

**ESCIENCE  
ASSOCIATES  
(PTY) LTD**

**ASSMANG (PTY) LTD BLACK  
ROCK MINE OPERATIONS,  
HOTAZEL, NORTHERN CAPE:**



BLACK ROCK MINE OPERATIONS

**ENVIRONMENTAL  
MANAGEMENT PROGRAMME  
(EMPr)**

**FOR**

**ESTABLISHMENT OF A SUPER FINES  
STORAGE FACILITY AT GLORIA MINE**

**Department of Mineral Resources:  
(NC)30/5/1/2/2/203 MRC**

**05 May 2020**

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**ENVIRONMENTAL MANAGEMENT PROGRAMME:**

**SUPER FINES STORAGE FACILITY AT GLORIA MINE**

**ASSMANG (PTY) LTD BLACK ROCK MINE OPERATIONS, HOTAZEL,  
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**05 May 2020**

# TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION</b> .....	<b>1</b>
1.1	ASSMANG (PTY) LIMITED .....	1
1.2	REGIONAL LOCATION .....	3
1.3	ADMINISTRATIVE INFORMATION .....	3
1.4	LAND TENURE AND ADJACENT LAND USE.....	5
1.5	SIGNIFICANT ENVIRONMENTAL FEATURES .....	7
1.6	PLANNED LIFE OF MINE .....	7
1.7	APPLICATION OF THE EMPR .....	7
<b>2</b>	<b>GENERAL DESCRIPTION OF CURRENT AND PLANNED ACTIVITIES</b> .....	<b>8</b>
2.1	GLORIA MINE .....	8
2.2	NON-MINING RELATED ACTIVITIES .....	10
<b>3</b>	<b>SUMMARY OF APPLICABLE ENVIRONMENTAL LEGISLATION AND LISTED ACTIVITIES</b> .....	<b>11</b>
3.1	CONSTITUTION OF SOUTH AFRICA .....	11
3.2	NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998) .....	11
3.3	NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008 (ACT 59 OF 2008) .....	15
3.4	AIR QUALITY.....	18
3.5	WATER USE .....	21
3.6	BIODIVERSITY .....	21
3.7	NATIONAL HERITAGE RESOURCES ACT (NHRA) (ACT 25 OF 1999) .....	24
3.8	NOISE.....	26
3.9	MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (ACT 28 OF 2002) .....	27
<b>4</b>	<b>DESCRIPTION OF THE RECEIVING ENVIRONMENT</b> .....	<b>28</b>
<b>4.1</b>	<b>PHYSICAL</b> .....	<b>28</b>
4.2	BIOLOGICAL .....	41
4.3	SOCIO-ECONOMIC .....	47
4.4	HERITAGE .....	48
4.5	CURRENT LAND USE .....	52
<b>5</b>	<b>IMPACT SUMMARY</b> .....	<b>54</b>
<b>5.1</b>	<b>METHODOLOGY</b> .....	<b>54</b>
5.2	IMPACT SUMMARY .....	57
<b>6</b>	<b>ENVIRONMENTAL MANAGEMENT GOALS AND OBJECTIVES</b> .....	<b>59</b>
6.1	CLOSURE OBJECTIVES .....	60
<b>7</b>	<b>ENVIRONMENTAL IMPACT MANAGEMENT</b> .....	<b>62</b>
7.1	KEY ROLES AND RESPONSIBILITIES.....	62
7.2	COMPLIANCE MONITORING, RECORD KEEPING, AND UPDATING .....	64
7.3	NOTE ON DEVELOPMENT PHASES .....	66
7.4	GENERAL REQUIREMENTS .....	67
7.5	PRE-CONSTRUCTION, PLANNING AND DESIGN .....	69
7.6	CONSTRUCTION PHASE.....	73
7.7	OPERATIONAL PHASE .....	90
<b>8</b>	<b>CLOSURE AND REHABILITATION PHASE</b> .....	<b>96</b>
8.1	PRINCIPLES OF REHABILITATION .....	96
8.2	REHABILITATION OBJECTIVES .....	96
8.3	ESTABLISHMENT OF NATURAL KATHU BUSHVELD AND GORDONIA DUNEVELD ON THE REHABILITATED AREAS	98
8.4	MAINTENANCE OF REHABILITATED AREAS .....	98
8.5	AREAS AND ACTIVITIES TO BE REHABILITATED .....	99

8.6	GENERAL SURFACE REHABILITATION.....	99
8.7	CONCLUSIONS AND SUMMARY OF REHABILITATION PLAN.....	107
<b>9</b>	<b>ENVIRONMENTAL MONITORING PLAN.....</b>	<b>108</b>
9.1	CONSTRUCTION PHASE.....	108
9.2	OPERATIONAL PHASE.....	110
9.3	CLOSURE PHASE.....	112
<b>10</b>	<b>PROCEDURES FOR ENVIRONMENTAL RELATED EMERGENCIES AND REMEDIATION .....</b>	<b>113</b>
10.1	OBJECTIVES OF AN ENVIRONMENTAL EMERGENCY RESPONSE PLAN .....	113
10.2	EMERGENCIES, PROCEDURES AND REMEDIAL ACTION.....	116
<b>11</b>	<b>ENVIRONMENTAL AWARENESS PLAN .....</b>	<b>120</b>
11.1	INTRODUCTION.....	120
11.2	ENVIRONMENTAL RISKS AND PRIORITIES.....	121
11.3	INCREASING ENVIRONMENTAL AWARENESS.....	121
11.4	ENVIRONMENTAL NON-COMPLIANCE.....	124
<b>12</b>	<b>FINANCIAL PROVISIONS.....</b>	<b>125</b>
<b>13</b>	<b>UNDERTAKING.....</b>	<b>126</b>

## LIST OF FIGURES

Figure 1-1: Overview of Assmang (Pty) Ltd South African Operations .....	2
Figure 1-2: Locality of Assmang Black Rock Mine Operations (BRMO) .....	3
Figure 1-3: Aerial image showing Existing Mining/Industrial Land Use in the vicinity of the Assmang (Pty) Ltd BRMO .....	6
Figure 2-1: Overview of Gloria Mine .....	9
Figure 3-1: Annual Wind rose for Kuruman ( <a href="https://www.meteoblue.com">https://www.meteoblue.com</a> ) .....	29
Figure 3-2: Monthly Average Temperature and Rainfall for Kuruman ( <a href="https://www.climatedata.eu">https://www.climatedata.eu</a> ) .....	29
Figure 3-3: Climatic Water Balance - Kuruman .....	32
Figure 3-4: Climatic Water Balance - Olifantshoek .....	33
Figure 3-5: Gamagara River Wetland Delineation.....	34
Figure 3-6: Regional Topography Displaying Relatively Flat Nature of the Region .....	36
Figure 3-7: General Stratigraphy of the Site. ....	37
Figure 3-8: Borehole Locations and Groundwater Flow Directions.....	40
Figure 3-9: Groundwater Levels .....	40
Figure 3-10: Map Reflecting Potential Environmental Sensitivities with the Proposed Activities. ....	42
Figure 3-11: Biome (Scientific Aquatic Services. Report Reference: SAS 211022).....	43
Figure 3-12: Floral Sensitivity (Scientific Aquatic Services. Report Reference: SAS 211022) .....	44
Figure 3-13: Faunal Sensitivity (Scientific Aquatic Services. Report Reference: SAS 219153) .....	47
Figure 3-14: Identified Heritage Sites Within the Area.....	49
Figure 3-15: Extract of Geological Map of the Area.....	50
Figure 3-16: Extract of the 1: 250 000 SAHRIS Palaeo Map (Council of Geosciences).....	51
Figure 3-17: Land Cover at Gloria Mine and Surrounding Areas .....	52
Figure 3-18: Land Use at Gloria Mine and Surrounding Areas.....	53
Figure 7-1: Conceptual diagram for EMPr review cycle. Note the main division between internal information, such as auditing and monitoring, and external information, such as changes to environmental laws and regulations, which should provide input on the revision of the EMPr.....	65
Figure 9-1: Dust Monitoring Locations .....	109
Figure 9-2: Recommended monitoring Borehole Locations.....	111

## LIST OF TABLES

Table 1-1: Name and Address of Mine .....	3
Table 1-2: Details of Environmental Specialist .....	4
Table 1-3: Details of EAP .....	4
Table 1-4: Details of the EAPs .....	4
Table 1-5: BRMO Mining Rights, Surface Rights, and Title Deed Description relevant to this application .....	4
Table 1-6: Project Applicable Servitudes relevant to this application .....	4
Table 1-7: Neighbouring Mining/Industrial Activity/ies.....	7
Table 1-8: Neighbouring Towns .....	7
Table 3-1: NEMA Listed Activities.....	11
Table 3-2: Listed Activities applicable to the Mine.....	17
Table 3-3: GN. R827:2013 Acceptable Dust Fall Rates.....	19
Table 3-4: National Ambient Air Quality Standards - GN 1210:2009 .....	20
Table 3-5: National Ambient Air Quality Standards for PM <sub>2.5</sub> - GN 486:2012.....	20
Table 3-6: Precipitation and Evaporation Data.....	31
Table 3-7: Protected species observed within the study area at the time of assessment or with increased likelihood to utilise the study area.....	44
Table 3-8: Protected species observed within the study area at the time of assessment or with increased likelihood to utilise the study area.....	45
Table 3-9: Dominant alien floral species identified during the field assessment with their invasive status as per NEMBA: Alien and Invasive Species Lists, GN R598 of 2016. ...	46
Table 3-10: Fossil Heritage (adapted from Almond and Pether 2009) .....	50
Table 5-1: Scoring for Significance Criteria.....	56
Table 5-2: Final Significance Scoring .....	56
Table 5-3: Summary of Environmental Impact Assessment.....	57
Table 6-1: Environmental Objectives.....	59
Table 7-1: General Requirements .....	67
Table 7-2: Mitigation for Pre-construction, Planning and Design Phase .....	69
Table 7-3: Mitigation for Pre-construction, Planning and Design Phase .....	70
Table 7-4: Construction Site Establishment and All Construction Activities .....	73
Table 7-5: Vegetation Clearance.....	82
Table 7-6: Topsoil Stripping .....	86
Table 7-7: Civil- and Earthworks .....	87
Table 7-8: Haul/Access Roads.....	88
Table 7-9: Raw/Construction Material Stockpiles and Storage.....	89
Table 7-10: Specialist requirements .....	89
Table 7-11: Operation of all authorised activities .....	90
Table 7-12: Super Fines Management - SFSF .....	95
Table 8-1: Requirements for General Surface Rehabilitation .....	100
Table 8-2: Unique Structural and Infrastructural Rehabilitation Requirements for the SFSF .....	105
Table 9-1: Monitoring Requirements – Construction Phase.....	108
Table 9-2: Monitoring Requirements – Operational Phase.....	110
Table 9-3: Monitoring Requirements – Operational Phase.....	112

# 1 INTRODUCTION

Assmang (Pty) Ltd mines manganese ore in the Black Rock area of the Kalahari, in the Northern Cape Province. The ore is mined from the Kalahari Manganese field. The Black Rock Mine Operations (BRMO) are approximately 80 kilometres (km) north-west of the town of Kuruman, in close proximity to the town of Hotazel.

In 1940, Assmang acquired a manganese ore outcrop on a small hillock known as Black Rock. Several large properties underlain by ore were subsequently found and acquired. Manganese ore mining operations were extended and today include 3 underground mining complexes:

- Gloria (commissioned in 1975) and producing medium grade carbonated ore
- Nchwaning II and Nchwaning III (commissioned in 1981 and 2004 respectively) and producing high grade oxide ore.

The manganese ores of the Kalahari Manganese field are contained within sediments of the Hotazel Formation of the Griqualand West Sequence, a subdivision of the Proterozoic Transvaal Supergroup. The manganese ore bodies exhibit a complex mineralogy and more than 200 mineral species have been identified to date. The hydrothermal upgrading has resulted in a zoning of the orebody with regard to fault positions.

Distal areas exhibit more original and low-grade kutnohorite and braunite assemblages, while areas immediately adjacent to faults exhibit a very high-grade hausmannite ore. The intermediate areas exhibit a very complex mineralogy, which includes bixbyite, braunite and jacobsonite amongst a host of other manganese-bearing minerals.

A similar type of zoning also exists in the vertical sense. At the top and bottom contacts it is common to have high iron (Fe) and low manganese (Mn) contents while the reverse is true towards the centre of the seam. This vertical zoning has given rise to a mining practice where only the centre portion of the seam is being mined. At the Gloria Mine the intensity of faulting is much less, which also explains the lower grade.

Two manganese seams are presently mined. The No. 1 seam is up to 6 metres (m) in thickness and approximately 400 m underground at Nchwaning II and 200 m underground at Gloria. No 2 seam is situated above No 1 seam and is accessed via the Nchwaning II mining infrastructure.

## 1.1 ASSMANG (PTY) LIMITED

Assmang (Pty) Ltd is jointly owned by African Rainbow Minerals Limited (ARM) and Assore Limited, and currently has three independently operating divisions based on three respective commodities – chrome, manganese and iron ore (Figure 1-1). Assmang's Manganese Division consists of the Nchwaning II, Nchwaning III and Gloria manganese mines in the Northern Cape, as well as the ferromanganese works at Cato Ridge in Kwazulu-Natal.



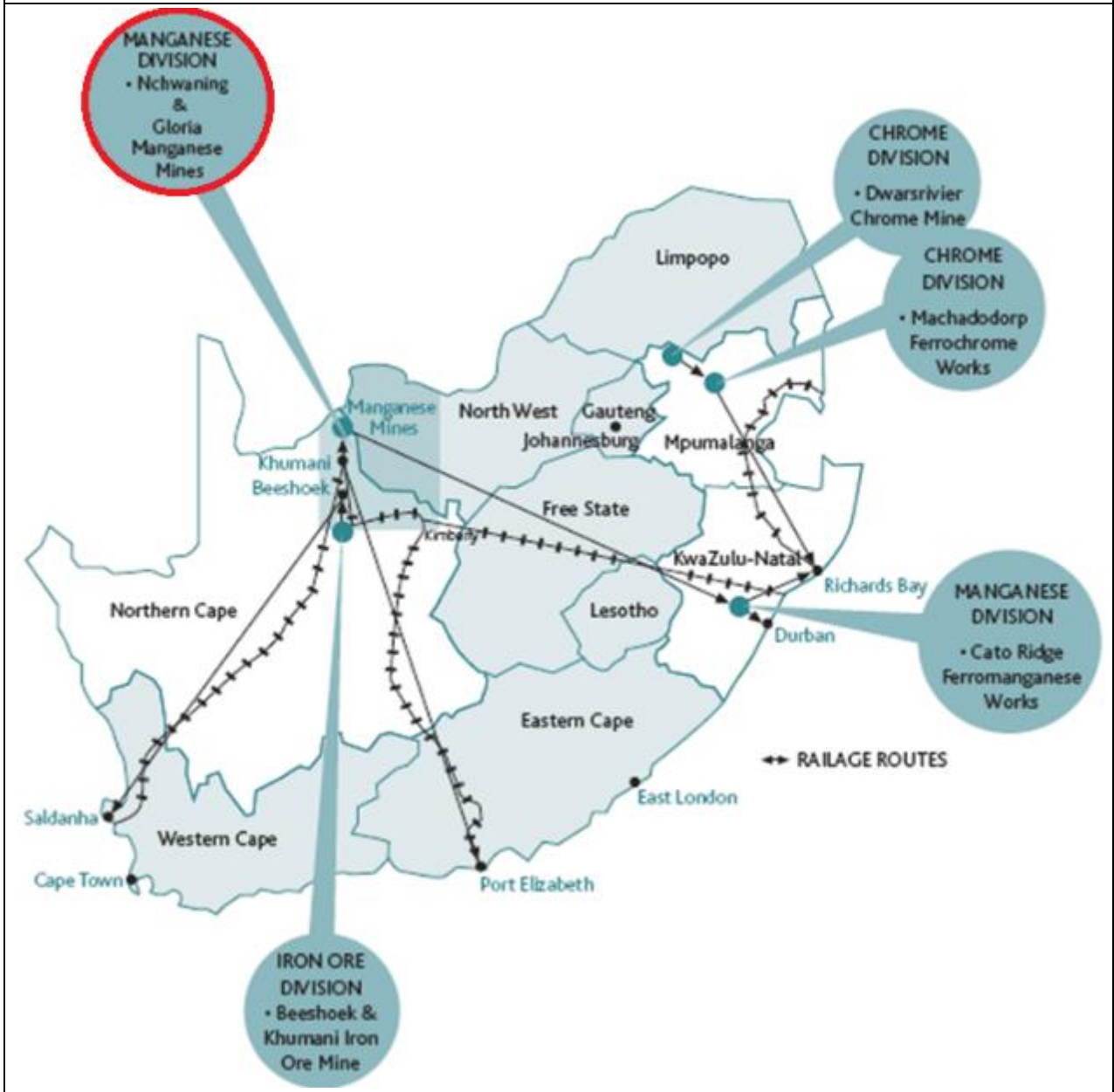
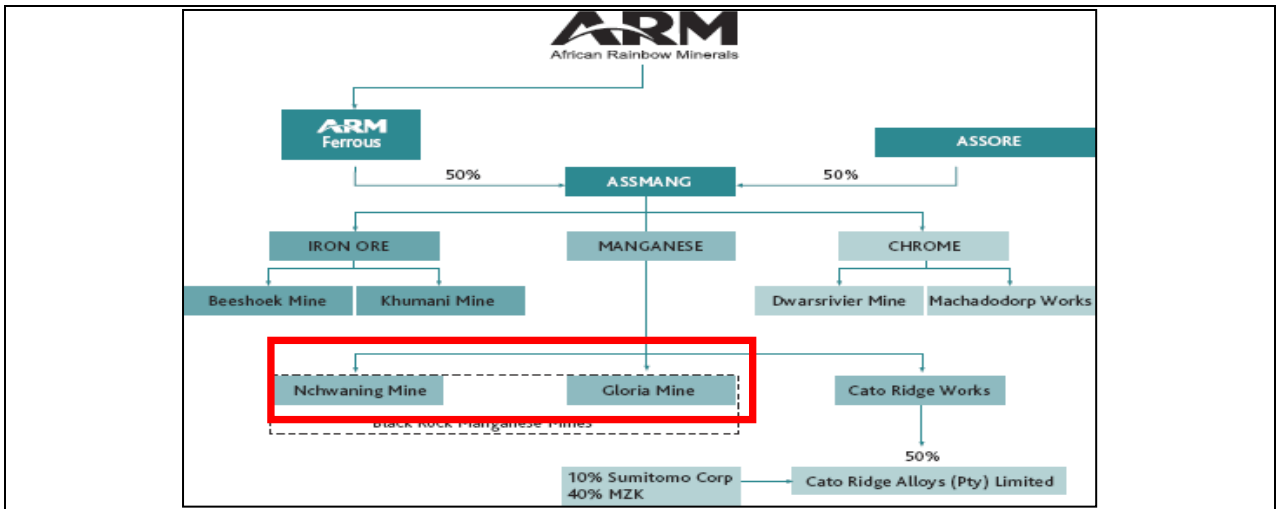
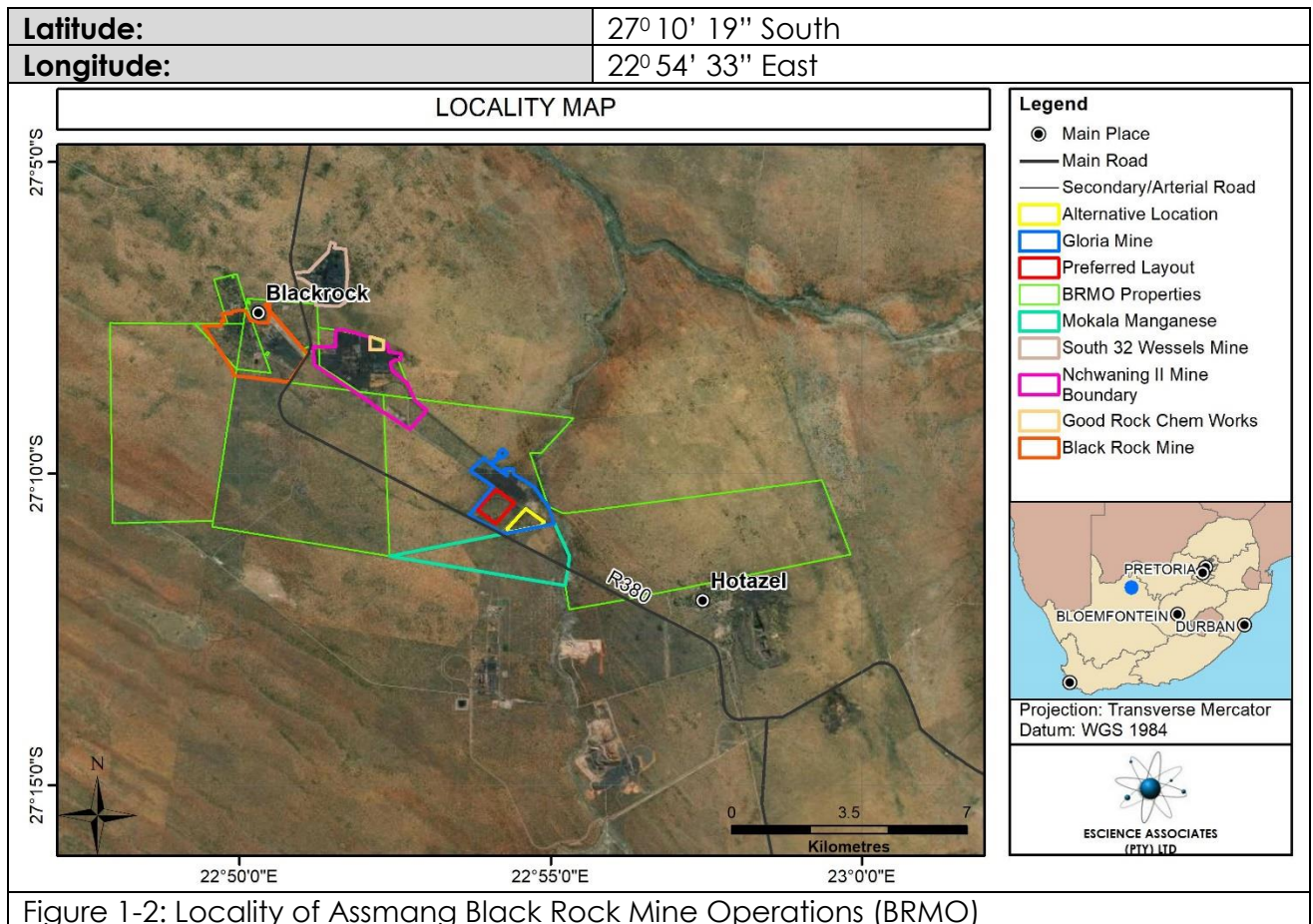


Figure 1-1: Overview of Assmang (Pty) Ltd South African Operations

## 1.2 REGIONAL LOCATION

The proposed site for the Assmang BRMO Super Fines Storage Facility is located on Portion 1 of the farm Gloria No. 226 on the Assmang Black Rock Mine Operations (BRMO). Portion 1 of the farm Gloria No. 226 is approximately 134 hectares (ha) in extent. BRMO is situated in the Northern Cape Province approximately 80 km north-west of the town of Kuruman and 12 kilometres north-west of the village of Hotazel. The land capability of the adjacent and surrounding areas has largely been altered to mining and industrial land use and will remain as such for the remaining life of the mine.

BRMO falls within the jurisdiction of the John Taolo Gaetsewe District Municipality.



## 1.3 ADMINISTRATIVE INFORMATION

The following section, and associated set of tables, provides pertinent administrative information pertaining to BRMO, the associated mine lease area, as well as the Environmental Assessment Practitioner who developed the Environmental Impact Report (Table 1-1 to Table 1-6).

Table 1-1: Name and Address of Mine	
Owner and Name of Mine	Assmang (Pty) Limited, Black Rock Mine Operations
Company Registration	1935/007343/06
Physical Address	Black Rock Mine Operations, Santoy, Northern Cape
Postal Address	PO Box 187, Santoy, Northern Cape, 8491

Telephone	053 751 5260
Fax	053 751 5555
Senior General Manager	Koos Janse van Vuuren

Table 1-2: Details of Environmental Specialist	
Name	Tshifhiwa Ravele
Physical Address	Main Offices Black Rock Mine Operations, Santoy, Northern Cape
Postal Address	PO Box 187, Santoy, Northern Cape, 8491
Telephone	053 751 5302
Fax	053 751 5555
Email	<a href="mailto:tshifhiwar@brmo.co.za">tshifhiwar@brmo.co.za</a>

Table 1-3: Details of EAP	
Name of Company	EScience Associates (Pty) Ltd
Contact Person	Mr. Abdul Ebrahim
Postal Address	PO Box 2950, Saxonwold, Johannesburg, 2132
Physical Address	9 Victoria Street, Oaklands, Johannesburg, 2192
Telephone	011 718 6380
Fax	072 268 1119
Email	abdul@escience.co.za
Qualifications	Certified EAP, BEng Honours Environmental Engineering
Curriculum Vitae	Refer to Appendix 1

Table 1-4: Details of the EAPs		
Name	Qualification	Experience
Abdul Ebrahim	BEng (Hons) Environmental Engineering Certified Environmental Assessment Practitioner (EAP) Member of the Engineering Council of South Africa	19 Years
James Pugin	MSc Archaeology BSc (Hons) Archaeology BA Geography and Archaeology	3 Years

Table 1-5: BRMO Mining Rights, Surface Rights, and Title Deed Description relevant to this application				
Mine	Farm Name	Title Deed	Surface and Mining Rights	SG 21 Key
Gloria	Ptn. 1 Gloria 266	No. 506 of 1966	Assmang (Pty) Ltd	C04100000000026600001

Table 1-6: Project Applicable Servitudes relevant to this application	
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Mine	Servitude Type	Servitude No.
Gloria	Rail	K38/83S
Gloria	Water pipeline (Sedibeng Water Vaal-Gamagara Supply)	K36/1978S

## 1.4 LAND TENURE AND ADJACENT LAND USE

Assmang (Pty) Ltd holds both the surface- and mining rights over the properties encompassing the greater BRMO and its constituent mining operations (i.e. Black Rock, Nchwaning and Gloria Mines). The region surrounding BRMO is dominated by mining, industrial and agricultural (extensive livestock production systems) land uses. Land in the immediate vicinity of BRMO that is not used for mining/industrial purposes, is utilised for extensive livestock farming (i.e. sheep, goats, and cattle) and game farming.

Figure 1-3, Table 1-7, and Table 1-8, provide a concise overview of mining activities and neighbouring towns with the Assmang BRMO.

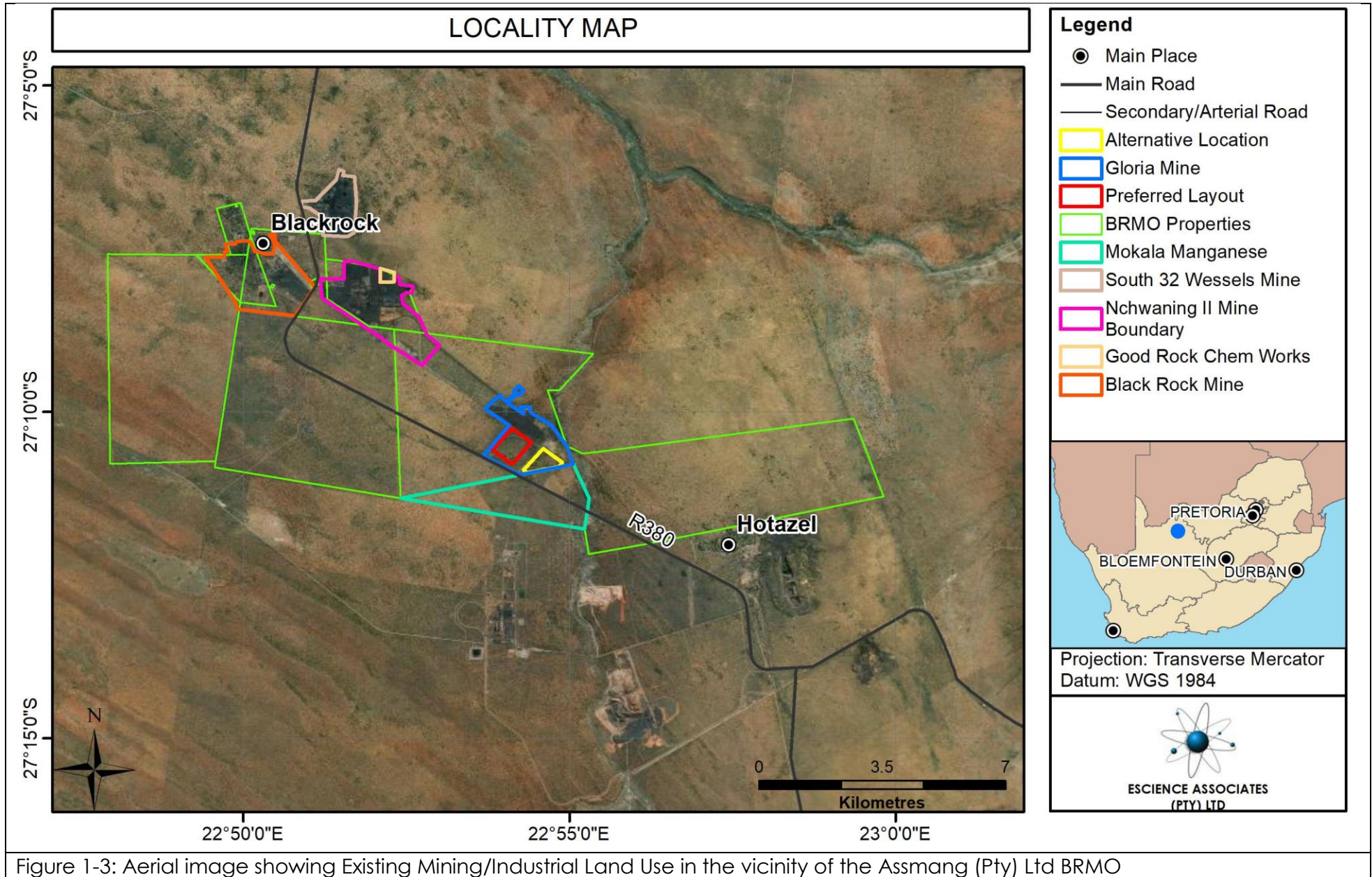


Figure 1-3: Aerial image showing Existing Mining/Industrial Land Use in the vicinity of the Assmang (Pty) Ltd BRMO

Table 1-7: Neighbouring Mining/Industrial Activity/ies	
Mine/Industry	Distance/Direction from BRMO
Good Rock (Pty) Ltd	Eastern boundary of Nchwaning II Mine
South 32 Wessels Manganese Mine	Approximately 1.3 km north of Nchwaning II Mine
Kalagadi Manganese Mine	Approximately 2.5 km south of Gloria Mine
South 32 Hotazel Manganese Mine	Approximately 7 km south east of Gloria Mine

Table 1-8: Neighbouring Towns	
Town	Distance/Direction from BRMO
Santoy (Black Rock Mine Village)	Adjacent to BRMO
Hotazel	Approximately 17 km south east of BRMO
Kuruman	Approximately 80 km south east of BRMO
Upington	Approximately 267 km south west of BRMO
Kimberley	Approximately 320 km south east of BRMO

## 1.5 SIGNIFICANT ENVIRONMENTAL FEATURES

BRMO is located within the Savannah biome and more specifically within the Eastern Kalahari Bushveld Bioregion with some incursion into Kalahari Duneveld. The site consists of transformed land (current and legacy mining and related infrastructure), open veld (presently used rented to farmers who graze livestock), the Belgravia Game Farm (the only on-site area presently considered of increased sensitivity), and limited riparian habitat (related to the Ga Magara River). There are several faunal and floral red data species inhabiting the area.

Soil fertility is low as is typical of sandy soils. Apart from the soil on the farm Perth, the soils in the area surveyed were deep yellowish-red sandy soils. Stone Age artefacts are located in and on the riverbanks of the Gamagara, and the likelihood of uncovering archaeological material is very high in the riverbanks.

## 1.6 PLANNED LIFE OF MINE

The planned life of mine is approximately 30 years but may exceed this.

## 1.7 APPLICATION OF THE EMPR

This EMPr is relevant to BRMO's activities, and land within the BRMO boundaries which is under BRMO's control. Where there is conflict between this EMPr and any relevant environmental legislation, the competent authority must advise BRMO in respect of how to resolve such conflicting requirements or stipulations. In addition, this EMPr is the result of the mine wide EMPr being narrowed down to the applicable activities of the proposed Gloria Super Fines Storage Facility.

