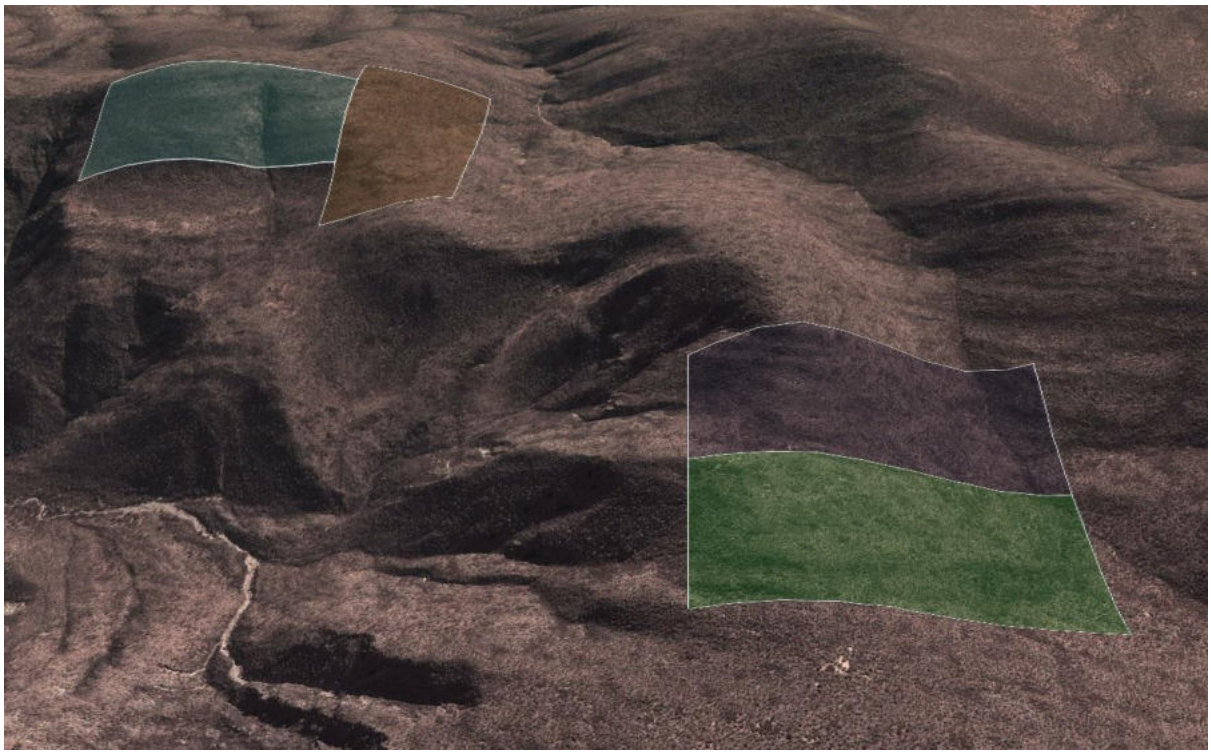
# UPDATED ENVIRONMENTAL MANAGEMENT PLAN

## MINING OF BARITE WITHIN MINING CLAIMS

## 70070, 70071, 70072 and 70073 ON THE STEILRAND MOUNTAINS

## EPUPA CONSTITUENCY, KUNENE REGION

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|---|---|
| Title | Updated Environmental Management Plan for Mining of Barite Within Mining Claims 70070 - 70073 at the Steilrand Mountains, Epupa Constituency, Kunene Region |
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| Client | Mr. JP Smit |
| Version | Draft |
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**ABREVIATIONS**

| | |
|---|---|
| EAP | Environmental Assessment Practitioner |
| ECO | Environmental Control Officer |
| EIA | Environmental Impact Assessment |
| EMP | Environmental Management Plan |
| ERA | Environmental Risk Assessment |
| HSE | Health Safety Environment Officer |
| I&AP | Interested and Affected Parties |
| MEFT | Ministry of Environment Forestry & Tourism |
| MC | Mining Claims |
| MSDS | Materials Safety Data Sheet |

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# 1. INTRODUCTION

Mr. Jacobus Petrus Smit (hereafter referred to as the proponent) is the holder of mineral rights as granted for four Mining Claims 70070 – 70073, located on the Steilrand Mountains, northwest of Opuwo, in the Epupa Constituency of the Kunene Region. The mining claims were pegged for mineral rights application in November 2016.

The proponent intends to operate a small-scale Barite mining quarry to excavate the resource within the mining claims area, which covers a combined area of approximately 72 hectares. The target rock material will be loosened by means of drilling and blasting. It is envisaged that an Accessory Works Area adjacent to the quarry will be constructed for the establishment of a works yard. Existing access roads will be utilized and, if necessary, will be upgraded to accommodate heavy motor vehicles and operational machines to minimize environmental damage to the area. The life of the mine is currently set at 10 years. The life of mine for the operations has been based on the expected demand and the size of the resource. However, this may vary significantly as the demand may fluctuate.

The proponent appointed Rose Mtuleni, an Environmental Manager from Gecko Exploration, to update the Environmental Management Plan accompanying the Environmental Clearance Certificate (ECC) renewal application.

This Environmental Management Plan (EMP) documents a series of individual management programmes (MPs) designed to meet legal requirements for the activities related to the Proponents operations. The EMP aims to avoid or minimise potential negative impacts, while optimizing the potential positive impacts associated with the mining operations and decommissioning once the activity has been completed.

# 2. Project Overview

## 2.1 Project Location

The Mining Claims 70070-70073 are situated at the Steilrand Mountains approximately 55 kilometres west of Opuwo, within the Epupa Constituency. The Mining Claims lie within communal area of Ombazu Conservancy, which fall under the responsibility of the Kunene Regional Council. The people living in the area are led by headmen who in turn grant stewardship and authority to junior headmen. Officially they fall under the authority of the Governor and the constituency councillors.

The mining claims are situated in a remote rural area. The physical and biological environment is aesthetically beautiful. Nonetheless, there are obvious signs of degradation by over-grazing

and the effects of the current drought exacerbate the difficulty that the communities experience in living off the land. The mining operations take place on communal land. Due respect will be given to the communities that use the area for subsistence living. The local people (Ovahimba) are semi-nomadic and may come in close proximity to the mining operations from time to time. Good community relations are imperative for the successful running of the mine. Public safety is of utmost importance.

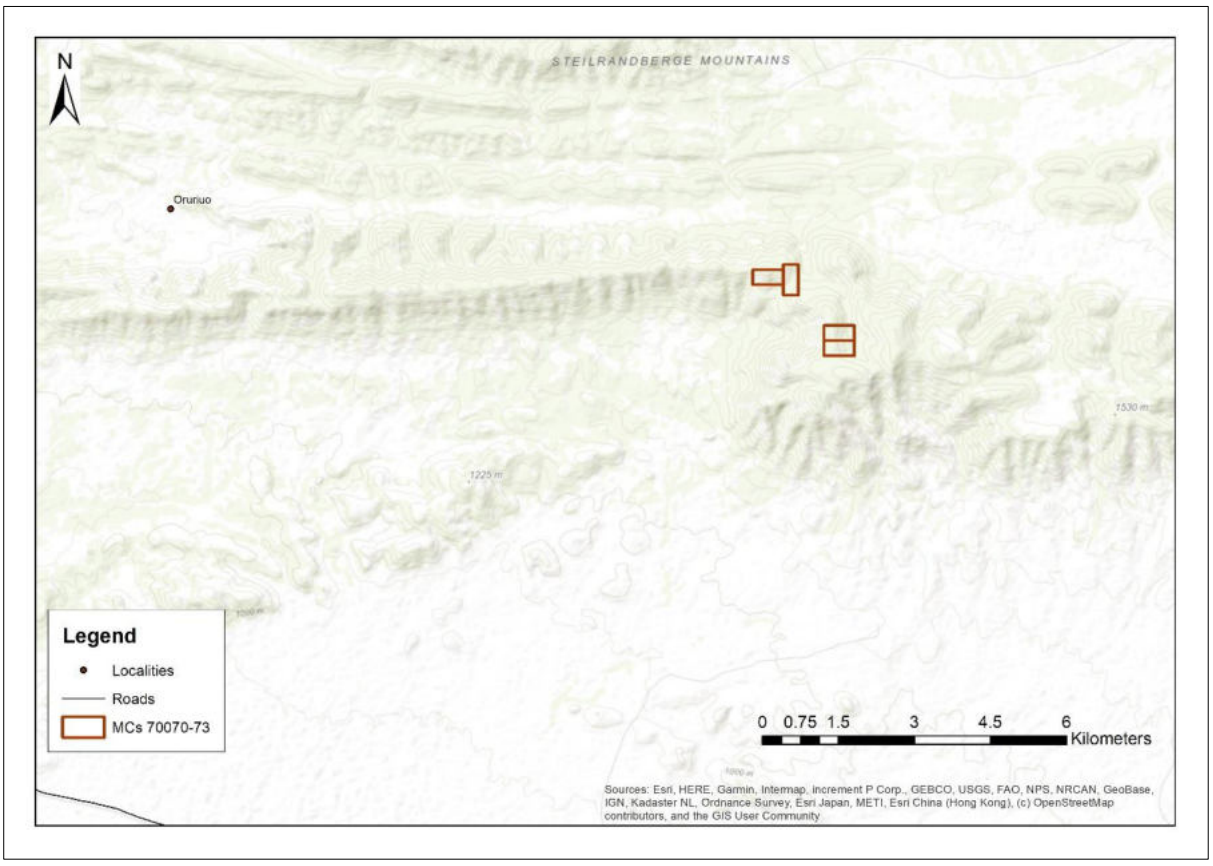


**Figure 1: Mining Claims 70070 - 70073 Locality Map**

## 2.2 Project Description

The following is the summary of the envisaged development of mining and processing activities that are expected to be undertaken by the project proponent during the different project development phases. The summary below provides a description of the project, including the primary mining and processing activities that are expected to be undertaken by the project proponent.

The activities will be undertaken in phases as follows:

- The construction phase activities
- The operational phase activities

- Decommissioning phase activities

## Construction Phase Activities

Construction activities will aim at establishing new infrastructure to accommodate the operational activities of the quarry and material processing like the crusher and screening plant. An Accessory Works Area will provide the area for the establishment of a works yard. This area will be demarcated so as to limit the movement of equipment and personnel beyond the footprint of the quarry and accessory works area, and also to limit the movement of animals onto the site from the surroundings. All offices will be made from prefabricated structures and temporary in nature. A mobile crushing unit and mills will be used on site. Existing access roads will be utilized and, if need be, upgraded to accommodate heavy motor vehicles and operational machines. The selective clearing of vegetation in areas designated for surface infrastructure and the stripping and stockpiling of topsoil and sub-soil (if any) will be minimal when the operations are started as considerable areas were already cleared during the exploration phase. When lateral expansion is required the removal of trees will be done in association with the Directorate of Forestry which issues such permits.

Digging of foundations and trenches, as well as drilling and blasting are expected in the construction phases for the development of a new quarry pit. The construction of facilities to divert storm water from the open quarries will be planned and actioned.

## Operational Phase Activities

Some of the proposed quarry site is an area where exploration activities have taken place. The main operational activities will entail drilling, blasting, extraction, crushing, milling, bagging, loading and hauling of products and waste. Solid mineral waste will go to waste rock dumps and the ore to ore stockpiles. Mining techniques will make use of equipment such as drill rigs, excavators, crushers, mills, dump trucks, explosives transport and magazine unit, bull dozers, front end loaders, and water bowsers.

Mining rates will average approximately 10 000 tonnes per year. Mining will be carried out by manual opencast method, with a possible extension to underground mining at a later stage. There will be diverse stockpiles on site ranging from uncrushed rock to varieties of crushed material. Crushing operations may occur on a 12 hour basis seven days a week. A static crushing unit will be used on site. A rod mill will also be present on site together with a jet mill to further grind the rocks to provide for various size products.

