PART B: VOLUME 3

ENVIRONMENTAL MANAGEMENT PROGRAMME

Geluk Mine Project

Development of an Iron and Vanadium Ore surface mine on farms Geluk 512KS, Geluk Oos 513KS & Ironstone 847KS at Magnet Heights, Magisterial District of Sekhukhune, Limpopo Province

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Document date: July 2016

ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) AND CLOSURE PLAN

Compiled in terms of Appendix 4 and 5 of the Environmental Impact Assessment (EIA) Regulations of 2014 (GNR. 982) and submitted as contemplated in Regulations 23 of the EIA Regulations of 2014

DISCLAIMER

Naledzi Group Pty Ltd has prepared this Environmental Management Programme (EMPr) and Closure Plan for the sole use of Rakhoma Mining Resources Pty Ltd and the appointed mine contractors/subcontractors to this project, in accordance with generally accepted consulting practices and for the intended purposes, as stated in the agreement under which this work was prepared. The report is also intended for review by the relevant competent authorities. Interested & Affected Parties (I&APs) are also privy to the review of the report to provide input to the Environmental Impact Assessment (EIA) process. This report may not be relied upon by any other party without the explicit written agreement of Rakhoma and Naledzi. No other warranty, expressed or implied, is made as to the professional advice included in this report.

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PART B: ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)

1. INTRODUCTION: PURPOSE OF EMPR

Naledzi Pty Ltd was appointed by Rakhoma Mineral Resources Pty Ltd to submit an Environmental Management Programme (EMPr) inclusive of a Closure & Rehabilitation Plan for the proposed development, operation and later closure of the proposed Geluk Mine.

This document is prepared as a requirement in terms of Regulation 23 (1-4), Appendix 4 and 5 of the Environmental Impact Assessment (EIA) Regulations of 2014 promulgated under the National Environmental Management Act (Act 107 of 1998) (NEMA). Dually, the Mineral Petroleum Recourses Development Act, 28 of 2002 (MPRDA) imposes on-going environmental management and mitigation obligations through the mine life cycle through an EMPr . The MPRDA Regulations of 2004 requires than an EMPr conforming to Regulation 51 of MPRDA must be submitted to Department of Mineral Resources (DMR). The EMPr also requires the applicant to set out the financial provision for mitigation. Regulations 51 (a)(i) of MPRDA further requires environmental objectives and goals for closure to be included in the EMPr which highlight the need to plan for closure of the operations.

This EMPr document and Closure Plan forms part of the Environmental Impact Report (EIR) compiled for the proposed project in pursuit of obtaining Environmental Authorisation (EA) and Waste Management License in terms of the NEMA and NEM: WA. Various potential environmental aspects and impacts have been identified and considered in the EIA process. These impacts require proactive management, which is achieved through the implementation of an EMPr.

The EMPr is a guideline document that sets out what needs to be considered to mitigate identified potential impacts and describes how this could be achieved. It is therefore not a specification of exact methods. The document provides a basis for managing, mitigating and monitoring the environmental impacts associated with all phases of the mine development in terms of the NEMA.

The requirements/procedures are binding on Rakhoma Mining Resources Pty Ltd, who would ultimately be the holder of the EA and Mining License after DMR approves the EIR and EMPr. Part and parcel of implementation of the EMPr will be the environmental awareness training of staff, employees, contractors and sub-contractors who will be operating on the proposed mining right area. Creating awareness will ensure greater success rate of conformance to the EMPr.

This section of the report serves to prescribe measures to reduce, limit, eliminate or compensate for impacts, to acceptable/insignificant levels. The term ‘mitigate’ means to *‘allay, moderate, palliate, temper, and intensify’*. In environmental terminology this term is used as follows:

- mitigation of a negative impact;
- to reduce the significance of an impact;
- mitigation/optimisation of a positive impact;

This EMPr is a working document; alterations can be made with regards to management measures or implementation of more stringent measures. If there are any changes to the EMPr, such will be submitted to DMR for approval before measures are implemented on the development of the Geluk Mine project.

2. DETAILS OF ENVIRONMENTAL ASSESSMENT PRACTITIONER

2.1 Details of EAP who prepared the EMPr

Naledzi Group Pty Ltd
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A team of qualified and experienced consultants was assembled for this project. The following consultants are involved in this project:
Mr. Desmond Musetsho (M.Sc (.Env Mngt) – Reviewer, Quality Control, EAP
Ms. Botha MI – EAP, Drafting of EMPr

2.2 Expertise of EAP who prepared the EMPr

Marissa Botha is a Senior Environmentalist and Public Participation Consultant. She has over 12 years' experience in environmental management and is responsible for the management of environmental projects, such as Environmental Impact Assessments processes (Scoping and EIA), Basic Assessment Processes and Environmental Management Programmes. She is also responsible for conduct and management of Applications for Prospecting Rights, Mining Permits and Mining Rights.

NEC has conducted Basic Assessment processes and Environmental Impact Assessment processes for multiple projects within the provinces of Gauteng, Mpumalanga, North West, Northern Cape and Limpopo.

Please refer to attached CV's under EIR Volume 1 - Appendix 1

3 DETAILS OF APPLICANT (ENVIRONMENTAL AUTHORISATION HOLDER)

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4 DESCRIPTION OF THE ASPECTS OF THE MINING OPERATION

The draft EIR and EMPr document comprises "Volumes" which have been set out as follows:

- **Volume 1** – Environmental Impact Report (**EIR) (PART A)**

The EIR comprises 8 Sections named section A – H. Section B contains a Description of the Scope of the proposed activity.

- **Volume 2 – Specialist Reports**
- **Volume 3 –** Environmental Management Programme **(EMPr) (PART B)**

The requirements to describe the aspects of the activity that are covered in the draft EMPr are already included in Volume 1 of the EIR (PART A) under Section B of the greater document. The reader is referred to Section B of the EIR (PART A).

5 COMPOSITE MAP

An overall sensitivity map superimposing the proposed Geluk Mine project, its associated infrastructure on the environmental sensitive areas on the project site is attached as PLAN C. All areas to be avoided due to their sensitivity are indicated on PLAN C by bufferzones.

Please note the mine plan currently indicated on PLAN C is preliminary and will be reformed to comply with the delineated environmentally sensitive areas specified by the recommended buffer zones.

6 DESCRIPTION OF MANAGEMENT OBJECTIVES INCLUDING MANAGEMENT STATEMENT

6.1 Closure objectives for the proposed Geluk Mine project site

Closure and rehabilitation is a continuous series of activities that begin with planning prior to the project's design and construction, and end with achievement of long-term site stability and the establishment of a self-sustaining ecosystem. Not only will the Implementation of this concept result in a more satisfactory environmental conclusion, but it will also reduce the financial burden of closure and rehabilitation. The following points outline the main objectives for rehabilitation and closure:

- Make all areas safe for both humans and animals;
- Make all areas stable and sustainable;
- Prevent soil and surface/groundwater contamination by managing all water on site to
- acceptable and agreed standards;
- Utilise approved sites for the safe disposal of all waste either onsite or off site;

- Follow a process of closure that is progressive and integrated into the short and long term plans, and that will assess the closure impacts proactively at regular intervals throughout project life;
- Establish a sustainable cover to prevent erosion risk and enhance ecological
- succession;
- Strive to rehabilitate the soil and land capability to emulate pre-disturbance land capability;
- Maintain or restore biodiversity at levels that are sustainable in the long term;
- Monitor key environmental variables (i.e. soils, erosion, vegetation, groundwater,
- surface water and air quality) to demonstrate stability of rehabilitated areas, this will be done for five years after closure or up until such a time all areas create a sustainable cover and ecosystem;
- Minimise negative impacts and maximise positive benefits on the local community;
- Comply with local, district and national regulatory requirements;
- Promote active partnerships with local communities, where possible; and
- Follow a comprehensive consultation and communication process with all Stakeholders.

The closure aims and objectives set as part of the mine closure planning process aims to ensure that the final land use plan is achieved and that the area is sustainable in the long-term from an environmental and social point of view.

The general area/region is characterised by grazing activities and due to this, the land affected by mining activities would be suited for grazing activities. The management measures were developed based on the assumption that grazing would be an acceptable final land use.

6.2 Management of environmental damage, pollution, extraneous water and ecological degradation caused by the Geluk Mine Project

The mining methodology greatly impacts on the rehabilitation methods required. Strip mining, the suggested mining methodology at the proposed Geluk Mine, can make use of progressive rehabilitation. Stripped overburden can be placed directly back into the previous strip that was mined and topsoil replaced in as quick a time period as possible, thereby increasing the chance of successful rehabilitation. Soil stockpiles should be placed as close to the open pits as possible to reduce soil handling.

The following actions will be undertaken by Rakhoma Mining Resources / Geluk Mine to ensure that the closure objectives are met during all the phases of the Geluk Mine.

The MPRDA, 2002 and its associated regulations require that all infrastructure associated with mining operations to be removed and the surface occupied by such structures be rehabilitated as close as possible to the original land use. The proposed project site post-mining land use will be grazing.

6.2.1 Offices, Workshops and Screening Plant

Infrastructure, including foundations, access roads to the buildings will be removed, unless liability is taken over by another party. If complete infrastructure removal is chosen the following steps will be followed:

- Re-usable items, will be removed from the site

- Remaining structures will be demolished to 1m below surface and demolition rubble removed;
- Soil will be tested for contamination. If contamination is discovered, the soil will be removed and disposed of in the appropriate waste disposal facility;
- Once the site has been cleared of all infrastructure and rubble and no contamination is present, exposed underlying material will be reshaped to create a gently sloping, free-draining topography. Natural drainage lines will be re-instated to limit erosion and sediment build up within local river courses;
- In terms of remaining infrastructure, once the site has been cleared of all infrastructure and rubble, the exposed underlying materials will be reshaped to create a gently sloping, free draining topography;
- Topsoil will be replaced to a minimum of 350mm thick in all rehabilitated areas (300mm for end land use of grazing, added 50mm allows for some compaction). If borrow pits are utilised, borrow pits from where topsoil originates will be rehabilitated and revegetated to create sustainable cover that prevents erosion and enhances natural succession. This will be included in the monitoring programme;
- Compaction will be reduced as compaction limits the effectiveness of replaced soils;
- Topsoil will be fertilised and ripped to 200 mm. The fertiliser requirements can only be determined once a fertility assessment is carried out at the proposed Geluk Mine;
- The area will be reseeded with grass mix (Table 1 and Table 2)
- Alien invasive species will be removed which establish on newly exposed soils and this will be done on an ongoing basis for at least 3 years;
- Pollution will be controlled.
- Revegetated areas will remain as "No-Go areas initially to allow recolonisation of the vegetation and all livestock animals must be kept out. Continual monitoring and maintenance will be undertaken. Basal cover will be 10-15%. Assessments will be carried out after each growing season for 5 years. Bare areas of >4m need to be reseeded with the grass species specified in Table 1.

6.2.2 Haul Road and Access Roads

Roads that can and will be used for rehabilitation/monitoring or by other users post-closure will be left in situ provided this is agreed upon by all parties concerned. If there is no future use for roads on site, they will require the following actions:

- Replacing of topsoil;
- Ripping the soil to 200mm to reduce compaction;
- Reseeding with grasses listed in Table 1;
- Prevention of access to the roads to allow regeneration of vegetation;
- Removal of alien invasive species;
- Again, revegetated areas are to remain as "No-Go" areas initially to allow recolonization of the vegetation and all livestock animals must be kept out. Continual monitoring and maintenance will be undertaken. Basal cover will be 10-15%. Assessment will be carried out after each growing season for 5 years. Bare areas of >4m need to be reseeded with grass species in Table 1.

6.2.3 Open Cast Pits (concurrent rehabilitation required)

Stripped mined areas/ void will be backfilled with overburden which was removed from the area that is currently being mined. Rehabilitated areas will be shaped and profiled to be free

draining and to roughly emulate the surrounding surface topography. Natural drainage lines will be re-instated to limit erosion and sediment build up in local river courses.

Water flow off the facility will be encouraged thereby limiting ingress and contributing towards the long-term integrity of the local water resource.

Topsoil will be replaced to a minimum of 350mm thick in all rehabilitated areas (300mm is required for an end land use of grazing and the additional 50mm allows for compaction). Borrow pits from where the topsoil originates will be rehabilitated, and revegetated to create sustainable cover that prevents erosion and enhances nature succession. This will be included in the monitoring programme.

Topsoil will be fertilised and ripped to 200 mm to reduce compaction. The fertiliser requirements can only be determined once a fertility assessment is carried out at the proposed Geluk Mine.

The rehabilitated pit areas will be reseeded with grasses as per Table 1. Species will be replanted that were stored/grown in the nursery will be replanted.

Alien invasive species will be removed and access to revegetated areas will be prevented to allow regeneration of vegetation.
Robust care and maintenance plans will be implemented. Revegetated areas will remain as "No Go" areas initially to allow recolonization of the vegetation and all livestock animals will be kept out. Continual monitoring and maintenance will be implemented. Basal cover will be 10-15%. Assessments will be carried out after each growing season, for 5 years. Bare areas of >4 m need to be reseeded with the grass species in Table 1.

A Geochemistry Analysis through laboratory work will be conducted to test the waste and ore material to be generated by the Geluk Mine as there is a risk of influx of oxygen into the system (stockpiles) and rainwater entering the dumps which can cause leaching/contamination.

6.2.4 Processed and unprocessed Stockpiles

The processed and unprocessed stockpiles will be designed in accordance to the specifications for Class C landfill sites (Old GLB+ landfill facilities). It will require impermeable liners.

For closure the infrastructure, including foundations, liners will be removed:

- The re-usable items will be removed from site;
- Remaining structures will be demolished to 1m below surface and the demolition rubble removed;
- Soil will be tested for contamination. If contamination is discovered , the soils will be removed and disposed of in appropriate waste disposal facility;
- Once the site has been cleared of all infrastructure and rubble and no contamination is present, the exposed underlying material will be reshaped to create gently sloping free-draining topography. Natural drainage lines will be re-instated to limit erosion and sediment build up within local river courses;

- Topsoil will be replaced to a minimum of 350 mm thick in all rehabilitated areas (300 mm is required for an end land use of grazing and the additional 50 mm allows for some compaction). If borrow pits are utilised, the borrow pits from where the topsoil originates will be rehabilitated, and revegetated to create sustainable cover that prevents erosion and enhances natural succession. This will be included in the monitoring programme.
- Topsoil will be fertilised and ripped to 200mm to reduce compaction. The fertiliser requirements can only be determined once a fertility assessment is carried out at the proposed Geluk Mine;
- Cleared areas will be reseeded with grasses in Table 1, species stored/grown in the nursery will be replanted;
- Alien invasive species will be removed;
- Access to revegetated areas will be prevented to allow regeneration of vegetation;

6.2.5 Topsoil Stockpiles

Once all stockpiled topsoil has been replaced onto the rehabilitated areas the topsoil stockpile will be rehabilitated. The correct topsoil will be replaced to a minimum of 350 mm thick in all rehabilitated areas (300 mm is required for an end land use of grazing and the additional 50 mm allows for some compaction). If borrow pits are utilised, the borrow pits from where the topsoil originates will be rehabilitated, and revegetated to create sustainable cover that prevents erosion and enhances natural succession. This will be included in the monitoring programme.

Topsoil will be fertilised and ripped to 200 mm to reduce compaction. The fertiliser requirements can only be determined once a fertility assessment is carried out at the proposed Geluk Mine.

Bare areas/rehabilitated areas will be reseeded with grasses in Table 1 and replanted with species that were stored in the nursery as well as species that were grown in the nursery.

Alien invasive species will be removed and revegetated areas will be prevented to allow regeneration of vegetation. Robust care will be taken and maintenance plans will be implemented to ensure full rehabilitation.

6.2.6 Managing ecologically degraded areas

For the Geluk Mine project, the exclusion approach will be implemented. Sensitive ecological features on site which would be at risk for degradation will be excluded from development by means of buffer zones. These features include:

- Shakwaneng River and associated tributaries/drainage lines;
- Mountain/ridges on the eastern and western portion of the project site;

The Geluk Mine project site has been superimposed with the identified environmentally sensitive features (Plan C).

The following buffer zones have been implemented:

- ***Ecological buffer***: A 200m bufferzone is to be implemented from both the western portion and eastern portion mountains/ridges on the Geluk Mine project site. This area

will be an exclusion zone from mining as it contains the most faunal and floral species with little to no alien vegetation encroachment. This mountain range is essential to maintain biodiversity and therefore strongly recommended as an exclusion zone;

- ***Aquatic Buffer 1***: A 200m buffer zone is to be upheld from the Shakwaneng River. Legislation requires that infrastructure and mining activities is placed above the 1: 50 and 1 : 100 year flood zone or 100m away from the centre line of a stream/river, yet the Aquatic specialists recommends 200m due to the topography and risk for erosion and sedimentation of the Shakwaneng river. One stream crossing for the haulage road will however be required over the river.
- ***Aquatic Buffer 2:*** 100 m buffer zone is implemented from drainage lines;

The aquatic buffer zone will have various advantages for the Shakwaneng River; it will trap sediment, trap nutrients and pollutants, help control flooding, improve habitat for fish, animals and birds. As soil erosion and sedimentation into the Shakwaneng River is an identified significant impact, the greater the bufferzone the more beneficial to trapping the former mentioned aspects.

The ecological buffer zone will be implemented to advert the effect of negative ecological impacts that may prevail on the project site ecology; it will significantly maintain biodiversity lost through clearance of the Sekhukhune Mountain Bushveld vegetation unit and maintain habitat for faunal species.

Placement of mine infrastructure and pits must adhere to the recommended buffer zones as set out in PLAN C. Currently the mine plan is preliminary and must be reformed to conform to the buffer requirements.

Shakwaneng River

Mining activities in the catchment of the Shakwaneng River have the potential to disturb part of it hydrological and riverine vegetation function within the local catchment. The main goal for the Shakwaneng River will be to maintain its Present Ecological State (PES). Also the quality of surface water may be affected by mining.

The rehabilitation of the mining area must thus be done in order to re-instate the pre-mining hydrology and vegetation through the life of mine.

The following measures will be implemented to manage ecologically degraded areas:

- Toe trenches will be constructed below mining pits;
- Concurrent rehabilitation of mining pits will be undertaken;
- Runoff water from waste rock dumps (if any), stockpiles and contaminated stormwater will be channelled into pollution control dams (PCD) to avoid effects on aquatic ecosystems. The water in the PCD will be reused during mining operations;
- Runoff will be routinely monitored for acidity and salinity as an early warning for potential increases in salinity and acid drainage water;
- Pollution sources will be isolated through clean and dirty water separation and will be monitored throughout the life of mine;
- The quality of water leaving the property should be monitored on a regular basis to ensure compliance of the various constituents with the standards approved by government. Samples will be analysed for particulate and soluble contaminants as

well as biological. Additional monitoring will include aquatic bio-monitoring (invertebrates, habitat, water quality and fish) on a bi-annual basis (high and low flow) to determine the ecological functioning and health of the rivers and streams, in and around the rehabilitated areas;

- Ongoing alien plant control will be undertaken during construction and operation particularly within disturbed areas.

