ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED GOLD VAT LEACHING AND ELUTION PLANT IN KAKAMEGA COUNTY

MAY 2024

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ACKNOWLEDGEMENT

The Ayes Consults Limited is grateful to the proponent STONES OF WEALTH LIMITED for bestowing us the honor of undertaking this EIA report for the proposed gold VAT Leaching and Elution plant. We really appreciate the entire staff of department of mines under the National Government. We thank the CGK through its CEC Member Water, Environment, Natural Resources & Climate Change Hon. Peninah Mukabane and Mr Patrick Ligami- Chair Artisanal miners. Our sincere thanks goes to the Stones of Wealth Limited staff led by Director Mr. Ahmed Abdi Jama for providing us with all the required documents and information we needed for this study. We also express our gratitude to the following, Member of County Assembly Hon: David Ikunza Shirere ward. Shikoye Community area administrator Sarah Amimo Ashikholwa, and Chief Phanice Achienza of Shirere Location,. Further, we acknowledge the NEMA office led by the Kakamega C D E, Mr. John Muniafu for their unequivocal support and guidance.

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Mr. Vic Philip Geoscientist Mr. Harry Mmbaya, (Freelance Environmental Journalist, Elizabeth Nyandia (Sociologist) who worked extra hard throughout the entire process of preparing this report to make sure that it is completed professionally.

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LIST OF ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
Au	Gold
Bgl	Below Ground Level
^0C	Degrees Celsius
CaO	Lime
CDE	County Director of Environment
CGK	County Government of Kakamega
CN	Cyanide
dB	Decibels
DOSH	Directorate of Occupational Safety and Health
EA	Environmental Audit
EI's	Environnemental Impacts
EIA	Environnemental Impact Assessment
EMCA	Environmental Management and Coordination Act
EMP	Environnemental Management Plan
EMPs	Environnemental Management Plans
ERC	Energy Regulatory Commission
HCN	Hydrogen Cyanide
HDP	High Density Pipes
HIV	Human Immuno Deficiency Virus
ICT	Information& Communication Technology
ICMC	International Cyanide Management Code
KPPB	Kenya Pharmacy & Poisons Board
KPLC	Kenya Power & Lighting Company Limited
M & E	Monitoring and Evaluation
MoPW	Ministry of Public Works
MSD	Minimum Safe Distance
NaCN	Sodium cyanide
NCA	National Construction Authority
NEAP	National Environment Action Plan
NEMA	National Environment Management Authority
NPEP	National Poverty Eradication Plan
O_2	Oxygen
OSHA (2007)	Occupational Safety & Health Act (2007)
PPA	Pharmacy and Poisons Act cap 244
PH	Acidity or alkalinity of the slurry.
TOR	Terms of Reference
WRA	Water Resources Authority

DEFINITION OF OPERATIONAL TERMS

Authority: National Environment Management Authority established under section 7 of the EMCA 1999

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

Proponent: A person who is proposing or executing a project, programme or an undertaking specified in the Second Schedule of the EMCA 1999.

Developer: A person who is developing a project which is subject to an Environmental Impact Assessment under the EMCA 1999

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

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

Environmental Impact Assessment-: A systematic examination conducted to determine whether or not a programme, activity or project will have any adverse impacts on the environment.

Hydrogen cyanide (also known as prussic acid): is a chemical compound with the formula HCN and structural formula **H−C≡N**. It is a colorless, extremely poisonous, and flammable liquid that boils slightly above room temperature, at 25.6 °C (78.1 °F).

Leaching: Process of extracting gold from tailings through cyanidation process. The gold is extracted from slurry of crushed gold ore tailings, water, and cyanide

Poison" means a poison included in Part I or Part II of the Poisons List in the Pharmacy and Poisons Act cap 244

Project Includes any project, programme or policy that may have an impact on the environment.

Slurry: The thick pulp made from a solution of crushed tailings, and treated with cyanide, mixed with caustic soda lime and hydrogen peroxide .

Tailings: Remnant low grade ore left behind as waste after gold has been extracted from grade high ore

Treatment: any method and technique or process for altering the biological, chemical or physical characteristics of wastes to reduce the hazards it presents

VAT Large rectangular containers drum barrels or vats, made of concrete and lined with material resistant to leaching

CERTIFICATION

This Environmental Impact Assessment (EIA) Report was prepared following a study by an approved firm of experts. This was done following a request by the proponent in accordance with the second schedule of the Act (EMCA 1999) which specifies projects or activities that must be subjected to Environmental Impact Assessment (EIA) and Environmental Audit (EA) and also in compliance with Environmental Impact Assessment and Audit Regulations (2003). This project report conforms to the Environmental (impact assessment and audit) (amendment) regulations, 2016. This project falls under the second schedule of these amendments which indicate the projects that should undergo environmental impact assessment. In this second schedule, mining of precious metals is categorized as among the high risk activities

In addition, this study also complies with the EMCA (2015) amendments, waste management regulations (2006), Water Quality Management Regulations (2006) and the Legal Notice number 61 of 2009 on noise and excessive vibrations. Further, it was also undertaken in compliance to article 42 of the constitution of Kenya 2010 on the right of every Kenyan to a clean and healthy environment. In addition it is in conformity with article 10 of the constitution of Kenya on the National Values and Principles of Governance which *inter alia* calls for public participation in all developmental matters. Further, it adheres to the provisions of the Kenya Mining Act No 12 of 2016, the Pharmacy and Poisons Act Cap 244, The Water Act 2016 and Climate Change Act 2016. It was done within the study limitations and resources available. I hereby certify that the information and particulars given in this report are correct and true to the best of my knowledge as at the time the EIA study was undertaken.

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EXECUTIVE SUMMARY

This is a critical examination of the proposed installation of the gold vat leaching extraction plant project. This project report is for submission to National Environment Management Authority (NEMA). It is in fulfillment of the requirements of the Environmental Management and Co-ordination Act, EMCA (1999) part VI section 58(1).

The proposed Vat gold extraction project will rely on supply of gold ores mined from various mines mainly in Vihiga and Kakamega counties. The proponent plans to engage in the mining and processing of gold. However mining will be first undertaken in different mines. These mines are in the following constituencies; Shinyalu, Vihiga and Ikolomani. The main supply will be from the abandoned Rosterman gold mine. EIAs for the mines will be discussed in different EIAS reports once the proponent concludes the agreement with the respective landowners.

The Gold vat leaching project has a sequence of 5 circular vaults made of brick and concrete and other materials resistant to leaching and leaking. The Vaults are entrenched on the ground facing upwards. The Vat leaching process involves crushing ore using a rock crusher, into fine dust and then cyanide solution is used to extract gold granules through Vat leaching process. The plant is to be located in Musiolo Village, Shirere ward, Lurambi sub-county in Kakamega County.

Cyanide Process is the most commonly used process for gold extraction. Various methods such as gravity concentration, flotation, panning, hydrometallurgy, cyanidation etc are available for the extraction of gold metal from its ores. Amongst these methods, cyanidation is the most common method used in the leaching of gold from the ore. This process involves the dissolution of gold containing ores in dilute cyanide solution in the presence of lime and oxygen. The proposed project is an industrial development project involving establishing a tailing, recycling and gold extraction plant. The project involves setting up a plant with stricter and infrastructures necessary for extracting gold from ores extracted from the mines. The proponent intends to establish more mines in future depending on the success of the first phase.

The vat leaching tanks will be 5 leach tanks, with provisions of expanding to 10, the plant will also have mixing/barren tank, water reservoir tank, septic tank and installation of associated equipment`s and fencing the whole premises by perimeter wall.

The proponent has plans to expand by constructing two more buildings in future, one which will be a one floor storey building that will comprise the manager's office, secretary's office, sales office, WC and shower on 1st floor. The ground floor will have provisions for laboratory, carbon chamber block and a store. Other provisions includes, a pit latrine,

However, under the Mining act no. 12 2016, the proponent is also advised to get a license from the department of mines under the National Government before commencing the project. The proponent has engaged Ayes consults Limited (NEMA Approved firm of experts) as their main environmental consultant to advise them on the general environmental management plan and safety for the project and also undertake an EIA report before the project becomes operational.

The process involves using a series of 5 tanks (vats)where crushed/milled ores or flotation concentrate are dipped into cyanide solution The solution is chemically treated in open tanks under atmospheric pressure conditions to extract gold granules from the gold ore extracted from the mines. This technique requires handling and grinding of all run-of-mine ores and disposal of processed materials (tailings) in tailings impoundments. The leaching facility operates in a way that allows the dewatered tailings sent to the leach pad for a second round of leaching or back to tank leaching after pressure oxidation or roasting to capture any residual gold. The cyanide solution will be left for 72 hours to ensure the contamination goes back to zero and is restricted by recycling to avoid it from spilling over to the environment. After the extraction of gold, the proponent intends to re-use the waste tailings for making interlocking bricks and concrete slabs and other building materials. However, the proponent is cautioned against using waste that has exceeded 0.1% cyanide. As it is considered hazardous above that threshold as per the NEMA waste management regulations of 2006.

The Proponent is therefore advised to establish a cyanide detoxication plant where the wastes would be detoxified before release to the environment. Cyanide detoxification can be achieved through the oxidation of cyanide by hydrogen peroxide using various hydrogen peroxide solutions at pH levels between 7-13 and temperatures between 12-65 °C using copper sulfate as a catalyst. The optimum pH and dose of hydrogen peroxide for complete cyanide removal in the presence of 30 mg/L copper sulfate as a catalyst were determined as 9.7 and 9.98 g/L, respectively. At high temperatures > 35°C, cyanide was completely removed perfectly at constant pH = 9.7 which was mainly due to cyanide evaporation in the form of HCN

He is also advised to plant a belt of reed or all around the facility between the facility and the river or the stream. The reeds are known to be natural detoxifiers of contaminated water. This is aimed at mitigating rainwater surface runoff which may wash contaminated tailings into the river during heavy downpour. The land upon which the construction will be undertaken is registered as a freehold belonging to Mr. Patrick Shiamia. The proponent has leased it for 15 years for purposes of establishing a gold leaching plant project

The site has patches of grass and young exotic trees. There is no endangered, threatened or protected flora or fauna on the proposed project site. The proponent is further advised to engage only qualified contractors approved by the NCA as per the National Construction Authority Act 2011 and the Ministry of Public Works. The tanks should be well constructed to ensure that cyanide solution does not leak from the tanks during the leaching process.

The proponent has been advised not to proceed before issuance of an EIA license as per the EMCA (1999) regulations and the 2003 EIA and EA regulations. He has also been advised to register the Vat gold leaching plant with DOSH as a workplace as per the OSHA 2007. He is further guided to ensure that all employees put on full PPE especially helmets both during construction and operational phase. He should also avail adequate sanitary facilities and first aid kits to his employees. The proponent is advised to fence the project site to prevent unauthorized persons or livestock intruding.

This report conforms to the EMCA Amendments (2015). The Project falls under projects outlined in the second schedule of EMCA. It is also categorized as a high risk project according to NEMA guideless issued on August 2016. Further, this EIA project report complies with various instruments and requirements at the International level, National level and County level. At the International arena, the proponent is advised to adhere to guidelines from the International Cyanide Management Code. The code outlines standard procedure for use of cyanide in extraction of gold. At the Kenyan national level, the proponent is advised to conform to the mining act no 12 of 2016. This report also takes into consideration Waste Management Regulations (2006), Water Quality Management Regulations (2006) and PPA cap 244 regulations on handling of poisonous substances. The PPA cap 244 state that any person handling poisonous substances for mining purposes must get a license which is renewable every six months from KPPB.

During the operational phase, the proponent is advised to ensure he gets cyanide only from established and licensed dealers as per the PPA cap 244. The proponent is additionally advised to use alternative chemical substances in the gold leaching process. Such alternatives include thiosulphate which is less toxic than cyanide. The proponent is advised that if he proceeds to use cyanide, then the waste waters and effluent released should be thoroughly detoxified since cyanide is highly toxic especially to aquatic life. In addition, the pH of the slurry should range between 11 to 12 in value. If it falls below that, then hydrogen cyanide gas (HCN) is likely to be released from the chemical processes. HCN is highly poisonous and toxic and can affect the employees and staff. The proponent is actually discouraged from using cyanide unless he has initiated reliable mitigation measures. This includes a system to monitor the pH on a continuous basis. In addition, he should consider using a fresh solution and discarding the slurry immediately the pH level decreases below 11.

However various alternatives have been recommended to mitigate possible negative effects of cyanide. This includes treating cyanide solution with lime to make it less toxic. The proponent has been advised to use water quality effluent standards as per the water quality regulations of 2006 (see appendix x). Alternatively, he is advised to consider substituting cyanide with Thiosulphate. However, thiosulphate may require more technical input during gold processing as opposed to cyanide. However it has less environmental impacts and is less toxic. The proponent intends to use 5,000 liters of water drawn from the nearby Shilumaka stream. He is advised to get authority from WRA.

Additionally, the proponent is advised to make provision of at least three first aid kits and have a number of staff trained in first aid. The proponent and contractor should also ensure that all safety guidelines are strictly adhered to including adequate safety and emergency plans such as access to provision of a first aid services and emergency evacuation procedures. The emergency procedures should be tested at regular intervals.

Under the Mining Act no 12 2016, the proponent is obligated to keep a record of the amount of Gold extracted and give the data to the Department of Mines under the National Government. It

is from this data that the department of mines under the National Government will calculate the royalties that the proponent will pay. The mining act 2016 further states that at least 10 % of royalties paid should benefit the community. 20 % of royalties paid to County Government and 70% should be paid to National Government. The proponent is advised to liaise with the community leadership to support community projects with the 10% that is due to the community. Such projects should include schools or health centers or markets. He should not give money to community leaders or groupings. The proponent intends to recycle the waste slurry by making interlocking bricks. However, effort should be made to test the cyanide levels to ensure that it does not exceed the maximum threshold of 0.1% in the waste. If the cyanide exceeds 0.1% it is considered hazardous as per the NEMA waste management regulations of 2006.

During decommissioning phase, the proponent is advised to contract a qualified plant engineer who will ensure that all machinery and equipment are removed from site with minimal risks of accidents. Effort should be made to ensure that waste cyanide or thiosulphate solution is not disposed onto the ground or river as they have the potential to contaminate the environment. No metallic part should be left idle on the ground. Further, the top soil waste should be used to refill the open pits after mining is completed. The site should be fenced after which indigenous trees and shrubs should be planted to stabilize the ground. During rehabilitation only soils from the surrounding land should be used as imported soil may lead to contamination of the land with invasive weeds and pests

Appropriate mitigation measures to ameliorate identified negative impacts on the Environment have been suggested through the respective E M Ps. There is an EMP proposed for each of the three main phases of the project. These three phases are: construction, operation and decommissioning phases. It is incumbent upon the proponent, the contractor and the plant manager to liaise with other lead agencies and stakeholders in ensuring that the EMPs are adhered to. The EMPs indicate the specific role to be played by various actors. And the specific time frames. Additional advice is given in this report.

Solid waste – The contractor should remove solid wastes from the site and dispose them in designated areas. The Plant manager to ensure that a proper solid waste management regime is developed and adhered to.

Toilet facilities: The proponent will construct pit latrines for the staff. He is advised to ensure that it is emptied by exhausters before it gets completely full. He is also directed to consult public health officer before constructing another pit latrine to minimize the risk of contaminating the underground water. The proponent has 50 casuals during the construction phase. But during the operation phase he intends to hire more casuals depending on the work load. He is advised to provide adequate sanitation facilities. The ratio should be at least one toilet per 10 casuals. This will translate to 12 pit latrines. He should also provide adequate water for hygiene purposes. The latrines should be handed over to the community leadership after the end of the project.

Water supply – The gold leaching plant will depend on water drawn from Shilumaka stream. The proponent will draw 5,000 liters of water every month from the stream. The Proponent is advised to get authorization from WRA before drawing water from the stream.

Accident occurrence – The proponent is advised to ensure that all staff are properly briefed on their roles and responsibilities and how to react in case of an accident. There must be a safety manager who would ensure that all safety procedures are strictly adhered to in order to minimize risks of accidents. No staff should run machinery under the influence of alcohol. In addition, no employees on medication should run machinery. Employees suffering from epilepsy should be given different tasks away from running machinery. All equipment and machinery should undergo regular checkup and maintenance as per the manufacturer's specifications.

Source of Energy: The main source of power for the plant will be electricity from KPLC and a backup generator which is diesel powered. The proponent will also use solar energy specifically for lighting.

Adverse construction activities- : Supervision of construction personnel by a qualified plant engineer taking into consideration general sources of air pollution, noise pollution and construction wastes.

Additional road traffic and safety implications: Adequate signage provision and parking space during off loading and loading of extracted gold ore and equipment.

Slurry waste after extraction of gold –The proponent intends to use the waste slurry to make interlocking brick after adding soil to it. The proponent is advised to ensure that cyanide composition does not exceed 0.1% of the slurry. Cyanide above 0.1% is considered hazardous as per the waste management regulations. For the waste that he may intend to dispose in designated sewerage areas, the cyanide composition should not exceed 2 mg per liter as per the water quality management regulations of 2006.

Storm water-The proponent plans to construct a water trenches to drain water and prevent surface water runoff from flowing into river Isiukhu and Shilumaka stream.

Adverse operational activities: Personnel training, equipment maintenance, testing and inspection.

Health and Safety - Develop a site safety action plan and workers to be provided with suitable protective gear. Plant manager must ensure equipment is periodically checked by qualified personnel as outlined in OSHA 2007

Security and accessibility: Fencing of the site to prevent livestock and unauthorized personnel from intruding into the facility.

Brief overview of construction phase
The project description has been separated into the following phases: construction, operation,

Decommissioning and closure. These phases are described below.

JUSTIFICATION AND PURPOSE

The gold Vat leaching plant will create job opportunities and generate wealth. The proponent will pay royalties to the National Government, County Government and also the community. Under the mining act 2016, the National Government should receive 70% of the royalties, County Government should receive 20 % of the royalties and the community is entitled to benefit from the 10% of the royalties. The proponent will also pay license fee both to the National Government and County Government.

In addition, the project intends to rehabilitate the land after the gold is extracted from the tailings. The tailings will be used to make interlocking bricks. This will help in availing affordable building materials and also generate wealth and job opportunities.

1.1 INTRODUCTION

1.1.1 Brief Background of the Gold VAT leaching and Elution plant

1.1.2 Project Summary

Owner: STONES OF WEALTH LIMITED.

Nature of Development: The proposed gold Vat leaching plant is yet to commence. The site upon which the proposed project will be constructed, has been leased for 15 years from the owner Mr. Patrick Shiamia and it is 0.46 Hectares. Mr. Patrick has leased the land to Stones of Wealth Limited for 15 years.

This piece of land is close to artisanal miners where the proponent will be relying to get tailings apart from sinking his own shafts. The proponent is assembling materials ready for construction of the VAT gold leaching plant. The proponent has been advised not to commence any mining processes before the issuance of an EIA license as per section 58 of the EMCA 1999. Additionally, the Engineering designs and structural plans should be approved by the County Government of Kakamega, Department of Public Works, and the Public health Department and Physical Planning department. Further, in pursuant of the National Construction Authority Act 2012, the proponent is directed to only engage contractors approved by the Ministry of public works and the NCA.

- Size of the Land: 0.46 hectares
- Cost of the Project:Kshs 12,000,000
- Duration of Lease-15 years
- Location of Project: Musiolo Village
- Ward: Shirere Ward
- Sub county : Lurambi
- County: Kakamega
- Plot No LR: – ISUKHA/SHIRERE/6664
- Land owner on which the project stands: MR Patrick Shiamia

Water supply: The gold Vat leaching project will rely on water supply from one of the tributaries (Shilumaka stream) to river Isiukhu. River Isiukhu is about 100 meters from the site of the proposed project. The tributary forms the southern end of the border of the leased land. The proponent intends to draw 10,000 liters of water once per month from the river for the project during the construction and operational phases. He has been advised to seek authority from WRA.

However, during the construction and operational phases, the staff will be drawing drinking water from a nearby protected spring that serves the community and also piped water from LVWSB.

1.1.3 Environmental Impact Assessment Report Outline

The proposed project will be built on plot no: **ISUKHA/SHIRERE/6664** which is registered under **MR Patrick Shiamia and its approximately 0.46 hectares in size.** The proponent has leased the land for 15 years.

The proposed project, falls under the second schedule of EMCA, 1999 section 58 (1), (5) that require an Environmental Impact Assessment study. As stipulated by the legal notice No. 101, 2003, PART VI, Section 31 (3((a) (i) and (ii) the building being an ongoing project, requires an Environmental Impact Assessment study which will provide baseline information upon which subsequent environmental control assessment and management shall be based .

The EIA study was done in accordance to the guidelines provided by the legal notice No. 101 section 58 (1) which stipulates the methodology to be adapted. Accordingly, the EIA study was carried out through site visits, baseline studies, literature reviews and interviews of key personnel representing the proponent and also residents living around the proposed project site.

1.1.4 The Terms of Reference

The following were the specific terms of reference which was arrived at after an in depth consultation between the proponent and the consultants: The ToR were submitted to NEMA and approved on 15th of April 2024.

i. How the project is designed
ii. Architectural designs of the project (Including camp site sewerage, administrative offices)
iii. Layout of the project plan
iv. The possible environmental impacts of open cast and shaft or underground mining
v. Management of Effluents
vi. Management of Chemical wastes
vii. The management of physical wastes

1.1.5 Objectives of the EIA

1. Identify the significant impacts of the project on the environment.
2. Evaluate the relative magnitude of the changes likely to occur on the environment as a result of the project.
3. Propose mitigation measures for the significant impacts of the project.

4.To generate data and standards for monitoring and evaluating the project.
5.Guide stakeholders and policy makers in making informed decisions with regard to the various aspects of the project

1.1.6 Assessment Methodology

This Environmental Impact Assessment Report was carried out in September 2015 in accordance with the procedures and protocols in the Legal Notice No. 101 (Environmental Impact and Audit Regulations, 2003). Principal activities of the study involved:

1. Extensive site tours to physically inspect and document equipment intended for use on the site, natural and socio-economic features of importance through direct observations.
2. In depth analysis of proposed chemical processes to extract gold from gold ore tailings
3. Review relevant literature on findings in similar project designs
4. Interviews with the proponent, local community, county and National Government officials.
5. Review of relevant legislation both at the international and national level

2.0 CHAPTER TWO: GOLD LEACHING PROCESSES USING CYANIDE

This chapter will give a description of the gold vat leaching processes. It also captures activities being undertaken during the construction phase. This chapter also briefly discusses how cyanide is used in gold leaching processes. It further examines the potential negative environmental and health impacts of cyanide use. Additionally, this chapter gives possible, project alternatives. Finally the map of the project area will be depicted.

2.1 Construction Phase

The purpose of the construction phase is primarily to establish VAT leaching plant and the required offices necessary for the operational phase.

2.1.1 Site facilities for construction phase

A number of contractor working areas will be established on site during the construction phase. These work areas will either be within the footprint of the planned operational infrastructure, or in the dedicated contractors camp and lay-down area to be located within the process plant area.

2.1.2 Purpose of construction phase

The purpose of the construction phase is primarily to establish the infrastructure and activities required for the operational phase, the overall site layout. The following facilities will be required for the construction phase:

- Workshop and maintenance areas
- Stores for storing and handling fuel, lubricants, solvents, paints and construction materials
- Contractors lay-down areas
- Mobile site offices
- Waste collection and storage areas
- Wash bay for washing equipment and vehicles
- Parking area for cars and equipment

- Change houses
- Sanitary facilities
- Temporary power and water supply infrastructure.
- Construction Camp.

2.2 VAT Gold Leaching Process

The project will involve bleaching gold tailings using VAT leaching process. In vat leaching the solids are loaded into the vat, once full the vat is flooded with a leaching solution in this case cyanide. The solution drains from the tank, and is either recycled back into the vat or is pumped to the next step of the recovery process. Vat leach units are either cyclical containers (drums, barrels, tanks or vats), usually very big and made of concrete, lined with material resistant to the leaching media. The treated ore is usually coarse. This process which is also known as 'vat leaching' most often takes place in a specialized mill that is located on the mining premises. This process works by exposing the surface of the finely crushed ore to the cyanide salt solution. Once exposed to the gold, the solution binds with ions in the gold that allows them to separate out into solution and then be screened for collection. It is well-known that the introduction of more oxygen speeds up the leaching process but it is not often done in a mill out of cost concerns. Different elements in the ore itself can wreak havoc on the process and significantly hurt the effectiveness of the process. The vats are usually run sequentially to maximize the contact time between the ore and the reagent. In such a series the leachate collected from one container is added to another vat with fresher ore. The VAT leach units or tanks are equipped with agitators to keep the solids in suspension in the vats and improve the solid to liquid to gas contact (Canada, Canadian Food Inspection Agency, 2012) Agitation is further assisted by the use of tank baffles to increase the efficiency of agitation and prevent centrifuging of slurries in circular tanks.. The VAT leaching process is closely related to the Tank leaching process. However there a few different features. These differences are briefly discussed in table 2.1 here below. Gold recovery in VAT leaching process is less than 70 % as compared to agitated tank leaching method which can be greater than 90% for free milling ores(Hiji and Maganga, 2015)

Table 2.1 Comparison between VAT gold leaching and Tank leaching	
VAT leaching	Tank Leaching
The gold ore or tailings are more coarser	The gold ore or tailings are ground sufficiently to form a fine pulp or slurry. Hence reducing the costs of size of reduction
Vats do not contain much internal equipment except for agitators	Tanks are typically equipped with agitators, baffles, gas introduction equipment designed to maintain solids in suspension in the slurry and achieve leaching.
VAT leaching is generally operated in a batch fashion	Tank leaching is typically continuous
Typically , the retention time required for VAT leaching is more than that for tank leaching to achieve the same percentage of recovery being leached	Requires less retention time for leaching as compared to VAT leaching
The solids remain in the VAT and solution is moved	The slurry is moved

Heap leaching – applied to gold recovery using cyanide

"Expanded pad" heap configuration: old heaps are left in place, and new heaps are placed ahead.

$$4\,Au + 8\,NaCN + O_2 + H_2O \rightarrow 4\,NaAu(CN)_2 + 4\,NaOH$$

Gold (solid) + Sodium cyanide (dissolved) + Oxygen (gas) + Water (liquid) → Gold-cyanide complex (dissolved) + Sodium-hydroxide (dissolved)

FIG 2.1: GOLD HEAP LEACHING RECOVERY PROCESS USING CYANIDE

2.3 Background information on cyanide

Cyanide is the general term for chemicals which contain a cyano group (triple-bonded carbon and nitrogen with the chemical formula CN) that occur naturally or are human-made in various forms. Low concentrations of cyanide are present in the everyday environment including as a stabilizer in table salt, in over 1000 plants including cassava and bamboo shoots, and in the pits of stone fruits like plums and apricots (Canadian Food Inspection Agency. 2012, Minerals Council of Australia, 2005) In fact, the greatest source of cyanide exposure for people and free-ranging animals comes from eating food plants and crops that contain cyanide (Eisler, and Wiemeyer 2004).

