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APPENDIX No 3

ENVIRONMENTAL MANAGEMENT PLAN

3.1 INTRODUCTION

The mining operations herein applied for will adhere to the requirements of the mines and minerals act No. 7 of 2008, the mines and m1nerals (environmental) regulations of 1997 and other relevant legislation as follows:

- Air Pollution Control (licensing and emission standards). Regulations of 1996 which provide for ZEMA to regulate emissions to the environment.
- Water Pollution Control (effluent and waste water) – These regulations (Statutory Instrument No. 72 of 1993) provide for the ZEMA to regulate the treatment and discharge of sewerage and other effluents into the natural aquatic environment.
- Waste Management (licensing of waste transporters and waste disposal sites); these regulations (Statutory Instrument No. 71 of 1993) provide for the ZEMA to regulate waste disposal.
- The Hazardous Waste Management Regulations (Statutory Instrument No125 of 2001) - these regulations provide for the ZEMA to control and monitor the generation, collection, storage, transportation, treatment and disposal of hazardous waste.
- Pesticides and Toxic Substances. Regulations of 1994 that provide for ZEMA to regulate the use and importation of pesticides and chemicals into the country.
- Noise.
- Natural Resources Management.

The relevant Acts and Legislation will include:

- Environmental Management Act No. 2011
- Town and Country Planning Act, Chapter 283
- Local Government Act
- Land Conversions of Titles Act
- Water Act, CAP 198
- The Land Act of 1995 and Land Acquisition Act of 1995

- Public Health Act
- National heritage and conservation commission Act
- Investment Act
- The Petroleum Act
- Forests Act, 1999

Mining activities will as much as practically possible is environmental friendly, and with strict monitoring measures. The project will also put in place measures to mitigate on any possible negative impact of the mining activities on the environment.

However, negligible social-economic and environmental negative impact is expected in the targeted area.

During the period, mining operations will be labour intensive with minimal mechanization, and therefore negligible impacts on the environment.

3.2 Brief Description of Area

The project area is mainly characterised hilly terrain with isolated plains between hills covered by stretches of woodlands, with some isolated grasslands

A few isolated open cultivated areas are used for substance farming mainly maize. There is almost no grazing of domestic animals within the project area.

No existing of large fauna is evident in the area. However, a few varieties of small mammals, birds, insects and reptiles exist in the area with habitation mainly provided by scattered vegetation, grasslands, anthills, sub-surface and rock outcrops.

The area of interest falls within forest area is purely of rural setup and thinly populated with scattered human settlements and activities. A few social-economic activities are available in the area for the local population. Mostly, the local community is involved in substance farming mainly maize. Since the area falls within gazetted forest area, farming activities are mainly carried out by members of the local community from Kafue town.

3.3 EXPECTED SOCIAL-ECONOMIC AND ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

Positive impacts

Socio-Economic Impacts

- Creation of employment to the local people. The proponent initially planned to create about 20 and 30 both direct/indirect jobs for various categories.

- Indirect opportunities for employment will be stimulated in the other sectors related to mining, such as manufacturers of local raw materials like blocks and provision of sand. Provision of equipment like picks axes and shovels during preparation stage.

- Local related financial and other service sector benefits will include bank guarantees, Insurance cover, pension funds such as NAPSA, workers compensation, council rates and levy, VAT on sale of finished product. PAYE (mining workers and other workers).

- Employing local people may result into transfer of skill and will build the additional local capacity.

- Accrued Community Benefits. The proponent is attaching great importance to social and economic empowerment of the local community. By undertaking the proposed project, there will be community benefits that will benefit from economic activity.

- Enhanced of land use of the area. Currently the land covered by outcrops of Granite ore is considered barren and neither Agriculture nor other activities are carried out on the land. The proposed project will be one of the alternative land uses for the area. After closure of the project, it is anticipated that the land use of

the area will be enhanced and such activities as agriculture could be implemented on the same land.

- Improved road infrastructure. The proposed project will bring about improved accessibility of the area through well maintained road network to be taken by the proponent. Arab Contractors has plans to be undertaken routine maintenance of the road infrastructure leading the proposed project site.

Significance of Impacts: Very High Positive

Physical Environmental Impacts On Land

- The development will result in removal of mineral waste from the proposed site there by reducing the impact of underground contamination at the project site.
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Significance of Impact: High Positive

3.2 Negative Impacts

Negative Socio-Economic Impacts

Increase in HIV/AID and STIs

Increase in local workers might result in an increase in casual sex and thus bring about high HIV/AIDS cases.	
Magnitude (M)	Significant
Frequency (F)	Daily
Likelihood (L)	Definite
Proposed mitigation measures	
1) A Comprehensive HIV/AIDS policy covering all members of staff which includes awareness and prevention activities such as providing information on various aspects of HIV/AIDS shall be instituted.	

