ENVIRONMENTAL & ENGINEERING

REPORT

CANYON RESOURCES (PTY) LTD – PROPOSED KOPPIE MINING PROJECT

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

REPORT REF: 19-907-AUTH-REP KOPPIE CANYON RESOURCES ENVIRONMENTAL AUTHORISATION & IWULA

DMRE REF: MP30/5/1/2/2/10273 MR

PORTION 4 OF THE FARM KOPPIE 228 IS, AND PORTIONS 2, 3, 6, 9, 10, 11, 21, 27, 30, 31, AND 32 OF THE FARM UITGEDACHT 229 IS IN MSUKALIGWA LOCAL MUNICIPALITY OF THE GERT SIBANDE DISTRICT MUNICIPALITY, MPUMALANGA PROVINCE OF SOUTH AFRICA.

VERSION 00

DOCUMENT AND QUALITY CONTROL

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QUALITY CONTROL BY:

Nature of Signoff:	Responsible Person:	Role / Responsibility	Qualification
Author	Riana Panaino	Senior Environmental Consultant	BSc Hons Biodiversity and Conservation Pr.Sci.Nat
Quality Reviewer	Leoni le Roux	Administrator	Professional Secretary and Personal Assistant
Reviewer	Vernon Siemelink	Director	Director of Environmental Compliance, M(EnvMan) Environmental Management UP

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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-

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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.

21/09/2021

_____ _____

Signature **Date**

Mrs Riana Panaino

BSc Honn Biodiversity and Conservation

Pr.Sci.Nat: 117170

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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
Contact Person:	Vernon Siemelink
Telephone:	012 807 0383
Fax:	N/A
E-mail:	vernon@ecoe.co.za
Physical Address:	361 Oberon Road, Glenfield's Business Park, Block D, Faerie Glen, PTA

1.b DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

Table 1.2: Proposed Activity

ITEM	DETAIL
Type of mineral	Coal
Mining method	Bord and pillar mining with continuous miners (CM) and shuttle cars, supported by roof bolters for roof support.
Depth of the mineral below surface	1) 4 Lower Seam – 58.96 m to 118.8 m below surface; and 2) 2 Lower Seam – 89.35 m to 132.72 m below surface.
Geological formation	The proposed Koppie Mining Project (Koppie) is situated south of the Smithfield Ridge and thus on the boundary between the Highveld and Witbank Coalfields. The pre-Karoo basement rocks forming the ridge outcrop to the north west of the Koppie area. The basement rocks consist of Rooiberg felsite and granite of late Bushveld age. These are overlain unconformably by diamictite and associated glaciogenic sediments of the Dwyka Group of the Karoo Supergroup. The Dwyka rocks are in turn overlain by sediments of the Vryheid Formation of the Ecca Group. During Permo-Carboniferous times erosion by continental ice-sheets sculpted the pre-Karoo palaeo-topography. The resultant glaciated relief consists of elongated low ridges and shallow valleys. This topography has influenced the depositional patterns until at least No. 5 Seam times. Sediments of glacial origin like tillites, diamictites and varvites, characterize the Dwyka Group. The Vryheid Formation comprises a predominately arenaceous sequence of sandstones and conglomerates with subordinate siltstones, shale and the coal seams. The Vryheid Formation comprises a series of five upward-coarsening depositional sequences of siltstone and sandstone, each capped by a coal seam or seam package. The thickness of the coal seams is generally larger in the trough of the glaciated valleys, whilst towards the banks of said valleys there is a tendency for seams to wedge out against the palaeo-topography. The major coal seams present in the area are named from the base upwards the No. 1, No. 2 Lower, No. 2 Upper, No. 4 Lower, No. 4 Upper and No. 5 Seam respectively.
Life of mine	21 Years.
Production rate	150 000 tonnes of coal per month.

Saleable Product	The major coal seams present in the area are named from the base upwards the No. 1, No. 2 Lower, No. 2 Upper, No. 4 Lower, No. 4 Upper and No. 5 Seam respectively. The following seams are earmarked for extraction as part of the Koppie project: 3) 4 Lower Seam – 58.96 m to 118.8 m below surface; and 4) 2 Lower Seam – 89.35 m to 132.72 m below surface. The project has an inferred resource of 68,199 Mt of coal that will be marketed to Export/local markets. It is anticipated that mining will involve removing ~ 150 000 tonnes of coal per month with life of mine 21 years.
Target Market	Local and International.