The hydrology of the project site is determined by the topography of the site. It determines in which direction the surface runoff is flowing over the area. The main objective at closure is to return the pre-mining topography as close to the original landscape as possible.

The topography design of the rehabilitated areas will ensure that there is no ponding of water and ensure a free draining environment. Mined out areas will be filled with available material and landscaped as close as possible to pre-mining topography. It is envisaged that the final landscape will be slightly elevated in height compared to the pre-mining state.

Potential seepage/leachate/contamination from the stockpiles is likely to migrate in south westerly direction towards the Shakwaneng River. Only 16 % of the initial 100 % concentration at the source is predicted to reach the groundwater table beneath the stockpiles. Less than 2% may end up in the Shakwaneng River, and no borehole is predicted to be impacted. Water Quality monitoring will be undertaken on a bi-annual basis.

Sekhukhune Mountain Bushveld vegetation:

This ecological unit will be reinstated to be safe, stable and non-polluting. The area will be re-instated for the purposes of grazing.

A sustainable cover will be established to prevent erosion risk and to enhance ecological succession. The soil and land capability will be rehabilitated to match the pre-mining land capability. The biodiversity will be restored at levels that are sustainable in the long-term.

It is proposed that if the Geluk mine proceeds, it must contribute meaningfully to conservation in the region. Conservation of natural land and the creation of corridors in the area would aid ecosystems, and fauna and flora. Corridors and conservation areas should be identified by qualified ecologists for a Biodiversity Action Plan (BAP).

6.2.7 Managing extraneous water as a result of the Geluk Mine Project

The mining at Geluk will progress below the regional water level and dewatering will be required to provide a safe working environment. An estimation inflow ranging between 0 and 297 m3/day into the proposed pits is anticipated. The inflows will be pumped back to surface via a return water system for reuse in the mining operation.

During the closure phase groundwater levels will recover towards their original state. The probability of decant occurring at the site is low, however should decant occur it would at area of lowest surface elevation where the pit shell of the mining blocks intersect surface topography. The decant volume would be in the order of 0.5 l/s (maximum). There are no mitigation measures for groundwater level rebound and the impact would be low. The open pits should be backfilled using suitably graded materials to mimic the natural groundwater environment as far as possible.

The stockpile areas will be cleared and vegetated during the closure phase, while the waste rock dump (if any) slopes should be vegetated and graded to allow runoff and prevent infiltration of rainwater to the material.

Multiple-level monitoring wells will be installed to monitor base-flow quality within the identified sensitive zones and to monitor groundwater level behaviour in the rehabilitated workings. The objective during the closure phase would be to continue with the groundwater quality and groundwater level monitoring for a period of 2-4 years after mining ceases in order to establish post-closure groundwater level and quality trends. The monitoring information will be used to update, verify and recalibrate the predictive tools used during the Geohydrological Assessment.

6.3 Potential risk for Acid Mine Drainage (AMD)

No waste and ore material was available for geochemical analysis. Hence a desktop Geochemical study was done with the recommendation of future laboratory work.

The overall outcome was that the waste or ore material to be generated by the Geluk Mine will have a low to negligible potential for metal leaching (AMD).

A review of the available geohydrological, hydrochemical, geology and other relevant documents and background information was done determine the processes involved in the formation of the lithologies to be classified and assessed. The review included a case study of similar projects to define the best way forward and to make recommendations based on the current knowledge of the local and regional geochemical assessments. The data sources reviewed as part of the desktop study:

- Assay results;
- Geological summaries and logs;
- Groundwater data from Naledzi Waterworks;
- Literature on the geological setting and mineralogy associated with the site;
- Case studies:
- Summaries and conclusions from previous Vanadium projects done for Vanchem in the Bushveld Complex;
- Summaries and conclusions of geological and geochemical studies done for mines in the Steelpoort region (Chrome and Platinum mines).

The gabbro-norite dominated formations of the study area and the magnetite rich ore body are mostly dominated by the following minerals (Cawthorn et al. 2006):

- Othopyroxene (Enstatite ($MgSiO_3$) and ferrosilite ($FeSiO_3$));
- Plagioclase $(Na, Ca)Al_2Si_2O_8$;
- Magnetite (Fe_3O_4);

Trace amounts of:

- Olivine at the base of the ore body (end-members - forsterite (Mg_2SiO_4) and fayalite (Fe_2SiO_4));
- Apatite ($Ca_{10}(PO_4)_6(OH,F,Cl)_2$);
- Muscovite ($KAl_2(Si_3Al)O_{10}(OH,F)_2$);
- Chlorite ($(Mg,Fe)_5Al(AlSi_3O_{10})(OH)_8$); and
- Siderite ($FeCO_3$).

Plagioclase composition ranges between a mixture of albite and anorthsite 40-70% anorthsite. Most rocks of the eastern BIC contain 50% Plagioclase and magnetite. The magnetite layering of the study area and most of the Upper Zone rocks make up 8% of rock mineralogy.

The assay results provided by the client for the tested material and the core borehole logs confirm the mineralogy and chemistry. From the assay results (XRF tests on the ore material) the ore body and associated mineralogy is dominated by Fe, Al_2O_3, SiO_2 and TiO_2. Smaller amounts of Cr_2O_3, CaO, MnO and V_2O_5 are also present. The minerals are mostly dominated by large percentages of silicate and clay minerals that are neutralising. The plagioclase can offer buffering capacity, yet influx of oxygen into the system can lead to decreased pH once reaction takes place.

The conclusions from tests conducted on similar projects with the same geology and mineralogical setting indicate:

- The pH of all samples showed a neutral range with low electrical conductivity values confirming the low metal leach (ML) potential from the waste material;
- The result of the sample classification is Type 3 waste (Moderate risk/hazardous) for all samples. Some elements are above the ideal TCT0 concentrations if disposed. A Class C landfill site facility is to be designed for disposal, stockpile facilities;
- The main parameters of concern were Ba, Cd, Co, Cu, Ni, Sb, V and F.

Areas with shallow groundwater levels and higher conductivity can be at risk if contaminants should leach from pollution sources like waste dumps, tailings facilities and ore stockpiles.

It is recommended that future work on testing the potential for AMD include the following tests, and should be performed on a minimum of 30 samples per material to conclude with accurate results and conclusions, as well as to confirm the findings of the desktop study:

- Acid Base Accounting (ABA) and Net Acid Generation (NAG) tests;
- X-Ray Fluorescence (XRF) and X-Ray Diffraction (XRD);
- Leachable concentration to be determined by the Australian Standard Leaching Procedure for Wastes, Sediments and Contaminated Soils (AS 4439.3-1997), as specified in the NEMWA Regulations (2013); and Total Concentration values to be determined by aqua regia digestion and analysis with ICP methods.

6.4 Steps to investigate, assess, evaluate the impact for AMD

In order to assess the impacts on groundwater, a desktop study, hydrocensus and a numerical groundwater model was undertaken.

The hydrocensus primary objective was to identify the baseline groundwater use and users within the Geluk Mine project area. The presence of springs, distribution of boreholes and hand dug wells were located and recorded. The detailed hydrocensus was conducted within 2km radius of the farms Geluk, Geluk Oos and Ironstone. Details obtained were: current groundwater use, - users, static water level and the discharge rate.

A groundwater numerical flow model was prepared which reflects the site specific conditions as accurately as possible to achieve the highest level of confidence in simulating impacts.

This is a reliable method of quantifying potential impacts on the groundwater regime. The model attempts to mimic the site's groundwater conditions.

6.4.1 Groundwater Flow Modelling

PMWIN Pro 8, which is a MODFLOW based modelling software package, was used for the simulations. MODFLOW and PMWIN Pro are internationally recognised modelling packages that have been proven to be capable of simulating these types of groundwater flow and contaminants transport assessments to a high level of accuracy.

The outcome indicated that a certain amount of groundwater flow could be expected to enter the model domain from part of the catchment designated as inactive cells. To account for this, a recharge rate of 20mm/a was used for topographically higher areas and a rate of 15.6mm/a for the valley floor.

The groundwater flow model was done to determine the inflow rate of groundwater over time into pits during mining, to determine the cones of depression associated with pit dewatering, and to identify changes in groundwater levels in local wells and springs. It also determined the effects of pit dewatering and mine water supply on baseflow discharge to surface water.

6.4.2 Transport model - Plume of contamination

The transport model was done in MODFLOW and PMWIN Pro. It determines the pathways of seepage from WRF's and Stockpiles and further determines the post-closure groundwater flow regime folloing the end of mining and pit flooding.

A Plume of contamination simulated from the stockpiles. It indicates that potential leachates will likely migrate in southwesterly direction towards the Y 26-20 mining block and the Shakwaneng River. Only 16 % of the initial 100 % concentration at the source is predicted to reach the groundwater table beneath the stockpiles. Less than 2% may end up in the Shakwaneng River, and no borehole is predicted to be impacted.

6.4.3 Risk Assessment

It is recommended that a detailed mine closure plan should be prepared during the operation phase including a risk assessment, water resource impact prediction.

6.5 Mine Design Solutions to be implemented to avoid / remedy AMD

The waste and ore materials that will be generated by the proposed Geluk Mine have been cautiously classified as Type 3 waste (moderate risk/hazardous) and have a low potential for leaching. As per legislation a facility design of Class C landfill site is required in terms of legislation. The product-, ore stockpiles and waste rock dumps (if any) will be constructed/designed with an impermeable liner with adequate stormwater design to divert dirty water from the stockpiles areas/facilities to the PCD.

The probability of decant occurring at the site is low, however should decant occur it would at area of lowest surface elevation where the pit shell of the mining blocks intersect surface topography. The plume migration model indicated its migration would be in a southwesterly direction. The potential of plume contamination is 16% into the groundwater table and less than 2% into the Shakwaneng River. The potential of pollution is thus very low to negligible.

It is recommended that the preliminary mine design be reformed to adhere to the bufferzones implied on PLAN C and take cognisance of the potential transport of contamination from stockpiles in the south-westerly direction towards the Shakwaneng River and drainage lines. Placement of stockpiles must be as far as possible from the river and its associated drainage lines and areas of shallow groundwater levels.

A groundwater monitoring network will be designed to comply with the risk based source-pathway-receptor principle. The groundwater-monitoring network will contain monitoring positions which can assess the groundwater status at certain areas. Both the impact on water quality and water quantity will be catered for in the monitoring system. The boreholes in the network will cover the following: contaminant sources, receptors and potential contaminant plumes.

Furthermore monitoring of the background water quality and levels will be implemented, namely:

Groundwater monitoring will be conducted to assess the following potential impacts:

- Groundwater Quantity: which will be achieved by monitoring the pit dewatering volumes during operations and the groundwater levels of monitoring boreholes at the site area; and
- Groundwater Quality: This will be achieved through sampling of the groundwater in the boreholes at the recommended frequency.

6.6 Measures put in place to remedy any residual / cumulative impact resultant from AMD

The probability of decant occurring, which can contaminate water due to rebound of water level after closure, is low. However if decant occurs it would be at areas of lowest surface elevation. There are not mitigation measures for groundwater level rebound and the impact would be low. The open pits will be backfilled using suitably graded materials to mimic the natural groundwater environmental as far as possible.

The numerical model should be updated bi-annually by using the available monitoring data to re-calibrate and refine the impact predictive scenarios.

Any downstream water users and surrounding groundwater users affected by residual / cumulative impacts resultant from AMD must be compensated and supplied for clean water.

6.7 Volume / Rate of water use required for mining

The mine will require potable water and mine service water. The water will be sourced from recycled mine return water and Sekhukhune District Municipality. The latter, is still to be confirmed through a services agreement.

The potable water demand has been estimated to be 5280 litres per day (5.28m³/day) (NRR Mining Electricity and Water Demand Report, 2016). The mine service water consumption is estimated to be a maximum requirement of 370m³/day. Any Mine return water will be pumped back to surface via a return water system. The return water will comprise water used by drill rigs, wash down water and groundwater encountered. The mine return will be recycled and used as mine service water. Due to water losses through evaporation, wasted potable water from the local municipality will be used as makeup water.

A copy of the Electricity and Water Requirements Report by NRR Mining is attached under Volume 1 as Appendix 4.

6.8 Has a Water Use License been applied for

During the operation of the Geluk Mine a number of water uses identified under Section 21 of the NWA will take place. The project requires a Water Use License Application in terms of Section 40 of the NWA. An integrated Water Use License Application will be prepared during August – September 2016 (with the availability of a final Mine layout plan) and will be submitted to the Regional office of DWS: Olifants Management Catchment Agency.
The application process is integrated and conducted parallel with the EIA Process. The potential water uses include:

- Section 21 (a): taking water from a water resource (water from dewatering of pits);
- Section 21 (b): Storage of water (clean water in Braithwaite tanks and return water dam for dewatering of mine pits)
- Section 21 (c): Impeding or diverting the flow of water in a watercourse (Water crossing for the permanent haulage road over the Shakwaneng River; other access roads to cross drainage streams)
- Section 21 (i): altering the bed, banks, course or characteristics of a watercourse (Water crossing for the permanent haulage road over the Shakwaneng River; other access roads to cross drainage streams);
- Section 21 (g): Disposing of waste in a manner which may detrimentally impact on a water resource; and (dust suppression, and storing of stockpile waste water if any)
- Section 21(j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people (dewatering of mining strips)

The WULA will be applied for once the improvement of the Mine layout plan for identification of potential water uses is completed.

An Integrated Water and Waste Management Plan will accompany the WULA.

6.9 Roles and Responsibilities for Implementation of this EMPr

The practical implementation of the EMPr is the responsibility of the Site Manager. Should these guidelines require alteration or additions during the construction, operation and decommissioning of the proposed mine this shall be done at the discretion of the responsible Site Manager. The Site Manager shall ensure that any alterations are communicated, explained to and discussed with all affected parties. It is the responsibility of the applicant to ensure that the Site Manager, employees and contractors are capable of complying with all the statutory requirements which must be met in order to construct operation and decommission the mine, which includes the adherence and implementation of the EMPr.

Applicant (EA, WML and WUL Holder)
Ensure that the Environmental Site Officer, Site Manager, employees and contractors are capable of complying with all the statutory requirements which must be met in order to construct, operate and decommission Geluk Mine, which includes the adherence and implementation of the EMPr.

Mine Manager

- **Practical implementation of EMPr**
- Review site inspection reports and implement recommendations contained therein;

Mine Contractor (CO)

Comply with the conditions and management measures as set out in the EMPr

Environmental Site Officer (SO)

- Establish an effective environmental control program.
- Establish routine management, liaison and reporting systems and prepare management reports.
- Monitor the environmental aspects and advise the Contractor of actions required.
- Manage the Contractor's methods of working with regard to the potential environmental impacts and recommend safeguards.
- Undertake site inspections on a day-to-day basis and notify the Contractor and Environmental Control Officer of any problems.
- Liaise in collaboration with the Environmental Control Officer with the local and surrounding communities and act as a channel for their concerns.

Environmental Control Officer (ECO)

- **Monitor the implementation of the EMPr.**
- Advise the Contractors on environmental issues during implementation of the EMPr.
- Ensure continuous auditing of the construction, operation and decommissioning activities for adherence to the EMPr.
- Inspect the mine site regularly.

7 ENVIRONMENTAL MANAGEMENT PROGRAMME: ENVIRONMENTAL MANAGEMENT MEASURES TABLE

7.1 CONSTRUCTION PHASE – MANAGEMENT MEASURES

Table 1: Environmental Management Measures for the proposed construction of Geluk Mine project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility for action/intervention	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
PLANNING AND CONSTRUCTION PHASE								
Listed Activity: The proposed development and operation of Geluk Mine, including all associated facilities and surface infrastructure (access road from the D2219, weigh bridge, offices and workshop, permanent haulage roads and access roads, stream crossing/bridge over Shakwaneng River, weighbridge, control room, mining pits, water structures, water supply structures, mobile crushing and screening plant, final product stockpile, overburden and topsoil stockpiles, run of mine pad)								
soil due to erosion, compaction and contamination (pollution of resource)	Soil, Agricultural Potential and Land Capability	Good quality topsoil is maintained for successful rehabilitation. Protection of soil resources Effective rehabilitation for post-mining land use (grazing) and soil reclamation	Enough soil, of adequate quality, will be available for rehabilitation to support vegetation growth to ensure successful rehabilitation	Vegetation clearing must not be undertaken more than 10 days in advance of the work front. (prevent erosion) Contractors must only clear bushes and trees larger than 1 m. Remaining vegetation must be stripped with the topsoil to conserve as much of the nutrient cycle, organic matter and seed bank as possible. **All long term stockpiles should be clearly and permanently demarcated and located in defined no-go areas and re-vegetated. Monitor stockpiles. Ensure that losses from the piles are minimized and that additional damage to the physical, chemical or biotic component is minimised.** Temporary soil stockpiles must be placed as close as possible to the areas that will be progressively rehabilitated. Topsoil stockpiles are to be kept to a maximum height of 2 m to maintain soil fertility and reduce erosion.	Mine contractor ECO Mine Manager Mine Contractor **Mine Contractor** **ECO** Mine Contractor Mine Manager Mine Contractor	Daily Daily **Monitor stockpiled spo; quality on an annual basis** As and when removed from pits Daily. Monitor height.	ECO ECO **Environmental Site Officer** **ECO** **ECO** **ECO**	Throughout the Planning and Construction Phase

Table 1: Environmental Management Measures for the proposed construction of Geluk Mine project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility for action/intervention	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				<u>Stockpile Stripping Guide:</u> Hutton and Oakleaf soils should be stripped and stockpiled together. Topsoil and subsoil must be stockpiled separately.(Stripping depth 800mm-1m) Mispah and Glenrosa soils can be stripped and stockpiled together. Only 200mm will be stripped due to shallow soil depth. Katspruit and Dundee must not be stripped and stockpiled as it has high clay content and is located along the river and drainage lines. Soils must be stripped using truck and shovel method to limit compaction. Minimize the project footprint and proper storm water management designs must be in place. Erosion control measures must be implemented in areas sensitive to erosion and where erosion has already occurred such as edges of slopes, exposed soil. These measures include but are not limited to - the use of sand bags, hessian sheets, silt fences, retention or replacement of vegetation and geotextiles such as soil cells which must be used in the protection of slopes. All disturbed areas around the new infrastructure including offices, workshops etc must be rehabilitated as soon as construction in this area is complete or near complete and not left until the end of the construction phase of the project to be	Mine Contractor Mine Manager Mine Manager/Mine Contractor ECO Mine Manager Mine Contractor Mine Manager / Mine Engineer Environmental Site	Daily Initiation of construction. Monitor for erosion on a monthly basis and repair instantly. As soon as construction is complete. Before construction activities at river commences – still completed	**ECO** **ECO** **ECO** **ECO**	

