ENVIRONMENTAL & ENGINEERING

REPORT

EYETHU (PTY) LTD - BLESBOKLAAGTE COLLIERY

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

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VERSION BB

DOCUMENT AND QUALITY CONTROL

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CC– draft		Leoni le Roux		Quality review
Approved for Distribution:				
0.0		Vernon Siemelink		Final report

QUALITY CONTROL BY:

Nature of Signoff:	**Responsible Person:**	**Role / Responsibility**	**Qualification**
Author	Riana Panaino	Senior Environmental Consultant	BSc Honns Biodiversity and Conservation
Quality Reviewer	Leoni le Roux	Administrator	Professional Secretary and Personal Assistant
Reviewer	Vernon Siemelink	Environmental Director	BSSc Honn GeoScience M(EnvMan) Environmental Management ISO 14001 Auditor
Client	Pamela Mqulwana	Snr. Environmental Officer	Environmental Practitioner

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.

09/06/2020

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:	Riana Panaino
Telephone:	012 807 0383
Fax:	N/A
E-mail:	riana@ecoe.co.za
Physical Address:	442 Rodericks Road, Lynnwood, Pretoria 0081

1.b DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

Table 1.2: Proposed Activity

ITEM	DETAIL
Type of mineral	Coal
Mining method	Strip and Rollover Mining Techniques
Depth of the mineral below surface	Average depth 13.97 m
Geological formation	Certain portions of the farm Blesboklaagte 296 JS is underlain by the Vryheid Formation sediments, situated in the northern part of the main Witbank Coalfield. The coal bearing strata in the Witbank Coalfield are contained within the Vryheid Formation of the Ecca Group. The coal seams are shallow and relatively flat lying and slightly undulating with a southwesterly dip in some areas. Borehole data revealed the existence of one coal seam associated with the sediments of the Vryheid Formation. Seams are numbered 5 to 1 with the no 5 seam being the highest in the sequence. Seams preserved in the area are only the no. 2 seam out of the normal 5 found coal seams in the Witbank area. The No 2 seam varies in thickness between 3 and 7 meters. Seven distinct bands or zones are recognised although some of these may be locally absent. The basal zone 1 is thin, in persistent and dull; whereas zone 2 is bright and often has a low phosphorous content. Boreholes drilled in the proposed opencast area intersected the Number 2 coal seam between 8.50m and 11.30m below surface. The Number 2 coal seam sub crops along the north and west due to erosion. The eastern limit is the R544 A 30 m buffer pillar is proposed between the opencast workings and the tar road. The thickness of the Number 2 seam and depth below surface is correlated in all boreholes. Continuity of the coal seam was therefore demonstrated by the drilling information.
Life of mine	4 Years.
Production rate	600 000 tons per annum
Saleable Product	Mining will consist of the removal of coal from the No. 2 coal seam, the ROM will be transported to an off-site beneficiation plant where the ROM will be processed to be sold to Eskom Holdings Ltd.
Target Market	Eskom

