ENVIRONMENTAL AND SOCIAL IMPACT STUDY REPORT FOR THE PROPOSED REVAMPING OF FLUORSPAR MINING IN KIMWAREL, KERIO VALLEY, ELGEYO MARAKWET COUNTY

CLIENT:

Sofax Fluorspar Kenya Ltd

Physical Address: Sang Plaza, Uganda Road, Eldoret, Uasin Gishu County

Postal Address: P.O. BOX 6279-30100, Eldoret,

Telephone: +254 20 7840300

Email: info@sofax.co.ke

CONSULTANT:

Tembo Sacco Plaza, Door 10, Mukima Drive off Thika Road

Tel: +254 720912463

P.O Box 9547-00300,

Nairobi, Kenya,

info@francisallen.co.ke, www.francisallen.co.ke

DECLARATIONS

I, **John Masanda** on behalf of **SOFAX Fluorspar Kenya Ltd**, submit this Comprehensive Environmental and Social Impact Assessment Report for the **Proposed Revamping of Fluorspar Mining in Kimwarel, Kerio Valley, Elgeyo Marakwet County.**

Signed on the **12th** day of **September** 2024

Signature _____

Designation: **Director**

I, **PATRICK KYALO KITUTA,** submit this Comprehensive Environmental and Social Impact Assessment Report for the **Proposed Revamping of Fluorspar Mining in Kimwarel, Kerio Valley, Elgeyo Marakwet County.** The Report has been prepared in accordance with the Environmental Management and Coordination Act, Cap 387 and the Environmental (Impact Assessment and Audit) Regulations, 2003.

Signed on the **12th** day of **September** 2024

Signature _____

Designation: EIA/AUDIT LEAD EXPERT REG. NO. 1275

Contact Person: Boniface Mwaniki

Mobile Number: **0729014295**

Designation: Associate Expert Reg. No 10414

EXECUTIVE SUMMARY

This Environmental and Social Impact Assessment (ESIA) report has been prepared by Francis Allen Consulting Ltd, in collaboration with a team of specialized experts, for the revival of fluorspar mining operations in Kimwarer, Kerio Valley, Elgeyo Marakwet County, by SOFAX FLUORSPAR KENYA LIMITED. The primary objective of this ESIA is to ensure that the proposed mining activities are conducted in an environmentally responsible and socially equitable manner, aligning with both regulatory requirements and community expectations.

Fluorspar, chemically known as calcium fluoride (CaF_2), is a versatile mineral found in various geologic environments, including igneous rock formations, sandstone, and as a by-product of industrial processes (Yager et al., 2020). Its applications are extensive, ranging from the production of hydrofluoric acid and fluoride to its use in the manufacture of steel, glass, and enamel. The fluorspar deposits in Kimwarer are significant, formed within sedimentary rock structures, and have the potential to substantially contribute to the local and national economy if mined sustainably.

The study area is geographically located in the Kimwarer region of Kerio Valley, Elgeyo Marakwet County. It is bounded to the south by latitude 0°11' S, to the north by latitude 1°30' N, and to the east by longitude 35°37'. The area is primarily inhabited by the Keiyo and Tugen communities, with a moderate to low population density. The local economy is predominantly based on farming and livestock rearing, with land ownership being characterized by individual holdings under freehold titles issued by the Government of Kenya.

The ESIA process undertaken by the consultants was comprehensive, adhering strictly to the guidelines provided by the National Environment Management Authority (NEMA) as outlined in the Environmental Management and Co-ordination Act No. 8 of 1999. The scope of the study included a thorough examination of the area's general characteristics, including its location, vegetation, climate, settlement patterns, and infrastructure. Additionally, the study reviewed relevant legislation governing the mining and processing sectors, assessed the geology and mineralogy of the fluorspar deposit, estimated ore reserves, and evaluated the potential environmental and social impacts

of the project. An Environmental Management Plan (EMP) was also developed to guide the mitigation of identified risks.

The fluorspar mining project is expected to generate significant positive impacts during its various phases. In the renovation phase, job creation and employment opportunities will be substantial, benefiting the local population through roles in site preparation, infrastructure development, and associated services. This phase will also inject investment into the local economy, stimulating business growth and regional development. Infrastructure improvements, such as roads and utilities, will enhance connectivity in the region, while training and capacity-building initiatives will equip the local workforce with valuable skills that will have long-term benefits.

Additionally, During the operational phase, sustained employment and continuous economic activity are anticipated, with local businesses profiting from the consistent demand for goods and services. The adoption of advanced mining technologies will not only improve production efficiency but also introduce innovations that minimize environmental impacts. Furthermore, the mining company is likely to engage in Corporate Social Responsibility (CSR) initiatives, funding community development projects that will improve the quality of life for local residents. In the decommissioning phase, efforts will focus on resource recovery, land restoration, and the transfer of skills and knowledge to the local workforce, paving the way for new development opportunities in the rehabilitated areas.

However, the project also presents potential negative impacts, particularly during the renovation and operational phases. Air quality could be compromised by dust and emissions from upgraded machinery, necessitating the implementation of dust control measures and the use of low-emission equipment. Water resources and soil quality could be at risk from chemical spills and erosion during renovation, requiring robust storage facilities, regular monitoring, and erosion control measures. Noise pollution and biodiversity disruption are also concerns that will be addressed through the use of noise-reducing equipment, habitat restoration plans, and proper site management. Waste management and public health and safety are critical areas of focus, with

comprehensive waste management plans, strict adherence to health and safety protocols, and traffic management strategies needed to minimize risks.

In the operational phase, challenges such as deforestation, soil erosion, water pollution, and the impact of blasting activities will require targeted mitigation strategies, including reforestation, erosion control, wastewater treatment, and advanced blasting techniques. Socially, the project will have both positive and negative effects, with the potential for community disruption balanced by the economic benefits and employment opportunities generated. Engaging with local communities, offering compensation where necessary, and investing in infrastructure will be essential in mitigating these impacts and ensuring a balanced approach to the project's development.

In conclusion, the ESIA provides a comprehensive roadmap for the sustainable development of fluorspar mining in Kimwarer, ensuring that the project aligns with environmental and social standards while maximizing economic benefits for the local community and the broader region. The successful implementation of the Environmental Management Plan will be crucial in achieving these objectives.

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Acronyms and Abbreviations

Acronyms and Abbreviations	Meaning
AOAC	Associations of Official Analytical Chemists
APHA	American Public Health Association
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
DOSH	Director of Occupation Safety and Health
EA	Environmental Audit
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EPZ	Export Processing Zone
ESIA	Environmental and Social Impact Assessment
FCK	Fluorspar Company of Kenya
FGDs	Focus Group Discussions
GPS	Global Positioning System
HFCs	HydrofluoroCarbons
ISO	International Organization for Standardization
KFC	Kenya Fluorspar Company
KFS	Kenya Forest Service
KWS	Kenya Wildlife Service
LCD	Liquid Crystal Display
LSAPC	Light Scattering Air Particle Counter

NEMA	National Environmental Management Authority
OPs	Operational Standards
OSHA	Occupational Safety and Health Act
PAH	Polycyclic aromatic Hydrocarbon
PM	Parts per Million
PPE	Personal Protective Equipment
TDS	Total Dissolved Solids
TPM	Total Particulate Matter
TVOC	Total Volatile Organic Compounds
UNFCCC	United Nations Convention on the Conservation of Nature
WRA	Water Resource Authority
ZLD	Zero-Liquid Discharge

2 INTRODUCTION ANDBACKGROUNDND OF THE PROJECT

2.1 Introduction

The Environmental and Social Impact Assessment (ESIA) report provides a thorough evaluation of crucial factors necessary for preserving a clean, sustainable, and healthy environment in a rural area affected by a mining project and related factory operations (Kamakia, 2015). It emphasizes the need to understand and address the environmental and social challenges that arise when large-scale earth and rock removal activities disrupt the natural balance of a typically untouched rural ecosystem. The report identifies potential impacts, such as land disturbance, water contamination, and air quality degradation, and outlines strategies to mitigate these effects. By focusing on sustainable practices and community well-being, the ESIA ensures that the project proceeds in a manner that respects the environment and supports the health and livelihoods of local populations, balancing economic benefits with environmental stewardship.

Francis Allen Consulting Ltd (hereinafter referred to as the ‘consultants’), in collaboration with a team of specialized experts, has prepared this Environmental and Social Impact Assessment (ESIA) study report for the proposed development project. The project proponent, SOFAX FLUORSPAR KENYA LIMITED, aims to revive fluorspar mining operations that were formerly managed by the Kenya Fluorspar Company in Kimwarer, located in the Kerio Valley of Elgeyo Marakwet County. This ESIA study is a critical step in ensuring that the renewed mining activities are carried out in an environmentally responsible and socially equitable manner. The consultants aim to provide a roadmap for sustainable mining practices that align with both regulatory requirements and community expectations.

The genealogy of fluorspar in Kenya dates back to 1967 when the ore deposits were discovered in the Kerio Valley by Mr. Al-Amin, who was prospecting for semi-precious stones; the Fluorspar Company of Kenya (FCK) was established in 1971 when the Kenyan government bought the operation from Mr. Al-Amin to increase production capacity, but financial and market-related problems led FCK into receivership in 1979,

resulting in the government-owned Kenya Fluorspar Company taking over and continuing operations amid market improvements and customer contracts until it was privatized in 1996 as part of government reform policy; the company operated until 2018 when it ceased operations and its lease expired, leading the government to repossess the assets on April 1, 2018, causing significant hardship for former employees and the local community, and in December 2023, Sofax Fluorspar Kenya Limited expressed interest in leasing the company for 25 years to revitalize the mine and restore economic livelihood (Bii, 2024).

SOFAX Fluorspar Kenya Ltd has a promising opportunity to capitalize on the extraction and production of high-quality fluorspar in an evolving market. Historically, the previous investor focused on producing bulk filter cake acid grade fluorspar through froth flotation concentration. This grade of fluorspar is crucial for the production of hydrofluoric acid, a key ingredient for the fluorochemical and aluminum industries.

The extraction process for fluorspar, particularly the acid grade, requires careful management of mining conditions and costs. Initially, the previous investor benefited from a favorable strip ratio of 2:1, which denotes the volume of overburden removed relative to the volume of ore extracted. This lower ratio allowed for more cost-effective mining. However, this ratio increased to 4:1 over time, indicating that more overburden needed to be removed for the same volume of ore, which could potentially increase mining costs and impact profitability.

SOFAX Fluorspar Ltd has the advantage of entering the market with a fresh perspective and the potential to optimize operations. The company can leverage the existing infrastructure and knowledge base while aiming to improve efficiency and reduce costs. Moreover, SOFAX Fluorspar Kenya Ltd can benefit from the existing ore bodies that were previously mined by the former investor. However, there are several active mines that remain unexplored or underdeveloped, including Kamnoun, Choff, and Cheberen.

By focusing on these existing mines first, the proponent can streamline its operations and reduce the costs associated with initial exploration and development. This approach

allows the company to build a stable foundation before exploring new areas, maximizing efficiency and profitability in its early stages.

Mining operations are designated as a prescribed activity under the second schedule of section 58 of the Environment Management and Coordination Act (EMCA), 1999, among other relevant laws. According to these regulations, any activity that is out of character with its surroundings and likely to cause a significant environmental impact such as waste disposal, sustainable resource use, ecosystem maintenance, social environment impacts, land use changes, and water extraction requires an Environmental Impact Assessment (EIA) Study. The study is essential for assessing potential impacts and proposing mitigation measures.

2.2 ESIA Objectives, Scope, and Terms of Reference

2.2.1 Objectives

The ESIA for the proposed revamping of fluorspar mining comprehensively addressed the environmental and social impacts across all project phases: renovation, operation, and decommissioning. The study aimed to identify and evaluate potential environmental and social impacts, develop mitigation strategies, and ensure regulatory compliance throughout these phases. It included baseline data collection to assess existing conditions, stakeholder engagement to gather and integrate feedback, and risk management to address potential issues proactively. By refining project design to enhance sustainability and establishing monitoring and management plans, the ESIA aims at promoting responsible mining practices while maintaining transparency and public trust.

2.2.2 Scope

The ESIA study covered the lease mining area, the processing plant, offices, surrounding community, and the residential complex. The study laid emphasis on the following

- Renovation of the processing plant
- Renovation of the Office block
- Renovation of the residential houses

- The mining process
- Community engagement
- Noise and Vibration
- The biophysical environment Soil, air, and water quality
- Waste and Effluent Discharge
- Occupational Health and Safety

2.2.3 Terms of Reference (TOR)

The study was carried out in accordance with Environmental Impact Assessment/Audit Guidelines and Administrative procedures in order to comply with the Environmental Management and Coordination Act, 1999 Revised in 2015 and Environmental (Impact Assessment and Audit) Regulations, 2003 revised in 2019

The specific TOR are as follows:

a) Describe the environmental aspects that may be affected by the renovation of the processing plant, office block and residential complex
b) Describe the environmental condition of the area, that may be affected by mining, processing, and transportation of raw and processed material.
c) Identify as many potential sources that have environmental effects and note their associated environmental impacts including:
    - Discharge to Water, land and air
    - Waste management
    - Contamination of soil and water
    - Material storage use and handling
    - Impact on immediate environment and ecosystem
d) Asses the Climatic risk and vulnerability within the project area of influence

2.3 Properties and Uses of Fluorspar

Fluorspar (also known as fluorite) is a mineral composed of calcium fluoride (CaF_2). It exhibits a variety of properties and has several important uses across various industries.

2.3.1 Properties of Fluorspar

Fluorspar commonly forms in hydrothermal veins, often associated with minerals like quartz, calcite, and barite. It can also be found in sedimentary rocks as a replacement mineral and in granite pegmatites (Burisch et al., 2017). Geologically, it is typically found in regions with significant volcanic or geothermal activity, with large deposits located in countries like China, Mexico, South Africa, and Mongolia.

Chemically, fluorspar is inert at standard temperatures and pressures, making it stable and resistant to reaction with most chemicals. It is relatively insoluble in water, though it can dissolve in hydrochloric acid due to the formation of soluble calcium chloride. This makes it stable in many industrial processes.

Fluorspar has a Mohs hardness of 4, meaning it is relatively soft. It can be easily scratched by harder minerals like quartz but is more resistant than gypsum or talc. In terms of color, fluorspar can be found in a wide range of hues, including colorless, purple, blue, green, yellow, and pink **(**Lawrence**,** 2012). These variations are due to impurities and trace elements within the mineral. Additionally, fluorspar is known for its ability to fluoresce under ultraviolet light, displaying vivid colors a property that gave rise to the term "fluorescent."

One of fluorspar's distinctive physical properties is its perfect octahedral cleavage, meaning it breaks along planes of weakness to form octahedral shapes. This makes it easily identifiable and useful in certain industrial applications. Fluorspar is mined on a large scale globally, with major producers including China, Mexico, Mongolia, and South Africa. China is the largest producer, accounting for a significant portion of global production. The primary consumers of fluorspar are the chemical industry, metallurgy, and manufacturing sectors, with significant usage also in the glass and ceramics industries (Berezhkovskaya, 1961).

2.3.2 Uses of Fluorspar

In the chemical industry, fluorspar is primarily used to produce hydrofluoric acid (HF), a precursor for many industrial chemicals, including refrigerants, pharmaceuticals, and fluoropolymers like Teflon. It also plays a crucial role in aluminum production, where it is used as a flux in the smelting process to lower the melting point of alumina.

In the field of metallurgy, fluorspar is used as a flux in steel manufacturing to remove impurities such as sulfur and phosphorus during the smelting process, leading to cleaner and higher-quality steel. It is also employed in cement production as a flux, helping to lower the temperature needed to form clinker, the main ingredient in cement.

Fluorspar has significant applications in the glass and ceramics industries. It is used in the production of opalescent glass, which has a milky or opal-like appearance, and is also an essential component in the production of enamels and glazes for ceramics. Additionally, high-purity fluorspar is used in the manufacture of specialized optical lenses with low dispersion, which are utilized in telescopes, cameras, and other optical instruments. Due to its attractive colors and fluorescence, fluorspar is sometimes cut into gemstones for collectors.

In environmental applications, fluorspar is used in water treatment processes to help remove impurities and in chemical neutralization, where its inert properties make it useful for neutralizing acidic waste and other chemical byproducts. Fluorspar's diverse properties make it a versatile mineral with widespread applications, particularly in industries where chemical purity and specific physical properties are essential.

2.4 Mining and Processing Methods

2.4.1 Mining

SOFAX Fluorspar Kenya Ltd will employ Open-Pit Mining: This method is commonly used for fluorspar deposits near the surface. Large open pits are excavated to access the mineral, and heavy machinery is used to remove overburden (the soil and rock above the deposit) to expose the fluorspar-bearing ore. Once exposed, the ore is drilled, blasted, and then transported to the processing plant. Open-pit mining is preferred when the fluorspar deposit is extensive and relatively shallow, allowing for efficient extraction.

2.4.2 Processing Methods

2.4.2.1 Crushing and Grinding:

Once the fluorspar ore is mined, it is transported to a processing plant, where it is first crushed to reduce its size. This is typically done using jaw crushers and cone crushers. The crushed ore is then ground into a fine powder using ball mills or rod mills, which is

crucial for liberating the fluorspar from the surrounding waste rock (gangue), making it easier to separate.

2.4.2.2 Flotation:

Flotation is the primary method used to concentrate fluorspar from the ore, separating fluorspar from impurities based on differences in surface properties. In this process, the ground ore is mixed with water to form a slurry. Reagents, such as collectors and frothers, are added to the slurry to make the fluorspar hydrophobic (water-repellent). Air bubbles are introduced into the slurry, and the hydrophobic fluorspar attaches to the bubbles, rising to the surface to form a froth. The froth, rich in fluorspar, is skimmed off, while the waste material (tailings) settles to the bottom.

2.4.2.3 Thickening and Filtration:

After flotation, the fluorspar concentrate still contains a significant amount of water. The thickening and filtration steps remove excess water to produce a concentrated product. The slurry is passed through thickeners, where the solid particles settle, and the excess water is removed. The thickened slurry is then filtered, using vacuum or pressure filters, to reduce the moisture content further. The resulting fluorspar concentrate is then ready for drying.

2.4.2.4 Drying:

The filtered fluorspar concentrate is typically dried to remove any remaining moisture before it is ready for sale or further processing. Drying is carried out in rotary dryers or other drying equipment. The dried fluorspar is then screened to ensure it meets the desired particle size specifications.

2.4.2.5 Purification and Refining:

Depending on the end-use, further purification and refining steps may be required to produce high-purity fluorspar. For certain applications, such as the production of hydrofluoric acid, fluorspar may undergo additional chemical treatments to remove impurities like silica, sulfur, and phosphorus. High-purity fluorspar is achieved through acid-grade processing, which involves additional refining steps to ensure the fluorspar meets stringent chemical specifications.

2.4.2.6 Packaging and Distribution:

Once the fluorspar has been processed and purified, it is packaged for distribution to end-users. The fluorspar is typically packaged in bags, bulk containers, or other forms suitable for transport. It is then shipped to consumers in various industries, including chemicals, metallurgy, and manufacturing.

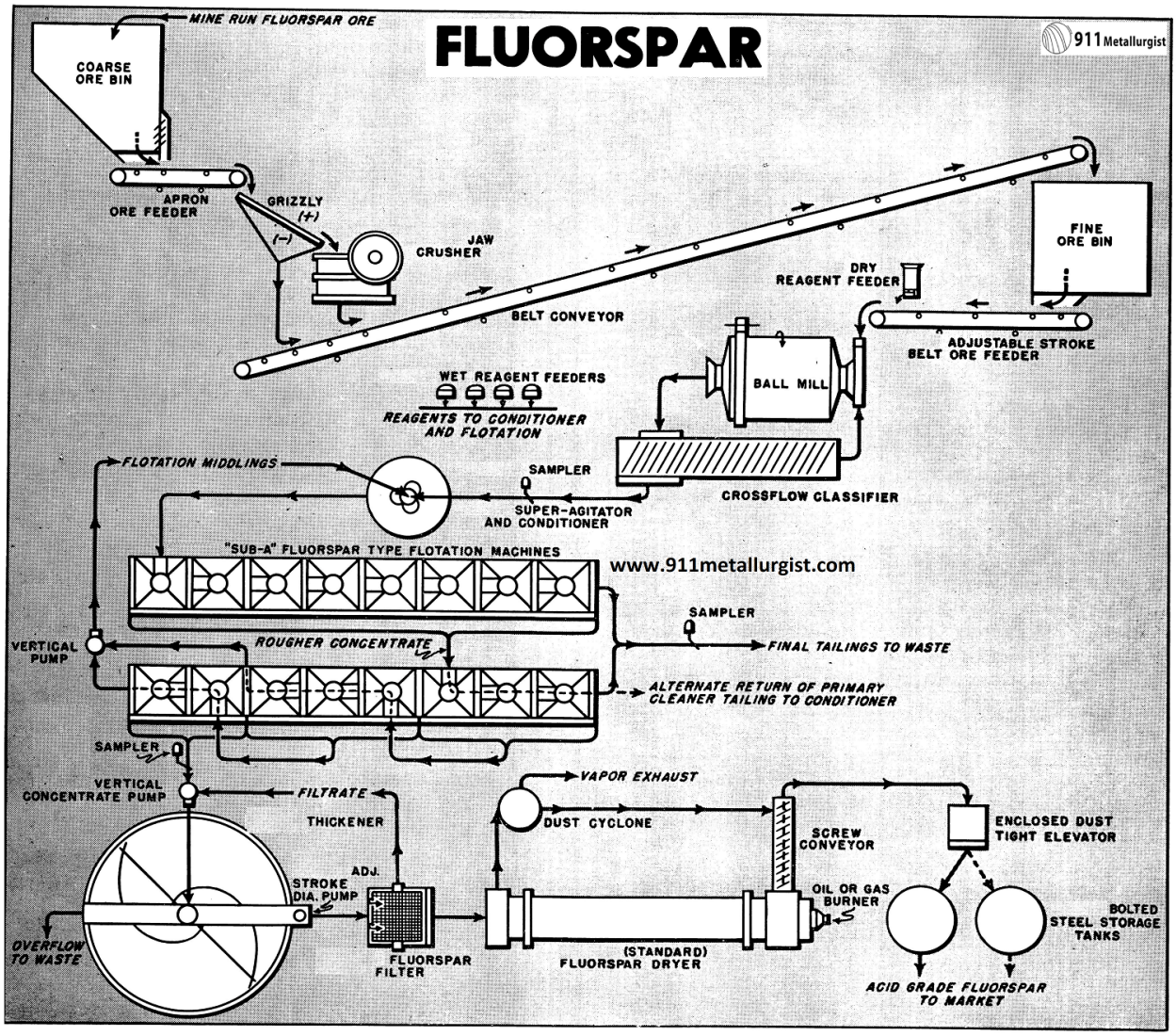


Figure 1: Fluorspar Processing Line

3 METHODOLOGY

3.1 Terrestrial and Aquatic Environment

An assessment and inventory of the vegetation cover including that of rare and endangered species was carried out. A similar procedure was carried out of the fauna and aquatic animals.

3.2 Social Economics

The socio-economic data for the Kimwarer-fluorspar mining area was collected using various methods, including checklists, semi-structured questionnaires, inspection of company records, and focused group discussions (FGDs) combined with participatory public meetings. The checklists guided the data collection process, while the semi-structured questionnaires targeted local communities and workers to gather opinions on the environmental impact of the company's operations.

The inspection of company records provided insights into the company's financial status, labor force, salaries, expenditure, revenue, and supplies, aiding in the reconstruction of the company’s economic activities. FGDs focused on gathering information from company personnel, including central management, sectional heads, and labor union officials. Public barazas held between August 7th to 13th, 2024, in six sub-locations within the mining lease area (Turesha, Tumeiyo, Kimwarel, Sego, Muskut, and Morop) culminated in major FGDs where issues concerning the mining company's revival were discussed, with attendees voting for or against it. These meetings, attended by local leaders, religious leaders, CBO leaders, an inspector of mines from the state department of Mining, the company’s management, and staff, were moderated by the Consultant.

3.3 Water Quality

The water quality testing was conducted to assess the physical, chemical, and microbiological parameters of water samples collected from three different sites: Kamnoun, Mong, and Cheberen. The testing followed standardized procedures outlined in APHA (American Public Health Association), ISO, and AOAC methods while the results were compared against EMCA (Water Quality) Regulations, 2006, as referenced below.

1. Sample Collection: Water samples were collected in sterile bottles from the three sampling sites. The samples were stored in coolers at 4°C and transported to the laboratory for analysis within 24 hours. Each sample was handled in accordance with the ISO 5667-3 guidelines for water sampling, ensuring that contamination during transport and handling was minimized.
2. pH and Conductivity: The pH was measured using the APHA 4500-H+ method with a calibrated pH meter at 25°C. Conductivity was determined using the APHA 2510 B method with a conductivity meter, calibrated with standard solutions, and results were expressed in micro Siemens per centimeter (µS/cm).
3. Chemical Analysis: Major ions, including chlorides, calcium, fluoride, and sulphates, were analyzed using the following methods:

    - Chlorides (Cl) were determined using the APHA 4500-CL-B method through argentometric titration.
    - Calcium (Ca) was measured using APHA 3111 B through atomic absorption spectrophotometry (AAS).
    - Fluoride (F-) was analyzed using ion-selective electrode techniques as outlined in PQA/LIM/061.
    - Sulphates (SO4) were determined using APHA 4500-SO4 B, a turbid metric method.

4. Heavy Metal Detection: Heavy metals, including lead (Pb), arsenic (As), cadmium (Cd), chromium (Cr), and mercury (Hg), were analyzed using atomic absorption spectrophotometry in accordance with APHA 3111 B and APHA 3112 B methods. Results were reported in milligrams per liter (mg/L) and compared to the maximum permissible limits.
5. Microbiological Analysis: The total coliform count and Escherichia coli (E. coli) presence were determined using the ISO 9308-1 membrane filtration technique. Samples were filtered through 0.45 µm filters, which were then incubated on selective media for 24 hours at 37°C. Colony-forming units (cfu) were counted and recorded in cfu/100 ml.

6. Turbidity and Total Dissolved Solids (TDS): Turbidity was measured using the APHA 2130B method with a calibrated turbidity meter, and results were expressed in nephelometric turbidity units (NTU). Total dissolved solids (TDS) were analyzed using the APHA 2540 C method, where a water sample was evaporated, and the residue was weighed.
7. Nutrients and Organics: Nitrates (NO3) and nitrites (NO2) were measured using the APHA 4500 NO3 and APHA 4500 NO2B methods, respectively. Ammonia (NH3) was tested using APHA 4500 NH4. Organic pollution indicators such as chemical oxygen demand (COD) and biochemical oxygen demand (BOD) were analyzed using the AOAC 973.46 and AOAC 973.44 methods, respectively.
8. Hydrocarbon and Volatile Organic Compounds: Hydrocarbons like benzene, toluene, xylene, PAH, and ethylbenzene were measured using gas chromatography according to APHA 6200B. Total petroleum hydrocarbons (TPH) were analyzed using the PQA/LIM/006 method.

All results were compared with the maximum permissible limits set by the EMCA (Water Quality) Regulations, 2006 to assess water safety and quality.

3.4 Air Quality

3.4.1 Objective

The main objective for undertaking the assessment was to establish concentration levels of potential ambient air pollutants to evaluate compliance of the achieved results with the local guidelines. This was to account for baseline environmental air quality of the premises prior to commissioning/resumption of the proposed mining activities.

3.4.2 Scope of Works

The scope of work was limited to:

- Monitoring of potential air quality pollutants such as Total Volatile Organic Compounds, Carbon Dioxide (CO_2), Carbon Monoxide (CO), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Inhalable Particulate Matter (PM_{10}) and Respirable Particulate Matter ($PM_{2.5}$)

- Evaluate compliance of the achieved results with national guidelines dictated under EMCA Air Quality Regulations, 2014

3.4.3 Criteria for Selection of Sampling Locations

This was achieved through;

- Proximity to the Sensitive Receptors - Air Quality Sensitive Receptor
- Prevailing Wind Direction/Speed (Meteorological information)
- The standard methodologies and the regulatory requirements e.g. EMCA Air Quality Regulations, 2014;

3.4.4 Prevailing Weather Conditions

The prevailing weather conditions during the measurement period were characterized by calm winds with a speed of 12 knots on the Beaufort scale. The sky was characterized by cloud cover of 90% and temperatures of 28^{o}C.

3.4.5 Site Location

The proposed Fluorspar mining site is located in Kimwarer, a village in the southern part of the Kerio Valley in Elgeyo -Marakwet County.

Kimwarer is located along the B54 Road between Eldoret and Tenges, in the southern part of Kerio Valley and in the drainage basin area of the Kerio River. One of the nearest villages is Kaptagat located 10 kilometers west of Kimwarer on the Highlands. The nearest larger town, Eldoret, is 50 kilometers west of Kimwarer.

Geographically, it falls on Latitude 0°20'29.3"N (0.341474) and Longitude 35°37'58.5"E (35.632921).

3.4.6 Procedure and Instrumentation

The Sampling of Particulate Matter (Respirable Dust $PM_{2.5,}$ Inhalable Dust PM_{10}, Total particulate Matter (TPM), Sulphur Oxides (SO_2), Nitrogen Oxides (NO_2), Carbon monoxide (CO), Carbon dioxide (CO_2), Volatile Organic Compounds (VOCs) was done using portable environmental air quality monitor (Oceanus AQM 09).

The target value was converted into voltage signal by operational amplifier circuit, and then filtered through high-precision AD data acquisition system. Finally, the gas

concentration was calculated by the CPU. Particulates used the laser scattering method to produce different scattering light according to different particle diameters under laser scattering conditions.

The scattered light intensity was collected by a response device, and the particle concentration obtained after amplification, filtering, and AD acquisition. The obtained gas concentration and particulate matter concentration were displayed on an LCD screen in real-time, and also be transmitted to cloud platform or environmental protection platform through GPRS, 4G LTE and other network signals, to realize the monitoring of regional environmental quality.

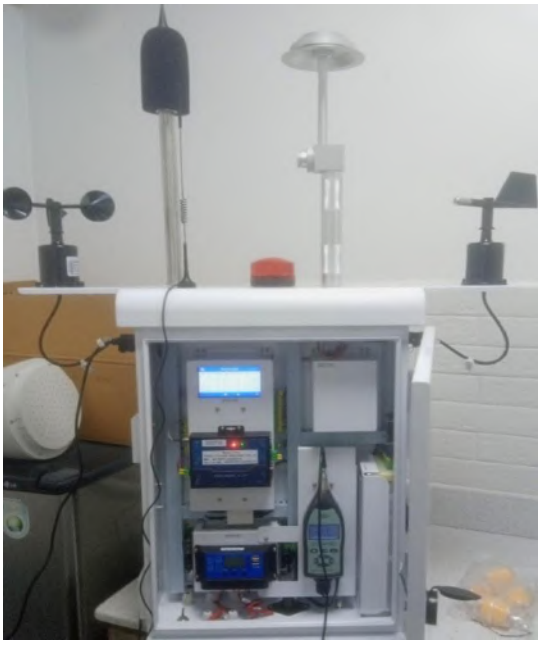
The particle concentration was measured by laser scattering. The test sample of the air in the atmosphere was pumped to the sensor assembly with a precision flow controlled membrane pump. The sensor measurement module was based on Gustav Mie's particle light scattering theory and combined with Micro-Photoelectric detection technology to produce a complete set of air particle distribution concentration measurement systems.