Table 1: Environmental Management Measures for the proposed construction of Geluk Mine project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility for action/intervention	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				rehabilitated. Where any construction will take place adjacent to any drainage channels or the Shakwaneng River, install sediment barriers along the edge of the construction servitude to contain sediment and spoil within the construction area. (stream crossing) No release of any substance i.e. cement, oil, that could be toxic. Do not place the construction camp infrastructure that can potentially cause pollution in sensitive areas such as close to drainage lines, or steep slopes. Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up immediately and contaminants properly drained and disposed of using correct solid/hazardous waste facilities. Any contaminated soil must be removed and the affected area rehabilitated immediately.	officer Mine Manager/employees Mine Manager Environmental Site Officer Mine Manager Contractor ECO	 Daily During construction camp establishment Daily	**ECO** **ECO** **ECO**	
Spread of alien invasive species will spread to disturbed areas and result in further • soil erosion • alien infestation • effect the faunal and floral habitat by lowering biodiversity • impact on	Soil, Agricultural Potential and Land Capability Ecological impact Aquatic Impact Assessment	To ensure that topsoil / soil is not colonised with alien species and result in further erosion of soils. Maintain Indigenous Faunal and floral biodiversity	Indigenous vegetation will be re-instated on disturbed areas to curb erosion of soils and maintain biodiversity	Protect as much indigenous vegetation as possible. Rehabilitate disturbed areas as soon as construction in this area has ended. Erosion and sediment control techniques will be implemented where needed. **On-going alien plant control will be undertaken in disturbed areas to ensure clearing / eradication of alien species.**	Mine Manager Mine Contractor Contractor ECO **Mine Manager/ Mine Contractor**	Daily Once construction is completed As required. **Monitor on-going basis. Eradicate as colonises.**	ECO ECO **ECO**	Through planning and construction phase

Table 1: Environmental Management Measures for the proposed construction of Geluk Mine project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility for action/intervention	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
riparian vegetation				Edge effects of all phases, such as erosion and alien plant species proliferation, which will affect faunal habitats adjacent to the development area, need to be strictly managed by either chemical and mechanical removing alien invasive vegetation within the mining footprint. The removal of this vegetation will provide job opportunities for community members. Re-instate indigenous vegetation (grasses and indigenous trees) in disturbed areas as soon as practically possible once construction ceases so as to stabilise against erosion and sedimentation.	Mine Manager Mine Contractor Mine Contractor ECO	On-going. Eradicate and remediate as required. Monitor re-establishment of indigenous vegetation on a monthly basis to prevent erosion.	**ECO** **ECO**	
Loss of indigenous vegetation, floral and faunal habitat and ecological structure	Ecological Impact (Fauna and Flora)	Maintain Indigenous Floral and Faunal Biodiversity and conserve as much of the habitat and faunal structure as possible	Important ecological and aquatic habitats are excluded from development and protected by buffer zones to lower the impact on aquatic habitat and to maintain biodiversity. Disturbed areas are promptly rehabilitated and planted with indigenous vegetation. Recorded species of conservation concern are protected and relocated.	The boundaries of the development footprint areas are to be clearly demarcated. Activities and construction workforce must remain within the demarcated footprint area. No activities (other than construction of stream crossing) are to infringe upon the riparian habitat along the Shakwanang River. Once footprint boundary is pegged, a qualified botanist/ecologist must walk the site to identify all conservation-important species (including red-data species). Species must be relocated to similar habitat with assistance of suitable ecologist. Floral species of special concern must be relocated or placed in a nursery. The clearing of vegetation, during the construction phase, must be kept to a minimum and must be within the project	Mine Manager ECO Mine Contractor ECO Appointed Botanist/Ecologist **ECO**	Daily Once-off. Before construction starts As and when required. Keep floral species until required for rehabilitation.	ECO ECO ECO	Through construction phase

Table 1: Environmental Management Measures for the proposed construction of Geluk Mine project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility for action/intervention	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				boundaries. Plant permits must be obtained from the relevant authorities prior to any construction activities commencing. Any bird nests that are found during the construction period must be reported to the Environmental Control Officer (ECO). A qualified herpetologist must be present on site, during site transformation, to identify and safely remove all South African Rock Pythons, Soutspansberg Flat Lizard, Sekhukhune flat lizard (subspp. Fitzsimons) or other slow moving species, should they occur on the proposed mining site. All buffer zones as set out in the Composite Sensitivity Plan (Shakwaneng River, drainage lines, eastern mountain) must be strictly adhered to. These are excluded from development/mining. **Disturbed areas must be rehabilitated immediately after construction has been completed in that area by planting appropriate indigenous plant species. Vegetation rehabilitation is to be monitored.**	Mine Manager ECO ECO, Mine personnel/contractor Appointed Herpetologist Mine Manager ECO **Mine Manager** **Mine Contractor**	Once-off As and when found. Before and during construction activities. As and when large transacts of vegetation is cleared / removed. Daily. Through LoM **As and when construction completed. Monitor annually.**	ECO ECO ECO ECO **Environment Control Officer**	
Sedimentation and soil erosion water sources	Aquatic Ecosystem (Shakwaneng River and associated tributaries, Steelpoort River)	Limit the significance of impacts on the functionality and hydrology of the Shakwaneng River and associated drainage	Contain sedimentation to mining pits and area of works. Maintain PES of Shakwaneng River and Steelpoort	Adhere to a 200m buffer zone from Shakwaneng River and 100m buffer from associated drainage lines. Demarcate construction footprint areas with danger tape / demarcate the riparian buffer zones to prohibit	Mine Manager Mine Contractor	On-going.	ECO and Mine Manager	Throughout construction phase

Table 1: Environmental Management Measures for the proposed construction of Geluk Mine project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility for action/intervention	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
		channels Limit changes in insitu water quality of the Shakwaneng River.	River	access. Toe trenches and silt traps will be built below mining pits/strips to contain erosion and sedimentation. Attenuation structures must be placed between the road upgrade and the river so as to be no closer than 300m from the river. Attenuation of storm water from the road upgrade is important to control the velocity of runoff towards the Shakwaneng River. Attenuation measures during construction include, but are not limited to - the use of sand bags, erosion control blankets, and silt fences. Progressive rehabilitation of disturbed areas must be undertaken. <u>Materials for construction, other than sourced from the approved quarries/pits, must be sourced from a licensed commercial source.</u> All construction material must be stockpiled as far away from the Shakwaneng River as possible. No sand excavation must take place from banks of the Shakwaneng River. Any topsoil removed from the road footprint must be stockpiled separately from subsoil material and be stored suitably for use in rehabilitation activities. Install sediment barriers (silt catchers and Reno mattresses) across the entire work servitude to prevent the	Mine Contractor Mine Manager Mine Contractor Mine Manager Mine Contractor Mine Manager Mine Contractor Mine Manager Mine Contractor Mine Manager Mine contractor Mine Manager Mine Contractor **Appointed Aquatic**	Once off. Maintain and clean as required. Once off attenuation structure placement. On-going stormwater monitoring. Implementation as and when required. As and when required. As and when required. Daily Once off **Once prior and during**	ECO and Mine Engineer ECO and Mine Engineer Mine Engineer ECO ECO ECO ECO and Mine Engineer ECO	

Table 1: Environmental Management Measures for the proposed construction of Geluk Mine project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility for action/intervention	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				migration of silt towards the Shakwaneng River. **On-going aquatic bio-monitoring (In situ water quality, habitat assessment, SASS 5 where/if flow conditions allow for effective sampling and Diatom analysis) must take place to determine trends in ecology and assess any impacts requiring mitigation.** Stabilise, re-shape and rehabilitate disturbed areas as soon as practically possible with indigenous wetland and riparian vegetation. Such rehabilitation should be informed by a suitable replanting and re-vegetation programme, sand bags, silt fencing, etc. A mix of rapidly germinating seed as soon as possible. **Bank erosion must be monitored at regular intervals during the construction (and operational) phase in order to assess whether further river bank protection/stabilisation works are required.**	**specialist** Mine Manager Mine Contractor/mine personnel **Mine Manager** **Mine Contractor**	**construction till one (1) year after construction.** As and when rehabilitation is required. **Regularly. Implement further protection as required.**	ECO **ECO** **Mine Engineer (road, stream crossing)**	
Pollution of water resources and soil	Aquatic Ecosystem (Shakwaneng River and associated tributaries, Steelpoort River)	Ensure the construction activities of the Geluk Mine project do not result in detrimental pollution of water resources and soil.	Contain, clean-up of spillages of fuel, oil and chemicals and proper removal and disposal of contaminated soils at suitable waste disposal sites. Lower the potential for pollution on water resources and soil.	No washing of construction equipment in close proximity to the Shakwaneng Rivers is permitted. Obey the prohibited 200m bufferzone from Shakwaneng River and 100m bufferzone from drainage line when locating construction camps. Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up immediately and contaminants properly drained and disposed of using proper	Mine Contractor Mine Manager/ Contractor ECO Mine Contractor ECO	Daily On-going As and when spillages occur.	ECO ECO ECO	Through planning and construction phase

Table 1: Environmental Management Measures for the proposed construction of Geluk Mine project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility for action/intervention	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				solid/hazardous waste facilities (not to be disposed of within the natural environment). Any contaminated soil must be removed and the affected area rehabilitated immediately. Materials needed for construction must be stored in a construction camp in the applicable manner i.e. hazardous substances must be stored in bunded areas; sand and stone in such a manner to reduce wind and water pollution, etc.	Mine Manager Mine Contractor	Daily	ECO	
Impact on groundwater quantity due to abstraction	Groundwater	Pre-mining groundwater level will be gathered. Maintain groundwater quantity available to surrounding groundwater users. Manage impacts on groundwater environment.	Obtain study site water level data to inform manage monitor groundwater levels and impact on groundwater quantity.	Water abstraction for use during construction should be monitored (both volume and drawdown impacts) with records kept by the site safety and environmental department. Measure all borehole levels.	Mine Contractor Geohydrologist ECO Geohydrologist ECO	Monitored on a regular basis/daily. Measure water levels in all boreholes on a monthly basis.	ECO ECO	During the construction phase, operation.
Decreased water quality due to groundwater contamination from fuel and hydrocarbons spillages from transportation vehicles and storages	Groundwater impact	Pre-mining groundwater quality will be gathered. Detect changes in background groundwater quality, early detection of contamination. Observe groundwater changes in groundwater levels and quality and refine and improve calibration and predictions of groundwater flow model and provide info to guide continuous improvement in groundwater	Low to negligible impact on groundwater. Maintain pre-mining groundwater quality for domestic and agricultural use. Groundwater Monitoring will be undertaken to SABS and DWS requirements and comply with SA Water Quality Guidelines for Domestic and Agricultural use.	Workshop and laydown areas should be suitably bunded to prevent the release of contaminants into the environment. These areas should also be equipped with spill kits and suitably trained personnel to mitigate any spills that may occur. **Groundwater quality and quantity monitoring should be implemented during the construction phase to allow for the development of a baseline water quality and quantity dataset.** Domestic waste should be disposed of at a dedicated, suitable landfill disposal site. Good housekeeping practices should	Mine Manager Mine Engineer, contractor, ECO **Geohydrologist** **Mine Contractor** **ECO** Mine Manager/waste department	Bund once-off. Spill-kits must permanently be available. **Monthly sampling for water quality analysis for the first 2 years of mining construction/operation** Waste to be removed on a weekly basis. At all times.	ECO **ECO and Geohydrologist** ECO	Throughout construction phase

Table 1: Environmental Management Measures for the proposed construction of Geluk Mine project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility for action/intervention	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
		management approaches and action.		be implemented and adhered to. Dirty footprints should be minimized and suitably contained.			ECO	
Fugitive particulate emissions and vehicle exhaust gasses will result from construction site	Air Quality impact	Ensure that the air quality impacts do have a detrimental impact on the surrounding communities, vegetation	Comply with NAAQS and NDCR for residential (<600mg/m^2/day) and non-residential areas (<1200mg/m^2/day). Comply with dust fall out rate <400mg/m^2/day close to crops/ subsistence farming in urban areas.	Wet suppression where feasible on stockpiles and materials handling activities will be undertaken. Minimise extent of disturbed areas. Reduction of frequency of disturbance. Early re-vegetation of disturbed area. Chemical Stabilisation of disturbed soil. Reduction of surface wind speeds through the use of windbreaks and source enclosures. Enforce low vehicles speeds on unpaved roads. Due to close proximity of sensitive receptors chemical binders should be applied to unpaved roads such as Dustex or Dust-a-side.	Mine Contractor ECO Mine contractor Mine Contractor Mine contractor/ECO Mine Contractor Mine Contractor Mine Engineer Safety Officer Mine Contractor Mine Engineer ECO	Management should be undertaken on a daily basis. No monitoring proposed for construction phases.	ECO	Management to be undertaken for construction phase.
Shift in immediate noise levels for temporary basis due to use of construction machinery and activities	Noise aspect	Ensure that the increased noise levels do not have a detrimental impact on onsite employees and surrounding communities	Ensure that the noise levels generated by the establishment of the mine and creation of infrastructure comply with the National Noise Control Regulations, SANS 10103: 2008 and International Finance Corporation's Environmental Health and Safety	Machinery with low noise levels complying with manufacturers specifications to be used. Activities should take place during day time period only. Noise monitoring must take place on site and at sensitive receptors.	Mine Contractor ECO Mine Manager Mine Contractor Mine Manager Acoustic specialist	Daily On-going Noise monitoring to be undertaken on monthly basis after which frequency change to quarterly basis.	ECO ECO and Mine Manager Acoustic specialist, ECO ECO	Construction Phase

Table 1: Environmental Management Measures for the proposed construction of Geluk Mine project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility for action/intervention	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
			Regulations for noise levels for residential and industrial areas.	Develop a mechanism to record and respond to complaints. Notify adjacent landowners prior to undertaking activities that may generate high noise levels that may cause a nuisance. Construction site workers must be equipped with earplugs for use during excessive noise generating activities.	Mine Manager ECO Community Liaison Officer, Mine Manager Mine Contractor Health and Safety Officer	Once-off As and when required. Daily	 ECO Mine Health and Safety Officer/ Mine Contractor	
Potential damage to identified site of cultural and heritage significance	Sites of archaeological and cultural significance	Protect / conserve site of cultural and heritage resources	The development of the mine and associated infrastructure will comply with the National Heritage Resources Act, 25 of 1999 and adhere to Heritage specialist recommendations	The 3 cemeteries within the built up areas (Mogashoa, Maphopha west, Mapohopha east) and two stone wall sites in proximity to the Shakwaneng River towards Mogashoa will be conserved. All 3 cemeteries are fenced off and do not fall within the mining area. The stone walls fall within the 500m restriction to mining area. No impact is foreseen. All new activities (Engineering aspects such as access routes, water, and sewage and electricity lines should be designed not to disturb these areas.(NO-GO Areas) These sites must be avoided by the Mining activities. In case of chance finds all work in the vicinity of finds must be ceased, the area demarcated with visible tape and will be reported to South African Heritage Resources Agency (SAHRA) and Limpopo Heritage Resources Agency (LIHRA) immediately. An accredited archaeologist (ASAPA	Mine Manager Mine Contractor ECO Mine engineer ECO Mine Contractor ECO ECO and accredited Archaeologists ECO and accredited Archaeologists	None required. Regular visual inspections of the stone wall sites are to be conducted to determine if there is any damage from mining. On-going/Daily As and when resources are found and identified As and when required	ECO ECO ECO ECO Archaeologist ECO Archaeologist	Throughout the construction phase

Table 1: Environmental Management Measures for the proposed construction of Geluk Mine project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility for action/intervention	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				registered) must be commissioned to assess the find and determine mitigation measures required. If there is a need to relocate the find permits/ authorisation will be required from SAHRA / LIHRA.	ECO and accredited Archaeologists	When required.	ECO Archaeologist	
Transportation or ore and goods, construction vehicles, private vehicles and public transport on local road network (D2219 and R555) will increase traffic in the local area and the surrounding road network	Traffic : Local and surrounding road network	Ensure that the traffic generated by the Geluk Mine project does not negatively impact on the functioning of the road network and road safety	Road network, intersections operating in accordance with acceptable levels of services, comply with road safety requirements	A two way priority stop controlled intersection, with priority on the D2219 Road will be constructed for the mine. The access intersection will be constructed with exclusive turning lanes on the D2219 Road. Approval will be obtained from Limpopo Roads Agency for the construction of the proposed road upgrades along the D2219. Street lighting for safety purposes at the access to the mine intersection will be provided. Provision of road signage and road markings. Construction of public transport bays in the vicinity of the mine's access intersection. Construction of a new bridge to replace the existing Malekane Steelbridge. The construction of this bridge should be a joint project between all the existing and future mine in the vicinity. The construction of the bridge will be beneficial to both the mines and the community.	Mine owner Appointed Road Engineer Appointed road engineer Mine owner Road Engineer, contractor Road Engineer, contractor Road Engineer, contractor Mine owner Future and existing mines in study area	Implemented within Year 1-3 of construction. Once-off Once-off Once-off Once-off Once-off Once-off	ECO Mine Engineer Road Agency of Limpopo ECO, RAL ECO, RAL ECO, RAL ECO, RAL ECO, RAL	Implemented within year 1-3 of construction.
Impact on motorists along the D2219, tourist, local communities impact and landscape	Visual aspect	The visual impact from the construction of the mine and associated infrastructure should not have a detrimental	Management is proposed to lower the significance of the visual impact to acceptable standards	Locate the construction camp in areas already disturbed, or where it isn't necessary to remove established vegetation.	Mine Contractor and ECO	Once-off	Mine Contractor	Throughout construction phase

Table 1: Environmental Management Measures for the proposed construction of Geluk Mine project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility for action/intervention	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
character		impact on the landscape character, surrounding local communities and motorists.		Keep the mining site and camp neat and organised to portray tidy appearance.	Mine Contractor and ECO	Daily	ECO	
				Remove rubble off site as soon as possible / place in a container to keep site free from additional unsightly elements.	Mine Contractor and ECO	Daily	ECO	
				Rehabilitate / vegetate disturbed areas as soon as practically possible after construction. Implemented to restrict long stages of exposed soil and possible erosion resulting in indirect landscape and visual impacts.	ECO	Implement as required. Disturbed areas will be monitored against the Rehabilitation and Closure Plan	ECO	
				Dust suppression procedures should be implemented especially on windy days.	Mine Contractor ECO	Daily, specifically windy days	ECO	
				Screen the construction camp and lay-down yards by enclosing the entire area with dark green / black shade cloth of no less than 2m height.	Mine Contractor, ECO	Once-off	ECO	
Impact on economy due to increased demand for goods and services	Socio-Economic Impacts	Ensure that the positive economic impact is sustained for the construction phase.	Ensure that the mines spent on goods and services are in line with its Local Economic Development and Procurement Programme which encourages local communities and promotes economic benefits and improved quality of life for residents	Goods and Services will be procured locally as far as possible as per the mines Local Economic Development and Procurement Plan.	Appointed Mine Contractor Procurement Officer	Will be monitored against Rakhoma's LED and Procurement Strategy	Rakhoma/Procurement officer	Throughout the construction phase.