## **2 GENERAL DESCRIPTION OF CURRENT AND PLANNED ACTIVITIES**

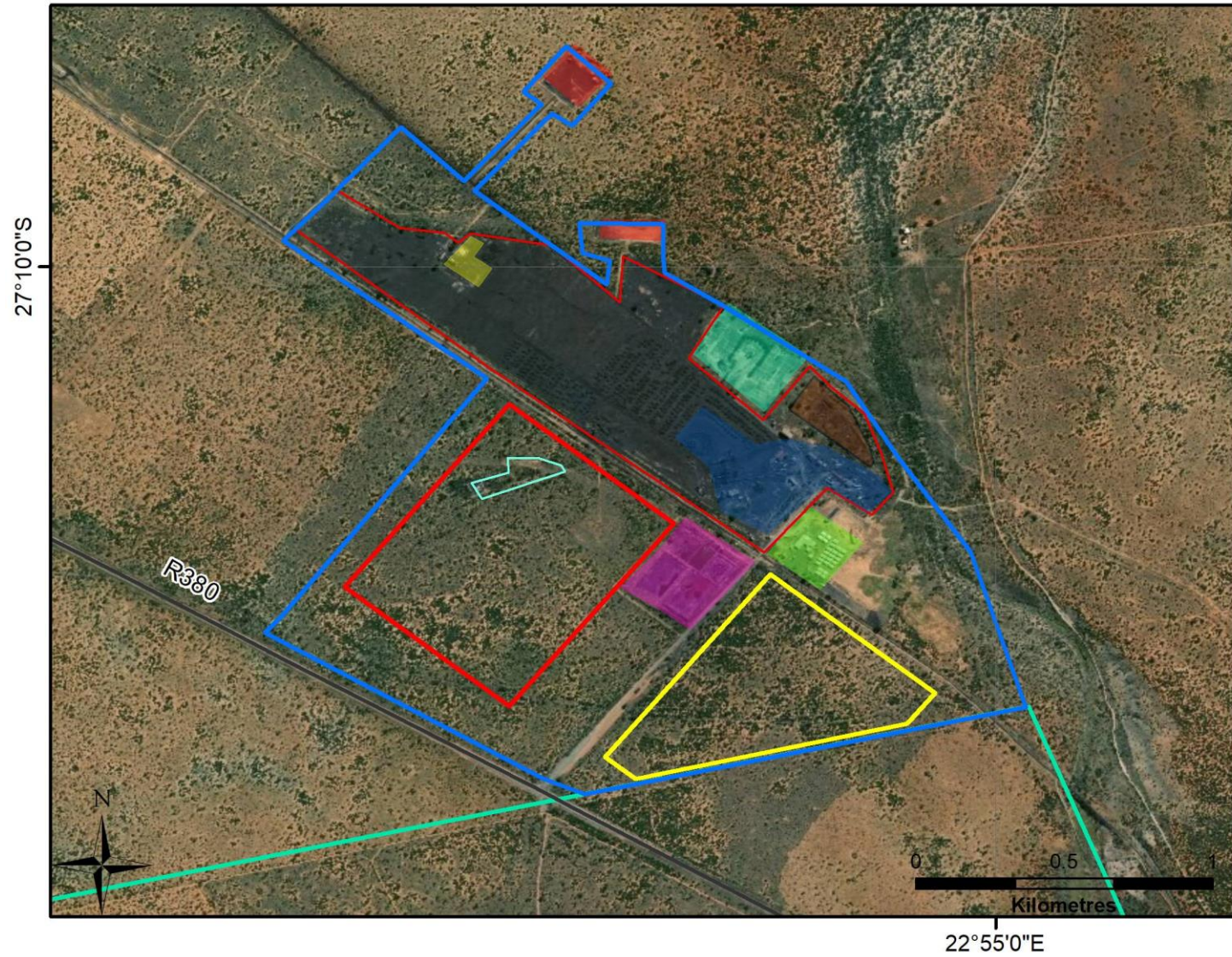
The general descriptions herein are intended to convey a broad understanding of the facilities and activities associated with the Gloria mine and the proposed development. These descriptions are not exhaustive. It should be noted that infrastructure typical of such mining activities is encountered on the site which may not be covered in specific detail herein. These facilities and infrastructure are subject to repairs, general maintenance, and upgrading, in accordance with standard practices, and thus will be altered from time to time. Current infrastructure is within the footprint of existing, historical, and/or authorised activities. Proposed infrastructure will require clearing of undisturbed land where it does not overlap with existing disturbed areas.

### **2.1 GLORIA MINE**

Operations at Gloria were commissioned in 1975. Gloria complex is comprised of several mining and mining related activities, including:

- Offices, administration, and support facilities
- Engineering services and facilities
- Underground mining access shafts, vent shafts and related infrastructure;
- Ore Processing Plant;
- Ore (including fines) storage and laydown areas;
- Stacking, reclaiming and loading facilities for transportation of ore;
- Current and historical tailings facilities;
- Contractor laydown areas;
- Waste storage and separation facilities;
- Salvage Yards;
- Potable water and process water storage and management facilities;
- A sewage treatment plant;
- Sub-stations and electrical works;
- Bulk fuel storage and refuelling station;
- Explosives magazines;
- Unpaved and paved roads connecting the above and other BRMO operations;
- Other ancillaries typical of such a mining operation.

# CURRENT OPERATIONS AT GLORIA



## Legend

- Main Road
- Secondary/Arterial Road
- Processing and Engineering Facilities
- Historical Tailings Storage Facility
- Bulk Diesel Storage and Contractor Yard
- Laydown ,Workshop and Processing Plant
- Explosives\_Storage2
- Vent Shaft
- Tailings Storage Facility
- Housing Facilities
- Partly demolished structures
- Explosives Magazine
- Alternative Location
- Gloria Mine
- Preferred Layout
- Mokala Manganese

Projection: Transverse Mercator  
Datum: WGS 1984



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Figure 2-1: Overview of Gloria Mine



## **2.2 NON-MINING RELATED ACTIVITIES**

Surface areas, belonging to BRMO, which are not disturbed by mining and which are outside of the demarcated mining areas, are used for farming, residential and related commercial activities. A portion of the Belgravia farm is used by BRMO as a game farm.

### 3 SUMMARY OF APPLICABLE ENVIRONMENTAL LEGISLATION AND LISTED ACTIVITIES

This section summarises relevant environmental legislation applicable to the development of the Super Fines Storage Facility and related infrastructure.

#### 3.1 CONSTITUTION OF SOUTH AFRICA

Section 24 of the Constitution provides the following rights:

*“Everyone has the right -*

- a. to an environment that is not harmful to their health or well-being; and*
- b. to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that -*
  - i. prevent pollution and ecological degradation;*
  - ii. promote conservation; and*
  - iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.”*

Accordingly, legislative measures as summarised in ensuing sections have been promulgated.

#### 3.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)

The National Environmental Management Act (NEMA), 1998 (Act 107 of 1998, as amended) is South Africa's overarching environmental legislation, and contains a comprehensive legal framework to give effect to the environmental rights contained in Section 24 of The Constitution. Section 2 of NEMA contains environmental principles that form the legislated foundation for sustainable environmental management in South Africa.

##### 3.2.1 EIA & ENVIRONMENTAL AUTHORISATION

NEMA introduces the principle of integrated environmental management that is achieved through the environmental assessment process in Section 24, which stipulates that certain identified activities may not commence without an Environmental Authorisation from the Competent Authority, in this case the Department of Mineral Resources (DMR). Section 24(1) of NEMA requires applicants to consider, investigate, assess, and report the potential environmental impact of these activities. The requirements for the investigation, assessment, and communication of potential environmental impacts are contained in the so-called EIA Regulations (currently GN. R 982:2014 amended by GN. R 326:2017).

The Regulations identify specific activities that require Environmental Authorisation (GN R. 983, GN R. 984 and GN R. 985; 4 December 2014, as amended by GN R.324, GN .R325, GN R.326 and GN R.327 of 2017 respectively). The listed activities relevant to the SFSF are presented in Table 3-1.

Table 3-1: NEMA Listed Activities
GN.R 983 – Listing Notice 1, as amended

Table 3-1: NEMA Listed Activities

**Activity No. 10:** The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes –

- (i) with an internal diameter of 0,36 metres or more; or
- (ii) with a peak throughput of 120 litres per second or more;

excluding where—

- (a) such infrastructure is for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or
- (b) where such development will occur within an urban area.

REASON: Infrastructure will be required for transport of tailings and process water between the SFSF and the ore processing facilities. This included piping, pumping, and supporting infrastructure typically related to the transport of slurries and water in pipes.

**Activity No. 24:** The development of a road—

- (i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or
- (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;

but excluding a road—

- (a) which is identified and included in activity 27 in Listing Notice 2 of 2014;
- (b) where the entire road falls within an urban area; or
- (c) which is 1 kilometre or shorter.

REASON: The SFSF, RWD, and soil stockpiles will require an access road and a service road around the site for maintenance and fire breaks and is anticipated to be a maximum of 5km long.

**Activity No. 34:** The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding—

- (i) where the facility, infrastructure, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;
- (ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water or sewage where the capacity will be increased by less than 15 000 cubic metres per day; or
- (iii) the expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 cubic meters or less per day.

Table 3-1: NEMA Listed Activities

**REASON:** The proposed development will result in an expansion of process water storage capacity, and fines deposition and storage capacity. Accordingly, an amendment of the mine's existing Water Use Licence, or a new Water Use Licence, is required per S22 of the National Water Act (Act 36 of 1998). It is notable that the SFSF is a listed activity in terms of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008); however the return water dam is not.

**Activity No. 46:** The expansion and related operation of infrastructure for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes where the existing infrastructure—

- (i) has an internal diameter of 0,36 metres or more; or
- (ii) has a peak throughput of 120 litres per second or more; and

(a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or

(b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more;

excluding where such expansion—

(aa) relates to the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes within a road reserve or railway line reserve; or

(bb) will occur within an urban area.

**REASON:** Upgrades to infrastructure for transport of tailings and process water between the Gloria plant and the SFSF may be required. These will fall within the existing disturbed mine footprint.

**Activity No. 56:** The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre—

- (i) where the existing reserve is wider than 13,5 meters; or
- (ii) where no reserve exists, where the existing road is wider than 8 metres;

excluding where widening or lengthening occur inside urban areas.

**REASON:** The final site of the proposed activities may require link roads from the existing road network at the mine to be widened at the junction with the access road for access of construction and maintenance vehicles and/or transfer of machinery.

GN.R 984:2014 – Listing Notice 2, as amended

**Activity No. 6:** The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding—

- activities which are identified and included in Listing Notice 1 of 2014;
- activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;
- the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or

Table 3-1: NEMA Listed Activities
<ul style="list-style-type: none"> <li>where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day.</li> </ul> <p><b>REASON:</b> The proposed development requires a Water Use Licence for the storage of process water in the return water dam, and for the deposition of the fines, as it may detrimentally impact on a water resource. Accordingly, an amendment of the mine's existing Water Use Licence, or a new Water Use Licence, is required per S22 of the National Water Act (Act 36 of 1998). It is notable that the SFSF is a listed activity in terms of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008); however the return water dam is not.</p>
<p><b>Activity No. 15:</b> The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— the undertaking of a linear activity; or (maintenance purposes undertaken in accordance with a maintenance management plan.</p> <p><b>REASON:</b> The proposed development is expected to require the clearance of land of up to 30ha.</p>

### 3.2.2 DUTY OF CARE

NEMA also places a duty of care on all persons who may cause significant pollution or degradation of the environment. Specifically, Section 28 of the Act states:

*“28 (1) Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.*

*(2) Without limiting the generality of the duty in subsection (1), the persons on whom subsection (1) imposes an obligation to take reasonable measures, include an owner of land or premises, a person in control of land or premises or a person who has a right to use the land or premises on which or in which-*

- (a) any activity or process is or was performed or undertaken; or*
- (b) any other situation exists, which causes, has caused or is likely to cause significant pollution or degradation of the environment.*

*(3) The measures required in terms of subsection (1) may include measures to-*

- (a) investigate, assess and evaluate the impact on the environment;*
- (b) inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed in order to avoid causing significant pollution or degradation of the environment;*

- (c) cease, modify or control any act, activity or process causing the pollution or degradation;
- (d) contain or prevent the movement of pollutants or the causant of degradation;
- (e) eliminate any source of the pollution or degradation; or
- (f) remedy the effects of the pollution or degradation."

Consequently, BRMO must take "reasonable steps" to prevent pollution or degradation of the environment which may result from the proposed activities. These reasonable steps include the investigation and evaluation of the potential impact, and identification of means to prevent an unacceptable impact on the environment, and to contain or minimise potential impacts where they cannot be eliminated.

### **3.3 NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008 (ACT 59 OF 2008)**

#### **3.3.1 DEFINITION OF WASTE**

The NEM:WA defines 'Waste' as

*"(a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act; or*

*(b) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the Gazette, but any waste or portion of waste, referred to in paragraphs (a) and (b), ceases to be a waste-*

*(i) once an application for its re-use, recycling or recovery has been approved or, after such approval, once it is, or has been re-used, recycled or recovered;*

*(ii) where approval is not required, once a waste is, or has been re-used, recycled or recovered;*

*(i) where the Minister has, in terms of section 74, exempted any waste or a portion of waste generated by a particular process from the definition of waste; or,*

*(ii) where the Minister has, in the prescribed manner, excluded any waste stream or a portion of a waste stream from the definition of waste."*

Schedule 3 of the Act includes the following definition under CATEGORY A: Hazardous Waste:

*"hazardous waste" means any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment*

and includes hazardous substances, materials or objects within business waste, **residue deposits** and **residue stockpiles** as outlined below:

**"residue deposits"** means any residue stockpile remaining at the termination, cancellation or expiry of a prospecting right, mining right, mining permit, exploration right or production right;

**"residue stockpile"** means any debris, discard, tailings, slimes, screening, slurry, waste rock, foundry sand, mineral processing plant waste, ash or any other product derived from or incidental to a mining operation and which is stockpiled, stored or accumulated within the mining area for potential re-use, or which is disposed of, by the holder of a mining right, mining permit or, production right or an old order right, including historic mines and dumps created before the implementation of this Act.

Residue deposits and residue stockpiles include:

1. Wastes resulting from exploration, mining, quarrying, and physical and chemical treatment of minerals	(a) wastes from mineral excavation
	b) wastes from physical and chemical processing of metalliferous minerals
	(c) wastes from physical and chemical processing of nonmetalliferous minerals
	(d) wastes from drilling muds and other drilling operations

It is clear from the above that the proposed SFSF will be a residue stockpile, and is thus also a "waste" according to the Act.

### 3.3.2 GENERAL DUTY IN RESPECT OF WASTE MANAGEMENT

S16 of the Act requires as follows:

*"(1) A holder of waste must, within the holder's power, take all reasonable measures to-*

*(a) avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated;*

*(b) reduce, re-use, recycle and recover waste;*

*(c) where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;*

*(d) manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour or visual impacts;*

*(e) prevent any employee or any person under his or her supervision from contravening this Act; and*

*(f) prevent the waste from being used for any unauthorised purpose.*

*(3) The measures contemplated in this section may include measures to-*

*(a) investigate, assess and evaluate the impact of the waste in question on health or the environment;*

- (b) cease, modify or control any act or process causing the pollution, environmental degradation or harm to health;
- (c) comply with any norm or standard or prescribed management practice;
- (d) eliminate any source of pollution or environmental degradation; and
- (e) remedy the effects of the pollution or environmental degradation."

### 3.3.3 RESIDUE STOCKPILES AND RESIDUE DEPOSITS

According to S43A of NEMWA:

(1) Residue stockpiles and residue deposits must be managed in the prescribed manner on any site demarcated for that purpose in the environmental management plan or environmental management programme for that prospecting, mining, exploration or production operation.

(2) No person may temporarily or permanently deposit any residue stockpile or residue deposit on any site other than on a site contemplated in subsection (1).

Section 69(1) (1A) stipulates:

The Minister may make regulations regarding the management and control of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation.

The requirements are gazetted in GN.R 632 of 2015: Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits, 2015, subsequently amended by GN 990 of 2018.

### 3.3.4 WASTE MANAGEMENT LICENCING

According to Section 19(1) and 19(3) of the NEM:WA, the Minister may publish a list of Waste Management Activities that have, or are likely to have, a detrimental effect on the environment, and must specify whether a Waste Management Licence is required to conduct these activities. Under these provisions, a list of 'Category A', 'Category B', and 'Category C' Waste Management Activities have been published in General Notice No: 921 on 29 November 2013 (with subsequent amendments) as Schedule 1 to NEM:WA. Category A and B activities require a Waste Management Licence in terms of Section 20(b) of NEM: WA, whereas Category C activities require that the person conducting these activities complies with the relevant requirements or standards as stated in GN 921, as amended.

The establishment of a residue stockpile requires a Waste Management Licence. Other potentially applicable listed activities have also been identified, with respect to the proposed development, and are listed in Table 3-2 below. It must be noted that the manganese super fines are defined as a hazardous waste in Schedule 3 of NEM: WA.

Table 3-2: Listed Activities applicable to the Mine
GN. 921:2014: Category B



Table 3-2: Listed Activities applicable to the Mine
<p><b>Activity No. 11:</b> The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).</p> <p><u>REASON:</u> The SFSF will be a residue stockpile and may become a residue deposit at some time in the future. The material may also be reclaimed and reprocessed if this becomes feasible, based on the economic value of the material or its constituents, or if BRMO identifies or develops technology adequate for conversion of the material to a product of sufficient value.</p>
<p><b>Activity No. 10:</b> The construction of a facility for a waste management activity listed in Category B of this Schedule (not in isolation to associated waste management activity).</p>
Other Activities Which May Apply
<p><b>Activity No. 1:</b> The storage of hazardous waste in lagoons excluding storage of effluent, wastewater or sewage.</p> <p><u>REASON:</u> Storage of manganese super fines in the SFSF may be considered storage of a hazardous waste. In particular, this is true if the fines will be reclaimed at some point in the future.</p>
<p><b>Activity No. 7:</b> The disposal of any quantity of hazardous waste to land.</p> <p><u>REASON:</u> Disposal of manganese super fines may be considered disposal of a hazardous waste.</p>

### 3.4 AIR QUALITY

Air Quality Management in South Africa is primarily regulated through the National Environmental Air Quality Act (NEMAQA) {Act 39 of 2004, as amended}. The object of this Act is:

(a) to protect the environment by providing reasonable measures for—

- (i) the protection and enhancement of the quality of air in the Republic;
- (ii) the prevention of air pollution and ecological degradation; and
- (iii) securing ecologically sustainable development while promoting justifiable economic and social development; and

(b) generally, to give effect to section 24(b) of the Constitution in order to enhance the quality of ambient air for the sake of securing an environment that is not harmful to the health and well-being of people.

NEMAQA defines atmospheric emissions as:

"atmospheric emission" or "emission" means any emission or entrainment process emanating from a point, non-point or mobile source that results in air pollution;

Air pollution as:

““air pollution” means any change in the composition of the air caused by smoke, soot, dust (including fly-ash), cinders, solid particles of any kind, gases, fumes, aerosols and odorous substances;”

NEMAQA is an effects-based legislation; consequently, activities that result in atmospheric emissions are to be managed through the setting of environmental health based ambient air quality standards. Facilities with potential impacts on air quality should ideally be assessed, not only in terms of its individual contribution, but in terms of its additive contribution to baseline ambient air quality i.e. cumulative effects must be considered.

### 3.4.1 DUSTFALL AND DUST CONTROL REGULATIONS

Section 32 states that the Minister, or MEC, may prescribe measures relating to dust control; these have been published in terms of National Dust Control Regulations, GN. R 827 2013. The Regulations prescribe general measures for the control of dust in all areas. Dustfall Standards for Acceptable Dustfall Rates are given in Table 3-3, for residential and non-residential areas. The Regulations also provide a method to be used for measuring dustfall rate and guidelines for locating sampling points. The method to be used is AST D1739:1970, or an equivalent method approved by any internationally recognised body.

Table 3-3: GN. R827:2013 Acceptable Dust Fall Rates		
Restriction Areas	Dustfall Rate (D) (mg/m <sup>2</sup> /day, 30-days average)	Permitted Frequency of Exceeding Fall Rate
Residential area	D <600	Two within a year, not sequential months
Non-residential area	600 < D <1200	Two within a year, not sequential months

These Regulations are of particular relevance to the construction and decommissioning activities for the proposed development. This is when potentially significant dust may be generated.

### 3.4.2 NATIONAL NORMS AND STANDARDS

According to S9 of NEMAQA:

“(1) The Minister, by notice in the Gazette-

(a) must identify substances or mixtures of substances in ambient air which through ambient concentrations, bioaccumulation, deposition or in any other way, present a threat to health, well-being or the environment or which the Minister reasonably believes present such a threat; and

(b) must, in respect of each of those substances or mixtures of substances, establish national standards for ambient air quality, including the permissible amount or concentration of each such substance or mixture of substances in ambient air; ..."

The Minister of Water and Environmental Affairs published limits for ambient air quality in Government Notice N<sup>o</sup> 1210 of 24 December 2009, in terms of S9(1) of NEMAQA, as shown in Table 3-4.

Pollutant	Averaging Period	Concentration (µg/m <sup>3</sup> )	Permissible FOE*
PM <sub>10</sub>	24-hours	75	4
	Annual	40	0
NO <sub>2</sub>	1-hour	200	88
	Annual	40	0
SO <sub>2</sub>	10-min (running)	500	526
	1-hour	350	88
	24-hours	125	4
	Annual	50	0
CO	1-hour	30	88
	8-hours (running)^	10	11
Pb	Annual	0.5	0
* FOE – Permitted Frequency of Exceedance in occurrences per year			
^ Calculated on 1-Hourly Averages			

The Ministry of Water and Environmental Affairs further published limits for PM<sub>2.5</sub> on the 29<sup>th</sup> June 2012, in terms of S9(1) of NEMAQA, as shown in Table 3-5.

Pollutant	Averaging Period	Conc. µg/m <sup>3</sup>	Permissible FOE*	Compliance Date
PM <sub>2.5</sub>	24-hours	60	4	Immediate
		40	4	01 January 2016
		25	4	01 January 2030
	Annual	25	0	Immediate
		20	0	01 January 2016
		15	0	01 January 2030
* FOE – Permitted Frequency of Exceedance in occurrences per year				

BRMO is required to ensure that the impacts from their proposed development does not result in an impact on ambient air quality exceeding these standards. Given the nature of

the proposed activities, it is not foreseen that the emissions related hereto would potentially result in exceedance of these standards.

### **3.5 WATER USE**

The National Water Act (NWA), 1998 (Act 36 of 1998), aims to manage national water resources in order to achieve sustainable use of water, for the benefit of all water users. This requires that the quality of water resources is protected, and integrated management of water resources takes place.

#### **3.5.1 WATER USE LICENCE**

In terms of the National Water Act, Act No. 36 of 1998 (NWA), a Water Use Licence is required for water uses for the proposed super fines storage as follows:

- *21 (g) disposing of waste in a manner which may detrimentally impact on a water resource:*
  - This relates to fines storage cells and the return water dam.
- *21 (b) storing water:*
  - This may relate to the return water dam. However, based on existing water use licensing for the BRMO's activities it is understood that 21 (b) does not apply to process water and therefore only 21 (g) is applicable to the return water dam.

Other provisions of the NWA have been taken into account, specifically relating to Part 4 (Section 19), which deals with pollution prevention, in particular situations where pollution of a water resource occurs or might occur as a result of activities on land. A person who owns, controls, occupies, or uses the land in question, is responsible for taking measures to prevent pollution of water resources. If these measures are not taken, the Catchment Management Agency concerned may itself do whatever is necessary to prevent the pollution or to remedy its effects, and to recover all reasonable costs from the persons responsible for the pollution.

#### **3.5.2 GN. R. 704 – REGULATION OF MINE WATER MANAGEMENT**

Regulation 704 of 4 June 1999 was promulgated under the NWA, with the primary goal of ensuring water resource protection from poorly effected mine water management. The requirements of GN.R. 704 must be seen as the minimum requirements to fulfil the above stated goal, and apply to BRMO's activities.

Notably, the proposed activities are well outside the 1:100yr flood lines of, and in excess of 100m from, the Gamagara River (refer to **Error! Reference source not found.**).

### **3.6 BIODIVERSITY**

#### **3.6.1 NATIONAL FORESTS ACT (ACT NO. 84 OF 1998)**

Various principles apply in terms of the NFA. Principle 3 and 6 in particular protect the forest resources, and the environmental and social functions thereof, amongst others. There are

a number of tree species that are protected according to Government Notice no. 1012 under section 12(l) (d) of the National Forests Act, 1998 (Act No. 84 of 1998). In terms of Section 15(1) of the National Forests Act, 1998 *"no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license granted by the Minister to an (applicant and subject to such period and conditions as may be stipulated)"*.

The occurrence of two such protected tree species, i.e. camel thorn (*Vachellia erioloba*) and grey camel thorn (*Vachellia haematoxylon*), has been confirmed at BRMO. Permits for the removal of relevant species will be applied for where applicable.

### **3.6.2 CONSERVATION OF AGRICULTURAL RESOURCES ACT (ACT 43 OF 1983)**

As per the Conservation of Agricultural Resources Act (CARA) (Act 43 of 1983), "Conservation" is defined as: *"in relation to the natural agricultural resources, includes the protection, recovery and reclamation of those resources;"*.

The objectives of the CARA, as stated in Section 2 of the Act, entitled "Objects of Act", are:

*"The objects of this Act are to provide for the conservation of the natural agricultural resources of the Republic by the maintenance of the production potential of land, by the combating and prevention of erosion and weakening or destruction of the water sources, and by the protection of the vegetation and the combating of weeds and invader plants."*

The proposed development must meet these objectives as far as practicably possible. Of most significance to the project are the provisions stated in Regulation 5 of the Act for the "Prohibition of spreading weeds", which states that:

No person shall-

- (a) sell, agree to sell or offer, advertise, keep, exhibit, transmit, send, convey or deliver for sale, or exchange for anything or dispose of to any person in any manner for a consideration, any weed; or
- (b) in any other manner whatsoever disperse or cause or permit the dispersal of any weed from any place in the Republic to any other place in the Republic.

### **3.6.3 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT (ACT 10 OF 2004)**

The National Environmental Management: Biodiversity Act (Act 10 Of 2004) (NEMBA) is the primary legislation governing biodiversity management in South Africa.

Section 2: "Objectives of the Act", states the following:

2. The objectives of this Act are-

- a) within the framework of the National Environmental Management Act, to provide for-
  - (i) the management and conservation of biological diversity within the Republic and of the components of such biological diversity.

- (ii) the use of indigenous biological resources in a sustainable manner; and*
- (iii) the fair and equitable sharing among stakeholders of benefits arising from bio-prospecting involving indigenous biological resources;*
- b) to give effect to ratified international agreements relating to biodiversity which are binding on the Republic;*
- c) to provide for co-operative governance in biodiversity management and conservation; and*
- d) to provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act.*

Chapter 5 of NEMBA regulates activities involving invasive species, and lists duty of care as follows:

- the landowner/land user must take steps to control and eradicate the invasive species and prevent their spread, which includes targeting offspring, propagating material and regrowth, in order to prevent the production of offspring, formation of seed, regeneration or reestablishment;
- take all required steps to prevent or minimise harm to biodiversity; and
- ensure that actions taken to control/eradicate invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment.

NEMBA requires that management of biodiversity takes place to ensure that the biodiversity of the surrounding areas are not negatively impacted upon, by any activity being undertaken, in order to ensure the fair and equitable sharing among stakeholders of the benefits arising from indigenous biological resources.

Furthermore, a person may not carry out a restricted activity involving either:

- a) A specimen of a listed threatened or protected species;
- b) Specimens of an alien species; or
- c) A specimen of a listed invasive species without a permit.

An amendment to the NEMBA has been promulgated, which lists 225 threatened ecosystems based on vegetation types present within these ecosystems. Should a project fall within a vegetation type or ecosystem that is listed, actions in terms of NEMBA are triggered. Based on the preliminary sensitivity screening undertaken for the proposed site, none of the threatened ecosystems occur within the study area.

The Alien and Invasive Species Regulations (GN.R 598 of 2014), and the Alien and Invasive Species Lists (GN 864 of 2016) are of particular significance with respect to the management of alien and invasive species. Categories according to NEMBA (Alien and Invasive Species Regulations, 2017) which are relevant to the proposed development, and the potential impact therefrom, include:

- Category 1a: Invasive species that require compulsory control;
- Category 1b: Invasive species that require control by means of an invasive species management programme.

### **3.6.4 NORTHERN CAPE NATURE CONSERVATION ACT (ACT 109 OF 2009)**

The Northern Cape Nature Conservation Act (Act 109 of 2009) {NCNCA} for the sustainable utilisation of wild animals, aquatic biota, and plants, as well as permitting and trade regulations regarding wild fauna and flora within the province, is relevant.

The NCNCA makes provision for specially protected species of fauna and flora. According to Section 49 of the Act:

(1) No person may, without a permit -

(a) pick;

(b) import;

(c) export;

(d) transport;

(e) possess;

(f) cultivate; or

(g) trade in,

a specimen of a specially protected plant.

(2) The provisions of subsection (1) (e), in so far as they prohibit the possession of a specially protected plant, do not apply to a landowner who is in possession of a specially protected plant which grows in its natural habitat and which was not planted by human interference.

"Protected plant" means a species of plant listed as such in Schedule 2. There are various protected species listed in schedule 2 of the Act that apply to the site. These include, for example *Harpagophytum procumbens* (devil's claw) and *Boophone disticha* (Candelabra Flower). Permits for the removal, or relocation and transport, of relevant species will be applied for where applicable.

### **3.7 NATIONAL HERITAGE RESOURCES ACT (NHRA) (ACT 25 OF 1999)**

The NHRA aims to promote good management of the national estate, and to enable and encourage communities to nurture and conserve their legacy, so that it may be bequeathed to future generations.

The Act protects as cultural heritage resources such as:

- a. Archaeological artefacts, rock structures, structures and sites older than 100 years;
- b. Ethnographic art objects (e.g. prehistoric rock art) and ethnography;
- c. Objects of decorative and visual arts;
- d. Military objects, structures and sites older than 75 years;
- e. Historical objects, structures and sites older than 60 years;
- f. Proclaimed heritage sites;
- g. Graveyards and graves older than 60 years;
- h. Meteorites and fossils; and
- i. Objects, structures and sites of scientific or technological value.

A Heritage Impact Assessment (HIA) is the process to be followed in order to determine whether any heritage resources are located within the area of interest, in particular as per section 38(1), any development categorised as:

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

- (b) the construction of a bridge or similar structure exceeding 50m in length;
- (c) any development or other activity which will change the character of a site -
- (i) exceeding 5 000m<sup>2</sup> in extent; or
  - (ii) involving three or more existing erven or subdivisions thereof; or
  - (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
  - (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
- (d) the re-zoning of a site exceeding 10 000m<sup>2</sup> in extent; or
- (e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,

Any person intending to undertake the above must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

The responsible Heritage Resources Authority must, within 14 days of receipt of the notification, indicate whether submission of an Impact Assessment Report is required, and specify the information to be contained in the report.

The responsible Heritage Resources Authority must then decide:

- (a) whether or not the development may proceed;
- (b) any limitations or conditions to be applied to the development;
- (c) what general protections in terms of this Act apply, and what formal protections may be applied, to such heritage resources;
- (d) whether compensatory action is required in respect of any heritage resources damaged or destroyed as a result of the development; and
- (e) whether the appointment of specialists is required as a condition of approval of the proposal.

However, according to S38(8), the above does not apply where an Environmental Impact Assessment is required, provided that the consenting Authority must ensure that the evaluation fulfils the requirements of the relevant Heritage Resources Authority in terms of Subsection (3), and any comments and recommendations of the relevant Heritage Resources Authority with regard to such development have been taken into account prior to the granting of the consent.

### **3.7.1 STRUCTURES**

Section 34 (1) of the NHRA states that no person may demolish any structure or part thereof which is older than 60 years without a permit issued by the relevant provincial Heritage



Resources Authority; where a structure means 'any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith'.

"Alter" means 'any action affecting the structure, appearance or physical properties of a place or object, whether by way of structural or other works, by painting, plastering or the decoration or any other means'.