1.c COMPOSITE MAP

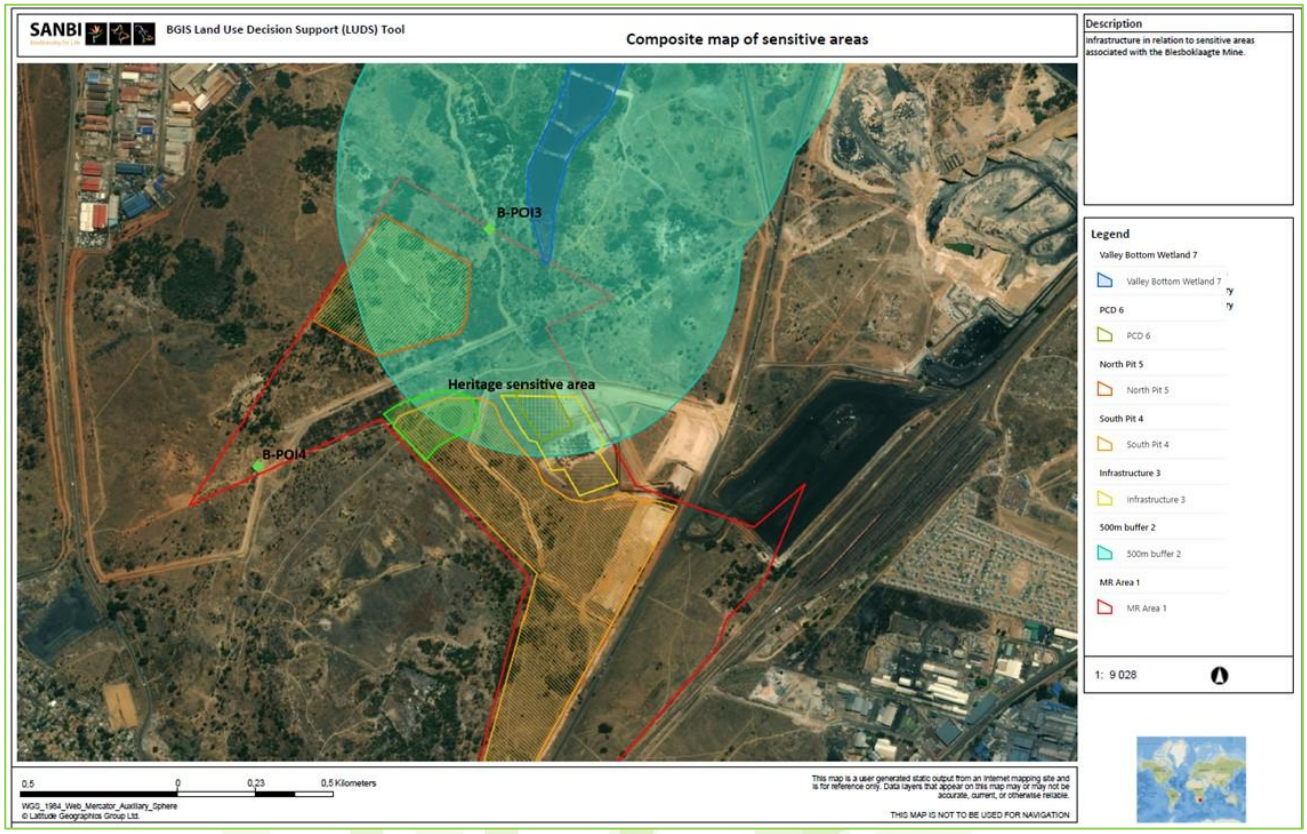


Figure 1.1: Site Layout with sensitivities

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.

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 opencast pit act as a groundwater sink. Contaminated groundwater, as a result of acid mine drainage will therefore also be contained within the pit area.

It is suspected that rebound water will start to decant after ~20 years. The current decant from underground workings is very acidic and it assumed that without treatment there should not be a negative or positive change in the decant water quality.

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.
- 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.

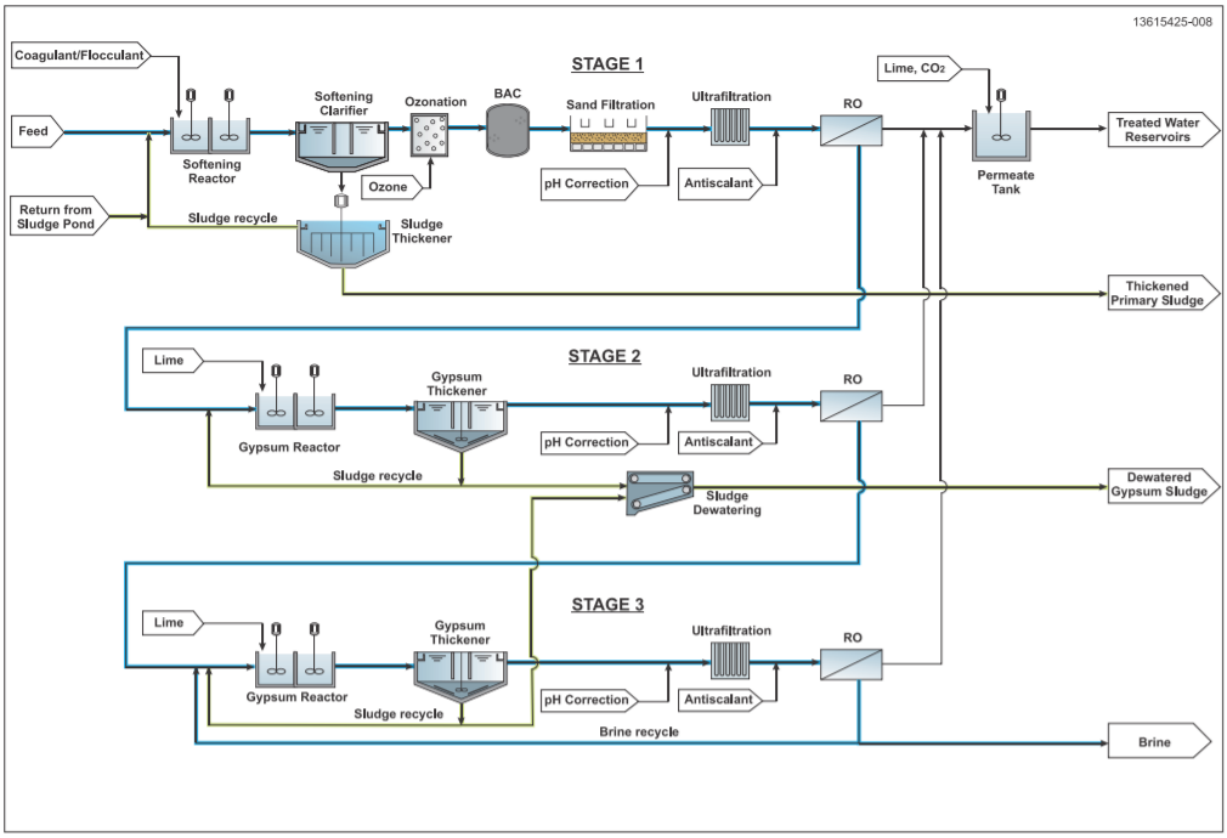
Three treatment options were considered for the treatment of acid mine drainage:

- **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.