The system ingeniously designs the light-sensitive area as the place where the scattering of particles occurs. When the particles pass through the light-sensitive area formed by the focused laser, the light scattered by particles was collected by the Micro-Photoelectric detector on the detection window.

The Micro-Photoelectric detector quickly and accurately converted the received light intensity signal into the equal voltage signal, and the signal was dense. Degree corresponds to the unit concentration value of particles. After coefficient conversion, the dust concentration value was output in real time through data interface. With cyclone physical cutter and PID real-time temperature control system, the response of humidity to test results can be effectively reduced. Combined with sheath gas protection system, the influence of test samples on optical elements is effectively prevented

The monitor allows for real-time data collection by Light Scattering Air Particle Counter (LSAPC) and laser diffraction. The sensor features active fan sampling which ensured a representative sample was taken and therefore increases measurement accuracy. Below shows real time air quality monitoring instrument used for the exercise

Table 1: Air Quality Monitoring Device



3.5 Environmental Noise

3.5.1 Scope

The objective of the measurement was to establish baseline noise/sound pressure levels in the sensitive areas within Kimwarer occupied by the community.

- Measure and determine the baseline diurnal and nocturnal noise levels at representative receptor points.
- Identify the main cause of noise pollution before mining activities.
- Assess how existing/current facilities'/ operations and activities impact on the noise levels.
- Identification, characterization, and ranking of noise levels.
- Compile the findings of the noise assessment in a final report.

3.5.2 Assessment Points

There were three assessment points strategically chosen and evenly distributed by the consultant at the main receptor points which are populated by people and likely to be affected by noise from mining operations once they begin.

Below is a table indicating all the assessment points and predominant sources of noise which impact the measured noise levels.

Table 2: Proposed measurement points/areas

ID	**Description of area**	**GPS Coordinates**		**Predominant Sources of Noise at the Location.**
		Latitude	**Longitude**	
MP 1	Kabokbok-Iten	0°20'29.3"N or 0.341474,	35°37'58.5"E or 35.632921	- Motorcycles passing on the roads - Sound captured from the people within the commercial center.
MP 2	Kimwarer center	0°19'12.0"N or 0.320007	35°38'05.7"E or 35.634922	- Welding and grinding activities within the commercial center

				-Music from a nearby barbershop within the commercial center
MP 3	EPZ Zone/ Processing Plant within Kimwarer	0°18'43.5"N or 0.312083	35°38'00.9"E or 35.633583	-Sound pressure from motor vehicles and motorcycles passing on the nearby road

3.5.3 Approach

The following approach was used to assess sound pressure levels.

- Measurement of the existing background noise at representative receptor points was conducted at a timeframe of seven to eight hours for all the points.
- Baseline noise levels from sorrounding facilities and ongoing activities were established by the data captured when there were no other operations.
- During measurement, the microphone of the sound level meter was set facing the direction from which the sound was emanating from.
- Afterwards, data was downloaded and analyzed from the sound level meter via the PC software, and a comparison done to establish the level of compliance.
- The findings were compiled to generate the noise assessment final report.

3.5.4 Instrumentation

The following instruments were used during the measurement:

- Precision Sound Level Meter Class 1 -Model Cirrus CR:171B
- Precision Sound Level Meter IEC 61672-1 Class 2 and ANSI S1.4 Type 2 -Model 816-1; Serial Number 000007357
- Open Field Microphone.
- GPS tracking device.
- Noise Meter Tripod Stand.
- Smart Phone Camera.

Figure 2: Sound Level Instrumentation setup

3.5.5 Survey methodology

The noise levels (existing measurements + particular noise of the project) were evaluated against the limits stipulated in the first schedule of Environment Management and Coordination Act (Noise and Excessive Vibration Pollution Control) Regulations, 2009.

The Noise measurements were taken at the identified noise receptors as per the ISO 1996 Parts 1, 2, 3 standards, entailing the following:

- Inspection of the monitoring locations and the implicated activities.
- Identification of the environmental measurement points with a GPS device.
- Compiling photographic reports of the monitoring locations and surroundings.
- Calibration of the sound level meter before and after each measurement.

- Noise levels expressed in decibels, A-weighted sound pressure level (dB (A)).

Series noise level measurements were recorded per point with the meter placed and supported 1.5 metres above the ground by a tripod stand. Multiple readings were collected at an interval of every sixty seconds and the following were recorded:

- Measurement time and durations.
- **LA max**- Maximum sound pressure level obtained during the measurement period
- **LA min**- Minimum sound pressure level obtained during the measurement period
- **LA peak** - Peak Sound pressure level with 'A' frequency weighting
- **LA eq** - Value of A-weighted sound pressure level of a continuous steady sound that, within a specified interval, has the same mean square sound pressure as a sound under consideration whose level varies with time.

3.6 Soil Quality

The methodology for the soil analysis consisted of a systematic approach to ensure accurate and reliable results. This process involved the identification of impacted areas, careful sampling techniques, comprehensive laboratory testing, and detailed data analysis. The primary objective was to assess the soil quality in areas affected by effluent water, such as the former factory establishment and surrounding wetland zones.

3.6.1 Site Selection and Sampling Locations

Sampling locations were selected in areas that had been exposed to pollutants from industrial activities, including:

- The former factory establishment
- Surrounding wetland zones
- Agricultural areas affected by effluent disposal

These locations were chosen based on the potential impact of industrial activities, particularly effluent discharge, and land use patterns. The identified sites reflected a variety of soil types, including degraded soils in effluent disposal areas, agricultural zones, and wetland regions.

3.6.2 Sampling Method

Soil samples were collected from various depths to capture vertical variations in soil composition and contamination levels. Depths typically ranged from 0-30 cm and 30-60

cm, focusing on the surface layer and subsoil. Sterilized tools and containers were used to avoid cross-contamination between sampling locations.

Sampling points were strategically distributed in areas where industrial effluent was likely to have the most significant impact on soil health and quality. In areas where factory operations and effluent discharge had previously occurred, particular attention was given to degraded soils.

3.6.3 Soil Characterization and Testing

The collected soil samples were transported to an accredited laboratory where a range of chemical and physical tests were performed to assess the soil's quality and contamination levels. The following parameters were analyzed:

- **Benzene, Ethyl Benzene, Toluene, and Xylene**: These volatile organic compounds were tested using the PQA/LIM/002 methodology to identify potential industrial pollutants.
- **Total Petroleum Hydrocarbons (TPH)**: TPH levels were measured using PQA/LIM/003 to assess the contamination from petroleum-based substances.
- **Heavy Metals**: Mercury (Hg), Lead (Pb), Arsenic (As), Cadmium (Cd), and Total Chromium (Cr) were tested using EPA 3050B MOD protocols. These heavy metals are common indicators of industrial pollution and their presence in the soil can pose significant environmental risks.
- **Polycyclic Aromatic Hydrocarbons (PAH)**: PAH were analyzed using PQA/LIM/004, focusing on organic compounds known to be harmful and persistent in the environment.
- **Calcium (Ca) and Fluoride (F-)**: These essential nutrients were also assessed, as their concentrations can indicate soil health and contamination levels.

3.6.4 Hydrological and Soil Physical Assessment

In addition to chemical testing, soil physical properties such as texture, hydraulic conductivity, and water retention capacity were measured:

- **Texture**: Soil textures in the study area were classified as loamy sands, silty clays, or friable clays. These textures were significant in understanding the soil’s ability to absorb and retain water.
- **Hydraulic Conductivity**: The rate of water movement through the soil was measured at different depths, providing insights into how efficiently water infiltrates

and drains through various soil layers. For instance, the factory area had a compacted lower layer with reduced conductivity.

- **Moisture Retention Capacity**: The ability of the soil to hold water was crucial in evaluating the soil's fertility and potential for supporting agricultural productivity.

3.6.5 Data Analysis

The results of the chemical and physical analysis were compared to the Environmental Management and Coordination (EMCA) 2006, regulations on waste management. Deviations from the recommended threshold values were noted, particularly in areas where pollutant levels exceeded the acceptable limits. The data were further analyzed to identify potential sources of contamination and assess their environmental implications.

The analysis of soil quality also focused on erosion risk and soil degradation, particularly in wetlands and cultivated areas prone to surface water runoff. Areas with lower hydraulic conductivity and water retention were identified as particularly vulnerable to overland flow, which could exacerbate soil degradation and water pollution.

3.7 Climate Change

The methodology for this Climate Change Risk and Vulnerability Assessment employed a mixed-methods approach, integrating both qualitative and quantitative data collection and analysis techniques. The approach included climate modeling to project future climate scenarios, a review of historical climate data to identify trends and patterns, and extensive stakeholder consultations to incorporate local knowledge and perspectives. Additionally, field surveys were conducted to gather on-the-ground data about the environmental and socio-economic conditions in the project area. The integration of these diverse methods allowed for a comprehensive assessment of the climate risks and vulnerabilities associated with the proposed fluorspar mining project. The use of both qualitative and quantitative data ensured that the analysis was robust and that the findings could be triangulated, providing a well-rounded understanding of the potential impacts of climate change on the project and the surrounding community.

3.8 Stakeholder Consultation

3.8.1 Stakeholder Identification and Mapping

Public consultation and participation were conducted across various levels, involving key stakeholders and community members. The consultant identified and mapped stakeholders within the project area, which included:

- Courtesy Visits: Engaging with the County Government and Deputy County Commissioners through courtesy visits to establish initial communication and collaboration.
- Meetings with County Executive Committees (CECs): Conducting courtesy calls to the CECs to ensure their involvement and alignment with the project objectives.
- Stakeholder Identification: Identifying and compiling a database of institutions and individuals with an interest in the project, including government departments, local Civil Society Organizations (CSOs), Non-Governmental Organizations (NGOs), and others critical to the smooth implementation of environmental, social, and related project issues.
- Scheduling Engagements: Setting dates for public barazas and technical meetings, targeting various groups to ensure comprehensive consultation.
- Questionnaire Administration: Distributing questionnaires to different target groups and local community members within the proposed project area to gather input and concerns.
- Public Meetings: Holding public meetings along the project road to engage with the community and discuss the project details directly with those affected.

3.8.2 Stakeholder Engagement and Public Consultation during the Study

o	Stakeholder consulted	Method of consultation	Record of consultation
1	County Commissioner for Elgeyo Marakwet	Courtesy call	None
2	Governor for Elgeyo Marakwet county	Courtesy call	None
3	Assistant County Commissioner for SOY Sub	Courtesy call	Call

	county		
5	CEC Mining	Courtesy call	Call
11	CEC of Water, Environment and Energy	Courtesy call	Call
15	NEMA	One on one meeting	ToR submission
17	KFS	Questionnaire	Filled questionnaire
18	KWS	Questionnaire	Filled questionnaire

Table 3: Public Participation During the Study

Item	Date	Target Sub-Location	Attendants
1	07 August 2024	Kimwarel	90
2	09 August 2024	Tumeiyo	48
3	10 August 2024	Morop	29
4	12 August 2024	Sego	48
5	12 August 2024	Muskut	47
6	13 August 2024	Turesha	37

4 DEVELOPMENT DESCRIPTION

4.1 Principal Development

SOFAX Fluorspar Kenya ltd who is the proponent is in the mining business. The most significant principal developments of the proposed project are the quarries and the processing plant, both located within the lease-mining area. There are several quarries with varying ore grades. the proponent will utilize open-cast mining to retrieve ores. The processing plant is a Denver design mechanical plant composed of 8 major sections: loading section, crusher, feeder, grinder, leaching section, thickening section, dryer, and packaging.

All these operations were previously powered by a 3300KVA power installation located close to the plant.

4.1.1 Detail of the Proponent

SOFAX Kenya Fluorspar Ltd is a joint venture formed by three key entities: Soy Fluorspar Limited, Fujax UK Limited, and Fujax East Africa Ltd. This collaboration combines local expertise and international mining experience to revitalize fluorspar mining operations in Kenya. **Soy Fluorspar Limited**, based in Nairobi, plays a critical role in ensuring the project aligns with Kenyan regulations and engages effectively with local communities. **Fujax UK Limited**, headquartered in London, brings global mining expertise, financial backing, and market access, helping to attract international investments and facilitate fluorspar exports to global markets. **Fujax East Africa Ltd**, based in Mombasa, contributes to the logistical and transportation aspects, leveraging the region's strategic location for export through East Africa’s largest port. Together, these companies form a robust consortium that positions SOFAX as a significant player in the fluorspar mining sector, contributing to both local economic growth and Kenya’s standing in the global mineral market.

4.2 Accessory and Infrastructure Development

4.2.1 Processing Plant

The plant had been left non-operational and unattended for a considerable length of time of about eight years, which resulted in its gradual decline into a state of severe despair. Without the necessary maintenance and oversight, the facility has suffered from significant neglect, allowing various structures and equipment to deteriorate. Over time, the absence of activity and security made the plant vulnerable to vandalism. Critical

components were damaged or stolen, leaving the site in a condition that was far from functional. This calls for intensive renovation to keep the facility operations up and running.

Figure 3: Condition of the Plant During Scoping

4.2.2 Electricity

The electricity supply line to the factory area were drawn by KFC, then Fluorspar Company of Kenya Ltd., at its inception. The total voltage supplied was 33,000 volts. This was stepped down to 3300KVA for use in the processing plant, and 415, and 240 volts for use in the offices and in the staff quarters. All the above infrastructure was vandalized which will be necessary for the management of SOFAX Fluorspar Kenya Ltd to invest in a new electrical system.

4.2.3 Roads

The Company is connected to the Eldoret-Eldama Ravine Road (tarmac) by a marram road of about 24 kilometers which was surveyed and constructed by KFC. It is also graded regularly by the local Member of Parliament. This road will provide an important link between SOFAX and the final consumers. Its use will not only of benefit to the company, but also to the local population.

4.2.4 Water

The plant previously drew its water from two sources, the Kimwarer and the Mong Rivers. Water from the Mong river was pumped up to the factory area and the living quarters while water from Kimwarer river flows by gravity, from the water intake point upstream of the factory, to the mill area where it was pumped to several overhead tanks located uphill. The facility also supplied the local community in Kimwarer town with this water.

Figure 4: Water supply system from Mong

4.2.5 Petrol station

There was an existing petrol station which appeared worn out and required renovation to reinstate its shape. The station will be used to power vehicles and machineries requiring fuel to run.

Figure 5: Condition of the Petrol Station

4.2.6 Septic tanks

The Kimwarer area of Kerio Valley where is a typical Kenyan rural area where no sewerage services are provided. The previous investor, therefore, set up on-site sanitation facilities, by way of septic tanks, for the treatment of black water sewage. Details of the septic tanks are given in the table below. The tanks are in poor condition which needs to be repaired ahead of the operationalization of the facility.

Figure 6: Condition of Septic tank near Kimwarel primary school

Table 4: Distribution of Septic Tanks

Area	**Premises**	**Number of Premises**	**Number of Septic Tanks**
Chebutie	Senior Staff Quarters	25 houses	25 tanks
	Site Quarters 2	9 houses	9 tanks
	Timber Quarters	24 houses	16 tanks
	Servants Quarters	16 houses	16 tanks
	Chebutie Club	1 Block	1 Tank
Mill and Offices	EPZ		1 large tank (pit latrines)

Area	Premises	Number of Premises	Number of Septic Tanks
	Central Offices		1 tank
Kimwarer Town	Kimwarer Canteen		1 tank
	Sports Ground		1 tank
	Fluorspar School		1 tank
	Dispensary		1 tank
	Kimwarer Camp		1 large tank + (pit latrines)

Typically, the septic tanks are concrete and plastic type tanks. The design includes soak away pits.

4.2.7 Waste Management

The activities of processing and maintenance at a fluorspar mining facility generate various types of waste that require careful management to mitigate environmental impacts. During processing, the primary waste includes tailings, which are fine materials left over after the extraction of valuable minerals. These tailings may contain residual chemicals used in the separation process and require proper handling to prevent contamination of soil and water. Additionally, waste rock and slag generated from ore processing need to be managed to avoid environmental degradation. Maintenance activities produce waste oil, used filters, and other mechanical debris, which must be properly disposed of to prevent pollution. Spent chemicals and solvents from equipment cleaning and maintenance also contribute to the waste stream and require safe disposal methods. Managing these wastes effectively is crucial to minimizing environmental impact, adhering to regulatory requirements, and ensuring sustainable operations.

4.2.7.1 Application od Extended Producer Responsibiliy

Extended Producer Responsibility (EPR) is a critical waste management approach that holds producers accountable for the entire lifecycle of their products, including their disposal after use (The Environmental Management and Co-ordination (Extended Producer Responsibility) Regulations, 2020). According to NEMA guidelines, EPR is designed to minimize environmental impacts by encouraging producers to integrate waste management considerations into their product design and production processes. For Sofax Fluorspar, applying EPR will involve specific measures for handling waste materials

associated with their operations. The company will focus on managing waste oil, bitumen, and other by-products generated from their mining and processing activities. Sofax Fluorspar will implement strategies to reduce waste generation by designing products and processes with end-of-life disposal in mind, ensuring that packaging and other materials are recyclable or reusable. The company will establish take-back programs to facilitate the collection and responsible disposal of waste oil and bitumen, coordinating with licensed waste handlers for proper management. By adopting these EPR practices, Sofax Fluorspar will not only comply with NEMA guidelines but also contribute to reducing the environmental impact of its operations, promoting sustainability, and supporting effective waste management practices.

4.2.8 Offices

The development is served by one bridge across Kimwarel river. These bridges, although primarily built to support the company's operations, serve a dual purpose as they are also utilized by the general public. This is particularly important because these bridges provide the only links to the broader road network, making them essential for both the company and the local community.

In addition to the infrastructure, the facility had established a structured organizational layout to support its operations. There is a dedicated office block for administrative and technical staff, ensuring that the company's management and support functions are well-coordinated. The production staff, on the other hand, had their offices situated at the processing plant, which allows for efficient oversight and management of production activities.

The above offices require renovation to ensure they are habitable.

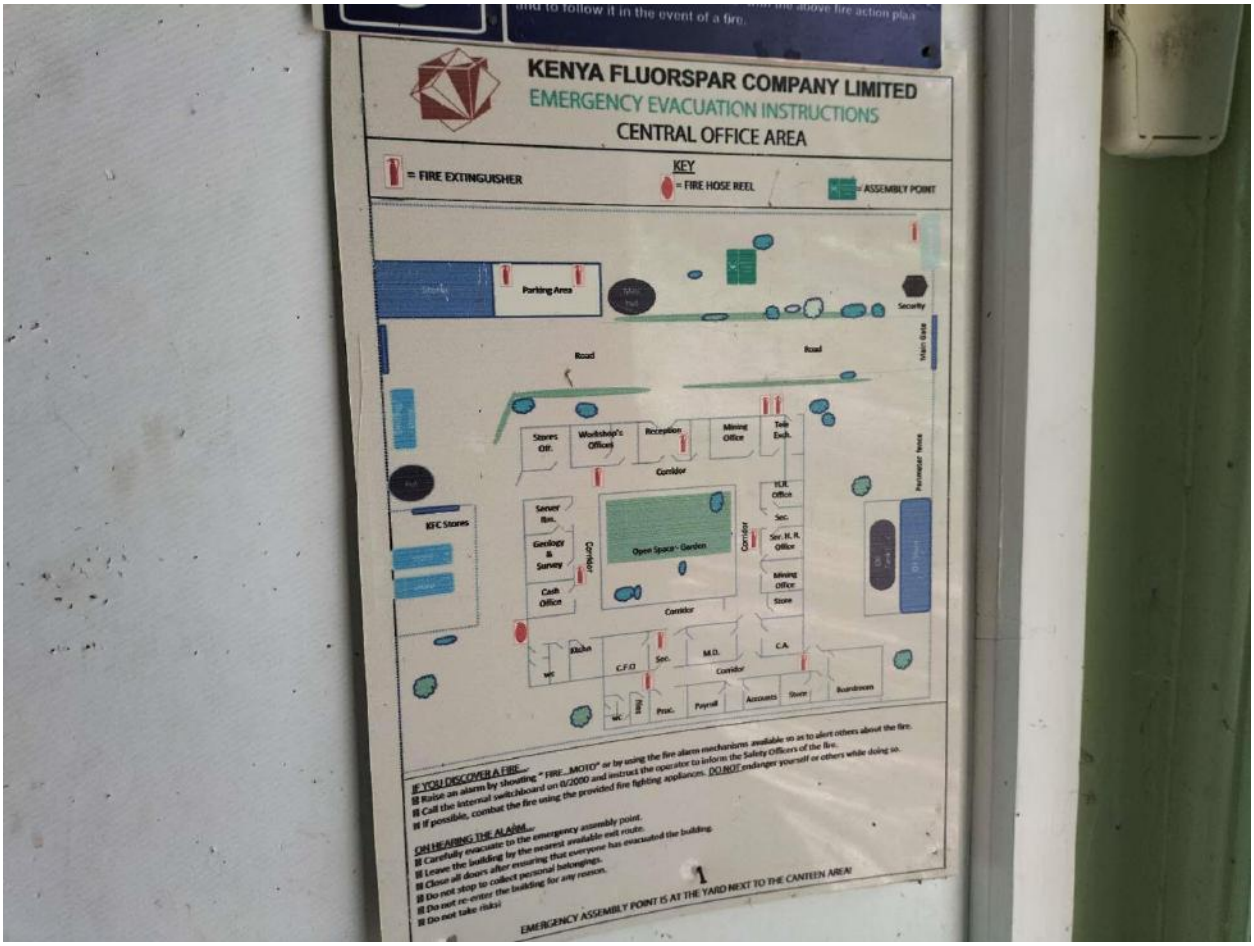


Figure 7: The general layout of the structures

4.2.9 Staff Houses

The staff quarters within the lease area are designed to accommodate the diverse workforce, reflecting a structured hierarchy and offering various levels of amenities to match the needs of different categories of employees. These quarters are spread out across several distinct areas, each with its own unique characteristics and intended for specific groups of staff members.

Senior Staff Quarters: These are the most exclusive accommodations, which were reserved for the higher-level management and senior professionals within the company. The Senior Staff Quarters are typically well-appointed, offering more spacious living arrangements and additional amenities. These quarters are strategically located to ensure privacy and comfort, providing a serene environment conducive to rest and work. The proximity to essential services, such as the central offices and recreational facilities, further enhances the living experience for senior staff. The presence of individual septic

tanks in these quarters underscores the emphasis on maintaining high hygiene standards.

Site Quarters 2: This segment of the staff quarters was designated for mid-level employees who play crucial roles in the daily operations of the company. Site Quarters 2 is designed to accommodate staff who are directly involved in the operational aspects of the mining process, including technical and administrative personnel. These quarters are functional, offering comfortable living spaces that balance practicality with comfort. The design and layout are geared towards fostering a sense of community among the residents, with shared facilities that encourage interaction and collaboration.

Servants Quarters: These quarters were specifically designed for support staff, including domestic workers and other service personnel who are essential to the daily functioning of the senior staff households and company facilities. The Servants Quarters are usually smaller and more basic compared to other housing units, yet they are well-maintained and provide the necessary facilities for a comfortable living. The proximity of these quarters to the Senior Staff Quarters and other key areas of operation ensures that support staff are readily available to perform their duties.

Chebutie Club: The Chebutie Club is a social and recreational facility within the staff quarters, which was providing a communal space where employees can unwind and engage in leisure activities. This club is an integral part of the staff quarters, serving as a venue for social gatherings, entertainment, and relaxation. It is designed to foster camaraderie among employees across different levels, promoting a sense of community and well-being. The Chebutie Club is equipped with various amenities, including a bar, dining area, and recreational facilities, making it a popular spot for both work-related events and informal socializing.

4.3 Quarry Selection

The company Sofax has been identified eight quarries for mining activities, specifically: Cheberen 3, Kimwarer 1, Chebt 4, Chebt 5, Chebt 6, Chebt 12, Kamnaon 1, and Kamnaon 2. These quarries have been carefully selected to ensure a sustainable and efficient extraction process. Sofax will utilize these quarries, focusing on maximizing the extraction of high-quality minerals while adhering to environmental and safety standards.

The utilization of these sites underscores Sofax's commitment to maintaining a consistent supply chain and supporting local economic development through responsible mining practices.

5 ENVIRONMENTAL SETTINGS

5.1 General Setting

The mining area is situated within a hydrological basin characterized by a landscape where mountains encircle lower-lying regions, creating a distinct topographical contrast. The elevation in the basin ranges from 1300 to 1500 meters above sea level, with the surrounding mountains and hills reaching heights of 1500 to 2500 meters. This elevation difference leads to a rolling topography, primarily composed of hills and uplands.

The steep slopes of the mountains and hills are prone to uncontrolled runoff, particularly during heavy rains. This runoff cascades down the slopes with significant force, causing extensive erosion. Over time, this erosion has carved out numerous gullies, leading to the formation of a dendritic drainage pattern. This pattern resembles the branching of a tree and is a common feature in areas where water flow is heavily influenced by the topography.

The predominant land use in this area is livestock farming, practiced mainly through free-ranging grazing. This method involves allowing animals to roam and graze over large areas of land, which, in arid and semi-arid regions, can put significant pressure on the vegetation. There is also evidence of crop farming, with crops like maize, groundnuts, beans, and vegetables being cultivated during rainy seasons. However, the combination of livestock grazing and crop farming has exacerbated the problem of land degradation. The continuous removal of vegetation cover, coupled with soil disturbance from farming activities, has led to severe soil erosion, reducing the land's productivity and its ability to sustain agricultural production.

This region's classification as arid and semi-arid reflects its susceptibility to environmental stress, with limited rainfall and harsh climatic conditions contributing to the challenges of maintaining soil fertility and supporting sustainable land use practices.

5.2 Location of the Project Site

The proposed Sofax Fluorspar Kenya mining project is situated in Kerio Valley, specifically in Kimwarer sub-location, Soy-South location, Keiyo South sub-county, within Elgeyo/Marakwet County. This area is part of the East African Rift System and lies within the coordinates of approximately 0°13'N to 0°23'N latitudes and 35°35'E to 35°40'E longitudes, covering an area of about 9,070 acres. The Kimwarer River and other smaller rivers, which are tributaries of the Kerio River, originate from the escarpment headlands to the south and flow past the mine site. This geographic setting positions the project within a region known for its significant geological and hydrological features, essential for the fluorspar mining operations.

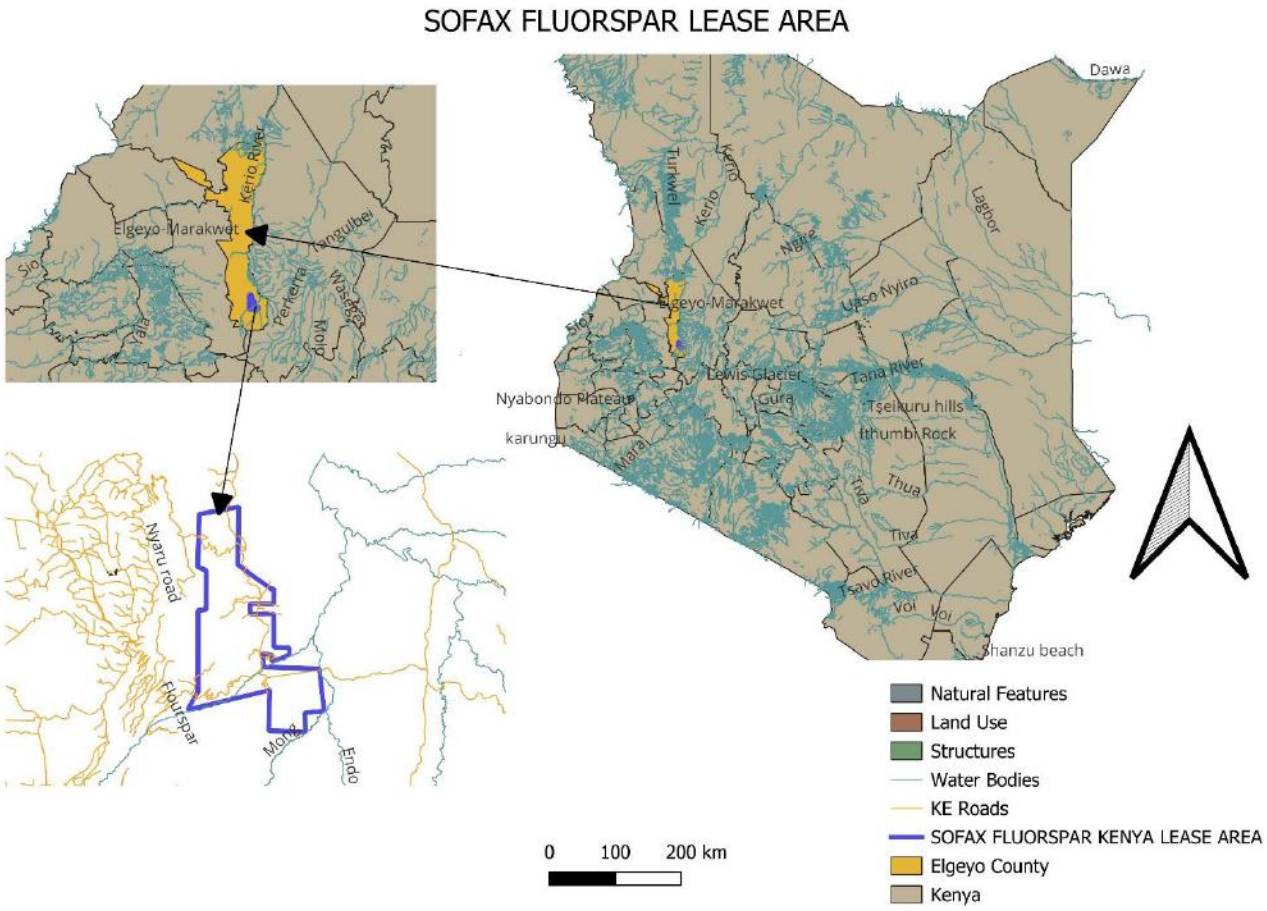


Figure 8: Location of Fluorspar Lease area

5.3 Demographic Characteristics

The area is predominantly inhabited by members of the Kalenjin community, specifically the Keiyo and Tugen sub-groups. This region is characterized by a low population density, reflecting its arid and semi-arid nature. The primary livelihood for the local population is subsistence livestock rearing, which is well-suited to the environmental conditions. The practice involves raising cattle, goats, and sheep, which are adapted to the challenging climatic conditions of the region. Due to the limited availability of arable land and water resources, agriculture is generally minimal, with the focus remaining on sustaining livestock as the main source of food and income for the communities**.**

5.4 Land Tenure

The mine area under study covers approximately 9,000 acres and is designated as government leasehold land. This means the land is owned by the government and leased out for specific purposes, such as mining activities. Beyond the boundaries of this leasehold area, the land ownership transitions to freehold, where individuals or entities hold the land outright. This distinction between leasehold and freehold land ownership can influence land use practices, rights, and responsibilities, with the leasehold area being subject to government regulations and oversight, particularly regarding the mining operations.

5.5 Infrastructure

The infrastructure within the mining area is generally underdeveloped, creating significant challenges for both the local community and ongoing mining operations. The road network, particularly the marram road that connects the mining area to the main Eldoret-Eldama Ravine road, is poorly maintained, though efforts have been made by the local Member of Parliament to keep it passable. Despite these efforts, the road conditions remain suboptimal, affecting transportation and access to the area.

