ENVIRONMENTAL & ENGINEERING

DRAFT REPORT

ROODEPOORT COAL (PTY) LTD – ROODEPOORT COLLIERY

DMR Reference Number: MP 30/5/1/2/2/10338 MR

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

REPORT REF: 21-1545-AUTH ROODEPOORT EA & IWULA

(ENVIRONMENTAL AUTHORISATIONS FOR MINING OF COAL ON PORTION 15 OF THE FARM ROODEPOORT 40 IS)

30 September 2022

VERSION AA

DOCUMENT AND QUALITY CONTROL

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BB – draft		Riana Panaino		Technical Review
CC– draft		Leoni le Roux		Quality review
Approved for Distribution:				
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QUALITY CONTROL BY:

Nature of Signoff:	**Responsible Person:**	**Role / Responsibility**	**Qualification**
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DISCLAIMER:

This is a legally binding document and many of the actions and recommendations remain the responsibility of the client (as the owner/lessee of the property).

EAP - was independent and performed the work relating to the application in an objective manner, even if this

results in views and findings that are not favourable to the application; have expertise in conducting environmental impact assessments or undertaking specialist work as required, including knowledge of the Act, these Regulations and any guidelines that have relevance to the proposed activity; ensure compliance with these Regulations;

Take into account, to the extent possible, the matters referred to in regulation 18 when preparing the application and any report, plan or document relating to the application; disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in the possession of the EAP and, where applicable, the specialist, that reasonably has or may have the potential of influencing-

The findings, results, observations, conclusions and recommendations provided in this report are based solely on the information provided to Eco Elementum (Pty) Ltd by the Client and other external sources (including previous site investigation data and external scientific studies). The opinions expressed herein apply to the site conditions and features which existed at the time of commencement of the investigations and production of this report.

The author has utilised his/her best scientific and professional knowledge in preparing this report and the content herein contained is and remains confidential in nature, save where otherwise ordered by a Court of law.

Whilst Eco Elementum (Pty) Ltd exercises due care and diligence in rendering the services and preparing this report, the accuracy of the content herein contained is reliant on the accuracy, correctness and completeness of information and/or data supplied to it by the Client. In this regard, Eco Elementum (Pty) Ltd accepts no liability for any loss and/or damages arising out of the inaccuracy of this report in instances where the information and/or data provided to it by the Client is found to be inaccurate, incorrect and/or incomplete.

DECLARATION OF INDEPENDANCE

I, Riana Panaino declare that;

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing:
    - any decision to be taken with respect to the application by the competent authority; and
    - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

30/09/2022

Signature **Date**

Mrs. Riana Panaino
BSc Hons Biodiversity and Conservation
IAIA Member
Pr.Sci.Nat
Registered EAP

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PART B: ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1. DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

1.a DETAILS OF THE EAP

Table 1-1: EAP details

EAP:	Eco Elementum (Pty) Ltd - Environmental and Engineering
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1.b DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

Table 1-2: Proposed Activity

Farm Name:	Roodepoort 40 IS Portion 15
Application area (Ha)	322.5019Ha
Magisterial district:	Nkangala District Municipality, eMalahleni Local Municipality
Distance and direction from nearest town	**Town** **Direction** **Approximate distance by road** Kriel South 10km
21 digit Surveyor General Code for each farm portion	T0IS00000000004000015

Table 1-3: Summary of Surface Right Owners

Farm			Ptn	Owner
Roodepoort	40	IS	15	MANHATTAN SYNDICATE LTD

1.c COMPOSITE MAP

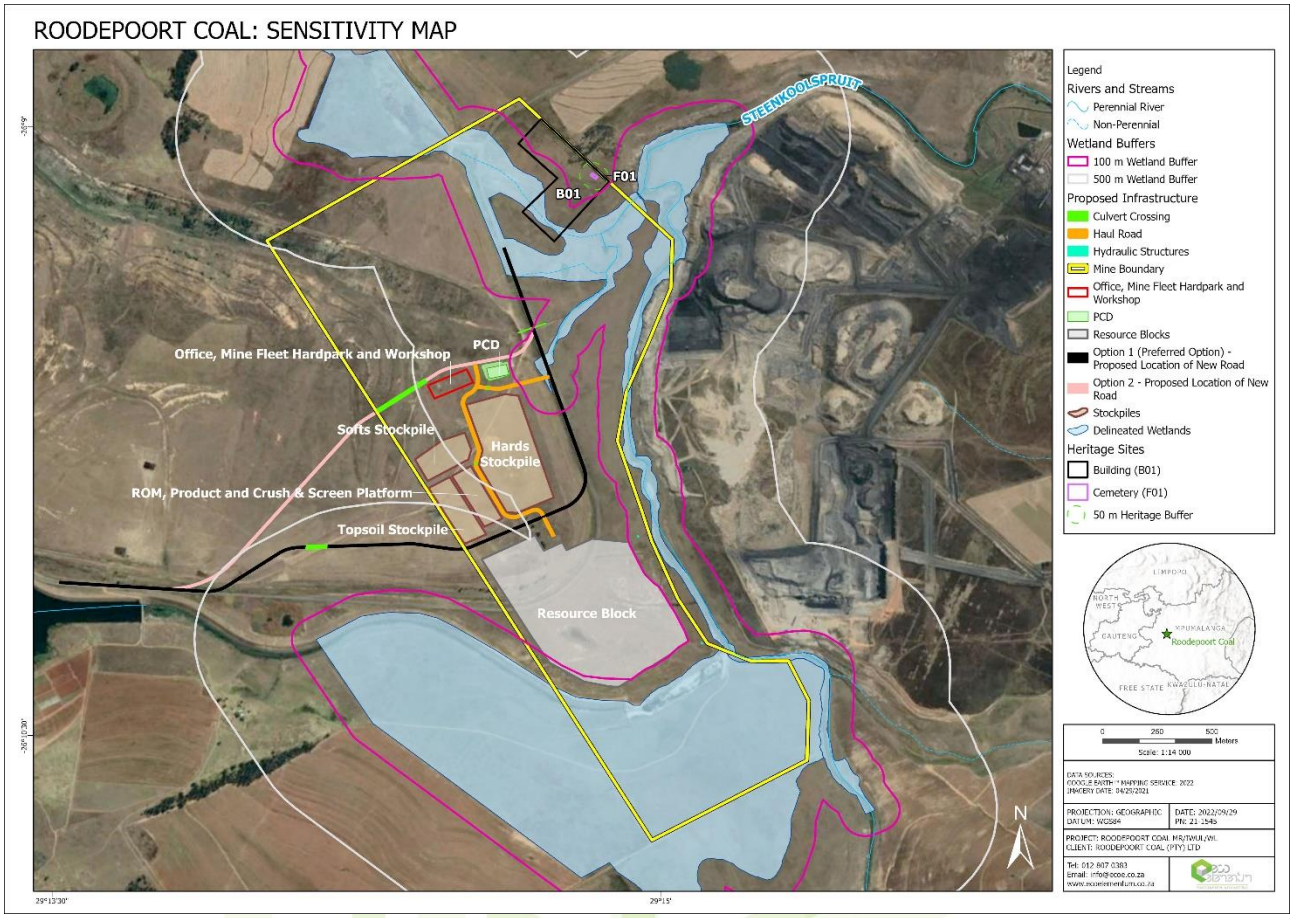


Figure 1.1: Site Layout with sensitivities

1.d DESCRIPTION OF IMPACT MANAGEMENT OBJECTIVES INCLUDING MANAGEMENT STATEMENTS

1.d.i Determination of closure objectives

- To appropriately close the mining area, the mine would annually identify areas of rehabilitation and actively pursue the closure vision. The annual rehabilitation plan will be updated on an annual basis and identify areas of concern.

1.d.ii The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity.

The management plan is detailed below for each aspect during each mining phase. Some measures are relevant to more than one aspect. These are not reiterated for each aspect.

The applicant shall ensure that employees and contractors are adequately trained with regard to the implementation of the EMP and environmental legal requirements and obligations. It is anticipated that Environmental awareness shall be targeted at all project involved personnel and also part time personnel shall be trained so that they are aware of environmental obligations by the time they visit the site. The environmental awareness practitioner will be appointed to conduct training during site establishment and will be responsible for how the site look like before the drilling and how it looks like after rehabilitation. This will be to ensure that the site has been restored to its original state or to an acceptable level.

The applicant is committed to identifying training needs and ensuring that all personnel whose work may create a significant impact upon the environment receive appropriate training. The Environmental Awareness Plan describes the training available and the manner in which environmental training needs are identified and continually reassessed.

1.d.iii Potential risk of Acid Mine Drainage.

When dewatering ceases at the end of the operational phase, the groundwater level will start to recover to a state of equilibrium. Decant from the lowest elevation on the pit boundaries may occur once the groundwater levels have recovered. Contaminated groundwater, as a result of acid mine drainage will therefore also be contained within the pit area.

1.d.iv Steps Taken to Investigate, Assess and Evaluate the Impact of Acid Mine Drainage

The potential for a given rock to generate and/or neutralise acid is determined by its mineralogical composition. This includes the quantitative mineralogical composition, mineral grain size, shape and texture. The potential for Acid Mine Drainage (AMD), or poor-quality leachate, in collieries is related to the generation of acid through the oxidation of sulphide minerals, which is caused through the exposure of these minerals (most commonly pyrite) to atmospheric oxygen. Pyrite (FeS_2) reacts under oxidising conditions (abiotically or bacterially catalysed by *Thiobacillus ferro-oxidans*) to generate acid according to the following basic reaction:

$$FeS_2 + \frac{15}{4} O_2 + \frac{7}{2} H_2O = FeOH_3 + 2H_2SO_4$$

In practice, this is a staged process in which the initial phases for the conversion of pyrite to ferrous and then ferric iron take place in moderately acidic environments (pH >4.5). The oxidation of ferrous iron in an acidic medium requires the catalytic influence of the bacteria (*Thiobacillus ferro-oxidans*). The chemical components of this acid generation process consist of the above sulphide oxidation reaction as well as acid neutralisation, which is mainly provided by carbonates and, to a lesser extent, silicates within the rock. It is important to evaluate the potential volume as well as the quality of leachate that could be generated.