Table 1: Environmental Management Measures for the proposed construction of Geluk Mine project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility for action/intervention	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
Impact on employment	Socio-economic impact	Ensure that local communities and labour are employed and positive the socio-economic impact is sustained.	Employment and recruitment will be undertaken in accordance to Rakhoma's recruitment strategy.	Rakhoma's recruitment strategy stipulates employment .of local labour as well as by appointed contractors. The Mine Contractor will comply with Mining Charter and the Social Labour Plan; therefore recruit labour from the local community as far as possible.	Appointed Mine Contractor Mine owner Community Liaison Officer	Records will be kept for audit purposes	Rakhoma HR Department	During the construction phase
Potential Squatting due to perception of work	Socio-economic impact	Measures must be taken to eliminate job seekers/squatting to the mining area and unrealistic expectations from the community	Avoid squatters/job seekers at the mine site and keep open communication with labour sending communities on job opportunities as per the labour plan.	Rakhoma is to communicate the planned job opportunities which will be available during the construction phase. Unrealistic expectations must be cleared between the mine and local communities, traditional authorities. If squatting is evident and numerous job seekers continue to approach the mine, a meeting is to be held with the traditional authorities and local communities to attend to the matter.	Mine owner Appointed Mine Contractor Community Liaison Officer	Signs of squatting and increased job seekers in the local area and to the mine site must be monitored regularly (weekly).	ECO Safety Officer	During the construction phase
Waste Management	Ground and Surface Water impacts	Minimise waste, recycle as much as possible of the waste generated. Remove waste to appropriate licensed disposal facilities on a regular basis.	Ensure that waste management complies with the recommendations as set out in the Waste Management Plan.	General/domestic and hazardous mining/industrial waste produced at the Geluk Mine needs to be collected and stored in demarcated areas on site. General waste is to be removed from the construction site o to Jane Furse Landfill Site. Used oil and grease needs to be stored in drums located in a designed bunded area with a collecting sump in place. A central salvage yard for the sorting and temporary storage of waste prior to collection by a waste contractor must be established. At the salvage yard building rubble and	Mine Manager Appointed waste contractor Mine Manager Appointed waste contractor Mine Contractor/Mine Manager Mine Engineer Min Manager	Every 4 days. Removal of waste is to be undertaken on a weekly basis. Weekly basis. Monitor waste volumes removed by waste documents **Daily** **Once-off**	Mine Manager Mine Manager ECO Mine Engineer	During construction

Table 1: Environmental Management Measures for the proposed construction of Geluk Mine project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility for action/intervention	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				scrap metal could be stored in an open air scrap and salvage areas. As much of the waste as possible is to be recycled or reused (onsite or offsite) so that as little waste as possible will have to be disposed of. The volumes of conventional recyclable materials, such as wood, paper, plastics and glass are unknown but should sufficient space be allocated these could be accumulated to warrant transportation to recycling facilities.	Mine Manager Mine Contractor	**Daily**	Mine Manager	
Erosion and Sedimentation, impact on water quality and quantity due to construction activities	Surface Water	Ensure that there is no detrimental impact on surface water (Shakwaneng River)	Maintain Shakwaneng and Steelpoort river Present Ecological State, pre-mining water quality and comply with recommendations as set in the Water Management Plan	Construct toe trenches, silt traps, pollution control dam, clean water diversion system and dirty water collection channels first, before undertaking any activities; Service vehicles in workshops. Refuelling of vehicles and construction equipment from a tanker/tank must be done in a designated dirty area and spill kits must be available on site. Spillages should be cleaned up immediately and contaminated soil must be remediated/disposed of at a licensed landfill site. Sanitation facilities must be provided in the form of chemical toilets that are serviced regularly. No construction equipment, fuel tanks, associated infrastructure may be placed 200m from the Shakwaneng River or 100m from any drainage line.	Mine Engineer Contractor Mine Manager/ workshop mechanic construction vehicle drivers machine operators Mine Manager Contractor / trained staff Mine Manager Mine Contractor Mine contractor Mine Manager ECO	Once off As and when required. As and when required. As and when spillages occur. Provided on-going basis. Serviced every 2 weeks. Once-off	Mine engineer ECO and Mine manager Mine Manager and ECO ECO and Mine Manager Mine Manager and ECO ECO ECO	During the construction phase

Table 1: Environmental Management Measures for the proposed construction of Geluk Mine project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility for action/intervention	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				Provide environmental awareness training to construction staff and workers on site.		Regular job specific training is to be provided		

7.2 OPERATIONAL PHASE MANAGEMENT MEASURES

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
OPERATIONAL PHASE								
Listed Activity: The proposed operation of Geluk Mine, including all associated facilities and surface infrastructure (access road from the D2219, weigh bridge, offices and workshop, permanent haulage roads and access roads, weighbridge, control room, mining pits, water structures, water supply structures, mobile crushing and screening plant, final product stockpile, overburden and topsoil stockpiles, run of mine pad)								
Opening of mining pits, temporary waste rock dumps (if any), and overburden yards/piles.	Topography	Ensure that the operational aspects do not have a detrimental impact on the topography of the site	Ensure a sustainable topography. Align actual final topography to agreed planned landform.	Concurrent rehabilitation must be undertaken with strip mining. Contouring of the filled-in areas must aim to achieve the approximate original contours that existed before mining. Rehabilitated mine pits must not have any ponding of water and must ensure a free draining environment.	Mine contractor, Mine Manager Mine contractor Mine engineer Mine contractor	Monitor the topography as and when mining pits are rehabilitated to align with planned final topography. Monitoring should be undertaken throughout the life of mine	Environmental Site officer/co-ordinator Mine Surveyor	Throughout the Life of Mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
Transportation of product to Roossenekal Rail siding – Dust from haulage trucks transporting ore along unpaved access road	Air Quality and Dust	To ensure that there is no detrimental impact on the individual residential units at the rails siding and Vlaklaagte residential settlement (sensitive receptors)	Comply with NAAQS and NDCR. Maximum total daily dustfall (total monthly dustfall) of not greater than 600mg/m^2/day for residential areas. Maximum total daily dustfall to be less than 200mg/m^2/day non-residential areas.	Control vehicle speeds on unpaved roads to 30km/hour. Due to close proximity of sensitive receptors chemical suppressants must be applied to unpaved roads in close proximity to sensitivity receptors to reduce impact from source to 80-90% control efficiency. **A dust fallout network comprising of ~3 single dust fallout buckets is recommended at the railway siding:** - **Placement of a dust bucket at closest sensitive receptors to the northwest and southeast of the railway siding (Bucket 1 and Bucket 2);** - **Placement of a dust bucket along unpaved access road (Bucket 3).** Dust fallout rates must be below 600mg/m^2/day averaged over 30 days. **Site inspections and progress reporting must be undertaken.**	Safety Official Mine Contractor Mine Manager ECO Mine Manager Rail Siding site manager ECO Mine Environmental Co-ordinator **Mine Environment Co-ordinator**	**The management and monitoring of all operations at railway siding should be evaluated on a daily basis and appropriate actions taken to minimise dust generation and impacts.** **On-going, continuous ambient air quality must take place through monitoring of dust fallout network to be implemented facilitating data collection over 1-month averaging period.** **Daily** **Site inspections and progress reporting to be undertaken on a quarterly basis.**	**Mine Environmental Co-ordinator** **Mine Environmental Co-ordinator** **Air Quality Specialist**	Throughout the of the Rail Siding operations
Dust from Vehicle entrainment on unpaved roads, material handling, in-pit mining operations and storage piles. Wind	Air Quality and Dust	To ensure that the mining operations does not have a detrimental impact on local communities (sensitive receptors)	All operations must be within ambient air quality criteria: Comply with NAAQS and NDCR. Maximum total daily	Control vehicles speeds along unpaved roads 30km/hour. The impacts from unpaved road surfaces may be mitigated with water sprayers (assuring ~75% control efficiency).	Safety Official Mine Contractor Mine Environmental Co-ordinator	Daily, continuous enforcement Daily	Safety Official, Mine Environmental co-ordinator Environmental co-ordinator	Throughout life of mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
erosion from exposed mining surfaces			dustfall (total monthly dustfall) of not greater than 600mg/m^2/day for residential areas. Maximum total daily dustfall to be less than 1200mg/m^2/day non-residential areas. Achieve control efficiency at sources: 80-90% - Haulage and Unpaved roads 75% - crushing operations. Absence of visible plume at all tipping points and outside crushing operations. Reduce health impacts.	Due to close proximity of local communities chemical suppressants must be applied to unpaved roads in close proximity to sensitive receptors to reduce impact from source to 80-90% control efficiency. (dusttex / Dust-a-side). At the mobile crushing plant, management measures that will be feasible are water sprayers on crushing activities and telescopic chute with water sprayers. Progressive backfilling rehabilitation efforts during the operation of the mine must be implemented. **A dust fallout network comprising of ~7 single dust fallout buckets is recommended at the mine operation:** - **1 downwind of product stockpile;** - **1 downwind of RoM Stockpile** - **1 along main unpaved road** - **1 along unpaved access road;** - **1 downwind of active mining pit;** - **1 at the closest receptor north and 1 at the closest receptor south of the mine operation;** Dust fallout rates must be < 600mg/m^2/day (residential areas) and below 1200mg/m^2/day (non-residential areas) averaged over 30 days.	Mine Manager Appointed Dust control contractors Mine Manager Appointed crushing and screening contractor Environmental Co-ordinator Mine Contractor Environmental co-ordinator Environmental Co-ordinator Environmental Co-ordinator Air Quality Specialist	Regular application will be required. **Once off design of mobile crusher and daily water spraying. The management and monitoring of all operations at mine site should be evaluated on a daily basis and appropriate actions taken to minimise dust generation and impacts.** **Daily monitoring. On-going continuous ambient air quality must take place through monitoring of dust fallout network to be implemented facilitating data collection over 1-month averaging period.** **daily**	Environmental co-ordinator Environmental co-ordinator Dust management contractor Mine Contractor Environmental co-ordinator Environmental Co-ordinator Environmental Co-ordinator	

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				Site inspections and progress reporting must be undertaken. <u>The following recommended distances must be upheld from residential dwellings to be inline with local air quality standards:</u> **VEHICLE ENTRAINMENT:** Recommended distances of residential dwellings from unpaved roads used to transport the RoM must be 1200m (unmitigated) and 310m (unmitigated). Recommended distances from residential dwellings to unpaved roads to transport product on unpaved roads is 680m (unmitigated) and 140m (mitigated) Recommended distances from residential dwellings from unpaved roads used to transport product and RoM is 1300m (unmitigated) and 420m (mitigated). **CRUSHING& SCREENING ACTIVITIIES** Recommended distance from residential dwellings is 900m (unmitigated) and 600m (mitigated). **ACTIVE MINING PITS** Recommended distance from residential dwellings is 900m (unmitigated) and 600m (mitigated.) **STOCKPILE AREAS:**	Mine Engineer Mine Contractor to responsible for placement of infrastructure and roads	**Annual Audit Reporting by specialist will be required to authorities, persons affected by pollution.** Daily monitoring of distances to receptors ensuring compliance.	Environmental Co-ordinator Air Quality Specialist Mine engineer Environmental Co-ordinator	

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				Recommended distance of residential dwellings from stockpile areas is 50m. **MINING TO CROP ACTIVITY** Distances to mining activities from crop activities due to unmitigated operations must be 320m and mitigated operations 230m. Stakeholder / Community Forum Meetings should be held to discuss any air quality issues, discuss solutions. Communities Forum meetings will be announced via a Community Liaison officer which will communicate in writing with the affected traditional authorities.	Community Liaison Officer Environmental Co-Ordinator	Bi-annual Community Forum meetings should take place	Community Liaison Officer Environmental Co-ordinator	
Increase in noise due to mine traffic, operation of emergency diesel generator, haulage of ore to and from sites including Roossekenal Rail siding, crushing activities, blast hole drilling.	Noise and ground vibration impact	Ensure that the permanent shift in noise levels do not have a detrimental impact on onsite employees and surrounding communities (sensitive receptors)	Ensure that the noise levels generated by the mine operation comply with the National Noise Control Regulations, SANS 10103: 2008 and International Finance Corporation's Environmental Health and Safety Regulations for noise levels for residential and industrial areas.	A 500m restriction to mining will be implemented to residential dwellings. **Noise from additional traffic between different sites must be monitored.** Emergency generators will be placed in such a manner that it is 500m away from residential areas. Drilling with drilling rig to be done in such a manner and must be 500m away from any residential areas. For haulage of material to the crusher and to and from the WRD including maintenance activities, machinery with low noise levels which complies with manufacturing specifications are to be used.	Mine Engineer Mine Manager Contractor **Acoustic specialist** Mine Manager Mine Contractor Drilling and blasting contractor Mine Contractor Mine Contractor Environmental Co-ordinator **Acoustic specialist**	**Monitor noise from traffic on annual basis.** Once off. Daily/On-going Daily	Safety Officer Environmental Co-ordinator **Acoustic specialist** **Environmental Co-ordinator / Safety officer** **Mine Contractor/Engineer** Mine Contractor Drilling and Blasting contractor Safety officer	Throughout Life of Mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				Noise from hauling of material to the crusher, waste rock dump, Roossekenal Rail Siding, blasthole drilling and maintenance activities should be monitored. Haulage of ore product to Roossenekal Rail Siding is to be undertaken during daytime period only. (Dayshift) **Crushing activities to will be monitored and a noise survey will be done.** **Regular feedback to the community leaders of baseline noise and vibration monitoring should take place. A system by which complaints are recorded and investigated must be in place.**	**Environmental co-ordinator** Mine Manager Transportation contractor **Environmental Co-ordinator** **Acoustic Specialist** **Community Liaison Officer** **Environmental Co-ordinator**	**Noise monitoring must be done on a quarterly basis**. Daily **Crushing activities to be monitored on a monthly basis, after which frequency can change to quarterly basis.** **Overall noise and vibration monitoring to be undertaken on monthly basis after which frequency may be changed to quarterly.** **Bi-annually**	**Acoustic specialist – submit progress report** Mine Manager **Acoustic specialist** **Environmental Co-ordinator**	
Impact of mine operation noise on onsite employees	Noise impact	Ensure that noise generated onsite are not detrimental to onsite employees	Noise generated on site must comply with applicable noise limits. Mine Health and Safety Act 1996 Regulations state an exposure limit of no	Areas of high noise levels should be clearly demarcated as NOISE ZONES. It must be stated at noise zones that hearing protection equipment must be worn. Employees are to be provided with	Safety Officer	Noise levels on site will be monitored and the use of ear protection by employees.	Health and Safety Officer	Through the Life of Mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
			more than 85dBA. No deterioration in hearing greater than 10% amongst occupationally exposed individuals	ear buts/ear protection for hearing protection.				
Blasting of overburden and ore seam may impact on surrounding residential structures and services	Noise and ground vibration	Blasts must be designed in such a manner that ground vibration and over pressure levels are adhered to.	Individual blasts must not exceed 25mm/s in the vicinity of poorly constructed buildings and the average level should not exceed 10mm/s in the vicinity of poorly constructed buildings. Limit flyrock to site of blast.	**500m blasting restriction for mining from residential settlements are implemented on the mine operations.** Blasting to take place under controlled conditions and by using the safe blasting methods at all times. A distance of 500m must be maintained at all times between residential area, water pipeline and blast site and an earthberm of 10.0m to be erected in vicinity of residential properties. **Blasting activities to be monitored and ground vibration and noise survey to be implemented.** Ground vibration to be carried out at the abutting noise sensitive areas. The feeder road D2219 is to be closed for traffic during blasting.	Appointed Mine Contractor Appointed Drill and Blast Contractor Drilling and Blasting contractor Mine Engineer Drilling and Blasting contractor Mine Engineer **Appointed specialist** Appointed specialist Safety officer/mine personal	Throughout life of mine Twice a week as per planned blasting. As and when blasting designs are done and conducted. Earth berm to be erected once-off. **Ground vibration and noise survey monitoring to be done on monthly basis after which frequency can change to quarterly basis.** Permanent monitoring of ground vibration at sensitive receptors. During blasts, for duration of blast until zone declared safe by blast contractor and	EHSO Environmental Health and Safety Officer Safety Officer Mine Engineer Safety Officer **Safety Officer Environmental Co-ordinate, Specialist** **Appointed contractor. Records submitted in progress report to Environmental Co-ordinator** Safety Officer –safety team	Throughout Life of Mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				Boom gates are to be constructed in the northern extent along the D2219 and southern extent along the D2219 from where traffic is to be closed off during blasting activities for the duration of blast. **No Blasting must be undertaken during night time.** Rakhoma will blast twice a week at 13:00pm. A blasting schedule is to be displayed on a sign board at both boom gates for traffic entering the Mining Right Area from the north and south. Regular feedback to the community leaders of baseline noise and vibration monitoring should take place. A system by which complaints are recorded and investigated must be in place. Blasts must be designed in such a manner that ground vibration and over pressure levels are adhered to. In order to comply with the above, the following measures should be implemented.	Mine Engineer Mine owner Safety officer/Drilling and Blasting contractor Mine Contractor Mine engineer Mine contractor Community Liaison Officer Environmental Co-ordinator, Safety officer Drilling and Blasting contractor	safety officer. Closed of twice a week Life of operation Schedules to be permanently displayed Monthly basis As and when blasting is undertaken. Continuously	Safety Officer –safety team Mine Manager Safety officer Drilling and Blasting Contractor Safety officer Community Liaison Officer Environmental Co-ordinator Safety officer Drilling and Blasting contractor	
Loss of landscape quality, impact on residences within a 2km radius of proposed Geluk Mine, tourists and	Visual impact	Ensure that Geluk Mine does not have detrimental visual impact on residences surrounding the Mining Right Area.	Management is proposed to lower the significance of the visual impact to acceptable standards	Routinely conduct rehabilitation of scarred areas rehabilitation of stripped mined areas. Maintain the landscape to a high aesthetic standard to retain a high	Mine contractor Environmental co-ordinator Mine contractor	Regular inspections should be undertaken to identify areas requiring further rehabilitation, stockpiles do not	Environmental co-ordinator Environmental Co-	Throughout the Life of Mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
motorists.				visual quality for visitors and observer. Refrain from installing permanent lighting where light is required intermittently. Dust suppression procedures should be implemented especially on windy days.	Safety officer Contracted Dust controller	exceed 2 m in height Continuous Daily, more intensively on windy days	ordinator Safety officer Dust Control Contractor Environmental co-ordinator	
Proliferation of alien invasive species will lower biodiversity due to surface disturbance (clearing of vegetation for mining pits and result in erosion	Ecological Impact (Fauna and Flora) Soils, Agricultural Potential, Land Capability	Avoid spreading of alien invasive species and encroachment into indigenous vegetation	Maintain indigenous floral biodiversity in exclusion areas and buffer zones, indigenous vegetation not targeted for mining.	Alien invasive plant species should be chemically and mechanically removed within the mining footprint. The removal of this vegetation will provide job opportunities for community members. Annual surveys, aimed at updating the alien plant list and establishing and updating the invasive status of each of the alien species, should be carried out (can be done by Geluk staff). Follow-up control of alien plant seedlings, saplings and coppice regrowth is essential to maintain the progress made with initial control work, and to prevent suppression of planted or colonizing grasses. Before starting new control operations on new infestations, all required follow-up control and rehabilitation work must be completed in areas that are originally prioritized for clearing and rehabilitation. Implement alien invasive plant monitoring.	Appointed contractor/community members Mine personnel Appointed contractor/community members Mine personnel	Implement Alien Invasive Control Plan. Monitor spread of alien species on a regular basis (monthly) Annually As and when required Annually	Environmental co-ordinator Environmental Co-ordinator Environmental Co-ordinator Environmental Co-ordinator	Through the Life of Mine
Destruction of	Ecological Impact	Restrict project	Maintain or restore	A 200m buffer zone must be upheld	Appointed Mine	Monitoring should take	Environmental	Through the