1.c COMPOSITE MAP

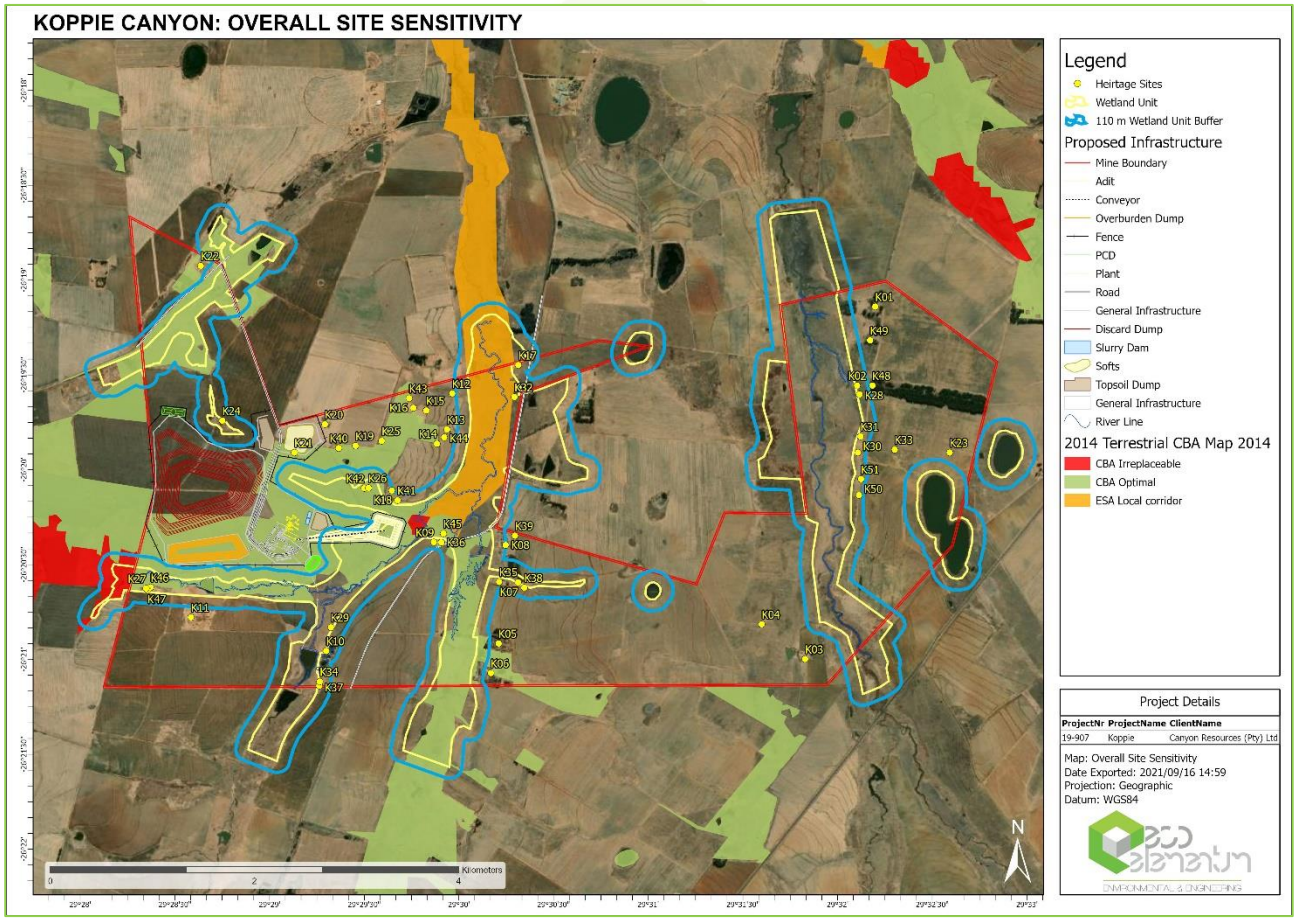


Figure 1.1: Site Layout with sensitivities

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 mining 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.

During the operational phase and for a period after, until the water level has reached equilibrium, a contamination plume will not migrate away from the mining operation. This is due to the fact that the underground void act as a groundwater sink. Contaminated groundwater, as a result of acid mine drainage will be contained within the underground void area.

The estimated decant of the mining has been estimated in the case where the mining is conducted in a manner that fracturing and cracking occur. The estimated filling times of the underground void areas is 133 years. Decant, if any, is expected to be up to 434 m3/day.

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

Acid-base Accounting Assessment Methodology

Guidelines from Price *et al.* (1997) in conjunction with Soregaroli and Lawrence (1997), Morin and Hutt (2007), MEND (2009) and De Wet (2012) were incorporated to assess the acid generating potential of the coal, the overlying and underlying material at Koppie.

Table 1.3: Guidelines from Price et al.(1997) & Soregaroli and Lawrence (1997).

Sulphide Sulphur	NPR (NP / AP)	ARD Potential	Comments
<0.3%	-	None	No further ARD testing required, provided there are no other metal leaching concerns. Exceptions: host rock with no basic minerals, sulphide minerals that are weakly acid soluble.
>0.3%	<1	Likely	Likely to be Acid generating.
	1 - 2	Possibly	Possibly ARD generating if NP is insufficiently reactive or is depleted at a rate faster than that of sulphides.
	2 – 4	Low	Not potentially ARD generating unless significant preferential exposure of sulphides occur along fractures or extremely reactive sulphides are present together with insufficiently reactive NP.
	>4	None	No further ARD testing required unless materials are to be used as a source of alkalinity.

Table 1.4: Guidelines from Morin and Hutt (2007) and MEND (2009).

Paste pH	NPR	Potential for ARD	Comments
<6	<1	Acid Generating (AG)	Net acid generating, and already acidic.
>6	1 ≤ NPR ≤ 2	Potentially acid generating (PAG)	Potentially acid generating unless sulphide minerals is non-reactive. Thus, samples are net acid generating, but not yet acidic.
<6 and >6		Uncertain	Possibly acid generating if NP is insufficiently reactive or is depleted at a rate faster than sulphides.

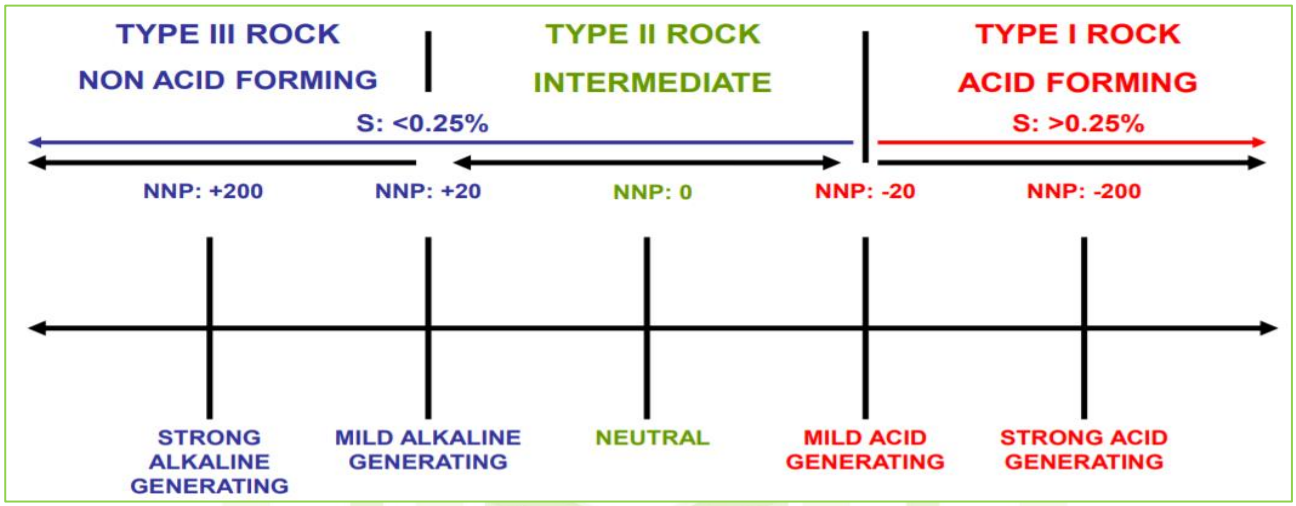


Figure 2: Rock Type Classification (De Wet, 2012).