### **3.7.2 ARCHAEOLOGY, PALAEOLOGY, AND METEORITES**

Section 35(4) of the Act deals with archaeology, palaeontology, and meteorites. The Act states that *no person may, without a permit issued by the responsible heritage resources authority (national or provincial):*

- a) *Destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or paleontological site or any meteorite;*
- b) *Destroy, damage, excavate, remove from its original position, collect or own any archaeological or paleontological material or object or any meteorite;*
- c) *Trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or paleontological material or object, or any meteorite;*
- d) *Bring onto or use at an archaeological or paleontological site any excavation equipment or any equipment that assists in the detection or recovery of metals or archaeological and paleontological material or objects, or use such equipment for the recovery of meteorites; or*
- e) *Alter or demolish any structure or part of a structure which is older than 60 years as protected.*

The above mentioned may only be disturbed or moved by an archaeologist, after receiving a permit from the South African Heritage Resources Agency (SAHRA). In order to demolish such a site or structure, a destruction permit from SAHRA will also be needed.

### **3.7.3 BURIAL GROUNDS AND GRAVES:**

According to Section 36 (3) *no person may, without a permit issued by South African Heritage Resources Agency (SAHRA) or a provincial heritage resources authority:*

- a) *destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;*
- b) *destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or*
- c) *bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.*

## **3.8 NOISE**

The Noise Control Regulations (R 154 GG 13717 of 10 January 1992) promulgated in terms of ECA, defines:

- "Nuisance noise", as 'any sound which disturbs or impairs or may disturb or impair the convenience or peace of any person'
- "Disturbing noise", as 'any noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more'.

Regulation 4 states 'No person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof.'

In addition, Section 28 of NEMA imposes a 'duty of care' on every person who may cause significant pollution to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.

### **3.9 MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (ACT 28 OF 2002)**

BRMO has a new order mining right issued in terms of the MPRDA. The right covers all current BRMO operations, including the Gloria mine. No amendments are required to the mining right for the proposed development.

Notably, Section 1 of the Act defines:

*"residue deposit" means any residue stockpile remaining at the termination, cancellation or expiry of a prospecting right, mining right, mining permit, exploration right, production right or an old order right;*

*"residue stockpile" means any debris, discard, tailings, slimes, screening, slurry, waste rock, foundry sand, beneficiation plant waste, ash or any other product derived from or incidental to a mining operation and which is stockpiled, stored or accumulated for potential re-use, or which is disposed of, by the holder of a mining right, mining permit, production right or an old order right;*

Clearly, the super fines storage facility will be a residue stockpile. It may become a residue deposit at some time in the future upon closure if the material is not recovered.

## 4 DESCRIPTION OF THE RECEIVING ENVIRONMENT

The description of the receiving environment is described herein based on observations at the site, findings of the specialist assessments, and the findings of previous environmental impact assessments undertaken for the wider mine environmental management programme.

The area of interest is adjacent to the existing surface activities of the mine. Although some portions of the land have previously been disturbed, the area largely consists of undisturbed land. The area is classified as having natural/indigenous vegetation. The site is **not** located on a shallow water table, dolomitic, sinkhole, or doline areas, seasonally wet soils, unstable rocky slopes, or steep slopes with loose soil, dispersive soils, soils with high clay content, and/or an area sensitive to erosion.

### 4.1 PHYSICAL

#### 4.1.1 CLIMATE

There are no South African Weather Stations (SAWS) proximal to the site, as such data for Kuruman is used to provide an overview of the climatology of the area. Kuruman is approximately 65km south-east of the BRMO operations. The meteorological conditions at this site may not be exactly representative of meteorological conditions at the site. However they are expected to be representative of the general conditions of the region.

#### 4.1.2 WIND

The observed wind direction and wind speed are dominantly from the north-northwest, with an average wind speed of 4.1m/s (for the windier months of the year, July to January) (Figure 3-1). The length of the colour-coded line in the wind roses is proportional to the frequency of occurrence of wind blowing from that direction. Wind speed classes are also colour-coded, and the length of each class/category is proportional to the frequency of occurrence of wind speed.

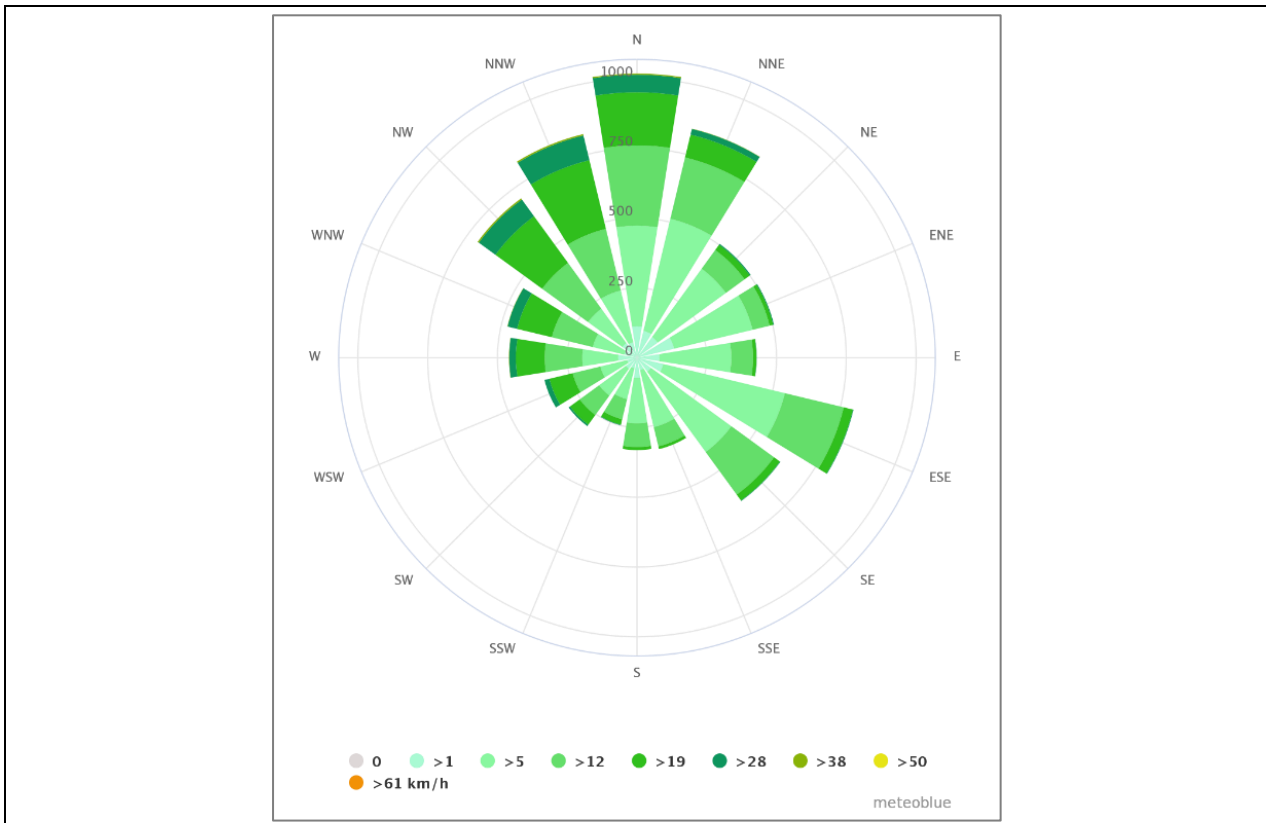


Figure 3-1: Annual Wind rose for Kuruman (<https://www.meteoblue.com>)

### 4.1.3 RAINFALL AND TEMPERATURE

Rainfall occurs predominantly in summer and autumn (Dec – Apr), while the least amount of rain falls in the months of May – Sep. The maximum daily temperature occurs in January/December, whilst the minimum daily temperature occurs in July/August for Kuruman (Figure 3-2). Temperatures are high in summer months, with a maximum temperature of around 32°C for Kuruman. Winter temperatures do drop below freezing. However, the average minimum temperature for Kuruman is 1°C.

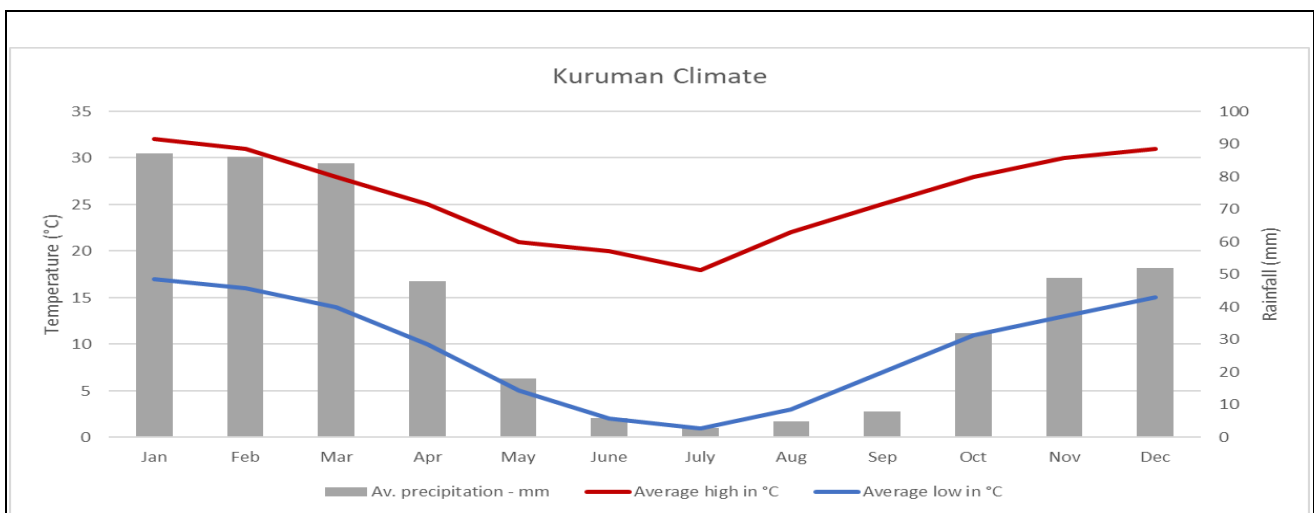


Figure 3-2: Monthly Average Temperature and Rainfall for Kuruman (<https://www.climatedata.eu>)

#### **4.1.4 EVAPORATION AND CLIMATIC WATER BALANCE**

The region is arid, with relatively high evaporation rates and low rainfall. Although site-specific data is not available, the mean annual precipitation versus evaporation rates can be estimated from mean rates from other stations in the area.

Average monthly rainfall and evaporation data for the area was obtained from the following Department of Water and Sanitation monitoring stations:

- Kuruman Station (D4E004), approximately 65 km south-east.
- Olifantshoek Station (D4E002), approximately 85 km north-west.

The average monthly and annual data is summarised in Table 3-6, and illustrated in Figure 3-3 and Figure 3-4.

Table 3-6: Precipitation and Evaporation Data

Month	Kuruman-D4E004			Olifantshoek-D4E002		
	Rainfall (mm)	Evaporation (mm)	Climatic Water Balance (mm)	Rainfall (mm)	Evaporation (mm)	Climatic Water Balance (mm)
January	85.6	259	-173.4	59.6	276.1	-216.5
Feb	82.9	208.4	-125.5	52.1	221.6	-169.5
March	86.5	161.3	-74.8	63.3	191.9	-128.6
April	45.1	122.3	-77.2	33.4	139.8	-106.4
May	21.5	113.2	-91.7	14.1	105.3	-91.2
June	7.4	82.5	-75.1	5.3	79.8	-74.5
July	2.8	99.1	-96.3	3.2	90.7	-87.5
August	9.8	131.2	-121.4	5.5	132.6	-127.1
September	7.9	188.5	-180.6	5.8	180.3	-174.5
October	26.4	236.3	-209.9	19	234.9	-215.9
November	45.1	243.6	-198.5	27.4	266.6	-239.2
December	44.9	272.7	-227.8	32.7	293.2	-260.5
<b>Annual</b>	<b>465.9</b>	<b>2118.1</b>	<b>-173.4</b>	<b>321.4</b>	<b>2212.8</b>	<b>-216.5</b>
<b>Annual Water Balance*</b>	<b>-1652.2</b>			<b>-1891.4</b>		
* The climatic water balance is calculated as total rainfall - total evaporation.						

### Monthly Climatic Water Balance - Kuruman

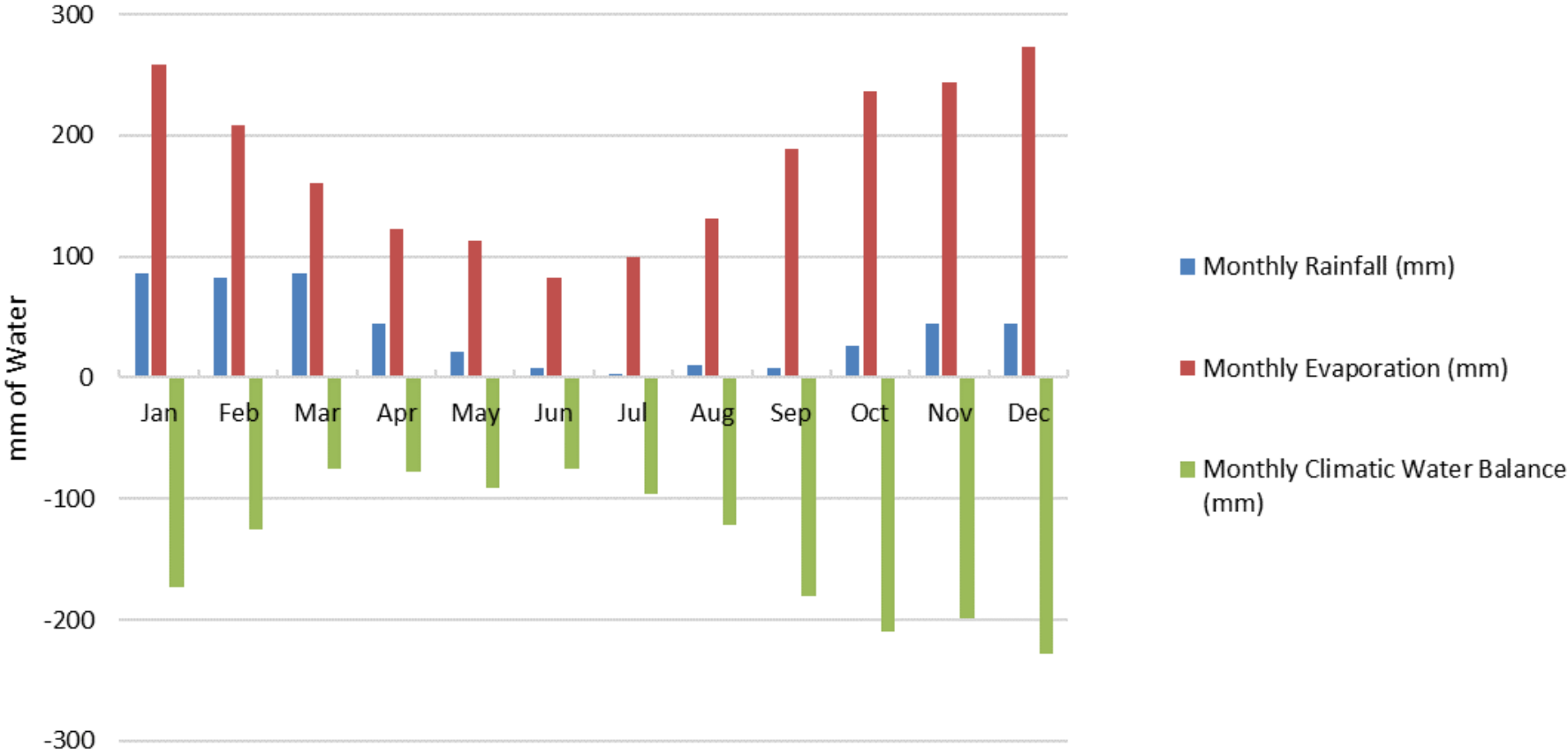


Figure 3-3: Climatic Water Balance - Kuruman

### Monthly Climatic Water Balance - Olifantshoek

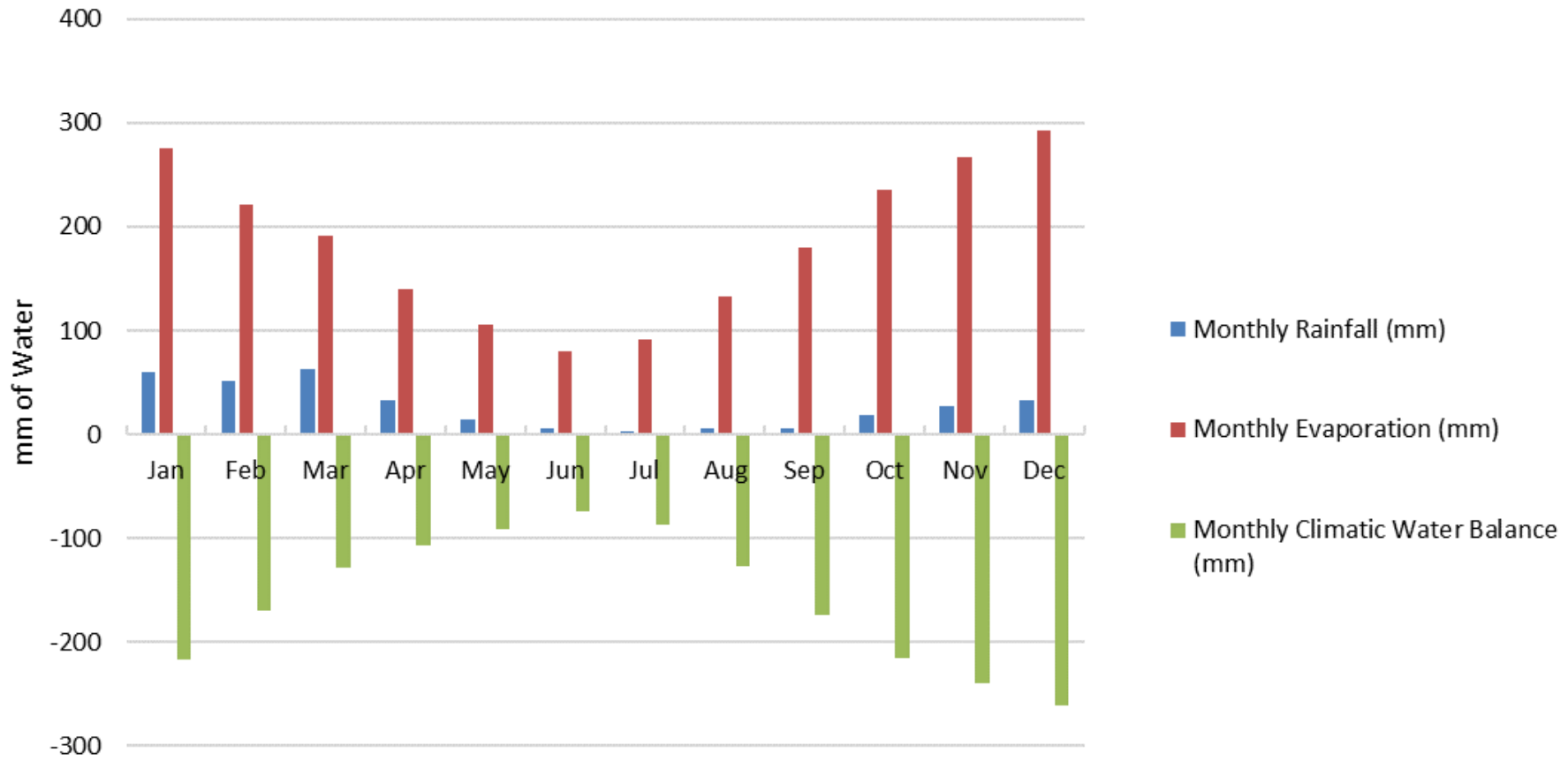


Figure 3-4: Climatic Water Balance - Olifantshoek



It is clear from the above that there is a significantly negative climatic water balance for the area. This is significant for the site, as it implies that there is limited potential for infiltration and leaching of material disposed, and significant potential for loss of water through evaporation, particularly over the long term.

#### 4.1.5 SURFACE WATER AND WETLAND/RIPARIAN ZONES

The gradient of the site is flat, and the landform associated with the site is plain (refer to Figure 3-6). Notably the Gamagara River runs to the east of the site. However, there are no apparent drainage channels to the river. The Gamagara River and its associated wetland/riparian features (including a 32 m buffer zone) can be considered as an ecologically sensitive area in relation to the proposed development activities (Figure 3-5). The proposed activities will be well outside of this area, with the preferred site located approximately 900m west of the Gamagara River.

According to a hydrological assessment undertaken at BRMO (African Environmental Development, report number AED0201), the site is located in the arid and endorheic Kalahari Basin. It does not have any true surface water, although there are a few areas where quarries have intercepted the water table below a dry streambed, and this water was considered to be surface water (with certain reservations). The study further demonstrated that the area where the mine is located is very flat with low slopes and that in general, hardly any actual surface run-off would enter the Gamagara River. If indeed surface run-off did reach the river, it would rapidly be absorbed by the riverbed and become part of the groundwater environment. Due to the endorheic nature of the Kalahari Basin, any contamination of groundwater would remain there for an extremely long time. This places an extended responsibility on BRMO and the other mines operating in this area, as negligent actions on the part of the mines leading to contamination of groundwater, could be responsible for this contamination lingering in the groundwater for potentially millions of years.

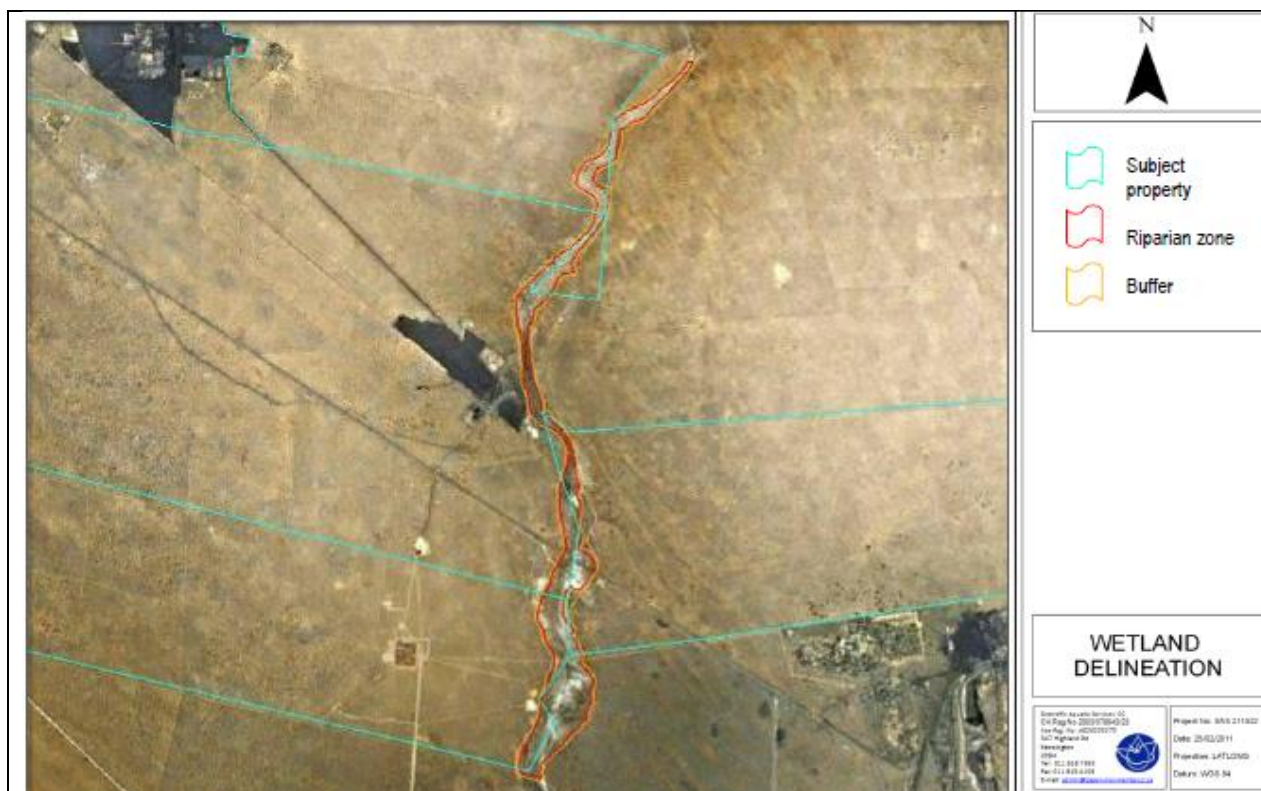
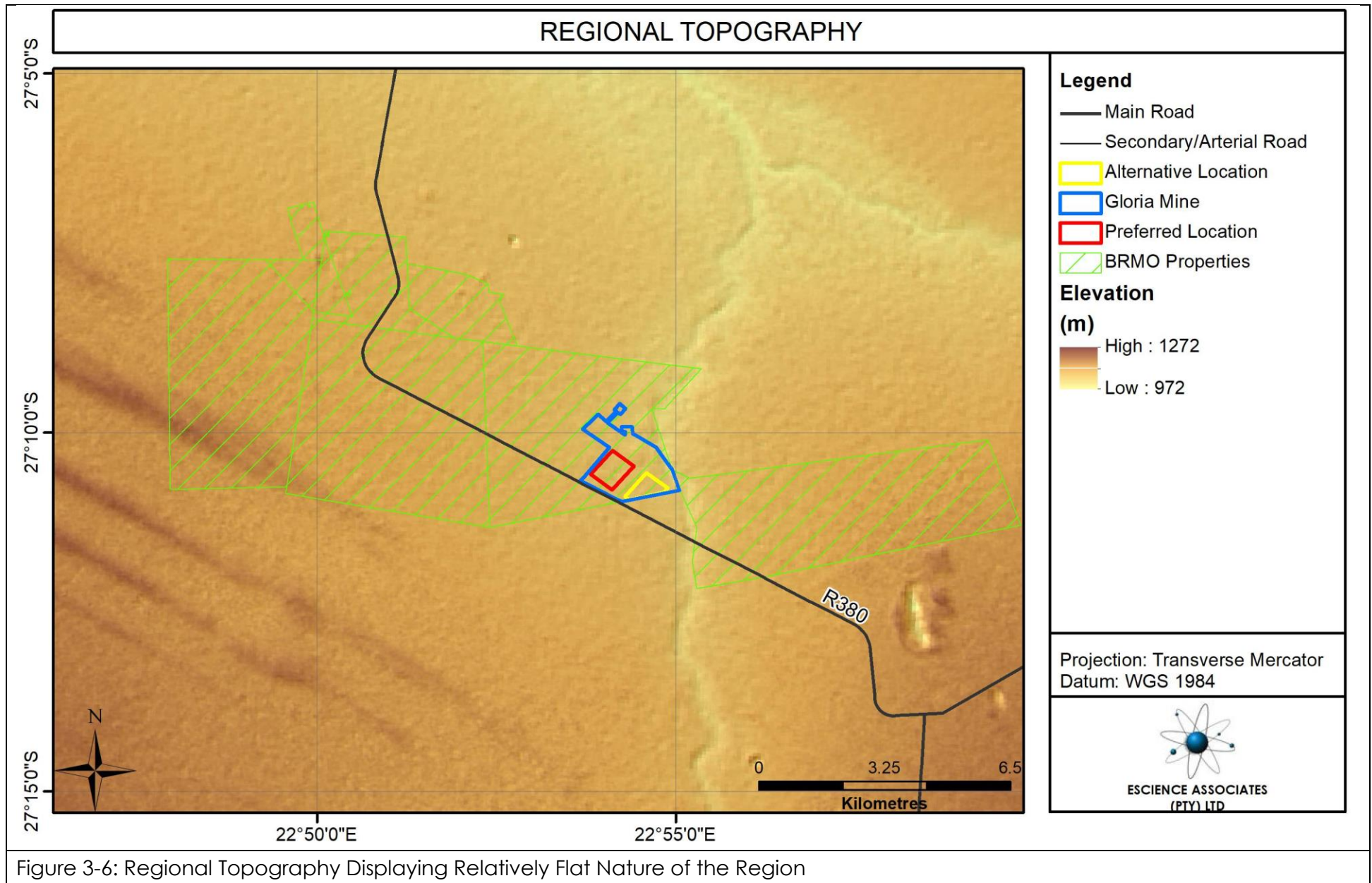


Figure 3-5: Gamagara River Wetland Delineation





#### 4.1.6 GEOLOGICAL AND GEOHYDROLOGICAL SETTING

A summary of the geological and geohydrological setting is presented herein based on the specialist hydrogeological and geotechnical assessments undertaken at the site, as well as previous specialist studies undertaken at BRMO (Geo Pollution Technologies, Report Reference Number: EBR-10-320, Envass report GEO- REP-107-08-19)).

The Kalahari Manganese Field (KMF), in the Kuruman area, has a covering of calcretized sediments of the Kalahari Group, which is comprised of aeolian, unconsolidated sand of the Gordonia Formation, non-conformably overlying calcified sand and gravel. The Kalahari Group is up to 125 m thick, underlain by a ~30 m thick red clay layer, and the Olifantshoek Supergroup. The Olifantshoek Supergroup is comprised of the shales and quartzites of the Lucknow Formation, underlain by the Mapedi Formation shale, with quartzite bands.

Regionally, the general area has a cover of predominantly Quaternary Surficial deposits of red to light orange coloured Aeolian (windblown) sands of the Kalahari Group, that extend to depths of 20.0 m, and deeper in some places. The geology underlying the site comprises approximately 100 m of unconsolidated Kalahari Formation, consisting of fine Aeolian sand, gravels, calcrete, and clays. Figure 3-7 illustrates the general stratigraphy of the site.

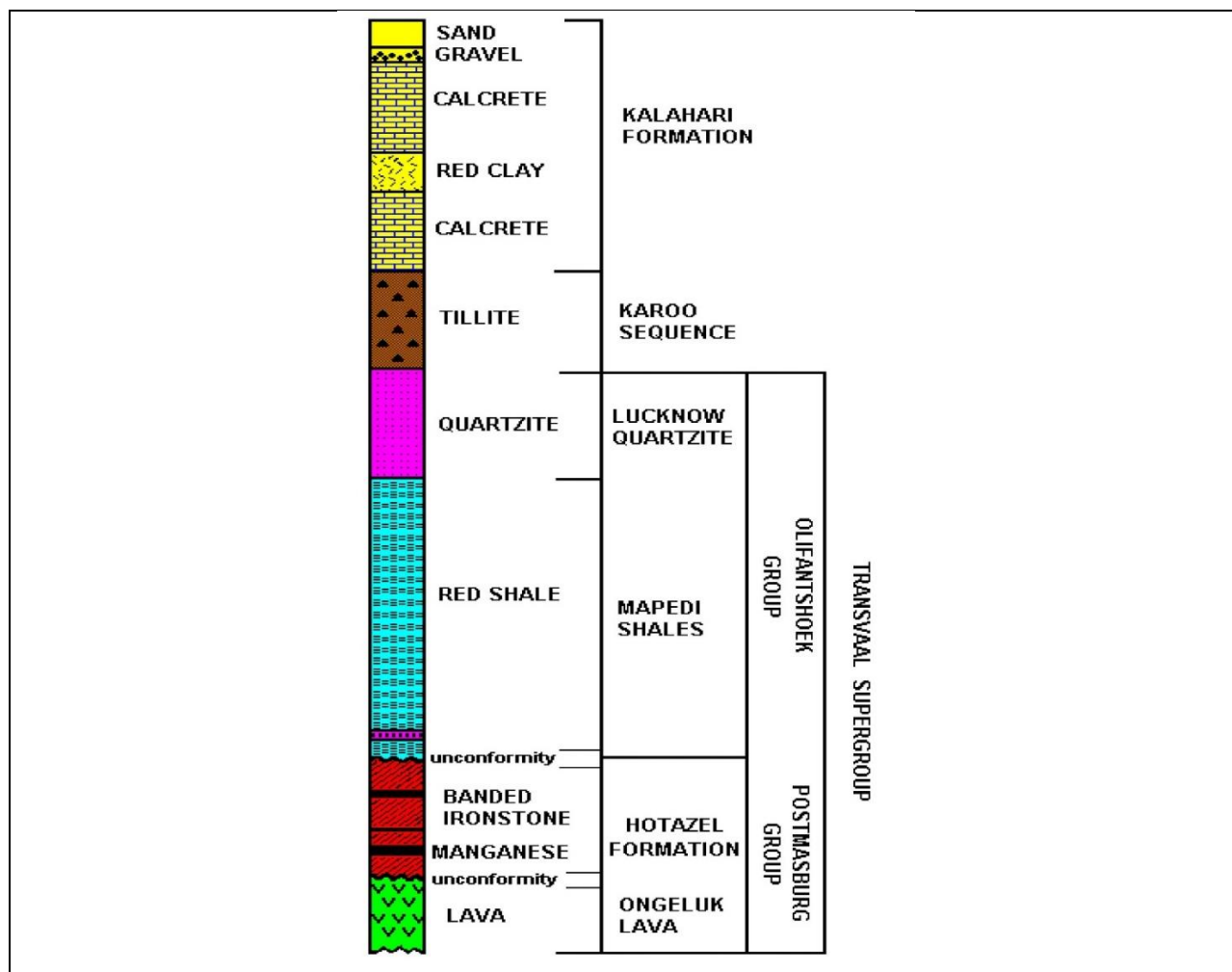


Figure 3-7: General Stratigraphy of the Site.