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
indigenous vegetation (habitat of fauna and flora species) due to clearing of indigenous vegetation for opening up of mining strips.	(Fauna and Flora)	footprint Rehabilitate all disturbed areas Implement a monitoring programme	biodiversity at levels that are sustainable in long term. Impacts will remain at a critically high level and the proposed mine area can never be fully rehabilitated and ecologically restored to its pre-mining condition	from the eastern mountain and a 200m bufferzone from the Shakwaneng River and 100m bufferzone from drainage lines as per Environmental Sensitivity Map. If bush clearing is required, contractors must only clear bushes and trees larger than 1 m. The remaining vegetation must be stripped with the topsoil to conserve as much of the nutrient cycle, organic matter and seed bank as possible. Rehabilitation must take place concurrent to operations, and post-closure. Harvesting and collection of any flora must be strictly prohibited. Education and awareness campaigns on faunal species and their habitat are recommended to help increase awareness, respect and responsibility towards the environment for all staff and contractors. A speed limit of 30km/h must be implemented on mine roads to minimise risk to fauna from vehicles and that signage is erected to this effect. Any kills/incidents must be reported immediately to the ECO and EWT (www.ewt.org.za). As per construction phase a	Contractor Mine Manager Environmental co-ordinator Mine contractor, sub contractor Mine contractor/appointed contractor Environmental coordinator Environmental Co-ordinator Safety officer Environmental Coordinator Appointed Herpetologist	place on a regular basis and action as and when required. As and when bush is cleared. Concurrent to operations Daily Induction course and monthly meetings Daily. Report incidents as and when incidents occur. As and when areas are targeted for transformation to create mining pits	coordinator Environmental coordinator Mine Manager Environmental coordinator Environmental coordinator Environmental coordinator Environmental coordinator Environmental coordinator	life of mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				qualified herpetologist must be present on site to identify and safely remove all species of concern when transformation takes place at the mine site. No trapping or hunting of fauna is to take place. Access control must be implemented to ensure that no illegal trapping or poaching takes place. Should any Red Data faunal species be noted within the mining pit footprint, these species must be relocated to similar habitat with the assistance of a suitably qualified Ecologist. Corridors and conservation areas should be identified by qualified ecologists for a Biodiversity Action Plan (BAP). If it is necessary to remove protected trees, permits will be required from DAFF. Various species may occur on site.	Safety officer Ecologist Environmental Coordinator Mine Owner Ecologist Environmental co-ordinator / appointed contractor	Daily As and when identified on site Once off AS and when required	Environmental coordinator Safety Officer Environmental co-ordinator Environmental co-ordinator Environmental co-ordinator	
Sedimentation and Soil Erosion result in alternation in hydrological regime due to increased stormwater flood peaks (increased impermeable surfaces)	Aquatic Ecosystem	Implement storm water management Erosion protection Control sediment migration from mine site to Shakwaneng River Control sedimentation at mining pits Protect, uphold bufferzone to Shakwaneng and drainage lines	Maintain the current PES of the Shakwaneng River and avoid pollution	Long term attenuation measures, such as attenuation/infiltration trenches, swales along roadways/pavements are to be implemented at site. Surface water and storm water should not be concentrated, or flow down cut or fill slopes without erosion protection measures being in place. Exposed soils must be rehabilitated as soon as practically possible to limit the risk of erosion. Erosion	Mine Engineer Mine Engineer Mine contractor	One off Once off and monitored for erosion. Visual inspections for	The Environmental co-ordinator will be responsible to monitor all management measures	Throughout Life of Mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				control measures must be employed where required. Bank erosion must be monitored at regular intervals during the operational phase in order to assess whether further river bank protection/stabilisation works are required. Berms/ earthen walls should be vegetated in order to avoid erosion and sedimentation. Runoff water from the waste dumps, stockpiles and contaminated storm water should be channelled into pollution control dams to avoid effects on the aquatic ecosystem. The water in these pollution control dams should be reused during the mining operations if possible. Demarcated and bunded stockpiles and waste dumps should also be placed in areas where groundwater and surface water pollution can be avoided. The runoff should be routinely monitored for acidity and salinity as an early warning for potential increases in salinity or acidic drainage water.	Mine engineer Mine contractor Mine engineer Mine engineer Appointed specialist	Monitor at regular levels and implement further stabilisation works when necessary. Once off Clean and dirty water separation systems must be monitored on a regular basis. – daily basis Once off Quarterly basis		
Pollution of water sources	Aquatic Ecosystem	Ensure that the mine does not have a detrimental impact the water sources	Maintain current insitu water quality of aquatic ecosystems, prevent pollution to Shakwaneng River	Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities	Mine Manager Mine Personnel	As and when spills occur.	Environmental Coordinator will be responsible for all monitoring aspects.	Through the Life of Mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				(not to be disposed of within the natural environment). The proper storage and handling of hazardous substances (hydrocarbons and chemicals) needs to been ensured. All employees handling fuels and other hazardous materials are to be properly trained. Storage containers must be regularly inspected so as to prevent leaks. Any contaminated soil must be removed and the affected area rehabilitated immediately. Portable toilets must be placed along the lines that must be on impervious level surfaces that are lipped to prevent spillage. Litter traps are to be installed at all storm water outlets . These will need to be cleaned out in accordance with a regular maintenance programme. Training programs must provide information on material handling and spill prevention and response, to better prepare employees in case of an emergency. Water quality should be routinely monitored at aquatic ecosystems.	Workshop manager/Mechanics Mine contractor/Mine personnel Mine Manager//contractor Mine engineer Environmental coordinator Appointed Aquatic specialist	Daily. As and when spills occur. Once off One off. Clean on regular basis (quarterly) An induction course with monthly meetings will be held. Routinely monitor water quality at aquatic ecosystems. Sites up and downs stream of the mine activities – monthly	Aquatic specialist .	

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
Alien Invasive species	Aquatic Ecosystem	Control spread of alien invasive species, clear/eradicate such species and allow colonisation of disturbed areas with indigenous vegetation	Shakwaneng River PES status maintained	Herbicides must be carefully applied, in order to prevent any chemicals from entering the river. Spraying of herbicides within or near to the Shakwaneng River is strictly forbidden. Monitor disturbed areas by mining activities for colonisation by exotics or invasive plants and control these as they emerge.	Mine Manager Appointed Mine Contractor Mine Personnel	Regular monitoring for spread of alien invasive species to be undertaken – weekly basis	ECO Site Manager	Throughout the Life of Mine
Use of heavy machinery and mine vehicles during mining operations will lead to Soil disturbance, erosion and compaction of soils	Soils, Agricultural Potential, Land Capability	To ensure good quality topsoil is maintained for successful rehabilitation. Ensure that soil resources are protected and not lost through erosion, disturbance, compaction or contamination. Ensure soil productivity and effective rehabilitation for post-mining land use (grazing) and soil reclamation.	Correct topsoil stripping and stockpiling will ensure that enough soil is available for rehabilitation and for soils to have adequate quality to support vegetation growth to ensure successful rehabilitation.	Erosion control measures must be implemented in areas sensitive to erosion. These measures include but are not limited to - the use of sand bags, hessian sheets, silt fences, retention or replacement of vegetation and geotextiles such as soil cells which must be used in the protection of slopes. All stockpiles must be maintained and progressive rehabilitation must take place during the operational phase of the mine.	Mine Engineer Mine Personnel	Once off. Maintenance implemented on erosion protection structures. Progressive monitoring to take place on quarterly basis	Mine Engineer Environmental Coordinator	Throughout the Life of Mine
Pollution of soil resources due to mismanagement of waste, pollutants	Soils, Agricultural Potential, Land Capability	Prevent/minimise pollution of soil resources	Ensure protection of soil resources and ensure that soil resources are not lost to contamination	Proper management and disposal of operational waste must occur during the lifespan of the mine. No release of any substance i.e. grease, oil, that could be toxic. Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up immediately and contaminants properly drained and disposed of using correct solid/hazardous waste facilities. Remove contaminated soils and	Mine Manager Appointed Mine Contractor Mine Personnel/ Contractor Mine Contractor / mine personnel	Monitored on a daily basis. Daily As and when spills occur	Mine Personnel / Environmental coordinator	Throughout the Life of Mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				rehabilitate the area.				
Pit inflows, reduction in borehole yield and groundwater contamination from stockpiles	Groundwater impact	Detect significant changes in background groundwater quality; detect possible adverse groundwater impacts from mining activities. Compare observed changes in groundwater levels, flow and quality to those predicted	Lower groundwater impacts to insignificant levels. Improve calibrations and predictions of groundwater flow to guide improvement in groundwater management actions.	Minimize the footprint of dirty areas, such as the pollution control dams, stockpile areas, workshops and diesel storage areas. The storm water management measures should be implemented and be updated as new surface infrastructure is implemented. Static groundwater levels should be monitored to ensure that any deviation of the groundwater flow from the idealised predictions is detected in time. The numerical model should be updated using the available monitoring data to re-calibrate and refine the impact predictive scenarios. The monitoring results must be interpreted annually by a qualified hydrogeologist and the monitoring network audited annually as well to ensure compliance with regulations. All old exploration boreholes must be sealed off to prevent the infiltration of surface contamination, if any, to groundwater. The waste rock dumps at the site should be clad and vegetated to prevent oxidation of the waste material and infiltration of rainwater into the complexes.	Mine Engineer Mine engineer Appointed Hydrogeologist Mine contractor Mine personnel Mine owner Hydrogeologist	All monitoring boreholes must be monitored for measurement of water levels on a monthly basis. IN-pit dewatering volumes must be monitored and recorded on a daily basis. Groundwater numerical model should be updated bi-annually Monthly sampling for water quality analysis for first 2 years of mining operations. Thereafter monitoring done on quarterly basis – on all monitoring boreholes. A full analysis during monthly sampling and a full analysis in April and October during quarterly sampling and abbreviated analysis in January and July. The dewater product in from mine pits are to be sampled on a quarterly basis for water quality analysis. Process water from	Mine Manager Environmental coordinator Hydrogeologist.	Through the Life of Mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				A detailed geochemical study should be completed for the site, to determine contaminants that may emanated from the mining, processing and/or waste disposal activities. The results of this study should be used to update the numerical groundwater model. A risk assessment, water resource impact prediction is to be prepared. as stipulated in the DWS Best Practice Guidelines. Monitoring of the mine/process water should be conducted throughout the operational phase in order to identify any poor quality water that may be released into the environment. Groundwater users need to be fairly compensated located within the predicted drawdown cone as a result of pit dewatering.	Appointed specialist Appointed Hydrogeologist Mine owner/ Mine Manager	PCD, return water dam must be monitored on a monthly basis by conducting a water sampling analysis for first 2 years of mining operations. Thereafter monitoring should be at a quarterly basis. A Full analysis should be done. Rainfall must be monitored on a daily basis at the mine. The groundwater monitoring network must be audited annually.		
Ore stockpiles, waste rock dumps (if any) will have a low potential for metal leaching. Water Quality impairment may take place due to runoff from stockpiles. Mine operation may lead to erosion and sedimentation into Shakwaneng River and tributaries.	Surface water impact	Ensure that the mining operations do not contribute to water pollution and overall degradation in the PES of the Shakwaneng and Steelpoort Rivers	Contain dirty water within pollution control system on mine site. Control / contain erosion and sedimentation within the mining operations, with no transport into 200m bufferzone of Shakwaneng or 100 m buffers of drainage lines. Limit risk for water	All ore laydown areas need to be designed with storm water control and a liner, an impervious layer. The storm water management system should capture all contaminated storm water from the stockpiles and convey it through silt traps and finally the PCD. Water quality in the PCD should be monitored. Silt is to be removed from the PCD on a regular basis to maintain storage capacity.	Mine Engineer Mine engineer Appointed specialist Mine contractor	Once off Daily Monthly basis Regular basis. As required.	Environmental Coordinator Mine engineer Appointed specialist Mine contractor Environmental	Throughout the Life of Mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
			quality impairment due to runoff from ore stockpiles, waste rock dumps (if any).	Toe trenches and silt traps are to be regularly cleaned. Sediment, soil and silt in trenches and traps can be left to dry and used as part of the backfill material for mining strips. Clean storm water and dirty water should be separated and controlled as per GNR 704 of NWA. A storm water channel should be maintained along the mine perimeter to ensure mine water from outside the property is diverted around the mine site into the nearest water source. Chemical toilets used during the operational phase of the mine must be emptied on regular bases (vacuumed from toilets by vacuum trucks) by a waste collector. Once emptied the sewage waste must be disposed of at the closest Waste Water Treatment Plant. Ensure that oil traps are well maintained, if oil traps are utilised. All hazardous waste should be removed by a suitably qualified service provider and disposed of to an approved permitted landfill site.	Mine contractor/Mine personnel Mine engineer Mine engineer Chemical Toilet Contractor Mine personnel Mine management/waste department	Visual inspections should be conducted at trenches and traps to determine need for maintenance. Regular inspections are to be undertaken. Daily For the life of mine/Permanently Weekly basis Maintain on monthly basis Hazardous waste is to be disposed of as and when required (volumes justify disposal to Holfontein).	Coordinator Mine Engineer Mine engineer Environmental Coordinator Environmental Coordinator Environmental Coordinator	
Mobile machinery, equipment will be used in the mining process which will require fuel and fuel storage facilities	Surface Water impact Groundwater impact Soil contamination	Prevent/reduce spillages from fuel	Fuel transfers will take place in bunded areas and potential for spillages are minimized	Fuel is to be stored within a bunded area, underlain by a concrete slab, and sloped towards a sump for spillage removal. The bund must at least accommodate the full volume	Mine engineer	Daily	Environmental Coordinator	Through the life of mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
(fuel storage tanks)				of one of the containers. Provide impervious paving adjacent to fuel tanks, upon which vehicles must park during refuelling. Method of fuel transfer is by means of pump/dispenser. Clean small fuel spills with an approved absorbent material, such as "Drizit" or Spill-sorb". A Spill Kit must be available at the fuel transfer point/depot to absorb and clean up small/large fuel spills. The used spillage kit is to be disposed of as hazardous waste at a hazardous waste disposal site.	Mine contractor Mine contractor/engineer Mine personnel Mine manager Mine contractor	Once off Daily When spills occur Permanently available Spill Kit.		
Potential unearthing of site of cultural or heritage significance during excavations	Sites of archaeological and cultural significance	Protect and record any chance find heritage or cultural resources	Comply with the National Heritage Resources Act, 25 of 1999 and follow procedures for change finds	Cease work in the vicinity of the heritage feature find. Demarcate the area with barrier tape/other visible means. The find should be reported to the South African Heritage Resources Agency (SAHRA) and Limpopo Heritage Resources Agency (LIHRA) immediately. An accredited archaeologist (ASAPA registered) must be commissioned to assess the find and determine mitigation measures required.	Mine Manager Mine Contractor Environmental Coordinator Accredited Archaeologist	For duration of investigation by archaeologist and until SAHRA, LIHRA issues permit for relocation	Environmental Coordinator Accredited Archaeologist	Throughout the life of mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				If there is a need to relocate the find permits/ authorisation will be required from SAHRA / LIHRA.	Accredited Archaeologist			
Potential damage to stonewall structures	Sites of archaeological and cultural significance	Protect / conserve stone wall structures	Comply with the National Heritage Resources Act, 25 of 1999	The stone wall sites are located within the 500m restriction to mining from residential areas zone. No impact is foreseen on the stone wall structure. These sites are considered NO-GO areas for mining activities.	Mine Manager Environmental Site Officer	-	-	Throughout the life of mine
Impact on road safety and increase in traffic on D2219 and R555 due to haulage of ore, public and commercial trips from mine	Traffic impact – Local and surrounding road network	Ensure road safety and low impact on the local and surrounding road network	Road network, intersections operating in accordance with acceptable levels of services, comply with road safety requirements	The capacity of the roads is sufficient to carry the existing traffic, added development traffic and future demand traffic. No road upgrades are proposed for the operational phase. Road upgrades recommended in Table 1 under the construction phase must be implemented within Years 1-3 of the construction and operational phase. (Malekane Bridge replacement, controlled access intersection to mine from D2219, pedestrian Transportation of ore to the Roossekenal Rail Siding must take place during day shift.	Mine Manager Appointed Transportation Contractor	Permanently	Mine Manager	For the duration of Mine operation
Domestic Waste/ General generated from the mine operations and personnel, offices	Waste Management	Avoid littering and pollution	Disposal of waste according to Waste Management Plan for Geluk Mine	Domestic waste from the mine to be disposed at Jane Furse Landfill Site. Place bins for domestic waste through the mine area. Bins are to be emptied regularly. A skip must be available at the mine into which bins can be emptied. The skip is either to be emptied by the local municipality / private waste	Appointed Waste Contractor Mine personnel Local municipality/private waste contractor	General waste removed to Jane Furse Landfill on monthly basis Empty bins on weekly basis. Permanent basis	Mine Manager Environmental Co-ordinator Waste Management officer	Through the Life of Mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				contractor. The collection and transport of waste should be done as frequently as possible to a waste disposal site. Care should be taken to ensure that non-hazardous materials do not become polluted. Where possible non-hazardous materials should be separated and should be collected in designated areas in the salvage yard. A dedicated reclamation area for reusable non – hazardous materials should be established there may include areas for paper, wood etc. Other re-usable wastes such as toner cartridges stored in this area in specifically marked containers. A waste management record (ie. Waste manifests, certificate of safe disposal etc.) Should be kept by the department responsible for waste for audit purposes. A central salvage yard for sorting and temporary storage of waste prior to collection by a waste contractor is to be constructed. At the salvage yard building rubble and scrap metal could be stored in an open air scrap and salvage areas. A covered store needs to be established for the storage of medical waste and laboratory chemicals (if any).	Appointed waste management contractor Mine Manager / Mine personnel Mine Manager Environmental Co-ordinator/waste manager Mine Manager/Mine administration Mine engineer Mine engineer Appointed waste specialist/ internal waste department	Skip to be emptied on monthly basis. As and when full. Daily Once off As and when waste is disposed and collected by waste contractor is safe disposal document is to be obtained. Once off Once off When the mine is in its first 1 years of production		