In opencast operations, the objective is to remove all the coal, therefore acid generation and neutralisation potential is based on the chemistry of the surrounding country rock (i.e. the roof (overburden) and floor of the coal seam. However, in high wall mining strips of coal are left behind to support the roof and prevent subsidence. In these instances, the acid generation potential will include the sulphur composition (volumes and speciation) within both the country rock and the coal itself, whilst the neutralisation potential remains that of the country rock only.

Should there be total coal extraction during opencast operations, with limited exposure of the floor material, the pre-mining geochemical model conducted as part of the EMPR showed that there will be insufficient sulphur to effect sustainable acid generation. The quality and volume of acid generated relates to the period of exposure of the coal/shale pyrite surface to oxygen before backfilling, and an anaerobic environment is created either through oxygen removal, dilution or flooding. It was thus recommended that any carbonaceous overburden or waste coal material be placed at the bottom of the pit, covered and compacted to reduce the potential for oxidation and acid generation. Any decant from all mining operations must be treated as a potentially contaminated.

1.d.v Engineering or Mine Design Solutions to Be Implemented to Avoid or Remedy Acid Mine Drainage

- Groundwater flow to the stream in close proximity to the pit will occur if the hydraulic head within the pit is higher than the stream bed elevation. It is proposed that the heads in the final pit void be kept lower than that of the river with the aid of dewatering.
- Carbonaceous material should be placed at the deeper base of the opencast pits to allow flooding with groundwater as soon as possible. This will reduce the redox reaction potential as oxygen is excluded from the system.
- Rehabilitation should occur in such a manner that surface runoff is directed away from the rehabilitated pit and recharge to the pit minimized.
- Flow paths which include fracture zones should be sealed to reduce inflow of fresh groundwater and outflow of contaminated groundwater.
- Methods of handling the potential decant should be investigated and may include treatment of polluted water through an active or passive treatment system.
- The groundwater quality in the monitoring boreholes should continue to be analysed on a quarterly interval basis.

1.d.vi Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage.

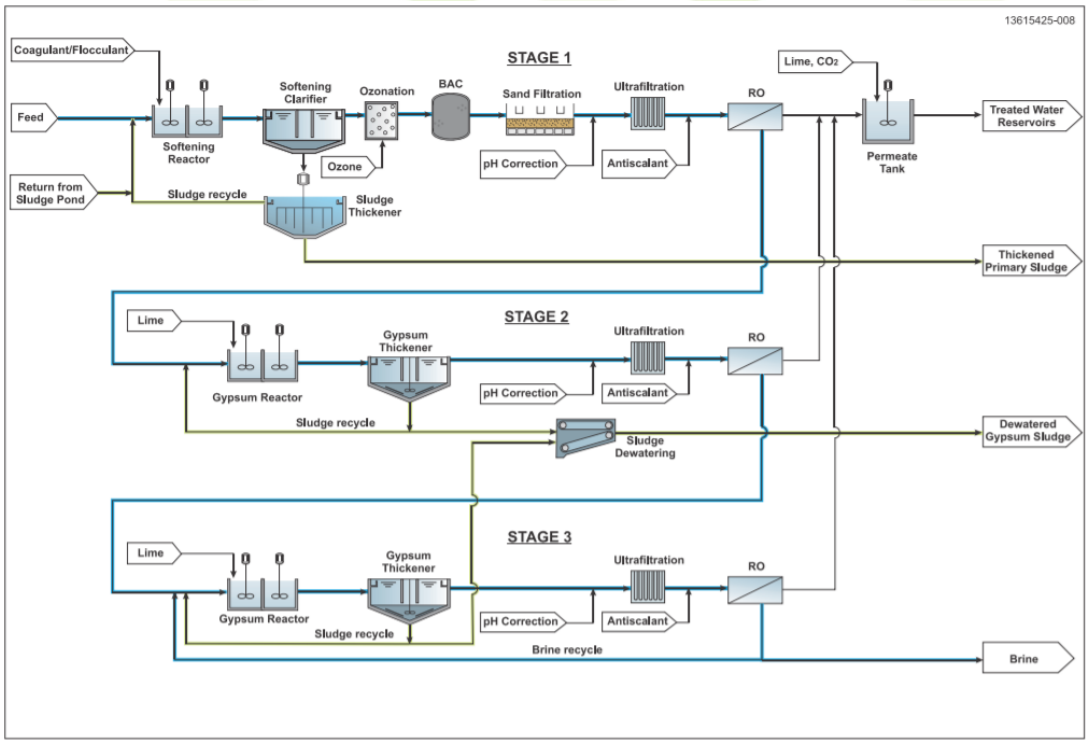
Three treatment options are considered for the treatment of acid mine drainage, The preferred method is being investigated and will be implemented before mine closure.:

- **RO Treatment plant**

  Reverse osmosis (RO) removes most of the dissolved solids from brackish or saline feed water and can treat water to a very good quality. Pre-treatment for RO often involves limestone and/or lime dosing and aeration for the neutralisation of acidic water and the removal of metals. Neutralisation is then followed by stringent filtration using either sand and cartridge filters, or ultrafiltration (UF), before RO. This process uses pressure to drive water through a semi-permeable membrane, leaving the ions behind. A clean water stream (permeate) and a concentrated brine solution (retentate) result. RO is capable of rejecting bacteria, salts, sugars, proteins, particles, dyes, and other constituents that have a molecular weight of greater than 150-250 daltons.

  RO has the ability to produce treated water with a very low TDS concentration; however, this is expensive (in terms of capital and operational costs) and reduces the quantity of water recovered. Generally, a recovery of 50%-80% can be achieved with a single stage RO plant, and this can be increased to 95% with multiple stage RO, thereby greatly reducing the waste brine volume and the cost of brine disposal.

  Multiple stage RO can achieve water recoveries of greater than 99%, depending on the feed water quality. These high water recoveries are achieved when the feed water consists of predominantly divalent ions that can be precipitated from the preceding stage's brine before being treated in the next RO stage. Multiple stage RO systems can also contain nanofiltration membranes to allow monovalent ions to pass through the membrane and increase the overall water recovery by reducing the production of brine.



The sludge and brine waste streams which are a by-product of the RO process require long-term disposal due to their hazardous nature and high concentration of dissolved salts.

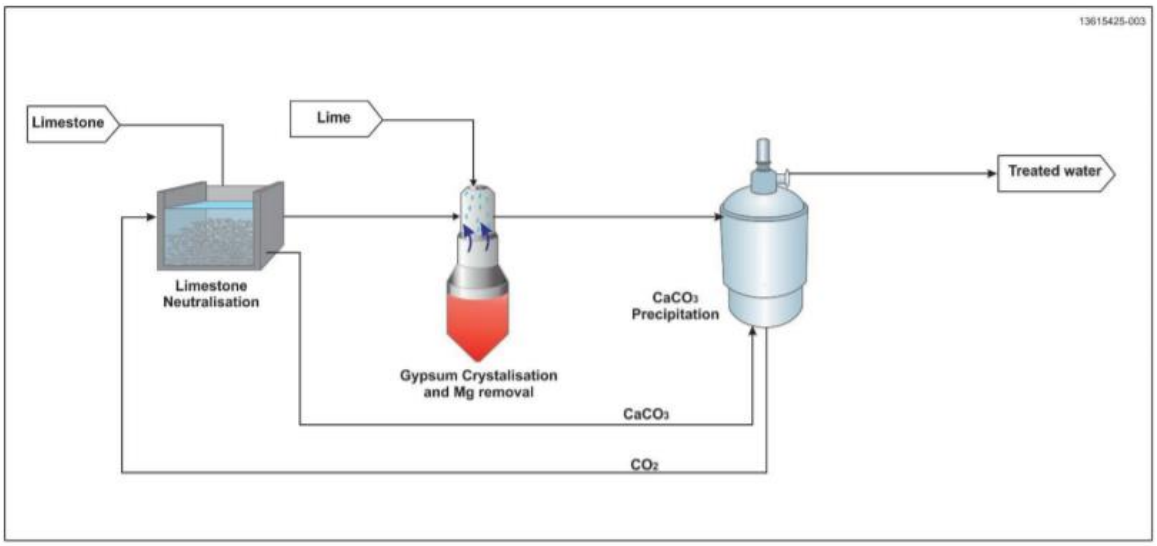
- **Lime treatment**

  The integrated limestone and iron(II)-oxidation process allows for the oxidation of iron(II) when limestone alone is used for neutralisation in the first stage (Maree and du Plessis, 1994; Maree et al., 1996). Powdered limestone is used for iron(II)-oxidation at pH 5.5, neutralisation of free acid, metal precipitation (e.g. Fe3+ and Al3+) and gypsum crystallisation. All reactions are achieved in the same reactor. The novelty of this development lies in the fact that conditions were identified in which iron(II) can be oxidised at pH 5.5 by the addition of limestone. Limestone, the cheapest alkali, is used for neutralisation of the bulk of the acid content. Carbon dioxide (CO2) is produced and stripped off through aeration and transported to the third stage. Lime is used in the second stage to allow for precipitation of magnesium and other metals, and the sulphate associated with these metals. The solubility product of gypsum controls the level to which sulphate is removed. In the third stage, CaCO3 precipitation occurs when the CO2 that is produced in the first stage makes contact with the high pH of the water from the second stage. This

occurs at pH 8.3. The CaCO3 is pure enough to be sold as a by-product, or it can be recycled to the first stage to supplement the limestone addition (Maree et al., 1996). This process offers benefits such as:

- (i) The treated water is under-saturated with respect to gypsum;
- (ii) if the feed water contains aluminium, sulphate removal is not only achieved through gypsum crystallisation, but also through ettringite (3CaO.3CaSO4.2Al2O3) formation as it precipitates in the pH range 11.3 to 11.4.