HIV/AIDs after applying mitigation measures	
Magnitude (M)	Negligible
Frequency (F)	Annually
Likelihood	Unlikely

2.2.2 Negative Environmental Impacts

The following major Environmental Negative Impacts and their mitigation measures listed in the order of significance were identified:

1. Water and Soil Pollution due to seepage and leakages of acidic solution, leachate from the leach residue stockpiles, domestic waste disposal, leakages of organic solution and hydrocarbons;
2. Noise and vibration from the Crushing Plant and Blasting;
3. Air Pollution due to Dust Generation from the Crushing plant and Machinery and Equipment;
4. Occupational Health and Safety impacts;
5. Fires and Explosion impacts from storage and use of hydrocarbons and organic solution; and
6. Loss of Flora and Fauna.

The tables below provide the impact analyses details and proposed mitigation measures.

1. Impacts on Air Pollution

Major environmental aspects that contribute to air pollution at the mine include haulage of waste from the pit to the dumpsites, haulage of the raw material from the pit to the crushing plant and road maintenance activities.

Air Pollution due to Dust Generation from the Crushing Plant	
Magnitude (M)	Significant
Frequency (F)	Daily
Likelihood (L)	Definite
Proposed Mitigation Measures	
1. Water shall be sprayed at the crushing process. 2. Water shall be sprayed around the working area to suppress dust. 3. Appropriate dust masks, goggles and working suites shall be provided to workers. 4. New employees shall be inducted on safety/environmental requirements when working in dust prone areas and safety talks shall be conducted weekly. 5. Passive dust monitoring using dust buckets shall be undertaken to monitor ambient dust generated per month. 6. Signs shall also be installed to educate workers about the health dangers of dust and appropriate protective clothes shall be provided.	
Air Pollution After Applying Mitigation Measures	
Magnitude (M)	Negligible
Frequency (F)	Daily
Likelihood (L)	Unlikely (3)

2. Impacts Associated with Blasting-related Noise and Vibration

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Operation of the Arab Contractors Quarry portion of the project would include the use of explosives for blasting purposes, which would be the primary source of noise and vibration from the project. Mineral extraction from the Quarry would require blasting to fracture and loosen rock. Ground vibrations and air blast overpressure are part of the output of the rock blasting operations. Blasting operations at the Quarry site would follow the general blasting guidance. The hard rock reserves at the Mine would be drilled and blasted on a series of mine benches.

Operation of the Quarry would include a maximum of one blast per day for 30 minutes and the hours of blasting would be limited to between 16:00 a.m. and 16:30 p.m., Monday through Friday, except for Saturdays between 13:30 a.m. and 2:00 p.m. when blasting would occur and in case of an emergency need as identified by a public agency. Other environmental aspects that contribute to noise and vibration are movement of earth moving machines, drilling activities, operations of the generator and blasting activities. Some of these activities are continuous while

others are intermittent. For examples, the generator runs about 12 hrs. Per day while blasting is only done once per day.. The table below presents the predicated environmental risk with mitigation measures and without mitigation measures.

Noise and Vibration from Blasting and Earth moving Machines	
Magnitude (M)	Significant
Frequency (F)	Daily
Likelihood (L)	Definite
Proposed Mitigation Measures	
1) Controlled blasting shall be introduced to minimize noise and vibration during blasting. 2) The blasting schedule shall be maintained at 16:00hrs and this schedule shall continue taking about 30 minutes every day when blasting is done. 3) Ear protection equipment (ear muffles) shall be provided to all the workers. 4) All operations shall be conducted during the normal working hours of the day to avoid noise disturbance at night. 5) Periodic noise monitoring shall be conducted to ensure that the noise emitted is below the international threshold limit value of 85dBA outside the plant. 6) All the machines shall be serviced frequently to ensure that they work according to design standards to minimize vibration and noise.	
Noise and Vibration after Applying Mitigation Measures	
Magnitude (M)	Negligible
Frequency (F)	Daily
Likelihood (L)	Unlikely

3. Impacts on Soil and Water Pollution

Key environmental aspects that contribute to water and soil pollution are generation of hydrocarbon waste due to servicing of mining machines and distribution of fuel. Other activities are domestic waste water, sewage disposal, dewatering activities and surface water run-off. The overall environmental risk before and after mitigation measures is predicted in the table below.