Acid-base Accounting Results

ABA tests were conducted for the Koppie mining area. Three samples were subjected to ABA analyses. The analysis was conducted by UIS lab in Pretoria.

According to the results of the ABA tests, the coal and the 1 m below the coal samples is Type II rock types and therefore have an intermediate acid generating potential. The sample from below the coal seam have a mild acid generating potential.

Table 1.5: ABA results for Koppie.

Method : EPA 600 Modified Sobek	Unit	COAL	ABOVE / COAL	BELOW / COAL
Paste pH		7,33	6,10	5,39
Total Sulphur	%	0,30	0,093	0,71
Acid Potential (AP)	kg $CaCO_3$/t	9,38	2,89	22,2
Neutralization Potential (NP)	kg $CaCO_3$/t	3,52	0,00	1,00
Nett Neutralization Potential (NNP)	kg $CaCO_3$/t	-5,86	-2,89	-21,2
Neutralising Potential Ratio (NPR) (NP: AP)	NP:AP	0,38	0,00	0,05
Total Carbon	%	57,5	7,43	0,68
Rock Type		Type II	Type II	Type III

Method : EPA 600 Modified Sobek	Unit	COAL	ABOVE / COAL	BELOW / COAL
Total Carbon	%	57,5	7,43	0,68

Koppie Assessment Summary

A summary of the waste rock assessment results is provided in Table 1.6.

Table 1.6: Waste rock from Koppie assessment summary.

Koppie	GNR635	ARD Generation Potential
COAL	Type 3	Intermediate acid generating potential
ABOVE / COAL	Type 3	Intermediate acid generating potential
BELOW / COAL	Type 3	Mild acid generating potential

In spite of the intermediate to mild potentially acid generating nature of the materials at Koppie, none of the elements were actually mobilised during leach testing. All the elements remained below the LCT0 limits.

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

- Cut-off trenches to intercept the shallow contamination plume.
- Keep dirty water areas separated from clean surface run-off areas.
- Should a contamination plume be detected, investigate the possibility of groundwater abstraction to contain the plume.
- Treat decant water before release to the environment.

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

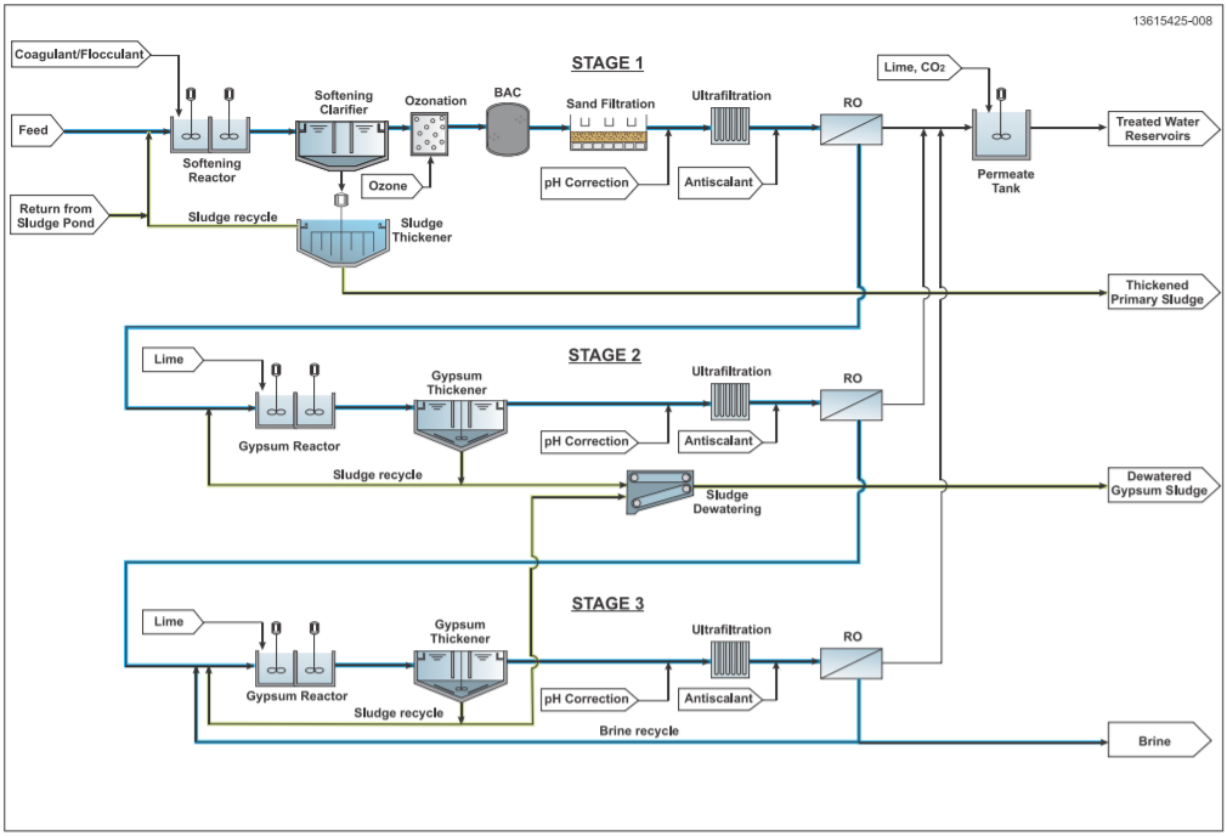
Three treatment options are available for considerations for the treatment of acid mine drainage. The preferred treatment option has not been decided on yet, however all options will be assessed for the most appropriate option in the long term:

- **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.