The entire Olifantshoek Supergroup, and the underlying Ongeluk Formation, have been influenced by the Kheis and Namaqualand orogenies, with thrust faulting within the area presenting evidence of compressional tectonics associated with the Kheis orogeny. The major thrust fault at Black Rock area is named the 'Kheis Thrust', which has a north-south trend and extends ~270 km north of the mine and south to the Rooinekke Mine. The site is situated within a large and imbricate thrust fault complex, where the Black Rock outcrop represents part of the thrust nappe structure.

From the thirty-five test pits excavated during the geotechnical assessment of the site, the site is generally underlain by poorly developed Topsoil / Aeolian soils from surface to an average depth of 0.3 m, underlain by orange brown to yellow brown silty fine sand to an average depth of 3.3 m. Pedogenic soils in the form of powder calcrete, nodular calcrete or strongly cemented fractured hardpan calcrete, are found underlying the Aeolian soils. Notably, no groundwater was noted in any of the test pits excavated.

According to the 1:500'000 Hydrogeological Map Series (2722 Kimberley), the site is underlain by intergranular aquifer units, with a median borehole yield between 0.1 and 0.2 l/s. Aquifers to the west and east of the site are mapped as intergranular and fractured aquifers, with the same median borehole yield. Most boreholes within the site region were drilled to depths between 60 and 150 m. Few boreholes were drilled deeper than 175 m, with the maximum borehole at a depth of 307 m. Water strikes within the site region were intersected predominantly between 40 and 70 m depths, with limited intersections after 125 m (i.e. approximate depth of the Kalahari Formation).

The top layer of aeolian sands is followed by calcrete of tertiary age. If weathered, the calcareous sands have high porosity and permeability. There is limited surface runoff in the Kalahari area, with high infiltration rates during precipitation. Due to the high porosity and permeability of the Kalahari sands, the calcrete deposit below the top layer of Kalahari sands acts like a "sponge".

#### **4.1.6.1 Unsaturated Zone**

The unsaturated zone in the mining area can be up to 40 metres thick (based on static groundwater levels from the monitoring as done by Black Rock), measured in the existing boreholes and consists of quaternary sediments at the top, underlain by tillite, shale and banded iron formation, with interbedded manganese ore bearing rock that become less weathered with depth.

#### **4.1.6.2 Saturated Zone**

In the saturated zone, at least two aquifer types may be inferred by the geohydrological specialist:

- A shallow aquifer formed in the weathered zone, perched on the fresh bedrock;
- An intermediate aquifer formed by fracturing of the underlying tillite, shales, iron formation, and manganese ore bearing layers.

Although these aquifers vary considerably regarding hydrogeological characteristics, they are seldom observed as isolated units. Usually, they would be highly interconnected by means of fractures and faults. Groundwater will thus flow through the system by means of the path of least resistance in a complicated manner that might include any of these components.

#### **4.1.6.3 Shallow Perched Aquifer**

A near surface weathered zone is comprised of transported quaternary sediments and in-situ weathered rock and is underlain by tillite, shales, iron formation, and manganese ore bearing rock. Groundwater flow patterns usually follow the topography, often coming very close to surface in topographic lows, sometimes even forming natural springs. The average groundwater recharge to the perched groundwater aquifer can reach up to 10% of the Mean Annual Precipitation (MAP) in the unconsolidated sand and calcrete.

#### **4.1.6.4 Fractured Rock Aquifers**

The host geology of the mining area consists of tillite, shales, and banded iron formation, with interbedded manganese ore bearing rock. Geology underlying the mining area consists mainly of lavas from the Ongeluk Formation. Most of the groundwater flow will be along the fracture zones that occur in the relatively competent host rock. The geology map does not indicate any major fracture zones in the mining area, but from specialist notes, it can be assumed that numerous major and minor fractures do exist in the host rock. These conductive zones effectively interconnect the strata, both vertically and horizontally into a single, but highly heterogeneous and anisotropic, unit. Major fault zones were, however, observed on the geology map, west of the mining area, running in a north-south direction.

#### **4.1.6.5 Water Levels**

Water level data is based on monitoring data that is undertaken by BRMO in accordance with the requirements of the mine's existing Water Use Licence. A total of 9 water levels are monitored. The water levels vary between 33.47 m and up to 101.10 m below ground level in the surrounding area.

Usually a good relationship should hold between topography and static groundwater level. This relationship can be used to distinguish between boreholes with water levels at rest, and boreholes with anomalous groundwater levels due to disturbances such as pumping or local hydrogeological heterogeneities. This general relationship for the BRMO shows a very poor correlation. A likely reason for this poor correlation could be water abstraction. The average depth to the groundwater level, in the intergranular and fractured aquifer, in the proposed area is 46 meters. Refer to Figure 3-8 and Figure 3-9, showing the borehole locations, groundwater levels, and direction of flow.

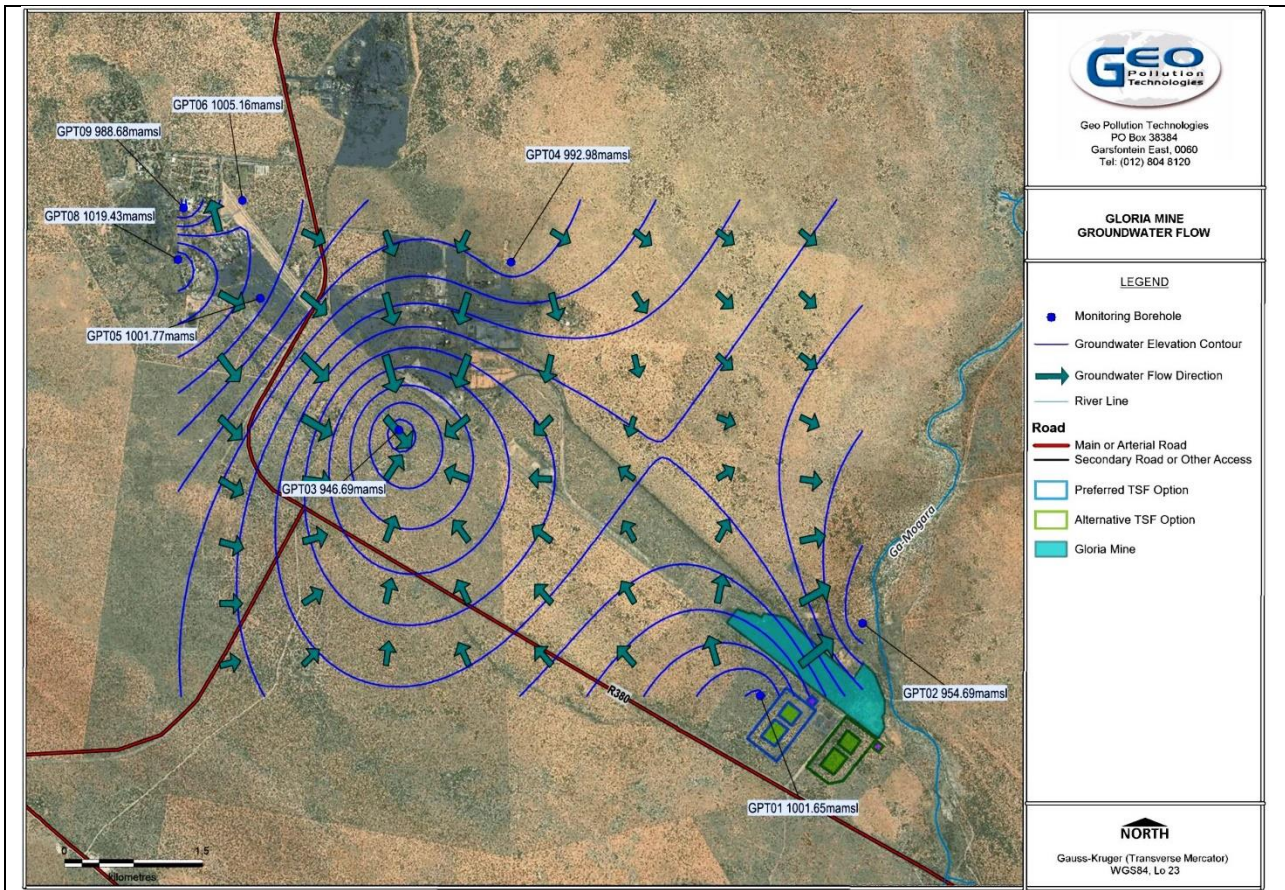


Figure 3-8: Borehole Locations and Groundwater Flow Directions

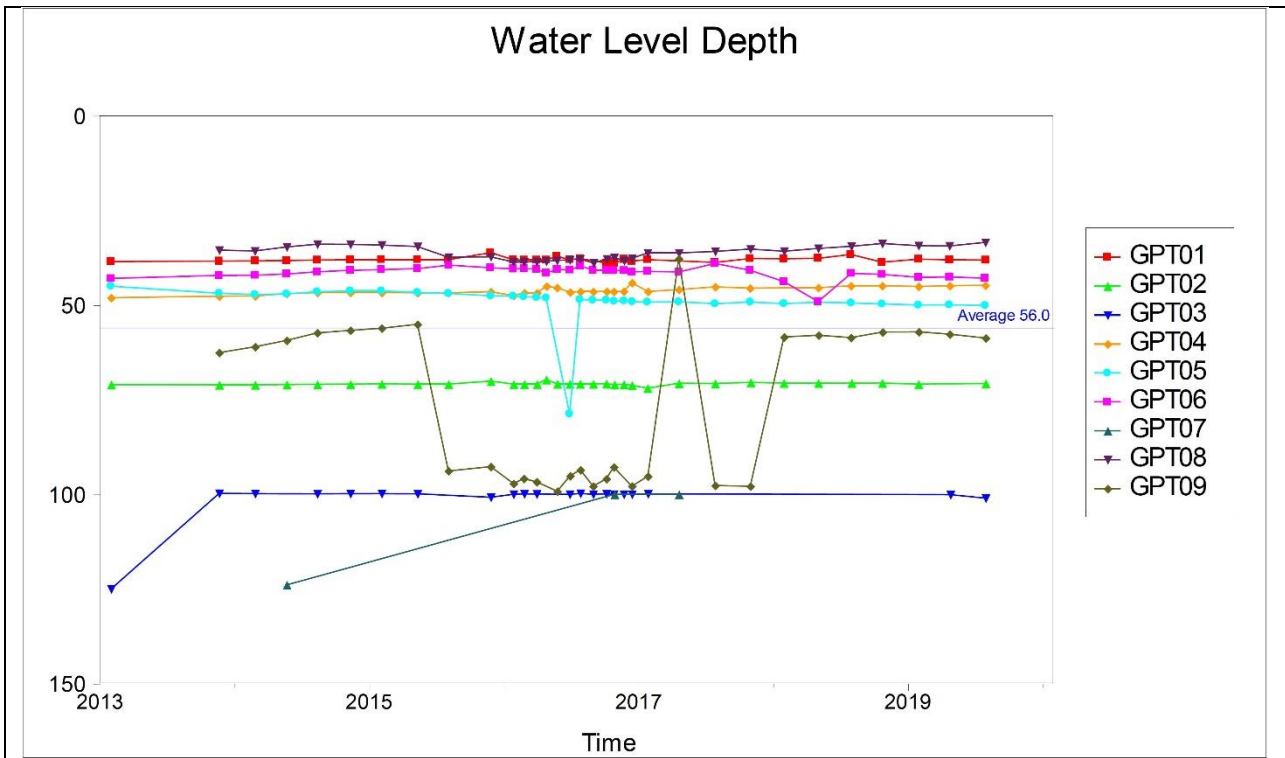


Figure 3-9: Groundwater Levels

#### **4.1.6.6 Groundwater Quality**

The water quality results for the monitoring boreholes are compared with the maximum recommended concentrations for domestic use as defined by the SANS 241-1: 2015 target water quality limits. The SANS 241-1: 2015 standard is applicable to all water services institutions, and sets numerical limits for specific determinants to provide the minimum assurance necessary that the drinking water is deemed to present an acceptable health risk for lifetime consumption. Colours of individual cells refer to the drinking water classification of the specific groundwater sample (Table 2). The following is noted:

- TDS exceeds the allowable limit in samples GPT2, GPT8.
- Nitrate as N exceeds the allowable limit in samples GPT1, GPT2, GPT5, GPT6, GPT8, and GPT9.
- Sodium exceeds the allowable limit in samples GPT2, GPT4.
- Chloride exceeds the allowable limit in samples GPT04.
- Fluoride exceeds the allowable limit in samples GPT03.

All other monitored parameters are within the guidelines for the boreholes.

#### **4.1.7 SOIL**

A soil survey has previously been undertaken at BRMO to assess soil characteristics and establish how and to what depth topsoil should be removed to prepare the area, and how the removed soil should be stored and treated when reused to remediate the disturbed area after mine closure (Report: Soil Survey and Soil Management Program for the Black Rock Mine Operations Concerning Establishing A New Sinter Plant and Shaft Complex - Prof Claassens 2011). The area around Black Rock, in the vicinity where the mining operations are undertaken, consists mainly of Kalahari sand. Kalahari sand is typically homogeneously very deep, with the exception of certain areas which are underlain by calcrete. Soil fertility is low, as is typical of sandy soils. Based on soil auguring undertaken, the soils in the area surveyed were deep yellowish-red sandy soils.

Due to a very low organic content, it was concluded that no specific recommendation on how deep the topsoil should be excavated to prepare the area, is necessary. Due to the texture of the soil and the size distribution it will not tend to compact while it is stockpiled, thus no special arrangements are necessary for stockpiling.

Although the soil is not very fertile, the stockpiled soils can be used as such to reclaim the disturbed area at mine closure. No fertilizer programme is recommended because it is assumed that the disturbed areas will be re-vegetated with natural grasses, which are adapted to the local environment.

## **4.2 BIOLOGICAL**

As previously mentioned, the area affected is currently adjacent to the existing surface activities of the mine. Although some portions of the land have previously been disturbed, the area largely consist of undisturbed land. The area is classified as having natural/indigenous vegetation.



Based on the findings of the biodiversity assessment undertaken for this application, as well as previous assessments (Biodiversity Action Plan For The Assmang Black Rock Manganese Ore Mine authored by SAS Environmental, 2011, Report Reference N<sup>o</sup> SAS 211022), the biodiversity of the area is described below.

The study area falls within an area that is currently not protected, in terms of the National Biodiversity Assessment (2011) Act/Regulations/Something. Ecosystem types are categorised as “not protected”, “poorly protected”, “moderately protected”, or “well-protected” based on the proportion of each ecosystem type that occurs within a protected area, recognised in the Protected Areas Act, 2003 (Act No. 57 of 2003), and compared with the biodiversity target for that ecosystem type. Ecosystems not occurring within any protected area, or where less than 5% of the biodiversity target has been met, are considered “not protected”.

The surrounding area, in terms of the National Threatened Ecosystems database, is shown in Figure 3-10. The entire area is described as “lightly threatened”.

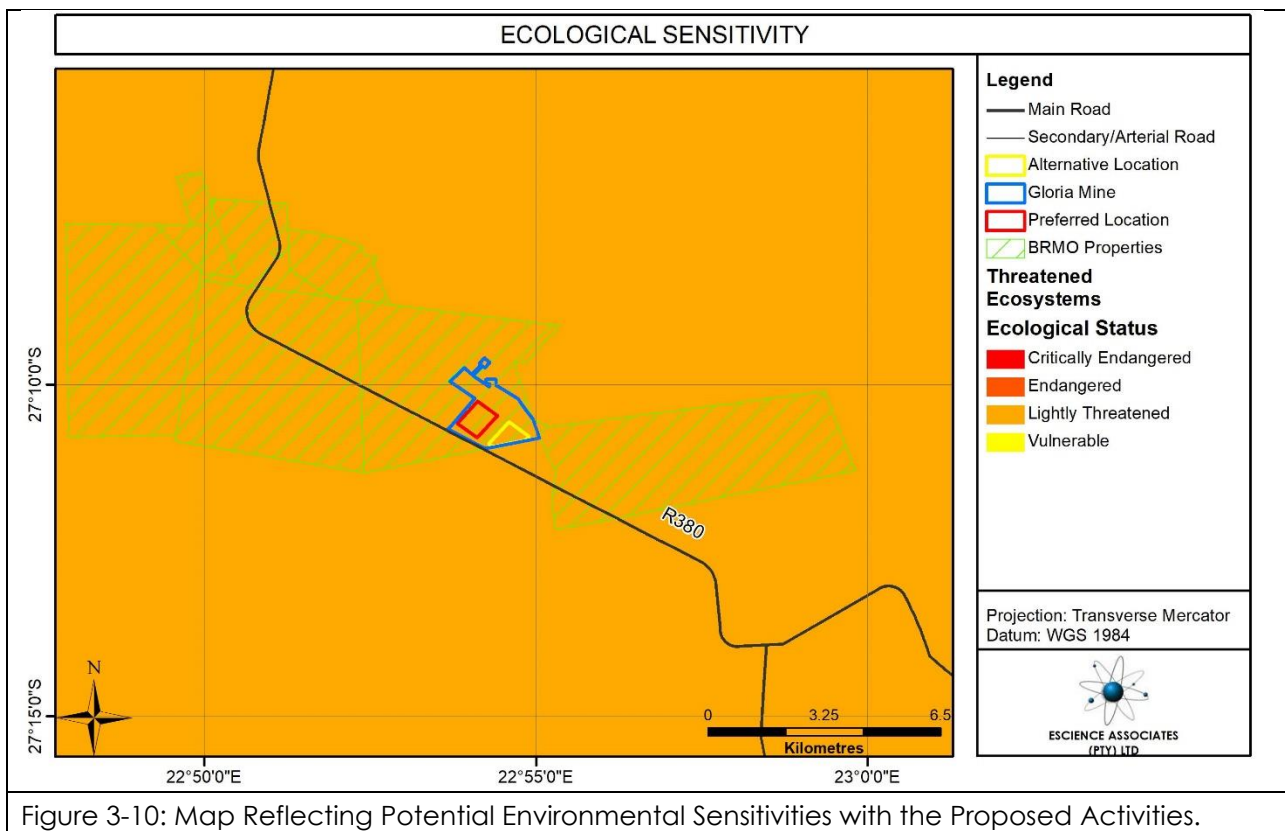


Figure 3-10: Map Reflecting Potential Environmental Sensitivities with the Proposed Activities.

#### 4.2.1 BIODIVERSITY

BRMO is located within the Savannah biome, and more specifically within the Eastern Kalahari Bushveld Bioregion, with some incursion into Kalahari Duneveld, according to a biodiversity assessment undertaken by Scientific Aquatic Services (Report Reference: SAS 211022 dated in May 2011, refer to Figure 3-11). The site consists of transformed land (current and legacy mining, and related infrastructure), open veld (presently used, rented to farmers who graze livestock), the Belgravia Game Farm (the only on-site area presently considered of increased sensitivity), and limited riparian habitat (related to the Gamagara River).

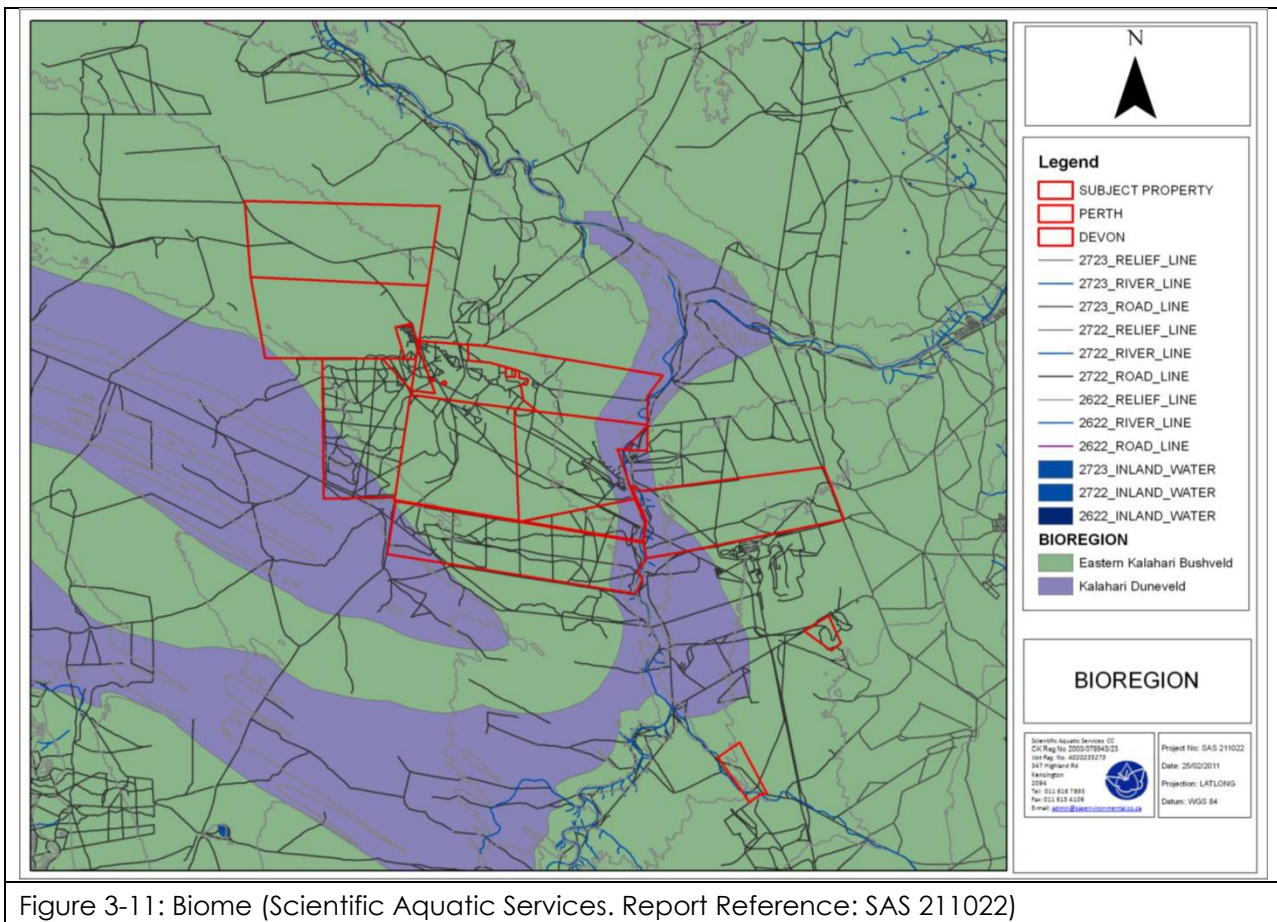


Figure 3-11: Biome (Scientific Aquatic Services. Report Reference: SAS 211022)

One broad habitat unit, namely the Kathu Bushveld, was identified for the majority of the preferred site and the alternative location. Small pockets of transformed areas were identified within the broader habitat unit of the preferred location and the alternative location. These vegetation transformations are associated with existing gravel roads leading to the existing TSF, as well as an existing fuel storage facility. Vegetation within the transformed habitat unit has been completely cleared, or is associated with limited vegetation cover.

The species composition and vegetation structure within the proposed site are typical of the Kathu Bushveld vegetation type. Bush encroachment of *Senegalia mellifera* (blackthorn or swarthaak) is noted within the Kathu Bushveld habitat unit associated with the preferred and alternative locations. Although individual species abundance differed for these vegetation communities, the species composition was similar, and both vegetation communities can be considered representative of the Kathu Bushveld vegetation type.

#### 4.2.1.1 Floral Diversity

When the boundary of the assessment site is superimposed on the vegetation types of the surrounding area, it is evident that the subject property falls within the Kalahari Thornveld and Shrub Bushveld veld type, Kathu Bushveld vegetation type, and partly in the Gordonia Duneveld vegetation type.

Several red data listed (RDL)/protected floral species are documented within the area, as shown in Table 3-7. The species identified are expected to be found throughout the site. None of the listed species may be cut, removed, relocated, or destroyed, without permits

having been issued by the relevant competent authorities, in terms of the legislation listed in Table 3-7.

The floral sensitivity is documented by SAS in Figure 3-13: Faunal Sensitivity (Scientific Aquatic Services. Report Reference: SAS 219153), which demonstrates similar levels of floral sensitivity for both proposed sites.

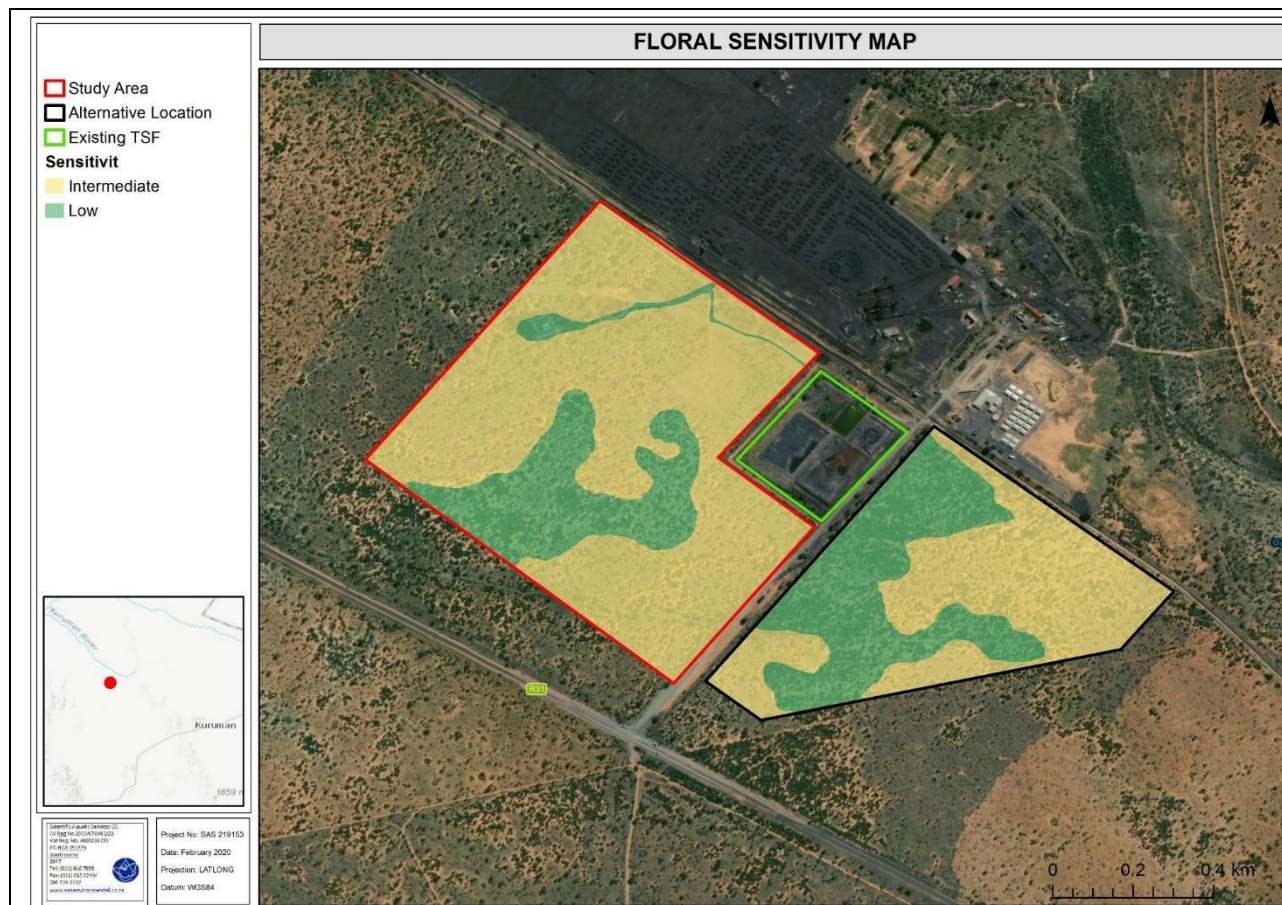


Figure 3-12: Floral Sensitivity (Scientific Aquatic Services. Report Reference: SAS 211022)

Protected species observed within the study areas are presented in Table 3-7.

Table 3-7: Protected species observed within the study area at the time of assessment or with increased likelihood to utilise the study area

Species	Status	Habitat Unit	POC
<i>Vachellia erioloba</i>	LC	Recorded within all habitat units during the assessment	100%
<i>Vachellia haematoxylon</i>	LC	Recorded within all habitat units during the assessment	100%
<i>Boscia albitrunca</i>	LC	Suitable habitat within the Kathu Bushveld, and observed in the surrounding region during the field assessment	60%
<i>Harpagophytum procumbens</i>	LC	Recorded within the Kathu Bushveld Habitat Unit	100%
<i>Hoodia gordonii</i>	DDD	Suitable habitat within the Kathu Bushveld	60%

<i>Lessertia frutescens</i> <i>subsp. frutescens</i>	LC	Suitable habitat within the Kathu Bushveld	60%
<i>Boophone disticha</i>	LC	Observed within the Kathu Bushveld and Degraded Bushveld Habitat	100%
<i>Orbea sp.</i>	LC	Recorded within the Kathu Bushveld	100%
<i>Babiana hypogaea</i>	LC	Previously recorded by STS in the vicinity of the study area. Suitable habitat within the Kathu Bushveld	60%
<i>Boscia albitrunca</i>	LC	Suitable habitat within the Kathu Bushveld, and observed in the surrounding region during the field assessment	60%
<i>Nerine laticoma</i>	LC	Suitable habitat within the Kathu Bushveld habitat unit	60%
<i>Harpagophytum procumbens</i>	LC	Recorded within the Kathu Bushveld Habitat Unit	100%

Medicinal plant species are not necessarily indigenous species, with many of them regarded as alien invasive weeds. The table below presents a list of dominant plant species with traditional medicinal value and the plant parts traditionally used, which were identified during the field assessment.

Table 3-8: Protected species observed within the study area at the time of assessment or with increased likelihood to utilise the study area		
Species	Name	Plant parts used
<i>Asparagus suaveolens</i>	Wild Asparagus	Rhizomes and flashy roots
<i>Dichrostachys cinerea</i>	Sickle Bush	Roots
<i>Elephantorrhiza elephantina</i>	Eland's Bean	Roots
<i>Tarchonanthus camphoratus</i>	Camphor Bush	Leaves
<i>Vachellia erioloba</i>	Camel Thorn	Pods, Gum, Bark, Roots
<i>Ziziphus mucronata</i>	Buffalo Thorn	Roots, Bark and Leaves
<i>Dicoma sp.</i>		Leaves and Twigs
<i>Harpagophytum procumbens</i>	Devil's Claw	Roots
<i>Salvia runcinata</i>	Wild Sage	Leaves
<i>Sansevieria aethiopica</i>	Bowstring Hemp	Rhizomes and Leaves
<i>Senna italica subsp. arachoides</i>	Wild Senna	Leaves
<i>Boophone disticha</i>	Poison Bulb	Bulb Scales

Alien and invasive floral species are floral species of exotic origin which are invading previously pristine areas or ecological niches. Not all weeds are exotic in origin but, as these exotic plant species have very limited natural "check" mechanisms within the natural environment, they are often the most opportunistic and aggressively growing species within the ecosystem. They are often the most dominant and noticeable within an area. Disturbances of the ground through trampling, excavations, or landscaping often leads to the dominance of exotic pioneer species that rapidly dominate the area. Under natural conditions, these pioneer species are overtaken by sub-climax and climax species through natural veld succession. This process, however, takes many years to occur, with the natural vegetation never reaching the balanced, pristine species composition prior to the disturbance. There are many species of indigenous pioneer plants, but very few indigenous species can out-compete their more aggressively growing exotic counterparts.

During the floral assessment, dominant alien and invasive plant species were identified and are listed in Table 3-9.

