underground utilities.

b) Unexploded explosives can pose a significant danger during subsequent operations or to anyone who comes into contact with them.

c) Misfires can lead to accidental detonations, posing risks to workers.

Mitigation Measures

i. Conduct thorough geological surveys to understand the rock structure and potential hazards.

ii. Establish safety zones and ensure all personnel are clear of the blast area.

iii. Those working in the mine should use PPEs and mats to contain flyrock, dust and noise. Ensure proper handling, storage, and disposal of explosives.

iv. All loading and firing shall be directed and supervised by competent person(s) thoroughly experienced in this field and accredited accordingly.

v. Increase the number of delay detonators used in a round of blasting.

vi. Inform local communities about blasting schedules and potential impacts prior to blasting. The distance of the explosives magazine from the closest dwelling will be about 160 m, thus allowing for a capacity of 3,500 kg with consent of the occupier.

vii. Adhere to local regulations and industry standards for blasting operations (Explosives Act of Kenya, 2012).

7.3.2.8 Impact on Ground and Surface Water Quality (by rock blasting and cyanide leaks)

Activities related to gold mining and processing have the potential to contaminate surface and ground waters. The hydrogeology regime may be impacted by poorly managed mining operations, particularly when surface rock is removed. When mines are excavated below the water table, hazardous materials may leak into the groundwater. Cyanide used in gold leaching may pose serious risk to the water quality and the ecosystem if leaks into the environment.

Mitigation Measures

i. Conduct a hydrogeological assessment to guarantee that drilling and blasting operations do not disrupt the water table.

ii. Construct containment systems such as double-lined tailings ponds and leach pads to prevent cyanide leakage into the soil and groundwater. Use high-density polyethylene (HDPE) liners for additional protection.

iii. Ensure proper handling and mixing of cyanide solutions to minimize spills and exposure. Use closed leaching systems where possible to reduce the risk of accidental releases.

iv. Implement cyanide recycling systems to reduce the amount of cyanide used and disposed of, minimizing the risk of leakage.

v. Regularly monitor groundwater and surface water quality around the mine site for cyanide levels. The comparison should be based on baseline data before mining operations.

vi. Equip the site with cyanide spill containment and neutralization materials, such as spill kits and neutralizing agents (e.g., sodium hypochlorite or hydrogen peroxide).

7.3.2.9 Effects of cyanide vapours from leach tanks

The leaching processes lead to release of Hydrogen Cyanide (HCN), a highly toxic, colourless gas with a faint, bitter almond-like odour. HCN is volatile and can easily disperse in the air, leading to potential inhalation exposure. Inhalation of HCN gas can lead to acute

toxicity, causing symptoms such as headache, dizziness, confusion, respiratory distress, and in severe cases, death due to respiratory failure.

Mitigation Measures

i. Processing environment should be maintained in basic condition to avoid evolvement of Hydrogen Cyanide (HCN) gas which is poisonous, to achieve this, the plant should use lime to suppress cyanide from being emitted as a fume into the environment.

ii. Install and maintain effective ventilation systems in areas where cyanide is used to disperse and dilute HCN fumes. Ensure proper air exchange rates to keep HCN concentrations below harmful levels.

iii. Utilize closed systems for cyanide processing to minimize the release of fumes into the workplace.

iv. Train workers on the safe handling of cyanide, recognizing the signs of HCN exposure, and emergency response procedures.

v. Equip workers with protective clothing, gloves, respirators and goggles to prevent skin and eye contact with cyanide solutions and fumes.

7.3.2.10 Natural Disasters

There might occur unexpected natural events that can`t be predicted such as storm, earth quake and flooding. These phenomenon can lead to flooding of open pit mines, collapse of mine walls, over-flow of tailing dam and even loss of life and property.

Mitigation Measures

i. All workers need to undertake emergency response drills.

ii. Construct surface water diversion facilities: security dam/barrier, drainage and ditches around open pit, social structure and waste rock dumps to prevent from flooding.

iii. Emergency dam should be constructed at the project site based on the slope of the area to collect water that might overflow from the tailing dam during flooding.

7.3.2.11 Increased Traffic

The transportation of ore from the mining site to the processing site will entail use of trucks which can pose a risk of traffic related accidents in the area if much care is not taken.

Mitigation Measures

a) Sensitize the drivers to control and reduce speed of vehicles on the road.

b) Expand and rehabilitate the local access roads to be used by the trucks.