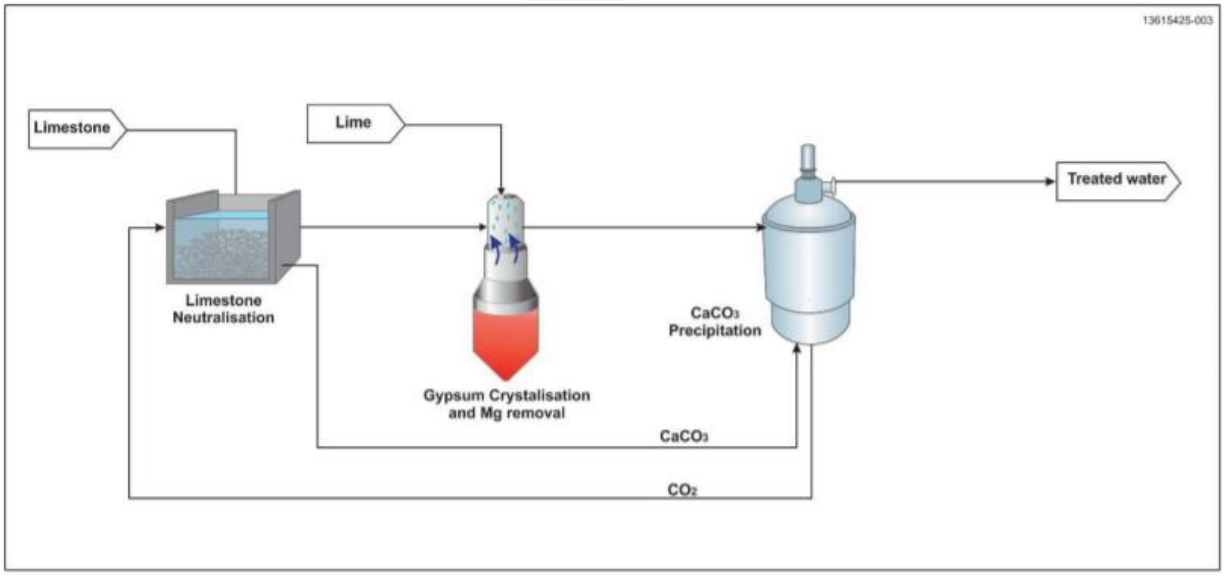
- **Lime treatment**

  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 longterm 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

AREA	IN (m^3/annum)				TOTAL
OPENCAST	Direct Rainfall	Runoff	Ground Water		
	6 366	2 570	146 100		**155 036**
DIRTY AREAS	Rainfall				
	70 005				**70 005**
PCD	Runoff Dirty Areas	Direct Rainfall	Open Cast Dewatering		
	8 183	4 373	73 050		**85 606**
DOMESTIC	Ground Water				
	2 922				**2 922**
				TOTAL	**313 568**
OUT (m^3/annum)					
OPENCAST	Dewatering	Evaporation	In-Pit		

	73 050	7 488	74 498		**155 036**
DIRTY AREAS	PCD	Entrained/Losses			
	8 183	61 821			**70 005**
PCD	Seepage	Evaporation	Discahrge	Dust Suppresion	
	0	5 225	0	80 381	**85 606**
DOMESTIC	Septic Tank	Losses			
	2 338	584			**2 922**
				TOTAL	**313 568**
BALANCE (%)					**0.000%**

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						
Surface clearing and preparation	Destruction of structures at B-POI4	Construction and Operation	<1 ha	Prevent impact on sites	National Heritage Resources Act 25 of 1999	Prior to construction
Topsoil and overburden removal	Destruction of possible sub-surface heritage material within the sensitive area	Construction and Operation	3 - 4 ha	Monitor sub-surface material	National Heritage Resources Act 25 of 2000	During site clearance, construction, and topsoil removal
Noise						
Construction and clearing activities	Increased Noise levels	Construction	~60ha	Construct a Noise Barrier between the main noise source noise sensitive receivers Equipment Maintenance Implement Road rules.	SANS 10103	Prior to construction. Ongoing maintenance throughout LoM
Operational Activities	Increased Noise levels	Operation	~60ha	Construct a Noise Barrier between the main noise source 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	~60ha	Equipment Maintenance Implement Road rules.	SANS 10103	Ongoing maintenance throughout LoM
Ecological Impacts						
Mining Activities	Loss of species of conservation concern	Construction and Operation	~60ha of activity	• Avoidance of wetland areas as far as possible, these areas are regarded as highly sensitive areas Create Environmental Awareness • Any disturbed areas should be rehabilitated • Protect as much indigenous vegetation as possible • An alien invasive management programme must be incorporated into an Environmental Management Programme.	• Search and rescue for reptiles and other vulnerable species, before areas are cleared • Environmental induction for all staff and contractors on-site Rehabilitate in line with the rehabilitation guidelines, this includes the clearing of alien vegetation, following the guidelines of a suitable alien invasive plant management plan. • The site must be regularly monitored for re-growth of alien invasive species, and any new seedlings etc. eradicated using methods appropriate for the particular species, whether mechanical, chemical or biological. • Ongoing alien plant control must be undertaken in the disturbed areas • Herbicides must be carefully applied, in order to prevent any chemicals from entering the river. Spraying of herbicides within or	Prior to construction with ongoing mitigation implementation during LoM
Mining Activities	Loss of indigenous vegetation, floral and faunal habitat and ecological structure of water resources and soil	Construction and Operation	~60ha of activity	• Avoidance of wetland areas as far as possible, these areas are regarded as highly sensitive areas Create Environmental Awareness • Any disturbed areas should be rehabilitated • Protect as much indigenous vegetation as possible • An alien invasive management programme must be		Prior to construction with ongoing mitigation implementation during LoM