There will be no further processing plant on site and crushed and milled materials will be transported offsite by road or railway. Existing access roads will be utilised, and these will be refurbished as necessary.

### *Operational Support Services*

#### *Water supply*

The Water supply sources being considered are either;

- Ground water abstraction; and/or
- NamWater

The proponent does not expect to use much water on site, as the only main activities are resource extraction, crushing and milling. It is suggested that amounts of water can be sourced from Opuwo or from one of the site neighbours and then be trucked to the site, as there is no existing infrastructure on site for the water utility company, this is the preferred option. If for any reason more water is required then the proponent suggests abstraction of ground water, which can be done at minimal extraction cost, a borehole can be sunk to augment supply volumes. However, for this option a groundwater exploration program would need to be undertaken.

#### *Power Supply*

No infrastructure to get electricity from the national grid has been planned. All mobile plant and equipment are diesel driven and self-propelled. Static plant equipment will use electricity generated by diesel generators. A small field of photovoltaic panels is also envisaged for power generation in the medium term.

#### *On-Site Fuel and Lubricant Storage*

Diesel storage at the mine site will consist of a bunded fuel tank system, conveniently placed and accessible for the frequent deliveries. In addition to this it is feasible for a few bunded mobile facilities to be placed conveniently for use by the mining equipment at the various active mining areas. These facilities will be of modern construction, either double-skinned or bunded to ensure spills are prevented. Contaminated soils will be transferred to a remediation section on site that is specifically designed for such soil remediation

Delivery systems will use sealed fittings to prevent spillage. The fuel facilities should be actively manned. Lubricants will be stored in a double bunded facility which is designed for this purpose. Lubricants will be transferred to machines via reticulated network within the heavy vehicles workshop or mobile lubrication trucks. Standardised spill kits and reporting systems will be in place to deal with hydrocarbon spills.

***Explosives Magazine and Use of Explosives***

In terms of the proper use and storage of explosive material on site, the Explosives Act of 1956 states that the proponent can only keep, store or possess explosives in such a manner and in such quantities as have been approved in writing by an inspector and shall only be stored on premises where there is an explosives factory or explosives magazine. The proponent should obtain a permit issued by an inspector of the explosive police unit and the explosives need to be kept in quantities not exceeding 500 kilograms and be stored in an isolated place. Every 120 days the proponent should furnish the Chief Explosive Inspector with information in writing as from the said date regarding the quantity of explosives in the company's possession or custody. The proponent should bear in mind that the inspector may enter any explosives factory or explosives magazine at any hour of the day or night for the purpose of inspecting the magazine and of making inquiries relative to the compliance with the provisions of this Act and its regulations, or relative to the means used therein for preserving the safety of the public or employees or for purposes of analysis or test, ask for samples of explosives or ingredients of explosives from the proponent.

***Security of the Mine and Accessory Works Area***

The site needs to be demarcated on its perimeter in order to control the access to facilities and the works area, so as to prevent unauthorised persons and vehicles from entering the site, and to keep out animals from the surrounding farming areas. Public safety is the guiding principle behind this aspect. Security personnel may be needed on site at frequencies and times to be determined by the proponent.

## Decommissioning Phase

The life of mine for the quarry will be based on the expected demand. However, this may vary significantly as the demand may fluctuate. However, ongoing rehabilitation and landscaping should be conducted as the mining activities progress. Shaping of the excavated area not only to accommodate rehabilitation efforts, but also in terms of safety, should be conducted according to a rehabilitation plan. In accordance with the EMA, the proponent is required to make funds available and allocated for rehabilitation efforts. This fund should continually be accessible during the life of mine and also be sufficient to cover all decommissioning activities when required. Furthermore, the proponent will ensure that the part of the quarry initially created will be made secure for public safety's sake at mine closure. This specific responsibility should be incorporated into the rehabilitation plan and incorporated into the financial requirements thereof.

Decommissioning activities will include the removal of infrastructure, preparation of final landforms for closure, rehabilitation of roads where necessary and encouraging vegetation

growth in order to reduce the effects of soil erosion and to re-establish normal ecosystem functionality so as to rehabilitate the environment. The support services and facilities constructed during this phase will either be removed at the end of the construction phase or incorporated into the further phases of the project.

# 3. EMP OBJECTIVES

The main purpose of the Environmental Management Plan ("EMP") is to provide a strategy for the identified socio-economic and biophysical impacts in order to provide measures that mitigate, as far as practicably possible, the effects of significant adverse impacts while providing strategies for maintaining or enhancing positive impact effects.

This mode of environmental protection is implemented in all the activities associated with the Proponent operations, ensuring that time and national resources are not wasted and that problems occurring during all operations are identified and rectified to prevent damage to the environment.

If any issues were overlooked, the plan must be amended in consultation with the Proponent and regulatory authorities. The EMP objectives are:

- To comply with national legislation and standards for the protection of the environment.
- To limit potential impacts on biodiversity through the minimisation of the footprint and the conservation of residual habitat within the project area.
- To ensure the Proponents operations are managed efficiently and effectively to reduce or avoid negative impacts and enhance positive impacts of the operations
- To keep surrounding communities informed of the activities through the implementation of forums for communication and constructive dialogue between the Proponent and all those affected
- To conserve soil resources by stripping, stockpiling and managing topsoil where practicably possible.
- To minimise the potential for dust emissions through the implementation of dust control measures.
- To minimise the potential for noise and vibration disturbance in surrounding areas.
- To undertake rehabilitation wherever possible during the life of the project.
- Prevent and minimise all forms of pollution.
- To include all components of the operations of the project.
- To prescribe the best practice control methods to lessen the environmental impacts associated with the operations of the project.

- To monitor and audit the performance of operational personnel in applying such controls.
- To ensure that appropriate environmental training is provided to responsible operational personnel.

The Environmental Management Act and Regulations require that an EMP for the proposed project be developed (see Legal Section of EIA Scoping Report). The Management Programmes within this EMP have therefore been compiled to satisfy requirements based on the regulations for all developmental projects in Namibia.

# 4. ENVIRONMENTAL MANAGEMENT ROLES AND RESPONSIBILITIES

The main parties that are responsible for specific aspects of the EMP's implementation or to whom the responsibility reports are:

- The **Proponent**- Jacobus Petrus Smit;
- The **Environmental Manager** (EM);
- The **Environmental Control Officer** (ECO).

| RESPONSIBLE PARTY | RESPONSIBILITY |
|---|---|
| **Proponent** | Bears the ultimate responsibility for mining and processing operations and is thus responsible for environmental performance. Must be informed of environmental issues and impacts of all operations (existing and future) and the resultant effect that such activities have on the environment. |
| **Environmental Manager** | Ensure compliance of the Environmental Management Plan; Update the Environmental Management Plan |
| **Environmental Control Officer** | Monitors the implementation of the EMP as well as identifies potentially detrimental impacts not identified in the EMP so that the EMP can be reviewed and updated. The following list outlines the ECO's responsibilities:<br>➢ Maintaining compliance to the EMP and any other relevant legal requirements e.g., permits and authorisations.<br>➢ Implementation of the Environmental Management System ("EMS").<br>➢ Coordination, monitoring and consultation with stakeholders and personnel, including the promotion of environmental management competence and providing risk assessment expertise.<br>➢ Undertake Environmental Risk Assessments (ERAs). |

| | |
|---|---|
| | ➢ Set environmental objectives and targets.<br>➢ Monitoring of systems to ensure compliance to legislation and company policies.<br>➢ To facilitate updating of the environmental management process and ascertaining the state of environmental risk and performance.<br>➢ Compile biannual reports for MEFT.<br>➢ Ensuring that all personnel undergo environmental awareness training as per company environmental standards on an ad hoc basis.<br>➢ Coordinate internal and external environmental audits.<br>➢ Submit required information to relevant authorities such as reporting related to monitoring and with regard to compliance with the EMP, permit and relevant authorisations.<br>➢ Liaise with the Proponent's management team and various external stakeholders such as authorities and interested and affected parties on environmental management |

# 5. ENVIRONMENTAL IMPACTS

The key environmental impacts identified and discussed in the Barite Mine scoping report for construction and operations were identified by site visits, consultation with the Proponent and an impact assessment.

## 5.1 Key Positive Environmental impacts

The following key issues and potential positive impacts associated with the proposed operations are:

- The operations help to create jobs and long-term employment.
- The local economy benefits; through direct contribution of the mine to the Namibian economy.
- Reducing income inequality, increasing job creation and economic growth.
- Implementation of environmental management measures to mitigate negative impacts.
- Environmental awareness created for all the mine personnel through training.
- Improve the standard of living of the Proponent's employees.

## 5.2 Key Negative Environmental Impacts

- Potential decrease in the road surface integrity due to increased haulage frequency could incur more frequent spending on road repairs.

- Potential air pollution from vehicle fumes and during windy conditions from dust generating activities.
- Potential decrease in aesthetic value of the area earmarked for mining as vegetation and top soil will be cleared in preparation for and during mining operations and expansion.
- Potential increases in waste and sewerage generation.
- Potential increase of soil erosion as a result of stripping of topsoil during the mining operations.
- Natural resource depletion, loss of land (habitat), change in land-use potential.
- Potential impact on health and safety (security) of personnel and the public.
- Potential pollution disturbance and alteration of water quality.
- Public safety concerns on National Roads and at the Port of Walvis Bay.

# 6. EMP IMPLEMENTATION GUIDELINES

The potential impacts resulting from the proposed operations were evaluated in the scoping report with assessment. The suggested mitigations for potentially negative impacts if implemented, will reduce the impacts on the biophysical and socio-economic environment so that their significance is negligible. The mitigation measures are included in the EMP implementation guidelines below. **Tables 1 to 13** describe the management programmes for the main potential impacts to mitigate and/or enhance the potentially significant environmental and socio-economic impacts.

This document may need to be periodically reviewed and updated due to new insights or operational changes to ensure that all the environmental impact aspects are included. It categorises aspects into loosely defined phases of planning, construction, operational, and decommissioning phases. These phases are applicable in the following ways:

- elements of the **Planning Phase** apply to the current review process, permit and certificate renewal periods;
- the establishment of new activities on site and the upgrading of infrastructure or equipment is covered under the **Construction Phase**;
- extraction, blasting, crushing, milling and haulage of the resource and supplies and transport of product to port and various accessory components falls under the **Operational Phase**;
- should any of the activities discussed eventually draw to a close then the **Decommissioning Phase** section will be applicable.