7.3.2.12 Alterations to Social Community Norms and Structure

The influx of people, changes in economic activities, and the introduction of new social dynamics can lead to alteration of community norms and traditions in the rural set-up of the project area. The project can lead to dependence on mining jobs and little investment in agriculture by the locals which can create economic instability if the project ends or scales down.

Mitigation Measures

i. Involve local communities in decision-making processes to ensure their needs and concerns are addressed.

ii. 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.

iii. Through the CSR, support local community income generating projects especially for members not working in the mining industry.

7.4 Anticipated Impacts during Project's 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.

The project has two sites, the mining and processing site, the decommissioning of the mining site will most likely be earlier than the processing site, and this is because the proponent has explored several other sites to be mined in the project area in near future. The most common impact associated with decommissioning a gold leaching plant is the disposal of tailings and waste water in the tailing ponds which may contain traces of cyanide.

At the closure of the operations, the proponent is required by law under the Mining Act, 2016 to ensure that the site will not pose a threat to the health and safety of the environment at that time and in future. The following will be adhered to during decommissioning:

a) A decommissioning report will be prepared and submitted to NEMA at least three months before decommissioning takes place (NEMA will advise accordingly on the decommissioning process and possible ways to mitigate the decommissioning impacts).

b) Remove any hazardous materials, reshape the land, restore the top soil and plant native plants at the site.

c) Mitigation for decommissioning phase impacts will follow general guidelines in the decommissioning report developed and approved by NEMA before decommissioning.

8 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN (ESMMP)

8.1 Introduction

This chapter lays out the steps that will be done to manage the environment while the proposed project is being built, run, and eventually decommissioned. The most effective way to manage the environment is to create and carry out an Environmental and Social Management Plan (ESMP), which guarantees that the project's environmental impacts are recognised and minimised at every stage.

The described ESMP takes into account the identified concerns and mitigating activities together with the roles, expenses, and monitoring metrics that may be used to assess how successfully the suggested project's environmental quality is being upgraded.

8.2 Enforcement Mechanism of the ESMP

The ESMP will be enforced by relevant Government Departments and Lead Agencies through continuous monitoring, consultation and feedback from the management of Spirit mining limited, neighbours and the general public. To ensure adherence to the set conditions:

a. The Environmental Management Procedures that will direct the mining and gold leaching plant's installation and operation must be developed by the proponent and documented. The policies should cover waste management, employee safety and occupational health, and proposed environmental conservation initiatives.

b. The project proponent shall avail necessary finance for implementation of ESMP.

c. The proponent to ensure employees carries out their work within Environmental and Occupational, Health and Safety requirements.

Table 8.1 below shows the Environmental and Social Management Plan (ESMP) for the proposed mining and tailings/ore processing project in Koguta Sub-Location, Pala Location, Pala Division, Ndhiwa Sub-County, Homabay County, Kenya.

Table 8.1: Environmental and Social Management Plan the Proposed Gold Ore Mining and Processing Project by Spirit Kenya Mining LTD in Koguta Sub-Location, Pala Location, Pala Division, Ndhiwa Sub-County, Homabay County, Kenya

Environmental/ social impact	Mitigation measures	Responsibility	Monitoring/performance indicator	Frequency of monitoring	Estimated cost in (Ksh)
CONSTRUCTION PHASE					
Loss of Biodiversity /Loss of Vegetation Cover and Alteration of Habitat	• Properly demarcate the project area to be affected by the construction activities to avoid spill over effects to neighbouring areas. • Strictly control movement of vehicles to ensure that they operate judiciously and over designated areas to minimize destruction of vegetation. • Re-establish vegetation in some parts of the disturbed areas through implementation of a well-designed landscaping programme by planting of appropriate plants.	Contractor and the proponent	• Percentage of flora destroyed • Percentage of plant cover re-established	Throughout construction period	50,000
Risk of Oil Spillage	• The proponent shall take into account safety procedures to minimise cases of oil spillage. Such procedures might include maintaining the machinery in specific designated areas designed	Contractor and the proponent	• Surface area affected by oil and fuel spill	Throughout the construction period	100,000