Additionally, the area's power infrastructure is in a deteriorated state, with power lines and transformers having been vandalized. This has left the electrical system in need of a

complete overhaul to restore reliable power supply to the community and the mining operations.

The Kimwarel Dispensary, the local healthcare facility, was taken over by the county government from the previous investor. However, it now faces challenges in providing essential services and medications, indicating a need for better resource allocation and management.

While schools are present in the area, they too suffer from inadequate infrastructure. These educational institutions require significant improvements to their facilities to better serve the local population and provide a conducive learning environment for students.

5.6 The Physical Environment

5.6.1 Physiography

The study area is characterized by a striking topography shaped primarily by the tectonic activity and volcanism associated with the East African Rift Valley. Moving from west to east, the region's prominent geomorphological features include the Elgeyo Escarpment, the Kerio Valley, and the Tugen Hills. To the north of the Tugen Hills stands the isolated Tiati Massif.

According to the Geological Survey of Kenya (2024), The Elgeyo Escarpment extends in a north-south direction for about 140 kilometers, starting from the Marich Pass, which separates it from the Sekerr Hills, and continuing to Biretwo. At the Metkei Highlands, the escarpment shifts its alignment to a north-northeast/south-southwest direction for an additional 30 kilometers.

South of latitude 0°25′N, the upper section of the escarpment is marked by a clear line of phonolite cliffs, which drop by 200 to 300 meters to a broad bench about 1 kilometer wide. This bench then drops another 250 to 300 meters, revealing a series of basalt cliffs. At the base of these basalt cliffs lies a second bench, which is marked by Kimwarel sediments of Tertiary age and forms a small line of cliffs a few tens of meters high. Below this, steep ridges of Precambrian metamorphic rocks emerge.

Between latitude 0°20′N and 0°50′N, the Elgeyo Escarpment features phonolite cliffs at the top that descend to a 1.5-kilometer-wide shelf composed of Tambach sediments,

which overlay the steep ridges of Precambrian rocks. North of 0°50′N, the escarpment is dominated by a single, rugged face of gneiss ridges, with no evidence of the benches seen further south.

5.6.2 Topography

The topography of Kimwarel, a region within Kerio Valley, is characterized by steep escarpments that flank a narrow, elongated valley floor. The elevation in this area ranges significantly, from about 1,000 meters at the valley floor to over 3,000 meters at the surrounding highlands. This dramatic elevation change creates a rugged terrain that heavily influences local drainage patterns. The steep slopes direct water flow towards the valley floor, which can present challenges for mining operations, particularly in terms of accessibility, erosion control, and water management. The unique topographical features of Kimwarel require careful planning and engineering to ensure safe and effective mining activities.

5.6.3 Hydrology

Kimwarel is part of the larger Kerio River catchment, a crucial water system for the region. The Kerio River, flowing through the valley, serves as the primary watercourse, supported by tributaries like the Kimwarel River and numerous seasonal streams and springs originating from the escarpments. These water sources are vital for maintaining ecological balance and supporting human activities, including agriculture, domestic use, and mining operations. Groundwater resources, including aquifers and springs, also play a significant role in the area, influencing both the availability of water for local communities and the feasibility of mining activities. Proper management of these water resources is essential to ensure sustainable use and prevent adverse environmental impacts.

A baseline survey of water quality was conducted to establish the possible contaminants and also set a reference for future periodic water monitoring in an effort to maintain a safe environment. The results are tabulated below.

Table 5: Water quality test result

Parameter	Test Method	Kamnoun Results	Mong Results	Cheberen Results	Unit	EMCA (Water Quality) Regulations, 2006 (Limits)
pH	APHA 4500-H+	6.57 @25.0°C	6.42 @25.0°C	6.64 @25.0°C	-	6.5 - 8.5
Conductivity	APHA 2510 B	84.2	69.2	295	µS/cm	2500 Max
Chlorides As Cl	APHA 4500-CL- B	<2.21	<2.21	13.27	mg/L	250 Max
Calcium As Ca	APHA 3111 B	9.25	3.8	17.3	mg/L	150 Max
Lead As Pb	APHA 3111 B	<0.01	<0.01	0.01	mg/L	0.01 Max
Fluoride As F-	PQA/LIM/061	0.21	0.17	0.28	mg/L	1.5 Max
Sulphates As SO4	APHA 4500-SO4 B	2.92	2.42	10.19	mg/L	400 Max
Total Coliform Count (+)	ISO 9308-1	210	250	240	cfu/100 ml	Absent
Escherichia Coli (+)	ISO 9308-1	41	42	23	cfu/100 ml	Absent
Turbidity	APHA 2130B	125.2	43.17	1.19	NTU	30 Max
Nitrates As NO3	APHA 4500-NO3	4.9	4.6	5.7	mg/L	50 Max
Nitrites As NO2	APHA 4500 NO2B	<0.003	<0.003	<0.003	mg/L	1.0 Max
Ammonia As NH3	APHA 4500 NH4	Nil	Nil	Nil	mg/L	0.5 Max
Arsenic As	APHA 3114B	<0.01	<0.01	<0.01	mg/L	0.01 Max
Cadmium As Cd	APHA 3111 B	<0.003	<0.003	<0.003	mg/L	0.003 Max
Chromium As Cr	APHA 3111 B	<0.01	<0.01	<0.01	mg/L	0.05 Max
Mercury As Hg	APHA 3112B	<0.001	<0.001	<0.001	mg/L	0.001 Max
Phosphorous As P	APHA 4500 P	0.2	0.1	0.1	mg/L	2 Max

Parameter	Test Method	Kamnoun Results	Mong Results	Cheberen Results	Unit	EMCA (Water Quality) Regulations, 2006 (Limits)
Chemical Oxygen Demand (COD)	AOAC 973.46	40	38	16	mg/L	50 Max
Biochemical Oxygen Demand (BOD)	AOAC 973.44	16.6	15.8	5.3	mg/L	30 Max
Oil & Grease	APHA 5520B	Nil	Nil	Nil	mg/L	Absent
Temperature	APHA 2550	28.1 @25.0°C	28.2 @25.0°C	28.1 @25.0°C	-	20-35°C
Total Dissolved Solids	APHA 2540 C	46.4	38.4	162	mg/L	1200 Max
Dissolved Oxygen	AOAC 973.45	6.82	6.87	6.95	mg/L	4-6 Min
Benzene	APHA 6200B	<0.01	<0.01	<0.01	µg/L	10 Max
Toluene	APHA 6200B	<0.01	<0.01	<0.01	µg/L	700 Max
Xylene	APHA 6200B	0.03	0.02	0.01	µg/L	500 Max
PAH	APHA 6200B	0.24	0.22	0.16	µg/L	0.7 Max
Ethyl Benzene	APHA 6200B	0.02	0.04	0.03	µg/L	--
Total Petroleum Hydrocarbons	PQA/LIM/006	44	51.5	34.5	µg/L	--

The water quality results show that most chemical parameters, including nitrates**,** heavy metals (lead, arsenic, mercury), and fluoride, comply with the EMCA (Water Quality) Regulations, 2006**.** Conductivity, chloride, calcium, sulphates, and phosphorus levels are also well within acceptable limits, indicating minimal contamination from dissolved salts, metals, and industrial pollutants. However, there are concerns regarding turbidity in the Kamnoun and Mong samples, which exceed the allowed threshold, and could indicate high levels of suspended solids or pollutants, making the water unclear and potentially

unsafe for consumption without proper filtration. The Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) levels are within safe limits, suggesting an acceptable level of organic pollution.

The most significant issue is the presence of total coliforms and E. coli in all samples, indicating serious microbial contamination. This makes the water unsafe for human consumption and poses a high risk of waterborne diseases. To address this, immediate measures should include disinfection of the water sources, such as chlorination or UV treatment, to eliminate microbial pathogens. Additionally, improving sanitation practices around the water sources and conducting regular monitoring of water quality is crucial. For sites with high turbidity, installing filtration systems is recommended to ensure the water is clear and free from suspended particles.

5.6.3.1 Drainage and Storm Water Runoff

The Kerio River is a prominent river flowing northwards between the Tugen Hills and the Elgeyo Escarpment, ultimately discharging into Lake Turkana. It is fed by several key tributaries, including the Kimwarel, Mong, Endo, Kiptum, and Chemosusu rivers, which originate from the Metkei Highlands and the southern Tugen Hills. While these tributaries are significant, many others that originate from the Elgeyo Escarpment and the Tugen Hills are mainly seasonal, contributing to the river's flow during the rainy season.

In the northern part of the Kerio Valley, near Chebloch, lies the Sauoni Swamp, which is closely associated with the Kerio River. Approximately 17 kilometers further north is Lake Kamnarok, an integral part of the Kerio River drainage basin. The Tugen Hills play a critical role in the region's hydrology, with their crest forming a watershed. The eastern side of the Tugen Hills drains into the Perkerra River, Burususwa River, and Lake Baringo.

The mining area is strategically located between the semi-perennial Kimwarel River and the perennial Mong River. The Kimwarel River exhibits a flow rate of 3-4 cubic meters per second (cumecs) during the wet season, but this reduces drastically to 0-0.3 cumecs during the dry season, highlighting the region's reliance on seasonal rainfall for its water resources.

The natural drainage system within the Kimwarel River's catchment area channels storm water runoff towards the Kerio River. The steep slopes, combined with relatively sparse

vegetation cover, contribute to rapid runoff during the rainy season. This swift runoff can lead to significant erosion and sedimentation, posing a substantial challenge for land management, particularly in mining areas where land disturbance is already considerable. To mitigate these environmental impacts, effective storm water management practices are crucial. The construction of retention basins, implementation of erosion control measures, and maintenance of natural vegetation buffers are essential strategies. These measures help to reduce the velocity of runoff, thereby minimizing soil erosion and protecting water quality in the Kerio River and its tributaries. In particular, maintaining natural vegetation buffers along riverbanks can slow down runoff, trap sediments, and filter pollutants before they reach the watercourses. This approach is vital for sustaining the ecological health of the Kerio River drainage basin, especially in the context of ongoing mining activities.

5.6.4 Geology

Kerio Valley is a unique geological feature, characterized by its elongate, cone-shaped tectonic graben within the Gregory Rift. This valley represents a classic example of rift valley formation, where tectonic forces have shaped the landscape through uplift, volcanicity, and faulting. Extending from the narrow southern tip, located at the highest point of the Kenyan dome, the valley broadens into an alluvial-filled depression in the north, culminating in the Lake Turkana basin. The Elgeyo Escarpment, forming the western wall of the valley, rises dramatically to 2,700 meters, while the Tugen Hills, with an average altitude of 2,500 meters, lie to the east. These prominent geological features expose a diverse array of rocks and deposits, each representing different periods of Earth's history and playing a crucial role in the valley's geology.

The four main geologic formations observed in the area include the Precambrian Basement System, Lower Miocene sediments, Upper Volcanic Rocks, and Quaternary and Recent Deposits. The Precambrian Basement System forms the foundational bedrock of the region, consisting of ancient metamorphic rocks that have been exposed through tectonic activity. These rocks are mineralized by Tertiary hydrothermal fluids, which have created significant fluorite deposits within the Basement rocks of the Mozambique Belt. The fluorite deposits exhibit three continuous stages of deposition, hosted by various rocks, including quartzofeldspathic gneiss, marble, biotite gneiss,

quartzite, hornblende-biotite gneiss, pegmatite, and diabase dykes, showcasing the complex geological history of the region.

Above the Basement System, Lower Miocene sediments are present, representing deposits from a time when the region was undergoing significant geological change. These sediments are typically composed of softer, sedimentary rocks, which have been eroded and deposited over time, creating layers that provide insight into the environmental conditions of the past.

Overlying the Miocene sediments are the Upper Volcanic Rocks, which were formed by extensive volcanic activity associated with the tectonic movements that created the rift valley. These volcanic rocks are typically basaltic and andesitic in composition and can be found as layers of hardened lava flows, pyroclastic deposits, and volcanic ash, which are key indicators of the valley's dynamic geological past.

Finally, the Quaternary and Recent Deposits represent the most recent geological formations in the area, consisting of unconsolidated sediments such as alluvial deposits, soils, and other materials that have been deposited by rivers, wind, and other natural processes. These deposits fill the broad, alluvial-filled depression in the northern part of the valley, including the Lake Turkana basin, and are crucial for understanding the valley's current landscape and the ongoing processes shaping it.

Together, these geologic formations illustrate the complex and dynamic history of the Kerio Valley, where ancient rocks formed deep within the Earth have been uplifted and exposed by tectonic forces, overlaid by younger sediments and volcanic rocks, and finally shaped by the forces of erosion and deposition that continue to influence the landscape today.

5.6.4.1 Kamnaon

At the Kamnaon site in the Kerio Valley, fluorspar, also known as fluorite (CaF_2), is prominently found within the Precambrian Basement System rocks, part of the Mozambique Belt. The fluorspar deposits here are primarily hosted in metamorphic rocks such as quartzofeldspathic gneiss, marble, and biotite gneiss, which have been extensively mineralized by hydrothermal fluids. These fluids, rich in fluorine, infiltrated

fractures and faults in the host rocks, forming well-defined, steeply dipping veins of fluorspar. These veins, which can vary in thickness and are often associated with minerals like quartz and calcite, can be extracted through both open-pit and underground mining methods.

Table 6: Stratigraphy of Kamnaon Mine Site

Layer	Unit	Thickness	Observations
1	Top soil	0-0.5 m	Reddish brown, sandy, loose soils.
2	Quartz feldspar gneiss	5-6 m	White colored, fine-textured. Kaolinitized in some sections. Where kaolinitized, coarse quartz crystals in a powdery matrix of kaolin. Intercalated with biotite gneiss.
3	Biotite gneiss	Occupies the rest of the exposed section	Medium textured, foliated. Minerals present include biotite, quartz, feldspar, kaolin, iron oxide (limonite*). Chloritized in some sections. Hosts the ore-containing veins.

5.6.4.2 Choff

The Choff mine site, located within the broader geological context of the Kerio Valley, is another significant area for fluorspar extraction. At Choff, fluorspar deposits are similarly associated with the geological formations of the region, specifically within the Precambrian Basement System. This site features fluorspar hosted in metamorphic rocks such as gneiss and marble, which have been subjected to hydrothermal activity over geological time.

Fluorspar at Choff is found in distinct, vein-like deposits within these metamorphic rocks. These veins often follow the structural patterns of the host rocks, including foliation planes and fault zones, which have facilitated the movement and deposition of fluorine-rich hydrothermal fluids. The fluorspar deposits at Choff are typically characterized by their

high purity and well-defined mineral veins, which can be accessed through a combination of surface and underground mining techniques.

Figure 9: Choff Mine Site

The Choff mining area is composed of 12 hills, Choff 1-12.

Table 7: Stratigraphy of Choff 4

Layer	**Unit**	**Thickness**	**Observations**
1	Top soil	0-1.5 m	Reddish brown, loose.
2	Biotite gneiss	12 m	Dark brown color. Altered, weathered. Medium texture. Layers of quartz and mica intercalated. Approximately 0.5 cm quartz and 1 cm micaceous layer. Iron oxide (limonite*) present.
3	Fluorspar ore	Occupies the rest of the exposed section	Generally brown colored, with some veins of purple colored fluorite. Medium to coarse texture.

5.6.4.3 Cheberen

The Cheberen mine site, situated within the Kerio Valley region, is another notable location for fluorspar extraction. At Cheberen, fluorspar deposits are found within the same geological framework as other significant sites in the area, specifically within the Precambrian Basement System. These deposits are hosted in metamorphic rocks, including quartzofeldspathic gneiss and marble, which have been extensively altered by hydrothermal processes.

Fluorspar at Cheberen is typically located in well-defined veins that have formed along fractures and faults within the host rocks. The hydrothermal fluids responsible for these deposits were rich in fluorine and have introduced fluorspar into the rock formations. These veins often display high purity levels and can vary in thickness, presenting valuable resources for mining.

Table 8: Stratigraphy of Cheberen

Layer	Unit	Thickness	Observations
1	Fluorspar ore	Occupies the rest of the exposed section	Buff-colored ore. Subhedral crystals are present but only limited to the vugs, which are common in this ore.
2	Quartz feldspar gneiss	2-3 m	White-colored, fine-textured. Where kaolinitized, coarse quartz crystals in a powdery matrix of kaolin. Intercalated with biotite gneiss.
3	Biotite gneiss	8 m	Dark brown color. Altered, weathered. Medium textured. Layers of quartz and mica intercalated. Approximately 0.5 cm quartz and 1 cm micaceous layer. Iron oxide (limonite) present.

4o

5.6.4.4 Muskut

The ore has got high silica content

Table 9: Stratigraphy of Muskut

Layer	Unit	Thickness	Observations
1	Topsoil	0-0.5 m	Brown, loose soil
2	Red soil	0.5 m	Red soil, compact
3	Quartz feldspar gneiss	3-4.5 m	White-colored fine textured. Kaolinitized in some sections. Where kaolinitized, coarse Quartz crystals in a powdery matrix of kaolin. Different degrees of weathering.
4	Fluorspar ore	Occupies the rest of the exposed section	White fluorite. Fine to medium texture. Vagues present, and contain euhedral crystals. Some of the euhedral crystals in the vagues have a golden color.

5.6.5 Safety and Stability of Mine Pits

The four mine sites Choff, Cheberen, Kamnoun, and Muskut were all actively operational at the time when the previous investor abruptly vacated the premises before the end of their lease period. Unfortunately, the transition was not smooth, and proper decommissioning efforts were not undertaken to allow for the rehabilitation of the mines. Since their abandonment in 2016, these open mines have posed significant environmental and physical hazards to the surrounding community, including their livestock and the local human population.

Figure 10: Abandoned Mine sites

The abandoned mines have accumulated water ponds, creating a breeding ground for crocodiles and increasing the risk of drowning, thereby exacerbating the dangers faced by the community. Recognizing these risks, SOFAX is committed to addressing this menace by ensuring the safety of both the community and their workers. As they plan to resume ore extraction from these sites, SOFAX intends to implement safety measures to mitigate the hazards posed by the open mines, demonstrating their dedication to responsible mining practices and community welfare.

SOFAX's commitment to managing the four mine sites Choff, Cheberen, Kamnoun, and Muskut focuses on ensuring environmental sustainability and the safety of the local community and workers during active mining operations. This commitment will be demonstrated through a comprehensive approach that addresses the environmental impacts of mining and implements robust safety measures.

5.6.5.1 Environmental Impact Mitigation:

Prevention of Contamination: SOFAX will implement a rigorous water management system to prevent the contamination of nearby water bodies. Stabilizing pit walls is crucial to avoid the leaching of harmful chemicals, such as cyanide, mercury, or heavy metals, into groundwater and surface water systems. Effective drainage systems, water treatment facilities, and continuous monitoring will be put in place to ensure that local water resources are protected.

Erosion Control and Sediment Management: To prevent environmental degradation from erosion, SOFAX will employ erosion control measures like terracing, planting native vegetation, and using geotextiles to stabilize slopes. These strategies will help retain topsoil, reduce sedimentation in water bodies, and protect aquatic ecosystems from the adverse effects of erosion.

5.6.5.2 Biodiversity Protection:

SOFAX will prioritize minimizing the impact of mining operations on local wildlife. Buffer zones around sensitive areas will be established, key habitats preserved, and wildlife corridors created to facilitate the movement of animals. Rehabilitation efforts, including replanting native vegetation and restoring natural landforms, will be essential in rebuilding ecosystems that may be disturbed by mining activities.

5.6.5.3 Proper Closure and Reclamation:

SOFAX is committed to responsible mine closure and reclamation practices. This will involve filling in mine pits, recontouring the landscape, and reestablishing vegetation to return the land to a natural or usable state. Where feasible, mine pits may be converted into reservoirs, recreational areas, or wildlife habitats, providing long-term benefits to the local community and environment. Continuous monitoring of reclaimed sites will ensure that they remain safe and stable over time.

5.6.5.4 Regulatory Compliance and Environmental Stewardship:

SOFAX will adhere strictly to environmental regulations and standards. Comprehensive environmental management plans will be developed and implemented, addressing all potential impacts of mining operations. By committing to these plans and actively engaging in environmental stewardship, SOFAX aims to mitigate negative effects,

conserve natural resources, and support the long-term sustainability of the regions in which they operate**.**

5.6.5.5 Ensuring Community Safety During Active Mining:

Physical Safety Measures: SOFAX will establish secure fencing and clear signage around all active mining areas to prevent unauthorized access. Regular safety drills and emergency response plans will be conducted in collaboration with local authorities and community members to ensure preparedness in case of accidents.

Water Safety: The accumulated water ponds in the mine pits, which pose a risk of drowning and harbor crocodiles, will be closely monitored. SOFAX will implement measures to secure these areas, including fencing, regular patrols, and the installation of warning signs to inform the community of potential dangers. Additionally, efforts will be made to safely manage and control the water levels in these ponds to reduce risks.

Community Engagement and Education: SOFAX will engage with the local community through regular meetings and information sessions to educate them on the safety measures being implemented. This will include raising awareness about the potential hazards of the mining operations and providing guidance on how to stay safe. The company will also establish a community liaison office where residents can report concerns or hazards and receive timely updates on mining activities.

5.6.6 Air Quality Management:

To protect both the environment and public health, SOFAX will implement dust suppression techniques such as water spraying, the use of dust screens, and the application of chemical stabilizers. Monitoring air quality and adhering to environmental regulations will be key to minimizing dust and emissions, thereby reducing their impact on nearby communities and ecosystems.

During the ESIA study the consultant was able to conduct a baseline air quality survey within the community that will be more susceptible to air pollution which include Kimwarel shopping center, Kabokbock Shopping Center, and the EPZ processing zone area with the results illustrated below.

The table below shows a summary of the ambient air monitoring results obtained from the field measurements.

Table 10: Monitoring Points

Points	**Description**	**GPS Coordinates**
Point 1	Kabokbok-Iten	0°20'29.3"N 35°37'58.5"E (0.341474, 35.632921)
Point 2	Kimwarer center	0°19'12.0"N 35°38'05.7"E (0.320007, 35.634922)
Point 3	EPZ Zone/ Processing Plant within Kimwarer	0°18'43.5"N 35°38'00.9"E (0.312083, 35.634922)

Table 11: Ambient Air Results

Ambient Air Monitoring Parameters	**Point 1**	**Point 2**	**Point 3**	**24Hr TWA Tolerance Limits**
	µg/m³	**µg/m³**	**µg/m³**	**µg/m³**
Particulate Matter Respirable Dust - $PM_{2.5}$	13.72	14.41	10.87	**- µg/m³**
Particulate Matter Inhalable Dust - PM_{10}	19.71	22.82	19.43	**100 µg/m³**
Total Particulate Matter TSP/TPM	32.20	34.15	29.23	**200 µg/m³**
Sulphur Dioxide	24.8	32.3	17.9	**80 µg/m³**

SO_2				
Nitrogen Dioxide NO_2	12	14	10	**80 µg/m³**
Carbon Monoxide CO	714	982	876	**4000 µg/m³**
Carbon Dioxide CO_2	410	524	684	**4000 µg/m³**
Total Volatile Compounds TVOCs	63.1	52.8	62.3	**-**
Hydrogen Sulphide	2.7	3.8	2.8	**-**
Ozone - O^3	BDL	BDL	BDL	**0.12 ppm**

N/B:

- For Particulate Matter -Respirable Dust ($PM_{2.5}$), Particulate Matter -Inhalable Dust (PM_{10}), Total Particulate Matter (TSP/TPM), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Carbon Dioxide (CO_2), and Total Volatile Organic Compounds (TVOCs), the obtained field results are compared against the 24Hr Time weighted Average.

while

- For Ozone and Oxides of Carbon (CO & CO_2) , the obtaine field results are

compared against the 1Hr Time weighted Average as the 24hrs TWA has not specified any limit under EMC (Air Quality Regulations) 2014.

The results indicate that all the potential air quality pollutants are within the stipulated/torelance limits as dictated in Air Quality Regulations 2014.

The baseline ambient air quality monitoring for the project area reveals that most pollutant levels, including particulate matter (PM2.5 and PM10), total suspended particulates (TSP), and gases like Sulphur Dioxide (SO2), Nitrogen Dioxide (NO2), Carbon Monoxide (CO), and Carbon Dioxide (CO2), are well within acceptable tolerance limits. Additionally, Total Volatile Organic Compounds (TVOCs) and Hydrogen Sulphide (H2S) concentrations are moderate, while ozone (O3) is below detection limits. These baseline values indicate that the air quality poses minimal risk to human health and the environment. The recorded data will serve as a benchmark for regular monitoring throughout the project lifecycle to ensure that air quality remains within safe levels and any deviations are promptly addressed to mitigate potential impacts. Regular assessments will enable proactive management of air quality in the project area.

Figure 11: Air Quality monitoring

5.7 Environmental Noise

Noise is a critical environmental aspect that must be carefully managed to minimize its impact on the surrounding communities and ecosystems. The mining activities, including drilling, blasting, transportation of materials, and operation of heavy machinery, are likely to generate significant noise levels. These elevated noise levels could have adverse effects on both human health and wildlife. Prolonged exposure to excessive noise can lead to hearing loss, stress, and sleep disturbances among workers and residents in nearby communities. Additionally, noise pollution may disrupt wildlife, potentially altering their natural behavior and habitats.

A baseline noise survey was conducted in within the project area with the objective of establishing the existing noise or sound pressure levels in sensitive areas occupied by the local community. The survey aimed to measure and determine both diurnal and

nocturnal noise levels at key receptor points to provide a clear understanding of the current acoustic environment. Additionally, the survey sought to identify the main causes of noise pollution prior to the commencement of mining activities, assess how existing operations and facilities contribute to noise levels, and rank the noise levels accordingly. The findings from this assessment were compiled into a comprehensive report as shown below, which provides a basis for understanding the noise conditions in the area and serves as a reference for mitigating future impacts once mining activities begin.

The measurement results are expressed as follows:

Table 12: Diurnal Noise Level Measurement Results

ID	**Status of the Predominant Noise Source**	**LA min**	**LA max**	**LA eq**	**Permissible Level (LA eq)**	**Rating**
MP 1	Kabokbok-Iten	42.8	78.2	54.8	**55 dB(A)**	
MP 2	Kimwarer center	42.1	70.2	50.4	**55 dB(A)**	
MP 3	EPZ Zone/ Processing Plant within Kimwarer	50.4	78.3	53.7	**55 dB(A)**	

Table 13: Nocturnal Noise Level Measurement Results

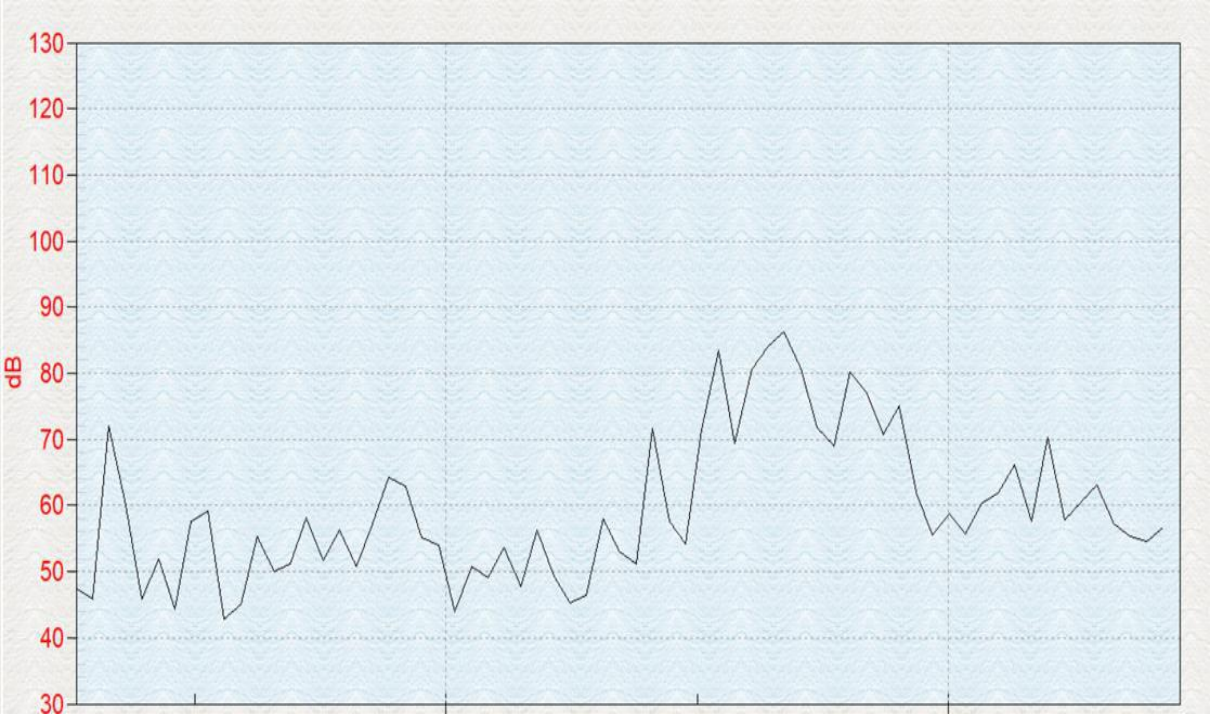
ID	**Status of the Predominant Noise Source**	**LA min**	**LA max**	**LA eq**	**Permissible Level (LA eq)**	**Rating**
MP 1	Kabokbok-Iten	28.5	47.5	33.3	**35 dB(A)**	

MP 2	Kimwarer center	30.1	55.2	34.9	**35 dB(A)**	
MP 3	EPZ Zone/ Processing Plant within Kimwarer	27.8	45.7	32.0	**35 dB(A)**	

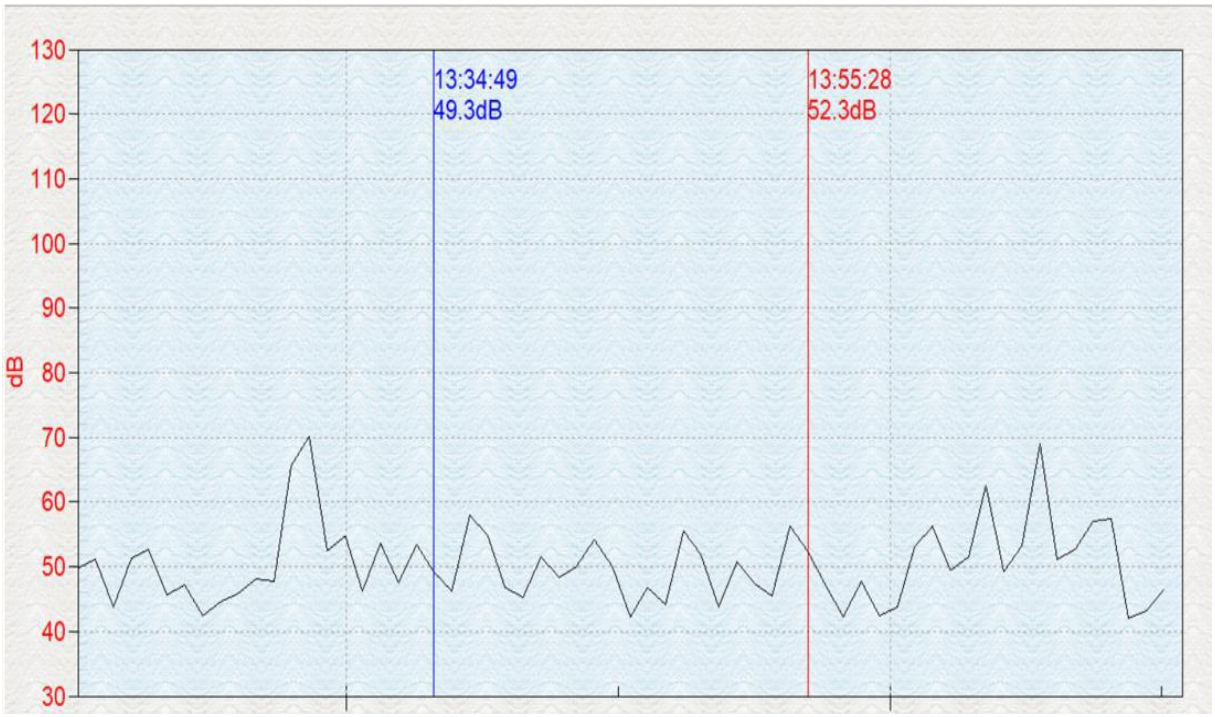
- Within the regulatory rating levels; This means the field measurement noise levels are within the stipulated limits.