Table 3-9: Dominant alien floral species identified during the field assessment with their invasive status as per NEMBA: Alien and Invasive Species Lists, GN R598 of 2016.				
Scientific Name	Common Name	Origin	NEMBA Category	Habitat Unit
<b>WOODY SPECIES</b>				
<i>Nicotiana glauca</i>	Wild Tobacco	Argentina	1b	Kathu Bushveld Transformed Habitat
<i>Prosopis glandulosa</i>	Mesquite	Mexico	3	Kathu Bushveld Transformed Habitat
<i>Echinopsis schickendantzii</i>	Torch cactus	Argentina	1b	Transformed Habitat
<b>FORB SPECIES</b>				
<i>Argemone ochroleuca</i>	Mexican Poppy	Central America	1b	Kathu Bushveld Transformed Habitat
<i>Chenopodium album</i>	White goosefoot	Europe	N/C	Kathu Bushveld Transformed Habitat
<b>GRAMINOID SPECIES</b>				
<i>Pennisetum setaceum</i>	Fountain Grass	North Africa	1b	Transformed Habitat

#### 4.2.1.2 Fauna

No mammal species of conservation concern (SCC) were recorded during the specialists' site assessments (winter and summer). The majority of mammal SCC in these arid regions are often secretive and not often seen, as such signs like scat, spoor, and in the case of some species, burrows, were searched for. Burrows were observed. However, many appeared inactive, as they were full of debris and were evidently not in use. Burrows that did show signs of activity were that of the common faunal species, *Hystrix africaeaustralis* (Porcupine), with no spoor of any SCC observed at these burrows. Furthermore, the overall location of the study area, and close proximity to the mine and mining activities, is likely to preclude mammal SCC from the area, as they will likely opt to utilise the more intact habitat to the south.

It is evident that, at some point in the past, vegetation clearance must have occurred in the central and eastern portions of the preferred site as this area is open and devoid of any medium to large shrubs. This was part of the originally authorised BRMO expansion. Additionally, the study area is bordered by the mine, the current TSF, a busy mine access road, and a national road to the west. The property is fenced in with a perimeter mesh wire fence, which limits species movement for all but the smallest species (mongooses and rodents), resulting in a loss of habitat connectivity with the surrounding natural areas.

Avifaunal SCC *Ardeotis kori* (Kori Bustard, NT) was observed foraging in the north western portion of the study area. It is however unlikely that this species will utilise the study area for breeding due to its small size, proximity to active mining areas, and the availability of more suitable habitat in the surrounding areas. Additionally, the following avifaunal SCC may also occur in the study area, although this species will likely only utilise the study area for foraging as opposed to breeding, namely *Neotis ludwigii* (Ludwig's Bustard, EN).

No reptile SCC were observed during the field assessment. The entire study area provides intermediate habitat availability for reptile species. The Kathu Bushveld unit is well utilised by reptiles, as sufficient burrows and vegetation structure are available for habitation. However, rocky areas that would provide additional niche habitat are lacking. Adjacent mining activity edge effects, and continued human movement through the area, may impact on reptile occupancy of the site. However, many of the reptile species have already adapted to such, and the shift in occupancy rates is unlikely to be significant.

The area is not suitable habitat for amphibian species in any form. There are no permanent or seasonal streams or pans that may be utilised for breeding or temporary habitation. No insect SCC were observed during the site assessment nor are any likely to occur within the study area. No arachnid SCC were observed within the study area.

Habitat availability is considered intermediate. Vegetation disturbance in areas, and the dense stands of *Senegalia Mellifera*, does limit the overall provision of habitat for faunal species. The small size, decreased food resources, and continuous mining activities in the surrounding area, further lower the habitat suitability of the study area.

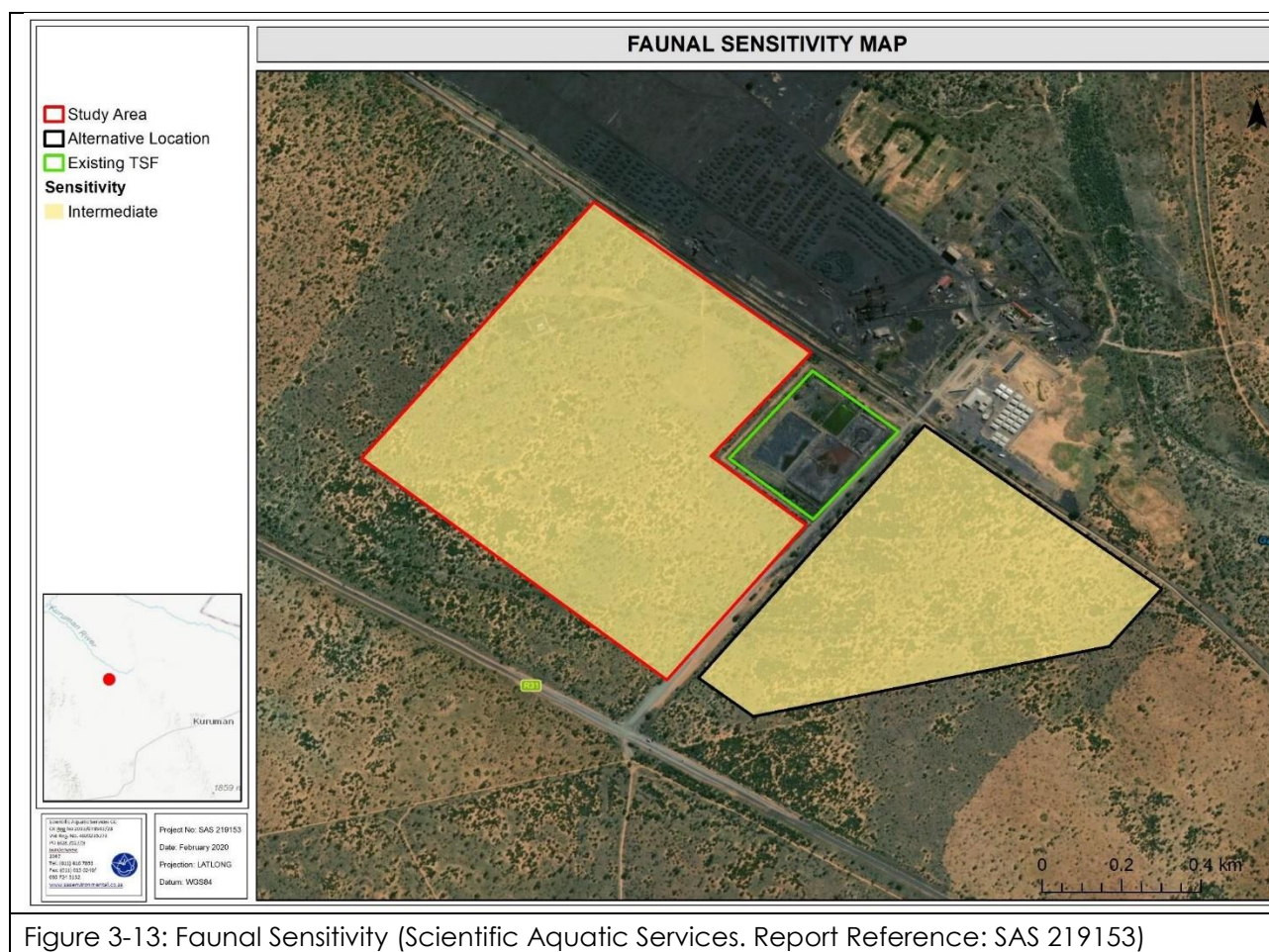


Figure 3-13: Faunal Sensitivity (Scientific Aquatic Services. Report Reference: SAS 219153)

### 4.3 SOCIO-ECONOMIC

The proposed development will have limited, if any, direct social and economic benefits to the area, with the exception of maintaining the economically sustainable operation of the

mine by improving its efficiency and competitiveness. Further social attributes that may typically be affected would include noise, traffic, and light pollution, but these will be unchanged.

The proposed SFSF will replace the operation of the existing Gloria TFS, and thus there will be no direct creation of new job opportunities. Opportunities from the construction phase will be congruent with existing mine expansion activities that have been underway since 2013, thus it is not anticipated that there will new opportunities in this regard.

## **4.4 HERITAGE**

### **4.4.1 ARCHAEOLOGICAL AND CULTURAL**

In addition to the specialist assessment undertaken for the proposed sites, Heritage Impact Assessments have been undertaken at BRMO in 2009 (African Heritage Consultants CC, Cultural Heritage Impact Assessment, 2009) and 2011 (Archaeos, Culture & Cultural report ASBR, 2011). Various sites of significance have been identified within the BRMO properties. These include:

- The Old Black Rock Mine works (otherwise referred to as the Black Rock Koppie) and associated infrastructure;
- Mine workers' cemetery;
- Sites of Stone Age origin in the Gamagara river basin;
- Farm cemetery on the farm Belgravia.

BRMO has subsequently developed a Heritage Management Plan. At present, all identified sites of heritage significance are outside the proposed location of the planned SFSF.

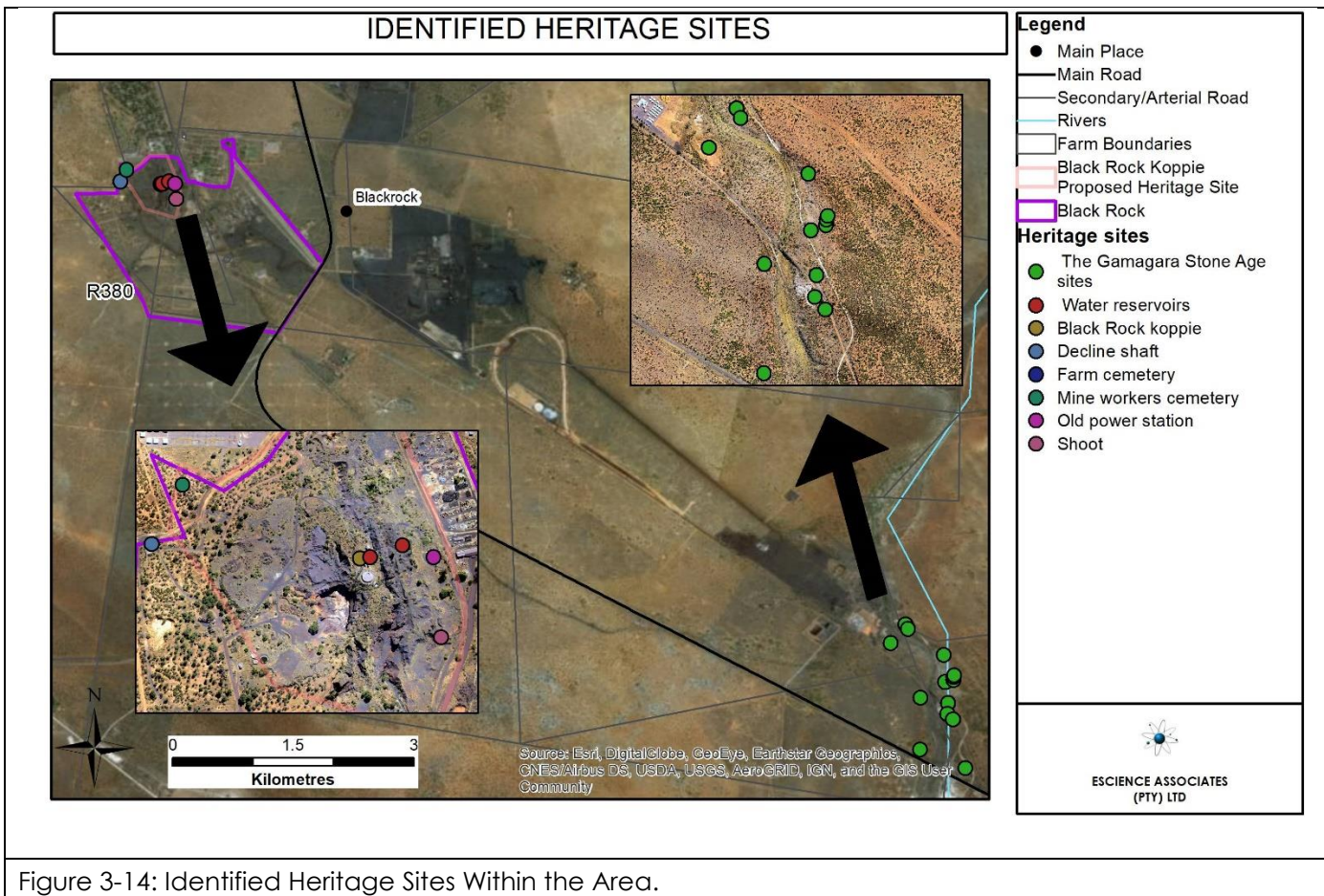


Figure 3-14: Identified Heritage Sites Within the Area.

Various Stone Age sites and scattered Stone Age material have been identified in the region. The Late Stone Age sites are associated with the San people. The specialist notes that the language group who occupied the Northern Cape is the /Auni-//Khomani and Eastern /Hoa. These people were hunters and gatherers, which means that they would have moved around, leaving little trace of their existence. Notably, No such heritage sites were identified during the site survey. The specialist notes that no Early or Middle Iron Age sites have been identified in the area of study, and the chances of finding any Iron Age remains in the study area are thus extremely slim, if not impossible.

#### 4.4.2 PALAEOLOGICAL

According to the palaeontological specialist, BRMO is underlain by the Cretaceous to Tertiary Kalahari Formation (Qs) and underlying Griqualand West Basin rocks, Transvaal Supergroup of Vaalian age.



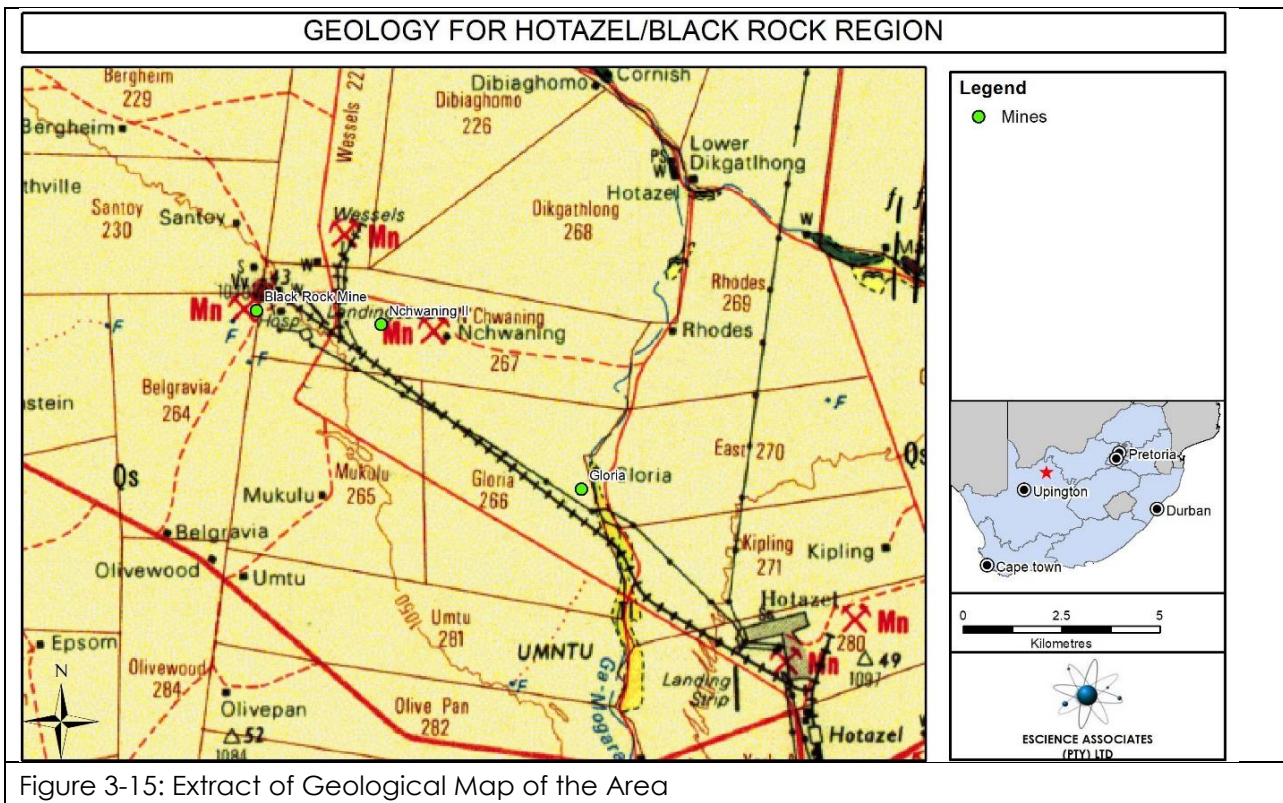


Figure 3-15: Extract of Geological Map of the Area

The Kalahari deposits are approximately Ca 65 – 2.5 million years old (Ma). The Cenozoic Kalahari Group is the most widespread body of terrestrial sediments in Southern Africa. The Cenozoic sands and calcretes of the Kalahari Group range in thickness from a few metres to more than 180 m (Partridge et al., 2006). The youngest formation of the Kalahari group is the Gordonia Formation, which is generally termed Kalahari Sand and comprises of red aeolian sands that covers most of the Kalahari Group sediments. The pan sediments of the area originated from the Gordonia Formation and contain white to brown fine grained silts, sands, and clays. Some of the pans consist of clayey material mixed with evaporates that show seasonal effects of shallow saline groundwaters. Quaternary alluvium, aeolian sands, surface limestone, silcrete, and terrace gravels are also included in the Kalahari Group (Kent 1980).

The fossil assemblages of the Kalahari are generally very low in diversity, and occur over a wide range, and thus the palaeontological diversity of this Group is low. These fossils represent terrestrial plants and animals with a close resemblance to living forms (refer to Table 3-10). Fossil assemblages include bivalves, diatoms, gastropod shells, ostracods, and trace fossils.

Subgroup/Sequence	Group	Formation	Fossil Heritage	Comment
Tertiary-Quaternary	Kalahari	-	Terrestrial organisms	Trace fossils, ostracods, bivalves, gastropod shells, diatoms
Griqualand West Super Group	Campbell	Ghaapplato (Vgh)	Stromatolites	Cyanobacterial microfossils are present
-	Griquastad	Asbestos Hills	Stromatolites	Cyanobacterial microfossils are present

Hotazel is located in the Griqualand West Basin, Northern Cape Province, which consists of clastic sediments, as well as volcanic rocks, diamictites, and banded iron formations. Manganese deposits are present in the Hotazel Formation, upper Postmasburg Group (approximately 2222 Ma). The Vryburg Formation is the basal unit and overlies unconformably the granite and rocks of the Ventersdorp Supergroup. The Campbell Group overlies the Vryburg Formation and consists of the Schmidtsdrif Formation and the upper Ghaap Plateau Formation. The Griquatown Group is divided into two formations, namely the Asbestos Hills and Koegas Formations. The Gamagara Formation follows, and is positioned on, the Maremane Anticline, and is overlain by the Makganyene Formation. The Cox Group comprises of the lower Ongeluk Formation and the upper Voëlwater Formation. The Ongeluk Formation was deposited under water and reaches a thickness of between 400 and 900 m. This Formation is basal, and is mainly volcanic (Visser 1989). Manganese is present in the upper Voëlwater Formation (Snyman 1996). According to Kent (1980) and Snyman (1996), the Griqualand West Basin attains a maximum thickness of 4500 m.

Algal growth structures, also known as "Stromatolites", are fossil structures from the dolomites of the Transvaal Supergroup. Stromatolites are layered mounds, columns, and sheet-like sedimentary rocks. These structures were originally formed by the growth of layer upon layer of cyanobacteria, a single-celled photosynthesizing microbe. Cyanobacteria are prokaryotic cells (the simplest form of modern carbon-based life). Stromatolites are first found in Precambrian rocks, and are known as the earliest known fossils. The oxygen atmosphere that we depend on was generated by numerous cyanobacteria photosynthesizing during the Archaean and Proterozoic Era.

According to the SAHRIS palaeo-sensitivity map (Figure 3-16), there is very little chance of finding fossils in this area, and a desktop study of the area of interest is required.

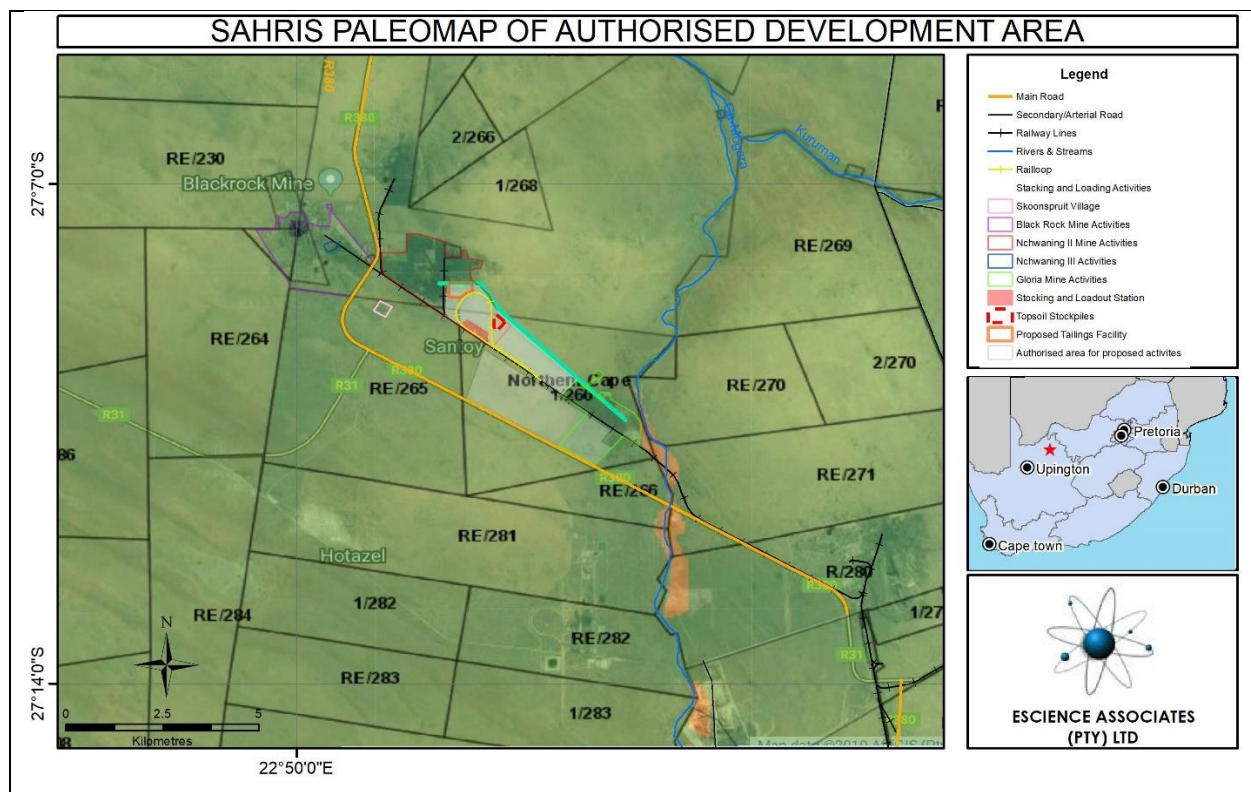


Figure 3-16: Extract of the 1: 250 000 SAHRIS Palaeo Map (Council of Geosciences)

## 4.5 CURRENT LAND USE

The current proposed sites are within the mining right area. All the alternatives fall within areas dominated by natural vegetation. As indicated in Figure 3-17 of this report, the region surrounding BRMO is dominated by mining, industrial, and agricultural (generally livestock production) land uses. Land in the immediate vicinity of BRMO that is not used for mining/industrial purposes, is utilised for livestock farming (i.e. sheep, goats, and cattle) and game farming (refer to Figure 3-18). The proposed site is currently reserved for mining activities.

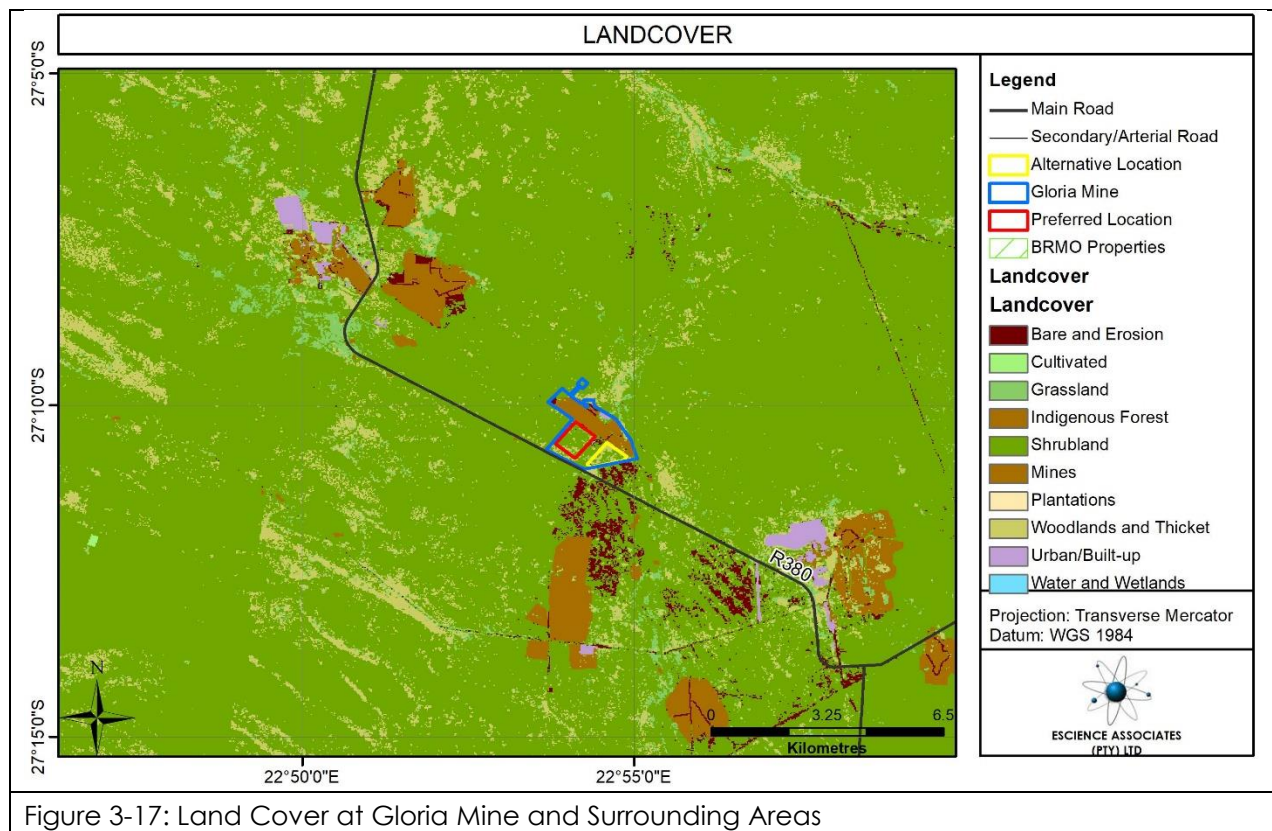


Figure 3-17: Land Cover at Gloria Mine and Surrounding Areas

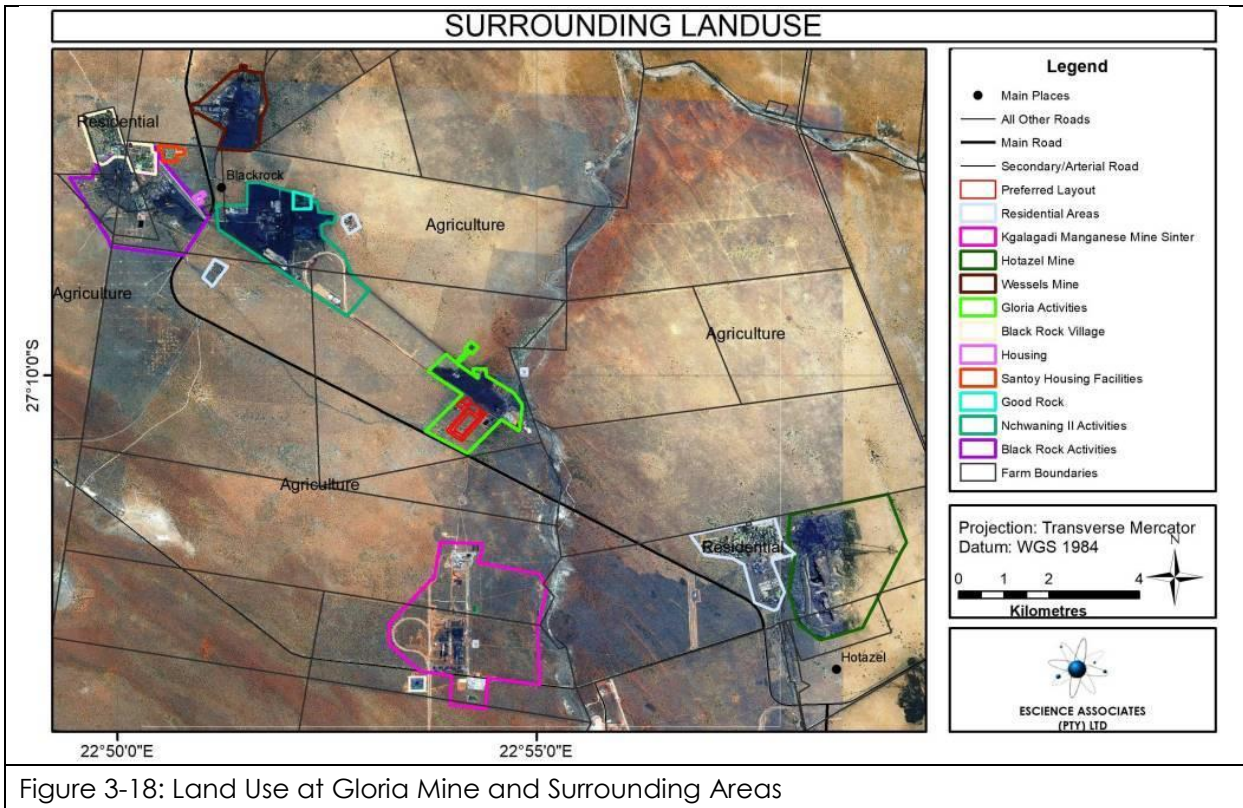


Figure 3-18: Land Use at Gloria Mine and Surrounding Areas

## 5 IMPACT SUMMARY

A summary of the impact assessment findings is presented below. This is in accordance with the findings of the environmental impact assessment report.

### 5.1 METHODOLOGY

The findings and conclusion of the specialists apply where specialist assessments have been undertaken, as per the approved plan of study for EIA. The following methodology is used to determine the significance of environmental impacts, where a specialist study was not deemed necessary as per the plan of study for EIA in the approved scoping report.

#### 5.1.1 TYPE/NATURE OF IMPACTS

Potential environmental impacts may either have a positive or negative effect on the environment, and can in general be categorised as follows:

a. Direct/Primary Impacts

Primary impacts are caused directly due to the activity, and generally occur at the same time and at the place of the activity.

b. Indirect/Secondary Impacts

Secondary impacts induce changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken.

c. Cumulative Impacts

Cumulative impacts are those that result from the incremental impact of the activity on common resources, when added to the impacts of the other past, present, or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time, and can include both direct and indirect impacts.

#### 5.1.2 DETERMINING SIGNIFICANCE

The following criteria were used to determine the significance of an impact. The scores associated with each of the levels within each criterion are indicated in brackets, after each description [like this].

##### 5.1.2.1 Nature

Nature (N) considers whether the impact is:

- Positive [- ¼];
- Negative [+1].

##### 5.1.2.2 Extent

Extent (E) considers whether the impact will occur:

- On site [1];
- Locally: within the vicinity of the site [2];
- Regionally: within the local municipality [3];
- Provincially: across the province [4];
- Nationally or internationally [5].

### **5.1.2.3 Duration**

Duration (D) considers whether the impact will be:

- Very short term: a matter of days or less [1];
- Short term: a matter of weeks to months [2];
- Medium term: up to a year or two [3];
- Long term: up to 10 years [4];
- Very long term: 10 years or longer [5].

### **5.1.2.4 Intensity**

Intensity (I) considers whether the impact will be:

- Negligible: there is an impact on the environment, but it is negligible, having no discernible effect [1];
- Minor: the impact alters the environment in such a way that the natural processes or functions are hardly affected; the system does however, become more sensitive to other impacts [2];
- Moderate: the environment is altered, but function and process continue, albeit in a modified way; the system is stressed but manages to continue, although not with the same strength as before [3];
- Major: the disturbance to the environment is enough to disrupt functions or processes, resulting in reduced diversity; the system has been damaged and is no longer what it used to be, but there are still remaining functions; the system will probably decline further without positive intervention [4];
- Severe: the disturbance to the environment destroys certain aspects and damages all others; the system is totally out of balance and will collapse without major intervention or rehabilitation [5].