Water and soil pollution due to seepage and leakages of waste disposal, hazardous waste and hydrocarbons	
Magnitude (M)	Significant
Frequency (F)	Bi-annual
Likelihood (L)	Definite
Proposed Mitigation Measures	
1) A perimeter drain shall be constructed around the mine area with silt settling ponds to trap storm water especially from materials stockpiles. 2) A standard workshop shall be constructed with appropriate storage facilities for hydrocarbons and used oil generation facilities. 3) The leach pads and ponds shall be provided with an electronic monitoring instrument for detecting possible leakages. 4) Soils shall be sampled and analyzed for pH and total metals. 5) All the hazardous wastes shall be stored in appropriate drums for disposal using licensed companies. 6) All storage facilities for hazardous substances shall be bunded to at least 110% the capacity of the storage tank. 7) No hazardous waste shall be given or sold to any person or company that is not licensed to handle hazardous waste. This includes used batteries, used oil and crude. 8) Domestic waste bins shall be procured and distributed in appropriate places and these shall be emptied using licensed facilities at a licensed domestic waste dump site. 9) A SHE Officer shall educate workers and conduct periodic environmental and safety inspections associated with water and soil pollution. 10) A bio-remediation farm shall be established within the mine area for treatment of hydrocarbon contaminated soils by mixing it with nitrogen based fertilizer, effluent from the modular sewage treatment plant and by frequent aeration.	
Soil and water pollution after applying mitigation measures	
Magnitude (M)	Negligible
Frequency (F)	Bi-annual
Likelihood (L)	Unlikely

4. Impacts on Occupational Health and Safety

Main environmental aspects associated with occupation health and safety includes blasting, loading and offloading waste, transportation of waste and row material and general maintenance activities. Contributing factors to risk assessment are dust, noise, explosions, fire and failure to follow machine operating procedures. The table below presents the risk assessment for occupational health and safety.

Occupational Health and Safety Impacts	
Magnitude (M)	Marginal
Frequency (F)	Monthly
Likelihood (L)	Definite
Proposed Mitigation Measures	
1) All the workers shall be provided with the appropriate safety clothes and shall be educated frequently about safety precautions. 2) Necessary medical check-ups shall be conducted frequently and medication shall be provided using reputable health facilities. Work recommendations shall also be followed as advised by health professionals. 3) Installation of appropriate warning signs around chemicals storage facilities hall be done. 4) Punitive measures shall be undertaken for all erring employees regarding use of protective clothes. 5) The SHE Officer shall develop working procedures for all operational activities with inherent potential to cause harm. 6) Safety and Environmental weekly discussions shall be conducted to remind all the workers about safe practices. 7) All accidents and near-misses shall be reported to the Safety, Health and Environmental Manager and failure to report shall result into disciplinary measures. 8) Signage will be written both in English and local language in order to remind the workers and the Public when blasting is taking place. 9) The emergency response and preparedness plan shall be developed and implemented within six months following approval of this EMP.	
Occupational Health and Safety After Applying Mitigation Measures	
Magnitude (M)	Negligible
Frequency (F)	Annual
Likelihood (L)	Highly Unlikely

5. Impacts on Loss of Flora and Fauna

Project activities that interact with flora and fauna are disposal of overburden material, extension of the pit, road maintenance activities, maintenance of the surrounding and maintenance of the firebreak/security patrol road around the camp. The environmental risk for flora and fauna was predicted as explain in the matrix table below.

Flora and fauna	
Magnitude (M)	Negligible
Frequency (F)	Annual
Likelihood (L)	Unlikely
Proposed Mitigation Measures	
1) Apart from areas that were cleared by the previous mine owner, the rest of the mine area remains intact and encroachment by illegal miners or settlers is not a challenge. This shall be maintained. 2) Site clearing shall be limited to development areas and before any clearing is done, the Mine Manager shall issue a site clearing approval in consultation with the SHES Manager. 3) Biological monitoring of trees and animal species around the mine area shall be undertaken once per year. 4) Trapping of wild animals and buying of illegal game meat shall be included in the disciplinary code for all employees and applicable disciplinary measures shall be instituted to erring employees in accordance with Labor Laws. 5) A firebreak shall be prepared every year around the mine licence area before the fire burning season starts to protect flora and fauna within the mine area. 6) Security patrols shall be conducted in the entire mine area to monitor deforestation activities which shall be considered as trespass and necessary legal actions shall be instituted to offenders. 7) Wildlife conservation awareness campaigns shall be conducted once per year for workers and the community. 8) Protection measures for flora and fauna shall be part of the material for environmental inductions.	
Flora and Fauna Impacts After Applying Mitigation Measures	
Magnitude (M)	Negligible
Frequency (F)	Annual
Likelihood (L)	Highly Unlikely

6. Impacts on Fire and Explosions Risks

Fires and Explosion from the Hydrocarbons and Organic Solution.	
Magnitude (M)	Significant
Frequency (F)	Daily
Likelihood (L)	Definite
Proposed Mitigation Measures	
1) Storage tanks in process for hydrocarbons and organic solution shall be equipped with smoke detectors and chemical fire extinguishers to deal with an eventuality. Clear signs of "NO SMOKING" and NO NAKED LIGHTS" shall be displayed prominently for safety reasons. 2) Appropriate earthling and lightening arresters shall be installed. 3) Storage of hydrocarbons not in process shall be limited to 210 liters at any one given time. 4) A fire emergency procedure shall be developed and implemented before completion of the construction phase.	