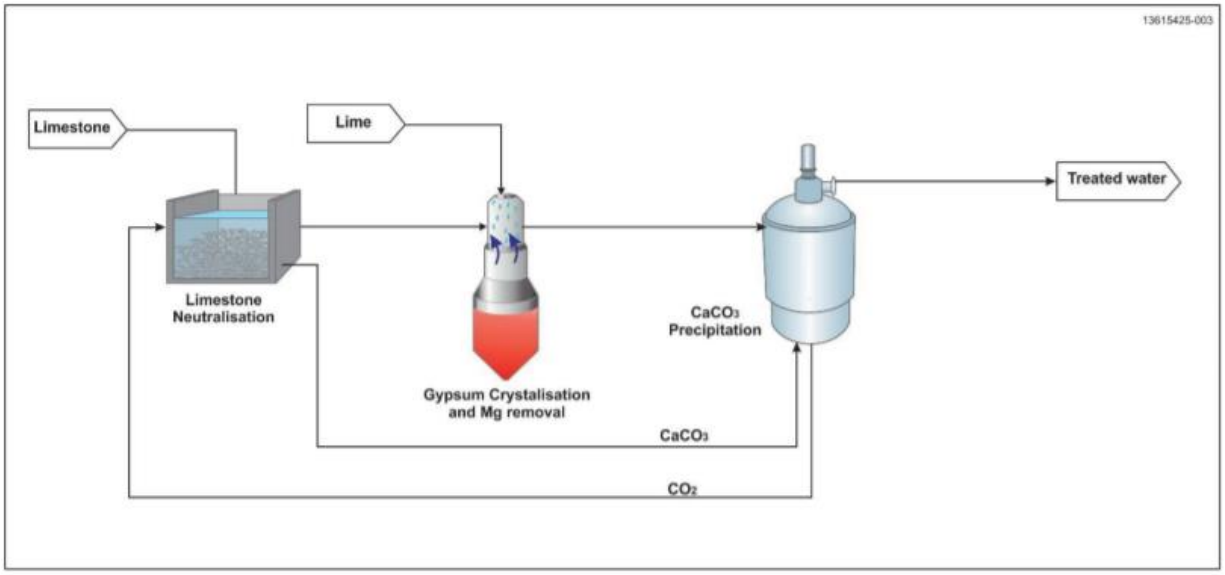
The sludge and brine waste streams which are a by-product of the RO process require long-term disposal due to their hazardous nature and high concentration of dissolved salts.

- **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**

  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

INFLOWS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Adit runoff (m^3)	310	1100	1400	1610	1200	620	230	60	30	20	10	20	6610
Dirty Catchment runoff PCD 1 (m^3)	3100	10700	13600	15600	11600	6000	2400	600	300	200	100	300	64500
Dirty Catchment runoff PCD 2 (m^3)	1350	4700	5900	6800	5000	2600	1000	300	100	80	80	100	28010
Monthly groundwater inflows (m^3)	300	2200	6400	11000	9800	10400	8700	6800	4000	1500	300	100	61500
Plant additional make-up water from dams (not achieved from PCD's and groundwater seepage)	12305	7505	2405	0	0	0	2105	4605	7405	10105	13305	14105	73845
Total inflows (m^3)	**17365**	**26205**	**29705**	**35010**	**27600**	**19620**	**14435**	**12365**	**11835**	**11905**	**13795**	**14625**	**234465**
OUTFLOWS													
Evaporation opencast pit (m^3)	40	10	20	20	30	30	30	40	40	40	50	60	410
Evaporation PCD's (m^3)	630	160	360	270	480	490	580	800	660	740	930	1070	7170
UG Continous mine (m^3)	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	27600
Drill and blast (m^3)	800	800	800	800	800	800	800	800	800	800	800	800	9600
Plant total required (m^3)	14105	14105	14105	14105	14105	14105	14105	14105	14105	14105	14105	14105	169260
Monthly Dust Control achieved (m^3)	100	200	900	1700	1860	2060	1440	700	180	0	0	0	9140
Net Evaporator evaporation (m^3)	0	0	0	5595	4695	995	0	0	0	0	0	0	11285
Total outflows (m^3)	**17975**	**17575**	**18485**	**24790**	**24270**	**20780**	**19255**	**18745**	**18085**	**17985**	**18185**	**18335**	**234465**
Balance (m^3)	-610	8630	11220	10220	3330	-1160	-4820	-6380	-6250	-6080	-4390	-3710	**0**

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 Activities	Potential destruction of buildings - demolished structure K18, K19, K25,	Construction/Development	12 ha	Monitor material	National Heritage Resources Act 25 of 1999	Prior to construction
Mining Activities	Potential destruction of buildings - Buildings K03, K05, K06, K08, K15	Construction/Development	1 ha	Monitor site	National Heritage Resources Act 25 of 2000	Prior to construction
Mining Activities	Potential destruction of grave/cemetery - K16, K36, K37, K39 K41, K42, K44, K45, K46, K47, K48, K49, K50	Construction/Development	1,6 ha	50 m conservation buffer	National Heritage Resources Act 25 of 2001	Prior to construction
Mining Activities	Potential destruction of buildings - Kraal - K43	Construction/Development	0,2 ha	Monitor site	National Heritage Resources Act 25 of 2002	Prior to construction
Mining Activities	Potential destruction of heritage material - partially demolished building K20, K21	Construction/Development	5,6 ha	Avoid site	National Heritage Resources Act 25 of 2003	During site clearance, construction, and topsoil removal
Noise						
Construction and clearing activities	Increased Noise levels	Construction	200 ha	Construct a Noise Barrier (tree line, berm etc) between the main noise source noise sensitive receivers Equipment Maintenance Implement Road rules.	SANS 10103	Prior to construction. Ongoing maintenance throughout LoM
Mining operations of surface infrastructure	Increased Noise levels	Operation	200 ha	Construct a Noise Barrier (tree line, berm etc) between the main noise source and noise sensitive receivers Equipment Maintenance Implement Road rules.	SANS 10103	Prior to construction. Ongoing maintenance throughout LoM
Decommissioning activities	Increased Noise levels	Closure and Decommissioning	200 ha	Equipment Maintenance Implement Road rules.	SANS 10103	Ongoing maintenance throughout LoM
Ecological Impacts (Wetland, Aquatic Terrestrial)						
Mining operations, change in land use	Loss of Species of Conservation Concern	Construction, Operation and Closure	200 ha	Avoidance of wetland areas as far as possible. Relocate sensitive species to more favourable areas.	Implement SWMP as per GN704	Prior to construction.