Cyanide occurs naturally in cassava roots, which are potato-like tubers of cassava plants grown in tropical countries. Hydrogen cyanide is a colorless gas with a faint, bitter, almond-like odor. Sodium cyanide and potassium cyanide are both white solids with a bitter, almond-like odor in damp air. Cyanide is usually found joined with other chemicals to form compounds. Examples of simple cyanide compounds are hydrogen cyanide, sodium cyanide and potassium cyanide.

Cyanide can be produced by certain bacteria, fungi, and algae, and it is found in a number of foods and plants. In the body, cyanide combines with a chemical to form Vitamin B 12. Cyanide and hydrogen cyanide are used in electroplating, metallurgy, and production of chemicals, photographic development, making plastics, fumigating ships, and some mining processes.

Cyanide is also a useful industrial chemical; over one million tons of it is used annually in electroplating, metal processing, the production of organic chemicals and plastics, and in photographic applications (Minerals Council of Australia. 2005). The mining industry has used cyanide to process ore for more than 120 years, and uses less than 20% of the global production of industrial cyanide (Minerals Council of Australia. 2005, InfoMine, 2012).

2.3.1 Potential Cyanide Toxicity To The Environment

- Cyanide is toxic in large doses and is strictly regulated in most jurisdictions worldwide to protect people, animals, and the aquatic environment.
- Cyanide prevents the body from taking up oxygen, resulting in suffocation, which may be fatal to humans and animals without prompt first aid treatment (Canada, Health Canada, 2012) However, people and animals can rapidly detoxify non-lethal amounts of cyanide without negative effects, and repeated small doses can be tolerated by many species (Eisler, and Wiemeyer 2004)
- Some long-term health effects have been observed in people who have a diet high in cyanide-containing plants such as cassava, and include goiter and depressed thyroid function(International Cyanide Management Institute 2012)
- Where cyanide is used extensively by miners with limited waste containment and safety practices, “human fatalities are relatively minimal particularly when compared with mercury or other hazards” (Hinton et al 2003).

- In high concentrations, cyanide is toxic to aquatic life, especially fish which are one thousand times more sensitive to cyanide than humans (UNEP/OCHA, 2000).
- Because the greatest environmental threat from cyanide to aquatic life is from intentional or unintentional discharges into surface waters, water monitoring and water management on mine sites is very important (Mudder et al ,2006)
- Regulations frequently limit the amount of cyanide which may be discharged into the environment, and there are a number of water treatment technologies available to remove cyanide from mine water (Minerals Council of Australia. 2005)
- Birds and other wildlife are also potentially at risk from cyanide poisoning if they are using tailings ponds for drinking or swimming (Mudder et al 2006).

2.3.2 Potential Risk Associated With Accidental Cyanide Spills

- Where cyanide has been accidentally released into surface waters, it has been investigated and changes have been made in the industry to prevent such releases happening again. One such change is the adoption of the International Cyanide Management Code. This code was developed following several cyanide spills, in particular the Baia Mare spill in Romania in 2000. In the Baia Mare case, a dam failure that spilled cyanide into nearby waters resulted in widespread contamination, fish deaths, and economic harm–but no human deaths.
- In such spills, the cyanide is rapidly destroyed through natural processes, such as evaporation, and the effects on aquatic life–while significant–are not long-term (Eisler, and Wiemeyer 2004).
- In the Baia Mare spill, the cyanide concentration decreased rapidly with increasing distance from the spill. After the contaminated water had passed, aquatic micro-organisms and plankton recovered within a few days (UNEP/OCHA, 2000).
- In Japan, an earthquake in 1980 resulted in a large amount of cyanide entering a stream from a gold mine. While the spill killed all life in the stream, cyanide was detectable for only three days after the spill; within 1 month flora began to regrow on above-water stones, and within 6-7 months the populations of fish, algae, and invertebrates had recovered.
- Cyanide was also not detectable in water and sediments in Yellowknife Bay in the Northwest Territories from 1974 to 1976, despite a continuous input of cyanide-containing effluents from a gold mining operation (a practice that would not be permitted today) (Eisler, and Wiemeyer 2004).

2.3.3 Cyanide Management

- In order to prevent wildlife fatalities, cyanide levels in tailings ponds can be reduced to safe levels by minimizing the amount of cyanide used, removing cyanide in waste streams and recycling it,
- By using chemical or biological reactions to convert the cyanide into less toxic chemicals(Botz, 1999),
- A standard of 50 mg/L weak acid dissociable (WAD) cyanide is widely accepted to be a safe level for water accessible to wildlife, and has essentially eliminated the number of migratory bird deaths from this cause(Australia Government,2008, Mudder et al 2006). Only a few hundred birds are killed by cyanide each year (Mudder et al 2006).

- Deterrents like fencing, polyethylene balls, and netting are also used to keep birds out of water bodies on mine sites(Eisler, and Wiemeyer 2004)
- Cyanides do not cause cancer, and do not build up or "biomagnify" in the food chain. (Laberge Environmental Services 2001).
- They do not persist in the environment, and are quickly broken down into less toxic chemicals by sunlight and air(Minerals Council of Australia. 2005)

2.4 Project Alternatives

This report has discussed several project alternatives. This is because the proponent intends to use cyanide solution during the leaching of the gold tailings. The proponent is advised to consider use of other alternatives that are less toxic than cyanide. These include thiosulphate or lime treated cyanide. All these alternatives have their advantages and disadvantages. However, overall, the proponent is advised to ensure that the alternatives with the least negative environmental and health impacts are selected. These alternatives are summarized in table 2.2

(a)"No project alternative"

(b) Thiourea

(c)Thiocyanate

(d) Halogens/Halides

(d) Bisulphide

(e) Ammonia

(f) Locating the project about 500 meters way from the river establishing a reed belt to naturally detoxify the waste. Currently the project is located about 100 meters from river Isiukhu

(g) Use of lime based cyanide for leaching which is less toxic

.

Alternative	Advantage	Disadvantage
No project alternative	• There will be no extra disturbance of the environment • There is no potential for cyanide poisoning of the environment and river Isiukhu which is close to the proposed project. • The land will be used for farming to increase food production.	• No generation of wealth as a result of gold sales • No revenue generated from rates and royalties paid from the project • Loss of potential jobs especially for manual jobs among the local community
Cyanide	• Cost effective • Easy to apply	• The pH of the slurry with cyanide must be maintained between 11 and 12 • Can release HCN if the pH falls below 11.HCN is extremely toxic especially for aquatic life • Highly toxic especially to aquatic life
Thiourea	• Proven technology • Availability • Suitable for refractory ores • Consumption has been reduced by redox control • Fast rate of gold dissolution	• Recyclable only to limited extent due to instability • Detoxification costs would be considerable • Difficult to control process parameters • Limited applicability • It is a known carcinogenic
Thiosulphate	• Proven Technology • Availability • Suitable for refractory/ preg -robbing ores not amenable to cyadination • Good leaching performance 99% • Like cyanide, thiosulphate leaching is an alkaline process (usually operated in the pH 8 to 10 range) so there are no concerns with corrosion and materials used in construction, and the process can be applied to heaps and dumps, or to stirred tanks.	• Recyclable only to limited extent due to instability • Detoxification costs would be considerable • Difficult to control process • Limited Thiosulphate leaching is a sensitive process that requires both dependent and independent optimization of each of the chemical components of the leach reaction, as well as physical parameters such as pulp density and temperature, in order to maximize gold recovery and minimize reagent losses.

	• It can yield substantially better recovery than cyanide. • It has great potential to reduce the impact on the environment compared to the cyadination process. Unlike cyanide, which is highly toxic, the chemicals used in the thiosulphate leaching process are benign • The main chemical components of the leaching process (ammonium thiosulphate and ammonium sulphate) are common fertilizers, which opens up the additional possibility of using mine tailings solutions in agricultural applications, in regions of the world where the local infrastructure and environmental regulations are favorable.	
Thiocyanate	• Can operate over a wide pH range • Partly recyclable	• Availability limited • No large scale applications known • Detoxification costs would be considerable • Higher temperatures required
Halogens/Halides	• Readily available • Leach performance is good • Proven technology in refining gold • Suitable for most ore types	• Requires oxidant. (often of halide) • Handling and control difficult

Bisulphide	• The availability and reasonable price of bisulphide and its sources indicate reasonable extraction economics	• Long retention times and closed system, that would probably be required, would mean high capital investment costs for such a leach plant. • The operating costs considering detoxification, however, would be very high, because a high chemical oxygen demand would again be necessary • Compared to cyanide, bisulphide does not offer any major technical advantages nor does it have such favorable lethal toxicity and ecotoxicity data to warrant a more favorable classification with regard to safe handling or environmental damage in the case of a spillage
Ammonia	• Availability • Recyclable • Could be suitable for refractory ores	• No large scale applications known • Not detoxiafiable. Must be recycled • Requires high temperatures and pressures for acceptable leach performance • Selectivity doubtful

2.4.1 Conclusion on Project Alternatives

From the alternatives mentioned above, the proponent is advised to combine the following project alternatives.

a) These include replacing use of cyanide with thiosulphate

b) Locate the project to at least 100 meters away from river Isiukhu.

c) Then the proponent should plant a belt of reed between the project site and river Isiukhu. The reed belt would naturally detoxify any toxic wastes that may be washed by runoff into river Isiukhu

d) Treat cyanide solution with lime to make it less toxic

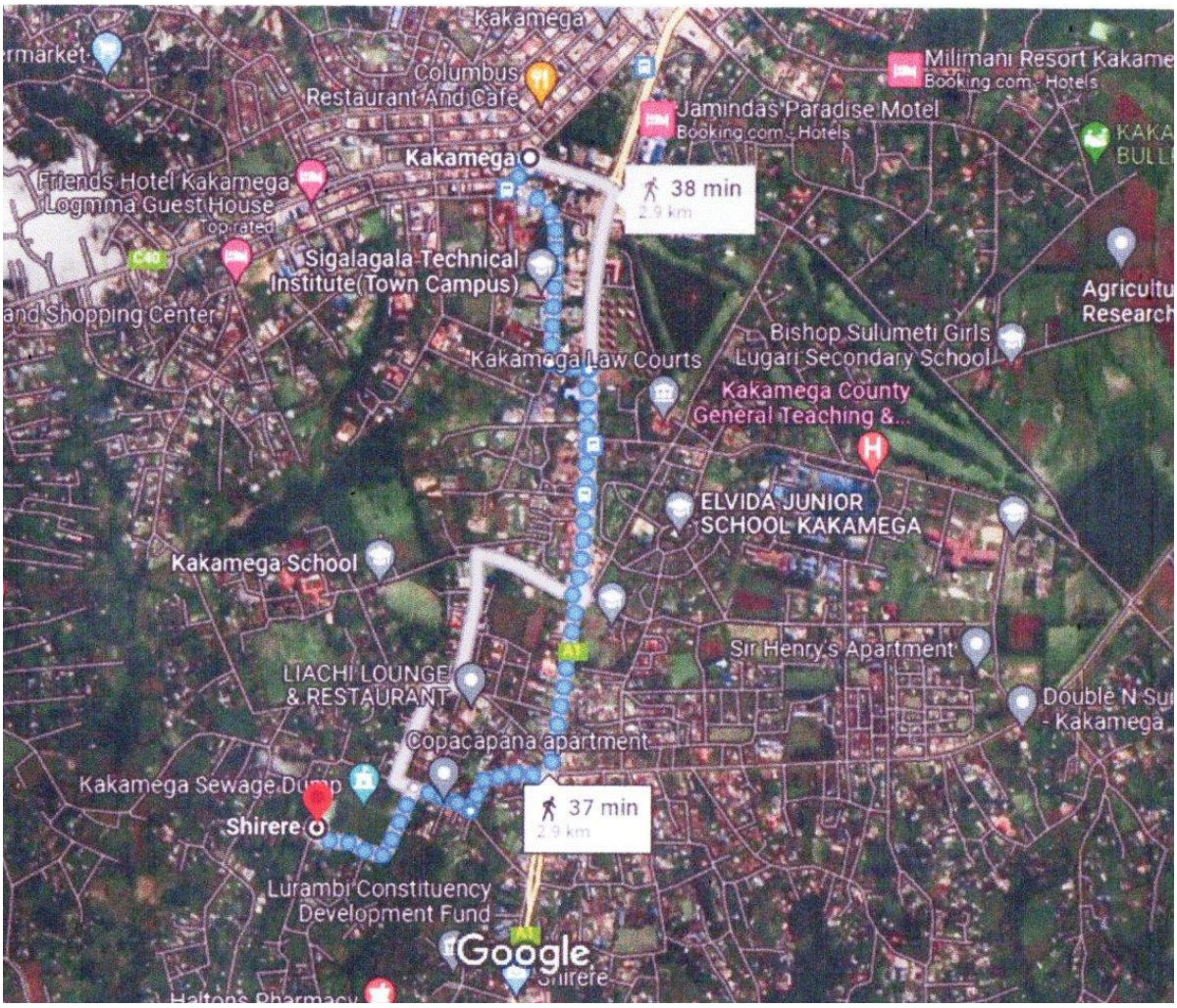

FIG 2.2: SATELLITE MAP SHOWING LOCATION OF THE PROPOSED PROJECT SITE

FIG 2.3 : MAP OF LURAMBI SUB COUNTY (SOURCE: KAKAMEGA CIDP 2018)

2.2 Ownership of Land

Currently, the land has a title deed registered as a Freehold in the name of Mr. Patrick Shamia. The land approximately 0.46 hectares. .

(**Check Appendix II indicating leasehold certificate**). The proponent has leased the land for 15 commencing 1st September 2023.

CHAPTER THREE: BASELINE INFORMATION:
3.0 BASELINE INFORMATION

3.1 Physiographic and Natural Conditions Of Kakamega County

The altitudes of the county range from 1,240 meters above sea level to 2,000 meters above sea level. The southern part of the county is hilly and is made up of rugged granites rising in places to 1,950 meters above sea level. The Nandi Escarpment forms a prominent feature on the county's eastern border, with its main scarp rising from the general elevation of 1,700 meters to 2,000 meters. There are also several hills in the county such as *Misango, Imanga, Eregi, Butieri, Sikhokhochole, MaweTatu, Lirhanda, Kiming'ini* hills among others. There are seven main rivers in the county namely, Rivers *Nzoia, Yala, Lusumu, Isiukhu, Sasala, Viratsi* and *Sivilie.*

3.1.1 Topography

Lurambi Sub-County has a varying topography with altitudes ranging from 1,250 meters to 2,000 meters above sea level. Kakamega Town lies on the altitude 1500 meters above sea level. They are two main physiographic units, namely the southern hills made up of rugged granites rising to 1,950 meters above sea level, and the peneplain with remnants of denudation at Kakamega and Kambiri. The Nandi Escarpment forms a prominent feature on the Lurambi sub county Eastern border with its main scarp rising from the general elevation of 1,600 to 2,000metres.

3.1.2 Ecological Conditions

There are two main ecological zones in the county namely; the Upper Medium (UM) and the Lower Medium (LM). The Upper Medium covers the Central and Northern parts of the county such as Lurambi, Malava, Shinyalu and Ikolomani that practice intensive maize, beans and horticultural production mainly on small scale; and Lugari and Likuyani where large scale farming is practiced. The second ecological zone, the Lower Medium (LM),covers a major portion of the southern part of the county which includes Mumias, Matungu and Butere and Khwisero. In this zone, the main economic activity is sugarcane production with some farmers practicing maize, sweet potatoes, tea, ground nuts and cassava production.

3.1.3 Climate

There are two rainy seasons in the district, the long rains and the short rains. The long rains start in March and end in June with the peak in May. The short rains commence in July and end in September and peaks in August. The driest months are December, January and February. Generally rainfall varies from 1,000mm per annum in northern parts of the district to 2,400mm per annum in southern parts. Most rainfall received in the district comes in the form of heavy afternoon showers with occasional thunderstorms.

3.1.4 Flora and Fauna

Kakamega forest is the largest forest resource nearest to the project site. However, the forest will not be directly affected by the project. The forest is a home to many wild animals including monkeys, baboons and bird species including snake-eating birds, Black and White Casqued Hornbills, Turacos, Pygmy Kingfisher, Jameson's Wattle-eye, Yellow crested Woodpecker, Red-breasted Owlet, Martial Eagle, Crowned Eagle, Bateleur The forest also has several species of trees Elgon teak, red and white stink woods, varieties of Croton, Aniageria Altisima and several types of orchids of which some are as old as 100years.

3.1.5 Land Uses

Agriculture is the dominant land uses in the whole county. However, the average land holding size in Kakamega County is 0.57 ha. Generally the Southern and central regions have lower average land holding compared to the northern region. . The land has been sub-divided into small uneconomic portions in the southern and central regions due to the high population. There is need to encourage optimal use of land through diversification of economic activities and also reduce over reliance on land as the main and only source of livelihood. The soil types in this locality are varied and ranges from red loam, sand to black cotton soil.

3.2 Population

3.2.1 Population Profile and Projections

As per 2019 census Kakamega county had a total population of 1,867,579 people, of which897, 133 are males, 970,406 being females and 40 intersex persons. There are 433,207 households with an average size of 4.3 persons per household and a population density of 618 people per square kilometer.

Distribution of Population by Sex and Sub-County

3.2.2 Population Density and Distribution

The county's population density in rapidly increasing. The population density is projected to increase to 761 and 800 persons per Km^2 in 2015 and 2017 respectively. As shown in table

3.1

Sub-county	Male	Female	Intersex	Total
Butere	73,634	80,463	3	154,100
Kakamega Central	92,774	95,432	6	188,212
Kakamega East	80,553	86,784	4	167,641
Kakamega North	115,511	122,814	5	238,330
Kakamega South	53219	58,524	0	111,743
Khwisero	53,670	59,803	3	113,476
Likuyani	73,710	78,341	4	152,055
Lugari	59,135	63,593	0	122,728
Matete	31,749	34,423	0	66,172
Matungu	78,793	88,143	4	166,940
Mumias East	55,895	60,953	3	116,851
Mumias West	54,915	60,438	1	115,354
Navakholo	73,275	80,695	7	153,977
Total	897,133	970,406	40	1,867,579

TABLE 3.1 Population Distributions and Density in Kakamega County

Source: Kenya National Bureau of Statistics, 2019

3.3 Gold Mining in Kakamega County

Surface gold mining activities have taken place in Kenya for many years up to the present time but most of the medium to large scale surface gold mining of gold and base metals took place during pre-independence days. The geographical survey and assessment of minerals revealed that the surface gold mining industry in Kenya is quite small. The endowment of mineral is varied. However, surface gold mining is hampered by poor accessibility to deposits, legal set ups, financial and technical requirements, lack of markets and lack of large mineral deposits to warrant major capital investments. In terms of gold mining methods, some open cast surface gold mining happens where stones and quarries are mined which often leave holes that fill with water when it rains. Many lives have been lost in these collected waters. The other issue with respect to

surface gold mining in Kenya is about community participation in making important decisions relating to the surface gold mining activity, for example, whether it ought to go or not, relocation of people and their socio-economic and cultural activities (Institute for Law and Environmental Governance (ILEG), 2003).

The largest gold mine in the country was located in Rosterman near Kakamega town in Western region and it operated from the 1930's till it was closed down in 1952. A medium scale copper mine was also operated at Malcalder in Migori areas of Nyanza region from 1956 until it closed in the late 1960's. Lead ore mines were operated in the Kinangoni and Vitengeni areas of Coast region till the 1970's (GoK, 2010).

The history of gold mining in Kakamega in Western Kenya dates back to 1892 when deposits of the precious metal was discovered along the Nyanza Rift Valley boundary. Kakamega town was began by a British company; Rosterman Gold Mines, which was incorporated and licensed in January 1935, to prospect and mine Gold. By 1952, it had mined 655,000 tons of ore and which had produced 259000 ounces of gold. By then it was one of the largest firms in western region (Machandaria 2011).

In later years, however surface gold mining in Kenya has been dominated by the production of a variety of industrial minerals, among which are Soda ash, fluorspar, diatomite, and limestone. Gold and gemstone production became the main activity of Small-Scale miners who have operated continuously in different parts of the country (GoK, 2010). In Kenya, Artisanal and Small-Scale gold mining is associated with rural areas especially the western part which is said to have potential for gold. These include Kakamega, Vihiga, Migori and Bondo areas (GoK, 2010).

After the firm ceased operation, the mines were left in the hands of the local residents and small-scale miners. Villagers still scavenge the abandoned mines in search of the elusive mineral in Rosterman mines. Experts believe that huge gold deposits remain embedded underneath the rocks in the region (Machandra, 2014)**.**

Rosterman in Kakamega traces back its Artisanal and Small-Scale gold mining to the early 1980's. It had a prospecting license with around 100 registered members involved. The license was supposed to work up to 1992 and since then it was never renewed. The surface gold mining process then became a local dealers' management process. Since then to date there have been no clear records on the amount of gold mined within the entire location as well as its market availability (Okoth, 2008).q

Nonetheless, surface gold mining can still be a significant employer, particularly to the people of Rosterman in Kakamega Central Sub-County, once the indirect impacts of job creation by suppliers to mining operations are considered. In addition to their core workforce, all mining operations will have significant requirements for suppliers to provide goods and services, for example construction, logistics, raw materials, catering, maintenance, accountancy and legal services.

Rosterman mines has produced an estimated 250,000 ounces of gold at an average grade of approximately 13g/t Au. It yielded the highest amount of gold since gold mining began in the 1930s and 1940s. After 70 years since production ceased at Rosterman, there has been limited exploration in this highly-prospective area until 2010, however, since this time drilling has confirmed the prospectively of this area, returning large ore grade intercepts. It is believed that the Kakamega Dome Camp has the potential for medium to large size, higher-grade gold deposits.

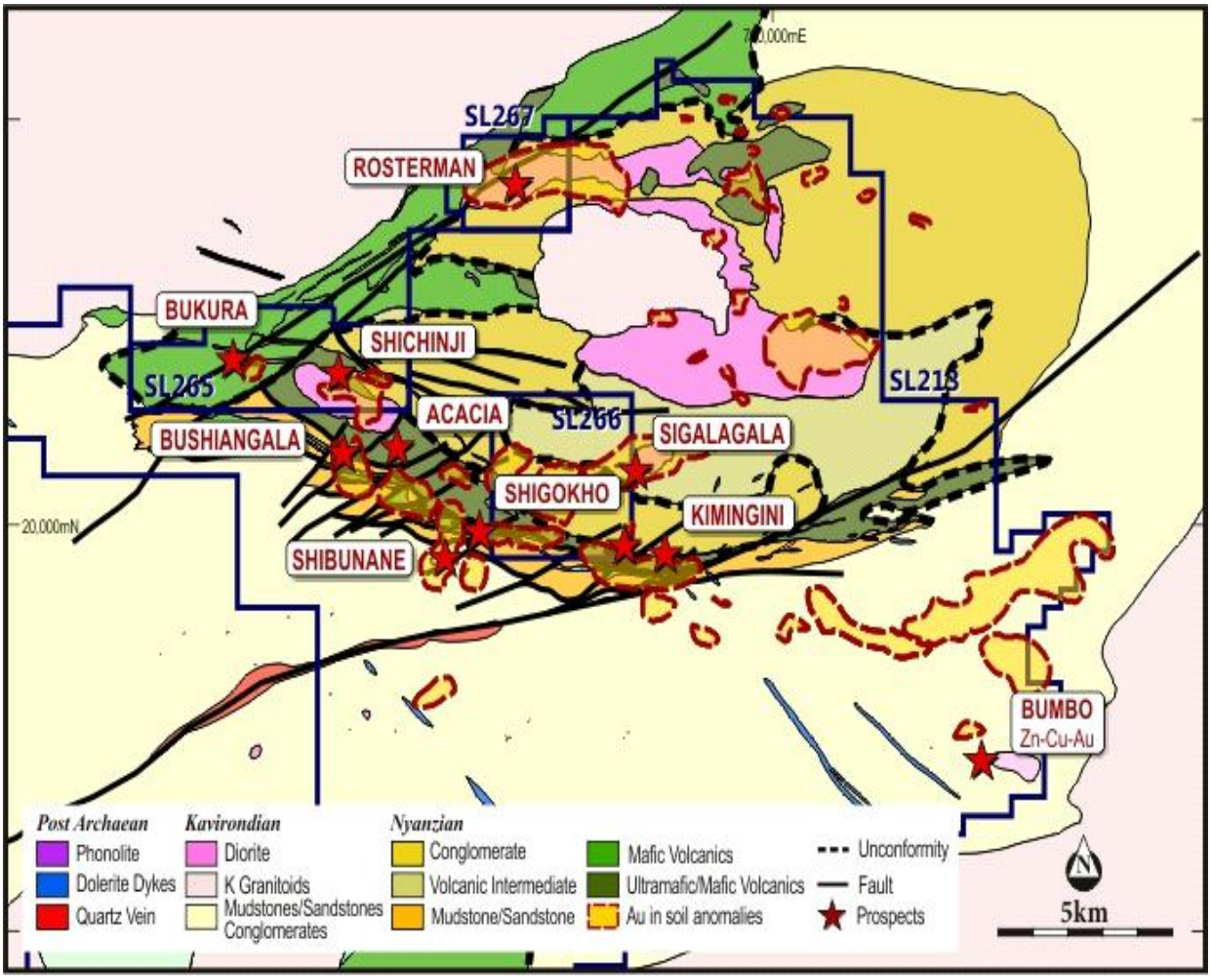

FIG 3.1: POTENTIAL MINERAL DEPOSITS IN KAKAMEGA COUNTY (NB: GOLD IS ABBREVIATED AS Au) Source (Kakamega County CIDP, 2017)

CHAPTER FOUR: PROJECT DESCRIPTION, DESIGN AND OPERATIONS

The project will involve leaching gold tailings using VAT process. In vat leaching the solids are loaded into the vat, once full the vat is flooded with a leaching solution in this case cyanide. The solution drains from the tank, and is either recycled back into the vat or is pumped to the next step of the recovery process. VAT leach units are either cyclical or rectangular containers (drums, barrels, tanks or vats), usually very big and made of wood or concrete, lined with material resistant to the leaching media. The treated ore is usually coarse. This process which is also known as 'vat leaching' most often takes place in a specialized mill that is located on the mining premises. This process works by exposing the surface of the finely crushed ore to the cyanide salt solution. Once exposed to the gold, the solution binds with ions in the gold that allows them to separate out into solution and then be screened for collection.