### **5.1.2.5 Probability**

Probability (P) considers whether the impact will be:

- Unlikely: the possibility of the impact occurring is very low, due either to the circumstances, design, or experience [1];
- Likely: there is a possibility that the impact will occur, to the extent that provisions must be made for it [2];
- Very likely: the impact will probably occur, but it is not certain [3];
- Definite: the impact will occur regardless of any prevention plans, and only mitigation can be used to manage the impact [4].

### **5.1.2.6 Mitigation or Enhancement**

Mitigation (M) is about eliminating, minimising, or compensating for negative impacts, whereas enhancement (H) magnifies project benefits. This factor considers whether –

- A negative impact can be mitigated:
- Unmitigated: no mitigation is possible or planned [1];
- Slightly mitigated: a small reduction in the impact is likely [2];
- Moderately mitigated: the impact can be substantially mitigated, but the residual impact is still noticeable or significant (relative to the original impact) [3];
- Well mitigated: the impact can be mostly mitigated, and the residual impact is negligible or minor [4];

A positive impact can be enhanced:

- Unenhanced: no enhancement is possible or planned [1];
- Slightly enhanced: a small enhancement in the benefit is possible [2];

- Moderately enhanced: a noticeable enhancement is possible, which will increase the quantity or quality of the benefit in a significant way [3];
- Well enhanced: the benefit can be substantially enhanced to reach a far greater number of receptors or recipients and/or be of a much higher quality than the original benefit [4].

### 5.1.3 CALCULATING IMPACT SIGNIFICANCE

The table below summarises the scoring for all the criteria.

Table 5-1: Scoring for Significance Criteria						
CRITERION	SCORES					
	- ¼	1	2	3	4	5
N-nature	positive	negative	-	-	-	-
E-extent	-	site	local	municipal	provincial	national
D-duration	-	very short	short	moderate	long	very long
I-intensity	-	negligible	minor	moderate	major	severe
P-probability	-	very unlikely	unlikely	likely	very likely	definite
M-mitigation	-	none	slight	moderate	good	-
H-enhancement	-	none	slight	moderate	good	-
R-reversibility	-	none	slight	moderate	good	-

Impact significance is a net result of all the above criteria. The formula proposed to calculate impact significance (S) is:

- For a negative impact:  $S = N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$ ; and
- For a positive impact:  $S = N \times (E+D) \times I \times P \times (H)$ .

Negative impacts score from 2 to 200. Positive impacts score from - ½ to -200.

### 5.1.4 UNDERSTANDING IMPACT SIGNIFICANCE

The following is a guide to interpreting the final scores of an impact (for negative impacts):

Table 5-2: Final Significance Scoring		
Final Score (S)	Impact Significance	
0 – 10	Negligible	The impact should result in no appreciable damage to the environment, except where it has the opportunity to contribute to cumulative impacts.
10 – 20	Low	The impact will be noticeable but should be localised or occur over a limited time period, and not cause permanent or unacceptable changes; it should be addressed in an EMP and managed appropriately.
20 – 50	Moderate	The impact is significant and will affect the integrity of the environment; effort must be made to mitigate and reverse this impact. In addition, the project benefits must be shown to outweigh the impact.

Final Score (S)	Impact Significance	
50 – 100	High	The impact will affect the environment to such an extent that permanent damage is likely, and recovery will be slow and difficult; the impact is unacceptable without real mitigation or reversal plans. Project benefits must be proven to be very substantial; the approval of the project will be in jeopardy if this impact cannot be addressed.
100 – 200	Severe	The impact will result in large, permanent, and severe impacts, such as sterilising of essential environmental resources, local species extinctions, and/or eco-system collapse; project alternatives that are substantially different should be considered, otherwise the project should not be approved.

## 5.2 IMPACT SUMMARY

A summary of the impact assessment outcomes is presented in Table 5-3 below.

Phase	Impact	Without Mitigation	With Mitigation
Construction	Management and Disposal of General Waste	Moderate	Low
	Management and Disposal of Hazardous Waste	Moderate	Low
	Air Quality	Low	Low
	Noise	Low	Negligible
	Socio-Economic	Positive (Moderate)	Not Applicable
	Visual/Aesthetic	Low	Negligible
	Odour	Negligible	Negligible
	Surface Water	Negligible	Negligible
	Traffic	Negligible	Negligible
	Groundwater Contamination	Low	Negligible
	Soil Contamination	Low	Negligible
	Groundwater Availability/Interception	Negligible	Negligible
	Heritage Resources (Archaeological)	Low	Negligible
	Heritage Resources (Paleontological)	Negligible	Negligible
	Biodiversity (Flora)	Medium-high	Medium-low
Biodiversity (Fauna)	Medium-low	Medium-low	
Operation	Management and Disposal of General Waste	Low	Negligible
	Management and Disposal of Hazardous Waste	Low	Negligible



Table 5-3: Summary of Environmental Impact Assessment			
Phase	Impact	Without Mitigation	With Mitigation
	Air Quality	Negligible	Negligible
	Noise	Negligible	Negligible
	Socio-Economic	Positive (Negligible)	Not Applicable
	Odour	Negligible	Negligible
	Visual/Aesthetic	Low	Negligible
	Surface Water	Low	Negligible
	Traffic	Negligible	Negligible
	Biodiversity (Flora)	Medium-low	Medium-low
	Biodiversity (Fauna)	Medium-low	Medium-low
	Groundwater Contamination	Low	Low
	Soil Contamination	Low	Low
	Heritage Resources (Archaeological)	Negligible	Negligible
	Heritage Resources (Paleontological)	Negligible	Negligible
Decommissioning	Management and Disposal of General Waste	Moderate	Low
	Management and Disposal of Hazardous Waste	Moderate	Low
	Air Quality	Low	Low
	Noise	Low	Negligible
	Socio-Economic	Positive (Moderate)	Not Applicable
	Odour	Negligible	Negligible
	Visual/Aesthetic	Low	Negligible
	Surface Water	Negligible	Negligible
	Traffic	Negligible	Negligible
	Groundwater Contamination	Low	Low
	Soil Contamination	Low	Low
	Biodiversity (Flora)	Medium-low	Medium-low
	Biodiversity (Fauna)	Medium-low	Medium-low
	Heritage Resources (Archaeological)	Negligible	Negligible
Heritage Resources (Paleontological)	Negligible	Negligible	

## 6 ENVIRONMENTAL MANAGEMENT GOALS AND OBJECTIVES

The environmental consequences/impacts on the receiving 'environment' associated with the proposed super fines storage facility were addressed within the EIA report. This section is an additional tool used to provide the assurances that BRMO has made suitable provision for the effective mitigation of the aforementioned consequences/impacts. This section furthermore, describes the method and procedures required for the effective mitigation and monitoring of impacts; where the prescribed mitigation and monitoring actions are closely linked with environmental objectives and targets that the proponent needs to achieve in order to reduce, or eliminate, negative impacts over the full project lifecycle (Aucamp, 2010).

To ensure that the impacts associated with the facilities as a whole are properly mitigated, managed and/or avoided (where possible), a number of specific environmental objectives have been defined for the project. The environmental objectives need to be attained and/or maintained to ensure satisfactory environmental management of the affected areas and the potential cumulative impacts on the surrounding environment. The objectives below are in alignment with broader BRMO EMPr.

Topography	<ul style="list-style-type: none"> <li>To minimise topographic disturbances resulting from mining and expansion project related activities;</li> <li>To minimise the potential impacts of the mining activities and project on surface hydrology;</li> <li>To minimise the potential for soil erosion resultant from the creation of steep slopes; and</li> <li>To ensure that any alteration to site topography resultant from mining activities and the project can be reversed to the extent that it does not conflict with end-use planning objectives for the site.</li> </ul>
Soils	<ul style="list-style-type: none"> <li>To effectively mitigate potential soil contamination impacts;</li> <li>To maintain the viability of the site soils (particularly topsoil) for future rehabilitation purposes;</li> <li>To ameliorate any altered ecological, physical and chemical properties of soils resulting through stripping, handling and stockpiling of 'topsoil'; and</li> <li>To install and maintain long-term erosion control measures.</li> </ul>
Land Capability	<ul style="list-style-type: none"> <li>To restore the affected surfaces to arable land capability; and</li> <li>To re-establish indigenous, pre-development, floral species that will stabilise the soils in the short term, and re-create the natural grassland and/or grazing lands in the long term, so that the area can be returned to its natural state as far as possible, and used for agricultural purposes.</li> </ul>
Land Use	<ul style="list-style-type: none"> <li>To restore the affected surface area to pre-mining status so that pre-mining land use activities can be resumed; and</li> <li>To reduce the area that is to be disturbed, and contain the impacts on the natural habitat caused by the mechanised equipment.</li> </ul>
Vegetation	<ul style="list-style-type: none"> <li>To minimise mining activities and project impact on the natural bio-diversity of the area to the greatest extent that is practical;</li> </ul>

	<ul style="list-style-type: none"> <li>• To control the establishment and propagation of alien invasive vegetation within the development area;</li> <li>• To ensure that protected trees removed during construction are re-established at closure and through concurrent rehabilitation efforts in similar numbers;</li> <li>• To ensure that the impact of the mining activities and project on protected floral species is appropriately off-set for the operational lifespan thereof and effectively remediated at closure; and</li> <li>• To re-introduce pioneer grass species for effective rehabilitation, such that will ensure natural succession over time.</li> </ul>
Animal Life	<ul style="list-style-type: none"> <li>• To minimise mining activities and project impacts on the natural bio-diversity of the area to the greatest extent that is practical; and</li> <li>• To ensure the prevention of animal hunting and poaching throughout the life of mine.</li> </ul>
Surface- and Ground Water	<ul style="list-style-type: none"> <li>• To ensure that no mining and project activities, or infrastructure, negatively influence ground- or surface water quality, or quantity, to the extent that human health or livelihoods are negatively influenced; and</li> <li>• To pro-actively monitor the mining activities and project's impacts on ground- and surface water quality/quantity, such that pro-active measures can be instituted by the BRMO to mitigate such impacts, where identified.</li> </ul>
Noise	<ul style="list-style-type: none"> <li>• To reduce the impact of mining related noise on the overall environment, and within the proposed mining area in particular.</li> </ul>
Socio-economic	<ul style="list-style-type: none"> <li>• To limit the socio-economic impacts as a result of cessation of the mining activities.</li> </ul>
Maintenance	<ul style="list-style-type: none"> <li>• To monitor and manage post-closure impacts until closure is obtained.</li> </ul>
Infrastructure	<ul style="list-style-type: none"> <li>• To find alternative uses for mine infrastructure, or if not possible, to ensure that the components are properly considered within the rehabilitation plan as stated.</li> </ul>
Waste	<ul style="list-style-type: none"> <li>• To minimise waste, and reduce/reuse/recycle where practical.</li> <li>• To collect and dispose of all waste at a permitted disposal site; where waste recovery, recycling or reuse alternatives are not reasonable or feasible.</li> </ul>
Air Quality	<ul style="list-style-type: none"> <li>• To minimise emissions where practical.</li> <li>• To ensure that emissions of atmospheric pollutants and subsequent impact on ambient air quality is within acceptable standards.</li> </ul>

## 6.1 CLOSURE OBJECTIVES

One also needs to make a distinction between the objectives for on-going environmental management applicable to the construction and operational phases, and the objectives for mine closure; where the inherent linkages between such objectives also need to be acknowledged. The most effective means of ensuring that closure objectives are achieved,

is by ensuring that all preceding development phases are managed with 'mine closure' in mind, as follows:

- Design with closure in mind;
- Construct with closure in mind; and
- Operate with closure in mind.

The broad overall environmental objectives of mine closure are proposed as follows:

- To rehabilitate the disturbed areas to arable grazing land capable of at least supporting an extensive livestock production system;
- To restore the pre-development topography to the greatest extent that is practical and feasible at closure;
- To restore the site biodiversity and ecological system functioning to as close as practically possible to pre-development conditions;
- To ensure that the site is made safe; where such entails:
  - Remediation of contaminated land;
  - Effective sealing-off of shafts and declines; and
  - Effective removal and decommissioning of redundant structures and infrastructure;
- To ensure that final site shaping allows for free drainage of rainwater and the prevention of erosion;
- To ensure that the pollution generating potential of residue deposits and residue stockpiles is addressed through appropriate capping and closure thereof, where applicable; and
- To ensure that there are no significant residual impacts on the underlying calcrete aquifer.
- To ensure that significant entrainment of particulate matter is prevented through adequate land cover and shaping where necessary.

## **7 ENVIRONMENTAL IMPACT MANAGEMENT**

The environmental mitigation tables to follow provide the management measures recommended to prevent and/or manage the potential environmental impacts associated with BRMO's activities. In addition to the management measures provided, the table indicates the person responsible to ensure that these commitments are adhered to and implemented.

It is the responsibility of BRMO to ensure that the commitments made in this EMPr are realised. Management must ensure that adequate resources are available to this end.

### **7.1 KEY ROLES AND RESPONSIBILITIES**

This section summarises the roles and responsibilities of key persons. It must be noted that the successful implementation of the management actions herein requires an integrated approach between the various parties and there may be overlap of responsibilities or practical requirements for delegation between the parties.

#### **7.1.1 THE PROPONENT (ASSMANG (PTY) LTD)**

Assmang BRMO will be responsible for the overall implementation, monitoring and enforcement of the activities as outlined in the EMPr. The site manager, will be a senior designate from Assmang BRMO, and will be responsible for overseeing that environmental compliance and monitoring is performed, and will direct correspondence with the relevant authorities.

Assmang BRMO remains ultimately responsible for ensuring that all activities are implemented according to the provisions of the EMPr and all conditions of relevant licences/permits/approvals/authorisations. Although role-players will be appointed by Assmang to perform certain functions on its behalf, the ultimate responsibility is not delegated. Assmang must ensure that sufficient resources (time, financial, human, equipment, etc.) are available to these other parties to efficiently perform their tasks in terms of the EMPr. Assmang is liable for harm caused to the environment; consequently, members of staff must be responsible and accountable for compliance with the EMPr where applicable.

#### **7.1.2 ENVIRONMENTAL SPECIALIST**

Assmang BRMO must appoint/designate a senior representative as Environmental Specialist to act on its behalf. The duties of this representative, as relevant, would include:

- Ensure compliance with the requirements of the EMPr;
- Ensure that the EMPr is part of relevant contractual documentation so that any contractors are bound to the conditions of the EMPr and relevant licences, permits/approvals/authorisations;
- Ensure environmental awareness training is undertaken for all new personnel coming onto site, and undertake environmental awareness courses themselves where appropriate;
- Appoint an Environmental Officer (Environmental Officer) to assist with day-to-day EMPr implementation and monitoring duties;

- Provide necessary support to the Environmental Officer to facilitate the fulfilment of the Environmental Officer's duties and responsibilities;
- Ensure that necessary information and planning data is available to the Environmental Officer timeously for fulfilment of the Environmental Officer's duties and responsibilities;
- Ensure that the necessary environmental authorisations and permits have been obtained and are maintained;
- Review operational procedures in conjunction with the Environmental Officer;
- Monitor, review and verify compliance with the EMPr as reported by the Environmental Officer, and drive action if the specifications are not followed or issues of non-compliance are not addressed in a timeous manner;
- Assist the Environmental Officer in finding environmentally responsible and effective solutions to challenges encountered during implementation;

### **7.1.3 ENVIRONMENTAL OFFICER**

BRMO's Environmental Officer will be responsible for monitoring, reviewing and verifying compliance with the EMPr on a day-to-day basis. This role may be fulfilled by any suitably qualified and responsible representative involved with daily on-site operations. In particular, the Environmental Officer shall:

- Regularly inspect and continuously monitor the site to ascertain the level of compliance with the EMPr;
- Maintain inspection reports on file;
- Monitor and verify that the EMPr is adhered to at all times and take action if the specifications are not followed;
- Monitor and verify that environmental impacts are kept to a minimum;
- Assist Assmang in finding environmentally responsible solutions to problems;
- Inform and advise the Environmental Specialist where applicable of EMPr, legal, and/or permitting requirements to facilitate planning and environmental legal compliance;
- Keep records of all activities/incidents concerning environmental performance;
- Keep a register of complaints from IAPs;
- Provide material/manuals and support for raising environmental awareness of staff;
- Ensure that activities on site comply with legislation of relevance to the environment;
- Liaise with relevant authorities;
- Liaise with contractors regarding environmental management.
- Complete checklists as necessary; and
- Internally review the EMPr and liaise with the Environmental Specialist.

#### **7.1.4 LIAISON WITH AUTHORITIES**

The Environmental Specialist would be responsible for liaising with all relevant competent authorities (NC DENC, DEFF, DMR, DHWS, etc.). The Environmental Officer would be responsible for submitting Environmental Audit Reports on the activities related to the proposed activities to these Departments where required. The Environmental Officer in consultation with the Environmental Specialist will be responsible for reporting of environmental incidents. The Environmental Officer, in consultation with the Environmental Specialist, will be responsible for accompanying or arranging the logistics of site inspections by the competent authorities.

#### **7.1.5 LIAISON WITH CONTRACTORS**

The Environmental Officer, in consultation with the Environmental Specialist, will be responsible for informing the contractors of any decisions that are taken concerning the natural and social environment during the project activities. This would also include informing the contractors of the necessary corrective actions to be taken against employees transgressing the management activities stipulated in this EMP.

#### **7.1.6 ENVIRONMENTAL CONTROL OFFICER (ENVIRONMENTAL CONTROL OFFICER)**

It is recommended that an independent Environmental Control Officer be appointed by Assmang BRMO for significant construction phase activities. The Environmental Control Officer would need to conduct regular independent audits to assess compliance with the EMP and be responsible for providing feedback on potential environmental problems associated with the activities on site.

The Environmental Control Officer will:

- Assist the Environmental Officer in ensuring that necessary environmental authorisations and permits are obtained;
- Undertake independent audits with regards to compliance with the EMP;
- Compile audit reports identifying areas of non-compliance and recommendations for rectification thereof; and
- Assist Assmang in achieving and maintaining acceptable environmental management practices.

### **7.2 COMPLIANCE MONITORING, RECORD KEEPING, AND UPDATING**

An essential aspect of any EMP is the review process. This includes auditing, record keeping, reporting and updating. The findings of the review process can inform planning on the mine, allowing future operations to benefit from the experiences of the past.

#### **7.2.1 COMPLIANCE MONITORING**

Foremost, auditing must be undertaken in accordance with the requirements of the various environmental permits issued for the site. Audits must include the following three key investigation techniques:

- Document review, including previous audit reports, technical reports, and monitoring data, etc.;
- Interviews with relevant staff and contractors; and
- Observation of activities and environmental management on the site.

Audit reports must:

- Specify whether the requirements of the EMP are adhered to;

- Include an interpretation of relevant data and analyses in respect of operation of the site and impacts on the environment;
- Recommend corrective and/or preventative action and target dates for the implementation of the recommendations;

### 7.2.2 RECORD KEEPING

Record keeping must be done in such a way that all information generated can be accessed easily in the future. The information must be clearly labelled and filed. All reports must be dated, and all monitoring results must specify monitoring points and where applicable provide comparison to permit standards or otherwise applicable legislated environmental standards. Audit and related corrective/preventative actions must be recorded and filed. Records must be kept for a period of at least 5 years from date generated unless a longer period is stipulated in any applicable permit or legislation.

### 7.2.3 UPDATING THE EMPr

An EMPr is a working document. As management methods are improved and as the mine operations change, requiring new methods and allowing others to fall away, the EMPr needs to be adjusted to reflect these changes. It is recommended that a biennial review of the adequacy of the EMPr be undertaken. The review process must consider:

- Changes in mine plans and operations which may be of significance;
- Results of audit and inspections;
- Monitoring results and trends identified;
- Changes in legislation;
- Advancements in environmental management best practice;

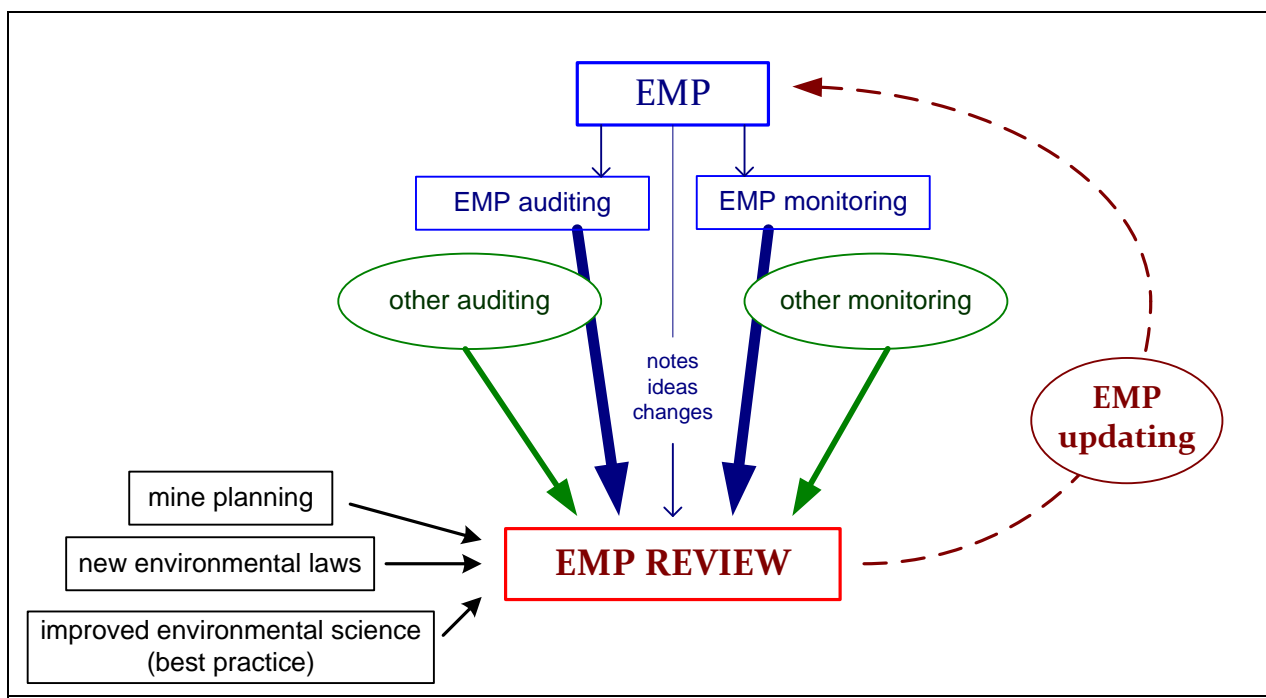


Figure 7-1: Conceptual diagram for EMPr review cycle. Note the main division between internal information, such as auditing and monitoring, and external information, such as changes to environmental laws and regulations, which should provide input on the revision of the EMPr.



### **7.3 NOTE ON DEVELOPMENT PHASES**

The EMPr is divided into the actions required for each phase of BRMO's activities, namely:

- Planning and design;
- Construction;
- Operations (the life of the activity); and
- Closure and aftercare.

The phases above may be applicable concurrently to different activities at BRMO.

## 7.4 GENERAL REQUIREMENTS

Table 7-1: General Requirements					
Activity/Structure/Infrastructure	General requirements applicable to all phases of the authorised activities				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Access to EMPr and permits	Awareness of the requirements of the EMPr and environmental permits	A copy of this EMPr (or relevant sections of it), and relevant environmental permits must be kept at the areas where the activity will be undertaken. These must be made available for inspection by any employee or contractor who works or undertakes work at the site.	All persons must have practical access to the EMPr and environmental permits relevant to their work/activities.	Environmental Officer	Continuous
Changing Circumstances	New legislation and updates of existing legislation	Where new legislation gazetted, or existing legislation is updated, and the new provisions are in conflict with the stipulations of the legislation, the legislation will take precedence unless otherwise indicated in the relevant transitional arrangements.	Compliance with current legislation at all times.	Environmental Specialist	Continuous
	Significant changes in planned or operational circumstances require that the EMPr be updated.	The competent authority must be informed of any significant changes to the activity descriptions, the proponent's details, or the EMPr.	The approved EMPr is kept up to date at all times	Environmental Specialist	Continuous
Reporting and control of Environmental incidents	Reporting and control of Environmental incidents occurring on the site	<p>NEMA defines "incident" as an unexpected, sudden and uncontrolled release of a hazardous substance, including from a major emission, fire or explosion, that causes, has caused or may cause significant harm to the environment, human life or property;</p> <p>The NWA defines an emergency incident as any incident or accident in which a substance –</p> <p>(a) pollutes or has the potential to pollute a water resource; or</p> <p>(b) has, or is likely to have, a detrimental effect on a water resource.</p> <p>All potentially significant incidents must be managed and reported as per the</p>		Environmental Specialist	As soon as reasonably practicable after obtaining knowledge of the incident, Preferably within 24 hours.

Table 7-1: General Requirements					
Activity/Structure/Infrastructure	General requirements applicable to all phases of the authorised activities				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		requirements of S30 of NEMA, and/or S20 of the NWA as applicable.			

## 7.5 PRE-CONSTRUCTION, PLANNING AND DESIGN

Table 7-2: Mitigation for Pre-construction, Planning and Design Phase

ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	RESPONSIBILITY	DATE/FREQUENCY
1. Project Planning & Design Phase				
1.1 Management (Set-up structures and procedures for implementation of EMPr)	Review and update the EMPr after detailed design has been completed	The EMPr must be reviewed after completion of detailed design. If necessary this EMPr must be updated to ensure that it is relevant to the detailed design of all applicable site structures, supporting infrastructure and activities.	Environmental Specialist	Once-off prior to commencement
	Inform the competent authority	The competent authority must be informed of any significant changes to the project description or the EMPr.	Environmental Officer	As required
	Update the EMPr to be congruent with the requirements of the DMR EMPr approval, and other relevant environmental permits.	Where necessary, this EMPr must be updated to ensure that the conditions of relevant approvals, licences and authorisations issued for this project are not in conflict with the EMPr.	Environmental Specialist and Environmental Officer	Biennial
	Appointment and duties of Environmental Control Officer	The project proponent may appoint an independent Environmental Control Officer who must audit compliance with the EMPr during the construction phase for the proposed super fines storage facility.	Environmental Specialist	Once-off prior to commencement
	Management of staff and contractors	The EMPr must be made binding to contractors and should be included in tender documentation for the contract.	Environmental Specialist	Once-off before contractor appointments
The EMPr must be made readily available to the contractors, staff, as well as other relevant role-players associated with the project.		Environmental Specialist and Environmental Officer	Continuous	
1.2 Training	Training of staff and contractors	Contractors and staff must be properly trained in all environmental aspects relating to their role in the project's construction and operation, as per requirements of the associated environmental awareness plan.	Environmental Officer	Once-off prior to commencement & update as required
1.3 Legal Compliance	Removal/destruction of protected floral species	Permits applicable to the removal, relocation or destruction of protected plants must be obtained prior to undertaking any such activity.	Environmental Specialist with support of Environmental Officer	Prior to removal
1.4 Design specifications	The SFSF must have an installed pollution containment barrier with at least a "Class C" performance equivalent.	Appropriate pollution containment barrier designed for installation	Engineering Manager	Once-off

Table 7-2: Mitigation for Pre-construction, Planning and Design Phase				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	RESPONSIBILITY	DATE/FREQUENCY
	Design processes and activities to meet requirements of the EMPr and environmental permits	Design engineers and contractors must be informed of the required minimum standards as may be stipulated in permits relevant to the processes and activities they are designing such that these can be incorporated in the design.	Environmental Specialist	Prior to commencement of design where relevant

### 7.5.1 SPECIALIST REQUIREMENTS

Table 7-3: Mitigation for Pre-construction, Planning and Design Phase				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	RESPONSIBILITY	DATE/FREQUENCY
1. Mitigation Measures from Biodiversity Specialist Report				
1.1 Impacts on Biodiversity flora and fauna	Protection of flora and faunal habitat, species and SCC	Minimise loss of indigenous vegetation and faunal habitat where possible through effective planning and limiting the SFSF footprint to what is essential.	Environmental Specialist and Project Manager	Once-off prior to commencement
		It is recommended that prior to the commencement of the site clearing, the footprint area be demarcated through the use of shade-net fencing / wooden poles to prevent habitat creep into surrounding natural areas.	Environmental Specialist and Project Manager	Once-off prior to commencement
		Where possible, and feasible, all access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat.	Environmental Specialist and Project Manager	Continuous
		Prior to the commencement of construction activities on site an alien vegetation management plan should be compiled for implementation throughout all development phases.	Environmental Specialist and Project Manager	Once-off prior to commencement
		The necessary permits need to be obtained from DEFF and NCDENC prior to the implementation of rescue and relocation activities.	Environmental Specialist and Project Manager	Once-off before contractor appointments

Table 7-3: Mitigation for Pre-construction, Planning and Design Phase

ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	RESPONSIBILITY	DATE/FREQUENCY
		Once all floral SCC and NCNCA protected floral species within the development footprint has been identified, a rescue and relocation plan should be designed for herbaceous species – this plan must give guidance on a species level with regards to their relocation potential and requirements. Rescue activities need to take place prior to the commencement of any activities. Rescue and transplanting of floral species should be overseen by a contractor/ mine employee with assistance from a suitably qualified botanist. The success of rehabilitation actions needs to be monitored quarterly for a minimum period of a year post-relocation.	Environmental Specialist and Project Manager	Once-off prior to commencement
		During the surveying and site-pegging phases, all faunal SCC that will be affected by surface infrastructure must be marked and, where possible, relocated to suitable habitat surrounding the disturbance footprint. The relevant permits must be applied for from the Northern Cape Department of Environment and Nature Conservation (NCDENC) prior to the commencement of the construction phase;	Environmental Specialist and Project Manager	Once-off prior to commencement
		Should any other faunal species protected under National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) or the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA) be encountered within the study area authorisation to relocate such species must be obtained from the NCDENC or the Department of Environmental Affairs (DEA);	Environmental Specialist and Project Manager	Once-off prior to commencement
		Prior to vegetation clearing activities in the Kathu Bushveld habitat, the site should be inspected for the presence of burrowing scorpion burrows and pythons. If located, these species should be carefully excavated ensuring no harm to fauna, and relocated to similar surrounding habitat outside of the footprint area;	Environmental Specialist and Project Manager	Once-off prior to commencement
		Construction personnel are to be educated about these species and the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or nominated mine official. For larger venomous snakes, a suitably trained mine official should be contacted to affect the relocation of the species, should it not move off on its own;	Environmental Specialist and Project Manager	Once-off prior to commencement
<b>2. Mitigation Measures from Dam Break Assessment Report</b>				
2.1 Dam Safety Assessment	Dam Break Analysis	It is recommended that the Dam Break Analysis be undertaken every 2-3 years.	Project Manager and Facility Manager	Repeated every two to three years

Table 7-3: Mitigation for Pre-construction, Planning and Design Phase				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	RESPONSIBILITY	DATE/FREQUENCY
2.2 Dam Safety Assessment	Expansion of Dam Safety Assessment	Survey to be extended to the West of Gloria Super Fines Storage Facility	Project Manager and Facility Manager	As required, within next update to Dam safety assessment
3. Mitigation Measures from Geotechnical Assessment				
3.1 Design Constraints	Geotechnical	The potential for collapse settlement of the Aeolian sands must be considered in foundation design.	Engineering and Design	Once-off prior to commencement
		The potential instability of the soils in excavations must be considered during construction.	Engineering and Design	Once-off prior to commencement
		The calcareous Pedogenic soils will need to be protected where used as construction materials due to the dispersive nature hence erosive potential of these soils as well as the possibility of these soils going into solution on exposure to groundwater.	Engineering and Design	Once-off prior to commencement
4. Mitigation Measures from Archaeological Impact Assessment				
4.1 Chance Find Procedure	Archaeological Artefacts	Implement a chance find procedure prior to construction to assist with managing any potential archaeological/ paleontological finds during construction.	Environmental Specialist	Once-off prior to commencement
4.2 Training	Train construction staff in the identification of heritage artefacts and fossils	Provide training to assist in the identification of heritage artefacts and fossils.	Environmental Specialist	Once-off prior to commencement