The equipment consists of low-cost mixed or aerated reactors and clarifiers. A number of process configurations exist, each with specific advantages or disadvantages. The process is robust and proven, but the resultant water quality normally fails to meet the standards that would allow for river discharge or reuse. The process also produces large volumes of mixed precipitate sludge waste that requires long term disposal. The process can be used as an effective metals removal pre-treatment step prior to desalination processes, such as RO or ion exchange. Limestone can be used for complete removal of iron(II) within 90 min reaction time. Lime can therefore be used for removal of metals (Maree et al., 2013).



- **Passive Treatment (Preferred option)**

  A constructed wetland (CW) is an artificial wetland to treat acid mine drainage. Constructed wetlands are engineered systems that use natural functions vegetation, soil, and organisms to treat polluted water. Depending on the type of polluted water the design of the constructed wetland has to be adjusted accordingly.

  Similarly, to natural wetlands, constructed wetlands also act as a biofilter and/or can remove a range of pollutants (such as organic matter, nutrients, pathogens, heavy metals) from the water.

  Passive treatment systems are a valuable option for treating acid mine drainage at remote locations. The advantages of passive treatment systems are that they do not require electrical power; do not require any mechanical equipment, hazardous chemicals, or buildings; do not require daily operation and maintenance; are more natural and aesthetic in their appearance and may support plants and wildlife; and, are less expensive than active alternatives.

1.d.vii Volumes and Rate of Water Use Required for The Mining Operation

Water Demand is still being investigated and detailed water demand will be provided with the application for a water use license

1.d.viii Has A Water Use Licence Been Applied for?

A water use license application (IWULA) and associated Integrated Water and Waste Management Plan (IWWMP) is in the process of being completed and will be submitted to the DWS.

1.d.ix Impacts to be Mitigated in Their Respective Phases

Measures to rehabilitate the environment affected by the undertaking of any listed activity

Activities	Impact	Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Heritage						
Mining operations	Damage to cemetery - F01	Construction, operational	1ha	Conservation buffer of 50 m	National Heritage Resources Act 25 of 1999	Prior to construction
Mining Operations	destruction of potential subsurface cultural material - B01	Construction, operational	1 0ha	If impact to the area is planned: ECO to monitor subsurface material	National Heritage Resources Act 25 of 2000	Prior to construction
Noise						
Site clearance/establishment	Bulldozers operating generating noise	Construction Phase	170ha	Limit the construction footprint to only the development area Noise barriers such as a berm between sensitive receptors Switch of equipment when not in use.	SANS 10103	Prior to construction. Ongoing maintenance throughout LoM
Construction related activities	Equipment moving around and construction related noise	Construction Phase	170ha	Limit the construction footprint to only the development area Noise barriers such as a berm between sensitive receptors Switch of equipment when not in use	SANS 10103	Prior to construction. Ongoing maintenance throughout LoM
Mining	Excavators and truck loading and unloading generated noise	Operational Phase	170ha	Noise barriers such as a berm between sensitive receptors Switch of equipment when not in use	SANS 10103	Ongoing maintenance throughout LoM
Mining	Haul truck moving on the Haul Roads	Operational Phase	170ha	Noise barriers such as a berm between sensitive receptors	SANS 10103	Ongoing maintenance throughout LoM
Mining	Commercial Trucks moving on the access road	Operational Phase	170ha	Noise barriers such as a berm between sensitive receptors	SANS 10103	Ongoing maintenance throughout LoM
Mining	Crusher plant generating Noise	Operational Phase	170ha	Enclose the crusher to reduce the noise impact on the surrounding area	SANS 10103	Ongoing maintenance throughout LoM
Removal of any infrastructure	Demolition equipment generated noise	Decommissioning Phase	170ha	Regulate the speed of the vehicles Noise barriers such as a berm between sensitive receptors Switch of equipment when not in use	SANS 10103	Ongoing maintenance throughout LoM
Decommissioning, rehabilitation and post-closure	Bulldozers shaping the final landform generated noise	Decommissioning /Rehabilitation Phase	170ha	Noise barriers such as a berm between sensitive receptors Switch of equipment when not in use	SANS 10103	Ongoing maintenance throughout LoM

Activities	Impact	Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Ecological Impacts (Wetland, Aquatic Terrestrial)						
Infrastructure, Work Revetments, New access routes, Site clearing for opencast area, Placement of cleared topsoil into allocated stockpiles, Use of heavy machinery	Flow alterations	Construction	170ha	· Avoid wetland areas and their associated buffer zones. · Attenuation of stormwater from any establishment and its associated infrastructure is important to control the velocity of runoff towards the wetland systems. Attenuation structures must be placed between the development and associated infrastructure and the river. · Do not allow surface water or stormwater to be concentrated, or to flow down cut or fill slopes without erosion protection measures being in place. · Vegetation clearing must be undertaken as and when necessary in phases. The entire area must not be stripped of vegetation prior to commencing construction/establishment activities. · All demarcated sensitive zones outside of the construction area are strictly off limits during any mining activity. · Exposed soils must be rehabilitated as soon as practically possible to limit the risk of erosion. Erosion control measures must be employed where required. · Bank erosion must be monitored at regular intervals during the construction/establishment (and operational) phase in order to assess whether further river bank protection/stabilisation works are required. · Riparian vegetation bordering on drainage lines, wetlands and rivers will be considered environmentally sensitive and impacts on these habitats should be avoided. · If erosion has taken place, rehabilitation will commence as soon as possible. · All roads need to be maintained and any erosion ditches forming along the road filled and compacted. · Demarcated and bunded stockpiles and waste dumps will also be placed in areas where groundwater and surface water pollution can be avoided.	Implement SWMP as per GN704 Follow the approved Closure and Rehabilitation Plan	Prior to construction. Ongoing maintenance throughout LoM
Increased traffic, Use of heavy machinery, Bank Erosion	Flow alterations	Operations	170ha			
Use of heavy machinery	Pollution of watercourse	Construction	170ha	· Demarcate wetland areas to avoid unauthorised access. · Cut-off trenches must be constructed to prevent any harmful substances from entering the wetland areas. · Materials needed for construction must be stored in a construction camp in the applicable manner · Education of workers is key to establishing good pollution prevention practices. Training programs must provide information on material handling and spill prevention and response, to better prepare employees in case of an emergency. · The proper storage and handling of hazardous substances (hydrocarbons and chemicals) needs to been ensured. · Industry Best Practise Guidelines and Standards needs to be implemented in terms of tailings storage design. Built-in engineering designs such as drainage systems and decanting pools are recognised as mitigation measures.	Implement SWMP as per GN704 Follow the approved Closure and Rehabilitation Plan	Prior to construction. Ongoing maintenance throughout LoM
Increased traffic, Increased road runoff during rainfall events	Pollution of watercourse	Operational	170ha			

Activities	Impact	Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
New access routes, Placement of cleared topsoil into allocated stockpiles	Spread of alien invasive vegetation	Construction	170ha	· An alien invasive management programme must be incorporated into an Environmental Management Programme.0	Follow approved Alien Invasive plan as guided by SANBI	Prior to construction. Ongoing maintenance throughout LoM
Hardened surfaces	Spread of alien invasive vegetation	Operational	170ha			
Groundwater						
Surface clearing and preparation.	Increase in surface run-off and therefore decrease in aquifer recharge.	Construction	170ha	Re-vegetate.	N/A	N/A
Box Cut	Decrease in water level from the point where development is lower than the water level.	Construction	5ha	No management can be incorporated to limit the impacts of dewatering should the box-cut floor be lower than the groundwater level.	N/A	N/A
Topsoil and overburden stockpiling.	Acid generation in the case of carbonaceous material placement.	Operation	18ha	Should a contamination plume be detected, groundwater abstraction to contain plume.	SANS241:2015	Storm water Management to be constructed prior to other infrastructure establishment. Ongoing monitoring.
ROM stockpiling.	Acid generation as a result of carbonaceous material.	Operation	2,5ha	Should a contamination plume be detected, groundwater abstraction to contain plume.	SANS241:2015	Storm water Management to be constructed prior to other infrastructure establishment. Ongoing monitoring.
Pollution Control Dams	Contaminated water in the dams can seep to the aquifer.	Operation	1ha	Should a contamination plume be detected, groundwater abstraction to contain plume.	NEMWA liner specifications	When Spills occur
Hydrocarbon spills.	Spills from mining vehicles can infiltrate to the aquifer and cause a down gradient plume migration.	Construction & Operation	170ha	Clean any hydrocarbon spills in the appropriate manner.	Standard Operating Procedure for Spill containment and clean-up	Throughout LOM
Opencast mining	The water infiltrating the voids will be removed for safe mining, causing a decrease in the water level.	Operation	36ha	No management can be incorporated to limit the impacts of dewatering.	Follow the approved Closure and Rehabilitation Plan	During construction
Closure of the mine	Groundwater decant is expected should the system behave as predicted. Decant is expected to occur on the	Closure and Decommissioning	170ha	Treat decant water before release to the environment	Follow the approved Closure and Rehabilitation Plan	During Closure and decommissioning