The following programmes are discussed in detail in the tables that follow:

1. Air quality Management Programme
2. Noise Management Programme
3. Health & safety Management Programme (includes Security)
4. Visual Management Programme
5. Stakeholder Communication Management Programme (include socio-economic aspects)
6. Waste Management Programme
7. Ecology Management Programme
8. Water Resource Management Programme
9. Traffic Management Programme
10. Mine Closure & Rehabilitation Management Programme

## Table 1. Air Quality Management Programme

| **Risk Event** | **Disturbances to soil and rock resulting in excessive dust in the atmosphere** |
|---|---|
| **Description** | Dusty atmospheric conditions do prevail around Opuwo during the winter months when dry north easterly winds blow. Barite mining activities may generate dust due to the nature of the substrate:<br>➢ Movement of vehicles along road network hauling ore on site are likely to lift dust into the air.<br>➢ Drilling and blasting will most definitely cause dusty conditions.<br>➢ Crusher, sifting screens and conveyor functioning result in dusty conditions<br>The surrounding habitats receiviing the dust that emanates from the mining activities which may potentially be affected. Fauna and flora alike could be impacted as ecosystem functioning is possibly affected.<br>Negative effects of dust on personnel working at the quarry site are likely to occur if dust suppression techniques are not employed and personal protection equipment is not used to safeguard the health of personnel. |
| **Status** | Negative |
| **Phases** | Phases during which sources of dust apply are highlighted below; Significance assessment was carried out on the operational phase which presents a long-term risk. |

| **Construction Phase** | **Operational Phase** | **Decommissioning Phase** | **Post Closure** |
|---|---|---|---|
| Road network establishment | Road use and maintenance | Demolishing infrastructure | Background levels will most likely become prevalent soon after closure. |
| Building and conveyor construction | Drilling & blasting | Rehabilitation of slopes | |
| | Ore haulage from quarry pit | Constructing fences | |

| | |
|---|---|
| **Severity** | Moderate / measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints. Noticeable loss of resources. |
| **Duration** | Reversible over time. Life of the project. Medium term |
| **Spatial Scale** | Fairly widespread – Beyond the site boundary. Localised at best. Though this does depend on mobility of particles and prevailing weather conditions. |
| **Probability** | Definite and continuous |

| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
|---|---|---|---|---|---|---|
| **Unmitigated** | **M** | **M** | **M** | **M** | **H** | **M** |

| | |
|---|---|
| **Significance of Consequence** | Unless it is mitigated the generation of dust should have an influence on the decision to carry out the activity or not. Natural weather conditions can create very dusty atmospheric conditions. However, mining and processing activities on site will contribute significantly to local atmospheric dust levels and will potentially affect the ecosystem functioning. additionally, personnel could be affected badly. |
| **Prevention** | Dust creation cannot be prevented completely. Water is normally used to suppress dust on the roads. However, this scarce resource cannot be applied continuously and indiscriminately. |
| **Mitigation Action** | Dust suppression techniques will be necessary during the dry winter months when excessive dust is an issue. The following can be done to reduce exposure of the environment and personnel to continuous and excessive dust plumes:<br>➢ Avoid dust generating activities that create excessive dust during windy conditions.<br>➢ Personnel are required to wear personal protection equipment if excessive dust should be created.<br>➢ All vehicles transporting crushed material off site should be covered with a tarpaulin when travelling on the highways. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | ➢ Windbreaks and covers can be used to reduce lifting of dust from crushers, screens and conveyors.<br>➢ Water spays at the various plant components will effectively keep dust from blowing into the atmosphere.<br>➢ The road network within the mine site can be sprayed with water and other dust suppressants during dry dusty conditions.<br>➢ Waste rock dumps can be covered/ stabilized with grass / rocks to supress erosion of soil and dust emission on windy days.<br>➢ To mitigate gaseous pollutants released from the combustion of hydrocarbons, use of high-quality fuels will ensure quantities released per unit weight of product are at levels within environmental limits. | | | | |
| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
| **Mitigated** | **L** | **L** | **M** | **L** | **L** | **L** |
| **Significance of Consequence** | | The dust suppression techniques if applied diligently and consistently will result in a low significance impact for both the biophysical and social environment | | | | |
| **Confidence Level** | | High, provided management implements the mitigation action and the company provides the necessary financial support to implement the changes required | | | | |
| **Monitoring** | | A complaint register should be kept on site and in a case where a complaint is recorded, a dust bucket network is recommended so that **monthly dust fallout** can be documented. Acceptable limits as proposed by the Ministry of Environment Forestry & Tourism must be complied with. In the absence of such guidelines, typical ambient conditions prior to operations can be compared to guidelines used by RSA and Botswana and limits can be set for this project. | | | | |

## Table 2. Noise Management Programme

| **Risk Event** | **Disturbance of sense of place and the effect on tranquil ambient noise levels** | | |
|---|---|---|---|
| **Description** | Potential noise sources during the mining and processing activities could originate from vehicles, earthmoving equipment like excavators and graders, generators, drilling and blasting. The irritation issue of these noise sources will depend on the closeness of the mining activities to various receptors. The nearest homesteads in the vicinity of the areas surrounding the claims are more than 4km away to the north and east.<br>For rural districts the day time ambient noise level requirement outlined in SANS 10103 (2008) between 6am and 10pm is 45dBA (**A-weighted decibel**). This is in line with the guidelines published by the World Health Organisation (WHO). The noise levels should not exceed the ambient noise levels for rural settings. | | |
| **Status** | Negative | | |
| **Phases** | Phases during which sources of noise will apply are highlighted below; Significance assessment was carried out on the operational phase which presents a long-term risk. | | |
| **Construction Phase** | **Operational Phase** | **Decommissioning Phase** | **Post Closure** |
| Vehicles on road network | Vehicles on road network | Demolishing buildings | Background or baseline levels will most likely become prevelant again immediately after closure. |
| Building construction | Drilling & blasting | Rehabilitation of slopes | |
| | Ore haulage from quarry pit | Constructing fences | |
| **Severity** | Moderate / measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints. Noticeable loss of resources. | | |
| **Duration** | Reversible over time. Life of the project. Medium term | | |
| **Spatial Scale** | Fairly widespread – Beyond the site boundary. Localised at best. Though this does depend on mobility of particles and prevailing weather conditions. | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Probability** | | Definite and continuous | | | | |
| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
| **Unmitigated** | **M** | **M** | **M** | **M** | **H** | **M** |
| **Significance of Consequence** | | Mitigations to reduce noise levels measured at receptors will be necessary. | | | | |
| **Prevention** | | Noise creation cannot be prevented and will occur, and should be mitigated. | | | | |
| **Mitigation Action** | | There are industrial standards to which the noise sources (i.e. machinery) must comply. Regular maintenance of machinery should maintain the acceptable noise levels for operators working with the machines. It is not clear whether this will produce the accepted rural standard at the farm homestead.<br>It is recommended that any complaints regarding noise be recorded and included in the environmental reports. Should complaints persist then a survey by a suitably qualified and independent hygienist will be required.<br>Shields which deflect the noise away from receptors may reduce the decibels to within the rural standards. The placement of stockpiles and buildings will also play a role to ensure sources of noise are not directly in line with the farm homestead.<br>Transportation routes should be planned for trucks such that they pass as far away as possible from noise sensitive receivers, a restriction of the hours of movement, e.g. not allowing the transport of material during the noise sensitive hours of the night can mitigate noise impacts. | | | | |
| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
| **Mitigated** | **L** | **M** | **M** | **L** | **L** | **L** |
| **Significance of Consequence** | | Mitigations to reduce noise levels measured at receptors will be necessary | | | | |
| **Confidence Level** | | The EAP is fairly confident that the mitigations will result in the impact reduction. A good equipment maintenance system will enable the mine to document the facts and respond accordingly by enhancing any noise reduction strategies. | | | | |
| **Monitoring** | | **Monitoring:**<br>➢ Keep a register of all complaints received and remediation action taken.<br>**Performance Indicator:**<br>➢ Number of registered complaints<br>➢ Record all information in a biannual report. | | | | |

## Table 3. Health & Safety Impacts - Noise and Vibration Management Programme

| | |
|---|---|
| **Risk Event** | **The effects of excessive noise and vibration on the health and safety of personnel.** |
| **Description** | Noise:<br>➢ Long term exposure to high levels of noise can cause permanent hearing loss. Neither surgery nor a hearing aid can help correct this type of hearing loss.<br>➢ Short term exposure to loud noise can also cause a temporary change in hearing (your ears may feel stuffed-up) or ringing in your ears (tinnitus). |

| | | | | | | |
|---|---|---|---|---|---|---|
| | These short-term problems may go away within a few minutes or hours after leaving the noisy area.<br>Vibration:<br>Different vibration types are defined as:<br>➢ Hand-Arm Vibration is defined as mechanical vibration that, when transmitted to the human hand-arm system, entails risks to the health and safety of workers, in particular vascular, bone or joint, neurological or muscular disorders.<br>➢ Whole-Body Vibration is defined as the mechanical vibration that, when transmitted to the whole body, entails risks to the health and safety of workers, in particular, lower back morbidity and trauma to the spine. | | | | | |
| **Status** | Negative | | | | | |
| **Phases** | Phases during which sources of noise and vibration will apply are highlighted below; Significance assessment was carried out on the operational phase which presents a long-term risk. | | | | | |
| **Construction Phase** | **Operational Phase** | | **Decommissioning Phase** | **Post Closure** | | |
| Vehicles on road network | Vehicles on road network | | Demolishing buildings | Background or baseline levels will most likely become prevalent again immediately after closure. Personnel no longer on site. | | |
| Building construction | Drilling & blasting | | Rehabilitation of slopes | | | |
| | Ore haulage from quarry pit | | Constructing fences | | | |
| **Severity** | Substantial deterioration (permanent damage to spine from vibration or hearing). Recommended level will often be violated. Personnel potentially unable to work any longer. | | | | | |
| **Duration** | Permanent. Beyond closure. Long term. | | | | | |
| **Spatial Scale** | Localised - Within the site boundary. | | | | | |
| **Probability** | Definite and continuous | | | | | |
| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
| **Unmitigated** | **H** | **H** | **L** | **H** | **H** | **H** |
| **Significance of Consequence** | Mitigations to reduce noise levels and exposure to vibrations for personnel are imperative. | | | | | |
| **Prevention** | Engineering controls that reduce sound exposure levels are available and technologically feasible for most noise sources. Engineering controls involve modifying or replacing equipment or making related physical changes at the noise source or along the transmission path to reduce the noise level at the worker's ear. The same goes for vibration. The following should be considered:<br>➢ Choose low-noise tools and machinery.<br>➢ Maintain and lubricate machinery and equipment (e.g. oil bearings).<br>➢ Enclose or isolate the noise source. | | | | | |
| **Mitigation Action** | **Noise:**<br>The **Occupational Safety and Health Administration** (OSHA) guidelines set legal limits on noise exposure in the workplace. These limits are based on a worker's time weighted average over an 8 hour day. With noise, OSHA's **permissible exposure limit** (PEL) is 90dBA for all workers for an 8 hour day. The OSHA standard uses a 5dBA exchange rate. This means that when the noise level is increased by 5dBA, the amount of time a person can be exposed to a certain noise level to receive the same dose is cut in half. | | | | | |

| | |
|---|---|
| | The WHO guideline on maximum noise levels to prevent hearing impairment set noise level limits at an average of 70 dBA over a 24 hour period with maximum noise levels not exceeding 110 dBA during the period. These latter limits would apply if the day time shift is prolonged beyond the 8 hour day.<br>**Mitigation actions include:**<br>➢ Operating noisy machines during shifts when fewer people are exposed.<br>➢ Limiting the amount of time a person spends at a noise source.<br>➢ Providing quiet areas where workers can gain relief from noise sources.<br>➢ Where possible, restricting worker presence to a suitable distance away from noisy equipment. (Controlling noise exposure through distance is often an effective, yet simple and inexpensive administrative control.)<br>➢ In open space, for every doubling of the distance between the source of noise and the worker, the noise is decreased by 6dBA.<br>➢ Hearing protection devices, specifically earmuffs for long periods of exposure in close proximity to sources and at all times use plugs for all places outside offices within the claims not near noise sources for extended periods<br>➢ PPE is considered an acceptable mitigation, but a less desirable option to control exposures to noise.<br>➢ Monitoring personnels' hearing, before, during (each year if employed longer than one year) and after employment, as a minimum.<br>**Vibration:**<br>Meet industry vibration regulations; set daily exposure limit values and action values for both hand-arm and whole body vibration for eight hour shifts. Personnel can work shorter shifts where conditions causing excessive vibration exist. |

| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
|---|---|---|---|---|---|---|
| **Mitigated** | **L** | **M** | **L** | **L** | **L** | **L** |

| | |
|---|---|
| **Significance of Consequence** | If all the mitigations listed are used then the significance of the impact will be maintained at low. |
| **Confidence Level** | The EAP is fairly confident that the mitigations will result in low significance. A good monitoring system will enable the mine to document the facts and respond accordingly by enhancing any noise and vibration reduction strategies. Continuous training of personnel is imperative |
| **Monitoring** | A mechanism to monitor noise levels, record and respond to health-related complaints of personnel and mitigate impacts appropriately.<br>**Monitoring:**<br>➢ Record all health-related incidents<br>**Performance Indicator:**<br>➢ Number of registered health complaints/incidences<br>➢ Occupational health policy is on file<br>Record all information in a biannual report. |