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				A full inventory of waste streams must be prepared and waste categorised in terms of nature, classification and final disposal option. The Waste Management Plan must be reviewed / updated based on the inventory.	Appointed waste specialist	At regular intervals when events occur that merit review.	Appointed waste specialist	
Hazardous Waste	Waste management	Prevent pollution from hazardous waste generated at the Geluk Mine	Collect, contain and dispose hazardous waste as per the Waste Management Plan prepared for Geluk Mine and according to the NEM:WA, 2008	Hazardous waste is to be taken to the Holfontein Hazardous Waste Landfill in Gauteng until an alternative closer site can be identified. Transport of hazardous waste an appropriate manifest system should be developed and implemented. Records should be kept for audit purposes.	Mine Manager / Waste Contractor	Hazardous waste is to be disposed of as and when required (volumes justify disposal to Holfontein).	Mine Manager Environmental coordinator	Throughout the life of mine
Sewage Waste	Waste Management	Ensure that sewage waste handling and disposal does not result in pollution	Maintain and regularly service of chemical toilets	Rental Chemical toilets will be used during the mining operations. Chemical toilets are to serviced regularly. Effluent from chemical toilets will be emptied (vacuumed by means of vacuum trucks) by a waste collected and disposed of at the closest waste water treatment works in Jane Furse.	Mine Manager Waste Management Contractor	Service every 2 weeks	Mine Manager / Mine Personnel	Throughout the Life of Mine
Mine Waste	Waste Management (surface and groundwater pollution)	Minimise potential pollution from mining waste	Prevent ingress of contaminants into ground water and prevent any of the material from running into the environment, water sources.	Determine the mineralogical and chemical nature of waste material and ore generated as part of the project. Waste and ore needs to be samples and analysed as per NEM:WA. 30 samples per material type (waste rock, ore, overburden) is required to conclude accurate results for it potential hazard to the environment. Class C landfill site facilities with	Mine owner/mine contractor to prepare samples Appointed Hydrogeologist conduct analysis. Mine Engineer	AS soon as construction and excavations take place a samples need to be taken for testing.	Environmental Coordinator	Throughout life of Mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				impermeable liners with storm water control and liner, an impervious layer will be developed for ore stockpiles and waste dumps. The storm water should capture all contaminated storm water from these piles and convey it to a silt trap and finally a PCD. Silt generated on the mining and operational areas can be trapped and left to settle in containment dams. Water from paddocks/silt traps can be re-used in plant and silt can be left to dry for later use in rehabilitation of mined areas. All hard and soft overburden, topsoil and waste rock generated from the mine operations will be temporarily stored and used as backfill for rehabilitation of mining pits. Records should also be kept by the mine of all mining waste placement and mineral processing. The waste management facilities are to comply with the Waste Management License conditions as issued by DMR.	Mine contractor Mine contractor Mine Manager Mine engineer	Once off Constant basis Concurrent to mining Monthly basis records should be kept of mining waste placement and mineral processing. Constant basis		
Creation of new employment: contractors, skilled and unskilled employment (30 years)	Socio-Economic Impact	Provide employment opportunities to the local communities	Sustain positive impact from mine in job opportunities	Local labour will be employed as far as possible in line with Rakhoma's Social and Labour Plan.	Rakhoma HR Officer Appointed Mine Contractor Mine Manager	Throughout the life of mine	Rakhoma HR Officer Mine Contractor	Throughout the life of mine
Positive impact on economy due to increased demand for goods and services	Socio-Economic Impact	Ensure that the positive economic impact is sustained for the life of mine	Ensure that the mine's spent on goods and services are in line with its Local Economic	Goods and Services will be procured locally as far as possible as per the mines Local Economic Development and Procurement Plan.	Appointed Mine Contractor Procurement Officer	Will be monitored against Rakhoma's LED and Procurement Strategy	Rakhoma/Procurement officer	Through the life of mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
			Development and Procurement Programme which encourages local communities and promotes economic benefits and improved quality of life for residents					
Impact on community due to nuisance impacts from dust, noise, visual impact and blasting.	Socio-Economic Impact	Ensure that the mining operations do not have a detrimental impact on the local communities	Manage nuisance impacts to acceptable levels	All management measures proposed for noise, air quality, visual impact and blasting as recommended must be adhered to. Recommended compliance to NAAQS and NDCR by placing mining operations at minimum distances to residential areas must be strictly complied with. A Complaints register must be kept on site and complaints must be recorded. Complaints shall be investigated within 24 hours, corrective action implemented and feedback should be given to the complainant on remedial action taken. Regular feedback on complaints on mine activities can take place through regular Community Forum Meetings between Geluk Mine and traditional leadership.	Mine Manager Community Liaison Officer	As and when required. Community forum meetings with traditional authorities are to take place on a regular basis (to be determined by community.	Environmental coordinator Community Liaison officer	Through the life of mine
Potential health and safety impact on mine employees and local communities surrounding the proposed Geluk Mine.	Social Impact Mine Health and Safety	Ensure safe and healthy working environment for mine employees. Ensure a healthy and safe environment for persons who are not	Comply with the Mine Health and Safety Act, 1996	A Mine Manager will be appointed at Geluk Mine who will maintain Healthy and Safe Environment as per the Mine Health and Safety Act, 1996. Employees must be supplied with sufficient quantities of PPE (personal	Rakhoma Mine Manager	Operation of mine (LOM) PPE is supplied	Mine Manager / appointed Health and Safety Consultant Mine Manager/Health and Safety Consultant	Throughout the Life of Mine

Table 2: Environmental Management Measures for the Operational Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
		employees but directly affected by activities at the mine.		protective equipment). Identify the relevant hazards and assess related risks to which persons who are employees at Geluk Mine may be exposed to whilst working at the mine and provide health and safety training to its employees. The mine is to monitor and control environmental aspects at the mine which affect, the health and safety of employees and other persons (noise, dust). Rakhoma is to compile an annual report on health and safety at the mine including the statistics and compile a medical report. A 500m restriction from mining to residential areas will be implemented at the Geluk Mine due to blasting activities in compliance with GNR 584 of 10 July 2015 under MHSA, 1996.	Rakhoma Mine Manager Appointed Mine Contractor Mine Manager Mine Manager Mine Manager Safety officer	annually Operation of mine (LOM) Operation of mine (LOM) Annually Operation of mine (LOM)		

7.3 DECOMMISSIONING AND CLOSURE PHASE MANAGEMENT MEASURES

Table 3: Environmental Management Measures for the Decommissioning Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
DECOMMISSIONING AND CLOSURE PHASE								
ACTIVITIES: Backfilling of opencast pits; removal of buildings, infrastructure including foundations; rehabilitation of disturbed areas **OVERALL OBJECTIVE OF THIS PHASE:** The closure aims and objectives are to ensure that the final Land use Plan is achieved and that the area is sustainable in the long-term from an environmental and social								

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Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
point of view. The general area/region is characterised by grazing activities and due to this, the land affected by mining activities would be suited for grazing activities. The management measures were developed based on the assumption that grazing would be an acceptable final land use.								
Incorrect contouring and sloping of topography may impact on the final land use.	Topography	Re-instate the pre-mining topography	Create a sustainable topography for the long term end land use: grazing	Once the site has been cleared of all infrastructure and rubble, the exposed underlying materials should be reshaped to create a gently sloping, free-draining topography. Final rehabilitation of strips will take place with backfilling of overburden and ore fines into mine voids. Contouring of filled in areas must achieve approximate original contours which existed before mining. Surplus overburden must be used to as fill material and shaped back to pre-mining topography. The topography design of the rehabilitated areas is to ensure that there is no water ponding experienced and will ensure a free draining environment. The mined out areas are to be filled with all the available material, thereafter, a gentle gradient of less than 1:7 will need to be created so that surface flow drains away from rehabilitated areas. Final topography and slope of	Appointed contractor Appointed contractor Mine Surveyor Appointed Contractor Appointed Contractor	The topography achieved during the rehabilitation will be continuously monitored and surveyed to compare to planned topography.	Mine Manager Mine Surveyor	Through the decommissioning and closure phase

Table 3: Environmental Management Measures for the Decommissioning Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				the constructed landscape is to be verified by a surveyor. A detailed topography design is to be investigated in detail during the life of mine. Final profile achieved should be acceptable in terms of surface water drainage requirements and the end land use objectives and there should be an alignment of actual final topography to agreed planned landform.	Mine Surveyor Mine Manager Mine Surveyor Mine Contractor			
Compaction, erosion and contamination of soil. .	Soil resources, land capability, agricultural potential	Ensure that soil resources are protected and not lost to erosion, compaction or contamination	Rehabilitate the soil and land capability to emulate pre-disturbance land capability	Soil should be tested for contamination. If contamination is discovered, soil should be removed and disposed of in the appropriate waste disposal facility. Compaction should be reduced. If erosion has occurred, usable soil should be sourced and replaced and shaped to reduce the recurrence of erosion. Keep grazers out of the rehabilitation areas, if possible for 1- 2 growing seasons, until a suitable vegetation cover has established. Heavy machinery should not be used to spread and level soils during replacement. Truck and shovel method should be used. End-tipping could be instituted	Appointed contractor Appointed contractor Appointed contractor Appointed contractor Appointed contractor	As and When contaminated soils are encountered. Throughout rehabilitation The rehabilitation area will need to be monitored on an on-going basis for any signs of soil compaction	Soil specialist	Throughout Decommissioning and Closure Phase

Table 3: Environmental Management Measures for the Decommissioning Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				so the trucks depositing the soil do not drive over tipped soils. Only the designated access routes are to be used to reduce any unnecessary compaction. Compacted areas are to be ripped to loosen the soil structure and vegetation cover should be re-instated. Progressive monitoring must take place on at least a quarterly basis and should involve the following: - Inspection of stripping depths; - Inspection of stockpiles to check degradation and/ pollution; - Soil compaction levels as measured with a penetrometer in stockpiles; - Erosion occurrences Erosion monitoring of rehabilitated areas should be undertaken and zones with excessive erosion should be identified. Erosion can either e quantified or the occurrence there-of simply recorded for the particular location; - Inspection of soil surfaces before replacing soil to ensure that pre mined topography is matched; and - Fertility analysis (exchangeable cations K, Ca, Mg and Na and P, soil acidity) every 16 ha (400 x	Appointed Contractor Appointed Contractor Appointed contractor Soil specialist Soil Specialist	Progressive monitoring must take place on a quarterly basis.		

Table 3: Environmental Management Measures for the Decommissioning Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				400 m).				
Generation of PM10 and PM2.5, gaseous emissions from vehicle tailpipes due to rehabilitation activities, demolition of structures.	Air Quality	Ensure that the decommissioning and closure of Geluk Mine does not have a detrimental impact on air quality and result in unacceptable air pollution at sensitive receptors (local communities)	Comply with NAAQS and NDCR. Maximum total daily dustfall (total monthly dustfall) of not greater than 600mg/m2/day for residential areas. Maximum total daily dust fall to be less than 1200mg/m2/day non-residential areas.	Short term controls include wet suppression and chemical suppressants. Long term controls include re-vegetation of disturbed areas with locally indigenous grass species, indigenous trees. Measure dust fall by means of dust fall collection buckets until vegetation cover is well established. Continuously monitor PM10 concentrations. Progressive backfilling and rehabilitation efforts.	Appointed contractor Appointed contractor Environmental Coordinator Environmental coordinator Appointed contractor	On-going On-going Measure dust fall on a monthly basis. Daily Basis On-going	Environmental Coordinator Interpretation of data by air quality specialist Environmental Coordinator Environmental Coordinator	Throughout the decommissioning phase
Backfill of mined out areas, planting of grass and vegetation at rehabilitated areas and removal of infrastructure may have an impact on ambient noise levels	Noise impact	Decommissioning and Closure activities at the Geluk Mine must not result in unacceptable noise levels	Ensure that the noise levels generated by the mine operation comply with the National Noise Control Regulations, SANS 10103: 2008 and International Finance Corporation's Environmental Health and Safety Regulations for noise levels for residential and industrial areas.	Use machinery with low noise levels which complies with manufacturers specifications. Activities are to take place during daytime period only. Noise monitoring must be implemented on a quarterly basis.	Appointed contractor Appointed contractor Acoustic specialist	Daily Daily Quarterly basis	Environmental Coordinator Acoustic specialist	Throughout the Decommissioning and Closure Phase
Restoration of the landscape and topography will take place. Residents within a 5km radius of the site will experience visual intrusion. Residents in close proximity will experience a higher	Visual Impact	Ensure that rehabilitation works do not cause detrimental negative visual impact on communities.	Restore the landscape to a sustainable end land use. Restore topography and rehabilitate disturbed areas.	All structures and infrastructure will be removed as per the rehabilitation and closure plan. Implement dust suppression with water or chemicals; Limit vehicle movement at	Appointed Contractor Appointed contractor	Regular inspections will be conducted to ensure rehabilitation works are in accordance to the rehabilitation and closure plan.	Environmental Site Officer	Throughout the Decommissioning and Closure Phase

Table 3: Environmental Management Measures for the Decommissioning Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
visual intrusion due to their proximity.				night. Post-mining the topography is the most important factors to be considered. Generally contouring of the filled-in areas must aim to achieve the approximate original contours that existed before mining. Vegetate rehabilitated areas with indigenous grasses and indigenous trees.	Environmental Coordinator Mine Surveyor Appointed contractor			
Incorrect rehabilitation could lead to further degradation of the ecology	Ecological Impact	Maintain or restore biodiversity at levels that are sustainable in the long term;	Prevent erosion; Avoid soil loss; Restore the land to the agreed land capability; Reduce sedimentation into aquatic ecosystems such as rivers and wetlands; Re-establish eco-system processes (succession) to ensure that a sustainable land use can be established without requiring fertilizer additions. Restore the biodiversity of the area as far as possible.	Remove all mine infrastructure and dispose of it in accordance with applicable regulatory requirements. Concurrent rehabilitation must take place as soon as possible. If topsoil is replaced within one year this will help maintain topsoil biological activity and keeps the seed bank in the topsoil viable. This viable seedbank will create an effective basis for rehabilitated areas where these soils are used. Soils should be stockpiled in a manner that limits compaction. Fertiliser requirements will most likely be necessary due to the low fertility of the soil types. However a fertility analysis will need to be undertaken in order to determine exact fertiliser requirements.	Appointed Contractor Appointed contractor Appointed contractor Soil Specialist Appointed Contractor	Monitoring of rehabilitation must be undertaken for at least 5 years. Progressively with mining during operational phase. Daily Once off	Contractor Environmental coordinator Botanist/Ecologist Environmental coordinator Soil specialist	Throughout the decommissioning and closure phase

Table 3: Environmental Management Measures for the Decommissioning Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				Remove all weeds and alien plants from the site and which has established on newly exposed soils.		As and when required.	Ecologist/Botanist	
				Rip compacted soils and shape the surface of the site to be free draining.	Appointed contractor		Environmental Coordinator	
				Rehabilitated areas must be monitored to ensure establishment of re-vegetated areas to a ground cover of at least 85%.	Environmental Site Officer Botanist/Ecologist	On-going for at least 3 years	Botanist, Environmental Coordinator	
				Rehabilitation must take place concurrent to operations and post-closure.	Appointed Contractor	Rehabilitation monitoring will take place up to 5 years after closure	Environmental Coordinator/ Botanist	
				Indigenous vegetation species as prescribed under the Rehabilitation and Closure Plan for the Sekhukhune Mountain Bushveld and Central Sandy Bushveld are recommended for revegetation	Appointed Contractor Environmental Coordinator	Once off	Environmental Coordinator/ Environmental Coordinator/ Botanist	
				Truncheons should be placed within the site to encourage recolonization through bird dispersal.		Once off	Environmental Coordinator/ Botanist	
				Higher diversity of species should be planted. Source indigenous species and grasses suitable for grazing should be planted.such as Rhodes grass, Finger grass, Couch grass, Teff, White Buffalo, Weeping love grass.	Appointed contractor Appointed contractor	Once off	Botanist	
				Indigenous grasses that can be				

Table 3: Environmental Management Measures for the Decommissioning Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				sourced for planting include Aristida canescens, Heteropogon contortus, Panicum maximum, Setaria, lindenbergiana, Themeda triandra. Alien Invasive Species must be continually removed after rehabilitation has occurred for at least three growing seasons to ensure the seed bank is depleted. Continual monitoring will be needed for seeds that are likely to be blown in from adjacent areas. Appropriate veld management should be applied to areas of secondary indigenous vegetation and especially the grassland and wetland vegetation of untransformed habitats. Vegetation Monitoring Programme is to be implemented. Biodiversity Assessments by external experts must be undertaken to establish the full range plants that have become established.	Appointed contractor Appointed contractor Appointed contractor Appointed contractor Ecologist/Botanist	At least 3 growing seasons Up to 5 years after decommissioning Up to 5 years after decommissioning Annually (up to 5 years after decommissioning	Environmental Coordinator/ Botanist Botanist Botanist Botanist	
Sedimentation and erosion of river and its tributaries due to backfilling and landscaping shaping, contouring of strip mined areas.	Surface Water Aquatic Ecosystem	Maintain pre-mining EIS and PES of Shakwaneng River, drainage line and Steelpoort River	Correctly functioning drainage systems post rehabilitation. Water Quality of surface run off is to	Establish a sustainable cover to prevent erosion risk and enhance ecological Succession. Hydrocarbons and hazardous substances must be stored in bunded areas and refuelling	Appointed contractor Appointed	Once with continuous monitoring Daily	Botanist Environmental coordinator Environmental	Throughout Decommissioning and Closure Phase

Table 3: Environmental Management Measures for the Decommissioning Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
Pollution from fuel, hydraulic fluids, degreaser, other chemical.		Prevent soil and surface/groundwater contamination by managing all water on site to acceptable and agreed standards. Monitor functionality of surface water drainage systems post rehabilitation.	comply with NWA, conditions set out in water use license. Detect contaminants in Shakwaneng River, Steelpoort River and drainage lines, remediate contaminant source.	should take place in contained areas, when rehabilitation activities are undertaken. The water management system (clean water, dirty water collection channels and PCD) must be last structures to be demolished. Vehicles and heavy machinery used during closure and rehabilitation should be serviced and checked on a regular basis to prevent leakages and spills. Ensure that the drainage on the recreated profile (contoured mining strips/pits) is correct and detect early when any drainage structures are not functioning efficiently. These structures are to be repaired or replaced before significant erosion damage is caused. Rehabilitated areas must be shaped to be free-draining. Qualities of all water leaving the property should be monitored on a regular basis to ensure compliance with NWA/ WUL requirements. Samples should be analysed for biological, particulate and soluble contaminants. Additional monitoring should include aquatic bio monitoring (invertebrates, habitat, water	contractor Environmental coordinator Appointed contractor Appointed contractor Mine engineer Appointed contractor Aquatic Specialist	Once off. As and when required servicing. Leak checks every day. (check below vehicles for oil or fuel drippings). Annual basis-. Done after 1st major rain and after major storm. Monitor aspect for 5 years. Quarterly basis Bi-annual basis	Coordinator Appointed Contractor Environmental Coordinator Mine Engineer Mine Engineer Aquatic Specialist Aquatic Specialist	