Activities	Impact	Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
	lowest elevation on the pit boundary.					
Closure of the mine	Pollution Plume spread	Closure and Decommissioning	Beyond the Mining Right Boundary	Treat decant water before release to the environment	Follow the approved Closure and Rehabilitation Plan	During Closure and decommissioning
Surface Water						
Construction activities	Sedimentation and pollution of the Watercourse	Construction Phase	170ha	Separate Clean and Dirty Water System	SWMP	Storm water Management to be constructed prior to other infrastructure establishment
Dewatering	Reduction in Baseflow	Operational Phase	36ha	No mitigation available	N/A	N/A
Operational Activities	Water quality deterioration	Operational Phase	170ha	Separate Clean and Dirty Water System	SWMP	Storm water Management to be constructed prior to other infrastructure establishment. Ongoing monitoring.
Closure of the mine	Decant of poor quality water	Closure and Decommissioning	Beyond the Mining Right Boundary	Treat decant water before release to the environment	ISO 5667: Grab Samples Water parameters as approved in the IWULA	Water treatment establishment before mine closure.
Air Quality						
Site clearance/establishment	Bulldozers generating fugitive particulate matter emissions including Dust and PM10	Construction Phase	170ha	Limit the construction footprint to only the development area	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) - National Dust Control Regulations (Government Gazette No. 36794 - No. R 827) SANS 1929:2011	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas
Construction related activities	Fugitive particulate matter emissions including Dust and	Construction Phase	170ha	Limit the construction footprint to only the development area Implement dust suppression specially on windy days	National Environmental Management: Air	Ongoing dust suppression throughout LoM.

Activities	Impact	Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
	PM10 from vehicle moving on roads				Quality Act, 2004 (Act No. 39 of 2004) - National Dust Control Regulations (Government Gazette No. 36794 - No. R 827) SANS 1929:2011	Concurrent rehabilitation of bare areas
Mining	Fugitive particulate matter emissions including Dust and PM10	Operational Phase	170ha	Water sprays at tipping points Wind breaks at tipping points	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) - National Dust Control Regulations (Government Gazette No. 36794 - No. R 827) SANS 1929:2011	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas
Mining	Wind blown fugitive particulate matter emissions including Dust and PM10 from stockpiles	Operational Phase	170ha	Water sprays at ROM stockpiles Revegetate topsoil and OVB stockpiles	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) - National Dust Control Regulations (Government Gazette No. 36794 - No. R 827) SANS 1929:2011	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas
Mining	Fugitive particulate matter emissions including Dust and PM10 from vehicles moving on the Haul road	Operational Phase	170ha	Water Sprays mitigating 75%	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) - National Dust Control Regulations (Government Gazette No. 36794 -	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas

Activities	Impact	Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
					No. R 827) SANS 1929:2011	
Mining	Fugitive particulate matter emissions including Dust and PM10 from vehicles moving on the Access road	Operational Phase	170ha	Adding a dust binding additive to the access road to achieve 90% or more mitigation	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) - National Dust Control Regulations (Government Gazette No. 36794 - No. R 827) SANS 1929:2012	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas
Mining	Fugitive particulate matter emissions including Dust and PM10 from the crusher plant	Operational Phase	170ha	Water sprays or fully enclose the crusher	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) - National Dust Control Regulations (Government Gazette No. 36794 - No. R 827) SANS 1929:2013	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas
Removal of any infrastructure	Fugitive particulate matter emissions including Dust and PM10 from vehicle moving on roads	Decommissioning Phase	170ha	Regulate the speed of vehicles on site Implement dust suppression activities	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) - National Dust Control Regulations (Government Gazette No. 36794 - No. R 827) SANS 1929:2014	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas
Decommissioning, rehabilitation and post-closure	Fugitive particulate matter emissions including Dust and PM10 from bulldozers shaping the landform	Decommissioning /Rehabilitation Phase	170ha	Revegetate areas/slopes with suitable indigenous vegetation	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)	Ongoing dust suppression throughout LoM. Concurrent

Activities	Impact	Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
					- National Dust Control Regulations (Government Gazette No. 36794 - No. R 827) SANS 1929:2015	rehabilitation of bare areas
Visual						
Site clearance/establishment	Negative impact on aesthetics - due to the site being more visible	Pre-Construction Phase	170ha	Limit the construction footprint to only the development area	N/A	Prior to construction
Construction related activities	Dust creation and change in visual/landscape character	Construction Phase	170ha	Limit the construction footprint to only the development area Regulate the speed of vehicles on site Implement dust suppression activities Laydown areas and construction camps should blend in or be screened from surrounding sensitive receptors	N/A	Prior to construction
Construction related activities	Light pollution at night on the identified sensitive receptors	Construction Phase	170ha	Reduce spill light and glare	N/A	Prior to construction
Mining activity	Visual impact on surrounding identified sensitive receptors	Operational Phase	170ha	Establish visual screens/barriers between the development and the identified sensitive receptors Limit the height of topsoil stockpiles and waste rock dumps where possible Ancillary infrastructure should blend in with the surrounding existing sense of place	N/A	Prior to construction
Mining activity	Dust creation and change in visual/landscape character due to an increased number of vehicles	Operational Phase	170ha	Limit the operational activities to only the development area Regulate the speed of vehicles on site Implement dust suppression activities	N/A	Prior to construction
Mining activity	Light pollution at night on the identified sensitive receptors	Operational Phase	170ha	Reduce spill light and glare	N/A	Prior to construction
Removal of any infrastructure	Dust creation and change in visual/landscape character due to an increased number of vehicles	Decommissioning Phase	170ha	Regulate the speed of vehicles on site Implement dust suppression activities	N/A	Prior to construction
Decommissioning, rehabilitation and post-closure	Change in landscape character	Decommissioning /Rehabilitation Phase Post-Closure Phase	170ha	Revegetate areas/slopes with suitable indigenous vegetation Where possible, reshape the area so that it resembles the pre-construction landscape Remove as much infrastructure as possible Ensure that residual infrastructure remains in good condition where possible	N/A	Prior to construction
Soils, Land Use, Land Capability and hydropedology						

Activities	Impact	Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Site Preparation	Loss of topsoil	Construction	170ha	— Limit earthworks and vehicle movement to demarcated paths and areas. — Limit the duration of construction activities where possible, especially those involving earthwork / excavations. — Access roads associated with the development should have gradients or surface treatment to limit erosion, and road drainage systems should be accounted for.	Soil Management Plan as per the Specialist Soils report	Throughout construction
Site Preparation	Erosion and Sedimentation	Construction	170ha	— Limit earthworks and vehicle movement to demarcated paths and areas. — Limit the duration of construction activities where possible, especially those involving earthwork / excavations. — Access roads associated with the development should have gradients or surface treatment to limit erosion, and road drainage systems should be accounted for.	Soil Management Plan as per the Specialist Soils report	Throughout construction
Site Preparation	Change in Surface Profile	Construction	170ha	Re-establish surface profile at closure.	Soil Management Plan as per the Specialist Soils report	Throughout construction
Site Preparation	Change in Land Use	Construction	170ha	Re-establish the area as a functioning wetland at closure.	Soil Management Plan as per the Specialist Soils report	Immediately after mining
Site Preparation	Change in Land Capability	Construction	170ha	— Limit earthworks and vehicle movement to demarcated paths and areas. — Limit removal of vegetation to demarcated areas only. — Avoid materials that sterilize the soil.	Soil Management Plan as per the Specialist Soils report	Prior to and during mining
Site Preparation	Soil Contamination	Construction	170ha	— On-site vehicles should be well-maintained, — Drip trays should be placed under stationary vehicles / plant; — On-site pollutants/hazardous materials should be contained in a bunded area and on an impermeable surface; — Ensure proper control of dangerous substances entering the site; — Adequate disposal facilities should be provided, and A non-polluting environment should be enforced.	Standard Operating Procedure for Spill containment and clean-up	When Spills occur
Ongoing mine management	Loss of Topsoil	Operation	170ha	— The site should be monitored for signs of erosion continually — Bare areas should be kept well vegetated — An operational-phase storm water management plan should be designed for the site and adhered-to.	Soil Management Plan as per the Specialist Soils report	Throughout operation
Ongoing mine management	Erosion and Sedimentation	Operation	170ha	— The site should be monitored for signs of erosion continually — Bare areas should be kept well vegetated — An operational-phase storm water management plan should be designed for the site and adhered-to.	Soil Management Plan as per the Specialist Soils report	Throughout operation