	for such purposes. • Construct an oil interceptor at the machine and equipment service station to separate oil and wastewater before the wastewater joins the natural drainages.				
Noise and Vibrations	• The proponent shall properly maintain the equipment and machinery and restriction of construction activities to daylight hours. • Providing ear protective devices to workers and visitors in noisy environments to prevent high frequency noise emitted by the high frequency machines.	Contractor and the proponent	• Complaints from neighbourhood • Records of type of PPEs issued to workers	Throughout the construction period	30,000
Dust Emissions	• The contractor on site should utilize dust suppressors (water sprays), cover the trucks carrying tailings and sand with canvass, and pre-start inspection of dust control equipment should be undertaken. • Provide construction workers with Personal Protective Equipment (PPE) such as dust masks.	Contractor and the proponent	• Records on complaints raised on air pollution. • visible dust particulate in the air • Plant leaves with or without excess dust cover.	Throughout the construction period (Especially during dry seasons)	70,000
Risk of Construction Related Accidents	• Construction workers must be provided with appropriate personal protective gears, especially while working in risky conditions.	Contractor, proponent and employees	• Safety protocols at the site • Presence and use of PPEs	Throughout the construction period	200,000

	• Drivers transporting construction materials to the site should be advised on the speed limit to minimize risk of accidents on the local roads. • The construction site to be safely secured with a clear entry and exit gates that are manned to control unauthorized access to the construction site including children playing and stray animals. • There will be no tolerance for drunkenness or intoxication during working hours, and no alcohol will be permitted at the project site.		• Number of accidents reported		
Solid and Liquid Waste	• The contractor must put in place proper waste management mechanism for solid and liquid wastes disposal. • Toilet and/latrine should be provided on site and the necessary sanitary arrangements made. • Food left overs and waste paper will also generate solid waste which must be separated and be disposed at designated sites.	Contractor, proponent and employees	• Number of waste receptacles • Solid and liquid Waste management plan in place at the project site	Throughout the construction period	500,000
Grievances/conflicts	• The proponent should put in place a pre-emptive community liaison structure aimed at identifying	The project proponent and the contractor	• Number of grievances reported,	Throughout the construction period	No expense

	potential issues arising from project-related impacts and addressing them before they become grievances, the proponent should also have mechanisms of escalating grievances to relevant mandated agencies in case the grievances cannot be handle at the community level. • Put a barrier between the electric fence and the public road/ homesteads to prevent easy access by the community members and livestock.		• Number of grievances resolved • Number of grievances escalated		
OPERATION PHASE					
Landform and Geological Change, Soil Erosion, Quality Deterioration	• Implement phased mining to minimize the area disturbed at any one time. • Use techniques such as terracing, retaining walls, and geo-fabrics to stabilize disturbed areas and reduce landform changes. • Soil conservation measures would be taken to the stockpiles to prevent erosion. This can include the use of erosion control fabric. • Design and implement effective drainage systems to manage	Project proponent and employees in the mining section	• Mining method used • Soil management measures in place • Storm water drainage design in the area	Throughout the mining period	200,000

	surface water and prevent erosion.				
Air Pollution and Dust	• Personal protective equipment (PPE) such as dust masks must be worn by those working in the mining and ore crushing site. • Adopt the wet crushing technology to minimize amount of dust generated during crushing of tailings and rock ore. • Slow down speed of vehicle on site and access road to the site to minimize dust generation. • Sprinkling water during dry season on the road to the mining site to suppress dust. • Care should be taken to prevent spillage of transported ore by covering the carrying vehicles with tarpaulin and sprinkling of water, if dry.	Project proponent and employees in the mining section	• Records on complaints raised on air pollution and dust. • visible dust particulate in the air • Plant leaves with or without excess dust cover.	Throughout the project's operational phase	100,000
Vibration and Noise	• Select and maintain mining equipment with lower noise levels. Utilize noise-reducing technologies such as mufflers, silencers, and noise enclosures.	Project proponent and the employees in the mining	• Number of noise-related complaints or inquiries received from the community or	Throughout the project's operational phase	70,000

	• Schedule noisy activities during daytime hours when they are less likely to disturb nearby residents. Implement quiet periods during the night. • Use controlled blasting techniques such as pre-splitting, cushion blasting, and electronic detonators to minimize noise. Conduct blasting at fixed times with prior notification to local communities. • Set up continuous noise monitoring stations around the mine site to measure noise levels and ensure compliance with regulations.	as well as the processing section	regulatory authorities. • Noise levels measured in decibels (dB) at project sites and surrounding sensitive receptors, such as residential areas or schools.		
Fire Risk	• 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. • “FIRE ASSEMBLY POINTS” at specific points at the site should be	The project proponent	• Number of fire-related incidents or accidents reported on project sites • Existence and status of fire fighting equipment • Number of staff trained on fire management and response as well as First Aid.	Regularly during the project’s operations	100,000