It is well-known that the introduction of more oxygen speeds up the leaching process but it is not often done in a mill out of cost concerns. Different elements in the ore itself can wreak havoc on the process and significantly hurt the effectiveness of the process. The vats are usually run sequentially to maximize the contact time between the ore and the reagent. In such a series the leachate collected from one container is added to another vat with fresher ore. The VAT leach units or tanks are equipped with agitators to keep the solids in suspension in the vats and improve the solid to liquid to gas contact (Canada, Canadian Food Inspection Agency, 2012) Agitation is further assisted by the use of tank baffles to increase the efficiency of agitation and prevent centrifuging of slurries in circular tanks..

The crushed fine ore will be heap on the water-proof ground, and set drain aside the ground in advance; the Vat leaching will involves the following:

- In vat leaching the solids are loaded into the vat
- Once full the vat is flooded with a leaching solution. The leaching solution in this case is cyanide)
- The solution drains from the tank, and is either recycled back into the vat or is pumped to the next step of the recovery process.
- Vat leach units are circular water proof containers (drums, barrels, tanks or vats), usually very big and made of concrete, lined with material resistant to the leaching media. The treated ore is usually coarse.
- For the large piles will be sprayed by the leaching solutions, through which the gold-containing solution will be leached from the piles
- Then the method of carbon adsorption, zinc powder displacement device will be used to separate gold from the liquid. The slurry will be further recycled

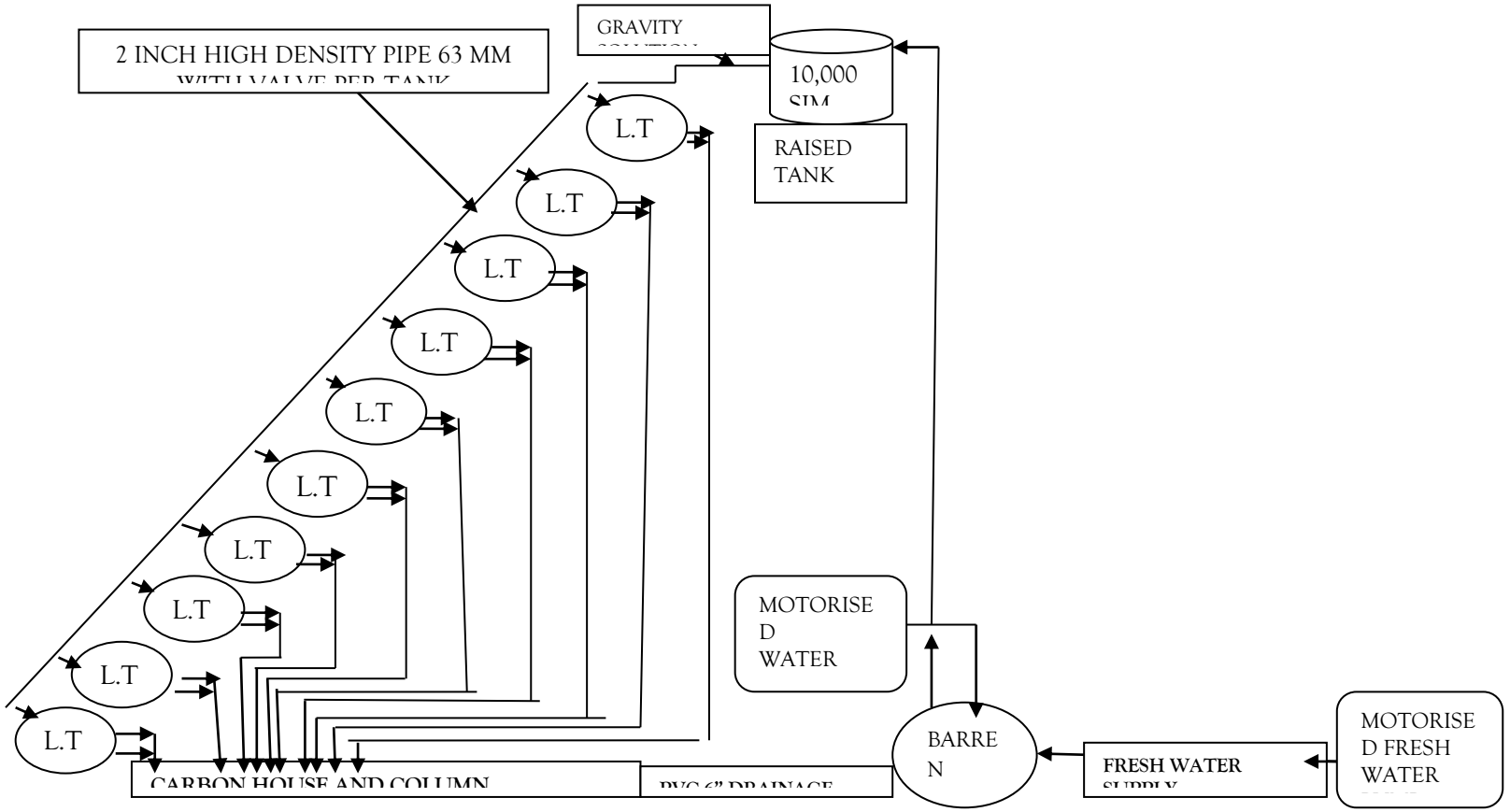

Fig 4.1: DESIGN FOR PROPOSED GOLD VAT LEACHING
L.T: Leaching Tank. (Each tank is 3.4 wide and 4 meters in height)

4.0 Description of the Project's leaching process.

The project will involve construction of 5 leaching tanks but with enough space to expand to 10 if need arises. Each tank will be 20ft id diameter 4 meters in height. The leach tanks are constructed using baked clay bricks, cement, ribbed steel and concrete.

The proponent has been advised to ensure the tanks are well constructed to prevent any possibility of the cyanide solution Leakage. It will also have a 10,000 liter Plastic tank. The tank will be raised. The leachate containing the crushed gold tailings will be prepared in this tank. The solution will flow by gravity through a 2 inch high density pipe with 63 mm with valve per tank. Each leaching tank will be connected to the carbon house and column through a small pipe (See figure 4.1)

Steps	Processes in each step
Step one	This involves crushing the gold tailings into fine powder.
Step two	This step will involve dissolving the crushed tailings into the cyanide solution. The proponent intends to use hydrogen peroxide to catalyze the process. He also intends to treat the solution with lime and (caustic soda) in order to make the cyanide solution less toxic by improving the PH.
Step three	At this stage, the slurry will be left to flow by gravity to each of the 10 tanks.
Step four	The slurry is then compressed and directed to the carbon house and column. It is in the carbon house and column that the gold granules are segregated from the slurry. The carbon is used to separate gold from the slurry
Step five	The slurry is further directed to the barren tank. At this stage, fresh water is pumped into the barren tank by two motorized fresh water pumps and the slurry is further pushed into the raised 10,000 liter SIM tank for recycling
Step Six	From the 10,000 liter tank, the slurry is once again recycled and flows

	by gravity once again into the leach tanks. The proponent intends to be replacing slurry after every one month.

Management of slurry and tailings waste

The proponent intends to be exhausting the slurry for disposal. He is advised to dispose slurry in only designated sites by the CGK. The proponent further intends to use waste tailings will be used to make interlocking bricks. However he is cautioned against using them if the composition of cyanide exceeds 0.1% as per the NEMA waste management regulations of 2006. If the cyanide composition exceeds 0.1%, the waste should be disposed of in designated areas by the CGK. But even if it will be disposed in sewerage wastes, it should not exceed 2 ml per liter as per the NEMA water quality management regulations of 2006 (See appendix IX).

4.1 Chemical processes

Caustic soda is meant to stabilize the cyanide. While hydrogen peroxide will be used as a catalyst. Cyanide, in the form of a very dilute sodium cyanide solution will be used to dissolve and separate gold from ore. Cyanide leaching is considered to be a much safer alternative of extraction as opposed to liquid mercury. Cyanide leaching has been the dominant gold extraction technology since the 1970s, although small-scale and artisanal miners continue to use mercury in some areas of the world. In Canada, more than 90% of mined gold is extracted from ore using cyanide (Eisler and Wiemeyer 2004).

The concentration of cyanide used in this process is normally in the range of 0.01% and 0.05% sodium cyanide (100 to 500 parts per million). As part of their best practices, mines use as little cyanide as possible for environmental, safety, and economic reasons. Cyanide leaching is usually done along with a physical process like milling, crushing, or gravity separation. The pH of the resulting slurry is raised by adding lime or another alkali to ensure that cyanide ions do not change into toxic hydrogen cyanide gas (HCN). The slurry arising from the chemical processes is then further concentrated and reduced to produce the gold which is smelted into bullions.

Once the solution has been depleted of the gold cyanide, it is called barren solution and is returned to the barren tank for recycling and the leaching process is continued. Long term use of the solution will cause the pH of the solution to drop, so makeup caustic and / or lime may be added periodically to the barren solution to improve the PH. Sodium cyanide (NaCN) releases free cyanide as long as the pH is above 10 (otherwise substantial HCN is formed). The cyanide chemically bonds to the gold metal in the reaction:

$4Au + 8CN^- + 2H_2O + O_2 \rightarrow 4Au(CN)_2 + 4OH^-$

4.1.1 Importance Of pH Control in Mitigating against Hydrogen Cyanide Gas

During the leaching process pH of the slurry must be controlled to range between 11 and 12values. PH values below 11 favor the formation of HCN, hydrogen cyanide that interferes with reaction (1). Hydrogen cyanide is a colorless and poisonous gas that, if released due to lower pH values, can quickly become deadly. Cyanide is also relatively expensive chemical, so small losses in heap leaching can amount to large makeup costs over time. Gas leaks into the environment are a risk to the mine personnel and a future liability to the mining corporation that can be avoided using pH measurement.

Measuring pH with an inline sensor is complicated by the nature of the leaching solution here. The solution has finely ground abrasive ore, which can abrade glass measurement electrodes and generally coat the sensor. Lime (CaO) is frequently used for pH control; however it has low solubility and can form a hard coating on the pH sensor, effectively taking the sensor out of service. In addition, the high concentration of cyanide can, over time, penetrate the pH sensor and contaminate the reference, also causing large errors. The recommended pH sensor for this application must be rugged enough to withstand abrasion, resistant to attack by cyanide, and also resistant to coating. PH indicator solution and PH paper is can concurrently be used.

PLATE 4.2: SAMPLE OF THE GOLD VAT LEACHING UNIT

THE PROPONENT HAS BEEN ADVISED TO CEASE FURTHER CONSTRUCTION UNTIL THE EIA LICENSE IS ISSUED.

PLATE 4.4: PROPONENT DURING PUBLIC PARTICIPATION

PLATE 4.5: STAKEHOLDER CONSULTATION MEETING COUNTY GOVERNMENT OF KAKAMEGA REPRESENTATIVE (CHAIR OF KAKAMEGA COUNTY ARTISANAL MINING COMMITTEE)

PLATE 4.5: THE STONES OF WEALTH REPRESENTATIVE MR AHMED JAMA DURING THE CHIEF's BARAZA.

4.1.2 Rehabilitation of the scooped land

The proponent is advised to ensure that the land is not left bare. The proponent is therefore advised to plant grass and trees on the site.

4.3 Risk of interferences of Existing Services

It is not expected that there will be interference of existing ducts or services during construction of the facility. This is because no water or sewerage services pass close to the site of proposed project. However, there is a nearby water spring and stream that supplies water to the neighboring community. Though the spring is protected, the proponent is advised against undertaking any works or activities near the spring may affect the quality of the water and the yield of the spring. Further, no water from the spring should be used for the gold leaching processes other activities other than domestic use. This also includes making sure that pit latrines are constructed at MSD of 30 meters from the spring

4.4 Energy Supply

Most equipment and machinery will be diesel powered. The project will also rely on a diesel powered generator. There will be minimal electrical works that will involve installation of electrical gadgets and appliances. This is because the most machinery will be diesel powered. However, the proponent is advised to install solar powered lighting system to light the facility at night. Solar energy would reduce the amount of money used to run alternative sources of Energy.

4.5 Plumbing works.

There will be minimal plumbing activities. This is because the project site will depend on water supply drawn from river Shilumaka stream for the leaching purposes. 2 inch pipes will be connected from each tank that will then feed the carbon room with the solution these pipes are fitted with valves inlet and outlet for each. However for domestic use the proponent staff will depend on water from a nearby protected community water spring. The area has no water supply. The staff will depend on the fresh water spring that supplies water to the community

4.6 Staff Amenities:

4.6.1 First Aid

The contractor is advised to ensure that he/she has a well-equipped with at least three first aid kits within easy reach for use whenever an emergency arises, In addition he/she should train his staff on use of first aid kit.

4.6.2 Site workers' Toilets

There is an existing 2 door pit latrine at the site the proponent is advised to construct 10 VIP latrines for use by the staff. The project will have 100 casuals during the operational phase. The proponent is advised that the staff have adequate sanitary and toilet facilities. The proponent is advised to ensure that the VIP latrines are emptied by registered exhausters when the pit latrine gets filled up.

4.7 Hazardous Materials

Hazardous materials shall include cyanide, caustic soda, hydrogen peroxide, oil grease and fuel. The store for these materials shall have iron sheet walling and roof and a water proof concrete floor to contain spills. The storage and handling of all hazardous chemicals shall be in accordance to manufacturers' instructions as outlined on the material safety data sheets. Care should be taken to ensure that cyanide, caustic soda and hydrogen peroxide are stored separately in their own store rooms. Only one person should have the key to the store room. Such a person should have expert knowledge of these chemicals as per the PPA cap 244.

4.8 Project Inputs/Raw Materials

Main raw materials during the operational phase are as indicated here below

- Tailings which will be the (low grade gold ore)
- Cyanide whose concentration should not exceed 100 to 500 parts per million.
- Lime which will be used to raise the pH of the resulting slurry is raised in order to ensure that cyanide ions do not change into toxic cyanide gas (HCN
- Caustic soda for stabilizing cyanide
- Hydrogen peroxide : Will be used as a catalysts to speed up the process
- Fresh water: will be an important component is the leaching solution. The proponent intends to use 10,000 liters of water during this process.

4.9 Machines to be used

The contractor has few machinery and equipment to be used for different purposes during the construction. The machines and their respective uses are summarized in the table below.

TABLE 4.1: MACHINES AND EQUIPMENT TO BE USED DURING OPERATIONAL PHASE

Type and nature of the machinery	Purposes and the uses of the machinery/equipment
10,000 water liter tank	Where the solution will be made. It will be composed of water, cyanide between 100 to 500 parts per million, caustic soda and hydrogen peroxide
Bulldozers	To scoop soil during construction and move the gold tailings at the project site
HDP PVC	Pipes to transport the slurry to the Leaching tanks and later to the carbon house and column. The HDP pipes will finally recycle the slurry back to the raised 10,000 liter water tank
Diesel powered Generator	This will be used to light the camp site
Two motorized fresh water pumps	They will be used to pump more fresh water into the slurry during recycling. By pumping the water, the pumped water pressure will push the slurry back to the raised tank and recycle the process once again
Barren tank.	Receives the slurry from which gold granules have been leached from before fresh water is added and pumped back to the raised tank
Carbon house and column	The site at which the gold granules are sieved and retained from the slurry
Lorries	These will be used for transportation of materials and proceeds to and from the processing facility to the market. Proponent is advised to procure security services from police officers when transporting and also to secure the processing facility from any possible burglary since gold are highly valued and can be an attraction to criminals.

4.10 Mitigation Measures

4.10.1 Accident Prevention and Safety

The contractor will ensure that safety of employees is given priority. No employees should be allowed to operate without proper gear and PPE. This includes: helmet, footwear, ear muffling, gloves and overcoat. The plant manager should also ensure that no employee is allowed to

operate machinery while drunk or while lacking adequate sleep. Any instance of the employees operating while drunk may lead to serious accident.

4.10.2 Dust. The workers will put on Personal Protection Equipment (PPE) e.g. Cup masks, overalls, helmets and boots. They should also sprinkle some water on the ground wherever possible to minimize the amount of dust.

4.10.3 Noise

Although the facility is expected to have minimal noise pollution, the proponent is supposed to ensure that the workers especially those driving machinery should be provided with hand gloves to protect their hands from minor injuries and noise mufflers noise injury to ears while minimizing noise pollution.

4.10.4 Disposal of sewerage wastes

The proponent should construct several pit latrines for use by the staff that will be stationed at the mine. The proponent should make arrangements to contract registered waste exhausters to empty the pit latrines. This is because the site is not covered by any sewerage system.

4.11 Project cost

As provided by the guidelines in section 58 (1) and the Schedule to this Act, a report is to be prepared and submitted to the Authority, in the prescribed form, giving the prescribed information and accompanied by the prescribed fee.

The estimated cost of this project is Kshs. 12,000,000 (twelve million shillings). According to the NEMA public notice issued in August 2016, projects involved in mining are classified as high risk projects. Under high risk projects, the minimum charges payable to NEMA is 0.1% of the total cost of the project. However, it should not be below 50,000 shillings and not more than 40,000,000 shillings. The proponent will hence be required to pay to NEMA a fee of Ksh 50,000 (fifty thousand shillings as per the revised NEMA guidelines). The Proponent will pay the expert the consultancy fee as agreed upon.

4.12 Project Approval

The proponent has submitted relevant documents and awaiting approval by the CGK; the proponent is in the process of securing the remaining licenses from the department of mines. He is also advised to secure a license to deal with poisonous substances like cyanide from the KPPB as outlined in the PPA cap 244.

CHAPTER FIVE: NATIONAL AND INTERNATIONAL POLICIES AND LAWS
5.0 NATIONAL & INTERNATIONAL LEGAL FRAMEWORK& POLICIES

5.1 General Overview

Environment Impact Assessment (EIA) is a tool for environmental conservation and has been identified worldwide as a key component in new project implementation. Major international financial institutions including the World Bank, FAO, EU, ADB, IFAD, UNDP and main donor agencies (SIDA, ODA, USAID etc) have also adopted EIA as one of their funding criteria. In this regard, appropriate guidelines have been developed for EIA executions on projects under their respective funding programs.

5.2 Verification Protocol for the International Cyanide Management Code

The International Cyanide Management Code was prepared in good faith to create uniformity and encourage a standard approach to cyanide use and management. Compliance with this Code is not intended to and does not replace, contravene or otherwise alter the requirements of any specific national, state or local governmental statutes, laws, regulations, ordinances, or other requirements regarding the matters included herein. Compliance with this Code is entirely voluntary and is neither intended nor does it create, establish, or recognize any legally enforceable obligations or rights on the part of its signatories, supporters or any other parties.

According to this code, a gold mining operation is expected to develop and implement a number of written management systems or procedures addressing water balance, fluid management, worker health and safety, training, emergency response, and monitoring and reporting, as well as various operating practices. These plans can take any form including but not limited to formalized manuals, standard operating procedures, checklists, signs, work orders and training materials. None of these need be limited solely to issues involving cyanide management. The intent of the Code is that management systems and procedures demonstrate the operation's understanding of the practices necessary to manage cyanide in a manner that prevents and controls releases to the environment and exposures to workers and the community.

The code advocates for operations that are in substantial compliance with a Standard of Practice must develop a Corrective Action Plan to correct the deficiency and commit to fully implement the Corrective Action Plan within an agreed time. The Corrective Action Plan must also reference any Corrective Action Plans being implemented to bring the mine's cyanide producer and/or transporter into full compliance. Compliance to this code is enforced by an auditor. The auditor must find that an operation is not in compliance with the Code if it is neither in compliance nor substantial compliance with any one of the Standards of Practice.

In evaluating these plans and procedures for compliance, the auditor must determine if a plan, procedure or system is in place, if it addresses the elements identified in the Protocol, and if there is evidence that the plan or procedure is being implemented. This evidence may be in the form of formal records, direct observations or interviews. The audit should determine if an operation's plans, procedures and management systems may reasonably be expected to meet the performance goals of the Standards of Practice based on available evidence. Disputes over

specific assumptions, calculations or procedures should be avoided unless the issue has a significant bearing on the operation's ability to comply with the Code.

In a number of cases, the Protocol calls for design, construction and/or quality assurance/quality control documentation for a facility. It may be difficult for an existing operation to provide this information, either because the information was not initially developed or because it is no longer available. Where design or construction information is called for but documentation is not available, an operation can substitute a report by appropriately qualified personnel substantiating that the facility can continue to be safely operated within established parameters that are consistent with the Code's Principles and Standards of Practice. In some cases, the results of such a review may require modifications to a site's operating practices to account for identified deficiencies or uncertainties in the initial design and/or construction of a cyanide facility.

Information regarding the design, construction and quality assurance/quality control of cyanide facilities need only be verified initially and need not be considered in subsequent re-verifications unless the facility has been modified or additional facilities have been constructed. The auditor should reference the initial audit report as evidence that the operation is in compliance with these Standards of Practice. Although an auditor may not be contracted for this purpose, the proponent is advised to abide by this code.

5.3 Relevant National Legislation & Policies

5.3.1 Constitution of Kenya 2010

Kenya promulgated a new constitutional on the 27th August 2010 Chapter Five of this Constitution is entirely dedicated to Environmental Conservation Protection and Management as well as land use planning. Part I addresses issues dealing with land and part II deals with Environment and Natural Resources.

5.3.2 Legal and Regulatory Instruments in Kenya

Applications of national statutes and regulations on environmental conservation suggest that the proponent has a legal duty and responsibility ensuring wastes discharged is of acceptable quality to the receiving environment without compromising public health and safety. This position enhances the importance of an EIA for the project to provide a benchmark for sustainable operation when it is fully operational. The key national laws that govern the management of environmental resources in the country have been briefly discussed in the following paragraphs. Note that wherever any of the laws contradict each other, the Environmental Management and Coordination Act 1999 prevails.

5.3.3 The Environment Management and Coordination Act, 1999

Part II of the Environment Management and Coordination Act, 1999 states that every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment. In order to ensure this is achieved, part VI of the same Act directs that the owner of premises or the operator of a project shall take all reasonable measures to mitigate any undesirable effects not contemplated in the environmental impact assessment study report

submitted under section 58(2) and shall prepare and submit an environmental audit report on those measures to the Authority annually or as the Authority may, in writing, require.

Part VIII Section 73 require that operators of projects which discharges effluent or other pollutants to submit to NEMA accurate information about the quantity and quality of the effluent. Section 74 demands that all effluent generated from point sources are discharged only into the existing sewerage system upon issuance of prescribed permit from the local authorities.

5.3.4 Mining Act 2016 No 12 of 2016

The Kenya mining Act 2016 was enacted to replace the mining act cap 306 which was last (revised in 2012). In part III under general principles it states that a person shall not search for, prospect or mine mineral, mineral deposit or tailings in Kenya unless that person has been granted a permit or license in accordance with this Act.