Activities	Impact	Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
				incorporated into an Environmental Management Programme.	near to the wetland areas is strictly forbidden. • Re-instate indigenous vegetation (grasses and indigenous trees) in disturbed areas directly after mining ceases so as to stabilise against erosion and sedimentation.	
Disturbance of the environment	increase in Alien Invasive species	Construction, Operation, Decommissioning and Closure	~60ha of activity	• Avoidance of wetland areas as far as possible, these areas are regarded as highly sensitive areas Create Environmental Awareness • Any disturbed areas should be rehabilitated • Protect as much indigenous vegetation as possible • An alien invasive management programme must be incorporated into an Environmental Management Programme.		Prior to construction with ongoing mitigation implementation during LoM
Construction and operational activities	Flow alterations due to erosion and sedimentation	Construction and Operation	~60ha of activity	• Rehabilitation of the disturbed areas; • Limiting instream sedimentation; • Minimising pollutants entering the watercourse Erosion control measures must be employed where required.	• Design and implementation of a suitable stormwater system; • Implement a programme for the clearing/eradication of alien species including long term control of such species; • A 50 m buffer implemented for the wetland system; • Water quality monitoring must take place every month during operational phases; and • Wetland monitoring and biomonitoring must take place bi-annually. • A topsoil stripping and stockpiling guideline must be completed to ensure rehabilitation success. • Attenuation measures must include, but are not limited to - the use of sand bags, erosion control blankets, and silt fences. • Long term attenuation measures, such as attenuation/infiltration trenches, swales must be established to control stormwater from hardened surfaces • Vegetation clearing must be undertaken as and when necessary in phases. • Install sediment barriers (silt catchers and Reno mattresses) along any drainage areas to prevent the migration of silt. • Exposed soils must be rehabilitated as soon as practically possible to limit the risk of erosion. • All roads need to be maintained and any erosion ditches forming along the road filled and compacted. • Demarcate wetland areas to avoid unauthorised access. • No washing of any equipment in close proximity to a watercourse is permitted. • No releases of any substances that could be toxic to fauna or faunal habitats within the channels or any watercourses is permitted. • Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities • Portable toilets must be placed on impervious level surfaces that are lipped to prevent spillage. The general consensus is that they	Ongoing concurrent rehabilitation.
Construction and operational activities	Pollution of watercourse	Construction, Operation	~60ha of activity	• Rehabilitation of the disturbed areas; • Limiting instream sedimentation; • Minimising pollutants entering the watercourse Erosion control measures must be employed where required.		Ongoing concurrent rehabilitation.
Operational, decommissioning and rehabilitation activities.	Spread of alien vegetation	Operational, Closure and Decommissioning	~60ha of activity	• Rehabilitation of the disturbed areas; • Limiting instream sedimentation; • Minimising pollutants entering the watercourse Erosion control measures must be employed where required.		Ongoing concurrent rehabilitation.

Activities	Impact	Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
					should be within 30 m to 50 m of a work face • Re-instate indigenous vegetation (grasses and indigenous trees) in disturbed areas.	
Groundwater						
Construction activities	Deterioration of groundwater quality	Construction phase	Beyond site boundary	Water management facilities should be designed to intercept and contain as much contaminated runoff and/or seepage as possible. Minimising the potential for water quality deterioration due to the oxidation of sulphide minerals Minimize the risk of spillages to the environment. Detect and prevent pollution at the earliest possible stage,	SANS241:2015	Storm water Management to be constructed prior to other infrastructure establishment
Operational Activities	Impact on Groundwater Quantity	Operational phase	Beyond site boundary	No mitigation available	N/A	N/A
Operational Activities	Impact on groundwater quality	Operational phase	Beyond site boundary	Minimize the risk of spillages to the environment. Water management facilities should be designed to intercept and contain as much contaminated runoff and/or seepage as possible.	SANS241:2015	Storm water Management to be constructed prior to other infrastructure establishment. Ongoing monitoring.
Closure of the mine	Groundwater decant	Closure and Decommissioning	Beyond site boundary	Treat decant water before release to the environment	SANS241:2015	Passive treatment establishment before mine closure.
Closure of the mine	Pollution Plume spread	Closure and Decommissioning	Beyond site boundary	No mitigation available	N/A	N/A
Surface Water						
Construction activities	Sedimentation and pollution of the Blesbokspruit	Construction Phase	Downstream of the site	Separate clean and Dirty Water System	SWMP	Storm water Management to be constructed prior to other infrastructure establishment
Open pit Mining	Reduction in Base flow	Operational Phase	Downstream of the site	No mitigation available	N/A	N/A
Pit dewatering	Reduced Poor Quality Water input	Operational Phase	Downstream of the site	No mitigation required	N/A	N/A
Operational Activities	Water quality deterioration	Operational Phase	Downstream of the site	Separate clean and Dirty Water System	SWMP	Storm water Management to be constructed prior to other infrastructure establishment. Ongoing monitoring.

Activities	Impact	Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Closure of the mine	Decant of poor quality water	Closure and Decommissioning	Downstream of the site	Treat decant water before release to the environment	ISO 5667: Grab Samples Water parameters as approved in the IWULA	Passive 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	Beyond site boundary	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	Beyond site boundary	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
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	Beyond site boundary	Avoid Dust Creation Enforce a low Speed limit	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 well as	Decommissioning Phase	Beyond site boundary	The area of disturbance must be kept to a minimum 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