Activities	Impact	Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Ongoing mine management	Soil Contamination	Operation	170ha	— Chemicals should be stored in fully enclosed areas and the car park area should be covered. Both should be on impermeable hardstanding. — Hardstanding should be monitored for cracks. — If chemicals are kept outside of the enclosed area temporarily, this area should be on hardstanding and bunded.	Standard Operating Procedure for Spill containment and clean-up	When Spills occur
Land Rehabilitation	Erosion and Sedimentation	Closure	170ha	Fence off No-go areas — Access roads associated with decommissioning should have gradients or surface treatment to limit erosion, and road drainage systems should be accounted for. — Exposed surfaces should be re-vegetated or stabilised as soon as is practically possible. — A decommissioning-specific storm water management plan should be designed for the site and adhered-to.	Soil Management Plan as per the Specialist Soils report	During Closure and rehabilitation
Land Rehabilitation	Soil Contamination	Closure	170ha	— On-site vehicles should be well-maintained, — Drip trays should be placed under stationary vehicles / plant; — On-site pollutants/hazardous materials should be contained in a bunded area and on an impermeable surface; — Ensure proper control of dangerous substances entering the site; — Adequate disposal facilities should be provided, and A non-polluting environment should be enforced.	Soil Management Plan as per the Specialist Soils report	When Spills occur
Social Economic						
Establishment of underground mine	Employment opportunities	Construction and Operational Phase	Local communities	Where reasonable and practical the mine should appoint local contractors; Opportunities for training of workers should be maximised; Ways to enhance local community benefits with a focus on broad based BEE need to be explored; Establish targets for the employment and training; Train workforce for longer term employment; Prevent nepotism/corruption in local recruitment structures; Conditions stipulated by property owners in terms of the construction activities should be implemented and monitored; All activities should be restricted to working areas; workers should wear name tags and clothing to ensure that they can be readily identified A specific contact person should be identified to allow community members and property owners to easily direct their queries and concerns and obtain general information regarding the operations; Vehicles used should be clearly marked; Promote employment of women and youth;	As per SLP	Prior to construction and throughout LoM

Activities	Impact	Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Supplier acquisition	Multiplier effect on the local economy	Construction and Operational Phase	Local communities	Linkages with skills development/ Small, Medium and Micro Enterprises (SMME) development institutions and other mining operations; Preference should be given to capable subcontractors who based within the local municipal area; Monitoring of sub-contractor's procurement; Local procurement targets should be formalised in the mines procurement policy.	As per SLP	Throughout LoM
Mining operation	Social upliftment	Construction and Operational Phase	Local area	Ensure that there is stakeholder buy-in; Collaboration with other developmental role players (e.g. local and district municipalities, neighbouring mines and NGOs) during implementation of envisaged projects, and where possible aligning envisaged development projects with existing ones;	As per SLP	Throughout LoM
Roll Over Mining	Increased social pathologies	Operation	Local area	Limit, as far as reasonably possible, social ills caused by influx of workers and job-seekers; Discourage influx of job-seekers by prioritising employment of unemployed members of local communities; Implement measures to address potential conflict between locals and non-locals.	As per SLP	Throughout LoM
Traffic Assessment						
Increased road traffic	Degradation of road	Construction and Operational phase	Local Residents	Improve road surfacing	Traffic management measures	Throughout LoM
Blast and Vibration						
Blasting	Ground Vibrations	Construction	localised	Limit ground vibrations to an acceptable value with a proper blast design, measure and record, evaluate and improve.	Mine Health and Safety Act of 1996	During Blasting
Blasting	Air blasts	Construction	localised	Limit the decibels to an acceptable value with a proper blast design, measure and record, evaluate and improve.	Mine Health and Safety Act of 1997	During Blasting

1.e IMPACT MANAGEMENT OUTCOMES

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
Heritage					
Mining operations	Damage to cemetery - F01	Sites of cultural significance	Construction, operational	Control through management and monitoring	Protect grave/cemetery
Mining Operations	destruction of potential subsurface cultural material - B01	Sites of cultural significance	Construction, operational	Control through management and monitoring	Protection of heritage material
Noise					

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
Site clearance/establishment	Bulldozers operating generating noise	Neighbouring communities	Construction Phase	Control through management and monitoring	Zero noise disturbance complaints
Construction related activities	Equipment moving around and construction related noise	Neighbouring communities	Construction Phase	Control through management and monitoring	Zero noise disturbance complaints
Mining	Excavators and truck loading and unloading generated noise	Neighbouring communities	Operational Phase	Control through management and monitoring	Zero noise disturbance complaints
Mining	Haul truck moving on the Haul Roads	Neighbouring communities	Operational Phase	Control through management and monitoring	Zero noise disturbance complaints
Mining	Commercial Trucks moving on the access road	Neighbouring communities	Operational Phase	Control through management and monitoring	Zero noise disturbance complaints
Mining	Crusher plant generating Noise	Neighbouring communities	Operational Phase	Control through management and monitoring	Zero noise disturbance complaints
Removal of any infrastructure	Demolition equipment generated noise	Neighbouring communities	Decommissioning Phase	Control through management and monitoring	Zero noise disturbance complaints
Decommissioning, rehabilitation and post-closure	Bulldozers shaping the final landform generated noise	Neighbouring communities	Decommissioning /Rehabilitation Phase	Control through management and monitoring	Zero noise disturbance complaints
Ecological Impacts (Wetland, Aquatic Terrestrial)					
Infrastructure, Work Revetments, New access routes, Site clearing for opencast area, Placement of cleared topsoil into allocated stockpiles, Use of heavy machinery	Flow alterations	Fauna and Flora diversity within wetlands and streams	Construction	Control through management and monitoring Remedy through rehabilitation	0
Increased traffic, Use of heavy machinery, Bank Erosion	Flow alterations	Wetland and stream integrity and functionality	Operations	Control through management and monitoring Remedy through rehabilitation	Dispersed flow to and in the wetland areas.
Use of heavy machinery	Pollution of watercourse	Watercourses on site and downstream	Construction	Control through management and monitoring Modify through design measures	0
Increased traffic, Increased road runoff during rainfall events	Pollution of watercourse	Watercourses on site and downstream	Operational	Control through management and monitoring Modify through design measures	Meet water quality standards
New access routes, Placement of cleared topsoil into allocated stockpiles	Spread of alien invasive vegetation	Natural Habitat	Construction	Control through management and monitoring	0
Hardened surfaces	Spread of alien invasive vegetation	Natural Habitat	Operational	Control through management and monitoring	Alien and invasive species eradication
Groundwater					
Surface clearing and preparation.	Increase in surface run-off and therefore decrease in aquifer recharge.	Groundwater	Construction	Control through management and monitoring	Minimal impact on aquifer recharge
Box Cut	Decrease in water level from the point where development is lower than the water level.	Groundwater	Construction	N/A	N/A
Topsoil and overburden stockpiling.	Acid generation in the case of carbonaceous material placement.	Groundwater	Operation	Remedy through control measures	Containment of poor quality groundwater

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
ROM stockpiling.	Acid generation as a result of carbonaceous material.	Groundwater	Operation	Remedy through control measures	Effective prevention of the pollution of the groundwater resource
Pollution Control Dams	Contaminated water in the dams can seep to the aquifer.	Groundwater	Operation	Remedy through control measures	Effective prevention of the pollution of the groundwater resource
Hydrocarbon spills.	Spills from mining vehicles can infiltrate to the aquifer and cause a down gradient plume migration.	Groundwater	Construction & Operation	Remedy through control measures	Effective prevention of the pollution of the groundwater resource
Opencast mining	The water infiltrating the voids will be removed for safe mining, causing a decrease in the water level.	Groundwater	Operation	Control through management and monitoring	Effective prevention of the pollution of the groundwater resource
Closure of the mine	Groundwater decant is expected should the system behave as predicted. Decant is expected to occur on the lowest elevation on the pit boundary.	Groundwater	Closure and Decommissioning	Control through management and monitoring	Continued increase in water quality
Closure of the mine	Pollution Plume spread	Groundwater	Closure and Decommissioning	Control through management and monitoring	Continued increase in water quality
Surface Water					
Construction activities	Sedimentation and pollution of the Watercourse	Watercourse	Construction Phase	Modify through design measures	Effective onsite dirty water management and retention.
Dewatering	Reduction in Baseflow	Watercourse	Operational Phase	Control through management and monitoring	N/A
Operational Activities	Water quality deterioration	Watercourse	Operational Phase	Control through management and monitoring	Effective onsite dirty water management and retention.
Closure of the mine	Decant of poor quality water	Watercourse	Closure and Decommissioning	Remedy through control measures	Release of acceptable quality water to the downstream environment
Air Quality					
Site clearance/establishment	Bulldozers generating fugitive particulate matter emissions including Dust and PM10	Social health and wellbeing Visibility	Construction Phase	Control through management and monitoring	minimal vegetation clearance and immediate rehabilitation where possible
Construction related activities	Fugitive particulate matter emissions including Dust and PM10 from vehicle moving on roads	Social health and wellbeing Visibility	Construction Phase	Control through management and monitoring	minimal vegetation clearance and immediate rehabilitation where possible
Mining	Fugitive particulate matter emissions including Dust and PM10	Social health and wellbeing Visibility	Operational Phase	Control through management and monitoring	Effective dust management on site
Mining	Wind blown fugitive particulate matter emissions including Dust and PM10 from stockpiles	Social health and wellbeing Visibility	Operational Phase	Control through management and monitoring	Effective dust management on site