**Table 4. Health & Safety Impacts - General Hazards, Risk of Injury Management Programme**

| **Risk Event** | **Injury risks due to normal working conditions** |
|---|---|
| **Description** | The potential impacts on human health and safety resulting from activities in any phase could include occupational accidents and injuries, vehicle accidents, exposure to |

<table>
<tr><td colspan="2"></td><td colspan="5">weather extremes, trips and fall on uneven terrain, adverse health effects from dust generation and emissions, and contact with hazardous materials. The potential for these impacts to occur would be low because of the limited range of activities and number of workers required during operations. The Proponent follows a set of industry-specific safety and health policies in the workplace.<br>Typical operational procedures that pose risks to operational personnel are:<br>➢ Operating heavy machinery such as, front-end loaders, excavators and sieves<br>➢ Operating haulage trucks</td></tr>
<tr><td colspan="2">Status</td><td colspan="5">Negative</td></tr>
<tr><td colspan="2">Phases</td><td colspan="5">Phases and specific activities or equipment during which personnel are exposed to health and safety risks will apply are highlighted below; Significance assessment was carried out on the operational phase which presents a long-term exposure risk.</td></tr>
<tr><td colspan="2">Construction Phase</td><td colspan="2">Operational Phase</td><td colspan="2">Decommissioning Phase</td><td>Post Closure</td></tr>
<tr><td colspan="2">Rock falls from steep and high cliff faces of quarry pit</td><td colspan="2">Rock falls from steep and high cliff faces of quarry pit</td><td colspan="2">Rehabilitation of slopes</td><td rowspan="4">Personnel no longer on site. Public safety ensured through restricted access though quarry pit will remain.</td></tr>
<tr><td colspan="2">Large mobile equipment</td><td colspan="2">Large mobile equipment and product haulage</td><td colspan="2">Demolishing buildings</td></tr>
<tr><td colspan="2" rowspan="2">Working at heights</td><td colspan="2">Drilling & blasting</td><td colspan="2" rowspan="2">Constructing fences</td></tr>
<tr><td colspan="2">Fire and explosion hazards</td></tr>
<tr><td colspan="2">Severity</td><td colspan="5">Substantial deterioration. Recommended level will often be violated. Personnel potentially unable to work any longer.</td></tr>
<tr><td colspan="2">Duration</td><td colspan="5">Permanent. Beyond closure. Long term.</td></tr>
<tr><td colspan="2">Spatial Scale</td><td colspan="5">Localised - Within the site boundary.</td></tr>
<tr><td colspan="2">Probability</td><td colspan="5">Definite and continuous</td></tr>
<tr><td>Mitigation</td><td>Severity</td><td>Duration</td><td>Spatial</td><td>Consequence</td><td>Probability of Occurrence</td><td>Significan</td></tr>
<tr><td>Unmitigated</td><td>H</td><td>H</td><td>L</td><td>H</td><td>H</td><td>H</td></tr>
<tr><td colspan="2">Significance of Consequence</td><td colspan="5">Mitigations to reduce exposure to health and safety risks for personnel are imperative.</td></tr>
<tr><td colspan="2">Prevention</td><td colspan="5">The removal of hazards or risks will possibly prevent accidents from occurring. However, it is not possible to remove all risks.</td></tr>
<tr><td colspan="2">Mitigation Action</td><td colspan="5">It is not possible to prevent all incidents from occurring completely. An accident is an unplanned incident though it could have been foreseen if the necessary precautions had been taken. Not all hazards can be removed but the risk it presents can be lowered. An integrated health and safety management system acts as a monitoring tool and mitigating tool to reduce the risks. Typical mitigating measures within the health and safety management systems are:-<br>➢ Draw up operational procedure manuals<br>➢ Provide health and safety awareness training<br>➢ Establish practical standard housekeeping rules<br>➢ Colour code certain areas, equipment and substances to thereby classifying the risks.<br>➢ Provide signage for personal protective equipment (e.g. protective clothing like safety boots and hard hats)</td></tr>
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| | |
|---|---|
| | ➢ Institute safe working procedures and require permits to work<br>➢ Devise and implement emergency response plans<br>➢ Close coordination with the traffic authorities to ensure road safety signs are strategically placed and ensure all employee drivers are well trained<br>➢ Provide easy access to Material Safety Data Sheets (MSDS)<br>➢ Provide first aid treatment and training<br>➢ Devise emergency medical procedures for all eventualities<br>➢ Undertake daily safety reminders and/or drills<br>➢ Establish regulations for handling fuel<br>The MSDS gives health related medical responses for personnel assisting staff who are exposed to the fuels.<br>Procedures for dealing with injuries or accidents must be in place and all contact details for emergency personnel must be available.<br>This list is not comprehensive and could be supplemented substantially by the Health & Safety Manager |

| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
|---|---|---|---|---|---|---|
| **Mitigated** | **L** | **L** | **L** | **L** | **L** | **L** |

| | |
|---|---|
| **Significance of Consequence** | If all the mitigations listed are implemented, then the significance will be maintained at low. |
| **Confidence Level** | The EAP is quite confident that the mitigations will result in low significance. Continuous training of personnel is imperative. |
| **Monitoring** | **Planning:**<br>➢ A register of all incidents must be maintained on a daily basis. This should include measures taken to ensure that incidents do not repeat themselves.<br>➢ An Emergency Response Plan should be developed.<br>**Construction and Operations:**<br>➢ Monitoring reports on file<br>➢ Non-compliances reported and on file<br>➢ Operators certificates on file<br>➢ Schedule of road maintenance on file<br>➢ A register must be maintained of all training provided to staff.<br>➢ A register must be maintained for all safety equipment and medical supplies kept on site. This should include date of purchase and date of service/replacement for items that can expire or deteriorate with age.<br>➢ A register of all incidents must be maintained on a daily basis. This should include measures taken to ensure that incidents do not repeat themselves.<br>➢ File any incident reports.<br>➢ Include all monitoring information in the biannual environmental report.<br>**Mine Closure:**<br>At the time of mine closure and abandonment, the contractor must rehabilitate the mine site to the state agreed upon at the start of the agreement. Comparisons with the baseline report drafted at the start of the relationship must be made.<br>➢ Removal of **contractor's** movable assets i.e., plant equipment<br>➢ Demolishment of **contractor's** fixed immovable assets<br>➢ Removal of this demolished plant and building rubble by **contractor**<br>➢ **contractor** to fence off dangerously deep pits or holes in the ground that poses a threat to the public safety<br>➢ In accordance with the rehabilitation plan the steep side slopes may need to be blasted to change angle of repose. |

| | |
|---|---|
| | The **proponent** is to fulfil the same rehabilitation tasks as above for all the accessory works area, including infrastructure, pits and holes etc. |

## Table 5. Visual Impact Management Programme

| **Risk Event** | | **Changes to the aesthetic appeal of the area due to presence of people, vehicles and machinery. Visible changes to habitats due to human activities.** | | | | |
|---|---|---|---|---|---|---|
| **Description** | | The experience of enjoying the landscape free of human activities is considered highly desirable. Intrusions into the current scenery may be unwelcomed.<br>Impact to visual resources would be considered unfavourable if the landscape were significantly degraded or modified. The presence of mine personnel, vehicles and other equipment may reduce the aesthetic appeal of the area. | | | | |
| **Status** | | Negative | | | | |
| **Phases** | | Phases during which traffic, infrastructure and dust plumes which potentially play a role in visual nuisances are highlighted below; Significance assessment was carried out on the operational phase which presents a long-term risk. | | | | |
| **Construction Phase** | | **Operational Phase** | | **Decommissioning Phase** | **Post Closure** | |
| Cranes used to build mine infrastructure | | Infrastructure and Traffic | | Dismantling infrastructure with cranes | Barren mountain slopes and quarry scaring | |
| Additional traffic on the district road and mine access roads | | Ore haulage and Blasting creating dust plumes | | Denuded mountain slopes not revegetated | | |
| Dust plumes caused by mobile equipment operating at the mine | | Bare mountain slopes | | Demolishing buildings causing dust plumes | | |
| **Severity** | | Moderate / measurable deterioration. Recommended level will occasionally be violated. Widespread complaints. Noticeable loss of resources.<br>It is a remote area off the main tourism route. Migrant herdsman infrequently stay in the vicinity.. | | | | |
| **Duration** | | Reversible over time. Life of the project. Medium term<br>(Except for the quarries which will remain visible for the long term. | | | | |
| **Spatial Scale** | | Fairly widespread – Beyond the site boundary. Localised at best. Though this does depend on mobility of particles and prevailing weather conditions. The setting is rural and the only receptor currently is the nearby homestead. | | | | |
| **Probability** | | Definite (in terms of dust plume creation from blasting) and continuous (in terms of the barren mountain slopes until revegetated during post closure) | | | | |
| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
| **Unmitigated** | **L** | **M** | **M** | **M** | **H** | **M** |
| **Significance of Consequence** | | The two aspects for visual impact are under consideration:<br>**1.** Unless it is mitigated the generation of dust should have an influence on the decision to carry out the activity or not. However, natural weather conditions can also create very dusty atmospheric conditions. The mining and processing activities on site could contribute significantly to local atmospheric dust levels and will potentially affect the visual experience of the people staying nearby. Those communities staying along the transport route are affected by other road users too so this aspect is a cumulative impact. This aspect is considered a minor aspect and temporary in nature. | | | | |

| | |
|---|---|
| | **2.** The aesthetic changes to the landscape can be mitigated for all phases of the mining project. Alternatives have been considered which will reduce the visual impact of the mine on any who pass through the area. |
| **Prevention** | Dust creation cannot be prevented completely. Water is normally used to suppress dust on the roads. Blasting will be intermittent, and the plume will dissipate fairly rapidly. The bare mountain slopes cannot be avoided in the medium term and the quarries will be a permanent feature of the mine site.<br>For the operations, personnel, vehicles and machinery will operate within the area for the duration of the project. It is not possible to operate and have no visual presence. |
| **Mitigation Action** | Best practice methodologies for operations will be employed. These may include the following:<br>➢ Existing roads and tracks are used to access the mine site.<br>➢ Careful planning to disturb significant floral and faunal habitats when accessing the mining site<br>➢ Dust suppression using water will most likely not be practical due to the non-sustainability of ground water usage.<br>➢ Product transport should either be containerised or at least installed with covers<br>➢ Training personnel regarding the visible signs of faunal and floral biodiversity and the avoidance of habitat disturbance.<br>➢ Minimise the footprint of personnel, vehicles and machinery<br>➢ Rehabilitate habitats through the removal of obvious signs of human presence.<br>➢ Removal of waste on a daily basis and disposal of waste in the appropriate manner.<br>➢ Removal of machinery from the mining sites if periods of inactivity are prolonged.<br>➢ If lighting is required at night, lights need to be strictly controlled and fixtures should be low-glare lighting with downward facing directed beams.<br>➢ Constructed structures should have natural desert colours (medium-grey brown) so they can blend in the surrounding environment.<br>Often, the sites that are disturbed and rehabilitated at least from an aesthetic perspective will in time be recolonized by both plants and animals. The aim is to minimise the footprint so as to achieve the least impact due to anthropogenic influence. With respect to this the following has been considered:<br>➢ A reduction in the size or number of the WRDs.<br>➢ Location and design of WRDs to make them inobtrusive.<br>➢ Landscaping of quarry sites to reduce visual impact. |

| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
|---|---|---|---|---|---|---|
| **Mitigated** | **L** | **M** | **L** | **L** | **L** | **L** |

| | |
|---|---|
| **Significance of Consequence** | The dust suppression techniques if applied diligently and consistently will result in a low significance visual impact for the residents of the neighbouring farm homestead |
| **Confidence Level** | High, provided management implements the mitigation action and the company provides the necessary financial support to implement the changes required. |
| **Monitoring** | **Planning:**<br>Visual baseline in the form of a photo survey should be undertaken periodically as the project progresses. |

| | |
|---|---|
| | **Construction:**<br>➢ Carry out audits and report findings.<br>➢ Keep a visitors' log.<br>➢ Maintain existing access road.<br>**Operation:**<br>➢ Visual audit in the form of a photo survey should be undertaken periodically.<br>➢ Enforce strict rules on the use of lighting by personnel on site.<br>**Decommissioning:**<br>➢ Requirements for restricting or prohibiting access to the abandoned mine are implemented and records on file.<br>A visual audit can be done prior to closure so that a landscaping plan can be drawn up for incorporation into the closure plan. |