Over rating levels; This means the field measurement noise levels are above the stipulated limits.

Graphical Presentation of Noise Distribution on MP1



Graphical Presentation of Noise Distribution on MP2



Graphical Presentation of Noise Distribution on MP3

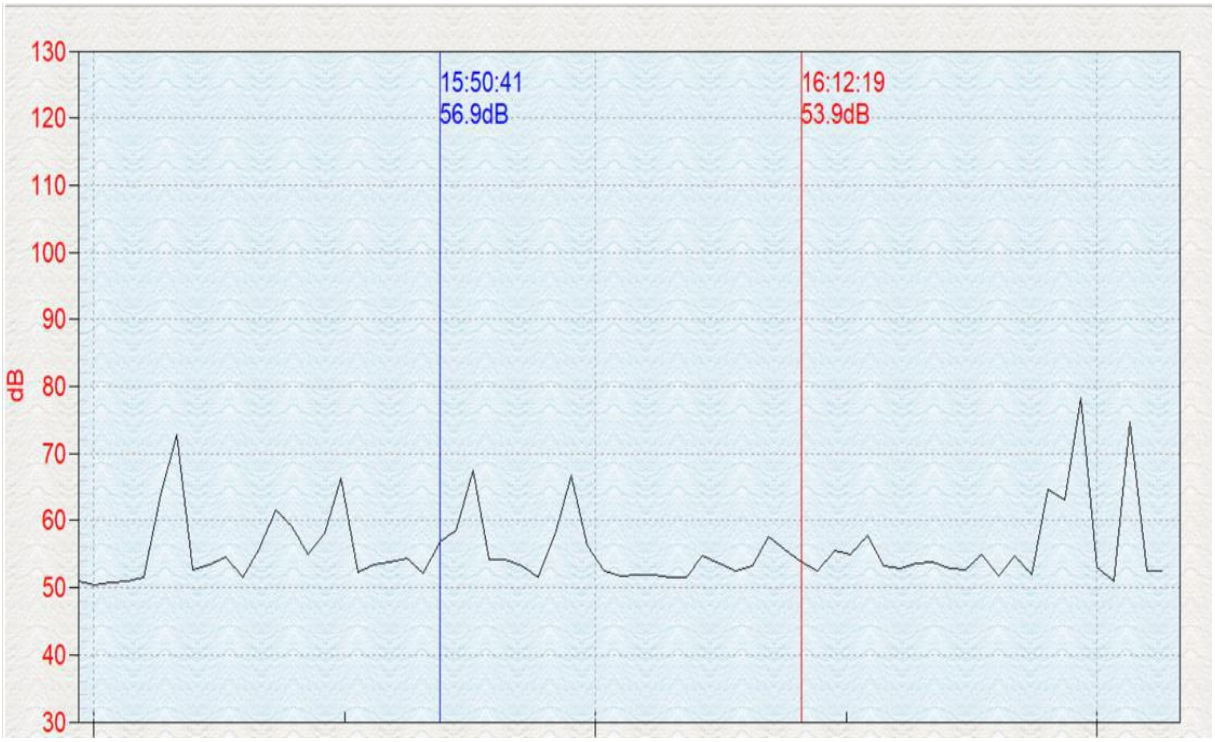


Table 14: Tabulated results and standard actions

Noise Level	Point	Description
Below 55 dB (A) and 35 dB (A) for nocturnal and diurnal noise levels respectively - Within NEMA recommended Noise Exposure Limits	MP 1	Kabokbok - Iten
	MP 2	Kimwarer center
	MP 3	EPZ Zone/ Processing Plant within Kimwarer
Above 35 dB(A) - 55 dB (A) and 35 dB (A) for nocturnal and diurnal noise levels respectively -Above NEMA recommended Exposure Limits.	-	None

The table above focuses on key measurement points to compare existing noise levels against the recommended Noise Exposure Limits set by NEMA. The results indicated that at Measurement Point 1 (MP 1) in Kabokbok - Iten, Measurement Point 2 (MP 2) at Kimwarer Centre, and Measurement Point 3 (MP 3) within the EPZ Zone/Processing Plant in Kimwarer, the diurnal and nocturnal noise levels were recorded below 55 dB(A) and 35 dB(A) respectively, which are within NEMA's recommended limits for both daytime and nighttime noise exposure. Notably, no areas were found to exceed these thresholds, as all measured points remained within the acceptable noise exposure levels, indicating that the current noise levels pose minimal risk to the community and environment prior to the initiation of mining operations.

5.7.1 Soils

Soil types in Kimwarel vary greatly with the topography. On the valley floor, fertile alluvial soils are prevalent, deposited by seasonal floods. These soils are rich in nutrients, making

them highly suitable for agriculture and supporting the cultivation of various crops. In contrast, the escarpments and higher elevations have shallow, rocky soils with lower fertility, which support mainly natural vegetation such as grasses and shrubs. These soils pose challenges for agriculture and require careful management in the context of mining, particularly in handling overburden and reclamation activities. The composition of these soils directly affects the feasibility of mining operations and the environmental management practices needed to mitigate impacts on the landscape.

5.7.1.1 Soil Characteristics

The soil characteristics in the areas affected by the factory processing and rock mining activities were evaluated, particularly focusing on how these soils influence the flow processes of effluent water from the factory to designated disposal areas. All the soils in the study area are developed on uplands derived from Precambrian basement system rocks. Depending on the sampling location, such as the factory establishment area and dry, arid regions, the soils exhibit varying degrees of degradation. The soil types range from rocky, stony, gravelly sandy loams, and clay loams to loams. In areas with agricultural productivity, low soil fertility and a lack of afforestation increase the risk of soil erosion, particularly during the rainy season. The potential impact of factory effluent on soil and water flow necessitates the implementation of management strategies, which are outlined in the environmental management plan, to support the factory's zero-tolerance policy toward environmental degradation.

5.7.1.2 Assessment and Evaluation of Soil Quality and Health

Soil quality is defined by the soil's ability, along with its biota, to perform essential functions such as supporting plant growth and resisting erosion. For soil to sustain both natural and agricultural ecosystems, it must effectively carry out these functions. The impact of rock crushing activities on soil quality was assessed by sampling soils from areas intended for effluent disposal. These soils are at risk of erosion and runoff, necessitating their stability to fulfill their role effectively. To ensure high soil quality, the factory management should implement strategies aimed at protecting and maintaining soil health.

5.7.1.3 Direct Impacts on Soil Quality and Productivity

The soils in the affected area, developed on uplands from Precambrian basement system rocks, vary in texture from rocky, stony, and gravelly sandy loams to loams in agricultural areas, and sandy loams in other areas. These soils have experienced degradation, particularly in areas designated for effluent disposal, leading to reduced fertility. In agricultural productivity zones, the risk of erosion during the rainy season is heightened, especially in "wetland" areas lacking afforestation. The factory, constructed on already degraded land currently under cultivation, further contributes to soil degradation, influencing the flow of effluent water into the environment. The environmental management plan must address these impacts by incorporating zero-tolerance strategies to mitigate soil degradation. Additionally, the presence of a thin layer with strong surface sealing in cultivated areas highlights the soil's reasonable water uptake and retention capacity, which must be managed to prevent further soil quality deterioration.

Table 15: Soil Quality

Sampling Location	**Characteristics and Quality of Soils**	**Potential Environmental Flow**
Within factory establishment	Slope: 3-5%; very friable loamy sand to silty loam. Hydraulic conductivity and available soil moisture retention capacity at the depth of 0-30 cm is 8.3 cm/hr and 1.5 cm, respectively. The depth of 30-60 cm is silty clay with 1.32 cm/hr conductivity and 0.09 cm available water holding capacity.	Materials accumulated from the factory have formed a hard layer that restricts water infiltration and results in lower hydraulic conductivity in soils below 8 cm/hr. This increases overland flow.
Wetland	Slope: 1-5%; silty clay with strong surface consistence and stony surface soils. Hydraulic conductivity at the	Taking into account the slope of 3-5%, strong surface soils, and low surface water

Sampling Location	Characteristics and Quality of Soils	Potential Environmental Flow
	depth of 0-60 cm is 0.132 cm/hr. Available water holding capacity is 0.3 cm and 6 cm/m.	infiltration, there is an increase in surface runoff, which may cause water pollution.
Dry land	Slope: 1-2%; friable clay with no surface sealing. Average hydraulic conductivity and available soil moisture holding capacity is 2.3 cm/hr and 10 cm/m, respectively.	Abstraction and utilization of surface and sub-surface water for domestic, agricultural, and factory operations may lead to overland flow, water pollution, poor waste disposal, and reduced soil productivity.
Cultivated area	Slope: 1-2%; friable and extremely compact clay, with average hydraulic conductivity and water holding capacity of 0.8 cm/hr and 9 cm/m, respectively.	Low hydraulic conductivity may result in low water uptake, thereby causing overland flow and hence water pollution.

5.7.1.4 Indirect Impacts

A comprehensive soil analysis was conducted to assess the chemical properties of soil in areas affected by effluent water, specifically in regions around the former factory establishment and nearby wetland zones. The parameters tested during this analysis included Benzene, Ethyl Benzene, Toluene, Xylene, Total Petroleum Hydrocarbons (TPH), Mercury (Hg), Lead (Pb), Arsenic (As), Polycyclic Aromatic Hydrocarbons (PAH), Cadmium (Cd), Total Chromium (Cr), Calcium (Ca), and Fluoride (F-). The testing was carried out to determine the concentration levels of these pollutants and to evaluate their compliance with the Environmental Management and Coordination waste management regulation, 2006 that set outs various standards for managing pollutants, including those

in soil. The findings from this analysis are critical in understanding the extent of soil contamination due to effluent discharge and in formulating necessary mitigation measures to safeguard the environment.

Table 16: Soils Quality Results

Test	Test Method	Results	Unit	EMCA Threshold
Benzene	PQA/LIM/002	<0.01	mg/kg	0.05 mg/kg
Ethyl Benzene	PQA/LIM/002	<0.01	mg/kg	0.05 mg/kg
Toluene	PQA/LIM/002	<0.01	mg/kg	0.05 mg/kg
Xylene	PQA/LIM/002	<0.01	mg/kg	0.05 mg/kg
Total Petroleum Hydrocarbons	PQA/LIM/003	13.96	mg/kg	50 mg/kg
Mercury (As Hg)	EPA 3050B MOD	<0.001	mg/kg	0.001 mg/kg
Lead (As Pb)	EPA 3050B MOD	<0.13	mg/kg	2.0 mg/kg
Arsenic (As As)	EPA 3050B MOD	<0.01	mg/kg	0.01 mg/kg
Polycyclic Aromatic Hydrocarbons (PAH)	PQA/LIM/004	0.69	mg/kg	1.0 mg/kg
Cadmium (As Cd)	EPA 3050B MOD	0.35	mg/kg	0.8 mg/kg
Total Chromium (As Cr)	EPA 3050B MOD	35.8	mg/kg	100 mg/kg
Calcium (As Ca)	EPA 3050B MOD	241.63	mg/kg	Not regulated by EMCA
Fluoride (As F-)	EPA 3050B MOD	3.12	mg/kg	4.0 mg/kg

- Most parameters, such as **benzene**, **ethyl benzene**, **toluene**, **xylene**, and **mercury**, are well below the EMCA threshold limits.

- **Total Petroleum Hydrocarbons (TPH)** and **PAH** are within acceptable limits, but continuous monitoring is advised.
- **Cadmium** and **chromium** are within safe levels but should be monitored to ensure they don't accumulate over time.

5.7.2 Safety and Stability of Dams

Tailings dams need to be carefully designed from the initial stages of the mine life to ensure stability and avoid costly reshaping and double handling later on. In practice, building tailings dams as the ore reserve and mine life increase is challenging due to the continuous development of mining and processing methods and the increasing volume of tailings over time. This emphasizes the need to design dams that can accommodate future tailings storage to ensure long-term stability. As the knowledge on ore bodies increases, so too will the size and complexity of the dams required.

5.7.2.1 Tailing Dam Development and Stability:

Given the expected ore processing volume, it is crucial for the company to develop a tailing dam that ensures long-term stability. This involves considering the embankment height, slope, compaction strength, permeability, and foundation strength. The placement of waste on steep slopes should be avoided to reduce the risk of landslides, earthquakes, and other failures, especially in areas with high rainfall or seismic activity. Embankments of dams should be shaped with gentle slopes (15 to 20 degrees, or 27% to 36%) to reduce erosion and allow for vegetation to establish, minimizing the negative visual impact of waste rock.

5.7.2.2 Community Concerns and Mosquito Breeding:

The community has raised concerns about mosquito breeding in the dam water, particularly in the tailings dam located near Kimwarel Secondary School dormitories. To address this issue, the company should implement anti-mosquito interventions, such as introducing mosquito larvae predators, applying environmentally friendly larvicides, or considering alternative sites for the dam that are distant from residential areas.

5.7.2.3 Monitoring Systems and Risk Analysis:

The company should also develop comprehensive monitoring systems to allow for the early detection of potential dam breaks. This includes installing sensors and conducting regular inspections to identify signs of instability. Additionally, the company should carry out a dam break risk analysis to understand the potential impact of dam failure and prepare contingency plans to protect both the environment and the local communities.

Water

5.7.3 Climate

Kimwarel experiences a semi-arid climate characterized by a bi-modal rainfall pattern, where long rains occur from March to June and short rains from November to December. The region's annual rainfall ranges between 600 and 1,200 mm, with an average of approximately 750 mm, making it a semi-arid area. This rainfall distribution is crucial for agricultural activities, as it influences the timing of planting and harvesting.

Temperatures in Kimwarel vary with elevation, typically ranging from 20°C to 30°C. The valley floor tends to be hotter and drier, while the surrounding highlands are cooler and more humid. These climatic conditions significantly impact the region's agriculture, water resources, and vegetation. Understanding these meteorological patterns is essential for planning agricultural activities, managing water resources effectively, and conducting thorough environmental assessments for mining operations.

Given the region’s climate, agricultural production is limited, and the timing of farming activities must align with the rainfall patterns to maximize crop yields. The area's semi-arid nature also underscores the importance of sustainable water management practices, especially in the context of mining operations, which must consider these climatic factors to mitigate environmental impacts.

5.7.4 Vegetation Types

The vegetation in Kimwarel reflects the varied climate and terrain of the region, with distinct variations from the Elgeyo Escarpment to the valley floor. The region’s rift

morphology has evolved through three major tectonic pulses, which caused downward movements in the rift axial zone, extensive volcanic activity, and significant fault displacement. The Elgeyo Escarpment, reaching about 2,700 meters at Nyaru, features a temperate climate that supports lush vegetation, including montane forests and bushlands. These areas are characterized by dense, diverse plant life, including large trees, shrubs, and understory plants. In contrast, the valley floor, at approximately 1,350 meters, experiences a warm, semi-arid climate. This environment supports a different type of vegetation, dominated by stunted thorny bushes, various species of acacia, and grasses that are well adapted to the semi-arid conditions. The diversity of vegetation types across the valley illustrates the complex interplay between climate, topography, and soil conditions in shaping the natural landscape.

Figure 12: Vegetation Characteristics in the area.

5.8 The Terrestrial and Aquatic Environment

5.8.1 Flora

The vegetation in the Kimwarel area is a reflection of its diverse climate, terrain, and geological history, showcasing a complex interplay between topography, climate, and soil conditions. The Elgeyo Escarpment, towering at approximately 2,700 meters at Nyaru, boasts a temperate climate that nurtures lush, dense vegetation, including montane forests and bushlands. These forests are rich in biodiversity, featuring a variety of plant life ranging from large trees to shrubs and understory plants that thrive in the cooler, moist environment.

In stark contrast, the valley floor, situated around 1,350 meters, experiences a warm, semi-arid climate, which supports a different type of vegetation. This lower elevation area is characterized by stunted thorny bushes, various species of acacia, and grasses well adapted to the dry conditions. The rift morphology of the region, shaped by three major tectonic pulses resulting in downward movements in the rift axial zone, volcanic activity, and significant fault displacement, has also played a crucial role in forming the varied vegetation patterns observed across the valley.

Mining activities in the Kimwarel area, particularly those carried out by the former mining company, KFC, have significantly impacted this diverse vegetation. The active mining sites have led to the removal of vegetation, reducing the cover in the mining lease area to less than 6%. However, KFC has made efforts to mitigate this loss by planting several trees and continuing activities aimed at improving the microenvironment and aesthetics of the area. The company has also planned to establish wetlands to further enhance the local ecosystem.

In addition to the mining impact, there is significant charcoal burning in the upper regions of the Kerio Valley, which could potentially spread fires or cause spillage into the mining areas. Moreover, some local communities rely on the rich biodiversity of the region for medicinal plants, such as *Balanites aegyptiaca***,** *Hurrihsonia abyssinica***,** *Dodonaea angustifolia, Solanum nigrum, Euclea divinorum,* and *Ajuga remota*. Indigenous plants like *Hibiscus natalensis, Vangueria apiculata, Vangueria acutiloba*, and *Carissa edulis* are also used as food sources. Recently introduced fruit trees in the Kerio Valley include mangoes and citrus, contributing to the region's agricultural diversity. *Eucalyptus* species have been planted around the plant, living quarters, and along the river Kimwarel to further enhance the area's vegetation.

As SOFAX takes over the mining operations, it is crucial to acknowledge and preserve the region's rich biodiversity and varied vegetation. The company should integrate comprehensive environmental considerations into their operations, ensuring careful management of vegetation clearing, active reforestation efforts, and the preservation of key habitats, particularly in sensitive areas such as riverine forests and the higher elevations of the escarpment. By doing so, SOFAX can minimize the environmental

impact of their activities, support the continued health of the local ecosystems, and contribute to the long-term sustainability of the Kimwarel region.

5.9 Biological Environment

5.9.1 Flora

The vegetation in the Kimwarel project area is highly diverse, reflecting the region's varied microclimates and soil conditions. Along the Kimwarel River, riverine forests thrive, creating a lush green corridor in the otherwise semi-arid landscape. These forests are rich in biodiversity and play a critical role in maintaining the ecological balance of the area. The valley floor is dominated by dryland shrubs and savannah grasslands, with common species including various acacia trees, grasses, and drought-resistant shrubs that are well adapted to the harsh, dry conditions. In contrast, the escarpment areas support montane forests and bushlands, where the higher elevation and cooler, more temperate climate allow for denser vegetation and greater biodiversity. This variation in flora across different parts of the project area is indicative of the complex interactions between climate, topography, and soil.

Figure 13: Montane Vegetation

Figure 14: Escarpments

Figure 15: Bushland

Figure 16: Riverine Vegetation along River Kimwael

5.9.2 Fauna

The Kimwarel project area is home to a variety of wildlife, each adapted to the diverse habitats found within the region. Common animals include herbivores like gazelles and antelopes, which graze on the savannah grasslands and bushlands. Predators such as leopards and hyenas roam the area, relying on the abundance of prey. Numerous smaller mammals, including hares and rodents, are also present, contributing to the area's rich biodiversity. The riverine forests and escarpment areas provide critical habitats for various

bird species, reptiles, and amphibians. Aquatic life in the Kimwarel River includes fish and other freshwater species, which are vital for maintaining the ecological health of the riverine system. The presence of such a wide range of fauna highlights the ecological significance of the area and the need for careful management to protect these species, particularly in the face of mining activities.

5.9.3 Rare or Endangered Species

The Kimwarel region may harbor rare or endangered species, particularly within its montane forests and riverine ecosystems. Although not commonly seen, species like the African elephant may occasionally migrate through the area, underscoring the importance of these habitats as wildlife corridors. Bird species such as the African crowned eagle and other raptors may be present in the escarpment zones, taking advantage of the high vantage points and dense vegetation for hunting and nesting. To identify and confirm the presence of any rare or endangered species in the area, specific wildlife surveys would be required. Protecting these species is crucial for biodiversity conservation and maintaining the ecological integrity of the region.

5.9.4 Sensitive Habitats

Sensitive habitats in the Kimwarel area include the riverine forests along the Kimwarel River and the montane forests on the escarpments. These habitats are crucial for maintaining biodiversity, providing essential refuge, and resources for various species. The riverine forests play a particularly important role in water regulation, preventing erosion, and supporting aquatic ecosystems. The montane forests, with their unique flora and fauna, are vital for preserving the region's biodiversity and maintaining ecological balance. These areas require careful management to ensure they are protected from the potential impacts of human activities, including mining, agriculture, and development.

5.9.5 Species with Potential to Become Vectors or Nuisances

Several species in the Kimwarel region have the potential to become vectors or nuisances, posing risks to human health and the local economy. Mosquitoes, particularly in areas with stagnant water, can become vectors for diseases like malaria, which poses a significant health risk to local communities. Rodents, such as rats and mice, may invade

human settlements and agricultural areas, causing damage and potentially spreading diseases. Insects like tsetse flies and ticks could also pose health risks to both humans and livestock, impacting the region's agricultural productivity. Additionally, reptiles such as snakes and crocodiles, which are common in the area, have the potential to become nuisances by attacking workers, community

6 SOCIAL SETTINGS

The socio-economic setting of the Soy-Fluorspar mining area is intricately linked to its historical mining activities, agricultural practices, and the rural nature of the surrounding communities.

6.1 Population and Demographics:

The socio-economic setting of the Kimwarer-Fluorspar mining area is characterized by a primarily rural population of about 15,000 residents as of the 2019 census, with low population density compared to urban centers. Historically reliant on agriculture, the community's demographic structure is youthful, with a significant portion under the age of 35. The closure of the fluorspar factory in 2016 led to a stabilization in population growth due to reduced employment opportunities and out-migration. However, the anticipated reopening of the factory in 2024 is expected to attract returning workers and their families, potentially leading to renewed population growth. The area's ethnic composition is predominantly Kalenjin, and while the young population offers a strong labor force, the community faces challenges related to employment, education, and infrastructure development to support the expected influx. This rural community is thus in a state of transition, shaped by the cyclical impact of the mining industry on its demographics, economy, and development.

6.2 Economic Activities:

Agriculture remains the backbone of the local economy. The majority of households engage in subsistence farming, growing crops such as maize, beans, and vegetables, while also keeping livestock like cattle, goats, and poultry. These activities are essential for food security and income generation. However, the region's agricultural productivity is often hampered by unpredictable weather patterns, including prolonged droughts and sporadic floods, which affect crop yields and livestock health.

The mining of fluorspar has been a significant economic activity in the area, providing employment opportunities and contributing to the local economy. The establishment of mining operations brought about infrastructural development, such as roads and power supply, which have benefited the local communities. However, the fluctuating nature of global fluorspar markets and the intermittent operations of the mines have led to periods of economic instability and uncertainty for those dependent on mining jobs.

6.3 Infrastructure and Services:

Infrastructure in the Kimwarer area is relatively underdeveloped, reflecting the region's rural setting. The area is connected by a network of roads, some of which are in poor condition, affecting transportation, especially during the rainy seasons. Basic services such as healthcare, education, and water supply are available, but they are often limited in capacity and quality. The presence of the fluorspar mining company has resulted in some improvements, such as the provision of water to the local community and better access to electricity in certain parts.

6.4 Social Services:

Educational facilities in Kimwarer include primary and secondary schools (Kimwael Primary and Secondary school, Choff Primary school, Sechia Primary School, and Kaptegat Primary School), but access to higher education remains limited since the only one existing Technical college, with students often needing to travel to larger towns or cities. Healthcare services are provided by a few health centers and dispensaries including Kimwarel dispensary which was taken over by the County government after the closure of Kenya Fluorspar Company in 2016, which struggled with limited resources and personnel. The mining company played a role in supporting local schools and health services, but these contributions were often seen as insufficient to meet the growing needs of the community.

6.5 Social Structure and Community Relations:

The social structure in Kimwarer is heavily influenced by traditional practices and community leadership, with elders playing a crucial role in decision-making processes. The community is close-knit, with strong social ties and a culture of mutual support. However, the introduction of mining activities has sometimes led to social tensions, particularly around issues of land use, environmental degradation, and the distribution of benefits from mining.

6.5.1 Environmental and Health Concerns:

The environmental impact of mining has been a significant concern for the local community. Issues such as deforestation, soil erosion, and water pollution have affected agricultural productivity and the overall health of the ecosystem. The community has also reported health problems related to mining activities, including respiratory issues and waterborne diseases. These environmental and health challenges have led to increased

awareness and demand for better environmental management practices from both the mining company and local authorities.

6.6 Livelihood and Poverty Levels:

Despite the presence of mining activities, poverty remains a significant challenge in Kimwarer. Many households rely on low-income farming, and the jobs provided by the mining company are not sufficient to lift the community out of poverty. Economic diversification is limited, and opportunities for alternative livelihoods are scarce. The community faces challenges related to access to capital, markets, and information, which limits their ability to improve their economic situation.

7 POLICY, LEGAL AND REGULATORY FRAMEWORK

7.1 Introduction

Environmental impacts are positive, negative, small-scale, large scale, temporary, permanent, reversible, or irreversible, depending on the nature of the activities/ operations being undertaken. In the face of continued development and the resultant impacts, a lot of legislative tools have been developed to guide development, safeguard environmental concerns and offer probable mitigation interventions. Kenya has a policy, legal and administrative framework for environmental management. Under the framework, NEMA is responsible for ensuring environmental and social impact assessment on proposed projects are conducted as per EMCA.

7.2 General Overview

Kenya has a policy, legal and administrative framework for environmental management. Under the framework, NEMA is responsible for ensuring that ESIAs are carried out for new projects and environmental audits on existing facilities as per EMCA. ESIAs are carried out in order to identify potential positive and negative impacts associated with the proposed project with a view to taking advantage of the positive impacts and developing mitigation measures for the negative ones. The guidelines on EIAs and EAs are contained in sections 58 to 67 of the Act. According to section 68 of EMCA, NEMA is responsible for carrying out EIAs and EAs on all activities that are likely to have a significant effect on the environment.

Environmental laws are put in place to ensure sustainable environmental management and to facilitate sustainable developments. Environmental law generally comprises the rules and doctrines arising from common law, provisions of constitutions, statutes, general principles and treaties that deal with protection, management and utilization of natural resources and the environment. Sustainability generally refers to the management and utilization of natural resources at present in a manner that would not compromise beneficial utilization of such resources in the future. Some of the guiding regulations

include:

- Constitution of Kenya (2010)
- Mining Act (2016)
- Environmental Management Principles and Guidelines
- National Environmental Action Plan 2009-2013(NEAP 2009-2013)
- Environmental Management and Coordination Act No. 8 of 1999 (Amended in 2015)
- Environmental impact assessment and audit regulations 2003.
- Occupational Safety and Health Act (OSHA) 2007.
- County Government Act, 2012 (Amended in 2014)
- Physical Planning Act, (Revised Edition, 2012).
- Local Authority Act (cap 265).
- EMCA (Waste Management) Regulations, 2006 Legal Notice No.12.
- The Public Health Act, Cap 242.
- Noise and Excessive Vibrations Pollution Control Regulations 2009.

7.3 Facility Compliance to Environmental Legislations

7.3.1 International Conventions and Treaties

Table 17: Compliance with International Regulations

Convention/Treaty	Summary Description	Compliance/Comments
Sustainable Development Goals	Also referred to as Agenda 2030, is a universal call to action to end poverty, protect the planet and ensure peace and prosperity by 2030.	The proposed project will contribute to ensuring sustainable income and alleviating rural poverty.
United Nations Framework Convention on Climate Change	The UNFCCC sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change.	The project proponent should observe the convention in all its operations throughout the project cycle.

Convention on Biological Diversity	This global convention was held to foster conservation and sustainable use of biological resources, to preserve their diversity for posterity.	There is a need to integrate biodiversity consideration into the project as the associated activities will impact the wildlife species in the area.
African Convention on the Conservation of Nature and Natural Resources	The convention sought to awaken the continent on the need to preserve natural ecosystems and employ sustainable use of natural resources of economic importance, particularly the soil, water, flora, and fauna.	SOFAX Fluorspar mining project should be carried out in conformity with the inter-governmental agreement at the convention, of which Kenya is a signatory.
Kyoto Protocol	The Kyoto Protocol is an agreement under which industrialized countries will reduce their collective emissions of six greenhouse gases - carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, HFCs, and PFCs.	Compliance with this convention will largely inform the technical and environmental evaluation of the project. There is thus a necessity that proper adherence to minimal carbon emission levels be ensured during the continued mining activities
IFCs Performance Standards	The safeguards ensure that environmental and social issues are evaluated in decision making, help reduce and manage the risks associated with a project or program, and provide a mechanism for consultation and disclosure of information.	The proprietor has adhered to OPs by subjecting the project to screening that proper documentation was carried out, that consultation was carried, that the EMP will be implemented accordingly.

7.3.2 Environmental Management Principles and Guidelines

Principle	Summary Description	Compliance/Comments
Principle of Sustainability	Requires that natural resources should be utilized in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.	This ESIA has been done for the project to ensure Environmental Sustainability in its renovation, and operation activities.
Principle of Intergenerational Equity	Focuses on future generations as a rightful beneficiary of environmental protection. Advocates fairness, so that present generations do not leave future generations worse off by the choices they make today regarding development.	The renovation and operation of the mine requires the utilization of natural resources in a sustainable manner while avoiding irreversible environmental damage.
Principle of Prevention	States that protection of the environment is best achieved by preventing environmental harm in the first place rather than relying on remedies or compensation for such harm after it has occurred.	It is the responsibility of SOFAX's management to ensure environmental destruction is avoided at all cost.
Precautionary Principle	It calls for precaution in the making of environmental decisions where there is scientific uncertainty. It requires that all reasonable measures must be taken to prevent the possible deleterious	The proposed mining project should observe precaution measures to ensure that the environment is not

	environmental consequences of development activities even where there is scientific uncertainty.	destroyed in such a manner that cannot be rectified.
Polluter Pays Principle	Requires that polluters of natural resources should bear the full environmental and social costs of their activities. It dictates that, when running institutions/facilities, if damage is caused to private properties or even public utilities such as roads or public goods such as water bodies, measures to compensate the affected should be instituted immediately and remediation actions taken.	It is thus upon the management to ensure rectification and bear full responsibility of any destruction of any environmental or natural resource as a result of its activities.
Principle of Public Participation	Seeks to ensure environmental democracy and requires that the public, especially local communities should participate in the environment and development decisions that affect their lives. This principle calls for public participation in the development of policies, plans and processes for the management of the environment.	SOFAX's management should thrive to engage the surrounding communities and neighbours to enhance harmony and mutual co-existence
The Cultural and Social Principle	Requires Decision makers to factor in indigenous knowledge systems and technologies of the local communities living within a project area of influence.	To achieve this, the proponent should ensure maximum adherence to the principle of public participation.
Principle of International Co-Operation	Applies in the management of environmental resources shared by two or more states. The principle ensures	The management of SOFAX should uphold the Principle of

	that international relations and understanding are upheld	International corporation by ensuring that environmental safeguards are adhered to at during the shipping of fluorspar to other countries for industrial use.