ACTIVITIES	IMPACT	PHASE	SIZE AND SCALE OF DISTURBANCE	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
Mining operations, change in land use	Loss of indigenous vegetation, floral and faunal habitat and ecological structure of water resources and soil	Construction, Operation and Closure	200 ha	Any disturbed areas should be rehabilitated in line with the rehabilitation guidelines, this includes the clearing of alien vegetation. Protect as much indigenous vegetation as possible.. Stabilise against erosion and sedimentation.	Follow the approved Closure and Rehabilitation Plan Follow approved Alien Invasive plan as guided by SANBI	Ongoing maintenance throughout LoM
Mining operations, change in land use	Increase in Alien Invasive Species	Construction, Operation and Closure	200 ha			
Increased traffic, heavy machinery movement, stockpiles, blasting.	Flow alteration	Construction, Operation and Closure	200 ha	A topsoil stripping and stockpiling guideline must be completed to ensure rehabilitation success. Attenuation of stormwater from any establishment and its associated infrastructure, 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. Exposed soils must be rehabilitated as soon as practically possible to limit the risk of erosion		
Vehicle and machinery movement, decant, stockpiling, rainfall seepage	Pollution of watercourse	Construction, Operation and Closure	200 ha	Prevent movement in wetland areas. Adhere to 110m buffer unless otherwise authorised. Prevent water quality deterioration.		
Mining operations, change in land use	Increase in alien and invasive species	Construction, Operation and Closure	200 ha	Alien and invasive management must be undertaken. Promote indigenous vegetation growth.		
Groundwater						
Surface clearing and preparation.	Increase in surface run-off and therefore decrease in aquifer recharge.	Construction	200 ha	Re-vegetate bare areas where no infrastructure will be placed, Unnecessary clearing of vegetation should be avoided	N/A	N/A
Shaft Complex	Decrease in water level from the point where development is lower than the water level.	Construction	15 ha	No management can be incorporated to limit the impacts of dewatering should the adit 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	25 ha	Appropriate lining of the stockpile areas will be constructed.	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	13 ha	Appropriate lining of the stockpile areas will be constructed.	SANS241:2015	Storm water Management to be constructed prior to other infrastructure establishment.

ACTIVITIES	IMPACT	PHASE	SIZE AND SCALE OF DISTURBANCE	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
						Ongoing monitoring.
Pollution Control Dams	Contaminated water in the dams can seep to the aquifer.	Operation	3 ha	Appropriate lining requirements for the PCD will be constructed.	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	200 ha	Clean any hydrocarbon spills in the appropriate manner. Use of hydrocarbon drip trays. Servicing of vehicles and other machines should be done in designated areas	Standard Operating Procedure for Spill containment and clean-up	Throughout LOM
Bord-&-pillar underground mining	The water infiltrating the underground voids will be removed for safe mining, causing a decrease in the water level of the secondary aquifer. Impacts on the shallow aquifer is not expected unless cracking or fracturing causes inflow of shallow aquifer to the underground voids.	Operation	1500 ha	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 not expected should the system behave as expected. If any connection between the underground void and the surface exist, decant is a possibility	Closure and Decommissioning	1500 ha	Treat decant water before release to the environment	Follow the approved Closure and Rehabilitation Plan	During Closure and decommissioning
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	200 ha	Separate Clean and Dirty Water System	SWMP	Storm water Management to be constructed prior to other infrastructure establishment
Adit and underground dewatering	Reduction in Baseflow	Operational Phase	1500 ha	No mitigation available	N/A	N/A
Operational Activities	Water quality deterioration	Operational Phase	200 ha	Separate Clean and Dirty Water System	SWMP	Storm water Management to be constructed prior to other infrastructure establishment.

ACTIVITIES	IMPACT	PHASE	SIZE AND SCALE OF DISTURBANCE	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
						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 establishment	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts	Construction and Operational Phase	200 ha	Area of disturbance to be kept to a minimum and no unnecessary clearing of vegetation to occur Reduce exposure areas Avoid Dust Creation	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
Site establishment	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts	Construction and Operational Phase	200 ha	Area of disturbance to be kept to a minimum and no unnecessary clearing of vegetation to occur Reduce exposure areas Avoid unnecessary dust creation through dust suppression and reduced speed limits	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
General transportation	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts	Construction and Operational Phase	200 ha	Reduce the amount of dust being blown from the load bin in the haul roads. Prevent excessive dust on Roads and from Haul trucks.	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
Site closure	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as	Decommissioning Phase	200 ha	Demolition should not be performed during windy periods	National Environmental Management: Air Quality Act, 2004 (Act	Ongoing dust suppression throughout LoM.