	established and marked. • The company should on regular basis train personnel concerning emergencies including those involving fire out-breaks. • Spirit Mining limited should facilitate regular inspection of the fire fighting equipment.				
Mining Operations related Accidents	• Underground mining and ore processing works to be undertaken by qualified and experienced experts. • Personal protective equipment to be provided and used by those working in high risk areas such as the mines and the processing plant. • Provide equipped first aid kits and train personnel on emergency response on site. • 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	Project proponent and the employees in the mining as well as the processing section	• Certification of those working in the mining and blasting section as well as leaching plant. • Safety protocol at the mining and processing sites.	Throughout the project's operational phase	500,000

	place. • Dangerous working areas such as mining and ore processing sites will be protected, fenced, demarcated and cordoned off from the general public.				
Risk associated with transportation, handling and storage of mining chemicals and explosives	• Obtain a license for transporting hazardous materials from NEMA, ensuring that the vehicle used for transportation is certified for carrying hazardous chemicals including proper labelling and safety features. In the event of an accident or spill, immediately report to NEMA and other relevant authorities. • Ensure that hazardous chemicals are packaged in containers that are leak-proof and resistant to the chemicals being transported. • Ensure that Safety Data Sheets (SDS) for all hazardous chemicals are available and accessible. SDS provide detailed information on handling, storage, and emergency measures. • Have a qualified person to handle	Project proponent and the employees in the mining as well as the processing section	• Nature of the chemical storage facility, • permit to procure, transport and store cyanide and explosives • Documented expert experience and knowledge of persons handling the Mining chemicals and explosives	Continuous monitoring throughout the project cycle.	

	the storage and monitor usage of hazardous chemicals and explosives at the company's site. No unauthorized persons should be allowed into the storage room or to use the chemicals.				

Risks associated with blasting	• Conduct thorough geological surveys to understand the rock structure and potential hazards. • Establish safety zones and ensure all personnel are clear of the blast area. • Those working in the mine should use PPEs and mats to contain flyrock, dust and noise. Ensure proper handling, storage, and disposal of explosives. • All loading and firing shall be directed and supervised by competent person(s) thoroughly experienced in this field and accredited accordingly. • Increase the number of delay detonators used in a round of blasting. • Inform local communities about blasting schedules and potential impacts prior to blasting. • Adhere to local regulations and industry standards for blasting operations (Explosives Act of Kenya, 2012).	Project proponent and the employees in the mining section	• record of explosives used • Safety protocols employed while blasting	Continuous monitoring throughout the mining and blasting operations of the project.	

Impact on Ground and Surface Water Quality (by rock blasting and cyanide leaks)	• Conduct a hydrogeological assessment to guarantee that drilling and blasting operations do not disrupt the water table. • Construct containment systems such as double-lined tailings ponds and leach pads to prevent cyanide leakage into the soil and groundwater. Use high-density polyethylene (HDPE) liners for additional protection. • Ensure proper handling and mixing of cyanide solutions to minimize spills and exposure. Use closed leaching systems where possible to reduce the risk of accidental releases. • Implement cyanide recycling systems to reduce the amount of cyanide used and disposed of, minimizing the risk of leakage. • Regularly monitor groundwater and surface water quality around the mine site for cyanide levels. The comparison should be based on baseline data before mining operations.	Project proponent and the employees in the mining section	• Waste water from the leaching plant management mechanisms • Scope/depth of the underground mines.	Continuous monitoring throughout the mining and leaching operations of the project.	

	• Equip the site with cyanide spill containment and neutralization materials, such as spill kits and neutralizing agents (e.g., sodium hypochlorite or hydrogen peroxide).				
Effects of cyanide vapours from leach tanks	• Processing environment should be maintained in basic condition to avoid evolvement of HCN gas which is poisonous, to achieve this, the plant should use lime to suppress cyanide from being emitted as a fume into the environment. • Install and maintain effective ventilation systems in areas where cyanide is used to disperse and dilute HCN fumes. Ensure proper air exchange rates to keep HCN concentrations below harmful levels. • Utilize closed systems for cyanide processing to minimize the release of fumes into the workplace. • Train workers on the safe handling of cyanide, recognizing the signs of HCN exposure, and emergency response procedures.	Project proponent and employees working in the leaching section	• Ventilation system in the leaching area • Presence and use of respirators, goggles and other necessary PPEs	Throughout the project operational phase	