## Table 6. Land Use and Stakeholder communication Management Programme

| **Risk Event** | **Users and owners of the land could potentially experience restrictions to their constitutionally entitled liberties.** | | |
|---|---|---|---|
| **Description** | The mining claims are situated on land belonging to the government of Namibia granted to rural people in the form of communal land. The claims lie within the Ombazu Conservancy. The area falls within the Epupa Constituency but may be under the stewardship of Opuwo's rural constituency councilor.<br>The communities of neighboring villages lay claim to the grazing rights of the area. The leaders of the communities requested that the dangerous quarry area be made off limits to curious shepherd boys by means of fencing. This would also prevent livestock from unwittingly falling from the steep precipice. | | |
| **Status** | Negative | | |
| **Phases** | Phases during which potential conflicts may apply are highlighted below; Significance assessment was carried out on the operational phase which presents a long-term risk. Aspects where potential conflicts may arise are listed. | | |
| **Construction Phase** | **Operational Phase** | **Decommissioning Phase** | **Post Closure** |
| Access to site | Access to site | Access to site | Access to site |
| Visual impact | Visual impact | Visual impact | Visual impact |
| Access to groundwater resources / boreholes | Access to groundwater resources / boreholes | Access to groundwater resources / boreholes | Public safety |
| Public safety | Public safety | Public safety | Alternative uses for pit |
| Asset security | Asset security | Asset security | |
| Waste management | Waste management | Waste management | |
| **Severity** | Moderate / measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints. Noticeable loss of resources. | | |
| **Duration** | Reversible over time. Life of the project. Medium term | | |
| **Spatial Scale** | Fairly widespread – Beyond the site boundary. Localised at best. | | |
| **Probability** | Definte / continuous | | |

| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
|---|---|---|---|---|---|---|
| **Unmitigated** | **M** | **M** | **M** | **M** | **H** | **M** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Significance of Consequence** | | Mitigations to ensure no conflicts with landowners occur, will be necessary. | | | | |
| **Prevention** | | It is not possible to prevent all conflicts. Any unforeseen issues will be mitigated through the various mechanisms stipulated in the EMP | | | | |
| **Mitigation Action** | | The EMA requires that permission be provided by the competent authorities for the listed activity. The EIA has facilitated a transparent process by which concerns can be raised. The PPP has ensured that all stakeholders have been informed. The proponent is subservient to the conditions laid down by the guidelines / conditions and the law that upholds it. The implementation of the mining programme will be in accordance with the approved Environmental Management Plan (EMP).<br>The following mechanisms should be included in the environmental management system:<br>➢ Correspondence and agreements - document filing system<br>➢ Review memoranda of understanding annually<br>➢ Keep complaints register up to date<br>➢ Update stakeholders register regularly<br>➢ Engage landowners regularly to maintain open channels of communication<br>➢ Demarcate perimeter of mining areas to increase public safety | | | | |
| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
| **Mitigated** | **L** | **M** | **L** | **L** | **L** | **L** |
| **Significance of Consequence** | | Maintaining good relationships with landowners is imperative so that the severity and duration of disputes can kept low. This will ensure the probability is low. | | | | |
| **Confidence Level** | | The EAP is confident that a well-designed and well implemented stakeholder engagement programme will cover the land use conflicts that could potentially arise. | | | | |
| **Monitoring** | | The following mechanisms should be included in the environmental management system as monitoring tools and performance indicators:<br>➢ Correspondence and agreements - document filing system<br>➢ Review any memoranda of understanding annually<br>➢ Keep complaints register up to date<br>➢ Update stakeholders register regularly<br>Demarcate mining areas to ensure public safety<br>Provided local residents are hired then one can be more confident in achieving the medium significance. Through meaningful permanent employment economic development can be secured for all concerned.<br>Include the employee statistics in the annual audit showing long term trends. Project annual production report.<br>Ensure upgraded skills of employees during employment at mine is documented and accredited where possible so that skills are recognised with future employers. | | | | |

**Table 7. Heritage Related Impact Management Programme**

| **Impact Event** | **Heritage related impacts.** |
|---|---|
| **Description** | Kaokoland is a special place, and it is recognised for its world heritage and for the people who continue to live off the land there. It is expected that the area has important sites of national importance from a historical and pre-historic perspective.<br>The siting of graves, ritual sites, middens and other such important heritage aspects within the mining area need to be kept pristine for further study.<br>If these sites were damaged in any way, it would be considered a heritage impact and depending on the importance of the site result in a great loss were it damaged by mining. |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Nature** | Negative | | | | | |
| **Phases** | Phases for which the significance assessment was carried out is highlighted in green. It is the various personnel who could potential come across as yet to be documented find. | | | | | |
| **Construction Phase** | **Operational Phase** | | **Decommissioning Phase** | | **Post Closure** | |
| Construction personnel | Operational personnel | | | | | |
| Security personnel | Security personnel | | | | | |
| Residents | Residents | | | | | |
| **Severity** | undetermined as yet | | | | | |
| **Duration** | Not reversible over time. long term | | | | | |
| **Spatial Scale** | Localised to within the mining licences. | | | | | |
| **Probability** | Possible because no records known to proponent | | | | | |
| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
| **Unmitigated** | **H** | **H** | **L** | **H** | **L** | **M** |
| **Significance of Consequence** | A medium significance is expected. | | | | | |
| **Prevention** | Well trained staff who know what to look for during the construction and operational phases could prevent any destruction of important sites. | | | | | |
| **Mitigation Action** | Undertake a survey of the area with the help of local leaders to identify any place of importance before any construction starts.<br>Submit the survey report and apply for the necessary clearance from the Heritage Council to be able to start construction on the planned site.<br>Should anything come up during construction or operations then work should stop and the police should be informed. A member of the heritage council would need to assess the importance of the find and provide the necessary permission to continue with works at that specific site. | | | | | |
| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
| **Mitigated** | **L** | **M** | **L** | **M** | **L** | **L** |
| **Significance of Consequence** | A low significance is expected. | | | | | |
| **Confidence Level** | Provided all personnel are trained in the procedure of chance finds the destruction of anything important could be prevented. | | | | | |
| **Monitoring** | Include any chance findings in the bi-annual report. | | | | | |

## Table 8. Waste Management Programme

| **Risk Event** | **Waste Production** |
|---|---|
| **Description** | Waste is generated during the construction, operational and decommissioning phases of the mine's life. Waste can be classified into mineralised and non-mineralised waste. Non-mineralised waste can be classified as non-hazardous and hazardous waste. Medical waste is an additional category. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 1. **Non-Hazardous, non-Mineralised Waste includes:** metal cut offs, rubber, wood, product packaging, organic materials, glass, plastics, food scraps, cardboard/paper, used PPE, etc.<br>2. **Hazardous, non-mineralised:** Printer cartridges, sewerage, batteries, hydrocarbons (oils, grease), fluorescent lightings, etc.<br>3. **Medical waste:** Syringes, material with blood stains, bandages, etc.<br>4. **Mineral waste includes:** waste rock, tailings from mineral processing, rejects from beneficiation or concentration of other minerals, refinery or processing discards and sludges, smelter and other furnace slags, ashes, etc. (not all apply to this site but provided as examples) | | | | | |
| **Status** | Negative | | | | | |
| **Phases** | Phases during which waste will be produced are highlighted below; Significance assessment was carried out on the operational phase which presents a long-term risk. Receptors potentially affected by waste. | | | | | |
| **Construction Phase** | **Operational Phase** | | | **Decommissioning Phase** | **Post Closure** | |
| Company personnel health | Company personnel health | | | Company personnel health | General public health | |
| General public health | General public health | | | General public health | Groundwater | |
| Groundwater | Groundwater | | | Groundwater | Biodiversity | |
| Biodiversity | Biodiversity | | | Biodiversity | Soil | |
| Soil | Soil | | | Soil | Atmosphere - dust and other volatiles emitted from waste are covered under air quality impacts but there is some overlap with waste management risks | |
| Atmosphere | Atmosphere | | | Atmosphere | | |
| **Severity** | Moderate / measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints. Noticeable loss of resources. | | | | | |
| **Duration** | Reversible over time. Life of the project. Medium term | | | | | |
| **Spatial Scale** | Fairly widespread – Beyond the site boundary. Localised at best. | | | | | |
| **Probability** | Definite / continuous | | | | | |
| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
| **Unmitigated** | **M** | **M** | **M** | **M** | **H** | **M** |
| **Significance of Consequence** | The mining activities will generate waste. Preventative and Mitigating mechanisms are imperative | | | | | |
| **Prevention** | Some waste products of categories 1-3 that can potentially impact the listed receptors can be managed to prevent impacts. Some actions and company commitments that can prevent the impacts include the following:<br>➢ A waste management procedure should cover recycling, re-use, storage, handling, transportation and disposal<br>➢ Collection and disposal of waste must be effective enough to not impact any of the receptors<br>➢ If waste must be stored and separated on site then the activities must take place on sealed surfaces, within bunds and fenced areas, and made ready for transport off-site by packaging the waste in sealed containers | | | | | |
| **Mitigation Action** | Where waste product impacts on the receptors cannot be prevented the preventative measures above should still be employed so as to mitigate or reduce the impacts. Mitigations for the various receptors include the following:<br>➢ Personal protection equipment (PPE) can protect personnel from exposure to disease or toxic chemicals | | | | | |