5) The SHE Officer shall be responsible for enforcing safety requirements in the plant and shall conduct periodical safety talks and safety mock drills.	
Fire and Explosion Hazards After Applying Mitigation Measures	
Magnitude (M)	Negligible
Frequency (F)	Daily
Likelihood (L)	Unlikely

7. Cumulative Impacts and Mitigation Measures

"Cumulative Impacts" refers to two or more individual effects which, when considered together, are considerable or compound or increase other environmental impacts. The individual effects may be changes resulting from a single project or a number of separate projects.

The cumulative impact from several projects is the change in the environment that results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects.

An assessment of cumulative impacts should consider impacts identified as significant, as well as impacts identified as less-than-significant for individual projects that may become significant in a collective sense when considering the co-occurrence of multiple projects.

Impacts Related to Cumulative Noise, Vibration and Traffic Levels.

Noise, Vibration and Traffic levels would be increased by 1 dBA Ldn in the vicinity of the project. Traffic and Noise level in the two studied roadway segments (the access gravel road to the site and the main road (Kafue Road) will also increase.

It should be noted that impacts related to increases in cumulative traffic noise levels would be similar to other similar projects in the area, as the alternative is expected to generate the same number of blasting and vehicle trips on the surrounding and roadways, although the impact would be slightly reduced because the alternative site is located farther from existing quarries

(Flame Arab Contractors which is non-operational and 2km away from the site and Raubex Quarry Mine which is also 5km away from the site respectively.

Overall, impacts related to cumulative traffic, blasting and noise levels under both the proposed project and similar projects alternative would be ***(less-than-significant).***

Noise, Vibration from Blasting and Traffic Levels	
Magnitude (M)	Significant
Frequency (F)	Daily
Likelihood (L)	Definite
Proposed Mitigation Measures	
1) Controlled blasting shall be introduced to minimize noise and vibration during blasting. 2) The blasting schedule shall be maintained at 16:00hrs and this schedule shall continue taking about 30 minutes every day when blasting is done. 3) Ear protection equipment (ear muffles) shall be provided to all the workers. 4) All operations shall be conducted during the normal working hours of the day to avoid noise disturbance at night. 5) Periodic noise monitoring shall be conducted to ensure that the noise emitted is below the international threshold limit value of 85dBA outside the plant. 6) All the machines shall be serviced frequently to ensure that they work according to design standards to minimize vibration and noise. 7) Vehicle traffic will be limited and restricted to the developed road network. 8) Slow down humps on the main route entering the quarry mine and the project vicinity	
Noise and Vibration after Applying Mitigation Measures	
Magnitude (M)	Negligible
Frequency (F)	Daily
Likelihood (L)	Less than Significant

1.4.6 Summary of Environmental Negative Impact and Mitigation

Impact	Effect	Mitigation Measure
Fuel (Burning)	Minor air pollution	Minimise driving of utility vehicle and operation of propelled mining equipment Good maintenance of utility vehicle and fuel propelled mining equipment
Fuel (Spillage)	Contamination of soil, vegetation and ground water	Good maintenance of utility vehicle and fuel propelled mining equipment. Fuel storage and refueling restricted to designated re-fueling bay Immediate cleaning and correct disposal of any spillage
Waste (Domestic)	Contamination of site(surface and soil)	Minimise generation of waste Collect and dispose off correctly.
Waste (sewer)	Contamination of site surface and ground water	Construct environmentally and public health friendly pit latrines Always use designated pit latrines
Vegetation clearance	Disturbance and loss of vegetation	Restrict to absolute minimum necessary No driving through existing footpaths Driving and movement of mining equipment restricted to only already motorable tracks Rehabilitation
Trenching and Channel Sampling	Creating temporary openings minor soil and vegetation disturbance Minor vegetation clearance Minor Chipping on rock outcrops.	Restrict the use of mechanization to absolute minimum necessary Restrict depths to minimum Backfill and rehabilitate trenches and pits at completion Rehabilitate all trenching and pit sites
Noise and dust roadways from vehicles	Minor air pollution Nuisance to community, wildlife, impaired visibility	All vehicles to be regularly maintained with sound control gadgets in place No over speeding of vehicles or any exploration mobile equipment will be allowed within the project area.