5.3.4.1 Mining license

(1) A person or company may apply for a mining license in the prescribed form and accompanied by the prescribed fee. (2) An application for a mining license under Subsection (1) shall be in the prescribed form and addressed to the Cabinet Secretary and shall provide the following information -

i. the mineral or minerals in respect of which the License is sought;
ii. the area in respect of which the license is sought;
iii. A proposed programme of mining operations that outlines the mine forecasts and operation plans including the options for minerals beneficiation in the prescribed form;
iv. A feasibility study;
v. A statement regarding the mineral or minerals in the area of land over which the license is sought, including details of all known minerals as well as probable mineral reserves;
vi. A statement of the financial and technical resources available to the applicant to carry out the proposed mining operations and to comply with the conditions of the license;
vii. a plan giving particulars of the applicant's proposals with respect to the employment and training of Kenyan citizens;
viii. A plan giving particulars of the applicant's proposals with respect to the procurement of local goods and services;
ix. Proof of submission and approval of an Environmental and social impact assessment report and environmental management plan for the term of the mining license to the National Environment Management Authority; and
x. A plan giving particulars of the applicant's proposals with respect to social responsible investments for the local community

102. The Cabinet Secretary shall not grant a mining license in respect of land which is the subject of a prospecting license, reconnaissance license, a retention license or a mining license unless –

i. the applicant is the holder of that license; or
ii. the applicant, with the consent of the license holder, is applying for a license that would permit
iii. The applicant to work a mine dump or mine waste and tailings on the land but not to undertake any other mining operation on the land.

The Cabinet Secretary, on recommendation of the Mineral Rights Board, may grant a mining license if satisfied. Where the Cabinet Secretary rejects the application, he has to give the applicant a notice of rejection and grounds for rejecting the application.

5.3.4.2 Important issues to a mining project

This Act further outlines the following important issues that are important to the project. The outlined provisions are as follows:

- Key requirements before a mining license is granted
- Financial provisions
- Occupational Health and safety of workers and mines
- Monitoring , compliance and enforcement
- Restoration of derelict land after the under mining act 2016.

5.3.4.3 Key requirements before a mining license is issued.

The mining act 2016 further states that a mining license shall not be granted to a person under this Act unless the person has obtained the following

- An environmental impact assessment license,
- Social heritage assessment and
- Site mitigation and rehabilitation or mine closure plans
- Environmental management plan has been approved.
- A mineral right or other license or permit granted under this act shall not exempt a person from complying with any law concerning the protection of the environment.

5.3.4.4 Financial Provisions under the Mining Act 2016

In part XII of the mining act, it outlines the required financial provisions
Under article 182. (1) it states that an applicant or a holder of a mineral right, a mineral dealer's license; or a diamond dealer's license, shall pay such fees or charges and at such time as may be prescribed, by notice in the Gazette. The prescribed fees may include -

- application filing fees;
- report filing fees;
- fees for access to geological data; and
- fees for access to public registers.

It also states that the prescribed charges may include annual charges payable upon grant of the relevant mineral right, mineral dealer's permit or diamond dealer's license. Further, the prescribed charges shall be payable annually for the duration of the mineral right, mineral dealer's permit or diamond dealer's license. This article also states that all fees and charges payable under this Act shall be demanded and recovered in the same manner as a civil debt.

Under article 183. (1) the mining act states that the holder of a mineral right shall pay royalty to the State in respect of the various mineral classes won by virtue of the mineral right.
(2) The Cabinet Secretary shall prescribe the rates payable under subsection (1). The Cabinet Secretary may require the holder of a mineral right to make returns relating to any royalties paid

in such manner and within a period as may be prescribed. Any mineral samples including core samples, removed for the purposes of testing, shall not be subject to royalty unless they exceed maximum value stipulated in regulations

The royalties' payable under sub-section (1) shall be distributed as follows—

- seventy percent to the National Government;
- twenty percent to the County Government; and
- Ten percent to the community where the mining operations occur.

5.3.4.5 Health, Safety and Environment

In part XI of the mining act, the proponent is reminded that a mineral right or other license or permit granted under this act shall not exempt a person from complying with any law concerning the protection of the environment. The Mining Act 2016 further states that:

- The Cabinet Secretary shall make Regulations for safety and health of persons employed in mines, and the carrying on of prospecting or mining operations in safe, proper, sanitary and effectual manner.
- A provision of this Act and a right or entitlement conferred under a mineral right shall not exempt a person from compliance with the provisions of the Occupational Health and Safety Act, 2007 concerning the safety of workers and mine
- The holder of a permit or license under this Act shall use the land in accordance with the terms of the permit or license and shall ensure the sustainable use of land through restoration of abandoned mines and quarries;
- that the seepage of toxic waste into streams, rivers, lakes and wetlands is avoided
- Disposal any toxic waste is done in the approved areas only
- Blasting and all works that cause massive vibration is properly carried out and muffled to keep such vibrations and blasts to reasonable and permissible levels in conformity with the Environmental Management and Coordination Act
- That upon completion of prospecting or mining, the land in question shall be restored to its original status or to an acceptable and reasonable condition as close as possible to its original state.

Section 180**.** (1) The Cabinet Secretary shall not grant a prospecting license, a retention license or a mining license to an applicant, unless the applicant has submitted a site mitigation and rehabilitation or mine-closure plans for approval.

5.3.4.6 Monitoring, Compliance and Enforcement

In part XIV of the mining act 2016, it states that the Cabinet Secretary may, by notice in the appointment of gazette, designate duly qualified public officers, to be inspectors of mines for such jurisdictional units as may be specified in the notice. A mines inspector shall monitor compliance and take enforcement action and perform such other functions as may be required under this Act or specified in the notice of appointment. The Cabinet Secretary shall issue a mines inspector with a document of identification.

197. (1) The Cabinet Secretary or a mines inspector authorized by the Cabinet Secretary may without prejudice to all other written laws, at all reasonable times

- Enter, inspect and examine land on which prospecting or mining operations are being conducted or land which is the subject of a mineral right;
- Enter into an area, structure, vehicle, vessel, aircraft or building that, in the opinion of the Cabinet Secretary or the mining inspector has been or is being used for or in connection with prospecting or mining operations;
- Carry out periodic inspections of premises within the jurisdictional limits which have been or are being used for or in connection with prospecting or mining operations;
- Enter, inspect and examine any premises where mineral dealings are being conducted;
- Require the production of, inspect, examine, and take copies of licenses, permits, registers, records of any kind and other documents relating to this Act and the carrying out of operations authorized by a mineral right, or other license or permit granted under this Act;
- Take samples of any article and substances to which this Act relates and submit such samples for testing and analysis in such a manner as may be prescribed;
- seize for a maximum period of seven days any article, vessel, motor vehicle, plant, equipment, substance or any other thing which the inspector reasonably believes has been used in the commission of an offence under this Act or regulations made there under;
- upon giving the holder three months' written notice, install any equipment on any land, premises, vessel or motor vehicle for the purposes of monitoring compliance with the provisions of this Act, or regulations made there under; enter into any premises to ascertain best mining and mineral processing practices including safety and health concerns;
- Enter into any premises to examine and enquire into the condition and ventilation of any mine or any building used in or connected with prospecting, mining or mineral processing operations and all matters relating to safety, welfare and the health of persons employed in any such mine or building, including the inspection of the accident and incidents register;
- Require such changes, as may be necessary in regard to the safety of the operation and protection of employees, to be implemented within a specified time, failing which the license holder will be considered in breach;
- Order the temporary cessation of operations where he considers that the mining or processing activities are so hazardous as to constitute a serious and imminent danger to life;
- Enter into any premises used in or connected with prospecting, mining or mineral processing operations to examine the circumstances surrounding any accidents or incidents affecting the health of employees including the subsequent actions taken by license holder; and
- With an arrest warrant and the assistance of a police officer, arrest any person whom he reasonably believes has committed an offence under this Act.

- In exercising the powers under subsection the inspector of mines shall carry the identification issued under this Act.

5.3.4.7 Restoration of Derelict Land after mining as provided Under the Mining Act 2016

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

- Sustainable use of land through restoration of abandoned mines and quarries;
- The seepage of toxic waste into streams, rivers, lakes and wetlands is avoided
- Disposal any toxic waste is done in the approved areas only
- Blasting and all works that cause massive vibration is properly carried out and muffled to keep such vibrations and blasts to reasonable and permissible levels in conformity with the Environmental Management and Coordination Act;
- Upon completion of prospecting or mining, the land in question shall be restored to its original status or to an acceptable and reasonable condition as close as possible to its original state.

5.3.4.8 Insurance Cover for Health and Safety of Employees

- In part XV on miscellaneous provisions. The holder of a mineral right or an agent appointed by a holder who is undertaking prospecting or mining operations shall, with respect to those operations, maintain insurance cover in respect of the attached risks especially for health and safety of employees.
- (2) The holder or person mentioned in subsection (1) shall, where required by the Cabinet Secretary, furnish the Cabinet Secretary with certified copies of certificates of Insurance that set out the insurance policy and any other documents that are required to demonstrate that the policy is valid, effective, and appropriate and covers the prescribed risks.

5.4 The Water Act 2016

The Water Act 2016 replaced the Water Act 2002 and was affected so as to conform to the devolution structure of governance. The Act takes cognizance of the fact that provision of water services is a shared function between the National Government and the County Government.

Under these Act several institutions have been established. These include the Water resources Authority which replaced the Water Resources Management Authority which had been established under the previous act water Act 2002. The objective of WRA is to protect, conserve, control and regulate use of water resources through the establishment of a national water resource strategy. In addition, the WRA is responsible for:

i. formulation and enforcement of standards, procedures and regulation for the management and use of water resources;

ii. policy development;

iii. planning and issuing of water abstraction permits;

iv. Setting and collecting permits and water use fees

5.4.1 Water Resource User Associations (WRUAs)

The act provides for establishment of WRUAs, which are community based associations for collective management of water resources and resolution of conflicts concerning the use of water resources. The BWRC may contract WRUAs as agents to perform certain duties in water resource management.

5.4.2 Water Works Development Agencies (WWDAs)

The WWDAs are responsible for the following:

i. development, maintenance and management of national public works

ii. Operation of the national public waterworks and provision of water services as a water service provider, until the responsibility for the operation and management of the waterworks is handed over to the county government, joint committee or CCA;

iii. Provision of technical services and capacity building to county governments and water service providers within its region.

5.4.3 Water Services Providers (WSPs)

WSPs are now the responsibility of County Governments who have the mandate to provide water services. WSPs are responsible for provision of water services within the area specified in their licenses and development of county assets. Currently, WSBs sign service level agreements with WSPs and the regulator issues licenses to WSB. Under the new Water Act 2016, WSPs must apply again for new licenses to WASREB.

5.4.4 Water Services Regulatory Board (WASREB)

The constitutionally guaranteed right to water and the need to protect consumers provides a strong basis for the national regulation and monitoring of water and sewerage services. This is critical to protect the interests and rights of consumers from exploitation and to set minimum national standards. As such, the functions of WASREB have been maintained in the 2016 act. WASREB holds the mandate to approve tariffs, monitor and enforce water services standards and issue licenses to Water Service Providers

5.4.5 Water Services Boards

As a result of sector reforms, responsibility for water and sanitation service provision has been devolved to eight regional Water Services Boards (WSBs): Athi (which serves the capital

Nairobi), Coast, Tana, Lake Victoria North, Lake Victoria South, Northern, Rift Valley Water Services Board, and since 2008, Tanathi

5.5 The Environmental Management and Co-ordination (Water Quality) Regulations, 2006.

These Regulations were published in the Kenya Gazette Supplement No. 68, Legislative Supplement No. 36, and Legal Notice No. 120 of 29th September, 2006. The Regulations provides for sustainable management of water resources including prevention of water pollution and protection of water sources (lakes, rivers, streams, springs, wells and other water sources).

It is an offence under Regulation No. 4 (2), for any person to throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, as to cause pollution. Regulation No. 11 further makes it an offence for any person to discharge or apply any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or permit the dumping or discharge of such matter into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards for effluent discharge into the environment

Regulation No. 14 (1) requires every licensed person generating and discharging effluent into the environment to carry out daily effluent discharge quality and quantity monitoring and to submit quarterly records of such monitoring to the Authority or its designated representatives. The proponent will have to ensure that appropriate measures to prevent pollution of underground and surface water are implemented throughout the project cycle.

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5.6 The County Government Act 2012

The County Government Act 2012 replaced the Local government Act (cap 245). Under the constitution promulgated in 2010, County Governments have taken over what used to be previously the functions of local authorities. They have been empowered to make by-laws in respect of all such matters as are necessary or desirable for the maintenance of health, safety and well-being of the inhabitants of its area. These includes the following ;control or prohibit all businesses, factories and other activities, including the proposed project which, by reason of smoke, fumes, gases, dust, noise or other cause may be or become a source of danger, discomfort or annoyance to the neighborhood, and to prescribe conditions subject to which such business, factories, yards etc. shall be carried. The mandate of construction and maintenance of water supply, sewage and solid waste management systems is also conferred upon the County Governments through this act

5.7 The Penal Code (Cap. 63)

Section 191 of the Penal Code states that, any person or institution that voluntarily corrupts or foils water for public springs or a reservoir, rendering it less fit for its ordinary use is guilty of an offence. Sections 192 of the same act says a person who make the atmosphere of any place noxious to health of persons/institutions in dwellings or business premises in the neighborhood or those passing along public way, commits an offence.

5.8 The Occupational Safety and Health Act, 2007

The proponent and project manager are advised to strictly adhere to the provisions of OSHA 2007 especially during the construction phase. The key areas addressed by the Act include but not limited to: They should be strictly observed during construction phase.

i. General Duties including duties of occupiers, self-employed persons and employees
ii. Enforcement of the act including powers of an occupational safety and health officer
iii. Machinery safety including safe handling of transmission machinery, hand held and portable power tools, self-acting machines, hoists and lifts, chains, ropes & lifting tackle, cranes and other lifting machines, steam boilers, air receivers, refrigeration plants and compressed air receiver
iv. Offences, penalties and legal proceedings under section 6 of this act, every occupier is obliged to ensure safety, health and welfare Of all persons working in his workplace. The occupier shall achieve this objective by preparing and as often as may be appropriate, revising a written statement of his general policy with respect to the safety and health at work of his employees and the organization and arrangements for the time being in force for carrying out that policy (Section 7).
v. Health General Provisions including cleanliness, lighting and sanitary conveniences

5.9 The Physical and Land Use Planning Act 2019

Replaced the Physical Planning Act of 1996 Cap 286 /. This act provides inter alia for the County physical and land use plan for every county. In provides that all development must be executed and be in conformity to the County physical and land use plans

Section 37 outlines the objects a county physical and land use development plan as follows:-

a) to provide an overall physical and land use development framework for the county;

b) to guide rural development and settlement;

c) to provide a basis for infrastructure and services delivery;

d) to guide the use and management of natural resources;

e) to enhance environmental protection and conservation;

f) to identify the proper zones for industrial, commercial, residential and social developments;

5.10 Legal Notice 61 of 2009 on Noise pollution and Excessive vibrations

According to the legal notice no 61 on noise pollution and excessive vibrations for any building in an area for residential and one or more of the following purposes: Commerce or small scale production, entertainment or any residential apartment in an area that is used for purposes of industry, commerce or small scale production or any building used for the purposes of industry, commerce or small scale production should not exceed 114 Db. The proponent is advised to apply for a license from the CGK noise control is now a function of the respective county governments

5.11 Climate Change Act No 11 of 2016

This Act calls for the adoption of eco-friendly technologies in all development activities. In this regard, the proponent is advised to ensure that he adopts energy friendly sources of energy like solar in addition he should focus on energy saving equipment

5.11.1 National Climate Change Council

There is established an unincorporated body to be known as the National Climate Change Council. Change Council.. The Council shall be chaired by the President. The Deputy President who shall be the vice- chairperson to the Council.

The Cabinet Secretary for the time being responsible for environment and climate change affairs shall be the secretary to the Council. The Directorate established under this Act shall serve as the Secretariat of the Council. . The Council shall provide an overarching Functions of the national climate change coordination mechanism. The Council shall ensure the following:

i. The mainstreaming of the climate change function by the national and county governments;
ii. approve and oversee implementation of the National Climate Change Action Plan;
iii. advise the national and county governments on legislative, policy and other measures necessary for climate change response and attaining low carbon climate change resilient development;
iv. approve a national gender and intergenerational responsive public education awareness strategy and implementation programme;
v. provide policy direction on research and training on climate change including on the collation and dissemination of information relating to climate change to the national and county governments, the public and other stakeholders;
vi. provide guidance on review, amendment and harmonization of sectoral laws and policies in order to achieve the objectives of this Act;
vii. administer the Climate Change Fund established under this Act; and
set the targets for the regulation of greenhouse gas emissions.

5.11.2 Climate Change obligations for private entities

The Council may, in consultation with the Cabinet Secretary and relevant State Departments, impose climate change obligations on private entities, including entities constituted under the Public Benefits Organizations

The Council shall make regulations governing the nature and procedure for reporting on performance by private entities, including the authority to monitor and evaluate compliance.

Notwithstanding other provisions in this Act, the Council may by notice in the Gazette, require a private entity that is subject to climate change obligations to, at any time, prepare reports on the status of its performance of the climate change duties and prescribe the period for reporting; and require any private entity that fails to comply with its climate change obligations to prepare a report within a specified time, on the actions it has taken , is taking or intends to take to secure future performance with those duties.

The Cabinet Secretary shall make regulations to Reporting on guide the reporting and verification of climate change climate change actions.

5.11.3 Right to seek legal redress where there is violation of climate change mitigation or adaptation efforts

Section 23 (1) of the Climate change act 2016 provides that " A person may, pursuant to Article 70 of the Enforcement of Constitution, apply to the Environment and Land Court rights relating to climate change. Alleging that a person has acted in a manner that has or is likely to adversely affect efforts towards mitigation and adaptation to the effects of climate change.

Whereas Section 23 (2) states that where an application is made under sub-section (1), the Court may make an order or give directions that it considers appropriate to- prevent,

stop or discontinue an act or omission that is harmful to the environment by issuing any of the following orders:

i. Compel a public officer to take measures to prevent or discontinue an act or omission that is harmful to the environment; or provide compensation to a victim of a violation relating to climate change duties.

ii. For the purposes of this section, an applicant does not have to demonstrate that a person has incurred loss or suffered injury.

5.12 Insurance Cover for Health and Safety of Employees

- In part XV on miscellaneous provisions, the holder of a mineral right or an agent appointed by a holder who is undertaking prospecting or mining operations shall, with respect to those operations, maintain insurance cover in respect of the attached risks especially for health and safety of employees.
- The holder or person mentioned in subsection (1) (here above) shall, where required by the Cabinet Secretary, furnish the Cabinet Secretary with certified copies of certificates of
  Insurance that set out the insurance policy and any other documents that are required to demonstrate that the policy is valid, effective, and appropriate and covers the prescribed risks.

5.13 Pharmacy and Poisons Act Cap 244

In schedule I Rule 5 of, the PPA cap 244, classifies cyanide as a poison if it exceeds the threshold of 0.10 percent. The act clearly stipulates how poisons should be handled. Specifically, this act states outlines how the poisons should be handled in regard to use, nature and labeling of containers, safe custody of containers and transportation of poisons.

5.13.1 Directions as to use

The proponent is advised to ensure that cyanide or its substitutes such as thiosulphate is retained in a container labeled with the wards “WARNING”. In addition he shall ensure that the container is opened and handled only by persons having expert knowledge of the precautions to be taken in its use. A person who fails to comply with any provision of this rule shall be guilty of an offence

5.13.2 Labeling and consigning of containers

A container of poison required to be clearly labeled and distinctly in the English language with the required particulars showing its composition. This act states that no person shall keep, sell or consign for transport a poison unless— it is contained in a container impervious to the poison and sufficiently strong to prevent leakage arising from the ordinary risks of handling and transport

5.13.3 Safe custody of poisons

The proponent is advised to assign a particular person with expert knowledge to be in charge of the cyanide solution. In addition, the proponent should ensure that the cyanide or its substitute is

kept under lock and key in a separate room or compartment specially reserved for keeping poisons and partitioned off from the rest of the premises. It can also be kept in a cupboard, box or other receptacle/container especially reserved for keeping poisons, clearly marked with the words “Poisons only”, and the poison shall be kept in a place ordinarily accessible only to persons lawfully having access thereto. It should also be kept in a place far from food or drink;

The proponent is advised that once cyanide container (or its substitute) is emptied, the container is disposed of in an environmentally sound manner. The act states that “A person in possession of a container or other receptacle which has been used for containing a poison and which is no longer required for that purpose shall by destruction or other means render that container or receptacle innocuous/harmless. In addition poisons for the treatment of human ailments shall be kept entirely separate from other poisons.

5.13.4 Transport of poisons

The proponent is advised to ensure that cyanide or its substitute is transported safely by conspicuously labeling the container with the name and description of the poison. The container should also be labeled that it should be kept away from food. Finally, the container should not be transported in the same vehicle transporting food unless that part of the vehicle is effectively separated from that part containing the poison or otherwise protected from the risk of contamination

CHAPTER SIX: STUDY METHODOLOGY

6.0 METHODOLOGY

6.1 Environmental Screening.

Screening is a process to determine what level of environmental assessment (i.e. no assessment, or a full EIA study) is necessary or appropriate for a specific project or proposal. Screening ensures that the level of environmental assessment required is appropriate to each specific project. Screening can also be used to focus resources on those projects most likely to have significant impacts, are uncertain and those where environmental management input is likely to be required. Experience has shown that it is generally advisable to screen all proposed development proposals. An EIA report of the project was found necessary.

6.2 Environmental Scoping.

Scoping sometimes referred to as preliminary assessment, is used to focus the EIA on the key issues for decision making. In addition, scoping is used to identify information needs, determine study boundaries and to review alternative options to the project. It also offers crucial and often first, opportunity for involving stakeholders in the project, identifying issues that are of concern to them, and tapping their knowledge on the environment. The objectives of scoping can be summarized as follows:

- The main problems and issues surrounding the project,
- The likely positive and negative impacts of the project;
- The spatial, temporal and institutional boundaries of the project and its impact and
- Identify key stakeholders who are likely to be affected by the project so that they can be consulted
- The likely data requirements for undertaking the full EIA

6.3 Desktop Study

This involved documentary review of project documents, engineering drawings, past EIA, relevant policy legal and institutional frameworks. Documents containing climatic, demographic and hydrological data for entire Sub-County were reviewed. The experts also held discussions with project proponent

6.4 Field Work

Field visits were meant for physical inspections of the project site in order to gather information on the state of environment. Several photos of the project site were taken for inclusion in this report. The study also sought public opinions through, consultations and open public meetings and barazas.This study was undertaken between 16th April 2024 and 20th June 2024 while the public participation was undertaken in the 27TH day of September 2023

6.5 Aims of Public consultation

- To seek views, concerns and opinions of people in the immediate neighborhood.
- To establish if the local people foresee any positive or negative environmental effects from the project and if so, how they would wish the perceived impacts to be addressed.
- To get views from key opinion leaders

6.5.1 Written Comments

The community members within the immediate neighborhood were requested to freely express their views with reference to the proposed project. A total of 120 short questionnaires were completed alongside written comments. The experts selected 10 that have been attached in this report. (See persons interviewed and selected comments in Appendix V)

6.5.2 Interview of key informants

A number of key informants were interviewed so as to give their opinions of the proposed mixed development. The project has received overwhelming and unanimous support from those interviewed. Among those interviewed were:

- The County Government of Kakamega ,Ministry of Environment officials
- Member of county assembly for Shirere
- Ward administrators for Shirere
- The Chief
- The Community Elders
- Kakamega Gold Mining Group
- Kakamega development group
- Immediate neighbors

The stakeholders were invited to submit their comments through a detailed questionnaire and through oral question and answer sessions. The objective of involving the public and other stakeholders was to gauge their reactions to the project and whether they were aware of its existence and its potential impact on their lives. No project can ever exist in isolation and its acceptance by the stakeholders is crucial to its successful implementation. The study was fully participatory.

6.5.2.1 The County Government of Kakamega, Ministry of Environment officials

They approved the project, however asked investors to make sure they follow the laid down guidelines and procedures within the law when setting up such facilities

6.5.2.2 Members of county assembly for Shirere Ward

They supported the project and said it will address the issue of unemployment and asked the proponent to seek the advice of experts to make sure the project doesn't cause negative impacts

to people and the environment. They thanked the proponent for engaging the community and praised the proponent for promising to support community projects.

6.5.2.3 Administrators for Shirere under the CGK

The ward administrators supported the project saying the County Government is committed to creating employment through various projects and asked the proponent to be compliant with the all agencies that manage mineral exploration.

6.5.2.4 The Chief

The area chief stated that the community would welcome the project. However care should be taken when using chemicals.

6.5.2.5 The Community elders

Welcomed the project and asked the proponent to give employment opportunities to residents and compensate injuries or losses as a result of the project. They also requested that the Lorries should avoid over speeding and turning in people's homes as the road to the project site is used for livestock grazing. This would minimize accidents.

6.5.2.6 Rosterman Umbrella Community Based Organization (RUCBO)

These stakeholders represent Mining Cooperative groups and the local community. The organization is registered under co-operative societies act. These stakeholders raised the following concerns

- Need for the proponent to give casual jobs to the local community.
- The proponent to assist the community in construction of social amenities and infrastructure like schools, health centers and access roads
- Compensation and insurance for the any person or family that suffers any negative effects as a result of the project.
- They also said that it was important to compare the proposed project with similar gold mining projects being undertaken elsewhere in the country in order to adopt the best practices

6.5.2.7 Immediate neighbors

They had confidence in what the leaders and experts said during the public participation, the neighbors were visited prior to the public meeting to seek their opinion and were sensitized by the project consultant thereafter. They said they should be involved in every stage to know whether the project will be of benefit to them or not, they fully supported the project

PLATE 4.7: IMMEDIATE NEIGHBOURS BEING INTERVIEWED

6.6 Soil and water sample analysis

The consultant contracted services of KALRO to collect and analyze the soil samples from the site of the proposed project. In addition, water samples from the nearby Isiukhu River were also collected. The results of the analysis are as indicated in Appendix XI.