| | |
|---|---|
| | ➢ Awareness training for company personnel and the general public will inform them of those wastes that may cause harm, pollute the soil, groundwater or air (if particulate)<br>➢ Some wastes are dangerous to fauna and flora; Animals should not be able to access the waste management area; waste must be contained so that it cannot enter the naturally vegetated areas beyone the accessory works area.<br>➢ Containerisation of highly volatile wastes should be actioned to reduce emissions but not so effectively that creates explosive risks if pressures build up. The latter may occur if the containers are stored outside in the heat of the sun.<br><br>A waste management programme should keep records in the form of an inventory of waste products collected, sorted, stored, recycled, re-used or disposed. Certificates for disposal of hazardous waste should be filed.<br><br>The mineral waste (category 4 above) will most likely only be waste rock that cannot be processed for product. This waste rock will be dumped or stockpiled on site and be used in the rehabilitation at decommissioning.<br><br>Sewerage created at the camp or management offices either needs to be deposited directly into approved and permitted French drains or removed offsite. If the latter is to be done then sealed sewerage tanks are required. The regulations under the Water Resource Management Act need to be consulted with regards to the erection of French drains near water courses. They cannot to be constructed within 100m of the banks of a water course.<br><br>Storage of hazardous liquid waste must by law follow industry standards. These standards will be communicated in fuller details by the fuel supplier. Ideally, self 110% bunded containers should be brought to site and placed upon sealed surfaces with waste collection sumps. Fuel collection should be carried out upon the same sealed surface with slopes for runoff into the sumps. At the mining claim itself a similar bunded surface must be constructed where fuel from a bowser can be transferred.<br><br>An oil water separator and wash bay could be constructed in conjunction with fuel dispensing to reduce costs and the concretised footprint. Regardless of this the oil water separator is a requirement to ensure hydrocarbons do not enter the environment indiscriminately. The workshop also needs to be constructed on a sealed surface and have liquid waste sumps so that spills can be collected and removed from site on a regular basis. A sealed waste oil contain should be constructed at the vehicle workshop. Regular removal of oil to recyclers is advised. All hazardous liquid waste should be stored on sealed surfaces |
| **Rehabilitation** | If the mitigation hierarchy is followed, rehabilitation may or may not be required. Should an accident occur during the process of collection, storage or disposal of waste and no mitigation be actioned then one of the receptors may be impacted. Consequently, the following examples of rehabilitation may be required:<br>➢ A person who is exposed to disease or toxic waste, which results in harm, will need medical attention<br>➢ Soil which is contaminated by used hydrocarbons needs to be relocated to a remediation cell where the addition of fertiliser, air and water will within a year be suitable for re-use<br>➢ In the event of groundwater contamination by chemicals or hydrocarbons, the sinking of a borehole or the excavation of a pit in the vicinity of the contaminate source will allow the pumping of the groundwater into a holding dam. Through the continued pumping a cone of depression will draw the contaminated water towards the pump. The collected contaminated water can be discarded at a registered hazardous waste site or if separable the contaminant can be removed from the water before disposal. The reclaimed water could be pumped back in the pit or borehole. |

| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
|---|---|---|---|---|---|---|
| **Mitigated** | **L** | **M** | **L** | **L** | **L** | **L** |

| | |
|---|---|
| **Significance of Consequence** | If the mitigation hierarchy is followed through to rehabilitation, then the resultant consequence could be insignificant. |
| **Confidence Level** | A well designed and well implemented waste management programme will provide the necessary confidence that the risks to receptors will be of low significance. |
| **Monitoring** | **Planning:**<br>➢ Waste Management Plan on file.<br>➢ Accessory works application submitted, and receipt kept on file.<br>➢ Accessory works plan on file.<br>➢ Application for effluent discharge submitted to competent authority and receipt on file.<br>➢ Maintenance plan on file.<br>**Construction:**<br>➢ Monitor compliance and file report.<br>➢ Hazardous waste certificate from hazardous waste dump on file.<br>**Operations:**<br>**Monitoring:**<br>➢ **Regular** inspection of waste collection and disposal areas.<br>➢ Check and file waste disposal slips.<br>➢ Compile all monitoring information in an **annual** report and audit this report against the waste management plan.<br>➢ Emergency Response Plan on file.<br>➢ Hazardous waste disposal certificate on file.<br>➢ Monitor maintenance workshop and wash bays for compliance and file reports.<br>**Performance Indicators:**<br>➢ Availability of plan<br>➢ Extent to which plan is complied with<br>➢ Presence of litter within the area and surrounding land<br>➢ Availability of rubbish bins and skips<br>➢ Total volume of general and hazardous waste storage capacity<br>➢ Total volume of general and hazardous waste stored on site<br>➢ Degree to which different waste is separated<br>➢ Frequency of waste collection<br>**Decommissioning:**<br>Monitor compliancy and report on file. |

## Table 9. Biodiversity and Ecological Management Programme

| **Risk Event** | **Mining activities may affect biodiversity of fauna and flora directly or through habitat alteration.** |
|---|---|
| **Description** | Through mining in general there is potential for impacting the diversity of species within the various habitats by reducing population numbers of certain species. Pressures on the population numbers can potentially lead to a reduction of a population within an area causing the species to no longer exist within that area. Should a species be endemic to that same area then the risk of extinction is high. Habitats can be severely altered potentially changing the type of habitat or leading to the removal of micro habitats.<br>No specialist fauna and flora studies have been commissioned for the mining claims. However, the site visits and reference to studies carried out elsewhere in the area reveals that the habitat and the flora present in the claims are not endemic to claims but are common throughout the Kunene. Fauna biodiversity, though dependent on these habitats in the claims, is relatively more mobile and less likely to be impacted by the mining activities.<br>**Fauna:**<br>A. **Potential destruction of habitats and organisms** could take place during construction and operations, construction and use of roads by vehicles and machinery, clearing of land, building of infrastructure, within laydown areas, |

around water tanks, at accommodation, around human activities, during blasting and earthmoving, around vehicle movements, and the operation of machinery. The potential impact could be as follows:

- Death of animals that are struck by earthmoving equipment, vehicles and machinery.
- Death of animals due to poaching.
- Bird nests, nesting habitats and feeding habitats are destroyed, affecting the viability of bird populations.
- Parts of territory and home ranges are destroyed.
- Dust creates conditions for health decline in plants and animals.
- Noise disturbs animals and causes increase in stress.

B. **Potential disturbance of animals and interference with their behaviour** during operations, when infrastructure and roads form obstacles to the directional movement of animals, when an increase in human and vehicle presence and movement results from mining activities, as a result of loud noises caused by blasting and the operation of heavy machinery. The potential impact could be as follows:

- Larger mammals and birds are the taxa most likely to be affected.
- The loss of migration corridors causes stress and an increased risk of death to various taxa.
- Animals could fall in the quarry.
- Birds and eggs could be poached.
- Animals, particularly birds, are disturbed while going about their daily activities, such as feeding, roosting and breeding.
- Dust creates conditions for health decline in plants and animals, and an increase in stress for animals.
- Noise disturbs the normal behaviour of animals, specifically mammals.

C. **Alteration of topography** during construction and operational phases can occur as a result of excavation of the ore bodies leaving a deep, open pit or several smaller quarries on the mountain. The processing plant and waste stockpiles will create large heaps of material on the surface of the landscape. This impact acts on the level of ecosystems and could result in the following:

- Direct destruction of habitat and organisms.
- Obstruction to the movement of animal populations.
- Fragmentation of habitat, leading to the loss of migration corridors for various taxa, in turn resulting in
- The loss of individual organisms and potentially populations.

D. **Potential light pollution as result of light sources** that are visible outdoors in the accessory works area and in the mining area. This can impact in the following ways:

- Invertebrates that are attracted to the light provide an unnatural food source for taxa such as bats, geckos, nightjars and frogs. These insectivores are attracted to the food and then face conditions where they are more likely to die from causes such as collisions and predation.
- Invertebrates could die every night from exhaustion or predation, potentially disrupting their population numbers and causing disturbances in ecological processes.

**Flora:**

Site visits, as well as reference to studies carried out at the area and elsewhere along the Steilrand Mountains reveal that the habitat and the flora present within the claims area are not endemic to those areas. The habitats and flora are either common throughout the Kaokoland and if restricted in distribution or to particular micro habitats, they do occur outside the mining areas.

Particular habitats within the planned mining claims area are more diverse both in terms of niches and species. The middle and upper slopes and gorges of the Steilrand Mountains are more species rich. Any major alteration or destruction of these habitats would rate the impact as substantial with respect to habitat loss as more species would be affected. No species extinction is expected from the mining activities.

Ecological functioning can be disturbed as plant populations of species are reduced, affecting the availability of food, shelter and building material for faunal species.

| | | | | | | |
|---|---|---|---|---|---|---|
| | Reduction in the populations reduces the amount of seed needed to sustain the long term regeneration of the plant populations.<br>A. Mining activities may affect the ecology of the flora directly through **habitat alteration or destruction** within the planned mining claim and accessory works area<br>B. Mining activities may affect the diversity of flora | | | | | |
| **Status** | Negative | | | | | |
| **Phases** | Phases during which mining activities may impact the ecology and biodiversity are highlighted below; The significance assessment was carried out on both the construction and operational phases which presents a long term risk. | | | | | |
| **Construction Phase** | **Operational Phase** | | **Decommissioning Phase** | | **Post Closure** | |
| Flora | Flora | | Flora | | Flora | |
| Fauna | Fauna | | Fauna | | Fauna | |
| Habitat | Habitat | | Habitat | | Habitat | |
| **Severity** | Moderate / measurable deterioration. Noticeable loss of resources. | | | | | |
| **Duration** | Reversible over time. Life of the project. Medium term | | | | | |
| **Spatial Scale** | Localised - Within the site boundary | | | | | |
| **Probability** | Possible/frequent | | | | | |
| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
| **Unmitigated** | **M** | **M** | **L** | **M** | **M** | **M** |
| **Significance of Consequence** | The mining activities will alter the habitats that previously existed. Soil and flora will be removed. Majority of fauna will relocate and compete for resources in adjacent habitats. Dust and lighting will also impact ecosystem. Mitigating & rehabilitation mechanisms are imperative. | | | | | |
| **Prevention** | Not possible as at least many specimens of the most common taxa found in the district will be removed during construction activities and quarry pit expansion. | | | | | |
| **Mitigation Action** | The planned spatial extent of the excavation is about 20m wide, 20m deep and up to 450m long. This amounts to a maximum of about 7% of the claim areas. The claims mainly span the slopes and steep terrain in the project area which constitutes one type of habitat. This means that the mountain habitat area that will be affected is only a small portion of this overall habitat and will leave ample mountain habitat for the commiphora trees habitat. Fauna will still be able to move freely along the ridge along the east west axis.<br><br>The planning of the mine layout must endeavour reduce the footprint to a minimum without compromising the realistic needs of the business operation and making decisions that will safeguard against indiscriminate habitat alteration. If any top soil exists then this should be stockpiled for use during rehabilitation.<br><br>Engage interested stakeholders to participate on site in the rescue and relocation of indigenous and protected flora.<br><br>Awareness training for personnel will focus on:<br>➢ Training all personnel to limit the habitat alteration during the construction and operational phases of the mine<br>➢ Teach knowledge and understanding of the fauna and flora and their ecology<br><br>The following basic rules should be adhered too:<br>➢ No killing or capturing of animals<br>➢ No littering<br>➢ No speeding<br>➢ Driving only on existing roads (national roads and roads created by the mine inside the gravel mining area. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | ➢ No collection of fire wood; NB: the Forestry Act makes it an offence to harm or damage any plant in or within 100m of a river-course; | | | | |
| **Rehabilitation** | | The scope of the rehabilitation at mine closure should be applied to the accessory works areas as defined above. However, it is not expected that the quarry pit itself can be filled up. There might be a possibility to terrace or slope the sides of the pit and to enhance safety but this planning must become part of the mine closure plan. The following aspects should be considered when finalising the mine closure plan:<br>➢ The waste rock dumps should be used to landscape certain aspects of the accessory works area.<br>➢ Contouring of waste facilities to facilitate establishment of vegetation in future<br>➢ The stockpiled soil should be used to cover areas for the re-establishment of natural vegetation.<br>➢ Funds for rehabilitation should be set aside from the start of the operational phase.<br>➢ Reasonable and acceptable ways of rehabilitation should be implemented on an ongoing basis as well as at the time of site closure.<br>➢ Where soils have been affected by spillages such hydrocarbons, these soils should be stockpiled and appropriately treated to regulate the contamination levels prior to being used for rehabilitation purposes.<br>➢ A plant nursery for running trials should be established at the start of the operational phase. | | | | |
| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
| **Mitigated** | **L** | **M** | **L** | **L** | **L** | **L** |
| **Significance of Consequence** | | If the mitigation hierarchy is followed through to rehabilitation, then the resultant consequence could be insignificant. | | | | |
| **Confidence Level** | | A well designed and well implemented rehabilitation programme will provide the necessary confidence that the altered habitats could be rehabilitated at mine closure to a degree that the final footprint of the mine will be acceptable. | | | | |
| **Monitoring** | | **Planning:**<br>➢ Bush clearing permits must be applied for prior to clearing of any areas.<br>➢ Environmental Clearance Certificate is on file<br>➢ Schedule for developing EMS documentation is on file.<br>➢ Visual baseline imagery to indicate which plant species preferred which habitats.<br>➢ Train personnel regarding the impact on the surrounding habitats.<br>➢ Plan mine layout to reduce the footprint size and thereby conserve more biodiversity<br>**Construction & Operation:**<br>➢ Monitor compliance and file report.<br>➢ Mine closure plan to be developed and put on file.<br>➢ Rehabilitation of cleared areas to be planned and put on file. (use baseline imagery for planning)<br>**Decommissioning:**<br>➢ Monitor compliance and file report.<br>Compare final revegetation layout with visual baseline imagery | | | | |