Activities	Impact	Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
	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					
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	Beyond site boundary	Minimise exposed surface duration The area of disturbance must be kept to a minimum 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
Visual						
Construction related activities	Potential visual impact on the viewpoints	Construction Phase	Beyond site boundary	The visual impact can be minimized creating a visual barrier.	Creating a Berm between the opencast pits and the town of Witbank and Planting Indigenous vegetation	Prior to construction
Mining related activities	Potential visual impact on Road and Land users	Operation, Decommissioning and Closure	Beyond site boundary	The visual impact can be minimized creating a visual barrier. Minimise areas of operation	reduce the visual disturbance to the area	Prior to construction
Soils, Land Use, Land Capability and Hydropedology						
Surface clearing and preparation	Exposure of soil surface to erosion	Construction Phase	~60ha of activity	Keep vegetation removal limited to footprint and use geo-textiles and other erosion control structures to limit soil erosion	Soil Management Plan as per the Specialist Soils report	Throughout construction
Heavy machinery and vehicle movement	Soil compaction and reduced water infiltration capacity	Construction Phase	~60ha of activity	Restrict vehicle and equipment movement to surface footprint	Soil Management Plan as per the Specialist Soils report	Throughout construction
Topsoil and overburden removal	Destruction of in situ soil profiles	Operational phase	~36ha	Only remove topsoil where necessary and don't mix topsoil layers with overburden	Soil Management Plan as per the Specialist Soils report	Throughout mining, implement concurrent rehabilitation
Topsoil and overburden stockpiling	Destruction of soil nutrient cycles and hydropedological functioning	Operational phase	~36ha	Re-establish vegetation on topsoil stockpiles and maintain vegetation cover until soil is used for rehabilitation	Soil Management Plan as per the Specialist Soils report	Immediately after topsoil removal.
Hydrocarbon spills	Soil chemical pollution	Construction Phase	~60ha of activity	Regularly check vehicles and equipment for possible oil and fuel leaks	Soil Management Plan as per the Specialist Soils report	Daily

Activities	Impact	Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Infrastructure construction	Destruction of arable and grazing land capability	Construction Phase	~60ha of activity	No mitigation possible	N/A	N/A
Heavy machinery and vehicle movement	Soil compaction and reduced water infiltration capacity	Operational phase	~60ha of activity	Restrict vehicle and equipment movement to surface footprint	Soil Management Plan as per the Specialist Soils report	Throughout operation
Hydrocarbon spills	Soil chemical pollution	Operational phase	~60ha of activity	Regularly check vehicles and equipment for possible oil and fuel leaks	Soil Management Plan as per the Specialist Soils report	Daily
Heavy machinery and vehicle movement	Soil chemical pollution	Closure and Decommissioning	~60ha of activity	Regularly check vehicles and equipment for possible oil and fuel leaks	Soil Management Plan as per the Specialist Soils report	Daily
Area preparation, shaping and topsoil placement	Soil compaction and reduced water infiltration capacity	Closure and Decommissioning	~60ha of activity	Restrict vehicle and equipment movement to the areas that are revegetated	Soil Management Plan as per the Specialist Soils report	Throughout closure and decommissioning
Social Economic						
Mine establishment	Employment and income opportunity	Construction and Operation Phase	Local communities	Maximise Employment Opportunities, Skills and Enterprise Development	As per SLP	Prior to construction and throughout LoM
Mining operations	Upskilling of Labour force	Construction and Operation Phase	Mine employees	Promote Socio-Economic Development in the Local Area	As per SLP	Throughout LoM
Mining operations	Increased Public revenue	Construction and Operation Phase	Local area	0	As per SLP	Throughout LoM
Mining operations	Increase in Local Economic Development Funds	Construction and Operation Phase	Local area	0	As per SLP	Throughout LoM
Mining operations	Project Induced In-Migration	Construction and Operation Phase	Local communities	Minimise Impacts of Project- Induced In-Migration	As per SLP	Throughout LoM
Mining operations	Safety and Health Risks	Construction and Operation Phase	Local Municipality	Minimise Safety and Health Risks	As per SLP	Throughout LoM
Mining operations	Change in sense of place	Construction and Operation Phase	Local communities	Minimise Negative Impacts of Nuisance Factors (Noise and Dust) Minimise Negative Impacts from Blasting Activities	As per SLP	Throughout LoM
Mining operations	Job losses	Decommissioning and Closure	Local communities	Minimise the negative economic impacts related to mine closure	As per SLP	Prior to Mine closure
Mining operations	Decrease/termination of community investment funds and support to local communities	Decommissioning and Closure	Local communities	0	As per SLP	Prior to Mine closure

Activities	Impact	Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Mine Closure	Safety and Health Risks	Decommissioning and Closure	Local Municipality	0	As per SLP	Prior to Mine closure
Geology						
Open pit Mining of underground workings	Burning of historic underground mining areas and spontaneous combustion	Operational decommissioning and closure	Beyond site boundary	opencast pillar mining makes use of a 30.0 m wide blasted buffer to prevent spontaneous combustion and sinkhole formation	As per measures in the OPEN CAST PILLAR ABUTMENT RISK ASSESSMENT compiled by ProVelop Mining	Throughout LoM

1.e IMPACT MANAGEMENT OUTCOMES

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
Heritage					
Surface clearing and preparation	Destruction of structures at B-POI4	Sites of cultural significance	Construction and Operation	Control through management and monitoring	preservation of heritage resources
Topsoil and overburden removal	Destruction of possible sub-surface heritage material within the sensitive area	Sites of cultural significance	Construction and Operation	Control through management and monitoring	Preservation of Archaeological artifacts
Noise					
Construction and clearing activities	Increased Noise levels	Neighbouring communities	Construction	Control through management and monitoring	Zero noise disturbance complaints
Operational Activities	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					
Mining Activities	Loss of species of conservation concern	Environment	Construction and Operation	Remedy through rehabilitation	Awareness and protection of species of conservation concern
Mining Activities	Loss of indigenous vegetation, floral and faunal habitat and ecological structure of water resources and soil	Environment	Construction and Operation	Remedy through rehabilitation	Effective rehabilitation of the post mining environment
Disturbance of the environment	increase in Alien Invasive species	Vegetation composition	Construction, Operation, Decommissioning and Closure	Control through management and monitoring	effective management of alien and invasive species
Construction and operational activities	Flow alterations due to erosion and sedimentation	Instream habitat	Construction and Operation	Modify through design measures	improve and maintain natural flow where possible