The analysis was undertaken with the aim of establishing the soil status before the commencement of the operational phase of the project. The results of the analysis will be compared against the findings that will be undertaken during the Environmental Audit 24 months after the project kicks off. Any variation in the soil sample analysis may explain a correlation with the activities of the project. Therefore the analysis will be of great importance in future Environmental Audit findings on the impact of the project on the nearby river Isiukhu and the quality of the surrounding soil.

6.7 Reporting.

Both reactive and non-reactive research methods were employed in utilizing various research tools gathering information. The local structures (government department and public service officers) provided very useful information about the project area. During the entire exercise, the proponent and EIA experts contacted each other on the progress of the study and signing of various documents. The proponent will have to submit ten copies of this report alongside a CD to the National Environment Management Authority for review and issuance of an EIA license.

CHAPTER SEVEN: ENVIRONMENTAL & SOCIAL IMPACTS AND RECOMMENDED MITIGATION MEASURES

7.0 ENVIRONMENTAL & SOCIAL IMPACTS

This chapter identifies analyses and classifies impacts that could arise from the activities of the project, either during the construction phase, the operational phase and the decommissioning phases. However, it is during the operational phases that most impacts will be felt because it will involve the use of cyanide or its substitutes during the gold leaching process. It's also at this stage that poor and inappropriate handling of these chemicals can cause widespread impact especially on aquatic life of the nearby river Isiukhu. The impacts of cyanide can be widespread through reversible. The anticipated impacts will affect the socio-economic environment (health, security, economic activities, finances, etc) and the biophysical environment (fauna, flora, water, air, soil, energy).

The extraction of gold from the tailings involves a series of distinct yet interdependent physical operations. These include transporting the tailings and gold ore to the project site kilometers away. The tailings and or ore will be crushed and poured into a water solution which will also be mixed with cyanide. The cyanide will also be mixed with hydrogen peroxide and caustic soda.

At this stage all chemicals must be handled by someone with expert knowledge of the same. This chapter gives a critical analysis of all potential impacts of the proposed project and makes recommendations on the mitigation measures.

7.1 Assessment Criteria for Anticipated impacts.

The anticipated impacts of the proposed project on the environmental elements are both positive and negative. The magnitude of each impact is described in terms of being significant, minor or permanent, short-term or long term, specific (localized) or widespread, reversible or irreversible. The assessment criteria for the significant impacts are as shown in the table below:

TABLE 7.1: ASSESSMENT CRITERIA FOR SIGNIFICANT IMPACTS

Key	Type of Impact	Key	Type of Impact
++	Major positive impact	+	Minor positive impact
--	Major negative impact	-	Minor negative impact
M	Moderate	NC	No Change

0	Negligible/Zero impact		
Sp	Specific/Localized	W	Widespread
R	Reversible	Ir	Irreversible
Sh	Short Term	L	Long Term
T	Temporary	P	Permanent

TABLE 7.2: POTENTIAL BIO PHYSICAL IMPACTS

Impacts on or due to	**Construction phase**	**Operational phase**	**Remarks/ impacts and mitigation measures**
Changes in land use- extent	-L sp	-/0	Changes expected at the site. Construction of the project is expected to cause permanent visual intrusion
Changes in Hydrology	T	- W	The impacts of hydrology may be widespread but temporary. This is because the proponent intends to draw about 10,000 liters of water from river Shilumaka stream. The proponent intends to use cyanide to extract gold from tailings. Equipment and facilities should not be washed in the stream or river Isiukhu as cyanide may contaminate the river.
Solid wastes	L Slurry and earth mounds from which gold has been extracted	L	The proponent intends to use the slurry and soil mounds to make interlocking bricks. The proponent is advised to ensure that the bricks are not made close to a river as the waste may still contain small elements of cyanide. Although cyanide degenerates fast in presence of sunlight and air. He is also advised to make sure that cyanide composition does not exceed 0.1 % of the waste as per the waste regulations of 2006. Household solid wastes generated from employees working at the plant will be either burnt or recycled. No polythene paper bags or non-biodegradable wastes should be left on site.
Pollution: - Air/Dust -Noise	 T --L	 -T --L	There will be minimal spread of dust and noise pollution. However, air pollution as a result of the leaching process may occur since the tanks will remain open. The proponent is advised to

			provide PPE such as gloves, footwear, nose and mouth masks, ear plugs and helmets to the employees to reduce the level of inhaling dusts which may affect their health during the operational phase. There may be more dust generated when the tailings will be scooped by use of bulldozer. Dust will also be generated when the tails are being dropped on the site where the leaching will be undertaken. Where possible the proponent may sprinkle water on the leaching to reduce the dust pollution. The project is not likely to emit noise that exceeds 114 Db.
Air pollution	--T	--L	The gold leaching chemical process may release Hydrogen cyanide gas (HCN) if the pH of the slurry falls below 11. The pH should range between 11 to 12 values. HCN is colorless and highly toxic and may be a danger to the workers. In order to mitigate this, the proponent is advised to use lime to treat the slurry in order to improve the pH levels .He is also advised to change the slurry more frequently. He currently intends to change it once every month.
Site Drainage	-/W	-/W	The proponent is advised to locate the project at least 500 meters from river Isiukhu. This would help to mitigate the washing of tailings into the river during surface water runoff. The proponent also intends to construct a water drainage trenches to minimize surface water runoff into the river.
Soil Erosion	- S	-L	There is possibility of soil erosion especially during surface water runoff. The proponent is therefore advised to plant trees on the area where the tailings were scooped and transported to the project site.
Water Resources	--T	--T	Cyanide degenerates fast after getting into contact with sunlight and air. But its impacts can spread far in aquatic ecosystems. For example if its residues enter river Isiukhu and the nearby stream. If the proponent decides to continue using cyanide he must ensure that adequate precaution is made to prevent contamination of river Isiukhu and underground waters. This includes treating cyanide with lime to make it less toxic. In addition, he is advised to plant reeds between the project site and the river to help detoxify

			any surface water runoff before it flow to river Isiukhu. Reeds and papyrus naturally detoxify contaminated water
Fauna	0	0	Fish and aquatic life is very sensitive to cyanide. Proponent advised to use less toxic alternatives such as thiosulphate. But if he insists on using cyanide, he must put in place extra caution to prevent contamination of river Isiukhu or underground waters by cyanide. This may include treating cyanide with lime. Proponent advised to cover the leaching tanks with wire mesh to reduce cases of birds flying into the leach tanks to swim, play or drink the leaching solution. Birds may die off if they stray into the leach tanks.
Flora	0	0	There will be clearance of grass in order to reach the gold tailings. However, there are no endangered, threatened, or protected flora.

TABLE 7.3: POTENTIAL SOCIO-ECONOMIC IMPACTS

Impacts on Or due to	Construction	Operation	Remarks
Generation of wealth and businesses	++	++	The surrounding community will benefit through providing goods and services to the project employees. The proponent will be able to generate income and generate wealth.
Employment Opportunities	++	++	The project will create job opportunities for the local community both during construction phase & operational phases. A number of people will be employed during construction phase while some subordinate staff will be employed during the operational phase to run the machinery, to drive lorries and operate equipment among other duties.
Revenue Collection	0	++	The CGK and the Government through the KRA will raise more revenue from the gold leaching facility during payment of rates.
Human Health	-w	--w	For workers living far from their spouses, there is the risk of the increase of HIV/AIDS and other Sexually Transmitted Diseases due to increased income which may entice the workers to engage in promiscuity.

Accidents	--L	--L	Risk of the accidents on the personnel of the site. Some of the workforce may not be familiar to gold leaching techniques which can be a cause of accidents. If workers don't use PPE adequately, then accidents are likely to occur. Proponent and plant manager should ensure that all employees are properly trained to handle equipment. They should also be cautioned against running machinery while drunk.

7.2 Potential Negative Impacts of the project and Recommended Mitigation Measures

Some of the negative impacts of the project on the Environment include:

- Air pollution from dust emission
- Air pollution from gaseous emissions of machinery and equipment.
- Air pollution from the leaching tanks due to the chemical processes going on pollution.
- Air pollution from the running Lorries transporting tailings to the project site and also Lorries transporting proceeds from the site.
- Risk of accidents
- Fire accidents
- Solid Wastes
- Liquid Wastes
- Sanitation services

7.2.1 Risk of Air Pollution from dust

During the construction and operational phase, it is anticipated that the surrounding air will be polluted by the dust emissions. There will be more dust generated during the operational phase than during the construction phase. There will be some dust emitted during clearing of site during in the construction phase. However, during operational phase, as the leaching process goes on there is likely to be gaseous emissions from the leaching tanks

7.2.1.1 Recommended Mitigation measures

- Constantly water the earth road from the site to the facility and the facility itself so as to reduce the amount of dust emitted in the air.
- Use appropriate machines for scooping tailings
- Ensure all employees put on appropriate wear. These includes goggles, helmets, gloves and ear mufflings
- Sprinkle water before sweeping dust from the floor of the plant.
- The project contractor and project engineer should supervise activities likely to release dust and smoke to the atmosphere e.g. sweeping and burning of wastes.

7.2.2Risk of Air Pollution from gaseous emissions of machinery and equipment

During the operational phase, there will be more gaseous fumes emitted from equipment and machinery using diesel more than during the construction phase. This is especially so if the proponent decide to operate on a 24 hour basis.

7.2.2.1 Recommended Mitigation measures

- Maintain Machinery at manufacturer's specifications
- Ensure machinery and equipment undergo regular servicing
- Use appropriate fuel free from adulteration
- Ensure all employees put on appropriate wear. These includes helmets, masks, and ear plugs , goggles and nose & mouth masks

7.2.3 Air pollution from the running Lorries and vehicles

There will be a lot of vehicular movement as vehicles and Lorries transporting the tailings to the project site will emit exhaust fumes which may contribute to air pollution. In addition it is also expected that lorries transporting materials and proceeds from the site will also be emitting.

7.2.3.1 Recommended Mitigation Measures

- Maintain Vehicles at manufacturer's specifications
- Ensure all motor vehicles are serviced
- Use appropriate fuel free from adulteration
- Ensure all employees put on appropriate wear. These includes helmets, masks, and ear plugs , goggles and nose & mouth masks

7.2.4 Air pollution from the Hydrogen cyanide

Due to the chemical processes going on the pH of the slurry is likely to go down thus affecting the leaching process. The pH should be maintained at between at the values of 11 and 12. If the pH falls below 11, there is the danger of hydrogen cyanide gas being released. Hydrogen cyanide is highly poisonous. It is at times it has an almond like odor odorless and colorless.

7.2.4.1 Recommendations

- Use lime to maintain the slurry pH at between 11 and 12 values
- All the employees to wear PPE including masks, helmets overcoats and appropriate foot ware
- Ensure the tanks are well maintained to prevent leakage of the slurry which may emit foul smell

7.2.3 Noise pollution from the proposed project

The proposed project is expected to have minimal noise pollution. The main noise pollution will actually emanate from machinery and vehicles. Noise is unavoidable during construction and operational phases. However for prolonged period of time, noise can cause hearing damage and tinnitus (ringing in the ears). It can also interfere with communication, cause fatigue and tiredness, reduce efficiency, affect morale and produce a severe and permanent loss of hearing, which may persist for several hours. Noise levels must be controlled. There will be more noise

generation during operational phase than during the construction phase. It is not expected that the noise level will exceed 114 Db as per the Legal Notice No 61 of 2009 on Noise pollution & Excessive Vibrations. However, should the proponent decide to use machinery emitting high levels of noise or vibrations, he is advised to get a license from Kakamega County Government on noise emissions and excessive vibrations.

7.2.3.1 Recommended Action

The following need to be considered during construction and operational phase:

- Adhere to Kenya Noise Prevention and Control rule which was passed in 1996 under legal notice No. 296, as a subsidiary legislation to the Factories Act and the legal Notice No 61 on Noise & Excessive Vibrations. In a GOLD MINING area such as the proposed project site, the Noise levels should not exceed 114 Db.

- Consider the rule which states that 'No worker shall be exposed to noise level in excess of the continuous equivalent of 90 dBA for more than 8 hours within any 24 hours duration'

- Operation of shorter shift period for workers who come in direct contact with high concentrations of noise or other hazards;

- Provision of ear protective devices to prevent high frequencies noise emitted by the high frequency machines during construction and operational phase by both the proponent and contractor e.g. ear muffling.

7.2.4 Risks of accidents

There is likelihood of accidents to occur during the construction, operational and even decommissioning phases of the proposed project. Such accidents may be due to drunken drivers or employees running machinery. They could also arise from poor handling of poisonous chemical substances like cyanide. Safety in industrial operations is anchored in the OSHA 2007 ACT and the public health act cap 242. Therefore most of the recommended actions are extracted from OSHA guidelines. Further, the mining act 2016 expressly obligates the proponent to comply with the provisions of the Occupational Health and Safety Act, 2007 concerning the safety of workers and mine operations.

7.2.4.1 Recommended Mitigation Action

Provision of Personal Protective Equipment (PPE)
These include:

- Gloves
- Ear Mufflings
- Overcoats
- Helmets
- Footwear
- Goggles to protect Eyes from dust during gold leaching from dust.

- Regular checking of electric wiring
- Routine safety mechanisms where the safety of machinery and equipment is regularly checked and serviced.
- Emergency and safety plan
- No employee suffering from epilepsy should run equipment or machinery
- Ensure that all employees get adequate rest before engaging them to run machinery
- Ensuring no employee either drives, or operates machinery or equipment while drunk
- Teach employees about first aid.
- Provision of First Aid Kit
- First aid equipment should be available at the site at all time, and several individuals among the permanent personnel on the site should have the skills necessary to use the equipment.
- A contract should be signed between the proponent and the nearest dispensary or hospital for taking care of injured employee in case of accident.
- An insurance cover policy cover should be secured for all the personnel during the construction phase and for those who will be employed in the factory during the operation phase as well as the decommission phase.
- Workers should be regularly trained on the use of the equipment as well as on the safety measures and procedures so as to limit the risk of accidents due to the ignorance in the equipment use as well as the importance of the safety procedures.

- All workers to be briefed and trained on causes and risks of fire, and on safe practice within the construction and work sites; as per OSHA 2007

- Border fences the gold leaching facility t to prevent children animals and unauthorized persons from intruding into the site.

NB: A typical First Aid Kit contains a First Aid manual, and is equipped with sterile adhesive bandages, safety pins, cleansing agent/soap, latex gloves; sterile gauze pads triangular bandages, non-prescription drugs, scissors, tweezers and antiseptic amongst others.

7.2.5 Risks of Fire Accidents

There is a potential risk of a fire hazard. This is because of the use of diesel and petroleum products to run machinery and equipment,

7.2.5.1 Recommended Action

- Therefore the plant manager and proponent should ensure that there is no unnecessary lighting of fire in the plant.
- Solid wastes should not be burned at the project site
- All machinery and equipment must be maintained at the manufacturer's specifications
- Provision of fire extinguishers

7.2.6 Energy Resource Management

Most machinery and equipment will be powered by diesel and petrol. The site is not connected to Kenya power supply.

7.2.6.1 Recommended Action

The proprietor is advised to adopt more energy efficient measures to reduce on power consumption. This translates to cost saving and less burden on the insufficient power supply system in the county and these include:

- Get diesel and petroleum products from qualified suppliers to avoid purchasing adulterated diesel or petroleum products.
- Install solar panels to tap solar energy since the site is not connected to Kenya Power Supply lines.
- Energy efficient. Night – time lighting only to be used at the premises.
- Light sensor switches are to be provided to ensure outdoors lights are not used in daytime.
- All energy using equipment used in lighting and heating should be switched off when not in use.
- Weather proof fittings for all lighting and power points located outside the facility.

7.2.7 Water Resource Management

The gold leaching facility will rely on water drawn from Shilumaka stream tributary to river Isiukhu. However he is to get approval from WRA. However, for consumption by the staff, the employees will rely on a nearby community water spring. The spring is protected to mitigate against pollution.

The Survey Act of 1989, and Water Quality Regulations (2006) and Water Resources Management Rules (2007) define riparian land as being a minimum of 6 meters up to a maximum of 30 meters on either side of its banks from the highest water mark. This distance is based on the width of the river and the water volume at any given time. Riparian land plays a crucial role as a buffer zone for wetlands in terms of preventing soil erosion, and other causes of degradation. NEMA regards wetlands as some of the most endangered ecosystems (NEMA 2006; NEMA 2007; GoK 1989)

7.2.7.1 Recommended Action

Besides Considering the Water Act, 2002 and the EMCA Act, 1999, which govern water abstraction and use; require permits for abstraction of large volumes of water for commercial uses. Opportunities for reducing water wastage during operational phase include:

- Get WRA approval to draw water from Shilumaka stream
- Avoid undertaking any activities within the riparian parts of river Isiukhu. The riparian land is within 30 meters of either side of the river.

- The proponent should not wash equipment and machinery in the river Isiukhu or shilumaka stream.
- Maximize on other sources of water for some uses e.g., rainwater harvesting and storage in larger tanks.
- The contractor and proponent are advised not to use asbestos for roofing in the campsite since water tapped through asbestos is known to be carcinogenic (have a tendency to trigger onset of cancer) if ingested/consumed by humans.

- There is the risk of surface water runoff transporting unprocessed tailings or slurry into river Isiukhu. In this regard, the proponent is advised to plant reeds or papyrus between the river and the project site. Papyrus and reeds are known to naturally cleanse water passing through them

- The proponent is also advised to uses very little about of cyanide to ensure that he does not exceed the threshold proposed under the PPA cap 244 since cyanide is known to have very serious negative impacts on aquatic resources especially fish.
- Where he chooses to use cyanide, he should consider using lime to make it less toxic
- Where possible the proponent should consider using thiosulphate as an alternative to cyanide since it is less toxic
- The proponent should employee a person with expert knowledge on use and storage and disposal of cyanide or its alternative chemical components in order to safeguard water bodies and the environment as per the PPA cap 244.

7.2.8 Liquid waste

There will be liquid waste arising from washing machinery and equipment. If not properly addressed such waste can pollute water bodies. The proponent should direct liquid waste into septic tanks.

- Direct liquid wastes into septic tanks. Where the wastes can later be carried by exhausters to be disposed in designated cesspits

- Where cyanide, hydrogen peroxide caustic soda, petroleum or diesel spills by mistake, the proponent to use saw dust to cover such spillage. The saw dust should then be removed and disposed in designed waste disposal areas by the CGK or in incinerators.

7.2.9 Waste management

The proponent intends to use the slurry waste from which gold has been extracted to manufacture interlocking bricks. However, the proponent is advised to ensure cyanide does not exceed 0.1% of the waste as per the waste management regulations on hazardous wastes. It exceeds 0.1% cyanide it will be considered hazardous. It is also expected that since the campsite will be located near the project site, household containers like empty cooking oil cans, paper, clothing and food remains might constitute part of solid wastes. In addition empty chemical

cans, worn out metallic parts of machinery and equipment, will also constitute part of the solid wastes.

7.2.9.1 Recommended Action

- Re use empty containers used to buy diesel and petroleum products. Reuse them to store similar products but cans and containers used for chemicals should not be used to store food, medicine or drinks.
- Excavated soil can be used for landscaping during the rehabilitation phase.
- Paper wastes and wastes that can be recycled should be removed from the site and burned in another area to minimize risks of fire explosion because of the stored petrol and diesel for running machinery
- Recycle metallic parts by selling to scrap metal companies for recycling
- Food remnants should be sold or given to local community to feed their domestic animals or make organic manure.

7.2.10 Sanitation Services

The proponent is advised to construct pit latrines for the employees and water supply to maintain the hygiene. Since the project will rely on about 120 casuals during the operational phase, the proponent is advised to construct about 12 pit latrines.

7.2.10 .1 Recommended Actions

The Proponent is advised to contract a registered exhauster to empty the pit latrines when it reaches 70% full. The proponent has already constructed pit latrines for the workers. He is advised to ensure that the latrines are maintained in a hygienic manner

The proponent and contractor are encouraged to construct pit larines for use in case of water shortgae or unavailablity. The contractor and client should design the roofing of the market in a manner that rain water can be harnessed and stored. The harnessed rain water should be used to wash the market as well as the pit latrines during casaes of water shortages either due to vaarious reasons such as pipe or equipment breakages. The contractor and proponent are advised to adopt any of the following two types of models to construct the pit latrines. They can construct the Ventilated Improved Pit (VIP) and Reed's odourless Earth Closet models (ROEC)

These improved types of pit latrines help to remove odurs and prevent flies from breeding and escaping. Excreta are collected in a pit which has a vent pipe covered with a fly proof screen at the top. The difference between the VIP and ROEC is that the pit of ROEC is offset from the floor of the latrine and connected to it by a chute whereas the pit of VIP latrine is directly under the floor of the slab. In these latrines, air circulates down the squat hole or chute, into the pit and up through the vent pipe. This reduces smells in the shelter. It is important that there is free throughflow of air into the shelter and into the pit, therefore no cover should be placed over the squat hole or seat. In order to ensure an unhindered flow of air , the top of the vent pipe must

be at leats 0.5 metrers avove the top of the shelter and the latrine must be well away from high buildings or trees.

These latrines cost more to build and require more maintenance than a simple pit latrine. They are however, still relatively low cost and maintenance staright fowrad. They are more pleasane to use than simple pit latrines because there is less smell and they are more hyginiec . The ROEC has gretaer capacity and needs replacing less often than the VIP. However the chute fouls easily with excreta and may allow fly breeding to occur. Therefore this report advices that the contractor and proponent to have more VIP latrines and less ROEC pit latrines. When the pit remains with 0.5 meters before it gets filled up, it should cease to be used. The proponent should cotract an exhauster to empty the pit latrines as often as is necessary.

Points to consider during construction of VIPs

- Minimum Safe Distance (MSD) of 30 meters from the nearest water source.
- Downhill
- Not too close to trees which might intefere with the flow of air circulation across the top of the vent pipe
- On slightly raised ground so that rain water can easily drain away

The proponent can hand over the toilets to the community after the end of the project as part poof their contribution to community's welfare.

7.2.11 Methods of Cyanide detoxification

The proponent is advised to take two main steps in detoxifying cyanide around the facility

7.2.11.1 Establishing a belt of reeds

The proponent should establish a fence of reed of approximately 12 meters wide around the facility. Reeds are known to detoxify chemicals including cyanide from the soils and spillover slurry. Therefore, before the process begins, he should consider establishing a belt of reed around the facility.

7.2.11.2 Setting up of a detoxifying plant.

The proponent should consider establishing a cyanide detoxification process. It involves the following three methods:

(i) Ozonation,

(ii) Electrolytic oxidation

(iii)Biodegradation

7.2.11.2.1 Ozonation

Treatment of cyanide bearing wastewater has been carried out with ozone.

Advantages of ozone oxidation include:

- Extremely effective against all free and complexed cyanides either alone or in combination with UV light
- Does not form any undesirable by products such a chlorinated organics or ammonia
- Does not require the purchase, storage or handling of dangerous chemicals on site
- Ozone is produced on site from air using an ozone generator

NB: **The reaction with ozone does not require high temperatures or pressures**

Ozone, with an electrode potential of +1.24 V in alkaline solutions, is one of the most powerful oxidizing agents known.
Cyanide oxidation with ozone is a two-step reaction similar to alkaline chlorination. Cyanide is oxidized to cyanate, with ozone reduced to oxygen per the following equation:

$CN^- + O \rightarrow CNO^- + O$

Then cyanate is hydrolyzed, in the presence of excess ozone, to bicarbonate and nitrogen and oxidized per the following reaction:

$2\ CNO^- + 3O + HO \rightarrow 2\ HCO_3^- + N + 3O$

The reaction time for complete cyanide oxidation is rapid in a reactor system with 10 to 30 minute retention times being typical. The second-stage reaction is much slower than the first-stage reaction. The reaction is typically carried out in the pH range of 10-12 where the reaction rate is relatively constant. To complete the first reaction requires 1.8 – 2.0 gram of ozone per gram of CN-.

The metal cyanide complexes of cadmium, copper, nickel, zinc and silver are readily destroyed with ozone. The presence of copper and nickel provide a significant catalytic effect in the stage one reaction but can reduce the rate of the stage two reaction (oxidation of cyanate).

7.2.11.2.2 Electrolytic Oxidation

Electrochemical oxidation is an alternative process for destroying cyanide ions at the anode and collecting heavy metals from the cathode. Free cyanide, cyanide complexes and concentrated cyanide solution can be handled with the electrochemical oxidation method.

First cyanide and cyanocomplexes become oxidized to form cyanate ions at the anode. The ions are then decomposed into carbon dioxide and nitrogen gas. Dissociated metal cations are reduced at the cathode.

7.2.11.2.3 Biodegradation

Cyanide is produced in the environment by plants, fungi and bacteria. Therefore, a number of micro-organisms and their enzymes have the ability to degrade cyanide and metal cyanide complexes (also stable iron cyanide complexes) into less toxic compound like ammonia, formic acid and formamide. Microbes can utilise these compounds as a source of nitrogen and carbon for their own growth. Reed beds are particularly effective in using cyanide and taking up heavy

metals. In Finland cyanide solution was used to irrigate pine trees which flourished on the cyanide.