7.3.3 The Constitution of Kenya

Chapter/Article	Summary Description	Compliance/Comments
Chapter four, Article 42	States that “Every person has the right to a clean and healthy environment, which includes the right– (a) To have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69; and (b) To have obligations relating to the environment fulfilled under Article 70.11”	The proprietor must ensure adherence to the various obligations in respect to the environment as well as the fundamental right and freedom to a clean and healthy environment for all citizens in the country.
Chapter five, Article 69	Section (a) states “The State shall ensure sustainable exploitation, utilization, management, and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits”	
	Section (b) states “‘The State shall work to achieve and maintain a tree cover of	

	at least ten per cent of the land area of Kenya".	
	Section (d) states "The State shall encourage public participation in the management, protection and conservation of the environment".	
	Section (e) states "The State shall protect genetic resources and biological diversity".	

Table 18: National Policies and Governing Las

No.	Policy and Legal Frameworks	Key Applicable Provisions	Regulations	Relevance to Fluorspar Mining
1	**Policy**			
	National Environment Policy, sessional paper no. 10 of 2013	Chapter 4, which covers sustainable mining	Mining Act 2016 and the Mining Regulations	Provides a framework for ensuring that mining activities, including fluorspar mining, adhere to sustainable practices to minimize environmental impacts.
	Mining and Minerals Policy, sessional paper no. 7 of 2016	Encourages responsible and sustainable		Directly relevant as it provides specific guidelines for sustainable mineral

No.	Policy and Legal Frameworks	Key Applicable Provisions	Regulations	Relevance to Fluorspar Mining
		mineral development		exploitation, which is crucial for fluorspar mining operations.
	National Water Policy, sessional paper no. 1 of 2021	Focuses on sustainable water management		Critical for managing water resources during the mining process, especially in preventing contamination of local water bodies.
	National Land Policy, sessional paper no. 3 of 2009	Provides guidelines for land use and management in Kenya		Relevant for ensuring that land used for mining is managed sustainably and that land rights are respected.
	National Land Use Policy, sessional paper no. 1 of 2017	Encourages proper land use and sustainable development		Important for ensuring that land affected by mining is used sustainably and restored post-mining.
	National Occupational Safety and Health Policy, 2012	Focuses on worker safety and health		Crucial for protecting the health and safety of workers involved in fluorspar mining operations.
2	**Laws**			

No.	Policy and Legal Frameworks	Key Applicable Provisions	Regulations	Relevance to Fluorspar Mining
	EMCA, 1999	Sections 3, 9, 24, 28, 29, 31, 57A, 58, 68, 108, 117, 125	Environmental (Impact Assessment And Audit) Regulations, 2003 Environmental Management and Coordination (Waste Management) Regulations, 2006, and others.	Provides the legal framework for environmental management in Kenya, including the necessary environmental assessments and audits required for mining projects.
	Mining Act, 2016	The entire Act is applicable	Mining (Work Programs and Exploration Reports) Guideline, 2017, and others.	The primary legislation governing all mining activities, including the granting of mining rights and the regulation of mining operations for fluorspar.
	OSHA, 2007	Sections 9, 11, 14, 16, 21, 44, 49, 50, 52, 64, 101	Various OSHA regulations including Eyes Protection Rules, Building Operations Rules, and others.	Ensures that mining operations comply with health and safety standards, protecting workers from occupational hazards, including those specific to mining.
	Explosives Act, Cap 115	Sections 18, 20, 21, 24, 28	Explosives (Blasting and Explosives) Rules	Relevant for regulating the use of explosives in mining operations,

No.	Policy and Legal Frameworks	Key Applicable Provisions	Regulations	Relevance to Fluorspar Mining
				including safety protocols for blasting in fluorspar mining.
	Work Injury Benefits Act, 2007	Sections 7, 10, 21, 45		Ensures compensation for workers injured during mining operations, crucial for addressing risks associated with fluorspar mining.
	Employment Act, 2007	Sections 4, 6, 17, 26, 27, 29, 30, 31, 32, 33, 34, 35	Employment General Rules of 2014	Protects the rights of workers in mining operations, ensuring fair labor practices and compliance with employment laws.
	Land Act, 2012	Sections 11, 19		Governs land acquisition and use, relevant for accessing and using land for fluorspar mining while ensuring compliance with land laws.
	Environment and Land Court Act, No. 19 of 2011	Sections 4, 13, 14, 16		Provides the legal avenue for resolving disputes related to land and environmental

No.	Policy and Legal Frameworks	Key Applicable Provisions	Regulations	Relevance to Fluorspar Mining
				issues in mining projects.
	Community Land Act	Sections 5, 6, 8, 27, 34, 35, 36	Community Land Regulations, 2017	Ensures that the rights of communities to their land are respected, especially in areas where fluorspar mining occurs on community land.
	Water Act, 2016	Sections 22, 23, 36	Water Resources Management Rules, 2007	Essential for regulating water use in mining operations, including the management of water resources and prevention of pollution.
	Physical and Land Use Planning Act, No. 3 of 2019	Sections 14, 18	Physical Planning and Land Use (Development Permission and Control) (General) Regulations 2021	Governs the planning and use of land for mining activities, ensuring that mining operations are conducted in accordance with land use regulations.
	Forest Conservation & Management Act, 2016	Sections 8, 20, 21, 30	Forest (Participation in Sustainable Forest Management) Rules, 2009	Relevant for protecting forests that may be affected by mining operations, ensuring

No.	Policy and Legal Frameworks	Key Applicable Provisions	Regulations	Relevance to Fluorspar Mining
				sustainable forest management practices are followed.
	Wildlife Conservation and Management Act, 2013	Sections 26, 45, 46, 47	Wildlife Conservation and Management (Protection of Endangered and Threatened Ecosystems, Habitat, and Species) Regulations, 2017	Ensures the protection of wildlife habitats that may be impacted by fluorspar mining, including compliance with regulations on endangered species and habitat conservation.
	National Land Commission Act, 2012	Sections 5, 6	National Land Commission (Review of Grants and Dispositions of Public Land) Regulations, 2017	Relevant for overseeing the use and management of public land used for mining activities, including compliance with legal and regulatory requirements.
	County Government Act, 2012	Sections 102, 103, 104, 105, 109, 110		Provides the framework for county governments' involvement in mining activities, including the regulation and oversight of mining projects within their jurisdictions.

No.	Policy and Legal Frameworks	Key Applicable Provisions	Regulations	Relevance to Fluorspar Mining
	Public Health Act	Sections 21, 22, 38, 115		Essential for ensuring that mining operations comply with public health standards, protecting the health of workers and local communities from mining-related hazards.
	The Lake and River Act, Cap 409	N/A		Relevant for protecting water bodies near mining sites from contamination and ensuring sustainable use of water resources affected by mining activities.
	Kenya National Commission on Human Rights Act, 2011	Sections 8, 28, 29, 33		Ensures that human rights, including those of workers and local communities, are protected in mining operations, with a focus on fair treatment and equitable resource management.

No.	Policy and Legal Frameworks	Key Applicable Provisions	Regulations	Relevance to Fluorspar Mining
	Climate Change Act, 2016	Section 23		Ensures that mining operations contribute to climate change mitigation efforts, including reducing carbon emissions and promoting sustainable mining practices in line with national policies.

8 PUBLIC PARTICIPATION/STAKEHOLDER ENGAGEENT

8.1 General Information

Public participation is a fundamental principle in Kenya's governance and environmental management frameworks, especially in the context of the Environmental and Social Impact Assessment (ESIA) process and the mining sector. The core principle of consultation in these processes is to ensure that stakeholders' perspectives are thoroughly considered and documented. This approach aims to create an assessment that is comprehensive, transparent, and addresses all relevant issues or perceptions in sufficient detail. It guarantees that beneficiaries and the public living in project areas, both public and private, have the opportunity to influence the overall project design by offering recommendations and expressing concerns before implementation begins.

Kenya's 2010 Constitution, under Article 69 Section 1, along with Legal Notice 101 of the Environmental Management and Coordination Act (EMCA), Cap 387, Section 3 of the EIA/EA regulations, 2003, and Sections 87 and 113 of the County Governments Act, 2012, mandates public participation. EMCA Cap 387 requires project proponents to actively engage with individuals or communities likely to be affected by the project. They must explain the potential impacts, gather oral or written feedback, and incorporate this feedback into the ESIA for the proponent to implement.

In line with these principles, the Mining Act of 2016 also underscores the significance of public participation in the mining sector. The Act mandates community consultation before any mining operations begin, ensuring that local communities are informed about proposed activities and have the chance to express their views. It requires an ESIA to be conducted before issuing mining licenses, integrating public participation to ensure transparency and community involvement.

Additionally, the Act provides for benefit sharing from mining activities with local communities, with public participation playing a key role in determining how these benefits are distributed. It guarantees the public's right to access information related to mining activities and establishes grievance mechanisms to address concerns or disputes. Through these provisions, the Mining Act of 2016 ensures that public participation is an

integral part of the mining process, fostering transparency, accountability, and the protection of community interests.

8.2 Objectives of Public Participation

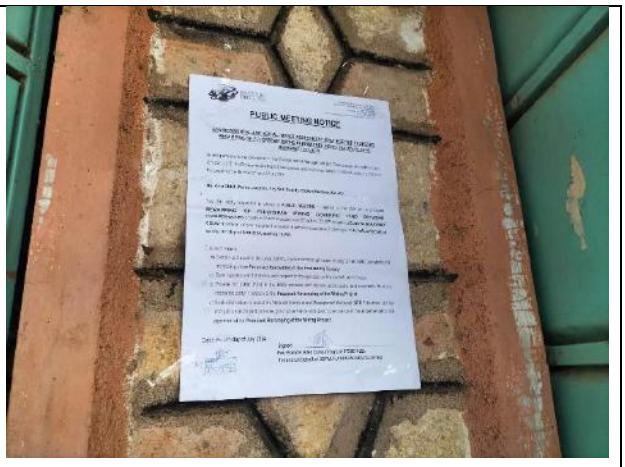
A structured approach to community engagement was implemented to facilitate discussions and, where possible, obtain and record consent on key aspects such as:

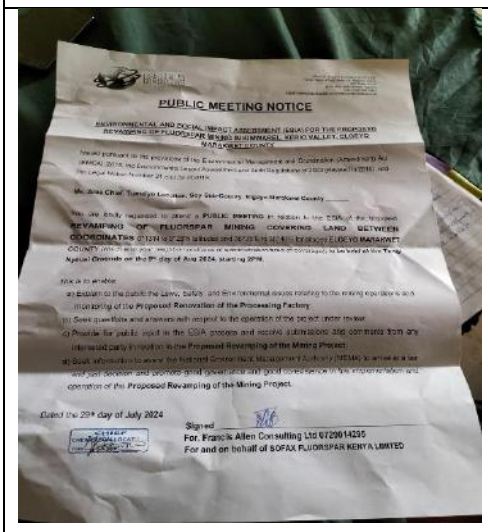
- General Project Acceptance: Engaging the community to gauge and document their overall acceptance of the project, ensuring alignment with local expectations.
- Proposed Mining Methods: Discussing the proposed mining methods, including practical considerations on the alignment design and the footprint of the right of way for fluorspar mining, to ensure that the community understands and can provide input on the operational aspects.
- Impact Identification: Involving the community in identifying both the positive and negative impacts of the project, with a focus on the biophysical and socio-cultural environment in relation to the project's proposed design, as required by the Mining Act of 2016.
- Alternative Alignments and Mining Approaches: Providing a platform for the community to suggest alternative alignments and mining methods for specific areas, giving them the opportunity to influence the final project design.
- Risk Identification: Offering a forum for the community to inform the study team of potential environmental and social risks that the project may encounter, allowing for a proactive approach to risk management.
- Expected Project Benefits: Facilitating discussions to capture the community's and stakeholders' perspectives on the expected benefits of the project, ensuring these are well-documented and understood by all parties.
- Mitigation Measures: Collaborating with the community, government officials, and civil society representatives to discuss practical mitigation measures, informed by local experience, to address potential project impacts.

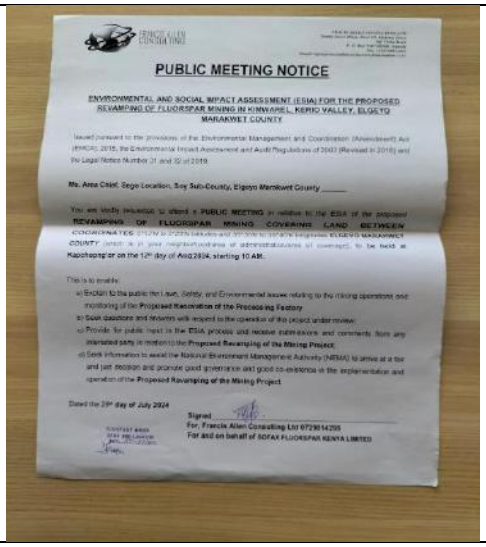
8.2.1.1 Public Consultation Meetings

a) Mobilization for public meetings

With the support of the Soy-Sub County Assistant County Commissioner's office, suitable dates for community consultations in the respective sub-locations were determined and announced at local administration forums and public venues, such as churches, using a language familiar to the community. This approach gave the community ample time to prepare and build consensus on their views and preferences regarding the project. Chiefs assigned their assistants and village headmen to make announcements and post notices at market centers, informing the public about the upcoming meetings. Each sub-location along the project road had its own scheduled meeting, with notices provided at least a week in advance.







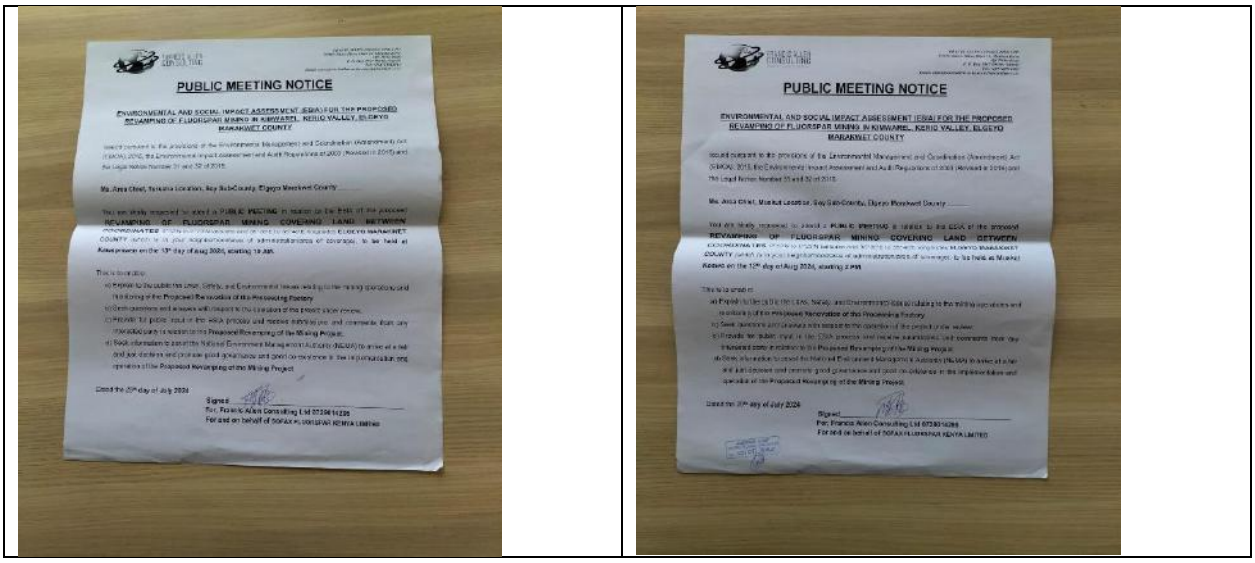


Figure 17: Public Balaza Notices

The consultations were conducted in an open and transparent manner, with the study team presenting both the positive and negative impacts of the project. This facilitated a discussion with the community, allowing them to voice their concerns and collaborate on potential mitigation measures to address the negative impacts. To ensure better understanding and engagement, the consultation team included a local female translator who assisted those unable to comprehend Swahili or English.

Figure 18: Public Balaza Meetings

Table 19: Public Meetings Attendance

Item	Date	Target Sub-Location	Attendants
1	07 August 2024	Kimwarel	90
2	09 August 2024	Tumeiyo	48
3	10 August 2024	Morop	29
4	12 August 2024	Sego	48
5	12 August 2024	Muskut	47
6	13 August 2024	Turesha	37

8.2.2 Feedback from the public meetings

Table 20: Summary of issues raised in public consultation meeting

ISSUE	COMMENTS FROM RESIDENTS	RESPONSE
Environmental and Health Concerns	• How will the mining activities manage environmental pollution, particularly the discharge of waste into rivers, to	• Pollution Control: Mining activities will implement strict pollution control measures, including the treatment of waste

	prevent hazardous effects? • What measures will be taken to control erosion and dust resulting from mining operations? • Are there plans to implement safety measures around mining sites, such as fencing dams and managing hazards from blasting activities? • How will the preservation of water sources be ensured during the mining process? • What steps will be taken to mitigate the environmental impacts on local wildlife and vegetation?	before discharge to prevent river contamination, in compliance with the Environmental Management and Coordination Act (EMCA), 1999, and its regulations on water quality. • Erosion and Dust Control: Erosion and dust control strategies, such as re-vegetation and the use of dust suppressants, will be employed to minimize environmental impact, as mandated by the Environmental Management and Coordination (Air Quality) Regulations, 2014. • Safety Measures: Safety measures around mining sites will include secure fencing around dams and controlled blasting, as required by the Occupational Safety and

		Health Act (OSHA), 2007, to reduce hazards. • Preservation of Water Sources: Preservation of water sources will be ensured through careful monitoring and water conservation practices during mining operations, adhering to the Water Act, 2016, which governs the sustainable use and management of water resources. • Protection of Wildlife and Vegetation: Environmental management plans will include measures to protect local wildlife and vegetation, in line with the Wildlife Conservation and Management Act, 2013, with regular assessments to mitigate impacts.

Compensation and Community Impact	• What compensation will be provided for individuals affected by mining activities, particularly those impacted by blasting damages and land leases? • Will there be clear procedures in place to ensure adequate compensation for those whose livelihoods are disrupted by mining operations? • How will the financial benefits and returns from mining activities be fairly distributed among the community members? • How will grievances related to land use be addressed, and what mechanisms are in place to ensure that affected individuals receive appropriate compensation?	• Fair Compensation: Compensation for individuals affected by mining activities will be guided by transparent procedures, ensuring timely and fair settlements for damages and disruptions, as outlined in the Land Act, 2012, which provides for compensation for land acquisition and use. • Comprehensive Impact Assessments: Affected individuals will receive adequate compensation based on comprehensive impact assessments, with provisions for both immediate and long-term support, in accordance with the Mining Act, 2016, which mandates impact assessments and community benefit sharing. • Equitable Distribution of Benefits: Financial benefits from mining activities will be

		distributed through community development programs, ensuring equitable sharing of profits and resources, as required by the Community Land Act, 2016, which emphasizes community benefits from resource extraction. • Grievance Redress Mechanisms: Grievance redress mechanisms will be established to address land use disputes, ensuring that all affected parties receive appropriate compensation and support, as per the Environmental Management and Coordination (EMCA) Public Complaints Committee Regulations, 2018.

Employment and Economic Opportunities	• How will local employment opportunities be created, especially for unskilled labor and the youth in the community? • What measures will be implemented to ensure transparency in the hiring practices of the mining companies? • How will local businesses be supported, and what infrastructure improvements are planned to enhance economic opportunities? • What steps will be taken to ensure that the community benefits from job creation and economic development resulting from mining activities?	• Prioritizing Local Employment: Local employment opportunities will be prioritized, with recruitment drives specifically targeting unskilled labor and youth within the community, in line with the National Employment Authority Act, 2016, which promotes local employment in major projects. • Transparent Hiring Practices: Hiring practices will be transparent, with clear criteria and processes communicated to the community to ensure fair and equal opportunities, as required by the Fair Administrative Action Act, 2015. • Support for Local Businesses: Local businesses will be supported through preferential procurement

		policies, and infrastructure improvements will focus on enhancing access to markets and services, as outlined in the Public Procurement and Asset Disposal Act, 2015. • Economic Development Initiatives: Economic development initiatives will include training and capacity-building programs to ensure that the community benefits sustainably from job creation, in accordance with the Vision 2030 Economic Pillar, which emphasizes skills development and economic empowerment.
Education and Capacity Building	• Will there be support provided for local educational institutions, including scholarships for students in mining areas? • What capacity-building programs will be offered	• Support for Educational Institutions: Support for local educational institutions will include funding for scholarships, infrastructure development, and resource provision in

	to enhance skills and employability, particularly for vulnerable groups such as PLWD, women, orphans, and youth? • How will the mining company contribute to empowering these groups through education and economic opportunities for long-term community development?	mining-affected areas, as promoted by the Basic Education Act, 2013. • Capacity-Building Programs: Capacity-building programs will be designed to enhance employability, focusing on skills development for women, youth, and other vulnerable groups, in line with the Technical and Vocational Education and Training (TVET) Act, 2013. • Partnerships with Educational Institutions: The mining company will partner with educational and vocational institutions to provide training programs that empower the community, in compliance with the Higher Education Loans Board (HELB) Act, 1995, which supports educational financing and capacity building.

Community Participation and Coexistence	• How will the community be involved in decision-making processes and public consultations before new projects or infrastructure developments are initiated? • What transparency and accountability measures will be implemented in managing community development activities and CSR initiatives? • How will historical grievances be addressed, and what steps will be taken to promote mutual respect and positive coexistence between the community and mining companies?	• Active Community Involvement: The community will be actively involved in decision-making through regular public consultations and stakeholder meetings before the start of new projects, as mandated by the Environmental Management and Coordination (EMCA) Public Participation Guidelines, 2016. • Transparency in Community Development: Transparency and accountability in community development and CSR initiatives will be ensured through open reporting and community oversight committees, in line with the Companies Act, 2015, which governs CSR activities and corporate governance. • Addressing Historical Grievances: Historical

		grievances will be addressed through dialogue and restitution programs, promoting mutual respect and fostering positive relationships between the community and the mining companies, as guided by the National Land Commission Act, 2012.
Infrastructure and Services	• What plans are in place to improve local infrastructure, including roads, water supply, and health facilities? • How will the continuity and development of essential services within the community, such as healthcare and educational facilities, be ensured? • What measures will be taken to address logistical challenges and ensure that the infrastructure and service	• Infrastructure Development: Local infrastructure development plans will include the construction and maintenance of roads, improved water supply systems, and upgraded health facilities, as required by the County Governments Act, 2012, which emphasizes local infrastructure development. • Support for Essential Services: Continuous development of essential

	needs of the community are adequately met?	services will be prioritized, with the mining company committing to support healthcare, education, and other critical services in the community, in compliance with the Health Act, 2017, which ensures the provision of health services at the county level. • Addressing Logistical Challenges: Logistical challenges will be addressed through coordinated efforts with local authorities to ensure that infrastructure meets the community's needs effectively, as outlined in the Physical and Land Use Planning Act, 2019, which governs land use planning and infrastructure development.

8.2.3 Community Questionnaire Results and Expert Comments on the Proposed Mining Activity

8.2.3.1 Support for the Proposed Mining Activity

All 38 respondents interviewed were in support of the proposed mining activity, voting "Yes" to its initiation. This overwhelming endorsement from the community highlights their recognition of the potential benefits that mining could bring to their region.

8.2.3.2 Positive Impacts and Reasons for Support

The respondents cited numerous reasons for their support, focusing on the positive socio-economic impacts of the mining project. These include:

- **Economic Development**: The community views mining as a driver for regional economic growth, contributing to poverty alleviation and boosting local commerce.
- **Employment Opportunities**: Job creation was a significant reason for support, as the mining project is expected to provide direct and indirect employment, addressing the high levels of unemployment in the area.
- **Infrastructure Development**: The community anticipates improvements in infrastructure such as roads, schools, hospitals, electricity, and water supply, which are often lacking in rural areas.
- **Revenue to the Government**: Mining activities will contribute to government revenues through taxes, royalties, and licensing fees, potentially leading to better public services for the community.
- **Promotion of Livelihoods**: The project is expected to enhance the livelihoods of local residents by increasing income levels and providing opportunities for business growth.
- **Capacity Building and Skills Development**: Mining operations typically come with training programs, which will improve the skill base of the local population, making them more employable in other sectors.
- **Improved Health Services**: The anticipated development of health facilities by the mining company as part of corporate social responsibility (CSR) efforts is seen as a potential improvement to community health care access.

Potential Negative Impacts and Concerns

While the support for mining is strong, the community also highlighted several potential negative impacts that could arise from the project:

- **Disturbance of Culturally Important Trees and Areas**: Mining could encroach on sacred sites and areas of cultural significance, causing a loss of heritage and affecting traditional practices.
- **Community Conflict with the Company**: There is concern about possible tensions between the community and the mining company, particularly regarding land use and benefit sharing.
- **Rise in Communicable Diseases**: The influx of workers and outsiders may lead to an increase in communicable diseases such as HIV/AIDS and other sexually transmitted infections (STIs).
- **Pollution and Impact on Animals**: The community is concerned about water pollution from mining activities, which could affect livestock and wildlife. Additionally, reduced grazing areas due to land degradation could disrupt pastoralist activities.
- **Increased Pollution**: Mining can lead to water, air, and soil pollution, impacting both human health and agricultural productivity.
- **Noise and Vibration Pollution**: Blasting activities in mining may cause noise and vibrations, potentially damaging properties and disturbing the local population.
- **Soil Erosion and Landslides**: The clearing of vegetation for mining may increase the risk of soil erosion and landslides, particularly in hilly areas.
- **Deforestation and Loss of Biodiversity**: The project may lead to deforestation, resulting in habitat loss for wildlife and increased human-wildlife conflicts.
- **Human-Wildlife Conflict**: Displacement of wildlife from their natural habitats could cause animals to move into residential areas, posing risks to both humans and wildlife.
- **Pollution-Related Diseases**: Increased pollution may lead to waterborne diseases and respiratory tract infections (RTIs) within the community.

8.2.3.3 Community Recommendations for Mitigating Negative Impacts

To address these concerns, the community has provided several recommendations to mitigate the potential negative impacts of the mining project:

- **Protection of Shrines and Culturally Important Sites**: The company should take measures to avoid disturbing sacred areas and culturally significant trees, respecting local traditions and practices.
- **Agroforestry and Conservation**: Implementing agroforestry practices and conserving vegetation in non-mining areas will help mitigate deforestation and soil erosion.
- **Proper Waste Disposal**: Ensuring that waste, including overburden from mining, is properly managed to prevent contamination of water bodies and surrounding land.
- **Coexistence with the Community**: The mining company must work closely with local residents to foster harmonious relationships, addressing grievances and involving the community in decision-making.
- **Observance of Safety Measures**: The company should adhere to strict safety protocols to protect workers and the community from potential mining hazards.
- **Compliance with Laws and Regulations**: Mining activities should comply with Kenya's Mining Act of 2016, including environmental and social impact mitigation requirements.
- **Management of Overburden**: Overburden from mining can be repurposed for refilling gullies, stabilizing land, and preventing soil erosion.
- **Benefit Sharing**: The community recommends allowing residents to graze animals and cultivate land in areas not actively used by the mining company, ensuring that local livelihoods are not disrupted.
- **Corporate Social Responsibility (CSR)**: The company should provide essential services such as water, scholarships for local children, and improvements to learning institutions as part of its CSR efforts.
- **Wildlife Management**: The involvement of Kenya Wildlife Services (KWS) in safely relocating wildlife from the mining area will help prevent human-wildlife conflicts.
- **Soil Conservation**: Soil conservation measures should be implemented to prevent erosion, including agroforestry and afforestation programs in affected areas.

- **Local Employment**: The company should prioritize employing locals for jobs created by the project to promote economic development within the community.
- **Communication and Engagement**: Maintaining open communication between the company and the community is crucial for resolving issues early and ensuring transparency.
- **Capacity Building**: The company should provide training to the community on environmental conservation and sustainable land use to minimize the negative impact of mining.
- **Fencing of Mining Sites**: Erecting fences around active mining areas can prevent animals and unauthorized individuals from entering dangerous zones.
- **Protection of Catchment Areas**: Ensuring that water catchment areas are preserved and not disturbed by mining activities will help maintain water quality for the community.

8.2.3.4 Comments

The results of the questionnaire indicate strong community support for the proposed mining activity due to its anticipated economic benefits. However, the concerns raised underscore the need for robust environmental and social management plans. The community's recommendations align with best practices for mitigating mining-related impacts, including the protection of cultural heritage, responsible waste management, and conservation efforts.

It is essential for SOFAX Fluorspar Kenya ltd to actively involve the community in the implementation of these recommendations, ensuring that their needs are addressed and that environmental sustainability is prioritized. The company must also ensure compliance with relevant legal frameworks, such as the Mining Act 2016 and EMCA regulations, to safeguard the health and well-being of both the community and the environment. Implementing CSR initiatives and providing training on conservation will foster positive relationships between the company and the community, while addressing long-term environmental concerns.

9 Climate Change Risk and Vulnerability Assessment

9.1 Introduction

9.1.1 Background

The proposed fluorspar mining project, initiated by Sofax Fluorspar Kenya Limited, aims to revive mining operations in the Kerio Valley, an area with a history of fluorspar extraction previously overseen by the Kenya Fluorspar Company. The project site is situated in the Soy-South location of Keiyo South sub-county in Elgeyo/Marakwet County. This region is notable for its varied landscape, characterized by a mix of steep slopes, valleys, and relatively flat areas, which are crucial for both the local ecology and human activity. The community within this area primarily relies on agriculture and livestock rearing, with smallholder farmers growing crops like maize, beans, and vegetables, and raising cattle, goats, and sheep. The project's reactivation is anticipated to provide economic benefits to the local population while also posing potential environmental and social challenges that need careful management, especially in the context of climate change and its associated risks.

9.1.2 Purpose and Objectives

The primary objective of this Climate Change Risk and Vulnerability Assessment is to systematically identify, analyze, and evaluate the climate-related risks that could potentially impact the proposed fluorspar mining project in Kerio Valley. The assessment seeks to provide a comprehensive understanding of how climate change could affect the project's operations, surrounding environment, and the local community. This understanding is crucial for developing effective adaptive strategies aimed at mitigating these risks, thereby ensuring that the mining operations remain sustainable and resilient in the face of a changing climate. Additionally, the assessment aims to protect the local community and environment by proposing measures that align with both national and international environmental standards. By doing so, the project will not only fulfill regulatory requirements but also contribute to the broader goals of environmental conservation and community well-being in Elgeyo/Marakwet County.