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
Construction and operational activities	Pollution of watercourse	Instream habitat	Construction, Operation	Control through management and monitoring	Effective pollution and dirty water management of the mining site, and no pollution of the downstream watercourse
Operational, decommissioning and rehabilitation activities.	Spread of alien vegetation	Vegetation composition	Operational, Closure and Decommissioning	Control through management and monitoring	effective management of alien and invasive species
Groundwater					
Construction activities	Deterioration of groundwater quality	Groundwater	Construction phase	Control through management and monitoring	Effective water management and prevention of groundwater pollution.
Operational Activities	Impact on Groundwater Quantity	Groundwater	Operational phase	Control through management and monitoring	N/A
Operational Activities	Impact on groundwater quality	Groundwater	Operational phase	Control through management and monitoring	Effective prevention of the pollution of the groundwater resource
Closure of the mine	Groundwater decant	Groundwater	Closure and Decommissioning	Remedy through control measures	Release of acceptable quality water to the downstream environment
Closure of the mine	Pollution Plume spread	Groundwater	Closure and Decommissioning	Control through management and monitoring	N/A
Surface Water					
Construction activities	Sedimentation and pollution of the Blesbokspruit	Watercourse	Construction Phase	Modify through design measures	Effective onsite dirty water management and retention.
Open pit Mining	Reduction in Base flow	Watercourse	Operational Phase	Modify through design measures	N/A
Pit dewatering	Reduced Poor Quality Water input	Watercourse	Operational Phase	N/A	N/A
Operational Activities	Water quality deterioration	Watercourse	Operational Phase	Modify through design measures	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 concurrent rehabilitation as mining progresses
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	Social health and wellbeing	Construction and Operational Phase	Control through management and monitoring	minimal vegetation clearance and concurrent rehabilitation as mining progresses

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
	10 microns, and dust with a size less than 2.5 microns) giving rise to health impacts				
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 clearing and preparation	Exposure of soil surface to erosion	Land use and capability	Construction Phase	Remedy through rehabilitation	effective erosion management control
Heavy machinery and vehicle movement	Soil compaction and reduced water infiltration capacity	Land use and capability	Construction Phase	Remedy through rehabilitation	Effective soil amelioration
Topsoil and overburden removal	Destruction of in situ soil profiles	Land use and capability	Operational phase	Remedy through rehabilitation	Soil profile replacement to a state as close the pre-mining environment
Topsoil and overburden stockpiling	Destruction of soil nutrient cycles and hydropedological functioning	Land use and capability	Operational phase	Remedy through rehabilitation	Retentions and maintenance of nutrient cycles within stockpiled and rehabilitated soils
Hydrocarbon spills	Soil chemical pollution	Land use and capability	Construction Phase	Remedy through rehabilitation	Effective hydrocarbon containment and spill management
Infrastructure construction	Destruction of arable and grazing land capability	Land use and capability	Construction Phase	Remedy through rehabilitation	N/A

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
Heavy machinery and vehicle movement	Soil compaction and reduced water infiltration capacity	Land use and capability	Operational phase	Remedy through rehabilitation	Effective soil amelioration
Hydrocarbon spills	Soil chemical pollution	Land use and capability	Operational phase	Remedy through rehabilitation	Effective hydrocarbon containment and spill management
Heavy machinery and vehicle movement	Soil chemical pollution	Land use and capability	Closure and Decommissioning	Remedy through rehabilitation	Effective hydrocarbon containment and spill management
Area preparation, shaping and topsoil placement	Soil compaction and reduced water infiltration capacity	Land use and capability	Closure and Decommissioning	Remedy through rehabilitation	Effective soil amelioration
Social Economic					
Mine establishment	Employment and income opportunity	Social Economic	Construction and Operation Phase	Remedy through Social and Labour Plan	Maximise local employment opportunities and develop skills during operations
Mining operations	Upskilling of Labour force	Social Economic	Construction and Operation Phase	Remedy through Social and Labour Plan	Promote socio-economic development in the local area
Mining operations	Increased Public revenue	Social Economic	Construction and Operation Phase	Remedy through Social and Labour Plan	Promote socio-economic development in the local area
Mining operations	Increase in Local Economic Development Funds	Social Economic	Construction and Operation Phase	Remedy through Social and Labour Plan	Promote socio-economic development in the local area
Mining operations	Project Induced In-Migration	Social Economic	Construction and Operation Phase	Remedy through Social and Labour Plan	Minimise any potential negative impacts associated with the inflow of workers and jobseekers
Mining operations	Safety and Health Risks	Social health and wellbeing	Construction and Operation Phase	Remedy through Social and Labour Plan	Limit any safety and health risks during operations
Mining operations	Change in sense of place	Sense of place	Construction and Operation Phase	Remedy through Social and Labour Plan	Limit nuisance factors relate to noise and dust Limit potential negative impacts on noise and infrastructure damage related to blasting activities
Mining operations	Job losses	Social Economic	Decommissioning and Closure	Remedy through Social and Labour Plan	Minimise the negative economic impacts related to mine closure
Mining operations	Decrease/termination of community investment funds and support to local communities	Social Economic	Decommissioning and Closure	Remedy through Social and Labour Plan	Minimise the negative economic impacts related to mine closure
Mine Closure	Safety and Health Risks	Social health and wellbeing	Decommissioning and Closure	Remedy through Social and Labour Plan	Minimise the negative economic impacts related to mine closure
Geology					
Open pit Mining of underground workings	Burning of historic underground mining areas and spontaneous combustion	Groundwater, and Health and Safety	Operational decommissioning and closure	Control through management and monitoring	prevention of spontaneous combustion, underground coal burning and sinkholes.