ACTIVITIES	IMPACT	PHASE	SIZE AND SCALE OF DISTURBANCE	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
	well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts			The area of disturbance must be kept to a minimum Prevent excessive dust on Roads.	No. 39 of 2004) - National Dust Control Regulations (Government Gazette No. 36794 - No. R 827) SANS 1929:2011	Concurrent rehabilitation of bare areas
Rehabilitation	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts	Decommissioning Phase	200 ha	Revegetation of exposed areas for long-term dust and water erosion control. The area of disturbance must be kept to a minimum. Avoid excessive dust generation.	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
Visual						
Construction related activities	Potential visual impact on the viewpoints	Construction Phase	200 ha	Create visual barriers	N/A	Prior to construction
Mining related activities	Potential visual impact on Road and Land users	Operation, Decommissioning and Closure	200 ha	Create visual barriers	N/A	Prior to construction
Soils, Land Use, Land Capability and hydropedology						
Surface activities and Adit Construction	Soil erosion from exposed soil surfaces	Construction	200 ha	Reduce water flow across the surface by cut off strips onto well vegetated areas, revegetating soils which will be exposed for long periods, such as the topsoil stockpiles	Soil Management Plan as per the Specialist Soils report	Throughout construction
Site clearance	Topsoil Degradation	Construction	200 ha	The impact can be reduced by stockpiling soils per horizon (not mixing different soil horizons), vegetating stockpiles and preventing wind blowing coal dust onto stockpiles, by minimizing dust generation by keeping roads moist and limiting the amount of dust generated during blasting.	Soil Management Plan as per the Specialist Soils report	Throughout construction
Site establishment	Soil Compaction	Construction	200 ha	Rip replaced soils when it reaches a depth of 500 mm, and again once all soil has been replaced	Soil Management Plan as per the Specialist Soils report	When Spills occur
Operation of Mine	Soil Compaction	Construction Operation, Decommissioning	200 ha	Rip compacted soils up to a depth of 500 mm	Soil Management Plan as per the Specialist Soils report	Immediately after mining

ACTIVITIES	IMPACT	PHASE	SIZE AND SCALE OF DISTURBANCE	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
Machinery operating on site	Soil chemical Pollution	Construction Operation, Decommissioning	200 ha	Ensure vehicle maintenance and adherence to driving precautions	Standard Operating Procedure for Spill containment and clean-up	Prior to and during mining
Mining related activities	Soil chemical Pollution	Operation	200 ha	Prevent wind blown coal dust onto stockpiles, by minimizing dust generation by keeping roads moist and limiting the amount of dust generated during blasting.	Standard Operating Procedure for Spill containment and clean-up	During stockpiling
Mining related activities	Loss of agricultural land	Construction and Operational Phase	87 ha	Reinstate Agricultural land after decommissioning	Rehabilitation Plan	Throughout operation
Adit placement	Loss of flow	Construction and Operational Phase	15 ha	No mitigation available	N/A	N/A
Underground mining	Loss in percolation	Construction and Operational Phase	1500 ha	No mitigation available	N/A	N/A
Mining infrastructure placement	Decreased infiltration	Construction and Operational Phase	200 ha	No mitigation available	SWMP, GN704	Throughout operation
Mining infrastructure placement	Erosion from Runoff	Construction and Operational Phase	200 ha	Prevent channelled runoff onto vertic soils	Soil Management Plan as per the Specialist Soils report	Throughout operation
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	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
				information regarding the operations; Vehicles used should be clearly marked; Promote employment of women and youth;		
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-contractors 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						
Underground mining	Insufficient design resulting in pillar failure and subsidence	Operational Phase	Local Residents	Ensure to design pillars according to the guidelines set apart for South African Coal mines for the protection of surface structures. The minimum recommended safety factor is 2. Adhere to the shallow mining guidelines set apart by the Chamber of Mines Research organization. Ensure to monitor pillar stability underground, reassess the pillar design (re-design) annually to determine compliance. Ensure rock engineering involvement throughout the mining process, including geotechnical logging and strength analysis of site specific strata layers.	Mine Health and Safety Act of 1996	During Blasting
Roof Stability	Roof collapse and Subsidence	Operational Phase	1500 ha			
Underground Blasting	Damage to surface structures.	Operational Phase	Local Residents			

1.e IMPACT MANAGEMENT OUTCOMES

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION type	STANDARD TO BE ACHIEVED
Heritage					
Mining Activities	Potential destruction of buildings - demolished structure K18, K19, K25,	Sites of cultural significance	Construction/Development	Control through management and monitoring	Protection of heritage material
Mining Activities	Potential destruction of buildings - Buildings K03, K05, K06, K08, K15	Sites of cultural significance	Construction/Development	Control through management and monitoring	Protection of buildings/structures
Mining Activities	Potential destruction of grave/cemetery - K16, K36, K37, K39 K41, K42, K44, K45, K46, K47, K48, K49, K50	Sites of cultural significance	Construction/Development	Control through management and monitoring	Protect grave/cemetery
Mining Activities	Potential destruction of buildings - Kraal - K43	Sites of cultural significance	Construction/Development	Control through management and monitoring	Protection of buildings/structures
Mining Activities	Potential destruction of heritage material - partially demolished building K20, K21	Sites of cultural significance	Construction/Development	Control through management and monitoring	Protection of heritage material
Noise					
Construction and clearing activities	Increased Noise levels	Neighbouring communities	Construction	Control through management and monitoring	Zero noise disturbance complaints
Mining operations of surface infrastructure	Increased Noise levels	Neighbouring communities	Operation	Control through management and monitoring	Zero noise disturbance complaints
Decommissioning activities	Increased Noise levels	Neighbouring communities	Closure and Decommissioning	Control through management and monitoring	Zero noise disturbance complaints
Ecological Impacts (Wetland, Aquatic Terrestrial)					
Mining operations, change in land use	Loss of Species of Conservation Concern	Fauna and Flora diversity	Construction, Operation and Closure	Control through management and monitoring	Improved wetland functionality and status, with adequate habitat availability.
Mining operations, change in land use	Loss of indigenous vegetation, floral and faunal habitat and ecological structure of water resources and soil	Fauna and Flora diversity	Construction, Operation and Closure	Remedy through rehabilitation	0
Mining operations, change in land use	Increase in Alien Invasive Species	Natural Habitat	Construction, Operation and Closure	Control through management and monitoring	0
Increased traffic, heavy machinery movement, stockpiles, blasting.	Flow alteration	Watercourses on site and downstream	Construction, Operation and Closure	Modify through design measures	Dispersed flow to and in the wetland areas.