9.1.3 Scope

This Climate Change Risk and Vulnerability Assessment encompasses the geographical area of Kerio Valley, with a specific focus on Soy-South location, Keiyo South sub-county

of Elgeyo/Marakwet County. The assessment covers both the current and anticipated future climate conditions, utilizing a combination of historical data, climate modeling, and stakeholder consultations. The scope extends to the physical environment, including land, water, and air quality, as well as the socio-economic aspects of the local community, particularly how they might be affected by climate-related changes. Additionally, the assessment integrates the insights and experiences of local stakeholders, including community members, local authorities, and environmental experts, to ensure that the evaluation is grounded in local realities and concerns. This comprehensive approach is designed to inform the development of robust adaptation strategies that can effectively address the identified risks and vulnerabilities.

9.1.4 Data Sources

The data for this assessment was drawn from multiple sources to ensure a comprehensive and accurate evaluation of the climate risks and vulnerabilities. Primary data was collected through stakeholder interviews with community members, local authorities, environmental experts, and representatives from Sofax Fluorspar Kenya Limited. These interviews provided valuable insights into local climate perceptions, historical weather patterns, and community concerns. In addition to stakeholder interviews, Geographic Information System (GIS) mapping and satellite imagery analysis were employed to assess the environmental impacts and spatial distribution of risks across the project area. The combination of these data sources allowed for a thorough analysis of both the physical and social dimensions of climate vulnerability in Kerio Valley. This multi-source data collection approach also ensured that the assessment was grounded in both empirical evidence and local knowledge, making the findings more relevant and actionable for stakeholders.

9.1.5 Assessment Tools

The assessment utilized several specialized tools to analyze the data and assess the climate-related risks. A GIS-based spatial analysis was conducted to map vulnerable areas within the project site and to assess the spatial distribution of various climate risks, such as flooding, erosion, and landslides. This spatial analysis provided a visual representation of the areas most at risk, enabling targeted adaptation measures. Scenario analysis was another critical tool used to project potential future climate risks based on

different climate change scenarios. This approach allowed for the consideration of a range of possible futures, helping to plan for uncertainties. Additionally, a risk matrix was applied to prioritize the identified risks based on their likelihood and potential impact on both the mining operations and the local community. These tools collectively provided a comprehensive framework for understanding and addressing the climate-related risks associated with the proposed fluorspar mining project.

9.2 Climate Change Context

9.2.1 Climate Change Trends

Kerio Valley has experienced significant shifts in climate patterns over the past few decades, with noticeable changes in temperature, precipitation, and the frequency of extreme weather events. Average temperatures in the region have been steadily rising, contributing to a range of environmental changes, including shifts in growing seasons and increased evaporation rates. Precipitation patterns have also become more erratic, with periods of intense rainfall leading to floods and prolonged dry spells causing droughts. These changes in climate patterns are already having serious implications for the local community and the proposed mining operations. Increased temperatures can lead to higher energy costs for cooling and greater water evaporation, exacerbating water scarcity. Altered precipitation patterns can increase the risk of floods, landslides, and soil erosion, all of which can negatively impact both the mining infrastructure and the agricultural livelihoods of the local population (Robalino et al., 2023). These trends highlight the urgent need for adaptive measures to mitigate climate-related risks.

9.2.2 Regional/Local Climate Projections

Projections for Kerio Valley suggest that climate change will continue to intensify over the coming decades, with significant implications for the proposed fluorspar mining project. Average temperatures are expected to rise by 1.5 to 2°C over the next 30 years, a trend that 90% of local respondents have already observed. This temperature increase is likely to exacerbate water scarcity, heat stress, and energy demand, all of which could impact mining operations and local agriculture. Precipitation changes are also anticipated, with more intense rainfall during the wet season, increasing the risk of floods and soil erosion, which could damage infrastructure and degrade land quality. The frequency of extreme weather events, such as floods, droughts, and storms, is expected to rise, posing

additional risks to both the mining project and the surrounding communities. These projections underscore the importance of integrating climate resilience into the planning and operations of the fluorspar mining project.

9.2.3 Uncertainties in Climate Projections

While the general trends in climate change are clear, there are still significant uncertainties regarding the exact timing and magnitude of future impacts. These uncertainties are inherent in climate modeling due to the complexity of climate systems and the influence of various socio-economic factors. For example, the exact increase in temperature or change in precipitation patterns could vary depending on global greenhouse gas emission trajectories and local environmental conditions. These uncertainties have been carefully considered in this risk assessment to ensure that the recommended adaptation measures are flexible and robust enough to handle a range of potential scenarios. By accounting for these uncertainties, the assessment aims to provide a more comprehensive and resilient framework for planning and decision-making, ensuring that the fluorspar mining project can adapt to a range of possible future climate conditions.

9.3 Risk Identification and Hazard Assessment

9.3.1 Climate Hazards

The primary climate hazards identified for the Kerio Valley region include flooding, drought, landslides, and soil erosion. Flooding is a particularly high-priority hazard, with 70% of local respondents reporting unpredictable and severe floods that pose significant risks to infrastructure, mining operations, and community safety. Flooding can lead to direct damage to mining infrastructure, disrupt operations, and pose serious safety hazards for workers and the local population. Drought is another critical hazard, with 80% of respondents experiencing periodic and prolonged droughts that threaten water resources, agricultural productivity, and operational continuity. Prolonged droughts can reduce water availability for both the community and the mining operations, potentially leading to conflicts over water use. Landslides are also a significant concern, particularly in areas with steep terrain and deforestation, as they can cause severe damage to infrastructure and pose safety risks. Soil erosion, exacerbated by increased rainfall

intensity and deforestation, is a critical issue that can lead to land degradation and potential damage to mining sites.

9.3.2 Frequency and Intensity

The frequency and intensity of the identified climate hazards are expected to increase with ongoing climate change. Flooding is anticipated to become more frequent during the rainy season, with increasing intensity due to climate change. This could lead to more frequent disruptions of mining operations, as well as greater risks to local infrastructure and communities. Droughts are also expected to increase in both frequency and duration, particularly during the dry season, exacerbating water scarcity issues and threatening agricultural productivity. Landslides and soil erosion, while more sporadic, are likely to become more severe, particularly in areas with disturbed soil or lacking vegetation. These hazards pose significant risks to both the mining project and the local community, necessitating the implementation of robust adaptation measures to mitigate their impacts. Understanding the frequency and intensity of these hazards is crucial for developing effective risk management strategies and ensuring the long-term sustainability of the mining project.

9.3.3 Exposure and Vulnerability

The exposure and vulnerability of the Kerio Valley region to climate-related hazards vary depending on the specific geographical and socio-economic conditions. Areas with steep slopes and deforestation are particularly vulnerable to landslides and soil erosion, while low-lying areas are more prone to flooding. The local community, which relies heavily on agriculture and livestock rearing, is highly vulnerable to droughts and changes in precipitation patterns. Additionally, the mining infrastructure, particularly in flood-prone areas, is exposed to significant risks from flooding and landslides. Vulnerability is further exacerbated by the limited adaptive capacity of the local community, including inadequate infrastructure, lack of access to resources, and limited awareness of climate risks. Understanding the exposure and vulnerability of both the mining project and the local community is critical for developing targeted adaptation measures that can effectively reduce the risks posed by climate-related hazards.

9.4 Impacts on Proposed Project

9.4.1 Environmental Impacts

The potential environmental impacts of climate change on the proposed fluorspar mining project are significant and multifaceted. Flooding could lead to the contamination of water sources with pollutants from mining activities, posing risks to both the environment and public health. Drought conditions could exacerbate water scarcity, leading to conflicts over water use between the mining operations and the local community. Soil erosion and landslides could result in the loss of topsoil and vegetation, further degrading the environment and threatening the sustainability of both mining and agricultural activities. Additionally, changes in temperature and precipitation patterns could disrupt local ecosystems, leading to a loss of biodiversity and negatively impacting the livelihoods of communities that rely on these ecosystems. These environmental impacts highlight the need for proactive measures to protect the local environment and ensure the sustainability of the mining project.

9.4.2 Socio-Economic Impacts

The socio-economic impacts of climate change on the proposed fluorspar mining project and the surrounding community are likely to be significant. Flooding and landslides could lead to the displacement of communities, loss of homes, and damage to infrastructure, all of which would have serious economic and social consequences. Drought conditions could reduce agricultural productivity, leading to food insecurity and loss of income for local farmers. Water scarcity could also lead to conflicts between the mining operations and the local community, particularly if water resources are not managed equitably. Additionally, the increased frequency and intensity of extreme weather events could lead to disruptions in mining operations, resulting in economic losses and potential job cuts. These socio-economic impacts underscore the importance of developing strategies to enhance the resilience of both the mining operations and the local community to climate-related risks.

9.4.3 Impact on Operations and Production

The proposed fluorspar mining project is likely to face significant operational and production challenges due to climate change. Flooding, landslides, and soil erosion could lead to damage to mining infrastructure, disrupting operations and potentially leading to

production losses. Drought conditions could exacerbate water scarcity, limiting the availability of water for mining processes and increasing the risk of operational delays. Additionally, the increased frequency of extreme weather events could lead to more frequent disruptions in mining operations, reducing productivity and increasing operational costs. These operational and production impacts highlight the need for adaptive measures to ensure the resilience of the mining operations to climate-related risks.

9.5 Adaptation Strategies

9.5.1 Short-Term Strategies

In the short term, the proposed fluorspar mining project should implement a range of adaptive strategies to mitigate the risks posed by climate-related hazards. These strategies could include the construction of flood defenses and drainage systems to protect mining infrastructure from flooding and landslides, as well as measures to improve water management and reduce water use during periods of drought. Additionally, the project should invest in early warning systems and emergency response plans to ensure that both the mining operations and the local community are prepared for extreme weather events. These short-term strategies are designed to provide immediate protection against the most pressing climate-related risks, ensuring the continuity of operations and minimizing potential impacts on the local community and environment.

9.5.2 Long-Term Strategies

In the long term, the proposed fluorspar mining project should focus on building resilience to climate change through the development of sustainable practices and infrastructure. This could include the adoption of more efficient water management practices, the use of renewable energy sources to reduce reliance on fossil fuels, and the integration of climate considerations into all aspects of project planning and operations. Additionally, the project should work closely with the local community to develop and implement community-based adaptation strategies, such as reforestation, soil conservation, and sustainable agriculture practices. By investing in long-term resilience, the mining project can ensure its sustainability and contribute to the broader goals of environmental conservation and community well-being.

9.6 Conclusion and Recommendations

The Climate Change Risk and Vulnerability Assessment has identified a range of climate-related risks that could impact the proposed fluorspar mining project in Kerio Valley. These risks, including flooding, drought, landslides, and soil erosion, pose significant challenges to both the mining operations and the local community. However, by implementing a combination of short-term and long-term adaptation strategies, the project can mitigate these risks and ensure its sustainability in the face of a changing climate. The assessment recommends that Sofax Fluorspar Kenya Limited prioritize the development of adaptive capacity, both within the mining operations and the local community, to enhance resilience to climate-related risks. This could include investing in climate-resilient infrastructure, improving water management practices, and working closely with local stakeholders to develop community-based adaptation strategies. By taking these steps, the project can not only protect its operations but also contribute to the broader goals of environmental conservation and community well-being in Elgeyo/Marakwet County.

10 Alternatives for Development

10.1 Introduction

In the planning and execution of development projects, the evaluation of various alternatives is a critical step to ensure that the selected course of action aligns with both the project's objectives and the broader goals of sustainability and environmental stewardship. The following section outlines multiple alternatives for the renovation of existing facilities, open cast mining and earth movement activities, and liquid and solid waste treatment and disposal options. Each alternative presents distinct benefits and challenges, reflecting different approaches to achieving the desired outcomes.

As the project proponent, you are presented with a range of viable alternatives. Each has been carefully analyzed to highlight its potential impact on operational efficiency, environmental sustainability, and community well-being. It is essential to recognize that the choice of alternative will significantly influence the project's long-term success and its compliance with environmental and social regulations.

In selecting the most appropriate alternative for your situation, we recommend a collaborative approach that considers both the technical and economic feasibility, as well as the environmental management strategies that can mitigate potential negative impacts. The final Environmental and Social Impact Assessment (ESIA) report will incorporate these considerations, ensuring that the chosen alternative not only meets your operational needs but also aligns with best practices in environmental management and regulatory compliance.

Ultimately, the goal is to identify an alternative that balances operational efficiency, cost-effectiveness, and environmental responsibility, thereby supporting sustainable development and fostering positive relationships with the surrounding community and regulatory bodies.

10.2 Renovation of the Existing Facility

10.2.1 Alternative 1: Comprehensive Renovation

This alternative involves a thorough renovation of the entire facility. The scope includes structural repairs, machinery upgrades, and enhancing operational efficiency across all areas, including the crushing plant, mine lab, offices, and residential

complex. The benefits of this alternative include a significant improvement in productivity and compliance with modern safety and environmental standards. Worker safety and comfort would also be enhanced, leading to better operational outcomes. However, the primary drawbacks are the high initial investment required and the potential for temporary operational disruptions during the renovation process. Despite these challenges, this alternative promises long-term gains in efficiency, safety, and compliance, making it a strong candidate for implementation.

10.2.2 Alternative 2: Partial Renovation

This alternative focuses on upgrading only critical areas of the facility, such as the crushing plant and mine lab, while other areas receive basic maintenance. The main advantage of this approach is the lower cost and shorter downtime compared to a comprehensive renovation. However, the drawbacks include limited improvements in operational efficiency and safety, which could lead to potential long-term operational issues. This alternative may offer short-term savings, but it might not fully address the facility's long-term needs, possibly resulting in higher cumulative costs over time.

10.2.3 Alternative 3: No Action

Under this alternative, the existing facilities would be maintained without any renovation. The primary benefit of this approach is the absence of immediate costs. However, the drawbacks are significant, including continued inefficiencies, an increased risk of equipment failure, and non-compliance with current safety and environmental standards. Over time, this could lead to operational disruptions and higher maintenance costs, making this option the least desirable among the alternatives.

10.3 Open Cast Mining and Earth Movement Activities

10.3.1 Alternative 1: Conventional Open Cast Mining

This alternative involves the use of standard drilling, blasting, loading, and hauling techniques using conventional mining equipment. The benefits of this approach include the use of proven technology that is reliable and well-understood in the industry. However, the drawbacks are substantial, including high levels of dust and noise, as well as significant environmental disturbance. This method also poses

greater risks to community health and safety, making it less favorable from an environmental and social perspective.

10.3.2 Alternative 2: Continuous Surface Mining

This alternative proposes the use of continuous miners, which reduce the need for traditional drilling and blasting methods. The benefits include lower dust and noise levels, as well as a reduced environmental footprint, which aligns with community health and environmental protection goals. However, this alternative requires a higher initial investment in machinery and offers less flexibility in mining operations compared to conventional methods. Despite these challenges, the environmental and health benefits make this a viable option for sustainable mining practices.

10.3.3 Alternative 3: Selective Mining Techniques

Selective mining methods are proposed under this alternative to minimize overburden removal and reduce environmental impact. The benefits include reduced waste generation and a lower environmental impact, making it an environmentally friendly option. However, the drawbacks include potentially lower ore recovery rates and the need for more complex planning and operations. While this alternative is environmentally advantageous, the economic feasibility may be compromised due to lower productivity and higher operational complexity.

10.3.4 Alternative 4: No Action

In this scenario, no new mining activities would be undertaken. The main benefit is the avoidance of additional environmental disturbances. However, the drawbacks include a halt in ore production, leading to a loss of economic benefits and potential job losses in the community. This alternative would also fail to capitalize on the available resources, making it an impractical option from an economic standpoint.

10.4 Liquid and Solid Waste Treatment and Disposal Options

10.4.1 Alternative 1: Conventional Treatment Systems

This alternative involves the use of established wastewater treatment plants and solid waste disposal methods. The benefits of this approach include the reliability and familiarity of the technology, which is widely used and understood. However, the drawbacks include higher operating costs and a larger environmental footprint due to

the extensive use of land and resources for waste treatment and disposal. While effective, this alternative may not align with modern sustainability goals.

10.4.2 Alternative 2: Advanced Treatment Technologies

Under this alternative, advanced technologies such as membrane bioreactors and anaerobic digesters for liquid waste, along with incineration for solid waste, would be employed. The benefits include higher efficiency in waste treatment, lower environmental impact, and better alignment with modern sustainability practices. However, the drawbacks include a high initial capital investment and the need for complex operation and maintenance processes. Despite these challenges, this alternative offers long-term benefits in terms of sustainability and compliance with environmental regulations.

10.4.3 Alternative 3: Zero-Liquid Discharge (ZLD) Systems

This alternative involves the implementation of ZLD systems to recycle and reuse all wastewater. The benefits include minimizing water pollution and promoting sustainable water management practices, which are critical for environmental protection. However, the drawbacks are significant, including very high costs and the complexity of the technology required. While ZLD systems offer excellent environmental benefits, the financial and operational challenges may outweigh the advantages, especially for smaller-scale operations.

10.4.4 Alternative 4: No Action

Continuing with existing waste management practices without implementing new technologies is the focus of this alternative. The main benefit is the avoidance of immediate costs associated with upgrading or implementing new systems. However, the drawbacks include ongoing environmental degradation and potential non-compliance with updated regulations. Over time, this could lead to penalties and increased environmental and social costs, making it a less sustainable option.

10.5 Summary and Recommendations

10.5.1 Renovation of the Existing Facility

The recommended alternative is Comprehensive Renovation. This approach ensures long-term operational efficiency, safety, and compliance with modern standards. While the initial investment is high, the benefits in terms of improved productivity,

reduced operational risks, and enhanced worker safety outweigh the costs. Comprehensive renovation also aligns with regulatory requirements and industry best practices, making it the most viable option for sustainable facility management.

10.5.2 Open Cast Mining and Earth Movement Activities

The recommended alternative is Continuous Surface Mining. This method offers a balance between operational efficiency and environmental protection. By reducing dust and noise levels, it aligns with community health and environmental goals, making it a sustainable option for modern mining operations. The initial investment is justified by the long-term benefits in terms of reduced environmental impact and improved community relations.

10.5.3 Liquid and Solid Waste Treatment and Disposal

The recommended alternative is Advanced Treatment Technologies. This option provides efficient waste management with a lower environmental impact, ensuring compliance with modern environmental standards. Though the initial costs are high, the long-term benefits in terms of sustainability and regulatory compliance justify the investment. Advanced treatment technologies also position the operation as a leader in environmental stewardship, enhancing its reputation and community relations.

10.6 Justification for Eliminated Alternatives

10.6.1 Partial Renovation

This alternative does not adequately address the facility's long-term needs and may result in higher cumulative costs due to ongoing maintenance and inefficiencies. While initially less costly, it could lead to greater financial burdens over time and fail to meet modern safety and environmental standards, making it an unsustainable option.

10.6.2 Conventional Open Cast Mining

The high environmental impact and community disturbance associated with this method make it less desirable. Despite its proven reliability, the significant dust, noise, and ecological disruption it causes are not aligned with current environmental and social expectations. This alternative would likely face significant resistance from both regulatory bodies and the community.

10.6.3 Selective Mining Techniques

While this approach is environmentally advantageous due to reduced waste and lower impact, the lower ore recovery rates and increased operational complexity do not align well with the project's economic goals. The reduced productivity and higher costs make this a less viable option for large-scale mining operations.

10.6.4 Zero-Liquid Discharge (ZLD) Systems

The extremely high costs and complexity of ZLD systems do not justify their benefits in the context of this project's scale and resources. While ZLD offers superior environmental outcomes, the financial and operational challenges make it impractical for implementation, especially when balanced against the project's economic objectives.

10.6.5 No Action Alternatives

Choosing to take no action results in continued inefficiencies, environmental degradation, and a loss of potential economic and social benefits. This approach fails to address critical issues related to operational safety, environmental compliance, and community well-being, making it an unsustainable and short-sighted option.

11 POTENTIAL IMPACTS AND MITIGATION MEASURES

11.1 Positive Impacts Associated with the Fluorspar Mining Project

11.1.1 Construction Phase

- **Job Creation and Employment Opportunities**: The construction phase of the fluorspar mining project will generate numerous employment opportunities for local residents, particularly in roles related to site preparation, infrastructure development, and support services. This will lead to a significant boost in local employment, improving the standard of living for many families.
- **Economic Stimulus**: The influx of investment during the construction phase will stimulate the local economy. The procurement of construction materials, the hiring of local contractors, and the demand for various services will benefit local businesses, leading to economic growth in the region.
- **Infrastructure Development**: Construction activities will include the development of essential infrastructure such as roads, utilities, and support facilities necessary for the mining operations. These improvements will enhance access and connectivity for the local community, contributing to regional development.
- **Capacity Building**: The project will offer training and capacity-building opportunities for the local workforce, equipping them with skills relevant to the mining industry. This will enhance their employability in future projects, leading to long-term benefits for the community.

11.1.2 Operational Phase

- **Sustained Employment**: The operational phase of the fluorspar mining project will provide ongoing employment opportunities, ensuring economic stability for many local families. This sustained employment will be crucial in maintaining livelihoods and supporting the local economy.
- **Increased Economic Activity**: Continuous operations will drive economic activity in the region through the regular procurement of goods and services. Local businesses, especially those providing mining-related supplies and services, will benefit from the steady demand, contributing to the overall economic prosperity of the area.

- **Enhanced Production Efficiency**: The mining project, through the use of advanced technologies and efficient processes, will lead to higher productivity and optimal resource utilization. This will ensure the project's long-term viability and contribute to the sustainable extraction of fluorspar.
- **Technological Advancements**: The adoption of modern mining techniques and environmental management practices will introduce innovation to the local mining sector. These advancements will not only improve operational efficiency but also minimize environmental impacts, aligning with best practices in sustainable mining.
- **Community Development Initiatives**: The mining company is likely to engage in Corporate Social Responsibility (CSR) initiatives, funding local educational programs, healthcare services, and other community projects. These efforts will directly contribute to the socio-economic development of the region, improving the quality of life for residents.

11.1.3 Decommissioning Phase

- **Resource Recovery and Recycling**: During the decommissioning phase, the project will focus on the recovery and recycling of materials used in the mining operations. This approach will reduce waste, promote sustainability, and minimize the environmental footprint of the project.
- **Land Restoration and Rehabilitation**: Decommissioning will include comprehensive land restoration and rehabilitation efforts, aimed at returning the mining site to a natural state or preparing it for future productive use. This will enhance local biodiversity, improve environmental quality, and potentially create new opportunities for land use.
- **Transfer of Skills and Knowledge**: Workers involved in the fluorspar mining project will have gained valuable skills and knowledge that can be transferred to other industries or future projects. This will contribute to the long-term development and diversification of the local workforce.
- **Potential for New Development**: After the decommissioning of the mining operations, the rehabilitated land and remaining infrastructure could be

repurposed for new development projects. This could lead to new economic opportunities for the local community, fostering continued regional development.

These positive impacts emphasize the potential benefits of the fluorspar mining project across its various phases, contributing to economic growth, community development, and environmental sustainability.

11.2 Negative Impacts Associated with the Fluorspar Mining Project

11.2.1 Renovation Phase Potential Environmental Impacts

1. **Air Quality**

Relative Importance: High

During the renovation phase, air quality is a significant environmental concern. The upgrading of processing and crushing plants may generate dust and emissions during the installation of new machinery and equipment. Additionally, the procurement and operation of new mining machinery could lead to an increase in emissions.

Mitigations:

- To mitigate these impacts, it is essential to implement dust control measures, such as water spraying and proper ventilation.
- Using equipment with low emissions standards can help reduce the overall impact on air quality.

2. **Water Resources and Hydrology**

Relative Importance: High

Water resources and hydrology are critically important during the renovation phase, particularly concerning the restocking of chemicals and the renovation of fuel pumps. There is a risk of chemical spills and contamination during the transportation and storage of these materials, which could adversely affect both surface and groundwater. Similarly,

the renovation of fuel pumps poses a potential risk for fuel leaks that could contaminate groundwater.

Mitigations:

- Proper storage facilities with spill containment systems should be established
- Regular monitoring should be conducted to ensure the integrity of these systems.

3. **Soil Quality**

Relative Importance: Medium

Soil quality may be impacted during the renovation phase, primarily due to construction activities associated with the installation of new equipment. These activities could lead to soil disturbance and increase the risk of erosion.

Mitigations:

- Implement erosion control measures such as silt fences, and contouring
- Practice proper site management.

4. **Noise Pollution**

Relative Importance: Medium

Noise pollution is a moderate concern during the renovation of the crushing plant and the operation of new machinery. The increased noise levels can affect both workers and nearby communities, potentially leading to health issues such as hearing loss and increased stress.

Mitigations:

- Use of noise-reducing equipment should be installed where possible.
- Providing hearing protection for workers
- Implementing operational time restrictions can help reduce the impact on the surrounding environment and community.

5. **Biodiversity and Habitat Disruption**

Relative Importance: Medium

The renovation activities have the potential to disrupt local biodiversity and habitats, particularly if they involve significant construction or land alteration. Such disruptions can negatively affect local flora and fauna, leading to habitat loss or fragmentation.

Mitigations:

- Conduct thorough environmental impact assessments before beginning renovation activities.
- Implementing habitat restoration plans where necessary will help mitigate the negative impacts on biodiversity and contribute to the preservation of local ecosystems.

6. **Waste Management**

Relative Importance: Medium

Waste management is another key environmental issue during the renovation phase, particularly concerning the generation of construction and chemical waste. The renovation of the processing plant and mine lab is likely to produce various types of waste, including hazardous chemicals and construction debris.

Mitigations:

- A comprehensive waste management plan should be developed and strictly followed to mitigate these impacts.
- Provisions for the safe disposal or recycling of waste materials,
- Apply measures to prevent environmental contamination.

7. **Socio-Economic Impacts**

Relative Importance: High

The renovation phase is expected to have significant socio-economic impacts, primarily positive. The renovation and deployment of human resources will create job opportunities, improve local infrastructure, and enhance the local economy. These benefits can contribute to the overall well-being of the community. To maximize these positive impacts, it is important to ensure:

- Fair labor practices,
- Provide adequate training for workers,
- Establish community support programs that address the needs of the local population.

8. **Health and Safety**

Relative Importance: High

Health and safety are critical concerns during the renovation and operation activities. Workers may be exposed to potential health risks from dust, chemicals, and noise, which could lead to respiratory issues, chemical burns, or hearing loss.

Mitigations:

- Strict health and safety protocols must be implemented, including the use of personal protective equipment (PPE),
- Regular health screenings for workers, and ongoing safety training.
- Ensuring a safe working environment will protect workers and minimize the risk of accidents or health issues.

11.2.2 Potential Environmental Impacts During Operation Phase

1. **Deforestation and Habitat Loss**

Relative Importance: High

During the operation phase, deforestation and habitat loss are significant environmental concerns, primarily due to the removal of overburden. This process involves clearing

vegetation and debris, which can lead to the destruction of habitats for local flora and fauna, resulting in a loss of biodiversity.

Mitigations:

- Implement reforestation programs.
- Develop and execute habitat restoration plans post-mining.

2. **Soil Erosion and Degradation**

Relative Importance: High

The operation phase also poses a high risk of soil erosion and degradation. The removal of overburden disturbs the soil structure, making it more susceptible to erosion, particularly during rainy seasons. This can lead to the loss of topsoil, reduced soil fertility, and further environmental degradation.

Mitigations:

- Utilize erosion control measures such as silt fences.
- Quickly revegetate exposed areas to stabilize the soil.

3. **Water Pollution**

Relative Importance: High

Water pollution is a critical concern during the operation phase, especially during the concentration process. The use of chemicals in flotation cells poses a risk of contaminating local water bodies if not properly managed, which can have severe impacts on aquatic life and water quality for human consumption.

Mitigation Measures:

- Install and maintain proper wastewater treatment systems.
- Regularly monitor water quality to detect and address any contamination promptly.

4. **Air Quality**

Relative Importance: High

Air quality may be significantly impacted during the ore extraction, crushing, and grinding processes. These activities generate dust and emissions from machinery and blasting, which can deteriorate air quality, affecting the health of workers and nearby communities.

Mitigation Measures:

- Employ dust suppression systems such as water sprays.
- Ensure that all machinery used complies with current emission standards.

5. **Noise Pollution**

Relative Importance: Medium

Noise pollution is another environmental concern during the operation phase, particularly due to ore extraction and drilling activities. The use of blasting and heavy machinery will generate significant noise levels, which can be disruptive to workers and local communities.

Mitigation Measures:

- Implement noise-dampening techniques such as sound barriers.
- Limit noisy operations to daytime hours to minimize disturbance to the community.

6. **Waste Management**

Relative Importance: Medium

Waste management is a moderate concern during the operation phase, particularly related to the generation of packaging waste and the risk of contamination from improper

storage of hazardous materials. Poor waste management practices can lead to environmental pollution and pose health risks.

Mitigation Measures:

- Develop a comprehensive waste management plan.
- Focus on recycling and the proper disposal of hazardous materials to minimize environmental impact.

7. **Public Health and Safety**

Relative Importance: High

Public health and safety are critical concerns, especially regarding the transportation and exportation of mined materials. The increased traffic and the transportation of hazardous materials pose significant risks to public safety, including the potential for accidents and chemical spills.

Mitigation Measures:

- Implement traffic management plans to regulate and monitor transportation activities.
- Ensure strict adherence to safety protocols during the transport of hazardous materials.

8. **Blasting and Fly Rocks Risk**

Relative Importance: High

Blasting activities during the operation phase present significant risks, including the potential for fly rocks, which can cause injuries to workers, damage to property, and pose a threat to nearby communities. This risk is particularly high in densely populated or sensitive areas.

Mitigation Measures:

- Conduct thorough risk assessments before any blasting activities.
- Establish safe blasting zones and enforce strict safety protocols.
- Use advanced blasting techniques to control fly rock distance and minimize impact.

9. **Economic and Social Impacts**

Relative Importance: High

The operation phase of the mining project has both positive and negative economic and social impacts. On the positive side, the project will create employment opportunities, boosting the local economy. However, there may also be negative impacts, such as community disruption due to noise, dust, and increased traffic.

Mitigation Measures:

- Engage with local communities to address concerns and provide timely information.
- Offer adequate compensation to those affected by the operations.
- Invest in improving local infrastructure to support the increased activity.

11.2.3 Potential Environmental Impacts During Decommissioning Phase

1. **Air Quality**

During the decommissioning phase, air quality may be impacted primarily through the dismantling of machinery and structures. This process can generate dust and emissions, which could contribute to air pollution if not properly managed.

Mitigation Measures:

- Implement dust suppression systems to control airborne particulate matter.
- Use low-emission equipment to minimize the release of pollutants during dismantling activities.

2. **Water Resources and Hydrology**

The removal of chemical and fuel storage during decommissioning poses risks to water resources and hydrology. Improper handling of these materials could lead to contamination of local water bodies, affecting both surface and groundwater quality.

Mitigation Measures:

- Properly drain and treat any wastewater generated during the removal of storage tanks.
- Ensure secure transportation and disposal of hazardous materials to prevent spills and leaks.
- Regularly monitor water quality to detect and address any potential contamination issues promptly.