1.f IMPACT MANAGEMENT ACTIONS

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Heritage				
Surface clearing and preparation	Construction and Operation	Control through management and monitoring	Prior to construction	National Heritage Resources Act 25 of 1999
Topsoil and overburden removal	Construction and Operation	Control through management and monitoring	During site clearance, construction, and topsoil removal	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
Operational Activities	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				
Mining Activities	Construction and Operation	Remedy through rehabilitation	Prior to construction with ongoing mitigation implementation during LoM	• Search and rescue for reptiles and other vulnerable species, before areas are cleared • Environmental induction for all staff and contractors on-site Rehabilitate in line with the rehabilitation guidelines, this includes the clearing of alien vegetation, following the guidelines of a suitable alien invasive plant management plan. • The site must be regularly monitored for re-growth of alien invasive species, and any new seedlings etc. eradicated using methods appropriate for the particular species, whether mechanical, chemical or biological. • Ongoing alien plant control must be undertaken in the disturbed areas • Herbicides must be carefully applied, in order to prevent any chemicals from entering the river. Spraying of herbicides within or near to the wetland areas is strictly forbidden. • Re-instate indigenous vegetation (grasses and indigenous trees) in disturbed areas directly after mining ceases so as to stabilise against erosion and sedimentation.
Mining Activities	Construction and Operation	Remedy through rehabilitation	Prior to construction with ongoing mitigation implementation during LoM	
Disturbance of the environment	Construction, Operation, Decommissioning and Closure	Control through management and monitoring	Prior to construction with ongoing mitigation implementation during LoM	
Construction and operational activities	Construction and Operation	Modify through design measures	Ongoing concurrent rehabilitation.	• Design and implementation of a suitable stormwater system; • Implement a programme for the clearing/eradication of alien species including long term control of such species;
Construction and operational activities	Construction, Operation	Control through management and monitoring	Ongoing concurrent rehabilitation.	

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Operational, decommissioning and rehabilitation activities.	Operational, Closure and Decommissioning	Control through management and monitoring	Ongoing concurrent rehabilitation.	• A 50 m buffer implemented for the wetland system; • Water quality monitoring must take place every month during operational phases; and • Wetland monitoring and biomonitoring must take place bi-annually. • A topsoil stripping and stockpiling guideline must be completed to ensure rehabilitation success. • Attenuation measures must include, but are not limited to - the use of sand bags, erosion control blankets, and silt fences. • Long term attenuation measures, such as attenuation/infiltration trenches, swales must be established to control stormwater from hardened surfaces • Vegetation clearing must be undertaken as and when necessary in phases. • Install sediment barriers (silt catchers and Reno mattresses) along any drainage areas to prevent the migration of silt. • Exposed soils must be rehabilitated as soon as practically possible to limit the risk of erosion. • All roads need to be maintained and any erosion ditches forming along the road filled and compacted. • Demarcate wetland areas to avoid unauthorised access. • No washing of any equipment in close proximity to a watercourse is permitted. • No releases of any substances that could be toxic to fauna or faunal habitats within the channels or any watercourses is permitted. • Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities • Portable toilets must be placed on impervious level surfaces that are lipped to prevent spillage. The general consensus is that they should be within 30 m to 50 m of a work face • Re-instate indigenous vegetation (grasses and indigenous trees) in disturbed areas.
Groundwater				
Construction activities	Construction phase	Control through management and monitoring	Storm water Management to be constructed prior to other infrastructure establishment	SANS241:2015
Operational Activities	Operational phase	Control through management and monitoring	N/A	N/A

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Operational Activities	Operational phase	Control through management and monitoring	Storm water Management to be constructed prior to other infrastructure establishment. Ongoing monitoring.	SANS241:2015
Closure of the mine	Closure and Decommissioning	Remedy through control measures	Passive treatment establishment before mine closure.	SANS241:2015
Closure of the mine	Closure and Decommissioning	Control through management and monitoring	N/A	N/A
Surface Water				
Construction activities	Construction Phase	Modify through design measures	Storm water Management to be constructed prior to other infrastructure establishment	SWMP
Open pit Mining	Operational Phase	Modify through design measures	N/A	N/A
Pit dewatering	Operational Phase	N/A	N/A	N/A
Operational Activities	Operational Phase	Modify through design measures	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	Passive treatment establishment before mine closure.	ISO 5667: Grab Samples Water parameters as approved in the IWULA
Air Quality				
Site establishment	Construction and Operational Phase	Control through management and monitoring	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas	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
Site establishment	Construction and Operational Phase	Control through management and monitoring	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas	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
General transportation	Construction and Operational Phase	Control through management and monitoring	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas	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
Site closure	Decommissioning Phase	Control through management and monitoring	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas	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
Rehabilitation	Decommissioning Phase	Control through management and monitoring	Ongoing dust suppression throughout LoM. Concurrent rehabilitation of bare areas	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
Visual				