CHAPTER EIGHT: RECORD KEEPING

8.0 Record Keeping and Environmental Policy

8.1 Record Keeping

Proper record keeping at the facility is necessary for accounting and administrative reasons. For efficient management of the facility; to facilitate future audits and to comply with the law, it is recommended that the following records must be prepared and kept available

- Such records include licenses, operational permits, site plans and land ownership documents etc in accordance with the EMCA (1999) Act, OSHA 2007, and Public Health Act, the mining act 2016 and the PPA cap244
- In addition to the pertinent documents above, the project owner is required to keep records on events of environmental significance that include inspection records, training/workshops/seminars records, waste disposal records, discharge monitoring reports, hazardous materials amongst others where applicable.
- Documented emergency management procedures
- Diary detailing incidents, accidents at the site.
- Inventory of materials at the site according to approved classification schedule.
- All inflammable materials should be kept safe and away from ignition of flame and an inventory of the same developed
- The mining act 2016 obligates the proponent to keep a record of the quantities of extracted gold and communicate the same to the department of mines and geology
- A record of the name and quantities of all chemicals that will be used at the facility. (These includes cyanide, or its substitutes, caustic soda and hydrogen peroxide)
- A record of the amount of water drawn
- A report on how wastes are managed (both solid and liquid wastes)
- A record of any accidents at the site.
- The proponent is advised that in case of an accident leading to the death of an employee or any other person such information should be communicated to the DOSH office within a period of 24 hours. In case of normal injury the same should be communicated to DOSH within seven weeks as per the OSHA 2007.

CHAPTER NINE: ENIRONMENTAL MANAGEMENT PLAN AND ENVIRONMENTAL AUDITS

9.0 ENVIRONMENTAL MANAGEMENT AND MONITORING MITIGATION PLAN

9.1 PURPOSE OF EMP

The purpose of the Environmental Management Plan (EMP) is to ensure environmental impacts are identified and mitigated during construction, operational as well as decommissioning phases of all new projects. The EMP has been developed with project knowledge and information available to date. As project commencement and scheduling plans are developed and changed, components of the EMP might require amending. This is therefore a working document, which can be updated whenever new information is received or site conditions change. However, it gives a general guideline.

Thus it is imperative to develop an EMP for construction phase and another for Operational Phase and Finally one for Decommissioning phase of the project. The EMPs outlines corresponding management strategies proposed that will be employed to mitigate potential adverse environmental impacts and assigns responsibility for the implementation of the mitigation measures. The EMP for Decommissioning is outlined in Chapter 10 Table 9.1 presents the EMP for construction Phase.

TABLE 9.1 ENVIRONMENTAL MANAGEMENT PLAN FOR CONSTRUCTION PHASE

Project activity	Anticipated impact	Management and Mitigation	Monitoring Timeframe	Actors	Monitoring indicators
Construction of the leaching facility	Intrusion by unauthorized persons and livestock	Fence the project site to keep off unauthorized persons and livestock	Throughout construction and operational phase	Proponent	A visible permanent fence around the project area
Construction of the gold leaching facility	Pollution of river Isiukhu through surface water runoff of excavated soils	Construct the project at least 500 meters from river Isiukhu**.**	The project should be located not less than 500 meters from river Isiukhu.	Proponent	No increase in river turbidity No significant increase in river coloration
Excavation and removal of top soil before the excavation of rock	Risk of increased loosening of soil leading to erosion.	Confine removal of top soil to project site and Reduce unnecessary truck movement.	Throughout during construction and operational phase	1-Proponent 2 - Plant - Manager 3 Contractor	No deposit of top soil on earth surface.
Clearance of Vegetation to create room for excavation	Minimal impact because the site has little patches of grass. It has no tree cover	The clearance of the site for the project shall only be within the approved work site.	Throughout	1-Proponent 2 Plant - Manager	No clearing of grass in areas not earmarked for mining.
Solid waste management	Disposal of empty fuel cans polythene paper bags.	-No dumping of solid wastes in the open. Solid wastes e.g. empty jerry cans ,polythene paper bags metallic rods should be removed and recycled	Throughout the entire contract period	1-Proponent 2 - 3 Contractor	No waste at work sites except in approved sites. Wastes should then be recycled

		Wherever possible, Solid waste should be recycled, re-used and utilized in an environmentally acceptable Manner. E.g. empty oil cans	Weekly Inspections and recording	1-Proponent 2 -Plant - Manager	Lack of solid wastes loads at the site area
		A Waste Management Plan to be developed to handle temporary storage, transport and disposal of hazardous waste that may potentially pollute water resources. E.g. petroleum and oil products used by the machinery	Throughout the construction period	1-Proponent 2 –Gold leaching Plant - Manager	No poor disposal of oil and petroleum products
		Wetting of unpaved areas and the entire work place	Daily inspection and reporting	1-Proponent 2 –Gold leaching Plant - Manager 3 Contractor	Lack of complaints Reports / log book entries
Use of Machinery and bulldozers to clear the grass vegetation.	Nuisance to the cool ambient. Noise pollution and excessive vibrations	Use equipment that has low noise emissions as Proper use of machinery & equipment as stated by manufacturers & as indicated in user manuals. -get license to emit noise	Throughout	1-Proponent 2 –gold leaching Plant Manager 3 Contractor	Lack of complaints by neighboring community Reports / log book entries -get license to emit noise
		Use equipment that is properly fitted with noise reduction devices such as mufflers. -get license to emit noise	Daily inspection of the machinery	1-Proponent 2 –gold leaching Plant - Manager	Lack of complaints Reports / log book entries Get license to emit noise

		workers operating equipment that generates noise should be equipped with noise protection equipment	Monthly	1-Proponent 2 –gold leaching Plant - Manager	Lack of medical complications by the workers
Staff Bathing and washing of equipment	Waste water generation. Direct waste water to pit latrines. Or	Provide pit latrines for workers. . Pour sparingly waste water site area to reduce dust.	Daily inspection and reporting	1-Proponent 2 –gold leaching Plant - Manager	Maintenance of good quality of water down stream
Transportation equipment , materials, tailings to the project site and also of extracted gold bullions	Possible cases of accidents	Adequate and approved road signs and bumps should be erected to warn road users of the construction activities to reduce speed near the entrance roads	Daily inspection and supervision	1-Proponent 2 –gold leaching Plant - Manager	Lack of public complains Minimal Number of accidents recorded in the area
		The movement of equipment (trucks) during the construction on the site should be limited to the working hours, 8:00 am - 4:30 pm per day.	Daily inspection and supervision	1-Proponent 2 gold leaching Plant - Manager	Lack of public complains
Occupational health and safety	Impact on health of the workers	Ensures workers health and safety through awareness campaign and provision of appropriate PPE(Helmets, Nose and Mouths masks, Overalls,	Weekly inspection of safety kits	1-Proponent 2 –Gold leaching Plant - Manager	Minimal cases of health related complications Minimal incidents of Public complains

		earplugs, if welding is will be undertaken, protective goggles, industrial footwear, first Aid Kit, Fire extinguishers and training of workers to use them. Gloves for those painting.			Lack of accidents at work place
	Injuries on workers	Avail first aid Box. Train staff in administration of first aid	Throughout	Proponent Plant manager	No cases of unattended employees in case of injuries
		Insure staff for compensation in case of injuries leading to incapacitation.	Throughout	proponent	No cases of employees lacking medical care in case of accidents or sickness
		Training of all workers in Safety Health and Environment (SHE)	Holding workshops and seminars for workers		
Obnoxious gases: SOx, NOx, CH_4, CO_2 Dust	Breathing & chest problems to workers	Maintaining machineries at manufacturers specifications , provide workers with PPE	Weekly	1-Proponent 2 –gold leaching plant manager	Lack of complaints Reports / log
Spillage of oil & petroleum products	Contamination of soils	Use of saw dust to soak spilt oil & removal of same to designed disposal sites	Weekly		Minimal incidents of polluted soils & water bodies
Total					

TABLE 9.2 ENVIRONMENTAL MANAGEMENT PLAN FOR OPERATIONAL PHASE

Project Activity	**Anticipated impact**	**Management and Mitigation**	**Monitoring timeframe**	Actors	**Monitoring indicators**
Use of cyanide or Thiosulphate to leach gold tailings	Possible leakage or spills of cyanide slur during Vat leaching	Seal the Vat tanks with impervious material to reduce possibility of leakage of cyanide during the leaching process Where possible replace cyanide with a less toxic leaching reagent such as thiosulphate	Throughout operational phase	Proponent Plant manager	No change in color of vegetation No unexplained deaths of aquatic life in the nearby Isiukhu river
	Getting chemical reagents for leaching	Ensure cyanide or any other chemical that will be needed is sourced only from approved dealers as per the PPA cap 244	throughout	Proponent Plant manager	-No cases of buying cyanide from unapproved dealers -Maintenance of chemical purchase receipts Get license from KPPB to handle cyanide or its substitutes
	Risk of release of hydrogen cyanide gas which is highly toxic and colorless	Use lime to maintain the pH of the slurry at between 11 to 12 values	throughout	Proponent Plant manager	No falling of pH below 11 and not rising above 12
	Risk of falling pH during the recycling of	-As the leaching process is ongoing, the pH level falls down. Change the slurry after recycling.	Throughout	Proponent Plant manager	No cases of pH falling below 11

	the slurry. This may comprise the process	-Constantly detect the pH levels			
	Risk of cyanide contamination when making interlocking bricks from waste slurry	Ensure that barren slurry from which gold has been extracted is certified as having less than 0.1% of cyanide before its reused to make interlocking bricks	Throughout	Proponent to liaise with NEMA on how to ensure the threshold of less than 0.1% cyanide in waste slurry is not exceeded 2 ml per liter	No use of waste slurry having cyanide composition of above 0.1%
	Cyanide Poisoning during making of interlocking bricks from slurry	Ensure that should the cyanide composition exceed 0.1 per cent, then it should be directed and disposed in designated sites. Cyanide waste that should be directed to sewerage system should not exceed 2 ml per liter			
	Poisoning through inhalation or ingestion cyanide or its substitutes	Ensure all poisonous substances are used handled and stored in a safe and environmentally sound manner as per the PPA cap 244. kept away from unauthorized persons	Throughout	Proponent Plant manager	No cases of poor storage, handling , transported, stored or disposed in an environmentally unsound manner
	Risk of purchasing substandard cyanide or its substitutes	Get a license from the KPPB to buy and use cyanide and other required chemicals in the gold vat leaching process. This is in conformity to the PPA cap 244	Throughout	Proponent Plant manager	A license from KPPB allowing purchase and use of cyanide and associated chemicals for mining purposes
Operating gold leaching machinery	Increase in the risk of hearing impairment	Maintain machinery at Manufacturer's specification Equip personnel with ear plugs/muffles	Throughout the operational	1-Proponent Plant -Manager	-No machine operator without ear muffler and/or ear plugs -No production of

	because of the noise and dust from the pollution from machines		phase.		unspecified/unusual excess noise by machinery
Running of generators and equipment to provide energy and equipment	Noise pollution and vibrations & Nuisance to the cool ambient. Likelihood of injuries to livestock and the local community caused by explosives	Get permit for Noise generation from CGK and NEMA Use equipment that has low noise emissions. Maintain equipment to manufacturer's specifications.	Throughout	Proponent Plant manager	Lack of complaints by neighboring community Reports / log book entries
Solid Waste Disposal	Soil and Water Contaminatio n	Solid waste e.g. oil containers, polythene paper bags and metallic rods should be recycled, re-used and utilized in an environmentally acceptable Manner	Weekly Inspections and recording	Proponent Plant manager	No waste at work sites except in approved and marked locations
Leaching of gold through carination in open tanks	Some birds are attracted to stagnant liquid or fluid or slurry (including cyanide solution)	Cover the open tanks with thin razed wire mesh.	Throughout operational phase	1-Proponent 2 - Plant - Manager 3 Contractor	No cases of birds dying as they come to consume or play in the leaching solution.

Disposal of cyanide polluted waste	Washing of cyanide laced toxic waste materials by surface water runoff into river Sikh	Proponent to plant a belt of reeds between the river and the leaching facility. Reeds are known to naturally detoxify wastes	Throughout the operational phase	Proponent	No cases of cyanide contamination of river Isiukhu. No cases of dying aquatic life. No significant change in river water coloration, odor or taste. No traceable levels of cyanide above WRA standards
Sewerage and Human waste disposal	Disposal of human waste	Provide proper and hygienic pit latrines should be constructed. The pit latrines should emptied by approved exhaust service providers Construct 12 VIP latrines. Provide adequate water for hygiene	When 70% full Throughout operational phase	1-Proponent 2- Plant -Manager	No poor disposal of human wastes -No human waste odor or stench
		Careful disposal of non-recycled wastes into a designated municipal waste collection areas	Weekly inspection and reporting	Proponent	No careless disposal of waste
Solid Waste Generation	Impact on Ecology	Waste bins should be strategically placed within the GOLD leaching plant and also be adequately designed and covered to prevent access by vermin and minimize odor.	Weekly inspection	Proponent	Waste disposal documentation and tracking.
		Waste bins should be emptied regularly to prevent overfilling.	Daily inspection and reporting	Proponent	No poor disposal of waste except in approved and marked locations.
Transportation of extracted gold from the site to the warehouse or market		Adequate and appropriate road signage should be erected before reaching the project site to warn road users of livestock and wildlife prevalence in the area. Bumps should also be erected along this road to minimize speeding trucks which	Daily inspection and supervision	1-Proponent 2 -CGK	Lack of public complaints and Road Accidents. Reduced Number of accidents recorded in the area

		may accidents. This should be done in with the approval and technical input from the Ministry of Public Works.			
Operating the leaching process	Impact on health of the workers	Training of all workers on -Occupational Safety ,Health and Environment (SHE) -Ensure that all employees are appropriately dressed with appropriate PPE (industrial helmets, gloves and masks, ear plugs and footwear.) -No employee should report for duty while drunk, -Train employees on first Aid -Provide the first aid kit -Get insurance cover for Employees	Holding workshops and seminars for workers	1-Proponent 2 Plant - Manager 3. DOSH	Minimal incidents of accidents at work place
	Fire accidents	Training of all employees and on Firefighting drills and use of Fire Extinguishers & evacuation procedures in addition to ensuring that there are adequate emergency fire exits and conducting fire drills.	One a year	1-Proponent 2 - Plant Manager	Minimal number fire accident victims
	Fires due to electric faults	Ensure maintenance of Electric wiring by a qualified Registered Electric Engineer/ Technician	Monthly	1-Proponent 2 - Plant -Manager	Minimal Incidents of fire accidents due to electric faults.
Enforcement of Safety Guidelines and Regulations	All safety guidelines to be followed	Ensure that health and safety is ensured at all times	throughout	-Plant Manager -Inspectors from DOSH -Inspectors from directorate of mines and geology	Minimal or no incidents of accidents

	Accidental Ingestion of chemical residues by staff	No eating of food or consuming alcohol while operating machinery on site	throughout	Proponent Plant manager	No cases of accidental cyanide ingestion.
	Ensure	Ensure that a proper record of leached gold granules is kept. The record should be shared between the proponent and the department of mines and geology. The proponent should pay royalties calculated by the Department of mines and geology from the extracted gold granules. 10% of royalties to be surrendered to support community projects. While 20% of royalties to be remitted to the CGK. Finally, the 70% of all royalties forwarded to the National Government. All these remittances are as established by the mining act 2016.	Throughout the operational phase	-Proponent -Plant manager -Department of mines and geology CGK through its ministry of Environment -Local community leaders	Availability of a record of quantity of gold extracted. Sharing of this information between the proponent, department of mines and geology , CGK and the local community
Total				Registration of the Mine with the directorate of Occupational Safety & Health as a work place and annual renewal	

9.2 Environmental Monitoring and Audits

Environmental monitoring and audits are essential in a Project's life span as they are conducted to establish if project implementation has complied with set environmental management standards for Kenya as spelt out in EMCA 1999 and the Environmental (Impact Assessment and Audit) Regulations 2003. In this Project, environmental monitoring and audit will be conducted to ensure that identified potential negative impacts are mitigated during the project's life span. Reports are to be made based on the outlined EMP plan. The Environmental Audits should be submitted to NEMA annually.

CHAPTER 10: DECOMISSIONING, PROJECT CLOSURE & SITE REHABILITATION

Decommissioning is an important phase in the project cycle and comes last to wind up the operational activities of a particular project. It refers to the final disposal of the project and associated materials at the expiry of the project lifespan. In such a case a proper process of project closure and rehabilitation of the derelict environment needs to be executed. This is expected to occur after all the gold has been extracted from all the tailings. The proponent is advised to prepare the surrounding community that he is about to close the project. So that even the employees can start planning about their future.

If such a stage is reached, the proponent needs to remove all materials resulting from the demolition/ decommissioning from the site. The following should be undertaken to restore the environment.

- Remove all underground construction e.g. the foundation stone, septic tanks
- The site should be well landscaped by flattening the mounds of soil and planting indigenous trees and shrubs
- All the equipment and metallic parts should be removed from the site
- Fence and signpost unsafe areas until natural stabilization occurs
- Backfill surface openings such as pit latrines and plant indigenous trees once such openings are filled.

He should also involve the community in rehabilitating the environment. In doing this he is advised to take soil and water samples for testing to see the extent to which the soil and water may have been contaminated by the chemicals that he used in the project. He will be advised on how to neutralize any such chemical residues. He is also expected to plant trees

TABLE 10.1 ENVIRONMENTAL MANAGEMENT PLAN FOR DECOMMISSIONING PHASE

Legal Framework Guiding Decommissioning	**Expected Negative Impacts**	**Recommended Measures**	**Responsible Party**
Occupational Health & Safety Act 2007.	All employees undertaking decommissioning must be provided with PPE	Decommissioning should be undertaken with minimal destruction of building materials for re-use elsewhere. E.g. stone, iron sheets, timber--Use of an integrated solid waste management system i.e. through a hierarchy of options.-Wastes generated as a result of facility decommissioning activities will be disposed of	Proponent 2 - Plant -Manager 3 decommissioning engineer
Local Government Act Public Health Act		-in compliance with standard waste management procedures. -The contractor will select disposal locations and the local council based on the properties of the particular waste generated.	Proponent 3 decommissioning engineer.
EMCA 1999	Vegetation disturbance Land deformation: soil erosion, drainage problems	-Implement an appropriate re-vegetation programme to restore the site to its original status. Unless land is to be utilized for another activity subject to fulfilling all other requirements. All open pits should be refilled with soil and indigenous vegetation planted. -During the vegetation period, appropriate surface water runoff controls will be taken to prevent surface erosion; -Monitoring and inspection of the area for indications of erosion will be conducted and appropriate measures taken to correct any occurrences; -Fencing and signs restricting access will be posted to minimize disturbance to newly-vegetated areas;	Proponent 3 decommissioning engineer

Public Health Act	Removal of Septic Tank and filling up of Pit latrine. If poorly handled can lead to underground water contamination	-Ensure the Public health department is involved in decommissioning of the septic tank.	Proponent 2 - Plant -Manager 3 decommissioning engineer
	Total Environmental and Logistical costs for Decommissioning		

Legal Instruments guiding Decommissioning	**Expected Negative Impacts**	**Recommended Measures**	**Responsible Party**
Occupational Health & Safety Act 2007	Physical injuries and disabilities	The safety of the workers should surpass all other objectives in the decommissioning of the project. They should be provided with PPE	Proponent
NSSF Act.	Loss of income	-Give gratuity where possible and recommend the workers to get employment opportunities elsewhere or start income generating activities. .Encourage those to join SACCOs while in employment to save enough to initiate income generating projects. -Contribution to NSSF for those permanently employed	1 Proponent 2 - Plant -Manager 3 decommissioning engineer
	Loss of livelihood for members of the local community employed	-Establish an alternative source of livelihood for the community around. E.g. the excavated pits can be developed for aquaculture.	1. Proponent 2 - Plant -Manager 3 decommissioning engineer

CHAPTER 11: CONCLUSION

11.0 CONCLUSION

The proposed Vat gold leaching plant will have numerous positive impacts as it has been outlined in the report. The negative environmental impacts that will result from establishment of the project can be mitigated. This study therefore recommends that this project be approved by NEMA for issuance of an EIA license. The proponent is also advised to ensure that annual environmental audits are undertaken after it has been completed and occupied. This will be in compliance with the Environmental Management and Coordination Act of 1999 and the Environmental Impact Assessment and Audit regulations, 2003. In regard to this, the proponent should carry out Environmental Audit 12 months after the project is completed and a report submitted to NEMA.

The proponent of the proposed project shall be committed to putting in place several measures to mitigate the negative environmental, safety, health and social impacts associated with the life cycle of the project as recommended in this EIA report. It is recommended that in addition to this commitment, the proponent shall focus on implementing the measures outlined in the EMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects.

This EIA report thus recommends that the project proceeds subject to fulfilling all other relevant legal and regulatory obligations.

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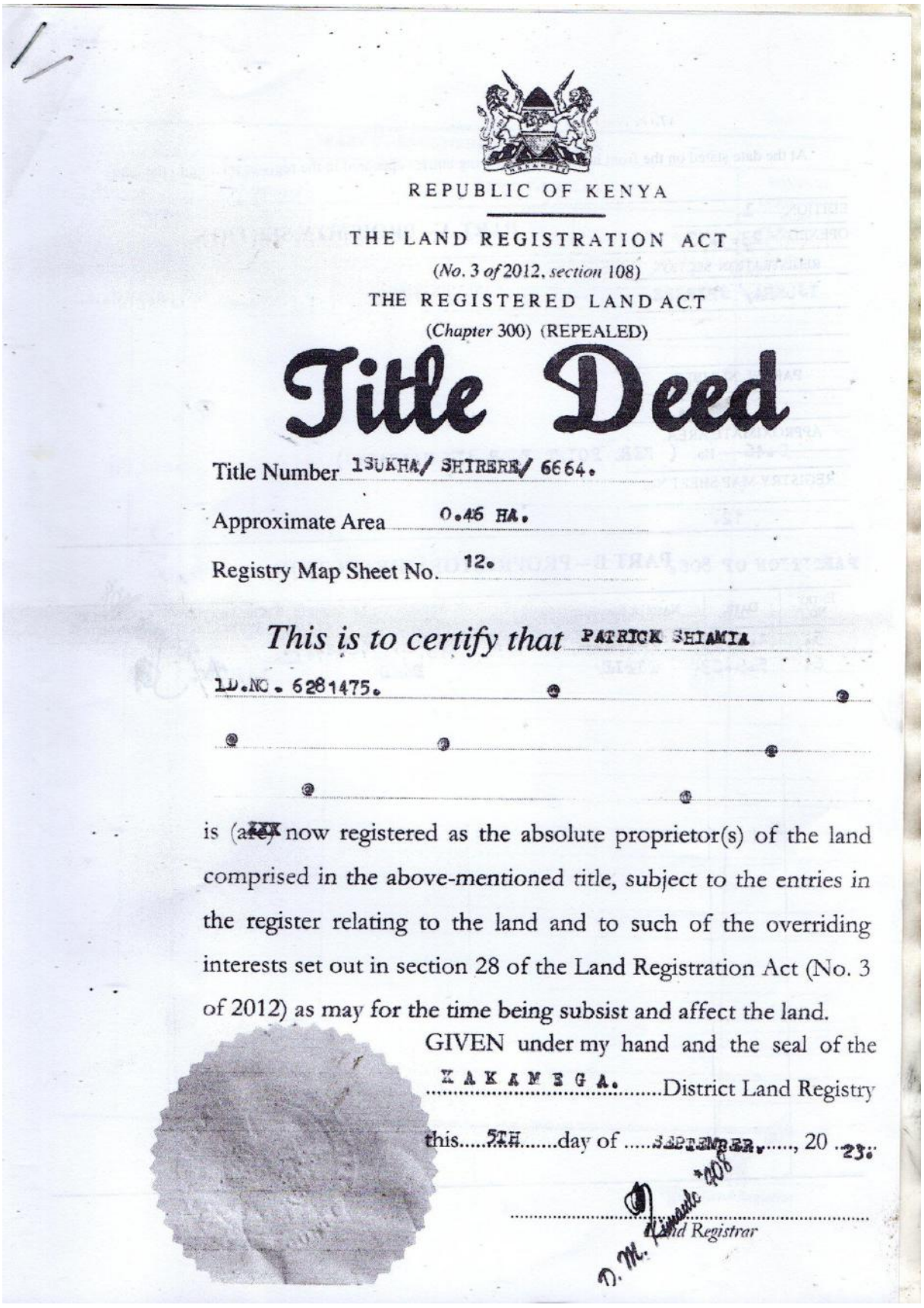
UNEP/OCHA.(2000) The Cyanide Spill at Baia Mare, Romania: Before, During and After.(P. Casgoly, Editor). The Regional Environmental Center for Central and Eastern Europe.

APPENDIX I: TITLE DEED OF LAND WHERE THE PROJECT WILL BE SITED



REPUBLIC OF KENYA

THE LAND REGISTRATION ACT

(*No.* 3 *of* 2012, *section* 108)

THE REGISTERED LAND ACT

(*Chapter* 300) (REPEALED)

Title Deed

Title Number ISUKHA/ SHIRERE/ 6664.

Approximate Area 0.46 HA.

Registry Map Sheet No. 12.

This is to certify that PATRICK SHIAMIA

I.D.NO. 6281475.

is (~~are~~) now registered as the absolute proprietor(s) of the land comprised in the above-mentioned title, subject to the entries in the register relating to the land and to such of the overriding interests set out in section 28 of the Land Registration Act (No. 3 of 2012) as may for the time being subsist and affect the land.

GIVEN under my hand and the seal of the KAKAMEGA. District Land Registry this 5TH day of SEPTEMBER, 20 23.