Table 3: Environmental Management Measures for the Decommissioning Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				quality and fish) to determine biological functioning and health of rivers and streams in and around the rehabilitated areas.	Aquatic Specialist			
Groundwater contamination, rebound of water levels within backfill material which may decant. Pollution plume may affect down gradient water use.	Groundwater Impact	To monitor potential groundwater contamination and minimise groundwater contamination from pollution plume to down gradient water users.	The groundwater quality needs to comply with the requirements under the NWA and water use license conditions set out by DWS.	The open pits should be backfilled using suitably graded materials to mimic the natural groundwater environment as far as possible. The stockpile areas should be cleared and vegetated during the closure phase, while the waste rock dump slopes should be vegetated and graded to allow runoff and prevent infiltration of rainwater to the material. Continue to monitor all boreholes for water level and quality measurements. Monitor the Decant Point Multi-level monitoring wells must be installed to monitor base-flow within identified sensitive zones and to monitor groundwater level behaviour in rehabilitated workings. Results should be used to validate predicted impacts on groundwater availability and quality after closure. Present Monitoring Programme results to Government on annual basis to determine	Appointed Contractor Appointed contractor Mine Engineer Hydrogeologist Environmental Coordinator Appointed contractor Hydrogeologist Hydrogeologist	Once-off Once off Monthly Visual inspection of the decant point must be conduct on a monthly basis. Until 2-4 years after closure Annually	Environmental Coordinator Mine engineer Hydrogeologist Environmental Coordinator Hydrogeologist Hydrogeologist	Throughout the Decommissioning and Closure Phase

Table 3: Environmental Management Measures for the Decommissioning Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				compliance with closure objectives. Audit the monitoring network.	 Hydrogeologist	Annually	Hydrogeologist	
If no heritage of cultural resources were found during the operational phase other than the 2 stone wall sites (within the 500m mining restriction area). It is not likely that any other features would be unearthed as backfilling of pits will take place from overburden piles and ore fines. No further excavations will be required.	Site of archaeological importance	Ensure there is no detrimental impact on any site of cultural or archaeological importance	Decommissioning and closure phase is to comply with the National Heritage Resources Act, 25 of 1999.	If any cultural or heritage features are found or unearthed the procedures for finds must be followed as stipulated for construction phase.	Environmental Site Officer	As discovered.	Environmental Site Officer	Throughout the decommissioning and Closure Phase
Road Safety and increase in traffic on R555 and D2219.	Traffic impact	Ensure safe road conditions for vehicles, pedestrians on the local road network.	-	Traffic is set to decrease during the decommissioning and closure phase. Transport of ore will cease. The mitigation measures implemented in the Construction and operational phase stage 1 will serve all the phases of the mine's life span. Therefore no upgrades are proposed for this stage.	Mine Manager Appointed Contractor	None required	-	-
Sudden loss of employment / jobs, local spending on goods and services	Social and Economic Impact	Minimise negative impacts and maximise positive benefits on the local community; Promote active partnerships with local communities, where possible. Follow a comprehensive consultation and	Implement Skills Development and LED opportunities throughout the Life of Mine to allow employees access to alternative livelihood opportunities in other sectors.	A Social Closure Plan will be formulated 2 years before planned mine closure. Rakhoma will make every effort to ameliorate the social and economic impact on its employees where retrenchment and closure of the Mine are certain. Through the implementation of Skills Development	Mine Manager Rakhoma HR Department	Monitor the employee skills development programme and LED opportunities and success through life of mine	Rakhoma HR Department Community Liaison Officer	Through the Life of Mine

Table 3: Environmental Management Measures for the Decommissioning Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
		communication process with all stakeholders.		Programmes and the creation of LED opportunities for employees and their households in local communities, the negative socio-economic impacts of closure should be minimised. This will enable the employee to access alternative livelihood opportunities in other sectors of the economy.				
Mine closure /production stop will result in weakening of local economy	Social and Economic Impact	Minimise the impact on the local economy	Strengthen local economy through diversification to manage negative impact from mine closure	Efforts should be made to diversify the local economy to reduce the dependence on the mining sector. Once mining operations are finished the sudden impact of employment loss from mining could be absorbed if the locality economy diversifies. The local municipality should be made aware of this possible impact of mine closure.	Mine owner Mine Manager	On-going basis	Mine Manager Mine owner	Throughout Life of Mine

7.4 POST CLOSURE PHASE MANAGEMENT MEASURES

Table 4: Environmental Management Measures for the After Closure Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
POST CLOSURE PHASE								
Listed Activity: Monitoring of rehabilitation activities and monitor stability of rehabilitated areas								
Unstable rehabilitated areas	Vegetation, soils, erosion, groundwater, groundwater, air quality	Ensure sustainable cover and ecosystem establishes on rehabilitated mining area	Stable rehabilitated area covered with the a well-established and desired ecosystem.	Monitor key environmental variables (i.e. soils, erosion, vegetation, groundwater, surface water and air quality) to demonstrate stability of rehabilitated areas, this will be done for five	Environmental Coordinator	Up to 5 years after closure	Environmental Coordinator	Until final desired ecosystem is established

Table 4: Environmental Management Measures for the After Closure Phase of Geluk Mine Project

Aspect / Impact	Environmental Feature	Impact Management Objective	Impact Management Outcome	Management Measures	Responsibility	Frequency and Timeframes	Responsibility for Monitoring	Completion Date
				years after closure or up until such a time all areas create a sustainable cover and ecosystem;				
Potential remaining risk for groundwater contamination due to backfilled pits, stockpile yards	Groundwater impact	Determine if there are any residual groundwater effects from the rehabilitation phase	Groundwater quality will comply with the SA Water Quality Standards for Domestic and Agricultural use.	Continue with groundwater quality and level sampling/monitoring for a period of 2-4 years after mining ceases to establish post-closure groundwater level and quality trends. Monitoring information is to be used to update, rectify, and recalibrate predictive groundwater tools to increase confidence in closure objectives and management plan. Groundwater monitoring database updates must be updated on a monthly basis. An Annual Compliance Report must be completed and submitted to authorities for evaluation and comment for up to 2 years after closure.	Environmental Coordinator Hydrogeologist Hydrogeologist Hydrogeologist	2-4 years Monthly basis Submitted on an annual basis	Environmental Coordinator Hydrogeologist	4 year post mine closure

8 FINANCIAL PROVISION

The National Environmental Management Act 107 of 1998 (NEMA) under Section 24P states:

"An applicant for an environmental authorisation relating to prospecting, exploration, mining or production or related activities on a prospecting, mining ore exploration area, must make provision for prescribed financial provision, before the Minister responsible for mineral resources issues the environmental authorisation, comply with the prescribed financial provision for the rehabilitation, closure and on-going post decommissioning management of negative environmental impacts."

Appendix 3 of the EIA Regulations of 2014 promulgated under NEMA regulates the content of the Environmental Impact Report (EIR). It indicates that details of the financial provisions for rehabilitation, closure and on-going post decommissioning management of negative environmental impacts must be included in the EIR. Appendix 4 of the regulations also requires the inclusion of financial provisions for rehabilitation.

The EIR and EMPr are considered part and parcel documents. To avoid duplication the financial provision has been included in the EMPr.

8.1 Describe the closure objectives and the extent to which they have been aligned to the baseline environment

The closure objectives have been described under Section 6.1 of the EMPr. The objectives are resultant from the Conceptual Rehabilitation and Closure Plan which have been prepared for the Geluk Mine Project. The rehabilitation and closure plan has been informed by various specialist studies conducted as part of the EIA process for the proposed project site, in which the baseline environment is methodically described and considered. The rehabilitation and closure objectives have been tailored to the project at hand and its baseline environment.

Specialist Studies used to base the Geluk Mine project Rehabilitation and Closure Plan include:

- Geohydrological Impact Assessment, Naledzi Waterworks, May 2016;
- Soils, Land Capability and Agricultural Potential Assessment, Afzelia Environmental Consultants May 2016;
- Ecological Impact Assessment, Afzelia CC, May 2016;
- Aquatic Ecosystem and Wetland Impact Assessment, May 2016;
- Geochemistry Desktop Analysis, Digby Wells, May 2016

8.2 Confirm that the environmental objectives in relation to closure have been consulted with the Landowner and Interested and Affected Parties

The closure objectives are outlined in the EMPr which will be made available to I&APs, traditional authorities of the Geluk Mine study area (allocation rights holders), local communities including organs of state which includes Department of Rural Development and Land Reform entrusted to manage state owned property. The EIR & EMPr will made

available for public review and comment for a period of 30 calendar days. Any comments received will be included in the final report to be submitted to DMR for approval.

8.3 Provide a rehabilitation plan that describes and shows the scale and aerial extent of mining activities including mining area at time of closure

A Rehabilitation and Closure Plan has been prepared by Digby Wells Environmental for the Geluk Mine project. The report is attached as Annexure A to the EMPr and contains under Section 8.1 (Figure 8-1) the required plan indicating the scale and aerial extent of the mining activities including the mining area at time of closure.

8.4 Compatibility of Rehabilitation Plan with Closure Objectives

The Rehabilitation Plan has been drafted to be compatible with the closure objectives.

8.5 Quantum of Financial Provision required to manage and rehabilitate the environment

The Quantum of Financial Provision required to manage and rehabilitate the environment has been included in the Rehabilitation and Closure and Rehabilitation Plan attached to the EMPr under Annexure A. The cost for rehabilitation and closure of the mine according to the DMR methodology and rates is R 71 064 086 (Incl. VAT).

8.6 Confirm that the financial provision will be provided as determined

The applicant will submit a bank guarantee to the Department of Mineral Resources.

9. MONITORING COMPLIANCE WITH PERFORMANCE ASSESSMENT AGAINST THE EMPR

9.1 Monitoring compliance with performance assessment against the EMPr

The monitoring requirements have been included in Table 1, 2, 3 and 4 under Section 7 of this EMPR which include the environmental management measures, monitoring requirements, frequency of monitoring and who is to take on the responsibility for monitoring.

The Environmental Control Officer will be responsible for the review of the environmental management performance and all monitoring programmes to be conducted as per the approved EMPr. The monitoring progammes will ensure that management measures implemented are adequate and will also detect shortcomings on management measures and exceedances of perimeters set by legislation, regulations and guidelines.

The Environmental Control Officer shall review the environmental management performance of the appointed Mine Contractor and its subcontractors and overall mine operations on a regular basis. The ECO shall conduct site inspections and audits and progress reporting on a regular basis (quarterly).

The environmental aspects affected by the proposed Geluk Mine and which require monitoring is detailed below:

i. Topography

The alignment of the final topography should be line up to the actual agreed final landform (grazing). Topography achieved is to be monitored and compared to the planned topography during rehabilitation to ensure a profile acceptable for surface water drainage. The constructed landscape is to be verified by a surveyor during the closure phase.

ii. Soils, Land Use Capability

Care must be taken when rehabilitation activities are undertaken to ensure that soil resources are protected and not lost through erosion, compaction or contamination. Correct topsoil stripping and stockpiling will ensure that enough soil is available for rehabilitation and for soils to have adequate quality to support vegetation growth to ensure successful rehabilitation.

Progressive monitoring of soils must take place on a quarterly basis and involve the following:

- Inspection of stripping depths;
- Inspection of stockpiles to check degradation and /pollution;
- Soil Compaction levels as measured with a penetrometer in stockpiles
- Erosion occurrences – Monitor rehabilitated areas and identify zones with excessive erosion. It can be quantified or recorded for specific location;
- Inspection of soil surfaces before replacing soil to ensure pre-mining topography is matched;
- Fertility analysis (exchangeable cations K, Ca, Mg and Na and P, soil acidity) every 16 ha (400 x 400 m).

Stockpiled soil qualities will be monitored during construction and a fertility analysis will be done to determine the fertilizer requirements for soil to be used for decommissioning and closure phase. Monitoring will also take place during decommissioning where soils have been placed on disturbed areas to monitor erosion and revegetation.

All stockpiles should be clearly and permanently demarcated and located in defined no-go areas, re-vegetated and monitored on an annual basis during construction and operation.

iii. Surface Water

Monitoring of surface water will include:

- Monitoring of surface water drainage systems; and
- Surface water quality

As part of the rehabilitation plan, a review and monitoring of the water management plan (action for implementation during all phases of mining) has to be conducted on an on-going basis. In addition the following will be implemented:

Surface water drainage systems

The functionality of the surface water drainage systems should be assessed on an annual basis. This should preferably be done after the first major rains of the season and then after any major storm. An assessment of these structures will ensure that the drainage on the recreated profile is correct as well as to detect early on when any drainage structures are not functioning efficiently. These structures can then be repaired or replaced before they cause significant erosion damage.

Water Quality

The quality of all water leaving the property should be monitored on a regular basis to ensure compliance of the various constituents with the standards approved by the government. Samples should be analysed for particulate and soluble contaminants .

iv. Aquatic Ecosystem

Ongoing aquatic bio-monitoring (water quality, habitat, invertebrates and fish, SASS 5) must take place once prior and during construction till one (1) year after construction to determine trends in ecology and assess any impacts requiring mitigation.

Additional bio-monitoring (water quality, habitat, invertebrates and fish, SASS 5) must be undertaken on a bi-annual basis (high and low flows) to determine the ecological functioning and health of the rivers and streams, in and around rehabilitated areas during the closure phase.

Bank erosion must be monitored at regular intervals during the construction (and operational) phase in order to assess whether further river bank protection/stabilisation works are required at the Shakwaneng River.

v. Groundwater

Groundwater quality and quantity monitoring should be implemented during the construction phase to allow for the development of a baseline water quality and quantity dataset. Monthly sampling for water quality analysis for the first 2 years of mining construction and operation must be undertaken. Groundwater monitoring should be conducted to assess the following potential impacts:

- Groundwater Quantity: to monitoring the pit dewatering volumes during operations & groundwater levels at site;
- Groundwater Quality: through sampling of the groundwater in the boreholes.

Groundwater Monitoring should be undertaken to SABS and DWS requirement according to the schedule presented in Table 5 below. The proposed monitoring locations are given in Figure 1.

Table 5: Groundwater Monitoring Frequencies

Monitoring Positions	Sampling Intervals	Analysis	Water Quality Standards
CONSTRUCTION AND OPERATIONAL PHASE			
All monitoring	Monthly –	-	-

boreholes	measurement of water levels		
In-pit dewatering volumes	Daily: Measurements and recording of dewatering volumes	-	-
All monitoring boreholes	Monthly Sampling of water qualities for first 2 years of mining operations; thereafter on a quarterly basis	Full analysis during monthly sampling. Full analysis in April& October during quarterly sampling and abbreviated analysis in January & July	SA Water Quality Standards for Domestic and Agriculture use
De-watering Product	Quarterly: Sampling of water quality analysis	Full Analysis	SA Water Quality Standards for Domestic and Agriculture use
Process water (PCD)	Monlty Sampling of water quality analysis for first 2 years of mining operation. Thereafter on a quarterly basis.	Full Analysis	-
Rainfall	Daily at the mine	-	-
CLOSURE PHASE			
All monitoring boreholes	Monthly: measurement of water levels		
Decant point	Monthly: visual inspection		
All monitoring boreholes	Monthly: sampling of water quality analysis	Full analysis during monthly sampling. Full analysis in April& October during quarterly sampling and abbreviated analysis in January & July	SA Water Quality Standards for Domestic and Agriculture use
Rainfall	Daily at mine	-	-

Groundwater quality and level sampling/monitoring will be continued with for a period of 2-4 years after mining ceases to establish post-closure groundwater level and quality trends.

Monitoring information is to be used to update, rectify, and recalibrate predictive groundwater tools to increase confidence in closure objectives and management plan. Groundwater monitoring database updates must be updated on a monthly basis. Monitoring parameters are provided in Table 6.

An Annual Compliance Report must be completed and submitted to authorities for evaluation and comment for up to 2 years after closure.

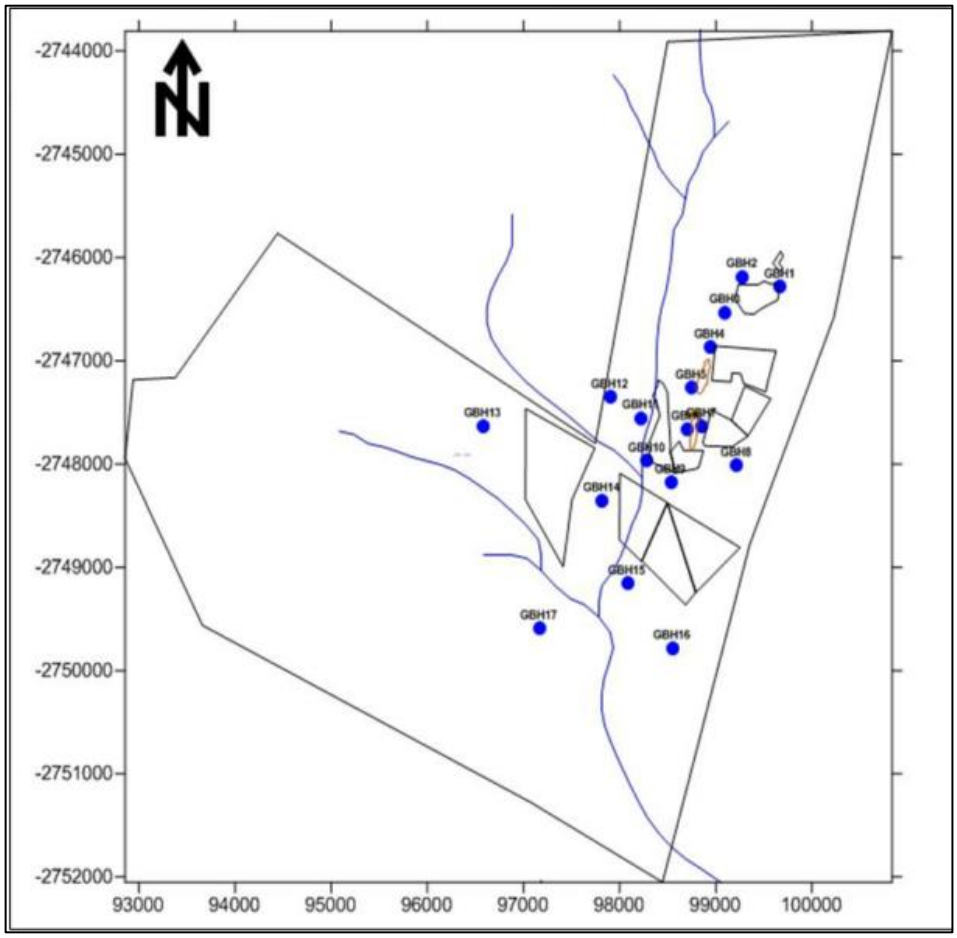


Figure 1: Proposed monitoring network

Table 6: Groundwater Monitoring Parameters		
ANALYSIS	**PHYSICAL PARAMETERS**	**CHEMICAL PARAMETERS**
Full	Groundwater levels Dewatering volumes	Field measurements of PH, EC. Laboratory analysis: Anions and cations (Ca, Mg, Na, K, NO3, SO4, F, Fe, Mn, Al, Cr & Alkalinity; other parameters (pH, EC, TDS). Include ICP metal scan Sewage related contaminants (E.Coli, faecal coliforms) for boreholes close to sewage facilities
Short	Groundwater levels Dewatering volumes	Field measurements of pH and EC Laboratory analysis of major cations and anions (CA, Na, Fe, Mn, Cl, SO4, NO3) and EC

Laboratory analysis techniques should comply with SABS guidelines. Monitoring database should be updated on monthly basis. Database used to analyse information and evaluate trends. An annual compliance report should be compiled and submitted to authorities for

evaluation and comment. The compliance report is to be submitted annually for all phases of the mine as well as 2 years after mining ceases.

vi. Vegetation / Biodiversity

Monitoring is to include:

- Vegetation basal cover
- Vegetation species diversity

Sekhukhune Mountain Bushveld will be removed and cleared to make way for mining pits and infrastructure. The management measures to address the impact will include rehabilitation of disturbed areas by revegetating and landscaping the site to end land use suitable for grazing. Rehabilitated areas must be monitored to ensure the establishment of re-vegetated areas to a ground cover of at least 85%. Monitoring will measure if the land has been restored to a stable rehabilitated area covered with a well-established and desired ecosystem with higher species diversity. A target of at least 10-15% basal cover should be set for fully established vegetation.