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Construction related activities	Construction Phase	Modify through design measures	Prior to construction	Creating a Berm between the opencast pits and the town of Witbank and Planting Indigenous vegetation
Mining related activities	Operation, Decommissioning and Closure	Modify through design measures	Prior to construction	reduce the visual disturbance to the area
Soils, Land Use, Land Capability and Hydropedology				
Surface clearing and preparation	Construction Phase	Remedy through rehabilitation	Throughout construction	Soil Management Plan as per the Specialist Soils report
Heavy machinery and vehicle movement	Construction Phase	Remedy through rehabilitation	Throughout construction	Soil Management Plan as per the Specialist Soils report
Topsoil and overburden removal	Operational phase	Remedy through rehabilitation	Throughout mining, implement concurrent rehabilitation	Soil Management Plan as per the Specialist Soils report
Topsoil and overburden stockpiling	Operational phase	Remedy through rehabilitation	Immediately after topsoil removal.	Soil Management Plan as per the Specialist Soils report
Hydrocarbon spills	Construction Phase	Remedy through rehabilitation	Daily	Soil Management Plan as per the Specialist Soils report
Infrastructure construction	Construction Phase	Remedy through rehabilitation	N/A	N/A
Heavy machinery and vehicle movement	Operational phase	Remedy through rehabilitation	Throughout operation	Soil Management Plan as per the Specialist Soils report
Hydrocarbon spills	Operational phase	Remedy through rehabilitation	Daily	Soil Management Plan as per the Specialist Soils report
Heavy machinery and vehicle movement	Closure and Decommissioning	Remedy through rehabilitation	Daily	Soil Management Plan as per the Specialist Soils report
Area preparation, shaping and topsoil placement	Closure and Decommissioning	Remedy through rehabilitation	Throughout closure and decommissioning	Soil Management Plan as per the Specialist Soils report
Social Economic				
Mine establishment	Construction and Operation Phase	Remedy through Social and Labour Plan	Prior to construction and throughout LoM	As per SLP
Mining operations	Construction and Operation Phase	Remedy through Social and Labour Plan	Throughout LoM	As per SLP
Mining operations	Construction and Operation Phase	Remedy through Social and Labour Plan	Throughout LoM	As per SLP
Mining operations	Construction and Operation Phase	Remedy through Social and Labour Plan	Throughout LoM	As per SLP
Mining operations	Construction and Operation Phase	Remedy through Social and Labour Plan	Throughout LoM	As per SLP
Mining operations	Construction and Operation Phase	Remedy through Social and Labour Plan	Throughout LoM	As per SLP
Mining operations	Construction and Operation Phase	Remedy through Social and Labour Plan	Throughout LoM	As per SLP
Mining operations	Decommissioning and Closure	Remedy through Social and Labour Plan	Prior to Mine closure	As per SLP
Mining operations	Decommissioning and Closure	Remedy through Social and Labour Plan	Prior to Mine closure	As per SLP

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Mine Closure	Decommissioning and Closure	Remedy through Social and Labour Plan	Prior to Mine closure	As per SLP
Geology				
Open pit Mining of underground workings	Operational decommissioning and closure	Control through management and monitoring	Throughout LoM	As per measures in the OPEN CAST PILLAR ABUTMENT RISK ASSESSMENT compiled by ProVelop Mining

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 ***R22 068 581.60*** 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 1.3: Financial Provision Quantum

	Item description	Cost
1	**Surface Infrastructure**	**R1 658 283.08**
1	Dismantling of processing plant and associated structures (including associated conveyors & power lines)	R16 087.08
2(A)	Demolition of steel buildings and structures (including floor slabs)	R0.00
2(B)	Demolition of reinforced concrete buildings and structures	R0.00
3	Rehabilitation of access roads	R1 642 196.00
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)	R0.00
12	Fencing	R0.00
2	**Mining Areas & Waste Sites**	**R3 950 748.00**
6	Opencast rehabilitation (including final voids and ramps)	R3 950 748.00
7	Sealing of shafts, adits and inclines (including concrete cap)	R0.00
3	**Mine Residue Sites**	**R7 418 612.51**
8(A)	Rehabilitation of overburden and spoils	R643 199.88
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)	R196 203.84
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)	R6 579 208.80
4	**General Rehabilitation**	**R2 683 573.49**
10	General surface rehabilitation, including of all denuded areas	R2 683 573.49
5	**Aftercare & Maintenance**	**R2 527 280.11**
13	Monitoring	R1 300 000.00
14	Maintenance	R1 227 280.11
15	Water Treatment Facility	R0.00
	Sub Total 1	**R18 238 497.19**
	Mobilisation and Project Management (10% of Subtotal 1)	**R1 823 849.72**
	Sub Total 2	**R20 062 346.91**
	Contingency (10% of subtotal 2)	**R2 006 234.69**
	Sub Total 3 (Closure Liability for Mine)	**R22 068 581.60**
	VAT (15% of subtotal 3)	**R3 310 287.24**
	Total	**R25 378 868.84**

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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

1.h MONITORING AND REPORTING FREQUENCY

1.i RESPONSIBLE PERSONS

1.j TIME PERIOD FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS

1.k MECHANISM FOR MONITORING COMPLIANCE

Table 1.4: 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 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 Blesboklaagte Colliery.

General Training:

- Environmental awareness training;
- Awareness of the Blesboklaagte Colliery SHEQ policy; and
- Awareness of environmental legislation or any other requirements Blesboklaagte 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 Blesboklaagte 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 Blesboklaagte 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 Blesboklaagte 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 1.5: 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: _____ 2019