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
Mining	Fugitive particulate matter emissions including Dust and PM10 from vehicles moving on the Haul road	Social health and wellbeing Visibility	Operational Phase	Control through management and monitoring	Rehabilitation of cleared areas
Mining	Fugitive particulate matter emissions including Dust and PM10 from vehicles moving on the Access road	Social health and wellbeing Visibility	Operational Phase	Control through management and monitoring	Effective dust management on site
Mining	Fugitive particulate matter emissions including Dust and PM10 from the crusher plant	Social health and wellbeing Visibility	Operational Phase	Control through management and monitoring	Effective dust management on site
Removal of any infrastructure	Fugitive particulate matter emissions including Dust and PM10 from vehicle moving on roads	Social health and wellbeing Visibility	Decommissioning Phase	Control through management and monitoring	Effective dust management on site
Decommissioning, rehabilitation and post-closure	Fugitive particulate matter emissions including Dust and PM10 from bulldozers shaping the landform	Social health and wellbeing Visibility	Decommissioning/Rehabilitation Phase	Control through management and monitoring	Effective dust management on site
Visual					
Site clearance/establishment	Negative impact on aesthetics - due to the site being more visible	Sense of place Visibility - impaired by dust	Pre-Construction Phase	Modify through design measures	Effective visual barriers surrounding the mining operation.
Construction related activities	Dust creation and change in visual/landscape character	Sense of place	Construction Phase	Modify through design measures	Effective visual barriers surrounding the mining operation.
Construction related activities	Light pollution at night on the identified sensitive receptors	Sense of place	Construction Phase	Modify through design measures	Effective visual barriers surrounding the mining operation.
Mining activity	Visual impact on surrounding identified sensitive receptors	Sense of place	Operational Phase	Modify through design measures	Effective visual barriers surrounding the mining operation.
Mining activity	Dust creation and change in visual/landscape character due to an increased number of vehicles	Sense of place	Operational Phase	Modify through design measures	Effective visual barriers surrounding the mining operation.
Mining activity	Light pollution at night on the identified sensitive receptors	Sense of place	Operational Phase	Modify through design measures	Effective visual barriers surrounding the mining operation.
Removal of any infrastructure	Dust creation and change in visual/landscape character due to an increased number of vehicles	Sense of place	Decommissioning Phase	Modify through design measures	Effective visual barriers surrounding the mining operation.
Decommissioning, rehabilitation and post-closure	Change in landscape character	Sense of place	Decommissioning/Rehabilitation Phase Post-Closure Phase	Modify through design measures	Effective visual barriers surrounding the mining operation.
Soils, Land Use, Land Capability and hydropedology					

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
Site Preparation	Loss of topsoil	Soil structure	Construction	Remedy through rehabilitation	Different morphology of different stockpiles No rills formed on stockpiles pH of soils remains in natural range
Site Preparation	Erosion and Sedimentation	Soil structure	Construction	Remedy through rehabilitation Control through management and monitoring	To minimise the areas where soil surfaces will be exposed to soil erosion
Site Preparation	Change in Surface Profile	Soil structure	Construction	Remedy through rehabilitation	Bulk density less than 1.5 kg.m-3 in rehabilitated soils
Site Preparation	Change in Land Use	Land use and capability	Construction	Remedy through rehabilitation	Effective rehabilitation of impacted areas for agricultural practices
Site Preparation	Change in Land Capability	Land use and capability	Construction	Remedy through training	Effective rehabilitation of impacted areas for agricultural practices
Site Preparation	Soil Contamination	Land use and capability	Construction	Remedy through rehabilitation	Log of vehicle breakdowns and traffic violations Soils test clean of pollutants
Ongoing mine management	Loss of Topsoil	Land use and capability	Operation	Remedy through rehabilitation Control through management and monitoring	Different morphology of different stockpiles No rills formed on stockpiles pH of soils remains in natural range
Ongoing mine management	Erosion and Sedimentation	Land use and capability	Operation	Remedy through rehabilitation Control through management and monitoring	To minimise the areas where soil surfaces will be exposed to soil erosion
Ongoing mine management	Soil Contamination	Land use and capability	Operation	Remedy through rehabilitation Control through management and monitoring	Log of vehicle breakdowns and traffic violations Soils test clean of pollutants
Land Rehabilitation	Erosion and Sedimentation	Land use and capability	Closure	Remedy through rehabilitation	To minimise the areas where soil surfaces will be exposed to soil erosion
Land Rehabilitation	Soil Contamination	Land use and capability	Closure	Remedy through rehabilitation	Log of vehicle breakdowns and traffic violations Soils test clean of pollutants
Social Economic					

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
Establishment of underground mine	Employment opportunities	Social Economic	Construction and Operational Phase	Remedy through Social and Labour Plan	Increased employment throughout the local communities
Supplier acquisition	Multiplier effect on the local economy	Social Economic	Construction and Operational Phase	Remedy through Social and Labour Plan	Local economical gain
Mining operation	Social upliftment	Social Economic	Construction and Operational Phase	Remedy through Social and Labour Plan	Local skills gain
Roll Over Mining	Increased social pathologies	Social Economic	Operation	Remedy through Social and Labour Plan	Maximisation of the proportion of job opportunities allocated to locals
Traffic Assessment					
Increased road traffic	Degradation of road	Road network and traveling	Construction, Operation and Closure	Remedy through Social and Labour Plan	Maintain Road in excellent condition for the general public to still use
Blast and Vibration					
Blasting	Ground Vibrations	Geological structure and stability	Construction, Operation and Closure	Control through management and monitoring	Zero effect on sensitive receptors identified
Blasting	Air blasts	Geological structure and stability	Construction, Operation and Closure	Control through management and monitoring	Zero effect on sensitive receptors identified

1.f IMPACT MANAGEMENT ACTIONS

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Heritage				
Mining operations	Construction, operational	Control through management and monitoring	Prior to construction	National Heritage Resources Act 25 of 1999
Noise				
Site clearance/establishment	Construction Phase	Control through management and monitoring	Prior to construction. Ongoing maintenance throughout LoM	SANS 10103
Construction related activities	Construction Phase	Control through management and monitoring	Prior to construction. Ongoing maintenance throughout LoM	SANS 10103
Mining	Operational Phase	Control through management and monitoring	Ongoing maintenance throughout LoM	SANS 10103
Removal of any infrastructure	Decommissioning Phase	Control through management and monitoring	Ongoing maintenance throughout LoM	SANS 10103
Decommissioning, rehabilitation and post-closure	Decommissioning/Rehabilitation Phase	Control through management and monitoring	Ongoing maintenance throughout LoM	SANS 10103
Ecological Impacts (Wetland, Aquatic Terrestrial)				
Infrastructure, Work Revetments, New access routes, Site clearing for opencast area, Placement of cleared topsoil into allocated stockpiles, Use of heavy machinery	Construction	Control through management and monitoring Remedy through rehabilitation	Prior to construction. Ongoing maintenance throughout LoM	Implement SWMP as per GN704 Follow the approved Closure and Rehabilitation Plan
Increased traffic, Use of heavy machinery, Bank Erosion	Operations	Control through management and monitoring Remedy through rehabilitation		0
Use of heavy machinery	Construction	Control through management and monitoring Modify through design measures	Prior to construction. Ongoing maintenance throughout LoM	Implement SWMP as per GN704 Follow the approved Closure and Rehabilitation Plan
Increased traffic, Increased road runoff during rainfall events	Operational	Control through management and monitoring Modify through design measures		
New access routes, Placement of cleared topsoil into allocated stockpiles	Construction	Control through management and monitoring	Prior to construction. Ongoing maintenance throughout LoM	Follow approved Alien Invasive plan as guided by SANBI
Hardened surfaces	Operational	Control through management and monitoring		
Groundwater				
Surface clearing and preparation.	Construction	Control through management and monitoring	N/A	N/A
Box Cut	Construction	N/A	N/A	N/A
Topsoil and overburden stockpiling.	Operation	Remedy through control measures	Storm water Management to be constructed prior to other infrastructure establishment. Ongoing monitoring.	SANS241:2015
ROM stockpiling.	Operation	Remedy through control measures	Storm water Management to be constructed prior to other	SANS241:2015

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
			infrastructure establishment. Ongoing monitoring.	
Pollution Control Dams	Operation	Remedy through control measures	When Spills occur	NEMWA liner specifications
Hydrocarbon spills.	Construction & Operation	Remedy through control measures	Throughout LOM	Standard Operating Procedure for Spill containment and clean-up
Opencast mining	Operation	Control through management and monitoring	During construction	Follow the approved Closure and Rehabilitation Plan
Closure of the mine	Closure and Decommissioning	Control through management and monitoring	During Closure and decommissioning	Follow the approved Closure and Rehabilitation Plan
Surface Water				
Construction activities	Construction Phase	Modify through design measures	Storm water Management to be constructed prior to other infrastructure establishment	SWMP
Dewatering	Operational Phase	Control through management and monitoring	N/A	N/A
Operational Activities	Operational Phase	Control through management and monitoring	Storm water Management to be constructed prior to other infrastructure establishment. Ongoing monitoring.	SWMP
Closure of the mine	Closure and Decommissioning	Remedy through control measures	Water treatment establishment before mine closure.	ISO 5667: Grab Samples Water parameters as approved in the IWULA
Visual				
Site clearance/establishment	Pre-Construction Phase	Modify through design measures	Prior to construction	N/A
Construction related activities	Construction Phase	Modify through design measures	Prior to construction	N/A
Mining activity	Operational Phase	Modify through design measures	Prior to construction	N/A
Removal of any infrastructure	Decommissioning Phase	Modify through design measures	Prior to construction	N/A
Decommissioning, rehabilitation and post-closure	Decommissioning/Rehabilitation Phase Post-Closure Phase	Modify through design measures	Prior to construction	N/A
Soils, Land Use, Land Capability and hydropedology				
Site Preparation	Construction	Remedy through rehabilitation Control through management and monitoring	Throughout construction	Soil Management Plan as per the Specialist Soils report
Site Preparation	Construction	Remedy through rehabilitation	Throughout construction	Soil Management Plan as per the Specialist Soils report
Site Preparation	Construction	Remedy through training	Prior to and during mining	Soil Management Plan as per the Specialist Soils report
Site Preparation	Construction	Remedy through rehabilitation	When Spills occur	Standard Operating Procedure for Spill containment and clean-up
Ongoing mine management	Operation	Remedy through rehabilitation Control through management and monitoring	Throughout operation	Soil Management Plan as per the Specialist Soils report