Land Registrar

APPENDIX II: LEASE AGREEMENT BETWEEN THE PROPONENT AND THE OWNER THE LAND ON WHICH THE PROJECT WILL STAND

REPUBLIC OF KENYA

LAND LEASE AGREEMENT

AGREEMENT MADE THIS .....11TH .....DAY OF .....SEPTEMBER 2023

BETWEEN

PATRICK SHIAMIA	Of **ID/NO.6281475** and of **phone No.0723887624** in the Republic of Kenya hereinafter referred to as the **"LESSOR"**
	AND
STONES OF WEALTH LIMITED	Of REG NO. PVT-BEUXRVAZ and of phone number 0723666655 in the republic of Kenya hereinafter referred to as the "**LESSEE**".
SUBJECT:	15 (Fifteen) years lease on land parcel number **Isukha/Shirere/6664** measuring 0.46HA registered in the name of the Lessor.
CONSIDERATION:	Mutually agreed at the sum of **KSHS.50,000/= (FIFTY THOUSANDS KENYA SHILLINGS ONLY)** per month for a period of 15 years with effect from 01st September 2023.

THIS AGREEMENT WITNESSETH AS FOLLOWS: -

1. The Lessor shall lease the entire land parcel ISUKHA/SHIRERE/6664 measuring 0.46HA to the Lessee.
2. The lease period shall be 15 years (fifteen years) commencing date shall be 01st September 2023.
3. The Lessee shall pay **KSHS.50,000/= (FIFTY THOUSANDS KENYA SHILLINGS ONLY)** per month to the Lessor being the monthly rent with effect from 01st September 2023.
4. The lessor hereby acknowledge receipt of a sum of **Kshs.300,000/= (Three Hundred Thousand Kenya Shillings Only)** being the rent for the first half of 12 months calendar.
5. That all payments shall be made through the bank by the Lessee who shall deposit the payment to the Lessor's bank account 0500193858509, Equity Bank Kakamega Branch
6. The Lessee shall pay to the Lessor the agreed rent six months in advance before the commencement of the lease. The Lessee shall make the payment twice for in a one year being the 12 months calendar.
7. The Lessee shall obtain all the necessary licences and or consents at his cost necessary for the operation of his business which includes processing of gold ore upto leaching with the necessary required chemicals and cynide compounds.
8. That upon expiry of the lease period, the Lessee shall vacate the land. Before vacating the land, the Lessee shall restore the land to its original position by back filling and take such reasonable action to make the said land habitable.

LESSOR: _____ LESSEE: _____

MUKAVALE KEVIN
ADVOCATE
11 SEP 2023
P. O. Box 101-50100,
KAKAMEGA

APPENDIX IV: NEMA PRACTISING LICENSE FOR FIRM AND LEAD EXPERTS

EAE 23061068

FORM 7 (r.15(2))

nema

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/21442

Application Reference No: NEMA/EIA/EL/28512

M/S **JESSEE NJOROGE NJUGUNA**
(individual or firm) of address
P.O. Box 30818 - 00100 NAIROBI

is licensed to practice in the capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert General** registration number **0395**

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

Issued Date: **4/8/2024** Expiry Date: **12/31/2024**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001 : 2015 Certified

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/20069

Application Reference No: NEMA/EIA/EL/26465

M/S **AYES COSULTANTS LTD.**
(individual or firm) of address
P.O Box 79999 - 00100 NAIROBI.

is licensed to practice in the capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Firm of Experts.** registration number **6604.**

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

Issued Date: 9/12/2023 Expiry Date: 12/31/2023

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001:2015 Certified

APPENDIX V: CERTIFICATE OF INCORPORATION FOR STONES OF WEALTH LIMITED

No. **PVT-BEUXRVAZ**

CERTIFICATE OF INCORPORATION

I hereby **CERTIFY** that,

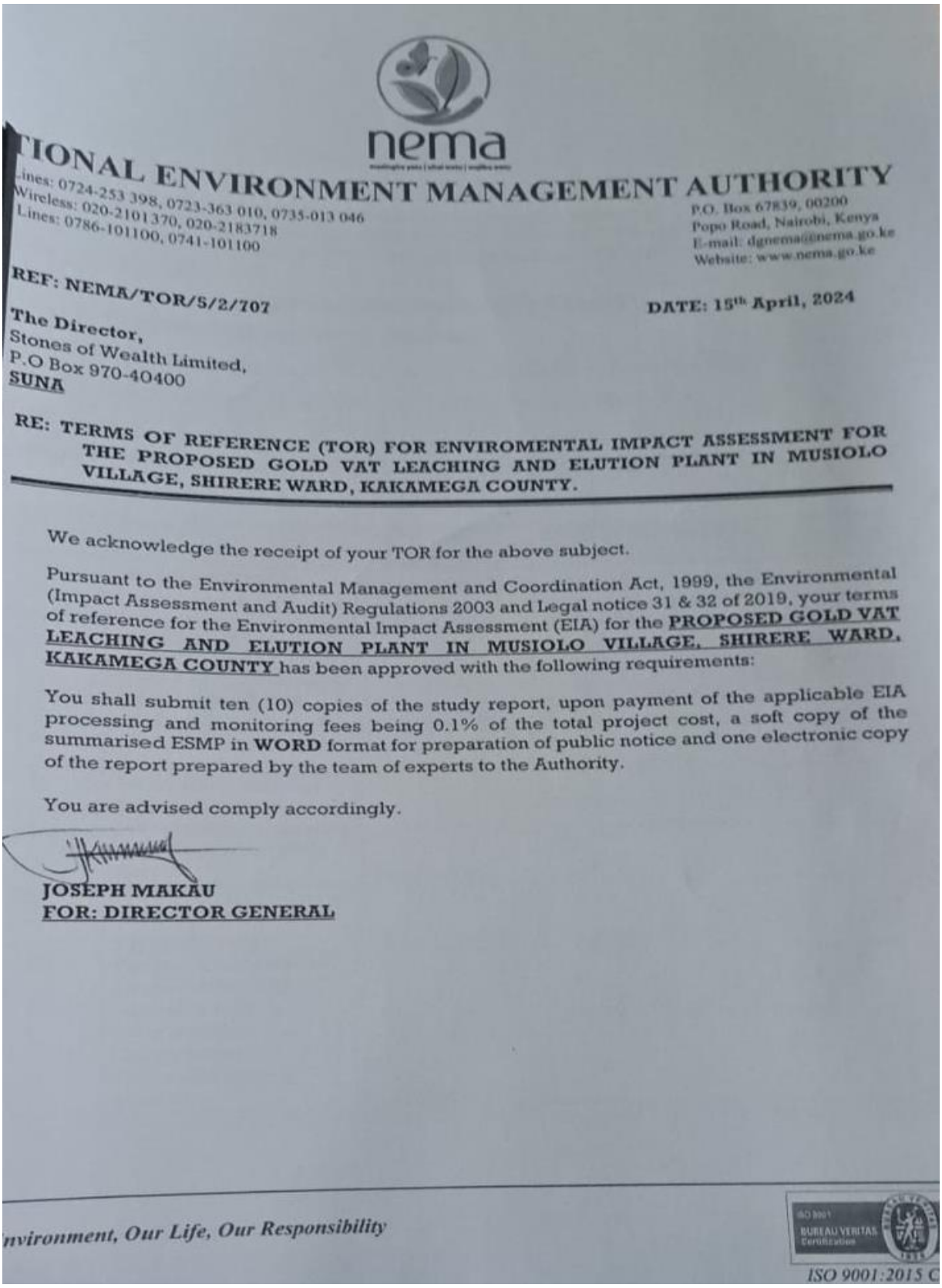
STONES OF WEALTH LIMITED

is on this date 16 Aug 2023 Incorporated under the Companies Act, 2015 and that the Company is a **PRIVATE LIMITED COMPANY.**

Registrar Of Companies

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

APPENDIX VII: APPROVED TERMS OF REFERENCE



nema

TIONAL ENVIRONMENT MANAGEMENT AUTHORITY

Lines: 0724-253 398, 0723-363 010, 0735-013 046
Wireless: 020-2101370, 020-2183718
Lines: 0786-101100, 0741-101100

P.O. Box 67839, 00200
Popo Road, Nairobi, Kenya
E-mail: dgnema@nema.go.ke
Website: www.nema.go.ke

REF: NEMA/TOR/5/2/707 **DATE: 15th April, 2024**

The Director,
Stones of Wealth Limited,
P.O Box 970-40400
SUNA

RE: TERMS OF REFERENCE (TOR) FOR ENVIROMENTAL IMPACT ASSESSMENT FOR THE PROPOSED GOLD VAT LEACHING AND ELUTION PLANT IN MUSIOLO VILLAGE, SHIRERE WARD, KAKAMEGA COUNTY.

We acknowledge the receipt of your TOR for the above subject.

Pursuant to the Environmental Management and Coordination Act, 1999, the Environmental (Impact Assessment and Audit) Regulations 2003 and Legal notice 31 & 32 of 2019, your terms of reference for the Environmental Impact Assessment (EIA) for the **PROPOSED GOLD VAT LEACHING AND ELUTION PLANT IN MUSIOLO VILLAGE, SHIRERE WARD, KAKAMEGA COUNTY** has been approved with the following requirements:

You shall submit ten (10) copies of the study report, upon payment of the applicable EIA processing and monitoring fees being 0.1% of the total project cost, a soft copy of the summarised ESMP in **WORD** format for preparation of public notice and one electronic copy of the report prepared by the team of experts to the Authority.

You are advised comply accordingly.

JOSEPH MAKAU
FOR: DIRECTOR GENERAL

nvironment, Our Life, Our Responsibility

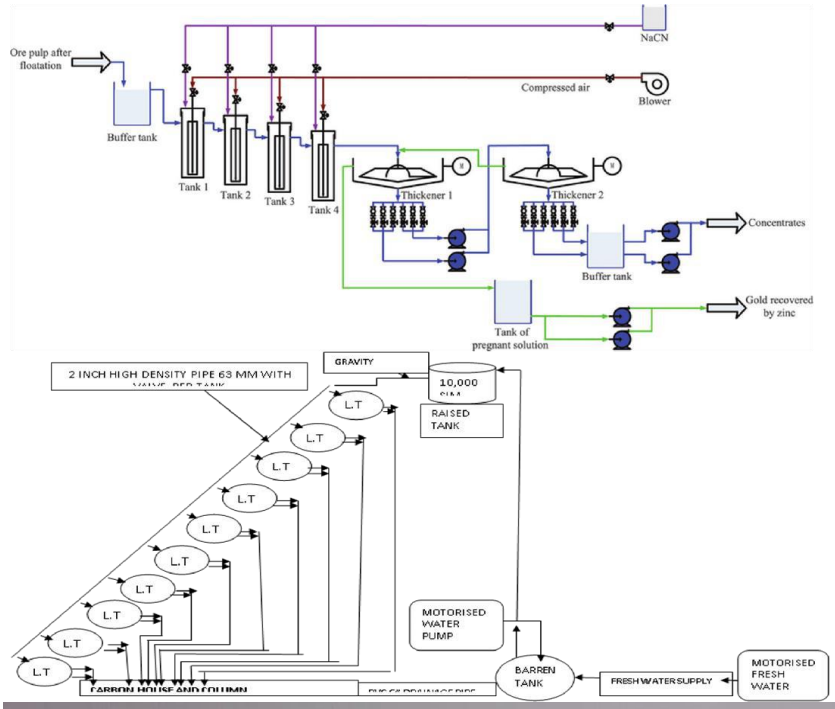
BUREAU VERITAS Certification

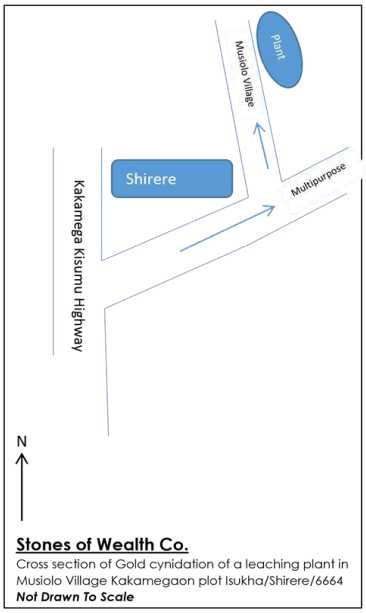
ISO 9001:2015 C

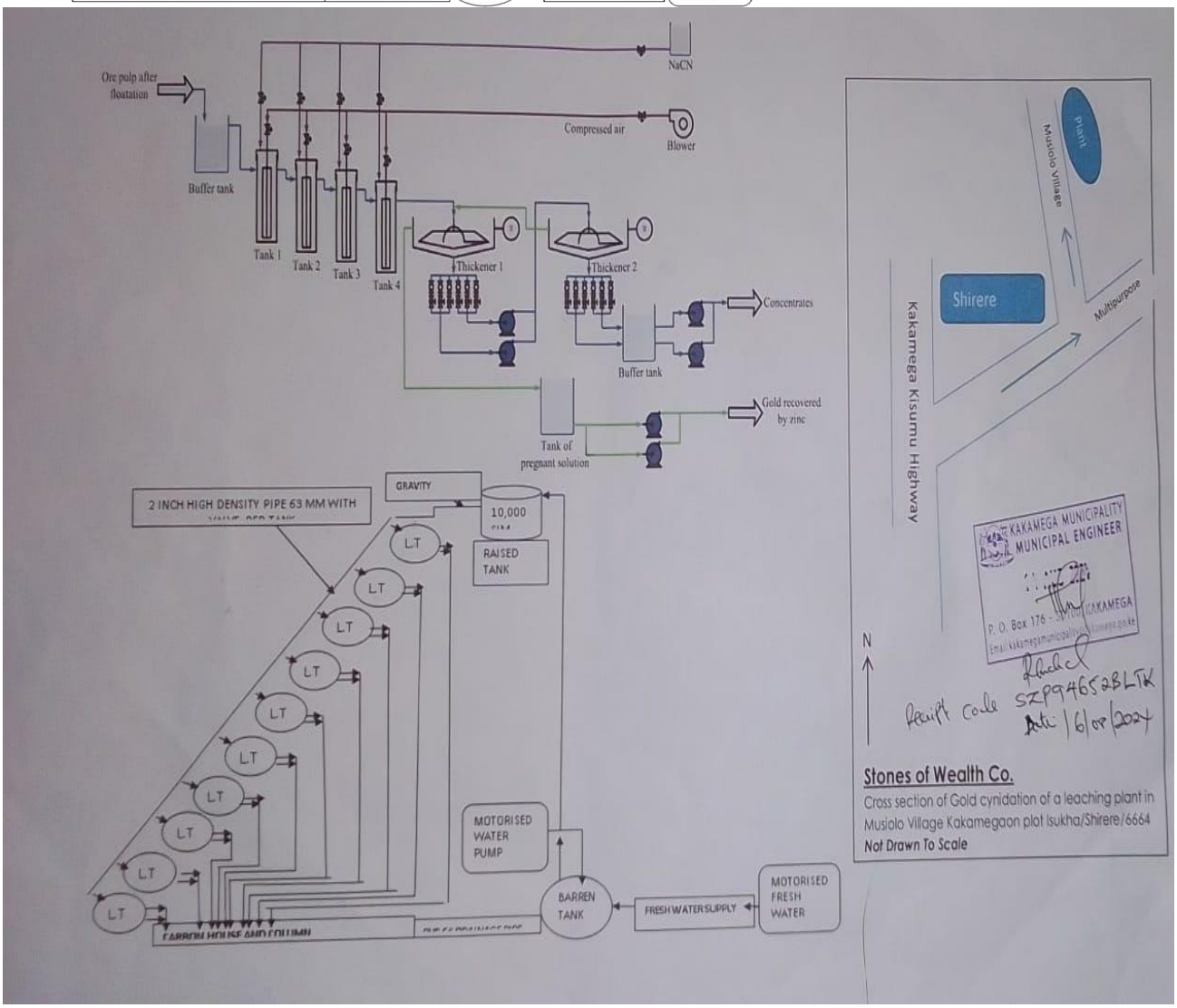
APPENDIX VIII: WATER QUALITY MANAGEMENT &CO-ORDINATION REGULATIONS 2006
STANDARDS FOR EFFLUENT DISCHARGE INTO PUBLIC SEWERS
(FIFTH SCHEDULE (r.13)

PARAMETER	**Maximum levels permissible**
Suspended solids (mg/L)	250
Total dissolved solids (mg/L)	2000
Temperature ^{0}C	20 - 35
Ph	6-9
Oil and Grease (mg/L) -where conventional treatment shall be used	10
Oil and Grease (mg/L)- where ponds is a final treatment method	5
Ammonia Nitrogen (mg/L)	20
Substances with an obnoxious smell	Shall not be discharged into the sewers
Biological Oxygen Demand BOD_5 days at 20 ^{o}C (mg/L)	500
Chemical Oxygen Demand COD (mg/L)	1000
Arsenic (mg/L)	0.02
Mercury (mg/L)	0.05
Lead (mg/L)	1.0
Cadmium (mg/L)	0.5
Chromium VI (mg/L)	0.05
Chromium (Total) (mg/L)	2.0
Copper (mg/L)	1.0
Zinc (mg/L)	5.0
Selenium (mg/L)	0.2
Nickel (mg/L)	3.0
Nitrates (mg/L)	20
Phosphates (mg/L)	30
Cyanide Total (mg/L)	2
Sulphide (mg/L)	2
Phenols (mg/L)	10
Detergents (mg/L)	15
Colour	Less than 40 Hazen units
Alkyl Mercury	Not Detectable (nd)
Free and saline Ammonia as N (mg/L)	4.0
Calcium Carbide	Nil
Chloroform	Nil
Inflammable solvents	Nil
Radioactive residues	Nil
Degreasing solvents of mono-di-trichloroethylene type	Nil

APPENDIX IX: APPROVED PROJECT DESIGN







APPENDIX X: RESULTS OF SOIL AND WATER ANALYSIS

APPENDIX X: PHARMACY AND POISON BOARD LICENCE

APPENDIX X: PUBLIC PARTICIPATION, LIST OF SOME OF THE PERSONS INTERVIEWED AND COMMENTS

REPUBLIC OF KENYA

COUNTY GOVERNMENT OF KAKAMEGA
MINISTRY OF PUBLIC SERVICE AND COUNTY ADMINISTRATION
LURAMBI SUB-COUNTY
SHIRERE WARD-SHIKOYE COMMUNITY AREA.

27TH SEPTEMBER 2023

MINUTES OF THE PUBLIC PARTICIPATION MEETING ON ENVIRONMENTAL ASSESSMENT IMPACT ON WEDNESDAY 27TH SEPTEMBER,2023 IN MUSIOLO VILLAGE AT MR.BARNABAS MAKOTSI'S HOME AT 11.00AM.

MEMBERS PRESENT

See the attached list.

AGENDA.

1. Preliminaries.
2. Environmental Assessment Impact
3. Sensitization of County Projects
4. A.O.B

MIN01/09/2023 :PRELIMINARIES.

The meeting was called to order the officer the Ministry of Environment and prayer was made by Bernadette Mmbwabi. Members were welcomed and introduction of stakeholders was done. Members sensitized through the activities of the day and urged to give out their views pertaining the project.

MIN02/09/2023: ENVIRONMENTAL ASSESSMENT IMPACT.

The environment officer Mr.Harry Mmbaya gave members of the public an opportunity to share their concerns. They were as follows:

1.Mr.Kizito Alusiola- Village Elder Musiolo village.

REPUBLIC OF KENYA

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MIN02/09/2023: ENVIRONMENTAL ASSESSMENT IMPACT.

The environment officer Mr.Harry Mmbaya gave members of the public an opportunity to share their concerns. They were as follows:

1.Mr.Kizito Alusiola- Village Elder Musiolo village.

He raised a concern of employment stating the residents to be given employment opportunity to establish their livelihoods. He emphasized on security reinforcement.

2.Jackline Khayati

Effects of chemicals used on residents and compensation to residents.

3.Catherine Muheyi and Ebby Anyonyi

Effects of noise pollution caused by the machines on school going children within the community.

4.Bernadette Mmbwabi.

She inquired about the formation and implementation of committee.

5.Rachel

She wanted to know on compensation of the land and rehabilitation of the roads. Pollution of the river by the chemicals used.

She urged the investor to ensure that plant is not operational on Sundays to enhance security in the area.

6.Barnas Makotsi

He insisted on the Rehabilitation of the road used.

7.Francis Otiende.

He urged the investor to deploy more security personnel.

8.Joram Mmbakaya.

Formation of Committee and change of user for the community land.

9.Likoko Fin

-He emphasized on protection of River Isiukhu and chemicals used.

-Feedback on Environmental Assessment Impact report and the legal processes.

RECOMMENDATIONS.

1.Mr. Patrick Ligami-Representative CECM Environment –County Government.

-He assured members of the public that no chemicals(mercury) will be used.

-Employment opportunities will be availed to residents.

-He assured members of the public that they shall ensure compliance of the regulations and recommendations from NEMA report.

MIN 03/09/2023.SENSITIZATION OF COUNTY PROJECTS AND INITIATIVES.

1.COMMUNITY AREA ADMINISTRATOR-SHIKOYE REMARKS.

-She emphasized on the implementation of the environmental report

-Child labour should not be practiced at the plant and emphasized on compliance of the stipulated revenue sources.

-Sensitized the public on county projects namely:shelter improvement ,one cow initiative beneficiaries and matsi khumukuru to access clean water by H.E Governor.

-Commissioning of the Shirere Slaughter House by H.E Governor FCPA Fernandez Barasa to enhance service delivery to mwananchi.

2. CHIEF SHIRERE LOCATION –REMARKS.

The Area Chief emphasized on the following:

-Details of all the employees to be availed to enhance security

-Professional expert and orientation of personnel to be involved in the shaft to avoid accidents.

-Child labour should not be involved to school going children.

3.MCA SHIRERE WARD REMARKS.

-The Area MCA emphasized on the implementation of Environmental Assessment report.

-He sensitized members of the public on County projects i.e Implementation of the Annual Development Plan and County Integrated Development Plan, Lighting along Shirere-Joy land road and opening of the roads within Shirere Ward.

4.HARRY MMBAYA- REPRESENTATIVE FROM NATIONAL ENVIRONMENTAL MANAGEMENT AUTHORITY.

He assured members of the public to that NEMA has a panel that will give out way forward on the environmental assessment report.

MIN04/09/2023. A.O.B

There being no any other business. The meeting ended with a word prayer from Ogutu Willis at 3.00pm.

CHAIR PERSON: HARRY MMBAYA *SIGN:* *DATE:* 28th/Sept/2023

SECRETARY: SARAH AMIMO ASHIKHOLWA SIGN: 25/9/23 DATE: 28/09/2023


COUNTY GOVERNMENT OF KAKAMEGA
SHIKOYE COMMUNITY
DATE: 28/9/23
COMMUNITY AREA ADMINISTRATOR

REPUBLIC OF KENYA

COUNTY GOVERNMENT OF KAKAMEGA

MINISTRY OF PUBLIC SERVICE AND COUNTY ADMINISTRATON

LURAMBI SUB-COUNTY

SHIRERE WARD – SHIKOYE COMMUNITY AREA

COUNTY GOVERNMENT OF KAKAMEGA SHIKOYE COMMUNITY DATE 28/9/23 COMMUNITY AREA ADMINISTRATOR

ATTENDANCE LIST

VENUE AT MR ~~LABAN~~ BARNABAS MAKOTSI HOME (MUSIOLO)

PURPOSE PUBLIC PARTICIPATION ON ENVIRONMENTAL ASSESSMENT.