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION type	STANDARD TO BE ACHIEVED
Vehicle and machinery movement, decant, stockpiling, rainfall seepage	Pollution of watercourse	Watercourses on site and downstream	Construction, Operation and Closure	Control through management and monitoring	Meet water quality standards
Mining operations, change in land use	Increase in alien and invasive species	Natural Habitat	Construction, Operation and Closure	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
Shaft Complex	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
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
Bord-&-pillar underground mining	The water infiltrating the underground voids will be removed for safe mining, causing a decrease in the water level of the secondary aquifer. Impacts on the shallow aquifer is not expected unless cracking or fracturing causes inflow of shallow aquifer to the underground voids.	Groundwater	Operation	Control through management and monitoring	Continued increase in water quality
Closure of the mine	Groundwater decant is not expected should the system behave as expected. If any connection between the underground void and the surface exist, decant is a possibility	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.
Adit and underground dewatering	Reduction in Baseflow	Watercourse	Operational Phase	Control through management and monitoring	N/A

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION type	STANDARD TO BE ACHIEVED
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 establishment	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts	Social health and wellbeing	Construction and Operational Phase	Control through management and monitoring	Minimal vegetation clearance and immediate rehabilitation where possible
Site establishment	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts	Social health and wellbeing	Construction and Operational Phase	Control through management and monitoring	Minimal vegetation clearance and immediate rehabilitation where possible
General transportation	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts	Social health and wellbeing	Construction and Operational Phase	Control through management and monitoring	Effective dust management on site
Site closure	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts	Social health and wellbeing	Decommissioning Phase	Control through management and monitoring	Effective dust management on site
Rehabilitation	Fugitive dust (containing TSP (total suspended particulate) will give rise to nuisance impacts as fallout dust, as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts	Social health and wellbeing	Decommissioning Phase	Control through management and monitoring	Rehabilitation of cleared areas
Visual					
Construction related activities	Potential visual impact on the viewpoints	Sense of place	Construction Phase	Modify through design measures	Effective visual barriers surrounding the mining operation.
Mining related activities	Potential visual impact on Road and Land users	Sense of place	Operation, Decommissioning and Closure	Modify through design measures	Effective visual barriers surrounding the mining operation.
Soils, Land Use, Land Capability and hydropedology					
Surface activities and Adit Construction	Soil erosion from exposed soil surfaces	Land use and capability	Construction	Remedy through rehabilitation	To minimise the areas where soil surfaces will be exposed to soil erosion
Site clearance	Topsoil Degradation	Soil structure	Construction	Remedy through rehabilitation	Different morphology of different stockpiles

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION type	STANDARD TO BE ACHIEVED
					No rills formed on stockpiles pH of soils remains in natural range
Site establishment	Soil Compaction	Land use and capability	Construction	Remedy through rehabilitation	Bulk density less than 1.5 kg.m-3 in rehabilitated soils
Machinery operating on site	Soil chemical Pollution	Soil structure	Construction Operation, Decommissioning	Remedy through training	Log of vehicle breakdowns and traffic violations Soils test clean of pollutants
Mining related activities	Loss of agricultural land	Land use and capability	Construction and Operational Phase	Remedy through rehabilitation	Effective rehabilitation of impacted areas for agricultural practices
Adit placement	Loss of flow	Water interflow	Construction and Operational Phase	Remedy through rehabilitation	N/A
Underground mining	Loss in percolation	Water interflow	Construction and Operational Phase	Remedy through rehabilitation	N/A
Mining infrastructure placement	Decreased infiltration	Water interflow	Construction and Operational Phase	Remedy through rehabilitation	N/A
Mining infrastructure placement	Erosion from Runoff	Soil structure	Construction and Operational Phase	Remedy through rehabilitation	To minimise the areas where soil surfaces will be exposed to soil erosion
Social Economic					
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
Traffic Assessment					
Increased road traffic	Degradation of road	Road network	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					
Underground mining	Insufficient design resulting in pillar failure and subsidence	Geological structure and stability	Construction, Operation and Closure	Control through management and monitoring	Stable underground and surface conditions

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION type	STANDARD TO BE ACHIEVED
Roof Stability	Roof collapse and Subsidence	Geological structure and stability	Construction, Operation and Closure	Control through management and monitoring	Stable underground and surface conditions
Underground Blasting	Damage to surface structures.	Geological structure and stability	Construction, Operation and Closure	Control through management and monitoring	No damage to infrastructure surrounding the mine

1.f IMPACT MANAGEMENT ACTIONS

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
Heritage				
Mining Activities	Construction/Development	Control through management and monitoring	Prior to construction	National Heritage Resources Act 25 of 1999
Mining Activities	Construction/Development	Control through management and monitoring	Prior to construction	National Heritage Resources Act 25 of 2000
Noise				
Construction and clearing activities	Construction	Control through management and monitoring	Prior to construction. Ongoing maintenance throughout LoM	SANS 10103
Mining operations of surface infrastructure	Operation	Control through management and monitoring	Prior to construction. Ongoing maintenance throughout LoM	SANS 10103
Decommissioning activities	Closure and Decommissioning	Control through management and monitoring	Ongoing maintenance throughout LoM	SANS 10103
Ecological Impacts (Wetland, Aquatic Terrestrial)				
Mining operations, change in land use	Construction, Operation and Closure	Control through management and monitoring	Prior to construction. Ongoing maintenance throughout LoM	Implement SWMP as per GN704 Follow the approved Closure and Rehabilitation Plan Follow approved Alien Invasive plan as guided by SANBI
Mining operations, change in land use	Construction, Operation and Closure	Remedy through rehabilitation	0	0
Mining operations, change in land use	Construction, Operation and Closure	Control through management and monitoring	0	0
Increased traffic, heavy machinery movement, stockpiles, blasting.	Construction, Operation and Closure	Modify through design measures	0	0
Vehicle and machinery movement, decant, stockpiling, rainfall seepage	Construction, Operation and Closure	Control through management and monitoring	0	0
Groundwater				
Surface clearing and preparation.	Construction	Control through management and monitoring	N/A	N/A
Shaft Complex	Construction	N/A	N/A	N/A