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Ongoing mine management	Operation	Remedy through rehabilitation Control through management and monitoring	Throughout operation	Soil Management Plan as per the Specialist Soils report
Land Rehabilitation	Closure	Remedy through rehabilitation	During Closure and rehabilitation	Soil Management Plan as per the Specialist Soils report
Land Rehabilitation	Closure	Remedy through rehabilitation	When Spills occur	Soil Management Plan as per the Specialist Soils report
Social Economic				
Establishment of underground mine	Construction and Operational Phase	Remedy through Social and Labour Plan	Prior to construction and throughout LoM	As per SLP
Supplier acquisition	Construction and Operational Phase	Remedy through Social and Labour Plan	Throughout LoM	As per SLP
Mining operation	Construction and Operational Phase	Remedy through Social and Labour Plan	Throughout LoM	As per SLP
Roll Over Mining	Operation	Remedy through Social and Labour Plan	Throughout LoM	As per SLP
Traffic Assessment				
Increased road traffic	Construction and Operational phase	Remedy through Social and Labour Plan	Throughout LoM	Traffic management measures
Blast and Vibration				
Blasting	Construction	Control through management and monitoring	During Blasting	Mine Health and Safety Act of 1996

1.f.i Financial Provision

1.f.i.1 Determination of the Amount of Financial Provision

1.f.i.1.a Describe the Closure Objectives and the Extent to Which These Are Aligned to the Baseline Environment

The closure vision aims to return the disturbed areas to a stable, non-polluting and safe state that represents, as close as possible, the pre mining conditions. Mining wishes to leave a positive legacy in the area once the mining operations cease.

To appropriately close the mining area, the mine would annually identify areas of rehabilitation and actively pursue the closure vision. The Annual rehabilitation plan will be updated on an annual basis and identify areas of concern.

1.f.i.1.b Confirm That the Environmental Objectives in Relation to Closure Have Been Consulted with Landowner and I&APS

- A comprehensive Public Participation Process was undertaken and all aspects of the project were discussed with interested and affected Parties. Refer to Appendix 2.

1.f.i.1.c Rehabilitation Plan to Attain Closure Objectives Including Proposed Post-Mining Land Capability and Land Use

The scheduling of actions for final rehabilitation, decommissioning and closure which will ensure avoidance, rehabilitation and management of impacts is presented in the table below. As the disturbance after construction occurs on surface, linking the rehabilitation plan to the mine works program is not meaningful. Rather, the schedule is linked to applicant's intention to undertake rehabilitation activities over a five-year closure period at the end of the Life of Mine. The perceived schedule drivers of this plan are also indicated in the table. This schedule is based on implementing the actions described in this report and relates to the aspects considered in this section.

Aspect	Scheduling	
Year 1		**Continuous**
Opencast workings	Concurrent backfilling sequence and removal of salvageable equipment	Topsoil stripping, handling, stockpiling, preservation and replacement in line with the general surface rehabilitation and revegetation actions prescribed in this report as land becomes available for rehabilitation.
Surface Infrastructure related to mining operations (including plant)	Removal, decommissioning and demolition of infrastructure	
Final void	Backfilling and sealing	
Contaminated land remediation	Hydrocarbons – Removal of fuel storage and refuelling bays Chemical – contaminated equipment removal	
Year 2		
Pollution Control Dams	Management of stormwater in closure period, but capacity requirements can be assessed to remove upon closure	

Aspect	Scheduling
Waste Management Facilities	Removal, decommissioning and demolition of infrastructure
Roads and parking areas	Only roads required after closure to remain in place
Fencing and walling	Only fences required to remain after closure to stay in place
Year 3 - 5	
Water Management	Monitoring, measurement and management where required
Maintenance and aftercare	All rehabilitated areas

Appendix 4 requires that a spatial map or schedule, showing planned spatial progression throughout operations be included in the plan. However, as the spatial progression is limited to the mining footprint and the mine haul route, the inclusion of a plan showing the spatial progression will not add any further information than that included in the table above.

1.f.i.1.d Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

During the rehabilitation phase the following actions will take place:

- Transfer of facilities (possibly the access road and dams): Facilities are required to be transferred to new landowners;
- Cleaning up of contaminated areas: all areas that have been contaminated will be remediated;
- Shaping: Areas requiring shaping will be shaped;
- Vegetating: The mine will allow the natural vegetation to be established on all denuded areas and where natural vegetation is not developing, and will ensure vegetation growth through seeding processes as quickly as possible;
- Monitoring: The site will be monitored to ensure the stability of landforms, that vegetation establishes and to monitor for possible latent risks. Once the studies prove the site is non-polluting and has reached equilibrium with the surrounding environment an application can be made to the relevant government department for the cessation of these activities; and
- Aftercare and maintenance: The monitoring programmes will be used to identify areas that require aftercare and maintenance. The length of this activity is therefore dependant on the continuation of the monitoring programmes.

1.f.i.1.e Quantum of the Financial Provision Required to Manage and Rehabilitate the Environment

Financial Provision, to the amount of ***R 12 976 529.50*** be made by way of a guarantee acceptable to the DMR, as per the Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations.

Table 1-4: Financial Provision Quantum

No.	Description	Unit	A	B	C	D	E=A*B*C*D
			Quantity	Master Rate	Multiplication factor	Weighting factor 1	Amount (Rands)
1	Dismantling of processing plant and related structures (including overland conveyors and powerlines)	m3	0	R 18.36	1	1	R -
2 (A)	Demolition of steel buildings and structures	m2	500	R 255.82	1	1	R 127 910.00
2(B)	Demolition of reinforced concrete buildings and structures	m2	0	R 376.99	1	1	R -
3	Rehabilitation of access roads	m2	1290	R 45.78	1	1	R 59 056.20
4 (A)	Demolition and rehabilitation of electrified railway lines	m	0	R 444.30	1	1	R -
4 (A)	Demolition and rehabilitation of non-electrified railway lines	m	0	R 242.34	1	1	R -
5	Demolition of housing and/or administration facilities	m2	100	R 511.63	1	1	R 51 163.00
6	Opencast rehabilitation including final voids and ramps	ha	10.00	R 368 200.17	0.52	1	R 1 914 640.88
7	Sealing of shafts adits and inclines	m3	0	R 137.33	1	1	R -
8 (A)	Rehabilitation of overburden and spoils	ha	14.37	R 178 800.11	1	1	R 2 569 357.58
8 (B)	Rehabilitation of processing waste deposits and evaporation ponds (non-polluting potential)	ha	0	R 222 692.31	0.8	1	R -
8 (C)	Rehabilitation of processing waste deposits and evaporation ponds (polluting potential)	ha	0.78	R 646 804.03	0.8	1	R 403 605.71
9	Rehabilitation of subsided areas	ha	0	R 149 733.48	1	1	R -
10	General surface rehabilitation	ha	19.12	R 141 639.86	1	1	R 2 708 154.12
11	River diversions	ha	0	R 141 639.86	1	1	R -
12	Fencing	m	4310	R 161.56	1	1	R 696 323.60
13	Water management	ha	2.12	R 53 855.46	0.67	1	R 76 388.05
14	2 to 3 years of maintenance and aftercare	ha	26.42	R 18 849.42	1	1	R 498 001.68
15 (A)	Specialist study	Sum	3	R 60 000.00	1	1	R 180 000.00
15 (B)	Specialist study	Sum	1	R -	1	1	R -
					Sub Total 1		**R 9 284 600.82**
1	Preliminary and General		R 9 748 830.87		**weighting factor 2** 1.05		**R 1 169 859.70**
2	Contingencies		928460.0825				**R 928 460.08**
					Subtotal 2		**R 11 382 920.61**
					VAT (15%)		**R 1 593 608.89**
					Grand Total		**R 12 976 529.50**

1.f.i.1.f Confirm that the financial provision will be provided as determined.

The Financial provision will be provided.

MECHANISMS FOR MONITORING COMPLIANCE WITH AND PERFORMANCE ASSESSMENT AGAINST THE ENVIRONMENTAL MANAGEMENT PROGRAMME AND REPORTING THEREON, INCLUDING

1.g MONITORING OF IMPACT MANAGEMENT ACTIONS (AS PER TABLE 1-5)

1.h MONITORING AND REPORTING FREQUENCY (AS PER TABLE 1-5)

1.i RESPONSIBLE PERSONS (AS PER TABLE 1-5)

1.j TIME PERIOD FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS (AS PER TABLE 1-5)

1.k MECHANISM FOR MONITORING COMPLIANCE (AS PER TABLE 1-5)

Table 1-5: Mechanisms to Monitor Compliance

Source activity	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (for the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
Construction, Operation and Decommissioning Activities	Water Quality	ISO 5667Grab Samples	Independent Specialist	Monthly as per WUL
Construction, Operation and Decommissioning Activities	Water Quantity	Water Balance to be Updated Annually Flow Meter Reading and Update of Datasheet	SHEQ/ Engineering	Daily
Construction, Operation and Decommissioning Activities	Bio-Monitoring	SASS 5 and IHAS Sampling Sites are to be established upstream and downstream of all Potential Impact	Aquatic Ecologist	Bi-Annually
Construction, Operation and Decommissioning Activities	Storm Water Management	Visual Inspection Check the system for blockages and possible spillage areas	SHEQ/ Engineering	After heavy rainfall
Construction, Operation and Decommissioning Activities	Biodiversity Assessment	Align the Fauna & Flora Compare the annual findings with those of the Baseline Studies	Ecologist	Annually
Construction, Operation and Decommissioning Activities	Alien Invasive Control Program (AICP)	Implement an Alien Invasive Control Programme. During the Biodiversity Assessment a qualified ecologist must be contracted to ensure that the implementation of the AICP are adequately addressed.	Ecologist	Bi-Annually