3. **Soil Quality**

Soil quality can be adversely affected during soil excavation and site restoration. Disturbance of soil through excavation activities can lead to erosion and degradation if not managed properly.

Mitigation Measures:

- Implement soil stabilization techniques to prevent erosion.
- Rehabilitate and revegetate disturbed areas to restore soil quality and prevent further degradation.

4. **Noise Pollution**

Noise pollution during the decommissioning phase is primarily associated with dismantling and transporting debris. High noise levels from these activities can affect nearby communities and wildlife.

Mitigation Measures:

- Schedule noisy activities during daytime hours to minimize disturbance to local residents.
- Use noise-dampening equipment and techniques to reduce the impact of noise pollution.

5. **Biodiversity and Habitat Disruption**

Site clearing and habitat restoration activities during decommissioning can lead to biodiversity loss and habitat disruption. Ensuring the protection and recovery of local ecosystems is crucial during this phase.

Mitigation Measures:

- Conduct a biodiversity impact assessment to understand the effects on local flora and fauna.
- Implement habitat restoration and reforestation programs to mitigate the disruption and support ecosystem recovery.

6. **Waste Management**

The disposal of demolition waste is a significant concern during decommissioning. Effective management of this waste is necessary to prevent environmental contamination and ensure compliance with regulations.

Mitigation Measures:

- Develop a comprehensive waste management plan focused on recycling and the safe disposal of waste materials.
- Ensure proper segregation and handling of different types of waste to facilitate effective recycling and disposal.

7. **Socio-Economic Impacts**

The decommissioning phase involves workforce demobilization and community transition, which can have socio-economic impacts on both employees and local communities. Addressing these impacts is important for a smooth transition.

Mitigation Measures:

- Provide retraining and job placement services to assist workers in finding new employment opportunities.
- Engage with local communities to address their concerns and provide support during the transition period.

8. Health and Safety

Health and safety concerns during decommissioning activities are paramount to protect workers from potential hazards. Ensuring a safe working environment is crucial throughout the decommissioning process.

Mitigation Measures:

- Implement strict health and safety protocols to safeguard workers during all decommissioning activities.
- Provide personal protective equipment (PPE) and conduct training for workers to ensure they are aware of and can mitigate potential hazards.

12 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

This table provides a structured overview of the ESMP, detailing the environmental and social impacts during each phase of the fluorspar mining project, along with corresponding mitigation measures, monitoring, and reporting mechanisms.

Table 21: Environmental and social management plan

Environmental/Social Impact	**Mitigation Measures**	**Monitoring & Reporting**	**Responsibility**	**Cost (KSH)**
RENOVATION/CONSTRUCTION PHASE				
Air Quality	- Implement dust control measures such as water spraying. - Use low-emission equipment and machinery.	- Regular air quality monitoring. - Documentation of equipment maintenance.	NEMA SOFAX Contractor Environmental Manager	230,000
Water Resources	- Ensure proper storage and handling of chemicals and fuels. - Install spill containment systems and monitor water quality regularly.	- Routine water quality testing. - Inspection of storage facilities and spill containment systems.	NEMA WRA SOFAX Contractor Environmental Officer	250,000

Environmental/Social Impact	Mitigation Measures	Monitoring & Reporting	Responsibility	Cost (KSH)
Soil Quality	- Apply soil erosion control measures like silt fences. - Manage construction sites to minimize soil disturbance.	- Regular site inspections. - Documentation of soil management practices.	NEMA SOFAX Contractor Site Supervisor	200,000
Noise Pollution	- Utilize noise-reducing equipment. - Restrict noisy operations to daytime hours and provide hearing protection to workers.	- Noise level monitoring during operations. - Worker feedback and community consultations.	NEMA SOFAX Contractor Health and Safety Officer	120,000
Biodiversity	- Conduct environmental impact assessments prior to renovation activities. - Implement habitat	- Biodiversity monitoring. - Reports on habitat restoration progress.	KWS KFS SOFAX Contractor Environmental Specialist	380,000

Environmental/Social Impact	Mitigation Measures	Monitoring & Reporting	Responsibility	Cost (KSH)
	restoration plans post-renovation.			
Waste Management	- Develop a comprehensive waste management plan with an emphasis on recycling. - Safely dispose of hazardous materials.	- Waste audits. - Regular review of waste management practices.	NEMA SOFAX Contractor Waste Management Officer	240,000
Socio-Economic	- Ensure fair labor practices and engage in community support programs.	- Monitoring employment practices. - Community engagement reports.	Contractor Community Liaison Officer	320,000
Health and Safety	- Implement strict health and safety protocols. - Provide PPE and conduct regular health	- Health and safety audits. - Documentation of PPE distribution and health screening records.	Contractor Health and Safety Officer	400,000

Environmental/Social Impact	Mitigation Measures	Monitoring & Reporting	Responsibility	Cost (KSH)
	screenings for workers.			
OPERATIONS PHASE				
Deforestation and Habitat Loss	- Implement reforestation programs and post-mining habitat restoration.	- Monitoring reforestation and habitat restoration efforts. - Biodiversity surveys.	KFS NEMA SOFAX Environmental Specialist	800,000
Soil Erosion	- Use silt fences and revegetate exposed areas quickly.	- Regular inspections of erosion control measures. - Documentation of revegetation efforts.	SOFAX Site Supervisor	1,080,000
Water Pollution	- Install and maintain wastewater treatment systems. - Regularly monitor water quality to ensure compliance with standards.	- Continuous water quality monitoring. - Inspection of wastewater treatment systems.	NEMA WRA SOFAX Environmental Officer	340,000

Environmental/Social Impact	Mitigation Measures	Monitoring & Reporting	Responsibility	Cost (KSH)
Air Quality	- Use dust suppression systems and comply with emission standards.	- Regular air quality monitoring. - Emission testing and documentation.	NEMA DOSH SOFAX Environmental Manager	320,000
Noise Pollution	- Employ noise-dampening techniques and limit operations to daytime hours.	- Noise level assessments. - Community feedback and worker protection records.	NEMA DOSH SOFAX Health and Safety Officer	130,000
Waste Management	- Develop and implement a waste management plan focusing on recycling. - Properly dispose of hazardous materials.	- Waste management audits. - Monitoring of hazardous material disposal.	NEMA SOFAX Waste Management Officer	420,000
Public Health and Safety	- Implement traffic management plans and enforce safety	- Traffic monitoring and accident reporting. - Regular safety inspections.	DOSH SOFAX Health and Safety Officer	330,000

Environmental/Social Impact	Mitigation Measures	Monitoring & Reporting	Responsibility	Cost (KSH)
	protocols during transport.			
Economic and Social	- Engage with local communities and provide compensation for disruptions. - Improve local infrastructure and ensure fair employment practices.	- Community engagement reports. - Monitoring of compensation processes and infrastructure development.	SOFAX Community Liaison Officer	400,000
Blasting Fly Rocks	- Implement strict blasting protocols to control fly rocks. - Ensure safe distances and provide training to workers on handling blasting risks.	- Monitoring of blasting activities. - Documentation of training and safety measures.	State department of mines SOFAX Blasting Supervisor	120,000
DECOMISSIONING PHASE				

Environmental/Social Impact	Mitigation Measures	Monitoring & Reporting	Responsibility	Cost (KSH)
Air Quality	- Implement dust suppression systems. - Use low-emission equipment during dismantling activities.	- Air quality monitoring during decommissioning. - Reporting on equipment usage.	DOSH NEMA SOFAX Environmental Manager	200,000
Water Resources	- Properly drain and treat wastewater. - Securely transport and dispose of hazardous materials. - Monitor water quality regularly to prevent contamination.	- Water quality monitoring and reporting. - Inspections of hazardous material disposal.	NEMA WRA SOFAX Environmental Officer	320,000
Soil Quality	- Apply soil stabilization techniques and rehabilitate disturbed	- Regular site inspections. - Documentation of soil restoration efforts.	NEMA SOFAX Site Supervisor	380,000

Environmental/Social Impact	Mitigation Measures	Monitoring & Reporting	Responsibility	Cost (KSH)
	areas. - Replant vegetation to restore soil integrity.			
Noise Pollution	- Schedule noisy activities during daytime hours. - Use noise-dampening equipment and techniques.	- Noise level monitoring. - Reporting on noise management measures.	DOSH SOFAX Health and Safety Officer	360,000
Biodiversity and Habitat Disruption	- Conduct a biodiversity impact assessment. - Implement habitat restoration and reforestation programs.	- Monitoring biodiversity impacts. - Reporting on restoration and reforestation progress.	KWS KFS NEMA SOFAX Environmental Specialist	270,000
Waste Management	- Develop a comprehensive waste management plan with a focus on	- Waste audits and regular reviews. - Documentation of waste disposal methods.	NEMA SOFAX Waste Management Officer	670,000

Environmental/Social Impact	Mitigation Measures	Monitoring & Reporting	Responsibility	Cost (KSH)
	recycling. - Ensure safe disposal of demolition waste.			
Socio-Economic	- Provide retraining and job placement services for workers. - Engage with local communities to address concerns. - Provide support during the transition period.	- Monitoring workforce transition. - Community engagement and feedback reports.	SOFAX Community Liaison Officer	300,000
Health and Safety	- Implement strict health and safety protocols. - Provide PPE and training for workers.	- Health and safety audits. - Documentation of PPE distribution and worker training.	DOSH SOFAX Health and Safety Officer	450,000

12.1 Environmental and social Monitoring plan

This table below outlines the monitoring activities, frequency, responsibility, performance indicators, and reporting requirements necessary to manage and mitigate environmental and social impacts across all phases of the fluorspar mining project.

Table 22: Environmental and Social Monitoring Plan

Phase	Impact	Monitoring Activity	Frequency	Responsibility	Performance Indicators	Reporting
Renovation Phase	**Air Quality**	- Conduct air quality monitoring near renovation sites. - Inspect and maintain dust control systems.	Weekly during renovation	Environmental Manager	- Air quality levels within standards. - Functional dust control systems.	Monthly monitoring reports.
	Water Resources	- Test water quality at various points near storage and renovation sites. - Inspect chemical and fuel storage facilities.	Weekly and after spills	Environmental Officer	- Water quality within legal limits. - No contamination incidents.	Water quality reports. Incident reports if applicable.

Phase	Impact	Monitoring Activity	Frequency	Responsibility	Performance Indicators	Reporting
	Soil Quality	- Inspect soil erosion control measures. - Monitor site management practices.	Bi-weekly during renovation	Site Supervisor	- No significant soil erosion. - Properly managed construction sites.	Inspection logs. Site management reports.
	Noise Pollution	- Measure noise levels at various locations around the site. - Monitor worker exposure to noise.	Weekly during renovation	Health and Safety Officer	- Noise levels within permissible limits. - Proper use of hearing protection.	Noise monitoring reports. Worker safety reports.
	Biodiversity	- Conduct biodiversity surveys before and after renovation activities.	Before and after major activities	Environmental Specialist	- No significant biodiversity loss. - Successful habitat restoration initiatives.	Biodiversity assessment reports.
	Waste Management	- Audit waste generated and disposed	Monthly during	Waste Management Officer	- Compliance with waste management	Waste audit reports.

Phase	Impact	Monitoring Activity	Frequency	Responsibility	Performance Indicators	Reporting
		of. - Review waste management plan implementation.	renovation		plan. - Proper disposal of hazardous waste.	
	Socio-Economic	- Monitor employment practices and community interactions. - Collect community feedback.	Monthly	Community Liaison Officer	- Positive community relations. - Fair labor practices in place.	Community engagement reports.
	Health and Safety	- Conduct health and safety audits. - Monitor PPE use and worker health conditions.	Weekly during renovation	Health and Safety Officer	- Compliance with safety protocols. - Proper use of PPE by workers.	Health and safety reports. PPE usage logs.
Operation Phase	**Deforestation and Habitat Loss**	- Monitor reforestation and habitat restoration efforts.	Quarterly	Environmental Specialist	- Progress in reforestation efforts. - Successful	Reforestation progress reports. Biodiversi

Phase	Impact	Monitoring Activity	Frequency	Responsibility	Performance Indicators	Reporting
		- Conduct regular biodiversity surveys.			habitat restoration.	ty surveys.
	Soil Erosion	- Inspect erosion control measures. - Monitor revegetation of disturbed areas.	After significant weather events or quarterly	Site Supervisor	- No significant soil erosion. - Effective erosion control measures in place.	Erosion control inspection reports. Revegetation monitoring reports.
	Water Pollution	- Test water quality regularly near processing areas. - Inspect wastewater treatment systems.	Monthly	Environmental Officer	- Water quality within standards. - Properly functioning wastewater systems.	Water quality reports. System inspection logs.
	Air Quality	- Monitor air quality near ore extraction and processing	Weekly	Environmental Manager	- Air quality levels within standards. - Functional dust	Air quality monitoring reports. Dust suppression

Phase	Impact	Monitoring Activity	Frequency	Responsibility	Performance Indicators	Reporting
		areas. - Inspect dust suppression systems.			suppression systems.	system logs.
	Noise Pollution	- Measure noise levels at the site. - Monitor compliance with noise mitigation measures.	Weekly	Health and Safety Officer	- Noise levels within permissible limits. - Effective noise mitigation techniques.	Noise monitoring reports. Community feedback reports.
	Waste Management	- Audit waste generation and disposal. - Review implementation of waste management plan.	Monthly	Waste Management Officer	- Compliance with waste management plan. - Proper disposal and recycling practices.	Waste management audit reports.
	Public Health and Safety	- Monitor traffic and transportation routes. - Inspect adherence to safety	Monthly	Health and Safety Officer	- No major incidents or accidents. - Compliance with safety protocols.	Traffic management reports. Incident reports.

Phase	Impact	Monitoring Activity	Frequency	Responsibility	Performance Indicators	Reporting
		protocols during transport.				
	Economic and Social	- Engage with local communities regularly. - Monitor job creation and community disruptions.	Monthly	Community Liaison Officer	- Positive community relations. - Effective communication and engagement.	Community engagement reports. Employment records.
	Blasting Fly Rocks	- Monitor blasting activities and control measures. - Inspect safety measures in place during blasting.	During blasting events	Blasting Supervisor	- No significant incidents related to fly rocks. - Effective blasting controls.	Blasting activity reports. Safety inspection logs.
Decommissioning Phase	**Air Quality**	- Monitor air quality during dismantling activities. - Inspect dust	Weekly	Environmental Manager	- Air quality levels within standards. - Proper functioning of dust control systems.	Air quality reports. Dust suppression logs.

Phase	Impact	Monitoring Activity	Frequency	Responsibility	Performance Indicators	Reporting
		suppression measures.				
	Water Resources	- Test water quality during decommissioning. - Inspect hazardous material disposal methods.	Monthly	Environmental Officer	- Water quality within permissible limits. - Secure disposal of hazardous materials.	Water quality reports. Hazardous material disposal logs.
	Soil Quality	- Monitor soil stabilization techniques. - Inspect revegetation efforts post-decommissioning.	Quarterly	Site Supervisor	- Stabilized soil conditions. - Successful revegetation.	Soil stabilization reports. Revegetation monitoring reports.
	Noise Pollution	- Measure noise levels during decommissioning. - Monitor compliance with noise	Weekly	Health and Safety Officer	- Noise levels within permissible limits. - Effective noise reduction techniques.	Noise monitoring reports. Community feedback.

Phase	Impact	Monitoring Activity	Frequency	Responsibility	Performance Indicators	Reporting
		mitigation measures.				
	Biodiversity and Habitat Disruption	- Conduct biodiversity impact assessments. - Monitor habitat restoration efforts.	Quarterly	Environmental Specialist	- Successful habitat restoration. - Positive biodiversity trends post-decommissioning.	Biodiversity assessment reports. Restoration progress reports.
	Waste Management	- Audit waste disposal methods. - Monitor implementation of waste management plan during decommissioning.	Monthly	Waste Management Officer	- Compliance with waste management plan. - Proper disposal of demolition waste.	Waste audit reports. Disposal logs.
	Socio-Economic	- Engage with local communities during workforce demobilization.	Monthly	Community Liaison Officer	- Smooth workforce transition. - Positive community relations	Community engagement reports. Workforce

Phase	Impact	Monitoring Activity	Frequency	Responsibility	Performance Indicators	Reporting
		- Monitor retraining and job placement services.			during transition.	transition records.
	Health and Safety	- Conduct health and safety audits. - Monitor PPE use and worker training during decommissioning.	Weekly	Health and Safety Officer	- No major health and safety incidents. - Proper use of PPE and adherence to safety protocols.	Health and safety audit reports. Training records.

13 CONCLUSION AND RECOMMENDATIONS

13.1 Conclusion

This Environmental and Social Impact Assessment (ESIA) report has been compiled to provide a thorough evaluation of the ongoing and proposed revamping of SOFAX Kenya Fluorspar Kenya Ltd operations in the Kimwarer area. The assessment examines whether the company's activities, both current and planned, could have significant adverse impacts on the environment and the socio-economic well-being of local communities. Key impacts identified include air and water pollution from mining activities, disruption of local ecosystems, and increased pressure on local infrastructure. The ESIA is intended to assist the National Environment Management Authority (NEMA) in making an informed decision regarding the revival of SOFAX Kenya Fluorspar and the resumption of its mining activities. Conducted in strict accordance with Environmental Impact Assessment (EIA) licensing conditions, the ESIA includes a comprehensive evaluation of these impacts in reference to applicable legislation, aiming to develop effective mitigation measures and an Environmental and Social Management Plan (ESMP) to minimize negative outcomes and ensure sustainable development. Additionally, a Climate Change Risk and Vulnerability Assessment has identified climate-related risks such as flooding, drought, landslides, and soil erosion, which could further affect the mining project in Kerio Valley. By implementing a combination of short- and long-term adaptation strategies, these risks can be mitigated, ensuring the project's sustainability in the face of a changing climate.

13.2 Recommendations

Based on the findings of the Environmental and Social Impact Assessment (ESIA) study, it is recommended that the management of SOFAX Kenya Fluorspar Kenya Ltd implement the Environmental and Social Management Plan (ESMP) and ensure strict adherence to all mitigation measures throughout the project's lifespan. Strengthening community engagement is crucial, with proactive consultations, grievance redress mechanisms, and support for local development initiatives. The company should enhance environmental conservation efforts, particularly reforestation, soil erosion control, and the protection of water sources, to mitigate the impacts of mining. Compliance with all relevant environmental and social regulations, as stipulated by the National Environment Management Authority (NEMA), must be maintained, including regular audits and

reporting. Investing in capacity building for staff and the community on best practices in environmental management and social responsibility is essential, as is developing a long-term sustainability strategy that integrates environmental stewardship, social responsibility, and economic viability. A dynamic monitoring system should be implemented to detect and address issues early, with regular updates to the ESMP based on ongoing data and stakeholder feedback. These actions will ensure that SOFAX Kenya Fluorspar's operations positively impact the environment and local communities while maintaining regulatory compliance.

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Appendix 1: ESIA Study Team Members

Key Experts					
No.	**Name of Staff**	**Position Assigned**	**Area of Expertise**	**Education**	**Task Assigned**
1.	Patrick Kyalo Kituta	Team Leader (Lead Expert 1275)	Environment	BSc	Team Leader, and Report Compilation
2	Ms. Joy Nabwire Wasirimba	Environmentalist /Social Safeguard (Lead Expert 6551)	Social Safeguard	MSc, BSc	Report Writing
3.	Jacinta Mutheu Kaliti	Environmentalist (Lead Expert 2065)	Environment and Public Health/Monitoring and Evaluation,	MPH, BSc, Dip	Development of monitoring tools and methodologies
4.	Douglas Murithi Kithuri	Environmentalist (Associate Expert 9398)	Environment (Environmental Parameter Testing)	BSc, Diploma	Testing of Environmental Parameters
5.	Boniface Mwaniki	Environmentalist (Associate Expert 10414)	Environment, GIS, Health and Safety, Data Analysis,	BSc	Data Collection, Public Participation, and Report Writing

Support Staff					
No.	**Name of Staff**	**Position Assigned**	**Area of Expertise**	**Education**	**Task Assigned**
1.	Dr. Maurice Ogoma	Ecologist	Ecology	PhD, MSc, BSc	Ecological assessment
2.	Elijah Kimani	Sociologist	Social work	MSc, BSc	Public Participation and social impacts report writing

Appendix 2: Copies of NEMA Licenses of Experts

EAE 2 3061569

FORM 7 (r.15(2))

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/20715

Application Reference No: NEMA/EIA/EL/27398

M/S **PATRICK KYALO KITUTA**
(individual or firm) of address
P.O. Box 76065 - 00508 NAIROBI

is licensed to practice in the capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert General**

registration number **1275**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: 1/31/2024 Expiry Date: 12/31/2024

Signature.....

(Seal)
Director General
The National Environment Management Authority

FORM 7

EAE 23060570

(r.15(2))

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/21054

Application Reference No: NEMA/EIA/EL/27978

M/S **Joy Wasirimba**
(individual or firm) of address
P.O. Box 4 - 50409 Nambale

is licensed to practice in the capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert**

General

registration number **6551**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **2/22/2024**

Expiry Date: **12/31/2024**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001 : 2015 Certified

EAE 23061099

FORM 7 (r.15(2))

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/21470

Application Reference No: NEMA/EIA/EL/27109

M/S **Jacinta Mutheu Kaliti**
(individual or firm) of address
P.O. Box 8116 - 00100 NAIROBI

is licensed to practice in the capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert**
General
registration number **2065**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **4/16/2024** Expiry Date: **12/31/2024**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001 : 2015 Certified

EAE 23061321

FORM 7 (r.15(2))

nema
Mazingira Yetu | Uhai Wetu | Wajibu Wetu

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/21644

Application Reference No: NEMA/EIA/EL/27658

M/S **Douglas Murithi Kathuri**
(individual or firm) of address
P.O. Box 34378 - 00100 Nairobi

is licensed to practice in the capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Associate Expert** registration number **9398**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **5/7/2024** Expiry Date: **12/31/2024**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001 : 2015 Certified

FORM 7

EAE 23060927

(r.18(2))

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/21391

Application Reference No: NEMA/EIA/EL/28458

M/S **BONIFACE MAINA MWANIKI**
(individual or firm) of address
P.O. Box 324 - 20303 OLKALAU

is licensed to practice in the capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Associate Expert** registration number **10414**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **3/22/2024**

Expiry Date: **12/31/2024**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001 : 2015 Certified

Appendix 3: Certificate of Incorporation

No. **PVT-MKU996XY**

CERTIFICATE OF INCORPORATION

I hereby **CERTIFY** that,

SOFAX FLUORSPAR KENYA LIMITED

is on this date 8 Mar 2024 Incorporated under the Companies Act, 2015 and that the Company is a **PRIVATE LIMITED COMPANY.**

Wanthaka.

.....

Registrar Of Companies

This is a system generated certificate. To validate this document send the word **BRS** to **21546**

THE REPUBLIC OF KENYA

BUSINESS REGISTRATION SERVICE
P. O. BOX 30031
NAIROBI
8 MAR 2024

To
The Director(s)
SOFAX FLUORSPAR KENYA LIMITED
P.O. Box 6279
30100 - ELDORET

THE COMPANIES ACT, 2015

Records relating to the below company held by the Companies Registry as at **8 Mar 2024**

COMPANY	SOFAX FLUORSPAR KENYA LIMITED
COMPANY NUMBER	PVT-MKU996XY
NOMINAL SHARE CAPITAL	100,000.00
NUMBER AND TYPE OF SHARES (VALUE PER SHARE)	ORDINARY: 1000 (KES 100.00 EACH)
DATE OF REGISTRATION	8 MAR 2024
REGISTERED OFFICE	P.O BOX 6279, ELDORET TELEPHONE: +254724761451, EMAIL: SOFAXLIMITED@YAHOO.COM COUNTY: UASIN GISHU, DISTRICT: ELDORET WEST DISTRICT , LOCALITY: ELDORET STREET: UGANDA ROAD, BUILDING: SANG PLAZA
POSTAL ADDRESS	P.O BOX 6279 ELDORET
ENCUMBRANCES	

Name of Directors and Shareholders of the above company with their particular are as follows

NAME	DESCRIPTION	ADDRESS	NATIONALITY	SHARES
SOY FLUORSPAR LIMITED	SHAREHOLDER	P.O BOX 6279 ELDORET	KENYA	ORDINARY: 5
WINNIE CHERUTO SANG	DIRECTOR	P.O BOX 6279 ELDORET	KENYA	
JOHN MOSIGISI MASANDA	DIRECTOR	P.O BOX 40442 MOMBASA G.P.O	KENYA	
DANIEL KIBET	DIRECTOR	P.O BOX 6779 ELDORET	KENYA	
DAVID KIPROTICH ORGUT	DIRECTOR	P.O BOX 3484 ELDORET	KENYA	
FUJAX EAST AFRICA LTD	SHAREHOLDER	P.O BOX 40442 MOMBASA G.P.O	KENYA	ORDINARY: 5
JOSEPH KIPCHIRCHIR BOINET	DIRECTOR	P.O BOX 3102 CITY SQUARE	KENYA	
			TOTAL	10

Yours Faithfully,
REGISTRAR OF COMPANIES

REF NO: PVT-MKU996XY

DISCLAIMER: THIS IS A SYSTEM GENERATED CERTIFICATE AND DOES NOT REQUIRE A SIGNATURE

Appendix 4: Kra Pin Certificate

KENYA REVENUE AUTHORITY

www.kra.go.ke

PIN Certificate

For General Tax Questions
Contact KRA Call Centre
Tel: +254 (020) 4999 999
Cell: +254(0711)099 999
Email: callcentre@kra.go.ke

Certificate Date : 08/03/2024

Personal Identification Number

P052307182I

This is to certify that taxpayer shown herein has been registered with Kenya Revenue Authority

Taxpayer Information

Taxpayer Name	SOFAX FLUORSPAR KENYA LIMITED
Email Address	sofaxlimited@yahoo.com

Registered Address

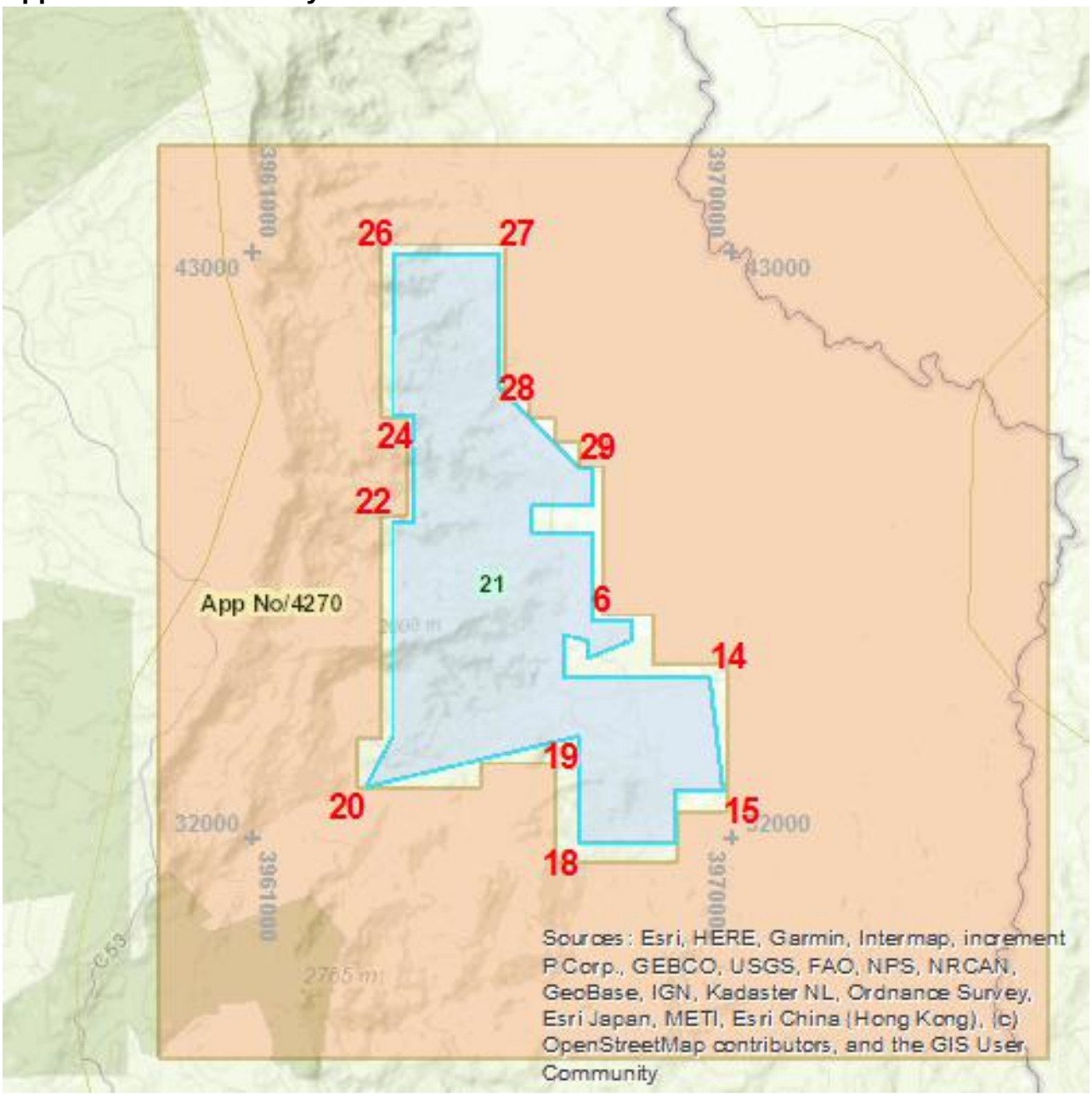
L.R. Number : NA	**Building :** SANG PLAZA
Street/Road : UGANDA ROAD	**City/Town :** NA
County : Uasin Gishu	**District :** Eldoret West District
Tax Area : Eldoret	**Station :** Eldoret
P. O. Box : 6279	**Postal Code :** 30100

Tax Obligation(s) Registration Details

Sr. No.	Tax Obligation(s)	Effective From Date	Effective Till Date	Status
1	Income Tax - Company	08/03/2024	N.A.	Active

The above PIN must appear on all your tax invoices and correspondences with Kenya Revenue Authority. Your accounting end month is December unless a change has been approved by the Commissioner-Domestic Taxes Department. The status of Tax Obligation(s) with 'Dormant' status will automatically change to 'Active' on date mentioned in "Effective Till Date" or any transaction done during the period. This certificate shall remain in force till further updated.

Appendix 5: General Layout of the Mine Area



Appendix 6: Lease Agreement

Appendix 7: Lease Area Illustration and Coordinates

Mining Licence (Mining)

General

Jurisdiction:	Mining Act, CAP.306
Official Area:	35.1021 km²
Application Number:	
Commodities:	Fluorspar
Comment:	The applicant has applied for the Mining Licence over the whole area under the Mining Act.