DATE 27/09/2023

S/N	NAME	I.D	CONTACT	DESIGNATION	SIGN
1	DAVID IKUNZA	6660536	0712102199	MCA	[signature]
2	SARAH ASHIKHOLWA	22700507	0723441882	CAA-SHIKOYE	[signature]
3	PHANICE ACHIEMBA	14678515	0712506259	CHIEF	[signature]
4	Harry Mmbaya	20981827	0720468952	AYES Consultant	[signature]
5	TIMOTHY KEYA	0998173	0794066716	MUSIOLO	[signature]
6	ASUMTHA MUKHOVI	40052638	0759217925	[illegible]	[signature]
7	Emmah Atamba	[illegible]	[illegible]	[illegible]	[illegible]
8	Mildred Mbuhila	[illegible]	[illegible]	Lutonyi	[illegible]
9	[illegible]	41798398	0750220109	Lutonyi	[illegible]
10	RICHO LUBEMBE	23139742	0711183054	LUTONYI	R.L
11	KLECTINE VIENDA	26947930	0714852973	Lutonyi	K.V
12	JUDITH INGANJI	22149810	0712263383	Lutonyi	J.I
13	PAMELAH AFANDI	12548318	726539823	MUSIOLO	P.A
14	TJERIDAH ATUMA	4150558	-	Lutonyi	J.A
15	MORINE ATEYA	33811598	0790471132	MUSIOLO	[signature]
16	FATUMA OWICH	8009359	0721600753	MUSIOLO	F
17	EUNICE MAKUNYENI	26122813	0724867914	MUSIOLO	[signature]
18	CRISTINE NALIAKA	31272391	0792210205	MUSIOLO	[signature]
19	COLETAH ASHIZA			MUSIOLO	C.A
20	MIRIAM GAKURU	22540208	0721626968	Joyland	[signature]

21	VELLY EGUCHI	22960471	0706350599	Joyland	V.E
22	KEVIN LUKORDI	35244212	0768818854	MUSIOLO	
23	FRANKLINE AMALA	23298351	0792033008	MUSIOLO	F
24	~~ROSA~~ ~~BERTHA~~ MUNGISI ~~ATIENA~~			MUSIOLO	
25	CATHERINE MUTIOBO	13051275	0713263321	MUSIOLO	CM
26	ROSA MUNGISI	-	-	-	
27	CAROLINE ATIENO	22943216	0714572432	MUSIOLO	CA.
28	SHARON LUHULI	36460156	0713450132	"	
29	SHARON NAMBAKA	29802792	0799915481	"	
30	WALENCE MINAYA	41263817	0741600270	"	
32	MARY KEFA	5635712	0745650488	"	MK.
33	Patience MOKOKHO	37425325	0795425149	"	
34	MERVIN SHITOHWA	32284232	0769511025	SHIKOYE	
35	JACKLINE SHIRUNDO	37845079	756622031	SHIKOYE	
36	MIRRIAM NAKHANYO	31491259	0790542632	SHIKOYE	
37	CYSTINE KAYESI			MUSIOLO	
38	ANTONINA MARIA	1000511	0758357805	LUTONYI	
39	TIFINAH KHAYATI			MUSIOLO	
40	EUNSEZIA ATHIZA	16080954	0700004919	MUSIOLO	
41	ELIZABETH MUSAMBAI			SHIKOYE	
42	AGNES STIMA			MUSIOLO	
43	SARAH IMINI	0960598	0715107016	MUSIOLO	
44	ROSSY SHIRIWA			LUTONYI	
45	FLORENCE MUKOTO	31787336	0745683721	MUSIOLO	FLO.
46	JUDITH SHIHAFU ~~SHAHALI~~	26886903	0715069462	MUKAMGO	
47	FELISTA MUSANGA	5628433	0701219061	ROSTAMAM ~~ROSA~~	
48	GLADIES KHASIALA	26536650	0790490934	MUKAMGO	FM

	JOAN JIENDE	0566389	0759575169	MUSIOLO	[illegible]
9	FLORENCE KAVERE			MUSIOLO	F.K
50	BETRONILAH INGANO	13188020	0721877683	MUSIOLO	P. [illegible]
51	JOICE MUMBOHE			MUSIOLO	J.
52	MAXINE INDAKALI			LUTONYI	M
53	ANGELAH KHASOHA		0716356931	ROSTMAN	AM
54	FELICE MATILAH	28239401	0726699323	MUKANGO	[illegible]
55	CLAUDIA SHIVOKO	23965807	0758629319	MUKANGO	
56	FLORAH MUCHERE	6615610	0725704061	MUKANGO	
57	ROSSY LUGIEKA	6670878	0727115829	Rostman	RA
58	BENISSY ATSHIVAMBO	21505591	0769699418	Rostman	[illegible]
60	SELESTINE MAINA	22194259	0717050229	Rostman	[illegible]
62	MENESAH AKINYI	27685575	0700909463	Rostman	[illegible]
63	REBECCA NGASI	28299328	722742801	Rostman	[illegible]
64	SIKUMENA KHAVEZIA	35517516	0706471032	Rostman	SK
65	JOAN ISIBI	27687784	0711559249	MUSIOLO	[illegible]
66	JUDITH MULUKA	33101972	0700179709	MUSIOLO	[illegible]
	ROSA AMUKAVU	22559962	0719729181	MUSIOLO	R.
68	BEATRICE LITTON	13304924	0790681720	MUSIOLO	[illegible]
69	TIFIMAH KADEKE	4185614	0713703432	MUSIOLO	[illegible]
70	MARIA MUKANGAI			MUSIOLO	[illegible]
71	PETRONILLAH MASINZA	30713426	0714289320	Musiolo	[illegible]
72	DORCAS YEKO	33625477	0741198520	SHIKOTE	[illegible]
73	JOAN ATESA	34931126	0745748254	MUSIOLO	JA

74	ESTER NYAHERA	37176698	758307517	SHIKOYE	[signature]
75	IRINE MUTEMBEI	26127467	790435632	MUSIOLO	IM
76	SARAH ANYONA	33084929	0758017672	MUSIOLO	S.A
77	CELINE MUKOYA	40181267	0745018310	MUSIOLO	[signature]
78	Elizabeth Shitote	36907598	0740087519	Musiolo	[signature]
79	TABITHAH MUSINA	16394498		MUSIOLO	[signature]
80	EILADIES AWIRE	26207308	0725488938	MUSIOLO	[signature]
81	FELISTAS MAKANANIKE	25992679	0714413427	MUSIOLO	[signature]
82	FLORENCE MUNUKA	10414058	0795988893	MUSIOLO	[signature]
83	ALEXANDER SHIHANZI	2255989	0798869619	SHICHINJI	[signature]
84	PATRIC SHIMONTO	20820826	0727945098	MUSIOLO	[signature]
85	SILAS ATODI	11832949	0724065886	MUSIOLO	[signature]
86	IAN KAVAKA	41036883	0798465199	MUSIOLO	[signature]
87	Rodgers Ichuji	32780640	0746756554	Musiolo	[signature]
88	JORA HUNA	5632199	0768962083	MUSIOLO	JH
89	Ayomi Stephen	13578892	0716737608	Rossgrove	[signature]
90	SHARON WESA	33258644	0794260718	MUSIOLO	[signature]
91	GEORGINAH INDOKO	35031570	0741556780	MUSIOLO	[signature]
92	BARNABAS MAKHOTSI	7936580	2408521	MUSIOLO	[signature]
93	DISMAS ISABWA	34924653	0719877957	MUSIOLO	[signature]
94	Patrick SHAMALA	6281475	0723007626	Musiolo	[signature]
95	Levi Mabia	35026872	0759710965	Musiolo	[signature]
96	FESTO LUHAKO	38854416	0743417441	MUSIOLO	[signature]
97	CHRIS ALUBISIA	20180312	0724698668	RIVER VIEW	[signature]

98	VINCENT JAMUHURI	10320088	07—	SHIKOYE	
99	GODFREY INDNO	1032086		MUSIOLO	
100	LINUS IMIANE	1876591	0721763837	MUSIOLO	
101	NIXON IFEDHA	13301451	0723573434	MUSIOLO	
102	[illegible] WIKHOLO	20487802	0729356882	MUSIOLO	
103	RACHEAL WASWA	8076542	0722508245	MUSIOLO	
104	PIUS ANGORIO	1044309	0723402414	LUTONYI	
105	JUNAS MUTSOTSO	10561508	0727455414	LUTONYI	
106	KANIRA D.H IMBALI	6982060	0718995386	ROSTERMAN	
107	Patrick Lugami	052442	0722213114	SHINYALU	
108	PAUL VICTOR MULOGA	29174793	0795985933	Rosterman	
109	Sussy mugasi	05656963	0710194333	Rosterman	
110	Esther Lubuyi	31714447	0775149010	Rosterman	
111	ESTER Madogo	20299843	0710622134	[illegible]	
112	JENIRIX MADEDE	30224103	0700491498	Rosterman	
113	Wills Olkata	1320701	0726366010	Rosterman	
114	ALEX IVAYO	12568097	0115886243	ROSTERMAN	
115	WYCLIFFE AYOYI	0277185	0725801669	Rosterman	
116	HENRY SHIKANGA	1958117	0115482110	Lutonyi	
117	GEORGE MBWABI	21312565	0729378750	ROSTERMAN	
118	GERALD SHIMOLI A	4274092	0720526869	MUSIOLO	
119	PATRICK IMONJE	22786529	0706060255	MUSIOLO	
120	FINNY LIKOVO	8636271	0748615914	Rosterman	

PUBLIC PARTICIPATION LIST OF PARTICIPANTS MUSIOLO

	NAME	ID.NO.	ORGANIZATION	RESIDENCE	PHONE NO.	SIGNATURE
31	TIMOTHY KEYA	0998173	Musiolo	Musiolo	0794066716	
32	ASUMPTHA MUKHOVI	A0082638	musiolo	Musiolo	0759217925	
33	FLORENCE MUKOTO	31763367	Musiolo	Musiolo	0745683728	
34	ROSE SHILIEBO		Musiolo	MUKANGO		
35	SARAH IMILI	0960598	Musiolo	Musiolo	0715107016	
36	JUDITH SHIHAFO	20866900 0715069462	Musiolo	MUKANGO	0715069462	
37	ELIZABETH MUSAMBAI		musiolo	Shikoye		
38	DIFINA KHAYATI		musiolo	Musiolo		
39	CAROLINE ATIENO	22943216	MUSIOLO	MUSIOLO	0714572432	
40	EDITH KHATENJE	26505021	MUSIOLO	MUSIOLO	0714843280	
41	SELINA MINYOSO	21589936	MUSIOLO	MUSIOLO	0724346433	
42	FRANCIS CHETI	6282040	MUSIOLO	MUSIOLO	0714636380	
43	ORIDA MUSAMI	4879803	MUSIOLO	MUSIOLO	0724096559	
44	FINNY LIKOKO	8636871	ROSTERMAN GOLD MINING	Rostermom	0743615914	
45	Emmah Atamba	19827000	Musiolo	Musiolo	0729099478	

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	NAME	ID.NO.	ORGANIZATION	RESIDENCE	PHONE NO.	SIGNATURE
16	BEWICE ADHIAMBO	21505591	MUSIOLO	ROSTERMAN	0769699418	
17	ROSE BUSIEKA	6670878	MUSIOLO	ROSTERMAN	0727115529	
18	CHAUDA SHIYOKO	23965507	musiolo	mukango	0758629319	
19	FULORA MUJERE	6615610	Musiolo	MUKONGO	0725704061	
20	PHYLICE MATILANE	28239401	musiolo	mukango	0226699323	
21	ANJILLA KHASOA	5628260	musiolo	ROSTERMAN	0716356731	
22	TITUS MASHETI		musiolo	MUKANGO	0725704061	
23	MAXLL INDAKHALI		MUSIOLO	MUKANGO		
24	GLADIS NAWIRE	26207305	MUSIOLO	MUSIOLO	0725488935	
25	JOICE MBONE		MUSIOLO	MUSIOLO		
26	Rebbekila Ingede	13188920	Musiolo	Musiolo	0721877653	
27	FLORENCE MUYUKA	10A14088	Musiolo	Musiolo	0795988883	
28	FILISTA MUSANGA	5628433	Musiolo	Musiolo	0701219061	
29	FLORENCE KHABELE		Musiolo	Musiolo		
30	JOAN OTIENDE	0566389	Musiolo	Musiolo	0759575169	

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	NAME	ID.NO.	ORGANIZATION	RESIDENCE	PHONE NUMBER	SIGNATURE
1.	MARY MUKANGAI		MUSIOLO	MUSIOLO		MM
2.	DIPHINA KADEGE	4185614	MUSIOLO	MUSIOLO	0713703432	DM
3.	PETRONILLAH MASINZA	30713426	MUSIOLO	MUSIOLO	0714289320	PM
4.	ESTHER NYAKRA	37176698	SHIKOYE	SHIKOYE	0758307617	Esther
5.	JOAN ATEGA	34931126	SHIKOYE	SHIKOYE	0745758354	JA
6.	DORCAS TEKO	33525477	SHIKOYE	SHIKOYE	0741978320	
7.	Elizabeth shitole	30975 98	Musiolo	Musiolo	0700375919	
8.	BETRIS LANYULO	13304924	MUSIOLO	MUSIOLO	0790681720	BL
9.	Rose AMULABU	22559962	MUSIOLO	MUSIOLO	0718729181	RA
10.	JUDITHA MUSINA	10842946	MUSIOLO	MUSIOLO	07	JM
11.	JOAN ISIFI	27681847	SHIKOYE	SHIKOYE	0711559249	
12.	SULUMENA KHANETSA	35517518	MUSIOLO	ROSTERMAN	0706471032	SK
13.	REBECCA NGASI	28299328	MUSIOLO	ROSTERMAN	0722744201	Reb.
14.	NERESA AKINYI	27685575	MUSIOLO	ROSTERMAN	0700019463	NA
15.	CELESTINE NAMWA	22194259	MUSIOLO	ROSTERMAN	0717050229	CN

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	NAME	ID.NO.	ORGANIZATION	RESIDENCE	PHONE NO.	SIGNATURE
107	VINCENT JAMUHURI	16320088	musiolo	shikoye	0 —	
108	ESTHER ALUKHABA	-	musiolo	musiolo	-	
109	AGGRI INGOSI	31311549	musiolo	Musiolo	0706941272	
110	LEVI MABIA	33026872	musiolo	Musiolo	0759710945	
111	JOHN SAHERA	24276891	musiolo	musiolo	0729778575	
112	CONSCANT LUBEMBE		Musiolo	Musiolo		
113	GODFREY ILOLO	10326436	musiolo	musiolo		
114	LINUS INYANJE	18765911	musiolo	Musiolo	0721763687	
115	Julius Muisotso	10561508	musiolo	LUTONYI	0727455413	
116	GEOFREY AMUKUYI	22469552	musiolo	LUTONYI	0710140150	
117	PIUS ANGOLIO	10443099	Musiolo	MUKANGO	0723202414	
118	KANIRA D.H /MBALA	6982060	MUSIOLO	MUKANGO	0718995386	
119	BERNADETTE MMBWANI	0702224	Musiolo		0723827896	
120	EBBIE KEGODE	8706925	EDUCATION	RIVERSIDE MUSOSO	0721510616	
121	Rachael Washa.	8076542	EDUCATION	MUSIOLO	0722508245	

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	NAME	ID.NO.	ORGANIZATION	RESIDENCE	PHONE NO.	SIGNATURE
92	PATRICK SHIMONYO	20820826		musiolo	0727745095	
93	JORAM MBAKAYA	5632199	Musiolo	Musiolo	0768962083	
94	AUGUSTINE HEKA	3785733	[illegible]	MUSIOLO	0710323582	
95	Rodgers Ichuj:	32780640	Musiolo	Musiolo	0746756554	
96	Ian Kavala	14036883	Musiolo	Musiolo	0798465199	
97	Cedric Mmasi	A0831802	Musiolo	Musiolo	0757470010	
98	SILAS Ayoki	11882149	MUSIOLO	"	0724065[illegible]	
99	SHARON WEKA	33254844	Musiolo	MUSIOLO	0794260718	
100	GEORGINAH INDOKO	38231572	Musiolo	MUSIOLO	0741556780	
101	GENECENRIA ACHITSA	16080954	Musiolo	MUSIOLO	0700904919	
102	ELVIS MASHETI	31035[illegible]1	Musiolo	musiolo	0795532384	
103	KRIZIO MUSIOLA	9448945	Musiolo	Musiolo	0726233115	
104	DISMAS ISABWA	34924053	musiolo	Musiolo	0714877857	
105	PATRICK SHAMALA	6781475	Musiolo	Musiolo	0723887624	
106	FESTO LUNALO	38854416	musiolo	Musiolo	0743417441	

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	NAME	ID.NO.	ORGANIZATION	RESIDENCE	PHONE NO.	SIGNATURE
61	ROSE MWINGIZI		MUSIOLO	MUSIOLO		
62	JACKLINE KHAYATI	22953593	MUSIOLO		0702401054	
63						
64	LINOSI NYACHIA	18765 91	MUSIOLO		0721763837	
65	Norine Ateya	33 8115 198	MUSIOLO		0790477132	
66	JERIDA AYUMA	41505558	MUSIOLO	LUSONYI	0719587204	
67	ROSELYNE MUDOME	26119725	MUSIOLO	MUSIOLO	0742538155	
68	MIRON MUDOME	13301451	MUSIOLO		0723573432	
69	COLINS AMWOKA	33539921	MUSIOLO		0726209075	
70	ELECTINE VIMENDA	26947920		Luloni	0711852973	
71	Kevin Bakuti	25623221	MUSIOLO	Luloni	0763818854	
72	Betrice Ayuma	23298851	MUSOSO		0728697118	
73	RECHD LUBEMBE				07111839	
74	CHRISTINA KHAESI		MusioLo	Musiol		
75	CHRISPINUS ALUBUIA	20180712	MUSIOLO	BEVERVIEW	0724698668	
76	ROSELING MUSESHI	9379359	Musiolo	Musiolo	0707359622	

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	NAME	ID.NO.	ORGANIZATION	RESIDENCE	PHONE NO.	SIGNATURE
77	CHOLETA ACHISA		Musiolo	Musiolo		
78	DAISY KALAMI		Musiolo		0704409038 074090	
79	Berly Busolo		musiolo		0714343821	BB
80	Ayomi Stephen	13058492	Rosterman	Rosterman	0716737608	
81	FRANKLIN AMANA	23280351	Musiolo	Musiolo	0792033008	
82	FRANCIS OTIENDE	0259192	Musiolo	Musiolo	0726610278	
83	MIRIAM GAKURU	22540208	Rosterman	Joyland	0721626968	
84	VELLY EGUCHI	22960471	Rosterman	Joyland	0706358599	
85	Patience Makokha	37425325	Musiolo	shikoye	0795425149	
86	JOYCE RACHEL LUBENDBE	23139742	Lutonyi	Lutonyi	0711183054	
87	ATNUS MMASI		Musiolo	Musiolo	0	
88	IRENE MUTEMBEI	26127467	Musiolo	Mussido	0794135623	
89	CELINE MUKOYA	40181267	Musiolo	Musijo	0745018364	
90	FELISTUS MADILANI	25992671	Musiolo	Musiolo	0714413427	
91	CHRISTINE NALIAKA	31272391	SHIKOYE	SHIKOYE	0792210205	

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	NAME	ID.NO.	ORGANIZATION	RESIDENCE	PHONE NO.	SIGNATURE
46	FAIUMA OWICH	8009359	MUSIOLO	MUSIOLO	0721600753	FW
47	EUNICE MAKUNGU	26122813	MUSIOLO	MUSIOLO	0724867914	Cer
48	CAROLINE BUSAKA	2932 5455	MUSIOLO	MUSIOLO	0705626086	CB
49	JUNET MAKHATSA	20204669	MUSIOLO	MUSIOLO	0724738503	JM
50	MERCY MWIKALI	30121704	MUSIOLO	MUSIOLO	0748406430	M.I
51	REACHEL AUMA	26649313	MUSIOLO	MUSIOLO	0758253011	R.A
52	VAMARY CHUMBA	33353074	MUSIOLO	MUSIOLO	711300587	
53	JUDITH MUNYUKA	33109972	MUSIOLO	MUSIOLO	700179709	
54	SARAH INYOMO	33084929	MUSIOLO	MUSIOLO	0758017672	
55	FESTAS LUNALO	38854416	MUSIOLO	MUSIOLO	743417441	
56	BRAYAN MASETI	36407596	MUSIOLO	MUSIOLO	755999312	
57	AGNES STIMA	- - -	MUSIOLO	MUSIOLO	0705541212	
58	MILDRET IMBILA	22079242	MUSIOLO	MUSIOLO	0712860083	
59	VALANTIN ATOLWA	41798398		LUTONYI	0750220109	
60	PAMELA AFANDI	11848319	MUSIOLO	MUSIOLO	726839823	

AYES Consults LTD.

SPECIALIZATION: General Environmental Consultancy in Medium & High Risk Projects, Property Management Experts. Utalii House Nairobi EMISSIOMA HOUSE 1ST FLOOR CANON AWORI STREET KAKAMEGA.
Email:ayesconsultsltd@yahoo.com PO BOX 79999-00200 Nairobi, 1498-50100 Kakamega.

Dear participant,

STONES OF WEALTH LTD has contracted Ayes Consults LTD ***(environmental experts)*** to carry out an Environmental Impact Assessment for the **Gold VAT Leaching** plant in Musiolo village Shirere ward in Kakamega County.

You are therefore, kindly, invited to participate in a research study being conducted by **Ayes *Consults (Environmental Experts)***. The purpose of the research is to ensure safe sustainable environmental Management for the proposed project. National Environmental Management Authority (NEMA) works in consultation with the stakeholders to make informed decision in either approving or recommending remedial measures in assessment of the said project. Community consultation and participation ensures that communities and stakeholders are part and parcel of the developments and in so doing assures the sustainable use of resources. It has also demonstrated successfully that projects that go through this process acquires high level of acceptance and accrue benefits to a wider section of the society.

Your participation is completely voluntary. You are encouraged to give your views to enable proper decisions as pertaining its operations. Your responses may be included in the EIA report, which will be made public and some may directly be forwarded to the Proponent to make proper decisions before its commencement.

If you agree to participate, please complete the questionnaire below.

Interviewee's bio data

Name...RACHEAL.....WASWA.....**ID NO**....8.0.7.6.542.....

Phone No.....0.7.2.2.5.0.8.2.4.5.....

Occupation.....TEACHER.....

Village/Estate/.....Musiolo.....**Ward**.....SHIRERE.....

County.....KAKAMEGA.....**Residence**.....MUSIOLO.....

Are you aware of the proposed project (***please tick***) YES [ ] NO [✓]

How will the project activities affect you? Please explain

AYES Consults LTD.

Socially The activities of this project will interfere with our peace. This is since it has alot of noise. The school children are likely to drop off to go looking for casual jobs

Economically The economically it May to some extend but weighing the demerits. They out number the benefits.

Culturally/spiritually Break ups in Marriages are at risk likely to happen. The citizens may deviate from their spiritual norms. Just wondering if they will not be operating on sunday or not

Do you think there will be any wastes/pollution generated during this project and how do you propose such to be handled.

Alot of chemical emissions will be there posing a healthy hazard to our health lives. Violence, thuggery & hooliganism will be on the high level

Do you anticipate any other negative environmental, social or cultural impacts of the proposed project? If yes, kindly list them and suggest mitigation measures for each *(ask for a separate answer sheet)*

The Minings will bring shake ups to the neighbourhood & the houses.

Water system & rivers will be contaminated.

Any other general Comments(s) *ask for extra sheet.*

The project picked off in a hasty way. There was no consultation first.

If you have any questions about this project, feel free to contact Ayes Consults LTD on *0720468952* or email us at ***ayesconsultsltd@yahoo.com***. We thank you for your assistance in this important endeavor.

Interviewee's Signature [signature]

Certified by [signature]

AYES Consults LTD.

SPECIALIZATION: General Environmental Consultancy in Medium & High Risk Projects. Property Management Experts. Utalii House Nairobi.EMISSIOMA HOUSE 1ST FLOOR CANON AWORI STREET KAKAMEGA.
Email:ayesconsultsltd@yahoo.com. PO BOX 79999-00200 Nairobi, 1498-50100 Kakamega.

Dear participant,

STONES OF WEALTH LTD has contracted Ayes Consults LTD ***(environmental experts)*** to carry out Environmental and Social Impact Assessment study for the proposed VAT Leaching and Elution plant u in Musiolo village in Shirere ward in Kakamega County.

You are therefore, kindly, invited to participate in a research study being conducted by **Ayes *Consults (Environmental Experts)***. The purpose of the research is to ensure safe sustainable environmental Management for the proposed project. National Environmental Management Authority (NEMA) works in consultation with the stakeholders to make informed decision in either approving or recommending remedial measures in assessment of the said project. Community consultation and participation ensures that communities and stakeholders are part and parcel of the developments and in so doing assures the sustainable use of resources. It has also demonstrated successfully that projects that go through this process acquires high level of acceptance and accrue benefits to a wider section of the society.

Your participation is completely voluntary. You are encouraged to give your views to enable proper decisions as pertaining its operations. Your responses may be included in the EIA report, which will be made public and some may directly be forwarded to the Proponent to make proper decisions before its commencement.

If you agree to participate, please complete the questionnaire below.

Interviewee's bio data

Name..KAVEDZA FELIXON.....**ID NO**..33256.....

Phone No.....0713834299.....

Occupation..H/W.....

Village/Estate/...SHIRERE.....**Ward**...SHIRERE.....

County..KAKAMEGA.....**Residence**...SHIRERE.....

1. a) What is your opinion regarding the proposed project.
   ..It's good.....
   .....
   .....
   a. In your opinion, are there some negative effects on public (sociological/ecological effects of the project brought about by this development. noise pollution and generation of dust.

YES ✓ NO

Briefly give an account of such effects

i. School drop out

ii. Domestic violence

iii. Pollution

iv. Religious deviation

v. Favouritism

c. What do you think should be done to combat the negative effects of this project?

The management of the project should have a well planned project, skilled and understanding team

2. a) What are most likely effects of the proposed project on the immediate neighbors

i. Effects on water resources?

The emission of chemical into water resources may results into disease to the people in the community after using i

ii. Effects on traffic?

Heavy loaded trucks may cause the road to break and have more pot hole and also cause traffic Congestion

iii. Effects on recreational sites?

Reduce the population of people in the sites due to loud noise, and congestion and poor roads

iv. Effects on animals, birds, mammals and reptiles?

3. a) Effects on soil

The soil loose it fertility due to immuion of more chemicals on the land hence low productivity

b) Effects on: -

a) Agricultural

Pot holes left on the ground causes the land to crack, soil ecosion take place that affect farmers not able to good any crops

b) Housing
The chemical produced by the minerals can cause the roof of the house to break hence lead to leakage

c) Infrastructure
More work is done but low or total failure to maintain the infrastructures caused the user

d) Security
When the products are more, the people may develop greedy happits which may lead them to steal murder to kill and get more money.

e) Aviation

f) Vegetation

C) What should the proponent do to minimize the said effects on the land?
Be able to use the waste products to generate other materials from them ~~them~~

4. What should the relevant government authorities do to alleviate adverse effects on the locality pertaining this project?
Have enough capital and tight security to secure the life of people in the area

5. Are there any sites of significance such as Shrines, places of worship ceremonial sites which will be affected by the proposed project?

YES ✓	NO

If yes give an account of such sites
Churches, People may not be able to attend the services instead the will deviate to seek for job opportunities or the land be grabbed

What should the proponent do to protect the sites?
Relocate the churches, and on the day of worship they should not work

6. Which social amenities e.g. school sites, health services, recreational, gave recent area & community development sites are likely to be affected?
   a. School sites
   b. Recreational sites
   c. Gave re cent
   d.

   How will each be affected?
   a. Schools sites children from the school may drop out to seek for job opportunities
   b. Recreational sites low income generation due to poor roads and congestion