## 7.6 CONSTRUCTION PHASE

Table 7-4: Construction Site Establishment and All Construction Activities					
Activity/Structure/Infrastructure	Establishment of construction site facilities (Including administrative offices, laydown areas, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Ambient air	Management of dust generation from unpaved surfaces subject to vehicle movement.	A dust palliative with at least 80% dust reduction efficiency must be applied to unpaved roads for alternative palliative options). Roads paved with low grade ore or aggregate shall be considered as being paved.	National dust outfall standards are complied with. National ambient air quality standards are complied with.	Production manager, Contractors	Application as necessary to meet target on an on-going basis, or as per the manufacturer's instructions where applicable.
	Burning of waste.	Waste shall not be burnt unless in a waste management facility, or other facility, licenced for that purpose. Evidence of lawful disposal all wastes streams generated must be maintained.	No unlawful burning of waste on the site.	All personnel and Contractors	Continuous
Surface water, soil and Ground water	Management of ablutions.	<p>Contractor/s must provide appropriate (capacity/effective containment of grey and black water), ablution/sanitary arrangements for employees, and maintain/service such for the duration of their sites activities in accordance with the MHSA as a minimum.</p> <p>Mobile facilities must be inspected on a daily basis for leaks and cleanliness, and emptied at frequency adequate to prevent overflow.</p> <p>Septic tank must be emptied at a frequency sufficient to prevent overflow. Caution must be taken to prevent leaks or spills during emptying of septic tanks. In the event of spill residue must be removed and the affected area must be treated with lime.</p>	No contact between black/grey water and site soils. No offensive odours emanating from ablution facilities.	Contractors	Once-off, with maintenance thereafter as per specification of the equipment/service provider



Table 7-4: Construction Site Establishment and All Construction Activities

Activity/Structure/Infrastructure	Establishment of construction site facilities (Including administrative offices, laydown areas, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
	Concrete batching activities	Concrete preparation (i.e. including mixing) and batching must take place on durable, impermeable, bunded surfaces	No contact between contaminated water, cement powder, or cement additives, and site soils.	Contractor	Continuous
		Run-off from preparation (i.e. including mixing) activities must be effectively contained and prevented from entering the natural environment (i.e. soils, surface water, and groundwater).	No contact between potentially contaminated run-off and site soils or surface water.	Contractor	Continuous
	Storage of fuel, oil and other hazardous chemical substances.	No underground (i.e. buried) fuel tanks may be established as part of the construction activities sites or anywhere else on site during construction, or operation.	No underground fuel tanks established on site	Proponent, Contractor	Continuous
		Bunded facilities must be compliant with specifications of the BRMO Spill Management and Specifications for Bund Walls procedure, as appended	Compliance with the BRMO bund specifications.	Engineering manager	Once-off
		Above ground fuel, or oil storage tanks, must be located within appropriately sized, impermeable, bunding that is constructed in accordance with BRMO's spill management procedure. Decanting must be undertaken within the bunded area or on an impermeable surface for this purpose.	All spillable hazardous substances stored in adequate bunds.	all persons storing and handling such substances	Continuous.
		Appropriate spill management kits must be kept and maintained on site wherever liquid hazardous materials are stored, and where refuelling and/or servicing of plant, vehicles and machinery takes place, in order to manage potential spillages effectively.	Spill management kits available on site and replenished as necessary.	All relevant supervisors	Continuous
		Training, in the use and maintenance of the abovementioned kits, as well as any contaminated waste products, must be provided to ALL staff either directly or indirectly involved in any of the activities identified above.	All relevant personnel trained. Records of training maintained.	All relevant supervisors	Once-off, with annual refresher training every year thereafter

Table 7-4: Construction Site Establishment and All Construction Activities

Activity/Structure/Infrastructure	Establishment of construction site facilities (Including administrative offices, laydown areas, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		Hazardous chemical containers must be stored within appropriately constructed bunds. Inspection of containers' integrity must be undertaken regularly, and compromised containers must be replaced.	Bund wall capacity sized to at least 110% of the volume of the largest chemical container stored therein.	All relevant supervisors	Continuous.
		Sorbents and contaminated soil must be immediately collected and placed within a water-tight, skip/container for subsequent disposal or treatment at an appropriately licensed hazardous waste management facility.	Appropriate skips/containers on site. Contents removed to appropriate facility. Safe disposal records available.	All relevant supervisors. Environmental Officer to keep records.	Continuous
	Undesirable impacts resulting from vehicle/plant workshops and wash bays	All servicing of plant and vehicles is to take place strictly within dedicated workshops within construction site/s, or otherwise off-site at appropriate maintenance facilities.	No servicing of plant or vehicles outside of dedicated workshop areas	Engineering Manager, Contractors	Continuous
		Furthermore, servicing and maintenance of plant and vehicles must take place on impermeable surfaces with appropriate measures in place to contain contaminated run-off. Impermeable surfaces must be maintained.	Impermeable, platforms established for the servicing of vehicles and plant within the construction site/s	Engineering Manager, Contractors	Continuous
		Where emergency/unplanned repairs are required during construction activities, or oil leaks are identified, suitable drip trays must be used to prevent contamination of soil and water.	Drip trays used for all leaks and in-situ repairs.	Engineering Manager, Contractors	
		Uncontaminated storm water run-off within the sites must be prevented from flowing through workshops and wash bays or any other contaminated areas.	Appropriate storm water management measures implemented, such that the generation of potentially contaminated surface water run-off is avoided	Engineering Manager, Contractors	Continuous
		Potentially contaminated water must be effectively diverted, contained and managed, such that no contaminants are ever in contact with site soils	No contact between potentially contaminated water and site soils or storm water systems	Engineering Manager, Contractors	Continuous

Table 7-4: Construction Site Establishment and All Construction Activities

Activity/Structure/Infrastructure	Establishment of construction site facilities (Including administrative offices, laydown areas, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
	Diminished ground water quality through poor waste management practices	Waste oil generated from vehicle workshops/drip trays must be immediately stored in sealable, water-tight, steel drums or containers within a bunded facility for subsequent removal from site for either recovery, or disposal thereof	Waste oil storage area/s appropriately bunded. Safe disposal/management certificates on record for all oil removed from site	Engineering Manager, Contractors	Once-off bund establishment. Continuous requirement for storage of waste oil.
		Waste oil storage areas may only be placed within relevant construction/contractor's sites, and BRMO workshop areas, before being moved to the BRMO hazardous waste storage area or direct removal by an appropriate waste removal or recycling company.	No waste oil storage outside of any dedicated contractor's sites, or BRMO workshop areas.	Engineering Manager, Contractors	Continuous
	Undesirable impacts due to inappropriate waste management, and soil contamination through contact with waste material/s	Sufficient, water-tight, skips/containers on site for the <u>separate</u> storage of general (including steel, rubble and other non-contaminated waste) and hazardous waste.	Sufficient skips provided for. No mixing of general and hazardous waste streams. No overflowing skips.	Engineering Manager, Contractors	Once-off
		Skips/containers must be clearly marked for the waste to be stored therein.	Waste skips clearly marked for applicable waste types to be discarded therein	Site supervisors,	Once-off
		Waste must not be temporarily stored on bare soil surfaces; Except where: <ul style="list-style-type: none"> <li>• The waste is regarded as being 'inert' (e.g. waste bricks, un-contaminated steel scrap, etc.), in terms of the definition provided for in the National Environmental Management: Waste Act (59 of 2008); and,</li> <li>• The waste will be removed from site within 30 days of the generation thereof; and</li> </ul>	No contact between site soils and potential contaminants in construction waste/s	All	Continuous
		<ul style="list-style-type: none"> <li>• Waste skips/containers must be cleared when full, such that waste doesn't overflow onto adjacent ground</li> </ul>	No evidence of full, or over-flowing, waste skips/ins	Site supervisors.	Continuous

Table 7-4: Construction Site Establishment and All Construction Activities

Activity/Structure/Infrastructure	Establishment of construction site facilities (Including administrative offices, laydown areas, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		Waste may only be taken to appropriately licensed/permitted waste management facilities.	Proof of facility licensing and waste manifests kept on record	Site supervisors, Environmental Officer	Continuous
		Records of safe disposal must be obtained, and kept on file, for all waste removed from site;	Records of safe disposal/management certificates kept on record	Environmental Officer	Continuous
		The area supervisor is responsible for ensuring that wind-blown litter is collected from the sites on a daily basis.	No evidence of wind-blown litter. Records of daily collections/inspections kept on record.	Site supervisors, Environmental Officer	Continuous
		Safe disposal/management certificates must be obtained for all waste removed from BRMO.	Safe disposal/management certificates kept on record	Site supervisors, Environmental Officer	Continuous, for every incidence of waste removal from site
		Waste may only be taken to appropriately licensed/permitted waste management facilities.	Proof of facility licensing and waste manifests kept on record	Site supervisors, Environmental Officer	Continuous
	Unsustainable use of natural resources and unnecessary landfill airspace utilisation	Contractors must abide by BRMO's standard operating procedures or provide a method statement specific to waste minimisation, reuse, recovery and recycling, as well as temporary storage and disposal; where such plans would need to be signed off by competent site environmental personnel/environmental control officer (Environmental Control Officer) prior to the start of construction activities.	Approved method statement/s on record	Site supervisors,	Once-off, prior to commencement
Surface water	Surface storm water contamination through contact with waste material/s	Surface storm water run-off must not be able to flow through any waste storage areas. Nor should skips/containers, or waste storage areas, be positioned where surface water may pond or flow preferentially during rainfall events	No contact between construction waste and surface water	Site supervisors,	Continuous

Table 7-4: Construction Site Establishment and All Construction Activities

Activity/Structure/Infrastructure	Establishment of construction site facilities (Including administrative offices, laydown areas, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
	Surface storm water contamination through contact with concrete/cement run-off	All concrete mixing or batching will be undertaken in machinery designed for the purpose or on impermeable surfaces made for that purpose.	No concrete and cement run off that may contaminate soil or water.	Site supervisors,	Continuous
Biodiversity	Reduced biodiversity due to construction site/s establishment in green-field areas	Construction sites may only be established within the anticipated development footprints of the proposed project and supporting infrastructure.	No excess vegetation cleared that will not already require clearing as part of the approved project.	Project Manager	Once-off
	Poaching/killing of indigenous site fauna	The hunting, Trapping, poaching, or killing, of indigenous site fauna is prohibited.	No harm to indigenous site fauna. Records kept on file of applicable training by contractor.	All Records kept by site supervisor or Environmental Officer	Continuous. Once-off training, with annual refreshers every year thereafter
	Destruction of site flora through unauthorised 'harvesting' thereof	Under no circumstances are wood, species of conservation concern, or medicinal plants, to be 'harvested' without an appropriate permit or licence.	No destruction/'harvesting' indigenous site flora.	All Records kept by site supervisor or Environmental Officer	Continuous. Once-off training, with annual refreshers every year thereafter
	Conservation of SCC	Should any SCC be observed on the site a biodiversity specialist should be contacted in order to advise the best way forward;	Should any snakes be encountered, either a suitably trained staff member or expert should be contacted to capture and relocate the specimen. No harm should be done to any snakes located within the study area.	SCC managed in accordance with legal requirements and best practice.	Site supervisor and Environmental Officer

Table 7-4: Construction Site Establishment and All Construction Activities

Activity/Structure/Infrastructure	Establishment of construction site facilities (Including administrative offices, laydown areas, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
	Alien Vegetation Management	<p>Edge effects of all construction activities, such as erosion and alien plant species proliferation, which may affect adjacent Kathu Bushveld, need to be strictly managed adjacent to the natural portions of Kathu Bushveld;</p> <p>An Alien and Invasive Plant Management and Control Plan must be designed and implemented in order to monitor and control alien faunal recruitment; and</p> <p>Where areas are disturbed during construction activities, spread of alien invasive species within these areas should be continually monitored and controlled throughout the construction phase.</p>	No establishment or proliferation of alien vegetation within the disturbed footprint or related encroachment into surrounding areas	Site supervisor and Environmental Officer	Continuous
	Anthropogenic veld fires resulting in biodiversity loss	<p>If open fires (i.e. not contained in a brazier or equipment designed for that purpose), for the purposes of cooking, are to be tolerated within the construction site/s, the following conditions are to apply:</p> <ul style="list-style-type: none"> <li>• Must be well removed from fuel and hazardous material storage areas, in line with appropriate BRMO safety standards;</li> <li>• Must be well removed from indigenous vegetation (at least 15m);</li> <li>• Fire-extinguisher must be readily available;</li> <li>• Must be screened from wind with non-flammable material/s; and</li> <li>• Non-smouldering ash residues must be disposed of in general waste skip/s, or containers, on site.</li> </ul>	Well managed, clearly designated, area/s established for cooking fires.	Site supervisor	Continuous

Table 7-4: Construction Site Establishment and All Construction Activities

Activity/Structure/Infrastructure	Establishment of construction site facilities (Including administrative offices, laydown areas, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
	Infestation and propagation of alien invasive species	Contractors must ensure that alien invasive species within the bounds of their sites are managed in accordance with relevant provisions of the BRMO alien invasive species management plan.	No alien invasive floral species infestation within sites	Site supervisors	Continuous
		All relevant personnel and contractors to receive training in regard to the above requirements.	Copy of BRMO alien invasive species management plan provided to contractor/s. Records available of relevant training	Environmental Officer	Once-off
Socio-economics	Social impacts stemming from an influx of contractors and associated employees.	Access by the contractor and his/her employees to adjacent farms (i.e. other than those falling within the ambit of the project) is strictly forbidden; unless otherwise agreed upon, in writing, by the relevant landowner/s.	No trespassing	Contractor	Continuous
		The negative impact on housing and service delivery provision pressures could be reduced by sourcing the majority of construction workers from local communities, thus reducing the need to bring new people into the local area.	Use of local labour sourced from the district to the practical extent practical	Project manager, Contractor	Continuous
Topography	Soil erosion resulting from the creation of steep, unnatural, slopes	No slopes with gradient > 33° (i.e. 3H:1V) should be established on site; unless otherwise protected from erosion by appropriate storm water management measures, or slope stabilisation/re-vegetation	No visible erosion	Project Manager, Contractor	Continuous
Noise and Vibration	Increased ambient noise levels resulting from heavy vehicle operation during vegetation stripping	Vegetation and topsoil stripping to only be undertaken between 7:00am and 5:00pm.	No 'noisy' construction activities outside of stipulated work hours	Project Manager, Contractor	Continuous

Table 7-4: Construction Site Establishment and All Construction Activities

Activity/Structure/Infrastructure	Establishment of construction site facilities (Including administrative offices, laydown areas, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
	Noise complaints	In terms of noise impact for various increases over the ambient, the National Noise Regulations define an increase of 7 dBA as “disturbing”. Noise levels during construction must, therefore, be kept within 7 dBA of the baseline data at sensitive receptors.	Once off baseline noise monitoring must be undertaken. Monitoring must be undertaken should a noise complaint be received.	Environmental Specialist	Continuous.
		Should noise complaints be received then the source of the noise causing the disturbance must be investigated and measures to reduce the noise level must be considered and implemented. Subsequent follow-up with the complainant must be undertaken to confirm elimination of the problem.	Investigation within 1 week of complaint. Rectification with 2 weeks or as soon as practical.	Environmental Specialist	Continuous.



Table 7-5: Vegetation Clearance

Table 7-5: Vegetation Clearance					
Activity/Structure/Infrastructure	Vegetation clearance				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Biodiversity	Destruction of habitat leading to overall loss of biodiversity (Incl. relocation, removal and destruction of protected species)	Vegetation clearance must be limited to the smallest area practical to enable construction activities and the establishment of structures and infrastructure. These areas need to be clearly marked out under the supervision/assistance of the Environmental Officer as vegetation clearance proceeds on site.  All vegetation clearance to be restricted to designated areas.	No unnecessary clearance of indigenous vegetation.	Project manager, Environmental Officer	Continuous
		No protected species may be removed, relocated or destroyed without the necessary permits for such having been obtained from the relevant competent authority	Copies of permits on file prior to proceeding with vegetation clearance	Project manager, Contractor, Environmental Officer	Once-off
		The removal, relocation or destruction of protected plant and tree species must be undertaken in compliance with all conditions stipulated in the above-mentioned permits.	Procedures developed and implemented in accordance with permit requirements	Project manager, Contractor, Environmental Officer	Continuous
		Any <i>Ammocaris coranica</i> , <i>Harpogophytum procumbens</i> , <i>Babiana hypogaea</i> and <i>Boophane disticha</i> , or any other red data listed (RDL) species identified on site, need to be rescued and relocated under the guidance of a competent ecologist, or by parties trained to undertake such by a competent ecologist, as part of species specific rescue and relocation plans formulated by a	Records kept of all RDL plant species rescued and relocated, as well as point of relocation thereof. Record of specialist ecologist appointment on file, as proof of involvement in rescue and relocation.	Project manager, Contractor, Environmental Officer	Once-off, prior to commencing with broad-scale vegetation stripping.

Table 7-5: Vegetation Clearance

Table 7-5: Vegetation Clearance					
Activity/Structure/Infrastructure	Vegetation clearance				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		competent ecologist, where possible.			
		All contractors and employees involved in vegetation clearance must be trained to identify the species above.	Environmental Officer to issue flashcards for identification of species	Environmental Specialist, Site supervisors	Once-off, prior to commencing with broad-scale vegetation stripping.
	Establishment of alien invasive species and associated negative impacts on biodiversity	All areas stripped of indigenous vegetation cover and topsoil need to be regularly inspected for the potential establishment of alien invasive species, and appropriate control measures applied where these species are observed to have established (i.e. in accordance with the provisions of the BRMO 'alien invasive species management plan').	Proof of training, in 'weed' identification, provided to mandated 'inspector/s. Inspection register maintained by the contractor/s, as well as documentation of any control measures applied (location, method & effectiveness at the very least)	Project manager, Contractor, Environmental Officer	Monthly 'weed' inspections Problem species cleared within 2 weeks of their identification.
		A copy of the BRMO alien invasive species management plan, inclusive of quick 'weed identification' flash-card sets, to be supplied to the relevant employees and contractor/s involved in vegetation stripping.	Proof of contractor's receipt of the management plan	Environmental Specialist	Once-off
Soils	Loss of topsoil to vegetation stripping, thereby reducing remaining available extent thereof for rehabilitation efforts at mine closure	The degree of 'topsoil' lost to vegetation stripping needs to be kept to a minimum by the relevant contractor/s.	Minimal loss of topsoil with 'stripped' vegetation.	Contractor	Continuous

Table 7-5: Vegetation Clearance

Table 7-5: Vegetation Clearance					
Activity/Structure/Infrastructure	Vegetation clearance				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
	Erosion losses from exposed soil surfaces	Any runnels, or erosion channels, which develop shall be back-filled and the area restored to the acceptable condition. The contractor shall not allow erosion to develop on a large scale before effecting repairs and all erosion damage shall be repaired as soon as possible (Topsoil washed away shall be replaced).	No evidence on site of erosion channels. Topsoil has been appropriately replaced where it has been lost through surface storm water flows.	Project Manager, Contractor	Continuous. Remedial action within 48 hours.
Heritage Resources	Negative impacts on elements of cultural, or heritage significance	Appropriate training to be issued to BRMO Environmental Officer and other relevant staff by a suitably qualified specialist.	Records of Proof of training maintained.	Environmental Specialist	Once-off, prior to commencement of vegetation stripping
		Basic training needs to be provided to the relevant contractor/s, as well as their relevant vehicle/grader operator/s, for the identification of possibly encountered elements of cultural and heritage significance (e.g. archaeological sites, graves, etc.)	Records of Proof of training maintained.	Environmental Specialist	Once-off, prior to commencement of vegetation stripping
		If archaeological sites are exposed during vegetation or topsoil stripping and borrowing activities, these should immediately be reported to the Local and National Branches of the South African Heritage Resources Agency (SAHRA)	No unauthorised disturbances to elements of potential cultural, or heritage, significance	Project manager, Contractor. Environmental Specialist/Environmental Officer for reporting.	Continuous. Reporting of archaeological finds within 48hours
		Under no circumstances shall archaeological artefacts discovered on site during construction or operational activities be removed, destroyed or interfered with.	Compliance with the provisions of the National Heritage Resources Act (Act No. 25 of 1999) [HRA].	Project manager, Contractor.	Continuous

Table 7-5: Vegetation Clearance					
Activity/Structure/Infrastructure		Vegetation clearance			
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Socio-economics	Wood harvesting 'off-set' in local communities	The wood from trees stripped during this phase of construction may be supplied to local community/ies as firewood; unless otherwise directed in the respective 'protected tree removal/destruction permit/s'.	Recovery and use of feasible firewood stock to the greatest extent possible	Environmental Specialist	Continuous

Table 7-6: Topsoil Stripping					
Activity/Structure/Infrastructure		Topsoil stripping for construction purposes.			
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Soils	Reduced effectiveness of rehabilitation efforts at mine closure, resulting from poor topsoil management practices	Topsoil to be stripped to a depth of at least 30 cm from all development footprints and stockpiled for reuse in rehabilitation actions at mine closure.	Topsoil is stockpiled in accordance with BRMO's topsoil management procedure.	Project Manager, Contractor	Continuous
		Vegetation stripping should not be conducted more than two weeks (14 calendar days) prior to commencement of topsoil stripping.	No areas left bare of vegetation for longer than a fortnight following the 'stripping' thereof for development, or mining	Project Manager, Contractor	Fourteen (14) day window
		Topsoil and subsoil must only be utilised as required for rehabilitation within the mining area, and according to the topsoil management plan.	Topsoil Reuse Plan available for inspection. No unauthorised use of topsoil in contravention of the aforementioned plan.	Environmental Officer	Continuous
		Stockpiles must be monitored for alien vegetation any existing alien vegetation must be removed and destroyed in accordance biodiversity management plan	Records kept on file of at least monthly inspections	Environmental Officer	Continuous

Table 7-7: Civil- and Earthworks					
Activity/Structure/Infrastructure	Establishment of structural and infrastructural foundations/founding conditions and associated, operational, compacted working 'floors'				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Topography	Soil erosion resulting from the creation of steep, unnatural, slopes	No slopes with gradient >33° (i.e. 3H:1V) should be established on site; unless otherwise protected from erosion by appropriate storm water management measures, or slope stabilisation/re-vegetation	No slopes >33°	Project Manager, Contractor	Continuous
Surface water	Generation of contaminated surface storm water flows during the operational phase of the project	Provision must be for the diversion of 'clean' storm water run-off away from or around potentially contaminated working surfaces	Appropriate storm water management infrastructure installed on site	Project Manager	Once-off, prior to commencement of operational activities
		Provision must be made for the diversion, and appropriate containment of 'dirty' storm water run-off generated within potentially contaminated areas.	Appropriate storm water management infrastructure installed on site	Project Manager	Once-off, prior to commencement of operational activities
		All 'dirty' storm water containment dams must be lined with a durable, impermeable, liner system as required in the BRMO IWWMP (e.g. HDPE liner), such that 'dirty/potentially contaminated' storm water is effectively contained for ultimate return to the process water circuit.	Appropriate storm water management infrastructure installed on site	Project Manager	Once-off, prior to commencement of operational activities
		All civil- and earth work must ensure that no surface ponding of storm water ultimately occurs at the operational mine works areas	No surface ponding of rain/storm water	Project Manager, Contractor	Once-off, prior to commencement of operational activities
Biodiversity	Biodiversity loss through destruction of natural habitat	Civil- and earth works may only proceed where vegetation- and topsoil stripping have been effected in compliance with the provisions of the EMPr	No extension of the development footprint beyond that approved in terms of this EMPr	Project Manager, Contractor	Continuous

Table 7-8: Haul/Access Roads					
Activity/Structure/Infrastructure		Heavy and light vehicle movements on un-surfaced site haul/access roads. Vehicle access to, and over-nighting on, site.			
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Air Quality	Degraded air quality through vehicle entrained dust	Dust palliation with an effectiveness of at least 80% must be applied to all un-surfaced/gravel access and haul roads for the duration of the construction period	Compliance with national dust outfall standards and national ambient air quality standards are complied with.	Project manager	Continuous
		Palliatives must be applied and re-applied as necessary per the manufacturer/supplier's recommendations		Project manager	Continuous
		Vehicle speeds must be limited to 60 km/h on access roads unless these have bound paving, in which case sped regulations as per the relevant traffic regulations must apply.  Vehicle speeds must be limited to 40 km/h on any exposed surfaces where palliatives or paving have not been applied.		Environmental Specialist	Continuous
Biodiversity	Biodiversity loss through unnecessary habitat destruction	Access and haul roads may only be established, immediately adjacent to (within 20 m), or directly between, the anticipated development footprints of the various project components.	Access and haul roads established, immediately adjacent to (within 20m), or directly between, the anticipated development footprints	Project manager	Continuous
		The hauling of materials and vehicle access to and from development sites must be strictly maintained to designated access/haul roads on site	No evidence of random, un-planned, road creation on site	Project Manager, Contractor	Continuous

Table 7-9: Raw/Construction Material Stockpiles and Storage					
Activity/Structure/Infrastructure	Storage of raw/construction materials on site during the construction phase				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Topography	Alteration of site topography, such that preferential storm water flows, or sensitive ecological features, are disrupted/disturbed	Raw/construction material storage areas and stockpiles may not be established within 32 m of any prominent drainage lines on site. Nor within the buffer zone and delineated wetland/riparian zone of the Gamagara River, or within 100 m of the Gamagara river	No disturbances to prominent drainage lines. No construction activities within the Gamagara River and associated buffer zones (other than those authorised as part of railway bridge construction)	Project manager	Continuous
Biodiversity	Biodiversity loss through unnecessary habitat destruction	Raw/construction material storage may only take place within the development footprints of project structures and infrastructure, or designated construction site/s	No storage of materials in 'green-field' areas	Project Manager, Contractor	Continuous
Soils	Soil contamination through inappropriate storage of hazardous construction materials	Where daily quotas/stocks of hazardous materials are to be stored outside of the construction site/s, the materials must be stored such that there is no contact between the material and site soils, and adequate containment is in place to prevent/capture spillage.	No soil contamination.	Project Manager, Contractor	Continuous

Table 7-10: Specialist requirements					
Activity/Structure/Infrastructure	Impacts to archaeology and palaeontology arising during the construction phase				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Archaeology and Paleontological Finds	Destruction/disturbance of cultural heritage or fossils	Implement a chance find procedure prior to construction to assist with managing any potential archaeological/ paleontological finds during construction.	Implement chance find procedure to prevent undue damage to artefacts and fossils.	Environmental Specialist	Once-off prior to commencement



## 7.7 OPERATIONAL PHASE

Table 7-11: Operation of all authorised activities					
Activity/Structure/Infrastructure	Operation of all authorised activities				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Resource Preservation	Waste Minimisation and Recycling	Waste generated on the site must be separated at sources into recyclable categories and non-recyclables.	All waste generated is separated at source.	All	Continuous
		Waste must be recovered, recycled and reused to the greatest practical extent.	Maximum practical recovery, recycling and re-use of waste.	All	Continuous
	Water use optimisation	Water use and disposal must be monitored and BRMO must set targets and implement plans for optimisation of water used per tonne of fines deposited.	Continuous improvement of water use.	Environmental Specialist, Engineering Manager and Production Manager.	Continuous, Annual review.
Waste Management	Accumulation and Storage of Waste	All areas where waste is generated must have suitable receptacles for source accumulation of separated waste.	All waste is accumulated in appropriate receptacles	All supervisors	Continuous
		Waste must be stored in accordance with the requirements of the National Norms and Standards for storage of waste	Compliance with the norms and standards	Environmental Officer	Continuous
		All waste that must be treated and/or disposed of, must be treated and/or disposed at suitably licenced facilities.	Treatment and/or disposal at licenced facilities	Environmental Officer	Continuous
Air Quality	Degraded ambient air quality resulting from operations.	Cumulative dust deposition target thresholds, in terms of SANS 1292, 2009/11/17, at the BRMO site boundary must be met	Less than 600 mg/m <sup>2</sup> /day at the BRMO Mine boundary – 30 day average	Environmental Specialist	Continuous
		Where the above standards are not met, the cause of this non-compliance must be investigated and subsequent corrective and preventative action must be implemented.	Causes for exceedances of the standards are determined and resolved.	Environmental Officer to investigate. Responsible departmental	Continuous

Table 7-11: Operation of all authorised activities					
				manger to resolve.	
	Management of dust generation from unpaved surfaces subject to vehicle movement.	A dust palliative with at least 80% dust reduction efficiency must be applied to unpaved roads. Roads paved with low grade ore or aggregate shall be considered as being paved.	National dust outfall standards are complied with. National ambient air quality standards are complied with.	Production manager,	Application as necessary to meet target on an on-going basis, or as per the manufacturer's instructions where applicable.
	Burning of waste.	Waste shall not be burnt unless in a waste management facility, or other facility, licenced for that purpose. Evidence of lawful disposal all wastes steams generated must be maintained.	No unlawful burning of waste on the site.	All personnel Environmental Officer to keep records.	Continuous
Surface Water, Soil and Ground Water	Storage of fuel, lubricants and other hazardous chemical substances.	Bunded facilities must be compliant with specifications of the BRMO Spill Management and Specifications for Bund Walls procedure, as appended	Compliance with the BRMO bund specifications.	Engineering manager	Once-off
		All liquid (including sludges and slurries) hazardous substances (including wastes) must be stored within bunded facilities.	All spillable hazardous substances stored in adequate bunds.	All persons storing and handling such substances	Continuous.
		Appropriate spill management kits must be kept and maintained on site wherever liquid hazardous materials are stored, and where refuelling and/or servicing of plant, vehicles and machinery takes place, in order to manage potential spillages effectively.	Spill management kits available on site and replenished as necessary.	All relevant supervisors	Continuous
		Training, in the use and maintenance of the abovementioned kits, as well as any contaminated waste products, must be provided to ALL staff either directly or indirectly involved in any of the activities identified above.	All relevant personnel trained. Records of training maintained.	All relevant supervisors	Once-off, with annual refresher training every year thereafter
		Sorbents and contaminated soil must be immediately collected and placed within a water-tight, skip/container for subsequent disposal or treatment at an	Appropriate skips/containers on site. Contents removed to appropriate facility.	All relevant supervisors.	Continuous

Table 7-11: Operation of all authorised activities					
		appropriately licensed hazardous waste management facility.	Safe disposal records available.	Environmental Officer to keep records.	
	Equipment storage and maintenance	All equipment (e.g. gear boxes, portable generators) which may leak oil, liquid fuels, or hazardous chemical substances must be located on impermeable bases which can contain leaks or must have appropriately sized drip trays.	No contamination of soil or surface water from leaking equipment.	Relevant Foremen and artisans	Continuous
	Separation of clean and dirty water	Where storm water flow paths are identified, storm water management infrastructure must be installed (i.e. cut-off trenches, diversion berms, silt traps, etc.).	Records kept of required inspections, as well as any maintenance applied	Engineering manager	Continuous
		Storm water management infrastructure must be regularly inspected and maintenance applied as necessary to ensure the efficient functioning thereof.	Records kept of required inspections, as well as any maintenance applied	Environmental Officer – Inspections Engineering manager – Maintenance	Fort-nightly (October – March) Monthly (April – September)
Noise	Increased ambient noise levels associated with operation	Noise caused by operations must not cause a nuisance. Any environmental noise complaints reported must be investigated and appropriate corrective and/or preventative action taken.	Compliance with SANS 10103 of 2008 and the ECA Noise regulations	Environmental Officer – Investigation Relevant department manager – corrective and preventative actions	Continuous
Biodiversity	Alien invasive species infestation and point of propagation, leading to biodiversity loss on site	The potential presence of alien invasive species on, and adjacent to the operational sites must be monitored and appropriately managed, in accordance with the BRMO alien invasive species management plan.	No evidence of alien invasive species occurrence within the vicinity of the SFSF. Records kept of any remediation effected at the site	Environmental Officer	Continuous

Table 7-11: Operation of all authorised activities

		Edge effects of all operational activities, such as alien plant species proliferation which may affect adjacent natural habitat within surrounding areas, need to be strictly managed adjacent to the SFSF footprint; Ongoing alien and invasive vegetation monitoring and eradication should take place throughout the operational phase of the SFSF, and the perimeters should be regularly checked during the operational phase for alien vegetation proliferation to prevent spread into surrounding natural areas; and Continue with and update the alien and invasive plant control plan accordingly.	(i.e. problematic species, nature of remedial efforts, date and party who effected remedial solution)		
		The use of herbicides on site must be undertaken according to the BRMO environmental procedure for the use of herbicides, and in accordance with the manufacturers' instructions.	Compliance with applicable operational procedure	Environmental Specialist	Continuous
	Protection of floral and faunal SCC	No collection of firewood (as this often provides microhabitats for small insect and arachnids) or floral and faunal SCC is allowed by mining personnel;  Edge effect control needs to be implemented to ensure no further degradation and potential loss of SCC outside of the footprint area occurs; and It must be ensured that related operational activities are kept strictly within the footprint.	No habitats are damaged and edge effects are prevented.	Environmental Officer	Continuous
Fire Prevention	Protection of natural habitat	No unauthorised fires must be allowed during the operational phase of the proposed mining development. Authorisation is required from the safety manager and environmental specialist	No unauthorised fires	Site manager	Continuous

Table 7-11: Operation of all authorised activities					
		Fire breaks should be maintained during the operational phase	Effective firebreaks maintained	Safety manager and site manager	Continuous
Continuous Rehabilitation	Minimisation of affected footprint	Rehabilitation of natural vegetation should proceed in accordance with the site rehabilitation.	All areas that may be rehabilitated during operational phase are successfully rehabilitated.	Project Manager	Commence upon completion of construction.
		Rehabilitation must be implemented at all times, and disturbed areas must be rehabilitated as soon as such areas become available. This will not only reduce the total disturbance footprint but will also reduce the overall rehabilitation effort and cost.			
Preparation for Rehabilitation	Ensure adequacy of soil for rehabilitation	Current topsoil stockpile volumes at the time of updating the EMP are insufficient for rehabilitation of the entire disturbed area. BRMO must therefore undertake an assessment of subsoils for use in rehabilitation and determine suitable procedures for successful use thereof if found to be possible.	Adequate soil resources for rehabilitation	Environmental Specialist	Prior to closure

Table 7-12: Super Fines Management - SFSF						
Activity/Structure/Infrastructure	Fines management (from point of generation to SFS deposition)					
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY	
Ground water	Degraded groundwater quality due to the potential leaching of inorganic contaminants from SFS	The SFSF must have an installed pollution containment barrier with at least a "Class C" performance equivalent.	Appropriate pollution containment barrier installed	Engineering Manager	Once-off	
		No waste, or materials, other than fines may be deposited into the SFS	Only fines deposited to SFS	Production Manager	Continuous	
		Update Geochemical model	Updated model	Environmental Specialist	Every 5 years	
Soils	Soil pollution through unaddressed pipe leaks	All pipe-work and associated infrastructure used in the transport of fines from the processing plant to the SFS must be regularly inspected (i.e. for structural integrity) and maintenance applied as necessary to ensure no losses between the plant and the SFS	No fines losses during transfer from plant to SFS. Records kept of monthly inspections, as well as of any maintenance effected (i.e. nature of problem, nature of maintenance, date and party who effected maintenance/repair)	Engineering Manager	Monthly inspections by competent person. Maintenance/repair within 24 hrs of problem identification (unless in the case of major incident; where emergency response procedures will apply)	
		Soil pollution from SFS over-flows	The SFS must have a minimum design free-board for storm water infiltration, in addition to a minimum 0.8 m dry freeboard over and above the normal operating level and excluding decant return.	Minimum free-board of 0.8 m maintained at all times	Engineering Manager – Design Production manager - operation	Continuous
			Soil pollution due to fines spillages resulting from the recovery thereof	Any fines spillages outside of the SFS footprint, resulting from fines recovery activities, must be immediately removed from location for subsequent recovery thereof.	No prolonged residence of fines outside of SFS, or intermediary storage areas.	Production manager

## 8 CLOSURE AND REHABILITATION PHASE

This rehabilitation plan is in alignment with the broader BRMO rehabilitation plan and provides details as to how site rehabilitation (whether this is concurrent with on-going operations, or at closure) should be undertaken, with step by step break-down of disturbed areas to be rehabilitated, when those areas should be rehabilitated, as well as a description of the actual rehabilitation measures to be implemented.