## Table 10. Water Resource Management Programme

| **Risk Event** | **Mining activities may affect water resources through over utilisation or contamination** |
|---|---|
| **Description** | Water will be needed for drinking, personnel ablutions and minimally also for mine processing. The proponent does not expect to use much water on site, hence It is |

| | | | | | | |
|---|---|---|---|---|---|---|
| | suggested that amounts of water can be sourced from Opuwo or from one of the site neighbours and then be trucked to the site, as there is no existing infrastructure on site for the water utility company, this is the preferred option. If for any reason more water is required then the proponent suggests abstraction of water from the ground, which can be done at minimal extraction cost, a borehole can be sunk to augment supply volumes.<br><br>The feasibility of each option must be weighed up. This depends largely on the supply capabilities of the source and the demand of the mine. Typically, the water demand for the mine site will be at least 3000$m^3$ per month.<br><br>Water is a scarce resource and needs to be used sustainably. Groundwater reserves should not be depleted below an acceptable level if boreholes are used.<br><br>The groundwater or infrequent surface water flow (adjacent river) is at risk of contamination by sewerage, chemicals and hydrocarbons that are not contained properly. | | | | | |
| **Status** | Negative | | | | | |
| **Phases** | Phases during which mining activities may impact the water resources are highlighted below; The significance assessment was carried out on the operational phase which represents the longest term where risks are present. | | | | | |
| **Construction Phase** | **Operational Phase** | | **Decommissioning Phase** | **Post Closure** | | |
| Surface water (ephemeral rivers) | Surface water (ephemeral rivers) | | Surface water (ephemeral rivers) | Receptors should no longer be at risk as abstractions should have ceased and all potential contamination sources would have been removed | | |
| Groundwater (via borehole abstraction or unconsolidated soils and rock fractures) | Groundwater (via borehole abstraction or unconsolidated soils and rock fractures) | | Groundwater (via borehole abstraction or unconsolidated soils and rock fractures) | | | |
| **Severity** | Substantial deterioration (death, illness or injury). Recommended water levels level could often be violated. Irreplaceable loss of resources should the groundwater be contaminated. | | | | | |
| **Duration** | Permanent. Beyond closure. Long term. | | | | | |
| **Spatial Scale** | Fairly widespread – groundwater and surface water can potential convey impacts beyond the boundary of the mining claims | | | | | |
| **Probability** | Definite / continuous | | | | | |
| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
| **Unmitigated** | **H** | **H** | **M** | **H** | **H** | **H** |
| **Significance of Consequence** | A high significance is expected if no mechanisms along the hierarchy of mitigation continuum are implemented. | | | | | |
| **Prevention** | Water abstraction from a borehole can be stopped immediately when the permit stipulated depth is reached. This will prevent overutilization of the resource. Pollutants entering the groundwater and surface water receptors can be prevented. In reality, this would mean that any pollutants brought to site must be handled in such a way that no accidental spillages onto the ground occurs. In practice, the probability of this being humanly possible is slim. By definition, accidents happen. There will be no discharge of wastewater from the mine. Therefore, there will be minimum pollution as far water quality is concerned. | | | | | |
| **Mitigation Action** | With regards water abstraction from boreholes, a monitoring programme is required so as to manage the water level fluctuations sustainably. Abstraction must be stopped if the sustainable use cannot be maintained.<br><br>To mitigate against the accidental spillage of pollutants it is necessary to construct sealed surfaces with drains (eg. oil water separators in the case of hydrocarbons) and bunds. These serve for dispensing or distribution sites and storage sites respectively. | | | | | |

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|---|---|
| | Drip trays are another example of a means to prevent spillage onto the ground when emergency maintenance work can only be carried out away from the designated areas.<br><br>Process water at the mine will be used in a closed system (from tanks). Water should be recycled on site and no discharge of waste water should be planned.<br><br>Ablution facilities should have correctly sized design criteria, to ensure that effluent discharge meet the requirements set by the Department of Water Affairs. |
| **Rehabilitation** | Should the water levels in the boreholes not re-establish a level which was measured at the start of the mining operations, and it can be shown that this is due to mining activity alone and not due to other factors then abstraction must be stopped permanently. The Department of Water Affairs would need to advise on whether this will be effective.<br><br>Any polluted soil, surface water receptors or groundwater will need to be rehabilitated:<br>1. Soil can be remediated or disposed of at a registered hazardous waste site<br>2. Surface water receptor (standing or flowing water to be impounded and pollutant separated if possible, or sandy substrate of riverbed removed and remediated or disposed as above)<br>3. Groundwater abstracted at site of pollution until no pollutants remain (in case of hydrocarbon fuel the fuel can be separated and the water cleaned and used for grey water applications) |

| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
|---|---|---|---|---|---|---|
| **Mitigated** | **M** | **M** | **L** | **M** | **L** | **L** |

| | |
|---|---|
| **Significance of Consequence** | If the mitigation hierarchy is followed through to rehabilitation, then the resultant consequence could be insignificant. |
| **Confidence Level** | A well designed and well implemented mitigation programme alone should provide for a low significance. Rehabilitation will provide greater confidence that if polluted, the receptors could be rehabilitated before or at mine closure. |
| **Monitoring** | Monitor groundwater level, rainfall, and abstraction daily.<br><br>Groundwater levels monitoring is recommended for the proposed new boreholes. Water levels are to be measured, preferably by using pressure transducers.<br><br>Monitoring Monitor field water quality parameters of downstream aquifer, seepage (TSF, waste dumps, containment dam); quarterly sampling and analyses<br><br>The following recommendations are made for the water quality monitoring.<br><br>➢ Water quality monitoring will include the following well head parameters for all water points. Well head chemistry parameters would include pH, EC, temperature, and alkalinity. Monitoring will be carried out in-house at one-month intervals.<br>➢ The above parameters will be monitored also on the ponding on the storage /evaporation dam and outflow, if any, from the tailings and waste rock dumps.<br>➢ Bi-annual sampling and analyses of water chemistry is to be done during the initial year of operation from the supply boreholes, storage / evaporation dam, and any water point established in the future downslope of the mine.<br>➢ Reassessment of sampling parameters and frequency of the sampling is recommended after 1 year of operation.<br>**Planning:**<br><br>➢ Water Management Plan on file<br>➢ Application for effluent discharge submitted to competent authority and receipt on file<br>➢ Water abstraction permit on file<br>➢ Keep water abstraction permit and effluent discharge permit on file<br><br>**Construction & Operations:**<br><br>➢ Monitor compliance and file report<br>➢ All certificates for hazardous waste disposal filed. |

| | |
|---|---|
| | ➢ Checklists and schedule for auditing compliance to the EMP are filed.<br>➢ Reports are filed.<br>➢ Awareness training attendance lists signed and filed<br>➢ Monitor oil water separators, oil sumps, bunds and assess compliance and file reports.<br>➢ Monitor water use and report on file.<br><br>**Decommissioning:**<br><br>Monitor rehabilitation and report on file. |

## Table 11. Socio-Economic Management Programme

| **Risk Event** | | **Positive aspect of sustaining employment in the sector.** | | | | |
|---|---|---|---|---|---|---|
| **Description** | | The mining to be carried out at the barite mining claims will employ about 40 personnel (including haulage truck drivers) to be employed by the contractor to manage the excavation, crushing, milling, screening and transportation processes. A security team of 3 personnel will also be employed. Families whose members can benefit from this project through employment permanently employed enjoy greater emotional and physical security.<br>The baseline survey showed that the immediate (radius of 3km) surrounding area is only sporadically resided upon. The negative social impact is deemed negligible and the positive aspects of the mine on the economic benefits outweigh any negative aspects. | | | | |
| **Status** | | Positive | | | | |
| **Phases** | | Phases during which mining activities may contribute to the local economy are highlighted below; The significance assessment was carried out on the operational phase which represents the longest term when benefits are greater. | | | | |
| **Construction Phase** | | **Operational Phase** | | **Decommissioning Phase** | **Post Closure** | |
| Construction personnel | | Operational personnel | | Demolition personnel | No employment | |
| Secuirty personnel | | Security personnel | | Security personnel | | |
| Support services | | Support services | | Support services | | |
| **Severity** | | Substantial improvement. Will be within or better than the recommended level. Favourable publicity. | | | | |
| **Duration** | | Reversible over time. Life of the project. Medium term | | | | |
| **Spatial Scale** | | Fairly widespread – Beyond the site boundary. Local | | | | |
| **Probability** | | Possible/ frequent | | | | |
| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
| **Unmitigated** | **M+** | **M+** | **M+** | **M+** | **M+** | **M+** |
| **Significance of Consequence** | | A medium positive significance is expected. | | | | |
| **Prevention** | | Economic benefits could be prevented locally if no local residents are employed, and all materials and equipment is imported from other towns in the region and beyond.<br>Actions that will prevent the positive impact of employment creation for this project would be the no go alternative due to either a fatal flaw from a socio-economic or biodiversity impacts being of high significance.<br>Retrenchment of permanently employed can be avoided by diversifying the business options in the construction industry. | | | | |
| **Mitigation Action** | | At least 50% of the personnel should be hired from the local resident pool. | | | | |
| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
| **Mitigated** | **M+** | **M+** | **M+** | **M+** | **H+** | **M+** |
| **Significance of Consequence** | | A medium positive significance is expected. | | | | |

| | |
|---|---|
| **Confidence Level** | Provided local residents are hired then one can be more confident in achieving the medium significance. Through meaningful permanent employment economic development can be secured for all concerned. |