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
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 infrastructure establishment. Ongoing monitoring.	SANS241:2015
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
Bord-&-pillar underground 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
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
Adit and underground 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				
Construction related activities	Construction Phase	Modify through design measures	Prior to construction	N/A
Mining related activities	Operation, Decommissioning and Closure	Modify through design measures	Prior to construction	N/A
Soils, Land Use, Land Capability and hydropedology				
Surface activities and Adit Construction	Construction	Remedy through rehabilitation	Throughout construction	Soil Management Plan as per the Specialist Soils report
Site clearance	Construction	Remedy through rehabilitation	Throughout construction	Soil Management Plan as per the Specialist Soils report
Site establishment	Construction	Remedy through rehabilitation	When Spills occur	Soil Management Plan as per the Specialist Soils report
Operation of Mine	Construction Operation, Decommissioning	Remedy through rehabilitation	Immediately after mining	Soil Management Plan as per the Specialist Soils report
Machinery operating on site	Construction Operation, Decommissioning	Remedy through training	Prior to and during mining	Standard Operating Procedure for Spill containment and clean-up
Mining related activities	Operation	Remedy through rehabilitation	During stockpiling	Standard Operating Procedure for Spill containment and clean-up

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
Mining related activities	Construction and Operational Phase	Remedy through rehabilitation	Throughout operation	Rehabilitation Plan
Adit placement	Construction and Operational Phase	Remedy through rehabilitation	N/A	N/A
Underground mining	Construction and Operational Phase	Remedy through rehabilitation	N/A	N/A
Mining infrastructure placement	Construction and Operational Phase	Remedy through rehabilitation	Throughout operation	SWMP, GN704
Mining infrastructure placement	Construction and Operational Phase	Remedy through rehabilitation	Throughout operation	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				
Underground mining	Operational Phase	Control through management and monitoring	During Blasting	Mine Health and Safety Act of 1996
Roof Stability	Operational Phase	Control through management and monitoring		
Underground Blasting	Operational Phase	Control through management and monitoring		

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**
Surface Infrastructure related to mining operations (including plant)	Removal, decommissioning and demolition of infrastructure	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.
Adit	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	
Waste Management Facilities	Removal, decommissioning and demolition of infrastructure	

Aspect	Scheduling
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: 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 ***R50 034 367.48 (excl VAT)*** 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 1.7: Financial Provision Quantum

Item description		Cost
1	**Surface Infrastructure**	**R4 378 675.46**
1	Dismantling of processing plant and associated structures (including associated conveyors & power lines)	R459 071.12
2(A)	Demolition of steel buildings and structures (including floor slabs)	R6 402.00
2(B)	Demolition of reinforced concrete buildings and structures	R0.00
3	Rehabilitation of access roads	R2 681 179.58
4(A)	Demolition of electrified railway lines	R0.00
4(B)	Demolition and rehabilitation of non-electrified railway lines	R0.00
5	Demolition of housing and facilities (including floor slabs)	R1 232 022.76
12	Fencing	R0.00
2	**Mining Areas & Waste Sites**	**R529 999.00**
6	Opencast rehabilitation (including final voids and ramps)	R0.00
7	Sealing of shafts, adits and inclines (including concrete cap)	R529 999.00
3	**Mine Residue Sites**	**R22 526 282.65**
8(A)	Rehabilitation of overburden and spoils	R21 203 995.93
8(B)	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	R0.00
8(C)	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	R390 886.72
9	Rehabilitation of subsided areas	R0.00
13	Water management (Separating clean and dirty water, managing polluted water and managing the impact on groundwater, including treatment, when required)	R931 400.00

	Item description	Cost
4	**General Rehabilitation**	**R307 156.17**
10	General surface rehabilitation, including of all denuded areas	R307 156.17
5	**Aftercare & Maintenance**	**R13 608 603.64**
13	Monitoring	R1 060 000.00
14	Maintenance	R2 463 146.70
15	Water Treatment Facility	R10 085 456.94
	Sub Total 1	**R41 350 716.93**
	Mobilisation and Project Management (10% of Subtotal 1)	**R4 135 071.69**
	Sub Total 2	**R45 485 788.62**
	Contingency (10% of subtotal 2)	**R4 548 578.86**
	Sub Total 3 (Closure Liability for Mine)	**R50 034 367.48**
	VAT (15% of subtotal 3)	**R7 505 155.12**
	Total	**R57 539 522.61**

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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 1.8)

1.h MONITORING AND REPORTING FREQUENCY (AS PER TABLE 1.8)

1.i RESPONSIBLE PERSONS (AS PER TABLE 1.8)

1.j TIME PERIOD FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS (AS PER TABLE 1.8)

1.k MECHANISM FOR MONITORING COMPLIANCE (AS PER TABLE 1.8)

Table 1.8: 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	Monthly
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 Koppie Mine.

General Training:

- Environmental awareness training;
- Awareness of the Koppie Mine SHEQ policy; and
- Awareness of environmental legislation or any other requirements Koppie Mine 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 Koppie Mine. 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 Koppie Mine 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 Koppie Mine 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 1.9: 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

	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
Subsidence and sinkholes	Alternative evacuation and access routes should be identified and used. All relevant emergency response units must be notified and hospitals informed of incoming patients.	Immediately	Operational Manager/SHE Coordinator

1.n SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

All information committed to in the scoping report and as requested by the DMR to date has been incorporated in the EIA/EMP.

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: _____ 2021