A Vegetation Monitoring Programme is to be implemented. Biodiversity Assessments and site surveys are to be undertaken by external specialists to establish the full range of plants that have become established. Summer and winter sampling should be done during the surveys post the rehabilitation phase for up to 5 years.

Alien Invasive Plant Monitoring is to be undertaken to monitor the introduction / spread of alien invasive species and ensure the rehabilitation of transformed areas. Annual surveys, aimed at updating the alien plant list and establishing and updating the invasive status of each species, should be carried out during rehabilitation phase.

vii. Noise and ground vibration

Noise levels will increase during the construction, operational and decommissioning phase of the Geluk Mine. There will be a temporary shift in noise levels during construction and permanent shift in noise levels during operation.

Noise and vibration monitoring must take place on a monthly basis during construction and operational phases of the project after which the frequency may be changed to quarterly. Monitoring will measure the noise levels to demonstate compliance with the SANS 10103 noise standards and guidelines, the local noise by-laws, and the International Finance Corporation's Environmental Health and Safety Guidelines. Regular feedback to the community leaders during the operational phase noise and vibration monitoring must take place.

When blasting is undertaken at the open cast mine, permanent ground vibration monitoring to be carried out at abutting noise sensitive areas. Blasting activities are to be monitored and ground vibration and a noise survey is to be done on a monthly basis after which the

frequency may change to quarterly basis. Monitoring will be done to ensure that site vibration limit is not exceeded and to mitigate any environmental effects of blasting.

Operation of crushing activities is to be monitored and noise survey is to be done on a monthly basis after which the frequency may change to quarterly basis.

During decommissioning phase noise monitoring will only to be carried out on a quarterly basis.

viii. Air quality and Dust

The construction, operation and decommissioning phase will increase the ambient air quality. The main contributing activities during operation will be vehicle entrainment from unpaved haulage roads (both mine and rail siding) and the crushing and screening plant. A dust fallout monitoring network is to be implemented and the proposed Geluk Mine and Roossenekal Rail Siding product stockpile in order to monitor the impacts.

7 Single dust monitoring buckets will be implemented at the mine site and 3 single dust monitoring buckets at the rail siding. The management and monitoring of all operations at the mine and railway siding should be evaluated on a daily basis.
The source based performance indicators for proposed routine operations for the project would include the following:

Unpaved roads: For unpaved roads on-site of the mine it is recommended that dustfall in the immediate vicinity be <1 200 mg/m2/day and dustfall at sensitive receptors to be <600 mg/m²/day. PM10 and PM2.5 concentrations at the closest sensitive receptor should be within NAAQS.

Crushing and screening plant: The absence of visible dust plume at all tipping points and outside the crushers during crushing operations would be the best indicator of effective control equipment in place. In addition the dustfall in the immediate vicinity of various sources should be <1 200 mg/m2/day and dustfall at sensitive receptors to be <600 mg/m²/day. PM10 and PM2.5 concentrations at the closest sensitive receptor should be within the NAAQ within NAAQS.

The sampling technique

Dust fallout sampling measures the fallout of windblown settle able dust. Single bucket fallout onitors to be deployed following the American Society for Testing and Materials standard method for collection and analysis of dustfall (ASTM D1739). This method employs a simple device consisting of a cylindrical container exposed for one calendar month (30 days, ±2 days). On-going, continuous monitoring to be implemented facilitating data collection over 1-month averaging period.

Progress Report must take place at least annually to the necessary authorities and community forum.

<u>Record keeping and Environmental Reporting</u>

Site inspections and progress reporting are recommended to take place at least quarterly during rehabilitation, with annual environmental audits being conducted.

Annual environmental audits should be continued at least until closure. Progress Reporting must be done to all I&AP's, authorities and persons affected by pollution.
For operations for which un-rehabilitated or party rehabilitated impoundments are located in close proximity (within 3 km) from residential areas, it is recommended that Community Forum meetings be scheduled and held at least on a bi-annual basis.

ix. Settlements, Community Liaison

A Complaints register must be kept at the Geluk Mine to record any complaints from the local / surrounding communities. Any complaints laid need to be recorded and addressed through the community forum meetings.

It is proposed that bi-annual meetings are held with the traditional leadership / Community Forum to discuss and record any issues and where possible address such. Regular feedback on blasting schedules, noise and vibration monitoring as well as air quality monitoring will be made to the Community Forum.

LEGAL PERMITS AND ADMINISTRATIVE RECORDS TO BE KEPT ON SITE

All legal documents required for the operation of the mine must be available at the Geluk Mine offices:

- Mining Right/License issued by DMR;
- Environmental Authorisation and Waste Management License issued by DMR
- Water Use License issued by DWS
- EMPr
- Environmental Performance Audits (against the EMPr)
- Public Complaints register

The permits should be reviewed on an annual basis to verify validity, specifically the waste management license. Expiry of permits/licenses should be foreseen and renewed in time.
Records to be kept at the Geluk Mine offices at all times include:

- Groundwater Quality and Quantity monitoring results
- Dust fallout monitoring results
- Surface Water Quality and Bio-monitoring (invertebrate, habitat, SASS 5, water quality) analysis results;
- Noise and Vibration Monitoring Results
- Waste manifest / Safe disposal documents

Records should be kept of Health and Safety Training provided to employees in terms of MHSA. The Occupation Health and Safety Act risk assessment and monitoring results are to be kept on site.

9.2 Indicate the frequency of submission of Performance Assessment Report

In terms of NEMA a Performance Assessment Report is referred to as an Environmental Audit Report.

The Environmental Audit report must comply with Appendix 7 of the EIA Regulations of 2014. It is to report on the level of compliance with the conditions of permits, the EMPr and closure plan; also the extent to which impact avoidance is achieved. It will evaluate the effectiveness of the EMPr, identify shortcomings and need for any changes to avoidance, management and mitigation measures provided.

Rakhoma Mining Resources will conduct continuous monitoring on environmental aspects (tables 1-4) and conduct performance assessments bi-annually to measure the Geluk Mine's performance against its approved EMPR.

A Performance Assessment Report demonstrating compliance with the approved EMPr will be submitted annually to the minister. The report will contain the following:

- Information regarding the period applicable to the performance assessment;
- Scope and purpose of the assessment;
- The methodology adopted in preparing the assessment (procedure followed)
- Interpretation of the information obtained from monitoring the status quo at Geluk Mine against the approved EMPr;
- The outcome of the audit / assessment;
- Recommendations on how and when non-compliance with the EMPr will be rectified;
- Recommendations on the adequacy / inadequacy of the EMPr.

10. ENVIRONMENTAL AWARENESS PLAN

In line with Appendix 4 the content of an EMPr must include an Environmental Awareness Plan describing the manner in which:

i. The applicant intends to inform his or her employees of any environmental risk which may result from their work; and
ii. Risks must be dealt with in order to avoid pollution or the degradation of the environment

10.1 Manner in which applicant intends to inform his/her employees of any environmental risks resultant from their work

The training of employees and contractors in environmental awareness at the proposed Geluk Mine is a prerequisite for reducing potential liabilities of Rakhoma Mining Resources. The training of employees is a reasonable measure to ensure that the environment is protected. Rakhoma will perform environmental training to reduce exposure to liability for environmental degradation caused by errant employees.

Rakhoma Mineral Resources will need to appoint an Environmental Control Officer (ECO) / responsible person which are to ensure that environmental awareness is carried out at the

proposed mine and the environmental awareness plan's objectives are met on an ongoing basis.

OBJECTIVES OF THE ENVIRONMENTAL AWARENESS PLAN

- Inform employees and contractors of any environmental risks which may result from their work, and
- Inform employees and contractors of the manner in which the identified possible risks must be dealt with in order to prevent degradation of the environment.
- In general, the purpose of implementing an plan is to optimise the awareness of those partaking in the mining and related activities which have the potential to impact negatively on the environment (e.g. spillages from dirty water dams)

RESPONSIBILITY FOR IMPLEMENTING THE EMPR

The environmental management programme will ensure environmental commitments are adhered to and will be used to evaluate the effectiveness of mitigation measures.

Environmental principles will be communicated effectively to newly appointed employees, employees returning from annual leave, as well as to contractors and visitors upon entering the mining area. The applicant shall ensure that all staff members, sub-contractors and suppliers understand and adhere to the Environmental Management Programme. The applicant shall ensure that all contractors, sub-contractors and suppliers are contractually bound to adhere to the Environmental Management Programme. All contractors, sub-contractors and suppliers have to give assurance that they understand the Environmental Management Programme and that they undertake to comply with its conditions.

AWARENESS CONTEXT

The worksforce, contractors are not informed about the environment and need to be informed of key elements that the EMPr strives to manage:

- Description of the environment and sensitive features;
- Explain simple key concepts;
- Introduce the environment of proposed mining right area and adequate management thereof;
- Provide examples of environmental degradation and pollution sources
- Explain the roles and responsibilities of the contractors, employees in managing the environment;
- Devise basic principles to manage the environment
- Indicate laws applicable to the management and protection of the environment;
- Indicate day to day preventative measures to assist elimination of pollution and degradation (presentation is better than cure)

SENIOR AND SUPERVISORY PERSONNEL

All senior and supervisory staff members shall familiarise themselves with the full contents of the EMPr. They shall understand and know how to implement the control measures of the EMPr and shall be able to assist other staff members in matters relating to the EMPr. Senior

and Supervisory personnel are to be identified and presented to the workforce, sub-contractors during training.

COMMUNICATION TO EMPLOYEES

Environmental awareness training courses shall be run for all personnel on site. Two types of course shall be run, one for Management and one for contractor's and labourers. A maximum of 20 people will be allowed per sessions. Courses shall be run in the morning during normal working hours at a suitable venue provided by the mine contractor/mine manager. All attendees shall remain for the duration of the course and sign an attendance register on completion that clearly indicates participant's names, a copy of which shall be handed to the ECO and kept on record at the Geluk Mine.

The ECO/responsible person shall allow for sufficient sessions to train all personnel. Subsequent sessions shall be run for any new personnel coming onto site. The type of training courses to the provided and to which groups are detailed below.

<u>During the construction phase the following training and communication will take place:</u>

- Management, the appointed mine contractor/engineer will attend an environmental awareness training workshop;
- Administration personnel, mine workers and sub-contractors are to attend an environmental induction course.

<u>During operation the following training and communication will take place:</u>

- Management, the appointed mine contractor/engineer will attend training through a detailed environmental awareness workshop with refresher training (status quo of environment, objectives to be met) on an annual basis;
- Administration staff will attend an environmental induction course;
- Mine workers/labourers and sub-contractors will attend an environmental induction course and monthly meetings for the LoM.

<u>During the decommissioning phase the following training and communication will take place:</u>

- Management and the appointed decommissioning contractor will attend and complete a detailed environmental awareness workshop;
- Mine workers/labourers, sub-contractors will receive an environmental induction course

All employees who start at the mine, and return from leave (3 weeks leave) must attend an environmental induction course.

ADDITIONAL TRAINING:

- Skills training will be provided to employees and contractors;
- The skills of employees and contractors will be evaluated and the extent to which they are equipped to manage environmental impacts through competency tests (testing training received);

- Job specific training (workshop, fuel depot, PCD, stockpile areas, transportation) training on emergency response as well as chemical spills and leaks will be provided. Regular refreshment training will be provided;

It may also be necessary to present the project EMPr to employees to highlight specific requirements and sensitivities.

The appointed person / ECO at Geluk Mine will be responsible to re-evaluate the need for environmental awareness training based on recorded incidents, developing issues and need to improve skills to manage environmental impacts.

10.2 Manner in which risks will be dealt with to avoid pollution/degradation of environment

An environmental risk deals with the probability of an event causing a potentially undesirable effect on the environment. It can be defined as an accident causing adverse effects by effluents, emissions, wastes, veld fires, chemical spills and leaks which result from natural, technological or human-induced factors.

The manner in which risks will be dealt with include:

- Contain potential pollutants and contaminants;
- Ensure that handling of potential pollutants and contaminants are conducted in a bunded area on impermeable surfaces;
- Implement the waste management plan prepared for all waste streams on site;

Where environmental emergencies arise, applicable emergency procedures must be followed. The name of responsible personnel and emergency services shall be available to staff and shall be clearly displayed at relevant locations within the proposed Geluk Mine site.

The Mine Manager shall advise the ECO of any emergencies on Site, together with a record of action taken, within 24 hours of the emergency occurring. Telephone numbers of emergency services shall be with the Site Officer at all times.

The responsibility of the ECO is;

- Identify problem areas and provide action plans to avoid further environmental damage;
- Review the proposals for pollution control measures and advise on its adequacy;
- Ensure that significant environmental incidents are reported to DWS and DMR.

The mine manager is responsible for the practical implementation of the EMPr and will be responsible for reporting the environmental incident/risk to the ECO.

(a) Fire

The mine manager shall advise the relevant authority of a fire as soon as one starts and shall not wait until he can no longer control it. The mine manager shall ensure that his employees are aware of the procedures to be followed in the event of a fire.

(b) Accidental leaks and spillages

The mine contractor/mine manager shall ensure that his employees are aware of the procedures to be followed for dealing with spills and leaks, which shall include notifying the ECO and the relevant authorities. The mine manager shall ensure that all the necessary materials and equipment for dealing with spills and leaks are available on Site at all times. Treatment and remediation of the spill areas shall be undertaken to the reasonable satisfaction of the ECO.

In the event of a hydrocarbon spill, the source of the spillage shall be isolated and the spillage contained. The area shall be cordoned off and secured. The mine manager shall ensure that there is always a supply of absorbent material readily available to absorb/ breakdown or where possible, be designed to encapsulate minor hydrocarbon spillages. The quantities of such materials shall be able to handle a minimum of 200 ℓ of hydrocarbon liquid spill. Any spills must be cleared and the contaminated soil/sludge disposed of in an appropriate manner, approved by the ECO, or at a licensed hazardous waste disposal site.

(c) Noncompliance with the EMPr or any applicable legislation

(d) Environmental incidents shall be investigated by the competent person and an environmental incident report shall be forwarded to the holder of the mining right. Incidents are to be reported to the DWS (relevant catchment management agency) and DMR. The incident report shall be filed within 5 working days.

11. SPECIFIC INFO REQUIRED BY COMPETENT AUTHORITY

The environmental liability figures contained in the financial provision will be updated on an annual basis as required in terms of NEMA. Costs will become more accurate over time and will reflect current market conditions.

12. UNDERTAKING BY EAP

The EAP confirms,

- The correctness of the information provided in the reports;
- The inclusion of comments and inputs from stakeholders and I&AP's;
- The inclusion of inputs and recommendations from the specialist reports where relevant; and
- That the information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties are correctly reflected herein.

13. UNDERTAKING BY APPLICANT

I,_____, the undersigned and duly authorised hereto by Rakhoma Mining Resources Pty Ltd understand the content of this EMPr and undertake to adhere to the conditions set out herein agreed to by the Limpopo Department of Mineral Resources: Regional Manager.

Signed_____on this day _____of 2016.

14. CONCLUSION

This Environmental Management Programme has been compiled by Naledzi Group Pty Ltd. The correctness of information contained in the report relies upon information provided on the project scope and method of mining from Rakhoma Mining Resources. Naledzi trusts that the information provided by Rakhoma is true and correct.

At the time of compilation of both the EIR and EMPr a final/detailed mine layout plan was not available and specific factual information on services provision was not detailed. The reports are thus based on the current available information.

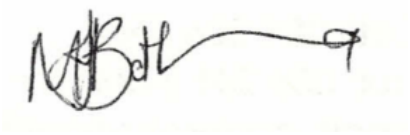
The public participation process undertaken thusfar for the Scoping and EIA process has resulted in several inputs/comments from I&APs, traditional authorities and organs of state. Such inputs have been included in Part A of this document (EIR) under Volume 1 Appendix 13 – Issues and Response Report. Further inputs will be solicited during the public review period of the EIR&EMPr.

Several specialist investigations were undertaken as part of the EIA process which have informed the EIR and set the target for monitoring and management of identified and ranked impacts in the EMPr.

The EIR and EMPr do not define whether the project should be approved or not. It provides a neutral, independent assessment of the proposed project's impact on the environment to help DMR make a decision on the application.

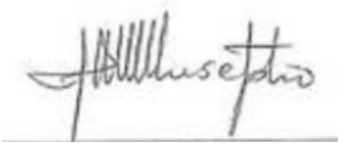
This EMPr has been compiled by Ms. Marissa Ilse Botha. Mr. Desmond K. Musetsho has reviewed the EMPR before release for public review in order to ensure quality control and accuracy of information.

Report Author 1:



Marissa Botha
Environmental Assessment Practitioner

Report Author 2:



Desmond Musetsho
MD & Environmental Assessment Practitioner

ANNEXURE A
REHABILITATION AND CLOSRE PLAN
INCLUDING FINANCIAL PROVISION