## Table 12. Traffic Impact Management Programme

| **Impact Event** | | **Transporting bulk barite by trucks (PBS) along national roads** | | | | |
|---|---|---|---|---|---|---|
| **Description** | | The potential impacts of the haulage of bulk barite can be categorised in terms of public safety and capacity of the road to handle 67 tonne vehicles.<br>For public safety the proponent or contractor must abide by the rules and regulations that are enforced by the Roads Authority. The vehicles need to be routinely checked for road worthiness and the containment of the goods needs to be such that no harm may come to the public and other road users during the transit from the mine to the port of Walvis Bay. No product may be strewn along the roadside as part of the normal transit. Covers over bulk transporters must be adequate at all times. Drivers must follow the rules of the road at all times. Additionally, the route provides for adequate visibility on hills and turns and that the road will be safe for two-way traffic at all times except where single traffic bridges exist.<br>The capacity of the whole road should be such that the surface is not damaged as a result of the load beyond the normal wear and that the bridges to be crossed have the integrity to handle multiple crossings at the frequency expected. A route might need to be altered should a bridge not be sufficiently strong to handle the 67 tonne laden vehicle. Additionally, the frequency of trucks per day is such that it does not exceed the threshold that was originally designed for the route. | | | | |
| **Nature** | | Negative | | | | |
| **Phases** | | Significance assessment was carried out on the operational phase which represents the period the road, road users and the general public are exposed to the hazard. | | | | |
| **Construction Phase** | | **Operational Phase** | | **Decommissioning Phase** | **Post Closure** | |
| | | Public safety – pedestrians and road users<br>Road design – surface integrity and bridge strength<br>Regulations – mass of vehicles when fully laden and permits | | | | |
| **Severity** | | Moderate / measurable deterioration. Noticeable loss of resources. | | | | |
| **Duration** | | Medium term. Life of Mine. | | | | |
| **Spatial Scale** | | Widespread – Far beyond site boundary. National | | | | |
| **Probability** | | Possible/ frequent | | | | |
| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
| **Unmitigated** | **M** | **M** | **H** | **H** | **M** | **H** |
| **Significance of Consequence** | | Mitigations to reduce risks to Public Safety are imperative. | | | | |
| **Prevention** | | The removal of all hazards will not be possible. | | | | |

| | |
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| **Mitigation Action** | As far as public safety is concerned it is not possible to prevent all incidents from occurring completely, but the probability can be reduced if the following aspects are considered: -<br>➢ Draw up operational procedure manual<br>➢ Provide road safety awareness training<br>➢ Establish specific rules for driving including travelling speed and rest times.<br>➢ Devise and implement emergency response plans<br>➢ Close coordination with the traffic authorities to ensure road safety signs are strategically placed and ensure all employee drivers are well trained<br>➢ Provide easy access to Material Safety Data Sheets (MSDS) for drivers<br>➢ Provide first aid training<br>➢ Devise emergency medical procedures for all eventualities<br>➢ Undertake daily safety reminders and/or drills<br>➢ Establish regulations for handling fuel<br>➢ Establish and implement measures to exclude discharge of barite particulates during travel<br>As far as capacity is concerned the frequency and of trucks must be maintained at the stated daily rate and there should be at least 2 km travelling distance between trucks. Only one truck should travel over a bridge at any one time. Avoidance of travelling during peak times on busy sections of road should be practiced. |

| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
|---|---|---|---|---|---|---|
| **Mitigated** | **M** | **M** | **H** | **M** | **L** | **M** |

| | |
|---|---|
| **Significance of Consequence** | If all the mitigations listed are implemented, then the significance will be maintained at medium. |
| **Confidence Level** | The significance would be lower had the spatial extent not been over such a long stretch of road. |
| **Monitoring** | A complaints register should be opened and maintained.<br>All necessary permits should be on file and maintained in accordance with the required renewal periods. |

## Table 13. Mine Closure & Rehabilitation Management Programme

| **Risk Event** | **Abandonment of the mining site potentially exposes public and wildlife to hazards** | | |
|---|---|---|---|
| **Description** | When a mining area is abandoned the infrastructure and altered landscape can affect the safe access of wildlife and public if not rehabilitated. The altered habitat may or may not promote the re-establishment of organisms once found there. Visual rehabilitation to the original state is not always practical due to economic factors. | | |
| **Status** | Negative | | |
| **Phases** | Phases during which decommissioning, and mine closure may impact public safety, future ecosystem functioning for domestic livestock and wildlife, economic stability and social health, and asset security. The significance assessment is carried out for the post closure phase. | | |
| **Construction Phase** | **Operational Phase** | **Decommissioning Phase** | **Post Closure** |
| Not applicable | Not applicable | Ecosystem functioning | Ecosystem functioning |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Public safety | Public safety | |
| | | | | Economic uncertainty | Social challenges of unemployment | |
| | | | | Asset security | | |
| **Severity** | | Substantial deterioration after mine closure with respect to aspects listed above. | | | | |
| **Duration** | | Permanent. Beyond closure. Long term. | | | | |
| **Spatial Scale** | | Fairly widespread – Beyond the site boundary. Local | | | | |
| **Probability** | | Definite / continuous | | | | |
| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
| **Unmitigated** | **H** | **H** | **M** | **H** | **H** | **H** |
| **Significance of Consequence** | | A high significance is expected if no mitigation mechanisms are implemented. This is a worst-case scenario where no alternative uses of the altered habitat is considered.<br>In terms of economic benefits lost, it is important to note that the longer the mine stays open the longer the benefit to the community which if the mine did not start up would not have been realised in the first place. | | | | |
| **Prevention** | | The resources are finite and so decommissioning is inevitable at some point. The degree to which the impact of closure will have will depends on the mitigations that can be considered.<br>Ecosystem functioning of the whole area cannot return to baseline conditions unless the excavated quarry is refilled and the area revegetated to baseline conditions. This is not practical<br>Public harm can be prevented provided the area is secured and the risky hazards are inaccessible.<br>Jobs within this sector will be lost. This cannot be prevented unless the employees move with the company to the next site.<br>Theft and damage to equipment can be prevented during the decommissioning phase provided good security prevents any form of criminal behaviour by disgruntled employees. | | | | |
| **Mitigation Action** | | Visual impacts can be mitigated through a thorough removal of all infrastructure.<br>The reduction in the size of the mine footprint during operations and decommissioning increases the probability that more habitat will become fully functional when the mine closes.<br>Secure fencing around the hazardous quarry pit could prevent accidents from occurring but the permanent and visually acceptable barrier to humans and wildlife would be required to prevent injuries due to falling from heights. Access down into the pit could be allowed provided there is no risk from falling rocks.<br>The access road leading to the pit, waste rock dumps areas should be closed off to the public except to those that need access to the facilities for inspection after closure. Wherever there are safe access roads that are useable by the owner / neighbours, these should be left.<br>Alternative sources of income from the mining claim area could provide alternative sources of income. The establishment of a plant nursery during the life of mine for the purpose of revegetating rehabilitated areas, could remain functional after closure and sell indigenous shrubs and trees to the public and other nurseries around the country. This would also mean that a continued presence at the mine site will further secure public safety.<br>Some infrastructure could remain if alternative uses for buildings could be found.<br>When the mine closes the losses of employment will have a negative economic effect on the livelihoods of the workers and the region. To mitigate this impact all stakeholders | | | | |

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| | should be notified about the mine closure three years prior to mine closure, as it will counter this impact during the decommissioning and closure phases of the operations. |
| **Rehabilitation** | Reasonable rehabilitation of the mine site should take place. The Proponent will be responsible to put aside funds for rehabilitation.<br>Rehabilitation of the abandoned mining area will amongst other things include the following:<br>➢ All movable assets to be removed off site<br>➢ All waste to be removed from site to prevent later potential excavation by people trying to recover any sort of usable scrap / materials<br>➢ All immovable machinery to be dismantled and removed from site<br>➢ Possibly create shallow sloped sides of quarried areas<br>➢ Waste rock dumps are used in landscaping<br>➢ All stockpiled topsoil will be re-laid on the landscaped areas.<br>➢ Designed landscaped areas to be revegetated with plants from the nursery<br>➢ Finally erect fencing or barriers to prevent access by public or animals to cliff faces of the quarried pits |

| **Mitigation** | **Severity** | **Duration** | **Spatial** | **Consequence** | **Probability of Occurrence** | **Significan** |
|---|---|---|---|---|---|---|
| **Mitigated** | **L** | **M** | **L** | **L** | **L** | **L** |

| | |
|---|---|
| **Significance of Consequence** | If the mitigation hierarchy is followed through to rehabilitation, then the resultant consequence could be insignificant or at worst a low significance. |
| **Confidence Level** | A well designed and well implemented mine closure plan should provide for a low significance upon mine closure. |
| **Legal** | **Risks associated with abandoning a mine without rehabilitating according to an approved plan:**<br>**<u>Minerals Act: Section 54</u>**<br>Any person who contravenes or fails to comply with the provisions of subsection (2) shall be guilty of an offence and on conviction be liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.<br>**Contractual Agreements**<br>The Contractor's failure to meet the obligations as stipulated in the contractual agreement with regards to rehabilitation will incur penalties to the value of the cost of rehabilitating the quarry and works area to a state agreed upon by the Contractor and Proponent at the start of the contractual agreement.<br>**Abandonment of mining areas**<br>The holder of a licence may abandon the mining area by notice in writing addressed and delivered to the Commissioner who in turn will notify the license holder that the mine has been abandoned as from the date of the cancellation notice.<br>(2) The holder of the mineral licence to which such area relates shall:<br>➢ demolish any accessory works erected or constructed by such person in such area, except in so far as the owner of the land retains such accessory works on such conditions as may mutually be agreed upon between such owner and person and remove from such land all debris and any other object brought onto such land. |

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| | ➢ take all such steps as may be necessary to remedy to the reasonable satisfaction of the Minister any damage caused by any mining operations carried on by such holder to the surface of, and the environment on, the land in the area in question.<br><br>The abandonment of a mining area shall not affect any legal proceedings instituted against such holder or any obligation or liability of such holder in terms of the provisions of the Act. |
| **Monitoring** | At the time of quarry closure and abandonment the contractor must rehabilitate the mine site. In general, as discussed above the following must be monitored:<br><br>➢ Removal of movable assets i.e., plant equipment<br>➢ Demolishment of fixed immovable assets<br>➢ Removal of this demolished plant and building rubble<br>➢ Fence off dangerously deep pits or holes in the ground that pose a threat to the public safety<br>➢ The proponent is to fulfil the same rehabilitation tasks as above for all the accessory works area, including infrastructure, tailings, pits and holes etc. which they created before the contractor began works in the quarry area.<br>➢ The proponent should regularly engage with the affected communities and stakeholders to record and respond to any grievances that may arise because of the project impacts and implement a monitoring process that seeks for feedback from stakeholders on the rehabilitation process.<br><br>A **mine closure and rehabilitation plan** and associated checklists must be followed and signed off at each stage of the mine closure/rehabilitation process. |

## APPENDIX A

# PROOF OF SUBMISSION OF BIANNUAL ENVIRONMENTAL REPORTS (MCs 70070 – 70073)

## 2022 - 2024

COPY
COPY

# ENVIRONMENTAL REPORT (ER)
# (Mining Claim Holder)
# MCs 70070, 70071, 70072, and 70073

**INSTRUCTIONS:**

1. An Environmental Report shall be submitted to the Ministry of Environment and Tourism (MET) by the following dates each year: -

**July to December 2022**

2. This form shall be the minimum reporting format. Mining Claim Holders are expected to attach a map of the area to this report. Mining Claim Holders are welcome to attach any other information they like, such as copies of new agreements, letters of explanation, aerial photographs, or anything else of interest.

3. The map shall be used to indicate the following:

* areas where activities has taken place,
* roads or tracks made and/or used,
* houses and other infrastructure erected,
* excavations or other scars that have been rehabilitated,
* conflict areas, etc….

MINISTRY OF ENVIRONMENT FORESTRY AND TOURISM
DIRECTORATE OF ENVIRONMENTAL AFFAIRS
15 MAR 2023
Tel: 061 284 2701
RECEIVED 2
Signature: J. Mupindi

4. It is recommended (but not compulsory) that Holders attach photographs to their report, which visually illustrate the activities described in their report.

5. Failure to submit an Environmental Report shall constitute a breach of the Environmental Contract, which could result in steps taken against the Holder.

6. All information contained in the Environmental Report shall be treated as confidential.

7. The Holder shall ensure that all the information recorded in the Environmental Report is, to their best knowledge, accurate and correct.

**Completed Environmental Reports should be sent to:**

**Ministry of Environment, Forestry and Tourism**
**Private Bag 13306**
**Windhoek**

**For Attention: Mr. Mr. Timoteus Mufeti– Environmental Commissioner**

COPY

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DIRECTORATE OF ENVIRONMENTAL AFFAIRS
26 JUL 2023
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Signature:.....

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# Steilrand Barite

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MINISTRY OF ENVIRONMENT, FORESTRY AND TOURISM
DIRECTORATE OF ENVIRONMENTAL AFFAIRS
13 FEB 2024
Signature: Date:

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DIRECTORATE OF ENVIRONMENTAL AFFAIRS
03 FEB 2025
Tel: 061 284 2701
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Signature:.....

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