	• Equip workers with protective clothing, gloves, respirators and goggles to prevent skin and eye contact with cyanide solutions and fumes.				
Impacts related to Natural Disasters	• All workers need to undertake emergency response drills. • Construct surface water diversion facilities: security dam/barrier, drainage and ditches around open pit, social structure and waste rock dumps to prevent from flooding. • Emergency dam should be constructed at the project site based on the slope of the area to collect water that might overflow from the tailing dam during flooding.	Project proponent and the company's employees	• Preparedness plans put in place in the event of a natural disaster	Throughout the project operational phase especially when there is a forecast/early warning information from credible sources.	
Increased Traffic	• Sensitize the drivers to control and reduce speed of vehicles on the road. • Expand and rehabilitate the local access roads to be used by the trucks.	Project proponent and the company's drivers and machine operators	• Status of the local access roads • Number of road related accidents recorded • Complains from other road users.	Throughout the project operational Phase.	

Alterations to Social Community Norms and Structure	• Involve local communities in decision-making processes to ensure their needs and concerns are addressed. • 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. • Through the CSR, support local community income generating projects especially for members not working in the mining industry.	The proponent and the leadership of the community	• Community social and economic support programs in place	Throughout the project's operational phase.	

DECOMMISSIONING PHASE					
Negative Impacts	Mitigation	Responsibility	Frequency	Indicators	Estimated cost
Waste storage structures	Construct mining storage structures that can remain stable for a minimum of over 200 years.	Proponent and Mining Engineers	Continuous monitoring	Effective storage facilities	1,000,000

Seeping from the tailings into surface or groundwater	Minimize the amount of water seeping from the tailings into surface or groundwater;	Proponent and Mining Engineers	Continuous monitoring	Tailings that do not seep water into surface and ground water	500,000
□ Waste rock piles and exposed material	□ Cover waste rock piles and exposed materials with topsoil and	Proponent	Follow up	Land covered by vegetation	500,000

9 Conclusions and Recommendations

9.1 Conclusions

The proposed mining project is seen as significant and advantageous since it will increase the size of Kenya's mining industry, which has been underdeveloped for many years. The majority of gold mining in Kenya is classified as artisanal, meaning that the capacity to fully extract gold from the ore is limited. The project is viewed as a catalyst for economic and industrial development, not only in Ndhiwa but throughout the entire nation. In addition to providing jobs and facilitating technological transfer, the initiative will help communities in accordance with corporate social responsibility guidelines and pay taxes to both national as well as county governments.

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.

9.2 Recommendations

Based on scientific analysis of the impacts analysed during the study, they were found to be mitigatable. To ensure the sustainable development of the gold mining and processing project while minimizing negative impacts, the following recommendations are proposed:

a) The proponent should ensure the Ensure that adequate financial resources are allocated for the implementation ESMP is enforced throughout the project cycle

b) The proponent should ensure that cyanide and other hazardous chemicals are handled, stored, and transported safely. This includes secure storage facilities, spill containment measures, and appropriate labelling.

c) The proponent should develop and implement an emergency response plan for cyanide spills or leaks, including immediate containment, neutralization procedures, and medical response protocols.

d) The proponent should establish a transparent and ongoing dialogue with local communities. This should include regular updates, consultations, and involvement in decision-making processes to address their concerns and ensure their participation in the project's benefits.

e) The proponent should formulate a detailed plan for the rehabilitation of the mining site post-closure. This should include land restoration, reforestation, and measures to ensure the long-term sustainability of the area.

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Homabay County CIDP II (2022– 2027).

Annexes

01. Company Certificate of Incorporation

02. Company KRA Pin Certificate

03. Land Lease Document (Mining site)

04. Land Lease Document (Processing plant site)

05. Land Title Deed (Mining site)

06. Land Title Deed (Processing Plant site)

07. Change of Land Use Approval

08. Minutes of Public Consultation Forum

09. List of Attendance to the Public Consultation Forum

10. Questionnaire Filled During CPP

11. Baseline Water Quality Report

12. Baseline Soil Quality Report

13. Baseline Noise Level Report

14. Project Site Detailed Drawings

15. EIA notification Letter to NEMA Homabay County Office

16. EIA notification Letter to Homabay County Government Department of Mining and Blue Economy

17. Baseline Air Quality Report

18. Risk Analysis Summary

19. EIA/EA Experts Practising Licenses

20. Project Feasibility study report with Geological surveys and Mineral Exploration details

21. Approved Terms of Reference(TOR) for the Study

22. EIA Upgrade from CPR to Study by NEMA Homabay County Office