Parties

Party Name	Party Type	Interest
Soy Fluorspar/Fujax UK	Registered	100.00%

Coordinates

28	00° 21' 47.98" N	035° 37' 26.48" E
29	00° 20' 59.16" N	035° 38' 14.94" E

Map References

Map Reference	Category	Full Map Reference	Area Percentage
Kenya	Country	Kenya	100.00 %
Elgeyo/Marakwet	County	Kenya, Elgeyo/Marakwet	100.00 %

Commodities

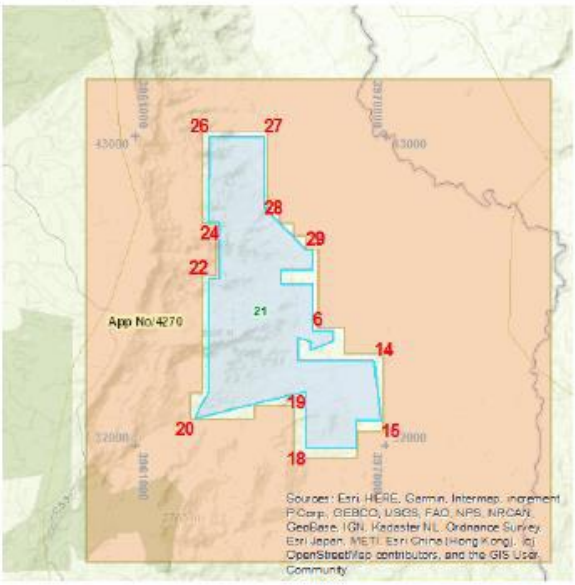
Fluorspar

Coordinates And Shape

Coordinates

Official Area:	35.1021 km²	
Coordinate system:	GCS_WGS84	
	Latitude	Longitude
Part 1		
1	00° 20' 59.16" N	035° 38' 23.02" E
2	00° 20' 36.38" N	035° 38' 23.01" E
3	00° 20' 36.39" N	035° 37' 45.85" E
4	00° 20' 20.12" N	035° 37' 45.84" E
5	00° 20' 20.11" N	035° 38' 23.01" E
6	00° 19' 26.43" N	035° 38' 22.99" E
7	00° 19' 26.42" N	035° 38' 47.23" E
8	00° 19' 15.03" N	035° 38' 47.23" E
9	00° 19' 03.65" N	035° 38' 20.40" E
10	00° 19' 14.39" N	035° 38' 20.41" E
11	00° 19' 17.49" N	035° 38' 07.48" E
12	00° 19' 18.62" N	035° 38' 05.22" E
13	00° 18' 52.27" N	035° 38' 05.21" E
14	00° 18' 52.25" N	035° 39' 34.09" E
15	00° 17' 43.92" N	035° 39' 42.15" E
16	00° 17' 43.93" N	035° 39' 13.06" E
17	00° 17' 11.39" N	035° 39' 13.05" E
18	00° 17' 11.41" N	035° 38' 14.88" E
19	00° 18' 16.48" N	035° 38' 14.90" E
20	00° 17' 45.60" N	035° 36' 05.61" E
21	00° 18' 16.51" N	035° 36' 21.78" E
22	00° 20' 26.65" N	035° 36' 21.81" E
23	00° 20' 26.65" N	035° 36' 34.74" E
24	00° 21' 31.72" N	035° 36' 34.76" E
25	00° 21' 31.73" N	035° 36' 21.83" E
26	00° 23' 09.34" N	035° 36' 21.86" E
27	00° 23' 09.32" N	035° 37' 26.50" E

License Shape



Appendix 8: Bill of Quantities

Appendix 9: Minutes of Meeting

Appendix 10: Questionnaires

Key Informants Questionnaire

KFS Response

FRANCIS ALLEN CONSULTING LTD
Tembo Sacco Plaza, Door 10, Mukima Drive
Off Thika Road
P. O. Box 9547-00300, Nairobi
Tel.:+25472091246.3
Email: info@francisallen.co.ke,www.francisallen.co.ke

FRANCIS ALLEN CONSULTING
TAKING SOLUTIONS TO THE WORLD

SOFAX Fluorspar Kenya Ltd intends to Revamp fluorspar mining within Kimwarel, Kerio Valley, in Elgeyo Marakwet County, which falls within Soi-location. To adhere to the Environmental Management and Coordination Act (EMCA, 1999) and Environmental Impact Assessment and Audit Regulations (2003), the project proponent has engaged Francis Allen Consultant Ltd to conduct the Environmental and Social Impact Assessment (ESIA) for this endeavor.

ESIA evaluates potential environmental, social, and economic impacts of a proposed project to aid decision-making. Public and stakeholder consultation is integral to this process, and we value your input as a Key Stakeholder to the project site. Your responses in the following questionnaire will greatly contribute to our understanding of forest management perspectives. Your information will be handled with utmost respect and confidentiality. Please provide objective feedback.

1. Are there guidelines that KFS provides for the restoration of forested areas post-mining activities?
   Yes ✓ No
   - If yes what are some of these guidelines?
     - Reclaim by back filling and Planting trees
     - Protect site by fencing
     - Provide Signage

2. What measures would KFS recommend to preserve the ecosystem services provided by forests, such as water catchment and carbon sequestration, in the mining region?
   - Restore degraded site, through tree planting; • Reclaim pits through land fill and tree planting • Protect area for Natural regeneration • Fence off site • Use scouts / Rangers to patrol area

3. How does KFS collaborate with mining companies to ensure that forest management practices are integrated into their operations?
   - Mining company Should adopt a part of forest for Protection & restoration. • Establish tree Nursery •

4. Are there specific forest management plans or frameworks in place for areas where mining activities overlap with forested regions?
   - Special use License provide each with specific rules.

5. How does KFS engage with local communities, particularly those reliant on forest resources, in areas impacted by mining?
   - Through Community Forest Association; communities are engaged through • construction of Infrastructure; Provision of libraries / school fees / livelihood improvement projects; eg
   - Sponsorship to high learning of bright students • provision of basic services eg electricity, water, road
   - Employ locals to work in

SOFAX

FRANCIS ALLEN CONSULTING

FRACIS ALLEN CONSULTING LTD
Tembo Sacco Plaza, Door 10, Mukinia Drive
Off Thika Road
P. O. Box 9547-00300, Nairobi
Tel: +254720912463
Email: info@francisallen.co.ke, www.francisallen.co.ke

6. What alternative livelihood programs can KFS promote to reduce dependency on forests that may be affected by mining? • ~~Adopt Agroforestry~~
• Provision of income generating activities eg dairy goats/cows cashcrops;
• Encourage adoption of agro-forestry.

7. What sustainable forest management practices does KFS advocate for in mining areas to minimize environmental impacts?
• Rehabilitation and Tree Planting

• How does KFS monitor and ensure the implementation of these practices by mining companies?
• Routine visit to the mines; monitoring and evaluation.

8. How does KFS view the role of forest conservation in mitigating climate change impacts in mining areas?
• This is a critical aspect where KFS demands Mining companies to incorporate it in their mandate.

9. What actions are being taken by KFS to enhance the resilience of forests in mining zones to climate change?
• Through sensitization, Protection and security to both local community and companies on conservation issues

10. How does KFS collaborate with other agencies, such as Kenya Wildlife Services, to protect critical wildlife corridors within forested areas near mining sites?
• KFS, NGMA KWS collaborate occasionally but each organization have its own mandate on wildlife corridors

11. What strategies are in place to balance forest conservation with the needs of wildlife and local communities in these regions?
• Conservation and Protect natural ecosystems (Natural Forests) through Electric fence, Forest patrols Personnel

12. What long-term strategies does KFS propose to ensure the conservation of forests in areas where fluorspar mining activities will be conducted?
• continuous rehabilitation and Protection of escurated areas through tree planting.

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FRANCIS ALLEN CONSULTING
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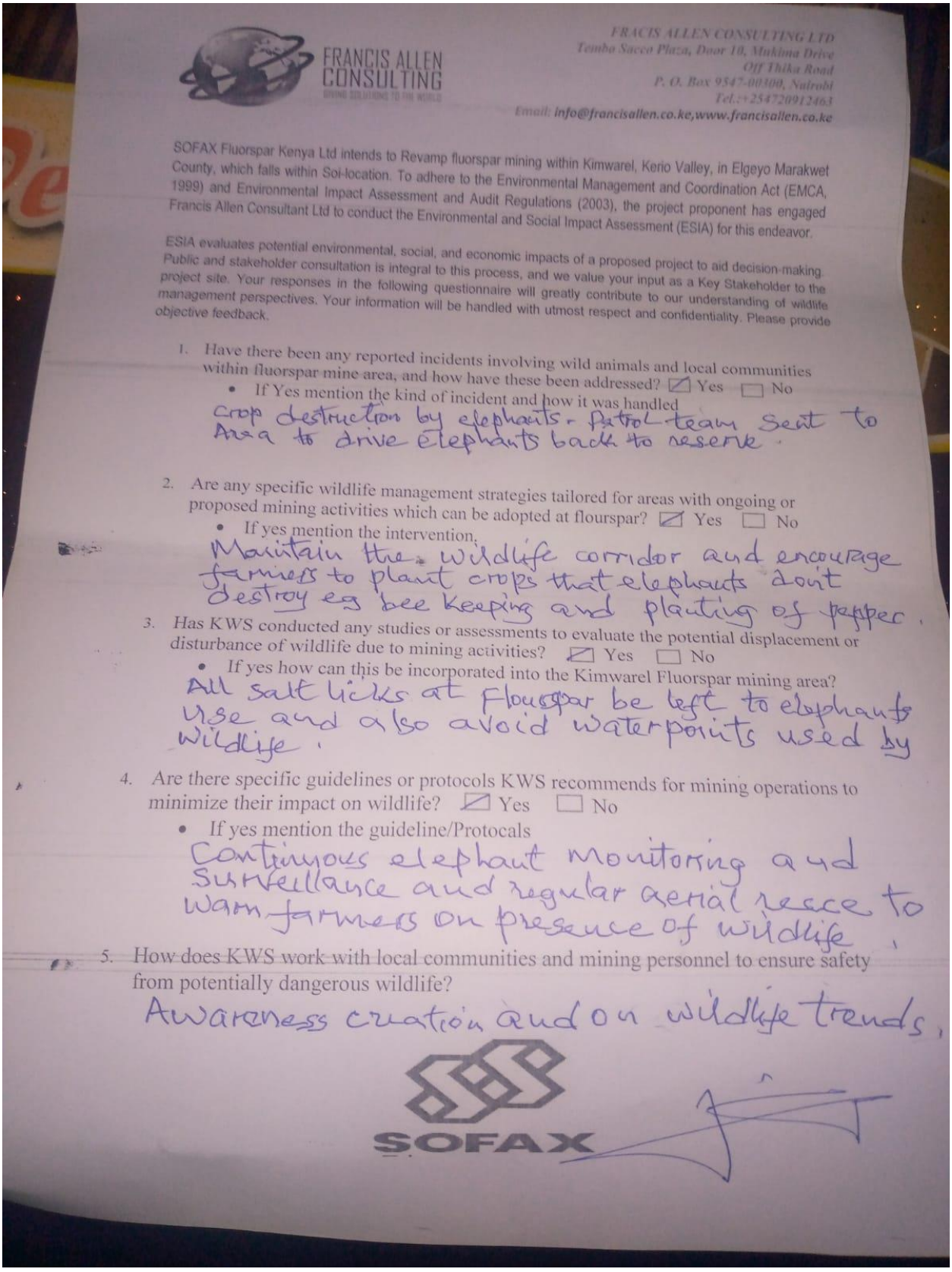
Tembo Sacco Plaza, Door 10, Mukima Drive
Off Thika Road
P. O. Box 9547-00300, Nairobi
Tel.:+254720912463
Email: info@francisallen.co.ke,www.francisallen.co.ke

13. How does KFS plan to collaborate with mining companies and other stakeholders to achieve these conservation goals?

- Mining companies should have
  (i) Sponsor tree planting within its jurisdiction
  (ii) Adopt a forest within forest areas and protect ecosystem through tree planting
  (iii) Start a tree nursery within its Mine — provide readily available seedlings (to be plant within ecosystem)
  (iv) collaborate with KFS — in National tree planting campaigns towards achievement of 15 Billion tree planting in line with Kenya Kwanza Strategy plan.

SOFAX

KWS Response



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Temba Sacco Plaza, Door 10, Muklina Drive
Off Thika Road
P. O. Box 9547-00300, Nairobi
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Email: info@francisallen.co.ke,www.francisallen.co.ke

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ESIA evaluates potential environmental, social, and economic impacts of a proposed project to aid decision-making. Public and stakeholder consultation is integral to this process, and we value your input as a Key Stakeholder to the project site. Your responses in the following questionnaire will greatly contribute to our understanding of wildlife management perspectives. Your information will be handled with utmost respect and confidentiality. Please provide objective feedback.

1. Have there been any reported incidents involving wild animals and local communities within fluorspar mine area, and how have these been addressed? ☒ Yes ☐ No
   - If Yes mention the kind of incident and how it was handled

   Crop destruction by elephants - Patrol team sent to Area to drive elephants back to reserve.

2. Are any specific wildlife management strategies tailored for areas with ongoing or proposed mining activities which can be adopted at flourspar? ☒ Yes ☐ No
   - If yes mention the intervention;

   Maintain the wildlife corridor and encourage farmers to plant crops that elephants don't destroy eg bee keeping and planting of pepper.

3. Has KWS conducted any studies or assessments to evaluate the potential displacement or disturbance of wildlife due to mining activities? ☒ Yes ☐ No
   - If yes how can this be incorporated into the Kimwarel Fluorspar mining area?

   All salt licks at Flourspar be left to elephants use and also avoid waterpoints used by wildlife.

4. Are there specific guidelines or protocols KWS recommends for mining operations to minimize their impact on wildlife? ☒ Yes ☐ No
   - If yes mention the guideline/Protocals

   Continuous elephant monitoring and surveillance and regular aerial rescce to warn farmers on presence of wildlife.

5. How does KWS work with local communities and mining personnel to ensure safety from potentially dangerous wildlife?

   Awareness creation and on wildlife trends.

SOFAX

FRANCIS ALLEN CONSULTING
DIVINE SOLUTIONS TO THE WORLD

FRACIS ALLEN CONSULTING LTD
Tembo Sacco Plaza, Door 10, Makima Drive
Off Thika Road
P. O. Box 9547-00300, Nairobi
Tel.:+254720912463
Email: info@francisallen.co.ke, www.francisallen.co.ke

6. Are there specific programs focused on educating the public about the behavior and conservation of the wild animals present in the area? ☑ Yes ☐ No
Awareness and outreach programs.

7. Are there plans to establish or maintain wildlife corridors to allow the safe movement of animals through the mining area? Yes.

8. How does KWS plan to monitor and mitigate the cumulative impacts of mining activities on wildlife over time? CSR projects, outreach programs to community and educational institutions

9. What advice or support would you give to the Soy community that intends to develop a snake farm as a tourist attraction site to help manage snakes within the area?
Educate on non consumptive wildlife farming and guide on best practices on this kind of enterprise and give technical advice to all those willing to venture into wildlife farming for educational and scientific purposes.

SOFAX

Appendix 11: Copies of Laboratory Results
Air Quality

1. Sofax Flourspar Keya Limited - Ambie

Environmental Noise Assessment

2. Sofax Flourspar Keya Limited - Envtal

Water Quality Results


Cheberen Pond Results.pdf


Kamnoun Pond Results.pdf


Mong River Results.pdf

Soil Quality Results


Soil Quality Results.pdf

Appendix 12: Stakeholder Engagement Plan/Mapping

Stakeholder Engagement Plan

The overall purpose of this Stakeholders Engagement Plan is to ensure that a consistent, comprehensive and coordinated approach is taken in stakeholder engagement and Project disclosure throughout the project implementation phase. It is further intended to demonstrate the commitment to engage each stakeholder during the implementation phase of the Project. This is in line with Article 69 (d) of the constitution of Kenya that encourages public participation in the management, protection, and conservation of the environment.

In line with Stakeholders Engagement Plan best practice, stakeholder engagement is conducted on the basis of timely, relevant, and accessible information. In this way, the Stakeholders Engagement Plan seeks to ensure that stakeholders are given sufficient opportunity to voice their opinions and concerns, and that these concerns influence project decisions. The Stakeholders Engagement Plan therefore:

- Provides the approach to stakeholder engagement, showing how this will be fulfilled throughout the project cycle;
- Identifies the main categories of stakeholders and how they will be included in the implementation of the Project; and
- Identifies the ways to document engagement undertaken with the stakeholders throughout the project.

Objectives of Stakeholder Engagement

The objectives of engaging stakeholders during the project Implementation phase include:

- **Ensuring Understanding:** An open, inclusive and transparent process of engagement and communication will be undertaken by to ensure that stakeholders are well informed about the proposed Project. Information will be communicated early and as detailed as possible.
- **Involving Stakeholders in the Assessment**: Stakeholders will be included in the scoping of issues and identification of sampling points especially in areas that had

high pollution. They will also played an important role in providing local knowledge and information for the baseline survey of sampling points and community involvement in the Project.

- **Building Relationships**: Through supporting open dialogue, engagement will help to establish and maintain a productive relationship between the implementation team and stakeholders.
- **Managing Expectations**: It is important to ensure that the proposed Project does not create, or allow, unrealistic expectations to develop amongst stakeholders about potential Project benefits. The engagement process will serve as a mechanism for understanding and managing stakeholder and community expectations, by disseminating accurate information in an easily understandable manner. The exercise will not involve handing over money during implementation. The Stakeholders will be made to understand that the Project is for their own benefit and falls within the mandate of Stakeholder.
- **Ensuring Compliance**: The process is designed to ensure compliance with both local laws requirements and international best practice.

REGULATORY CONTEXT

Policy, Legal and Institutional Framework for Public Participation

The Republic of Kenya has the following polices and legislations related to citizen/stakeholder engagement which covers both the right to access information and participation in policy development and decision-making.

The Constitution entrenches a wide range of social, political, economic and cultural rights and revolutionizes the entire system of political governance by devolving authority to county governments and decreeing the need for citizen participation in decision making. It enshrines the right to access information and makes principles of international laws and treaties ratified by Kenya an integral part of the country's municipal law. The Constitution in Article 232 further outlines transparency and timely provision to the public of accurate information as one of the values and principles of public service, going further to bind all

state agencies at both national and county government levels and state corporations to these values and principles.

Moreover, Article 69 outlines the obligations of the government in respect to the environment, asserting that “The State shall ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources and ensure the equitable sharing of the accruing benefits”. Under its sixth chapter on leadership and integrity, the constitution has entrenched values and principles that should govern the operations of all entities and public officers within the state and called for adherence of the same. The Constitution introduces changes in the public finance management framework in Kenya, outlining principles of public finance such as equity, openness and accountability through public participation in financial matters.

Under the Social Pillar of Vision 2030, i.e., the Country’s commitment to invest in the people of Kenya, Kenya’s journey towards prosperity is envisioned to involve the building of a just and cohesive society, which enjoys equitable social development in a clean and secure environment. The Political Pillar, -Moving to the Future as One Nation, states in part that Kenya is committed to “adherence to the rule of law as applicable to a modern, market-based economy in a human rights-respecting state” (emphasis in italics, added). Furthermore, Vision 2030 is anchored on aspirations to better define and clarify land tenure rights and perhaps by extension facilitate the identification of carbon rights and associated equity in accruing benefits.

The Climate Change Act (2016) provides guidance for application of public participation, access to information and representation in all sectors of the economy, at both national and country level for climate change adaptation and mitigation Environmental Impact Assessment (EIA), Review Guide for Communities, Dec. (2014). The Environmental, Management and Coordination Act (1999, 2015) has mandatory requirements on public participation. This review guide seeks to enhance public participation in the project cycle management under the Environmental (Impact Assessment and Audit) Regulations, (2003). The guide targets communities falling within the project areas to assist them in reviewing and commenting on Environmental Impact Assessment

(EIA) reports. It gives a step-by-step guidance and direction on how communities can actively participate in the EIA process through provision of clear responses to public participation calls to ensure that their needs and aspirations are taken into account.

Environmental Management and Coordination Act (EMCA) 2009 set out general principles, and the principle of public participation in the development of policies, plans and processes for the management of the environment is made mandatory in the Act.

Environment Impact Assessment Guidelines and Administrative Procedures required public participation and disclosure of project information during EIA procedure in the development of projects, policies, plans and programmes.

International Requirements

International laws and guidelines for public participation and stakeholder engagement ensure that communities and stakeholders are involved in decision-making processes that affect them. A key framework is the Aarhus Convention (Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters), which grants public rights regarding access to information, participation in decision-making, and access to justice in environmental matters. This convention emphasizes transparency and accountability in environmental governance.

The Rio Declaration on Environment and Development (1992) also underscores the importance of public participation. Principle 10 of the Rio Declaration asserts that environmental issues are best handled with the participation of all concerned citizens, advocating for access to information, public participation in decision-making processes, and access to judicial and administrative proceedings. The United Nations Sustainable Development Goals (SDGs) further support this principle, with Goal 16 promoting inclusive, participatory, and representative decision-making at all levels, and Goal 17 emphasizing the importance of multi-stakeholder partnerships for sustainable development.

The International Finance Corporation (IFC) Performance Standards are another critical set of guidelines. Performance Standard 1 requires clients to identify and engage with stakeholders, including affected communities, through information disclosure,

consultation, and informed participation. Performance Standard 7 specifically focuses on Indigenous Peoples, requiring Free, Prior, and Informed Consent (FPIC) for projects affecting them. Similarly, the World Bank Environmental and Social Framework, through Environmental and Social Standard 10 (ESS10), mandates stakeholder engagement and information disclosure throughout the project life cycle.

The UN Guiding Principles on Business and Human Rights also emphasize stakeholder engagement. Principle 18 requires businesses to consult with potentially affected groups and other relevant stakeholders as part of their human rights due diligence processes. Additionally, the Equator Principles, a risk management framework adopted by financial institutions, require borrowers to engage with stakeholders and disclose information in line with the IFC Performance Standards.

The OECD Guidelines for Multinational Enterprises recommend that enterprises consult with stakeholders to provide them with relevant information and address their concerns about the enterprise's activities and impacts. Finally, the UN Declaration on the Rights of Indigenous Peoples (UNDRIP) highlights the need for FPIC. Article 32 of UNDRIP states that indigenous peoples have the right to determine and develop priorities and strategies for the development or use of their lands and resources, requiring states to obtain FPIC before adopting and implementing legislative or administrative measures that may affect them.

These international frameworks emphasize the importance of transparency, accountability, and inclusivity in decision-making processes. They ensure that affected communities and stakeholders have the opportunity to participate meaningfully in decisions that impact their environment, health, and livelihoods.

STAKEHOLDERS IDENTIFICATION AND ANALYSIS

Identification of Project Stakeholders

Project stakeholders are defined are persons or groups who are directly or indirectly interact with the project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively (IFC's Handbook on Stakeholder Engagement (2007)).

Stakeholder identification and analysis is an essential component of effective and meaningful stakeholder engagement activities. The objective of this step was to provide a general overview of all stakeholders.

Key stakeholders' groups that were identified are parties that were directly interlinked and have a stake in the Project. A participatory and consultative approach that involves all stakeholders was adopted, to ensure optimal participation of key stakeholders at all stages of the assignment and enrich the outcomes of the study. The identified stakeholders were divided into Primary, Secondary and Tertiary. This is shown in the table below;

No.	Name	Category
Primary Stakeholders		
1.	SOFAX Fluorspar Kenya Ltd	Proponent
2.	National Government Administrative Office Deputy County Commissioners (DCC), Chiefs/ Assistant chiefs	National Government
3.	State Department of Mining	National Government, Regional offices
4.	Kenya Forest Service (KFS)	KFS Regional Office
5.	Kenya Wildlife Service (KWS)	KWS Regional Office
6.	Elgeyo Marakwet County Government, Ward Administrator	County Government
7.	Village Elders	Community Representatives
8.	Area Residents	Community
9.	Community Groups	Community

Secondary Stakeholders		
1.	Physical Planning Officer	National/County Government Agencies and Ministries
2.	Sub-county Lands Registrar	

The methodology for stakeholder analysis

This stakeholder analysis was conducted as follows:

1. **Identification of Stakeholders**

The first stage in stakeholder relations involved researching individuals and third-party organizations that may be relevant to the project. This included groups/organizations that are directly affected by the Project (positively or negatively), have influence or power over its success, and have an interest in its successful or unsuccessful conclusion. This was done through search in traditional media and industry reports and analysing online conversations occurring in the digital space to identify individuals, groups or organizations that that have interest in fluorspar mining within Elgeyo Marakwet.

2. **Analyzing Stakeholders**

Once potential stakeholders were identified the consultant analysed them to establish their interest, involvement in the project, their points of intersection with our objectives, their level of activity in the project or their key points of contact. The consultant also did a network with others through phone and in-person meetings to gain more insight.

3. **Prioritize Stakeholders**

Having achieved a better understanding of the stakeholder ecosystem, the next step for the consultant was to prioritize the actors. The following was considered:

- Relevance
- Visibility
- Credibility
- Influence
- Reach

4. **Contacting Stakeholders**

Once the stakeholders had been identified, researched, and prioritized, the final step involved making contact with them and exploring their interest in potential future collaboration and to build opportunities that will demonstrate a win/win proposition for both organizations. Efforts were made to identify the contact person within the organization.

STAKEHOLDER ENGAGEMENT PROGRAM

The Stakeholder Engagement Program is a formal document that outlines the plan to communicate with stakeholders with an interest or potential interest in a project. It helps engage all the stakeholders in the project and, by doing so, helps the project become sustainable and inclusive. It is important to keep in mind that SEP implementation is a dynamic process and some stakeholders and their interests might change over time or new stakeholders and information emerges, and hence the SEP will be updated accordingly.

Engagement Methods and Tools to be used

The Project intend to utilize various methods of engagement that will be used by as part of its continuous interaction with the stakeholders. For the engagement process to be effective and meaningful, a range of various techniques need to be applied that are specifically tailored to the identified stakeholders. Methods used for consulting with statutory officials may be different from a format of liaising with the local communities.

The suggested methods would be used to communicate and consult with the stakeholders:

Online Platform: A dedicated webpage/platform will be created for the project to enable users to find all the information about the project. The goal of the platform is to provide core information about the project and to ensure accessible online feedback project stakeholders and to support several stakeholder engagement activities. The platform will be used to support face-to-face consultations through digital feedback surveys at regular intervals and will provide a dedicated portal for the identified sub-projects to inform the population and engage them in providing feedback and support monitoring through the

implementation cycle. All stakeholder consultations events will be advertised through this platform.

Stakeholder consultations/virtual consultations: Consultations will be organized during the project planning stage and project implementation. Stakeholder consultations will be organized for mine extraction reports. Moreover, public consultations will be held on quarterly basis as part of the stakeholder engagement process during the project cycle.

Workshops: The workshops with stakeholders will be carried out. The main topics of these workshops will include proper mining methodologies and project progress.

In-depth interviews with relevant experts: Expert's views and recommendations on various project issues will be conducted as part of the social assessment. They will continue to be used as part of specific project activities.

Leaflets/ informative notes: Leaflets with information that might present more interest for stakeholders will be developed and distributed in the meetings/ stakeholder consultations.

Letters: introduction letters, invitation letter during stakeholder meetings will be an instrument used in order to facilitate the Project implementation process through good collaboration between the implementing entity and other stakeholders.

Reports: periodic reports will be distributed to keep informed the main stakeholders of the Project.

E-mails: To facilitate communication between implementing entity and the stakeholders.

The format of every consultation activity should meet general requirements on accessibility, i.e., should be held at venues that are easily reachable and inclusiveness, i.e., engaging all segments of the stakeholders. If necessary, logistical assistance should be provided to enable participants to attend public meetings scheduled by the project. All the meetings and consultations will be taken while ensuring an observation of MOH guidance on hand washing.

Stakeholder engagement is an inclusive process that must be conducted throughout the project cycle.

In case of stakeholder consultation “events” (whether virtual and in face -to-face meetings), the Sofax Fluorspar Kenya Ltd will strive to provide relevant information to stakeholders with enough advance notice (7-15 business days) so that the stakeholders have enough time to prepare to provide meaningful feedback. Sofax Ltd will gather written and oral comments, review them and report back to stakeholders on how those comments were incorporated, and if not, provide the rationale within 7-15 working days from the stakeholder consultation event. All consultation events will be widened in terms of outreach through the opportunity to use on-line feedback through the platform.

Table 23: Stakeholder categories and their responsibilities

STAKEHOLDER CATEGORY	**SUBGROUP**	**RESPONSIBILITIES**
GOK & AGENCIES	Ministry of Mining, Blue Economy and Maritime Affairs	Issue of Licenses and coordination of mining activities.
	Ministry of Land, Public Works, Housing and Urban Development	Offering continuous advise and co-ordination of project activities
	Ministry of Environment, Climate Change and Forestry	Coordinate environmental protection and climate change
	-Ministry of Tourism and Wildlife	-Ensure protection of wildlife.
	- Ministry of Labour and Social protection	- Ensure citizen and workers safety, protection of minors, and Contractor compliance with the country’s Labour laws during project execution.

STAKEHOLDER CATEGORY	SUBGROUP	RESPONSIBILITIES
Lead Agencies	-NEMA -DOSH -State Department of Mining	-Providing oversight and monitoring of project activities to ensure environmental sustainability and compliance with environmental standards established under EMCA. -Compliance with safety and health legislation (OSHA, WIBA) and promotion of safety and health of workers -Monitoring of mining operations to ensure compliance with the mining Act
Supervision Consultant	Resident Engineer and team	-Preparation of Engineering Designs and Procurement Documents. -Renovation Supervision. -Support the engagement processes and help address stakeholder concerns where necessary.
Community	-Residents/settlements where project activities will be performed -Farmers -Vulnerable groups	-Following the implementation of the OH&S and environmental standards in all project phases, -Public participation

STAKEHOLDER CATEGORY	SUBGROUP	RESPONSIBILITIES
	-Administrators of Public enterprises-e.g. Schools and Religious institutions -Leaders of community associations-e.g. business communities.	-Implementation of the OH&S and environmental standards in all project phases.
Contractors	-Contractors -Suppliers of goods and services -Transportation workers	-Implementation of good construction practice, OH&S measures and environmental protection, -Quick intervention and elimination of risks that cause adverse incidents -Efficient and timely execution of construction work.
Vulnerable Groups/ People	-Disabled -Elderly -Single parents -Orphans	-Expressing their opinions, suggestions and specific proposals during the implementation of project activities -Active participation during project lifecycle -Support project in implementation of vulnerable groups programs
Civil Society Organizations	-National	Following the implementation of the

STAKEHOLDER CATEGORY	SUBGROUP	RESPONSIBILITIES
	-Community based. -Faith Based -Self-Help groups	vulnerable groups' projects and raising concerns regarding the environmental and social issues that need to be mitigated.
Local Authorities	County Governments Municipal Boards Townships Local Communities Public Enterprises	-Support the project and Project Implementation Team (PIT) for efficient implementation of the vulnerable groups support -Adoption of the technical documentation for the realization of the project, -Issuing of sectorial comments for approval of the EIA Report -Ensuring proper access of the population to their homes -Ensuring the full implementation of OH&S and environmental standards during the construction activities.

STAKEHOLDER CATEGORY	SUBGROUP	RESPONSIBILITIES
Financial Institutions and Private Companies	-Financial Institutions (Banks, Sacco) -Suppliers of equipment -Transporters -Contractors/Providers of consultancy services	-Providing financial support for realization of the project,
Other Interested Parties	-Media -General public -Workers	-Publicity of the project through local radio station, social media, newspaper -Providing information on the dynamics of performing the project activities, -Providing information about delays of the project during the execution of project activities, -Professional and efficient execution of the project activities in accordance with the Dynamic Plan.