Source activity	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (for the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
Construction, Operation and Decommissioning Activities	Vegetation and Rehabilitation	RSIP to be adhered to As specified in EMP	Ecologist	Bi-Annually
Construction, Operation and Decommissioning Activities	Groundwater Quality	SANAS Standards As specified in Geo-Hydro Report	Independent Specialist	Quarterly
Construction, Operation and Decommissioning Activities	Groundwater Levels	Depth meters Determine the groundwater fluctuation over a LOM	Independent Specialist	Determine the groundwater fluctuation over a LOM
Construction, Operation and Decommissioning Activities	Dust Fallout	Implement a Monitoring Programme Gravimetric Dust Fallout	To be analysed by an Accredited Laboratory Independent Specialist	Monthly
Construction, Operation and Decommissioning Activities	Environmental Noise & Vibration	Implement a Monitoring Programme SANAS Standards Noise monitoring are to be done to determine the effect of mining, and associated activities, on the receptors	Independent Specialist (Noise Specialist)	Annually
Construction, Operation and Decommissioning Activities	Visual Inspection of receptors	Implement Monitoring Schedule in-house Physical Census Any incidents of cracking must be recorded and addressed.	SHEQ/ Engineering	Before and After each blasting event

1.l Indicate the Frequency of the Submission of the Performance Assessment Report

All information as required by the various Government Departments should be captured and be readily available for submission when required and also for review by the external consultant conducting the performance assessment and audits.

As per NEMA EIA Regulations (GNR982 of 2014), a performance assessment/audit will be conducted by an external consultant throughout the life of mine at intervals stipulated in the EA. It is recommended to complete these audits annually. This is conducted to assess the adequacy and compliance to the EMP and the relevant legislation. As per NEMA, any amendments to the EMPr that may be required due to the performance assessment findings will be completed if necessary.

The Quantum of the Financial Provision must be reviewed on an annual basis and submitted to the DMR.

In addition to the NEMA requirements, the IWUL will be audited as per conditions once this is obtained, at which time the site will also be audited against GN704. The IWWMP will be updated annually once approved.

1.m Environmental Awareness and Emergency Response Plan

1.m.i Manner in Which the Applicant Intends to Inform Employees of Environmental Risk Which May Result from Their Work

Objectives and Aims

The Objectives of the Environmental Awareness Plan are to ensure that: -

- Training needs are identified and all personnel whose work may create a significant impact upon the environment have received appropriate training.
- Procedures are established and maintained to make appropriate employees aware of:
  - The importance of conformance with SHEQ policy and procedures and the requirements of the EMS;
  - The significant environmental impacts, actual or potential, of their work activities and environmental benefits of improved personal performance;
  - Their roles and responsibilities in achieving conformance with environmental policy, procedures and EMS; and
  - The potential consequences of departure from specified operating procedures.
  - Personnel performing tasks, which can cause significant environmental impacts, are competent in terms of appropriate education, training and/ or experience.
- The Environmental Awareness Plan Aims at:
  - Informing all personnel of environmental policies, procedures and programmes applicable to the mining activities;
  - Providing job specific environmental training to ensure the protection of the environment;
  - Promoting general environmental awareness amongst all employees; and
  - Providing general training on the implementation of environmental actions.
- The Environmental Awareness Training Programme will include:
  - Training of the implementation of emergency procedures where necessary;
  - Environmental induction for new employees;
  - Code of conduct signed by all inducted employees; and
  - Identification of environmental risks associated with each job and job specific training on addressing these risks.

Responsibilities

The responsibilities in terms of environmental awareness training lie with the Applicant and Mine Manager.

Identification of training needs

- The identification of environmental training and development needs are derived from the analysis of role descriptions.
- The following general and specific training needs have been identified at Roodepoort Colliery.

General Training:

- Environmental awareness training;
- Awareness of the Roodepoort Colliery SHEQ policy; and
- Awareness of environmental legislation or any other requirements Roodepoort Colliery subscribes to.

Specific Training:

- Awareness of significant environmental aspects associated with work activities;
- Awareness of environmentally related operational procedures that need to be followed when conducting work activities;
- Awareness of the potential consequences of not following environmentally related operational procedures; and
- Environmental legislative requirements of work activities.

General Environmental Awareness

General environmental awareness training forms part of the induction at Roodepoort Colliery. An employee will attend induction training and all contractor employees are required to undergo the general induction training should their work at the mine exceed a period of 1 week on site.

The training material encompasses information regarding the Roodepoort Colliery SHE Policy, charter and visions, the description of environmental impacts, namely air pollution, waste management, water management, land management and energy conservation, the importance of environmental legislation, key roles and responsibilities in terms of environmental management and the reporting of non-conformances.

Evaluation of the Environmental Awareness Plan

The effectiveness and efficiency of this plan will be monitored by the performance of annual audits aimed at testing the environmental awareness of employees directly and the analysis of the root causes of environmental incidents, including non-conformance to legal requirements, to determine which incidents were caused by a lack of environmental awareness and training. The evaluation of the Environmental Awareness Plan will be conducted by the Environmental Department. This evaluation will entail the auditing of the operation during the construction and operation phase once the activity has commenced.

The Environmental Awareness Plan described above is sufficient to make all those involved with the project aware of those risks that may occur as well as the necessary mitigation required to minimise these risks. This awareness plan displays that the Roodepoort Colliery is serious about the environment's well–being, empowerment of the local people and returning the land to appropriate use once the reclamation activities have been completed. Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment.

Emergency Response Plan

The EMP and other management options are intended to minimise all environmental risks as far as possible. Should there for some reason is unforeseen circumstances that might lead to unacceptable risks, emergency systems and procedures have been especially designed for this operation and is to be adhered in the case of such emergencies. The environmental emergency contingency plan addresses any reasonably anticipated failure (most probable risk) for the entire mining area and focuses on incidents that could cause environmental emergencies. As with any system, the most important and critical component is the identification and communication with the Responsible personal. Consequently, the contact information for these role-players should be available around the facility and be updated on a regular basis. In addition to this, first-party employees (such as security, safety superintendents, mine overseers, environmental officers) will be trained to respond to the responsible personnel in the event of an emergency.

Table 1-6: Emergency Response and Preparedness Plan

Possible environmental related emergency	Action plans / remediation	Time / period	Responsible person / party
Hydrocarbon Spill (diesel, oil, grease, etc.)	In the event of a small spill the soil will be treated in situ using a spill kit. In the event of a large spill a specialized crew will be called in to decontaminate the area and remove and rehabilitate the soil. The Environmental Management Representative will have the contact details of companies that provide this service.	Immediately	Immediate Supervisor
Veld Fires	The mine management team must ensure that trained personnel are appointed and that firefighting equipment is in serviceable order. The responsible person must ensure that fire breaks are maintained. The responsible person must undertake periodic inspections of firefighting equipment. In the event of a fire on site the fire master and firefighting crew must immediately respond and in instances where the mines firefighting team is unable to control the fire, the services of the local municipal fire brigade must be called in. The fire master is responsible for ensuring that adequate arrangements are made with the local municipal fire brigade to ensure timeous response to veld fires.	Ongoing	Fire Master / Safety Officer
Explosions	Alternative evacuation routes should be identified and used, should the exit to the mine be blocked. Alternative air supply routes should be identified and implemented. All relevant emergency response units must be notified and hospitals informed of potential incoming patients. The Environmental Management Representative will assess the situation from the information provided and set up an investigation team or relevant personnel. This team may include the Operations Manager, Chief Safety Officer, the employee who reported the incident and the individual responsible for the incident.	Immediately	Mine Manager
Pollution Control Dam Breach	Prevent overflow from the adjacent dam by sandbagging the overflow point. Stop all pumping from pits. Pump as much water as possible into the pit areas to increase the capacity of the surface dams to contain run-off water as evaporation is increased.	Immediately	Plant Manager
Berm Breach / Drain Overflow	Where there has been overflow due to a blockage, the drain must be cleaned as soon as possible. Where the overflow is the result of a lack of capacity the dimensions of the drain must be increased. A breached berm must be repaired as	Immediately	Manager / Plant Manager

Possible environmental related emergency	Action plans / remediation	Time / period	Responsible person / party
	soon as possible. The dimensions of a breached berm must be increased to prevent a recurrence.		
Leakage or spill from the chemical toilets and associated infrastructure.	The failure of the chemical toilets and associated infrastructure poses a threat to both groundwater and surface water resources. In the event of a failure, the following procedures must be followed: • The incident must be reported to the Environmental Management Representative immediately. • An investigation team, set up by the Environmental Management Representative must investigate the cause of the failure. • Precautions must be taken to prevent the spread of any contaminants/material, especially into surface water courses. • Repairs must be commissioned as soon as possible, followed by an inspection to determine if repair work was efficient, and to detect any overlooked or future potential issues. • The failure must be recorded and inspected during the routine maintenance of the sewerage plant and associated infrastructure. The affected environment must be suitably rehabilitated or cleaned up.	Immediately	Environmental Management Representative

1.n SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

No other specific information has been requested by the CA.

2. UNDERTAKING

The EAP herewith confirms

a. The correctness of the information provided in the reports ☒
b. The inclusion of comments and inputs from stakeholders and I&APs ; ☒
c. The inclusion of inputs and recommendations from the specialist reports where relevant; and ☒
d. The acceptability of the project in relation to the finding of the assessment and level of mitigation proposed; ☒

Signed:  30/09/2022