It must be noted that the nature of the proposed activities is such that there will not be any annual of on-going rehabilitation once the construction phase has been completed. Thus the focus is on the closure phase.

### 8.1 PRINCIPLES OF REHABILITATION

The following principles should be followed during the planning, implementation and post-implementation phases of the rehabilitation process:

- Define and agree upon end-goals for the rehabilitation process, such as land-use, rehabilitation objectives, areas to be rehabilitated, etc.;
- Prevent and continually manage the propagation and establishment of alien and invasive species;
- As far as is practical, implement concurrent rehabilitation in order to limit degradation of soil biota;
- Limit the footprint area of the disturbing activity in order to minimise environmental damage;
- Rehabilitation earthworks should aim to reshape the disturbed areas to represent the area prior to disturbance (with the exception of the two opencast voids) and to present a safe, functional and sustainable environment;
- Visual impacts of rehabilitated areas must be minimised by recreating natural landforms and ensuring that reshaped areas are visually suited to surrounding landscapes;
- Natural landforms such as drainage lines, undulating areas and ridges, which have been damaged during activities, must be restored;
- Implement erosion control measures to prevent the loss of topsoil;
- Rip and aerate all compacted soils in order to facilitate plant establishment and growth;
- Re-vegetate all disturbed areas with suitable vegetation cover and methods;
- After completion of activities ensure that the site is safe for use by the intended land users and remove all activity equipment; and
- Implement a monitoring plan to determine the efficacy of the rehabilitation exercise (this should be a long-term monitoring program).

### 8.2 REHABILITATION OBJECTIVES

The rural/agricultural nature of the mine, and the aridity of the area, limits the range of potentially feasible end land-use alternatives available to BRMO at the end of life of the mine.

The overall environmental objectives of mine closure are as follows:

- To rehabilitate the disturbed areas to arable grazing land capable of at least supporting an extensive livestock production system;
- To restore the pre-development topography to the greatest extent that is practical and feasible at closure;
- To restore the site biodiversity and ecological system functioning to as close as practically possible to pre-development conditions;
- To ensure that the site is made safe;
- To ensure that final site shaping allows for free drainage of rainwater and the prevention of erosion;
- To ensure that the pollution generating potential of residue deposits and residue stockpiles is addressed through appropriate capping and closure thereof, where applicable; and
- To ensure that potential residual impacts on the underlying aquifers are managed.
- To ensure that significant entrainment of particulate matter is prevented through adequate land cover and shaping where necessary.

The area affected by BRMO's operations should not pose any significant direct, indirect or residual risks to either human health and livelihoods, or environmental quality, over the short-, medium- or long-term post closure and rehabilitation thereof.

### 8.2.1 RE-VEGETATION

- A grass mixture of species endemic (particularly important to ensure that grasses are non-invasive) within the area, such as *Aristida meridionalis*, *Centropodia glauca*, *Stipagrostis ciliata*, *Eragrostis lehmanniana* and *Schmidtia pappophoroides*, should be utilised in the seeding process;
- The seed mixture should be incorporated into a mulch which includes fertiliser and germination acceleration agents;
- The seed mulch should then be along with suitable means for maintain stability;
- The seeded areas should then be irrigated; and
- Weekly monitoring should take place in order to ascertain the efficacy of the seeding and to repair any areas where gullies or rills are forming.

### 8.2.2 MAINTENANCE

- Along the crest of steep gradients a 1 m high Hessian screen should be placed around the facility to assist with the trapping of seeds and to protect the crest from wind erosion;
- Application of fertiliser should take place in order to ensure efficient establishment of vegetation cover until such time as sufficient organic matter is being produced by the established grasses to allow for self-sustaining growth;
- The process of 'Unification' can be utilised to ensure a constant supply of organic compost (fertiliser). This entails the establishment of a compost heap, where cleared indigenous organic matter is stored and allowed to break down naturally to the point of resembling garden compost; and



- Care must be taken to ensure that only indigenous plant matter is utilised for this process, as the presence of alien invaders may cause the establishment of invader plant communities in the rehabilitated areas.

### **8.3 ESTABLISHMENT OF NATURAL KATHU BUSHVELD AND GORDONIA DUNVELD ON THE REHABILITATED AREAS**

- Once sufficient basal cover has been established, the introduction of species representative of the applicable vegetation types must commence;
- Introduction of these species should commence through the stages of natural floral succession [i.e. Pioneer species (grasses, herbaceous species), Secondary species (grasses, small shrubs, and small trees) and Climax state (larger shrubs, large trees)];
- This process will also occur naturally as seeds from the neighbouring areas are introduced and germinate;
- Certain tree species with special mention of *Acacia erioloba*, *Acacia haematoxylon* and *Boscia albitrunca* can be selectively introduced, however consideration will need to be given to rooting depths and soil stability as well as the ability of the trees to establish on the subject area;
- A test area should be designated to test possible tree species to be introduced for their ability to grow in different substrates. This should commence immediately in order to allow informed decision making once rehabilitation commences; and
- The primary goal is to achieve a stable, climax state, representative of the vegetation types where the ecological function of the plant community is tolerant of most environmental conditions it encounters.

### **8.4 MAINTENANCE OF REHABILITATED AREAS**

All areas must be maintained for a period of 5 years after formal rehabilitation ceases. During maintenance, the following should be done:

- Clearing of alien and invasive plants to allow native and indigenous plants to out-compete invasives and take a strong hold in the area;
- Watering of larger trees that were planted during rehabilitation to allow for these trees to establish adequately;
- Patching/fixing (if necessary) of any areas that have eroded since rehabilitation;
- If hydro-seeding was not effective during 1<sup>st</sup> application, a second application of hydro-seed mixture may have to be applied in certain areas. The application of hydro-seed should be at the discretion of the hydro-seeding specialist;
- Maintain water run-off areas so as to not increase chances of further potential erosion;
- Encourage growth of plants and grasses by cordoning off, fertilising and watering areas that have struggled to take root or re-vegetate; and
- Areas of high importance (i.e. slopes and riparian areas) should be more vigorously maintained, fertilized and watered during maintenance.

## 8.5 AREAS AND ACTIVITIES TO BE REHABILITATED

In general terms, the rehabilitation requirements for various areas of disturbance at the mine will be relatively homogenous, with the exception of distinct features such as the SFSF.

Distinction has been made between areas that require general surface rehabilitation alone (i.e. following the removal of surface structures and infrastructure, as well as site preparation for rehabilitation), and those activities that warrant unique management and rehabilitation provisions at closure (Table 8-2); where, *inter alia*, the following circumstances warrant such interventions:

- The activity/area presents a potential, residual, point source of groundwater- or soil pollution; or
- The activity/area presents a potential, direct, risk to human health or well-being.

### 8.5.1 MINE RESIDUE DEPOSITS

Mine residue deposits i.e. tailings dams, present potential point sources of groundwater pollution and continued visual intrusion following closure of the mines. These facilities will, unless otherwise recovered, remain on the surface at mine closure and require specific actions at closure, or concurrent to operation, to mitigate the potential long-term impacts thereof on groundwater quality and the visual and aesthetic character of the landscape.

The required mitigation at closure will differ from the greater closure and rehabilitation provisions for 'general surface rehabilitation'. These facilities will also need to be effectively fenced-off from the remainder of the site in order to prevent any potential injury, or loss of life, that could result through indiscriminate access thereto until final closure status is achieved. The unique closure and rehabilitation of such facilities is discussed in Table 8-2.

## 8.6 GENERAL SURFACE REHABILITATION

The 'general surface rehabilitation' of degraded/disturbed mine areas to meet the stated end land-use objectives, must comply with the following broad sequentially implemented phases of rehabilitation:

Phase 1: Removal of all surface structures and infrastructure, as well as buried service infrastructure that may act to impede subsequent phases of rehabilitation;

Phase 2: Preparation and amelioration of structural and infrastructural development footprints for further rehabilitation;

Phase 3: Sequential replacement of stockpiled top- and treatment of sub-soil where topsoil is lacking, to mimic pre-mining soil profiles;

Phase 4: Initial hydro-seeding of prepared areas to establish basal cover for subsequent rehabilitation;

Phase 5: Initial maintenance and monitoring of basal cover;

Phase 6: Establishment of Central Sandy Bushveld tree species once sufficient basal cover is achieved; and

Phase 7: On-going monitoring and maintenance.

Table 8-1 and Table 8-2 that follow provide further detail as to the actions that need to be taken by BRMO for each of the respective phases of surface rehabilitation. Note that requirements specific to the SFSF are in Table 8-2.

Table 8-1: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
Preparation and Initiation				
A1	Notify the Minister of Environmental Affairs of intended cessation of mining activities and rehabilitation in accordance with S33 of NEM:AQA.	Minister notified	Environmental Officer	5 years prior to cessation.
A2	Appoint a project manager to oversee the process	Project manager appointed	Mine manager	Once-off prior to commencement of closure
A3	Appoint specialists as required for the rehabilitation process	Environmental specialists appointed	Environmental Officer (with support of project manager)	Once-off
A4	Identify any protected species that may require permitting prior to disturbing.	Required biodiversity permits in place.	Environmental Specialist	Prior to commencement.
A5	If any archaeological artefacts of potential significance are identified at any stage, work must cease and SAHRA must be notified for instruction on how to proceed.	No destruction or disturbance of potentially significant artefacts	Environmental Specialist	On going
PHASE 1: Removal of Surface Structures and Infrastructure				
1.1	All surface structures, infrastructure and 'hard surfaces' ( <i>inter alia</i> , redundant surfaced roads, parking and paved areas) are to be demolished and removed from the disturbed footprint; unless an alternative/continued use for any such items is agreed upon, in writing, with the Department of Mineral Resources (DMR).	Area cleared of all mining related structures and infrastructure.	Project Manager	Once-off
1.2	The foundations of removed structures and infrastructure are to be removed to a depth of at least 0.5m below ground level.	No remaining sub-surface structures that may impede further phases of rehabilitation, or the ultimate root penetration of re-introduced plant and tree species.	Project Manager	Once-off

Table 8-1: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
1.3	On-going alien and invasive floral species control is required through all phases of rehabilitation.  Edge effects of decommissioning and closure activities, such as erosion and alien plant species proliferation, which may affect adjacent sensitive habitat, need to be strictly managed adjacent to the footprint;	No establishment and propagation of 'undesirable' plant species over rehabilitation sites.	Environmental Officer	On-going. Monthly inspections; unless otherwise expressly stated for subsequent phases of rehabilitation
PHASE 2: Preparation of underlying soils for further phases of rehabilitation				
2.1	Exposed, compacted, soil surfaces must be ripped to a depth of at least 0.5 m to allow for adequate aeration and plant root penetration.	No topsoil replacement on compacted underlying soil horizons.	Project Manager	Once-off
2.2	Pre-mining topography should be reasonably restored through shaping, such that the topography of rehabilitated areas will ultimately be commensurate with that of adjacent, non-disturbed areas, with the exception of tailings facilities if they are to remain. Consultation with a hydrologist may be required to eliminate potential for prevent erosion.	No evidence of significant alteration to 'natural', pre-mining, surface drainage and topographical regime.	Project Manager	On-going
2.4	Care should be taken in choosing a method/machinery to implement 2.2 above, such that ripped soils are not re-compacted through efforts to appropriately shape the disturbed sites.	No topsoil replacement to compacted underlying soil horizons.	Project Manager	Once-off
2.5	Vehicular access to rehabilitation sites from this phase of rehabilitation onward should be limited to vehicles/machinery expressly required for the sound implementation of this plan.	No <i>ad hoc</i> , unauthorised, vehicular movements over rehabilitation sites.	Project Manager	On-going
PHASE 3: Topsoil/growth substrate replacement/preparation				
3.1	As far as available stockpile volumes allow, topsoil should be replaced in the appropriate order to a consistent depth of at least 20cm across areas prepared in terms of phase 2. Where topsoil is insufficient, subsoil must be treated in accordance with the specification of the soil specialist to meet rehabilitation objectives.	Topsoil replacement implemented prior to further efforts to re-introduce basal cover. Even surface, free from surface ponding of water.	Environmental Officer	Once-off

Table 8-1: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
3.2	Topsoil should be screened, as necessary, to remove any foreign objects, rocks, etc., prior to the replacement thereof.	Replacement of topsoil that is fit for purpose, and which does not impede BRMO from achieving the stated end-use objectives for the site.	Project Manager	On-going
3.3	Topsoil, and modified subsoil should at least meet the following physical and chemical profile required for successful rehabilitation:	Replacement of topsoil that is fit for purpose, and which does not impede BRMO from achieving the stated end-use objectives for the site.	Project Manager, soil scientist	Once-off
3.4	Any areas with slope $\geq 3^\circ$ should be inspected weekly for signs of topsoil erosion following the replacement thereof, and appropriate action taken to curb any problematic areas.	Records of weekly 'erosion inspections'. No topsoil erosion following replacement.	Environmental Officer	Monitor weekly, address erosion within 48 hours
3.5	Care should be taken during topsoil replacement to minimise the extent to which vehicle movement over replaced topsoil may act to compact these surfaces.	No significant compaction of soil surfaces prior to commencement of re-seeding (phase 4)	Project Manager	On-going
<b>PHASE 4: Re-seeding for basal cover establishment</b>				
4.1	A mixture of endemic vegetation known to be non-invasive within the area, should be utilised in the re-seeding process for the re-introduction of basal cover over rehabilitation sites.	Establishment of basal cover commensurate with the indigenous floral communities of the pre-mining site, such that would also allow BRMO to meet the stated land-use objectives for the site.	Project Manager	Once-off
4.2	BRMO should investigate the commercial availability of seed stocks of the aforementioned grass species; and if not commercially available, BRMO must implement a seed harvesting programme from undisturbed areas of the surface rights area (in conjunction with a competent specialist).	Sufficient available seed stock on hand to effect rehabilitation that meets the stated land-use objective for the site.	Proponent, specialist	Proof of commercial availability within 3 months of the EMP approval, or seed harvesting programme commencement within 12 months.

Table 8-1: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
4.3	Seeding, or any other suitable means of re-introducing basal cover, should be planned and implemented in conjunction with the professional inputs and services of a competent contractor, with experience in such undertakings.	Optimal establishment of basal cover that will ensure that BRMO achieves the stated end-use objectives for the site.	Environmental Officer	Once-off appointment with on-going management thereafter
4.4	Re-seeding should commence within 14 days of topsoil replacement, and areas should be free of alien and invasive plants.	Records kept of topsoil replacement and re-seeding dates for all rehabilitation sites.	Environmental Officer	Within 30 days of topsoil replacement
4.5	The potential requirements for the irrigation and fertilisation of seeded areas, is to be done according to the recommendations and specifications of the specialist contractor appointed for this work.	Optimised efficacy of efforts to establish appropriate basal cover over rehabilitated areas.	Environmental Officer	Once-off
4.6	No grazing on rehabilitated areas is to occur within three years of phase 4 completion.	<ul style="list-style-type: none"> <li>• Documented records of dates upon which re-seeding was effected;</li> <li>• Establishment of robust basal cover prior to introducing grazing herbivores; and</li> <li>• BRMO to meet stated end land-use objectives for the site</li> </ul>	Project Manager	3 years from re-seeding
<b>PHASE 5: Intermediary monitoring and maintenance of basal cover</b>				
5.1	Weekly monitoring should take place in order to ascertain the efficacy of the seeding, and to repair any areas where gullies or rills are forming. Appropriate interventions to be adopted where basal cover establishment fails.	Documented records of weekly inspections. Basal cover establishment commensurate with adjacent undisturbed areas over the mine surface rights areas (i.e. % cover relative to exposed soil surfaces).	Environmental Officer, ecologist	Weekly monitoring until adequate basal cover establishment has been confirmed by an ecological specialist
5.2	Regular application of fertiliser, under the guidance of a suitably qualified soil scientist, should take place in order to ensure efficient establishment of vegetation cover until such time as sufficient organic matter is being produced by the established grasses to allow for self-sustaining growth.	Basal cover establishment commensurate with adjacent undisturbed areas over the mine surface rights areas (i.e. % cover relative to exposed soil surfaces).	Environmental Officer, soil scientist	On-going, as per specialist recommendations

Table 8-1: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
5.3	If re-seeding for basal cover establishment was not effective during 1st application, a second application of hydro-seed mixture may have to be applied in certain areas. The application of hydro-seed should be at the discretion of the specialist contractor.	Basal cover establishment commensurate with adjacent undisturbed areas over the surface rights areas (i.e. % cover relative to exposed soil surfaces).	Environmental Officer, rehabilitation contractor	As necessary, per specialist recommendations
<b>PHASE 6: Establishment of Central Sandy Bushveld</b>				
6.1	Once sufficient basal cover has been established, the introduction of species representative of the applicable vegetation types over the site may commence.	Establishment of stable, climax state, plant communities on rehabilitated areas.	Environmental Officer	On-going
6.2	Introduction of these species should commence through the stages of natural succession (i.e. Pioneer species (grasses, herbaceous species), Secondary species (grasses, small shrubs, and small trees) and Climax state (larger shrubs, large trees).	Establishment of stable, climax-state, plant communities on rehabilitated areas.	Environmental Officer	On-going
6.3	The potential requirements for the irrigation and fertilisation of re-introduced floral species, is to be done according to the recommendations and specifications of the specialist contractor appointed for this work.	Effective establishment and growth of introduced floral species.	Environmental Officer and Project Manager	On-going.
<b>PHASE 7: On-going monitoring, maintenance and aftercare</b>				
7.1	Monitoring and maintenance (as necessary) of phase 6 implementation is to be effected for at least five years following the completion of active species re-introduction to the site.	<ul style="list-style-type: none"> <li>At least 90%, sustainable, establishment of re-introduced plants/trees; and</li> <li>'Ecological' objectives for site closure met.</li> </ul>	Environmental Officer	On-going, Monthly inspections for at least two years; every 6 months thereafter if efforts to rehabilitate are proving effective.
<b>GENERAL PROVISIONS</b>				
8.1	External, independent, 'Mine Rehabilitation' compliance audits must be undertaken by a competent auditor for all areas where rehabilitation is being implemented at the mine.  Audit to at least document compliance with this plan, as well as any other relevant provisions of the EMP revision approval by the DMR.	Full compliance with the provisions for mine site rehabilitation.	Environmental Officer	Every 6 months for as long as any rehabilitation (concurrent and/or closure) is being undertaken at the site

No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
8.2	BRMO should undertake monthly internal compliance audits for all areas where rehabilitation is being implemented at the mine.  Audit to at least document compliance with this plan, as well as any other relevant provisions of the EMP revision approval by the DMR.	Full compliance with the provisions for mine site rehabilitation.	Environmental Officer	Monthly
8.3	BRMO should comply with all relevant environmental legal provisions concerning protected floral species, in executing any relevant provision of this plan.	Full legal compliance for the duration of rehabilitation efforts.	Environmental Officer	On-going
8.4	Post closure monitoring must be undertaken in accordance with the monitoring plan set out in Section 9 of the EMPr.	Compliance with the monitoring plan.	Environmental Officer	On-going

\* All required actions to be implemented and completed within reasonable, practical, time-frames; unless time-frames otherwise expressly stated.

No.	Management/Monitoring Measures	Target	Responsible party(ies)	Time-frames
SFSF				
1.1	The SFSF must be capped, rehabilitated and closed in compliance with the relevant provisions of Section 11 of the Department of Water Affairs & Forestry Minimum Requirements for Waste Disposal by Landfill (2 <sup>nd</sup> Edition, 1998), or any future amendments thereto/ new legislation applicable to such.	Ultimate compliance with stated 'general closure' objectives for the Mine	Project Manager	Once-off. Within at least 24 months of last deposition /disposal thereto.
1.2	Engineering design drawings for capping and closure of the aforementioned facilities, as developed by a competent civil engineer, must be submitted to the competent authority in accordance with the requirements of the Environmental Authorisation and Water Use Licence.	Ultimate compliance with stated 'general closure' objectives for the greater Mine site	Project Manager, civil engineer	Once -off
1.3	The side slopes of all mine residue deposits should be shaped to at least 18°; unless otherwise assessed by a competent person in accordance with the legislation in place at the time.	Slope stability/safety, effective plant establishment and no signs of erosion.	Project Manager	Once-off



Table 8-2: Unique Structural and Infrastructural Rehabilitation Requirements for the SFSF				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	Time-frames
1.4	Closed SFSF should be effectively fenced off to avoid access thereto by unauthorised parties, until such time as it is permanently stable.	Mine residue deposits made safe and inaccessible to the general public at closure. Mine residue deposits effectively fenced-off with controlled access.	Project Manager	Immediately. Once-off
Return Water- and Pollution Control Dams				
2.1	Any plastic liners and any other non-natural materials (e.g. piping, gantries, pump-houses), as well as any residues contained therein, should be removed for subsequent off-site recovery, re-use, recycling or disposal.	All artificially established structures and infrastructure removed from site. Records of waste manifest/safe disposal certificate(s).	Project Manager and Engineering manager	Once-off
2.2	Where relevant, dam walls should be flattened into the respective dam basins following 2.1 above.	Resultant topography conforming to that of the adjacent, pre-mining, land surfaces (Item 2-3, Table 8-1)	Project Manager	Once-off. Within 14 days of completing 2.1 above.
2.3	Proceed with relevant provisions of phases 2 through to 7 of Table 8-1 (i.e. once 2.1 and 2.2 above are appropriately implemented).	Ultimate compliance with stated end land-use-, ecological- and general closure objectives for the Mine.	Project Manager	Once-off. Within 14 days of completing 2.2 above.

### **8.6.1 BUILDINGS AND INFRASTRUCTURE**

Brick buildings and infrastructure can be put to beneficial use upon closure of the mine, and thus should not be removed if there is an adequate use for these buildings post-closure. This “adequate use” should be determined before final closure and rehabilitation measures are formally implemented.

If, however, any agreement is reached with the community and or any other organization to take over the occupation of one (1) or more buildings, then a formal agreement to that extent needs to be entered into and signed by all parties concerned. The DMR also needs to be alerted to this fact, and adequate legal arrangements need to be made in this regard. If various parties cannot reach agreement on the adequate use for these buildings, then these buildings too need to be demolished. All temporary buildings (pre-fabricated buildings) should be removed and their footprints rehabilitated.

## **8.7 CONCLUSIONS AND SUMMARY OF REHABILITATION PLAN**

This rehabilitation plan has taken into consideration areas that need to be rehabilitated on the site either at closure, or concurrently. The effective end result of rehabilitation should be to return the entire project area to as close to its previous pre-mining state as is possible and practical. All acceptable options for recycling and reuse should be considered before final disposal of any building materials, steel structures, electrical equipment or any associated equipment that could be reused, recycled or appropriately scrapped.

The rehabilitation plan is a working document and should change as seen fit, or necessary to achieve a better environmental outcome. The process of rehabilitation is diverse and various obstacles will be encountered during rehabilitation which may call for a revision in this plan. Maintenance of all rehabilitation must be on-going for a period of at least five years.

This maintenance will help to ensure that all rehabilitated areas, re-vegetated areas and alien invasive control is undertaken effectively. Rehabilitation of disturbed areas, as far as is practical, should proceed concurrently with the remainder of the operational period. Disturbed areas should be rehabilitated as quickly as possible. The requirements for such are similar for concurrent and closure rehabilitation.

## 9 ENVIRONMENTAL MONITORING PLAN

The monitoring requirements herein are based on the findings of the environmental impact assessment and related specialists' assessments. These should be applied unless different or alternative stipulations are made in the relevant environmental authorisations and licences, in which case the prescriptions of relevant environmental authorisations and licences must apply.

### 9.1 CONSTRUCTION PHASE

No.	Management/Monitoring Measures	Units	Target	Responsible party(ies)	* Time-frames/ Frequency	Location(s)
1	Alien and invasive species must be identified for removal	Species count	All alien and invasive species removed and no edge propagation	Environmental Officer	Quarterly	Affected footprint
2	Dustfall out monitoring must be undertaken and reported on a monthly basis in accordance with the National Dust Control Regulations (GN.R 827 2013).	mg/m <sup>2</sup> /day	Less than 600 mg/m <sup>2</sup> /day at the BRMO Mine boundary – 30 day average	Environmental Specialist	Continuous	As per Figure 9-1 below.
3	Internal monitoring of compliance with the EMPr and related environmental authorisations and licences	N/A	Full compliance with the EMPr and related environmental authorisations and licences	Environmental Officer	Monthly	Full project scope
4	Internal monitoring of compliance with the EMPr and related environmental authorisations and licences if required.	N/A	Full compliance with the EMPr and related environmental authorisations and licences	Appointed ECO	Quarterly	Full project scope

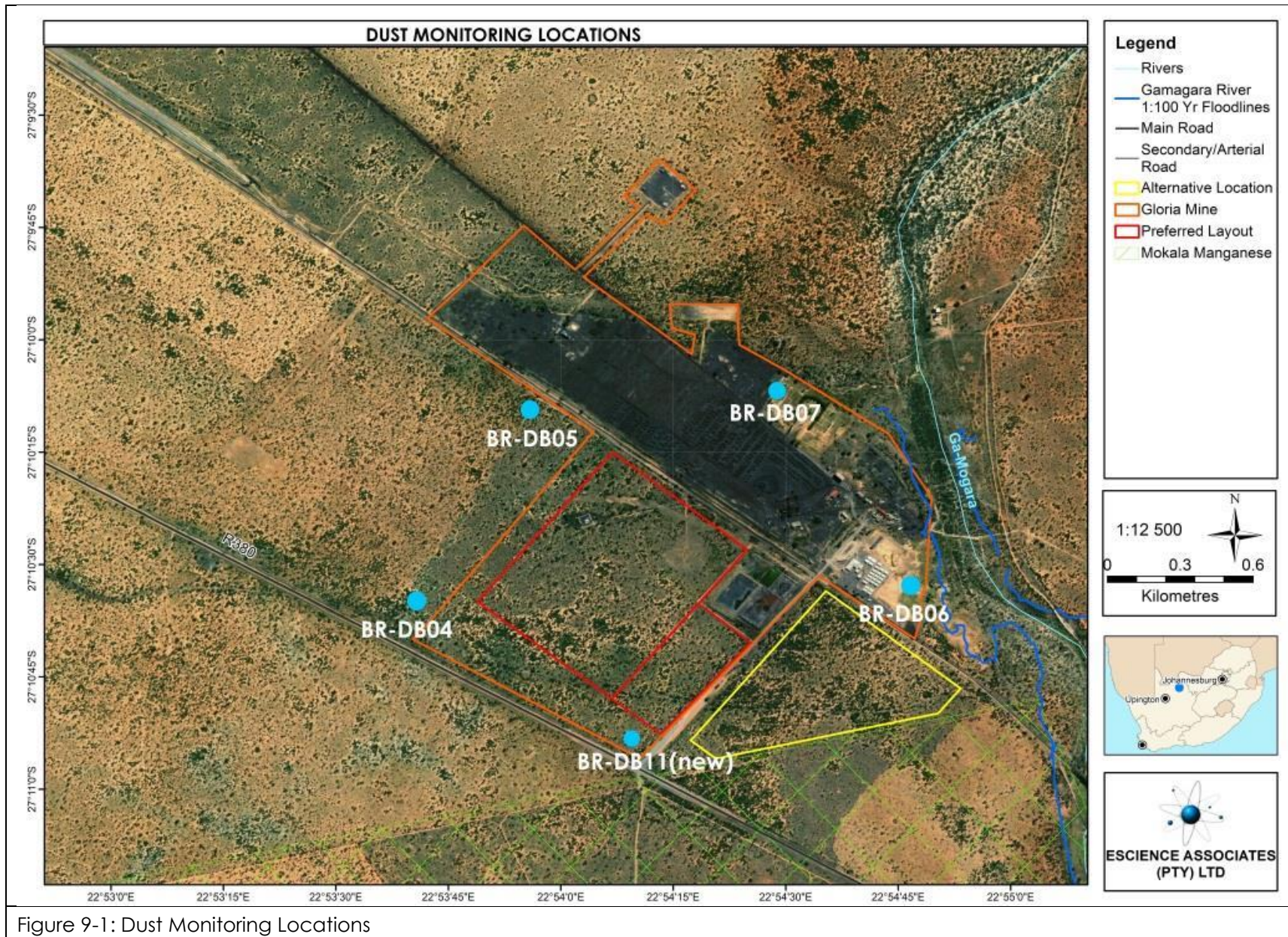


Figure 9-1: Dust Monitoring Locations

## 9.2 OPERATIONAL PHASE

No.	Management/Monitoring Measures	Units	Target	Responsible party(ies)	* Time-frames/ Frequency	Location(s)
1	Alien and invasive species must be identified for removal	Species count	All alien and invasive species removed and no edge propagation	Environmental Officer	Quarterly	Affected footprint
2	Dustfall out monitoring must be undertaken and reported on a monthly basis in accordance with the National Dust Control Regulations (GN.R 827 2013).	mg/m <sup>2</sup> /day	Less than 600 mg/m <sup>2</sup> /day at the BRMO Mine boundary – 30 day average	Environmental Specialist	Continuous	As per Figure 9-1 above.
3	Groundwater Quality		Compliance with the quaternary catchment water quality objectives or as set out in the Water Use Licence	Environmental Officer	Quarterly	As per Figure 9-2 below
	Groundwater levels	mbgl				
	pH					
	Electrical conductivity	mS/m				
	Anions and cations (Ca, Mg, Na, K, NO <sub>3</sub> , Cl, SO <sub>4</sub> , F, Fe, Mn, Al, & Alkalinity)	mg/L				
4	Internal monitoring of compliance with the EMPr and related environmental authorisations and licences	N/A	Full compliance with the EMPr and related environmental authorisations and licences	Environmental Officer	Monthly	Full project scope

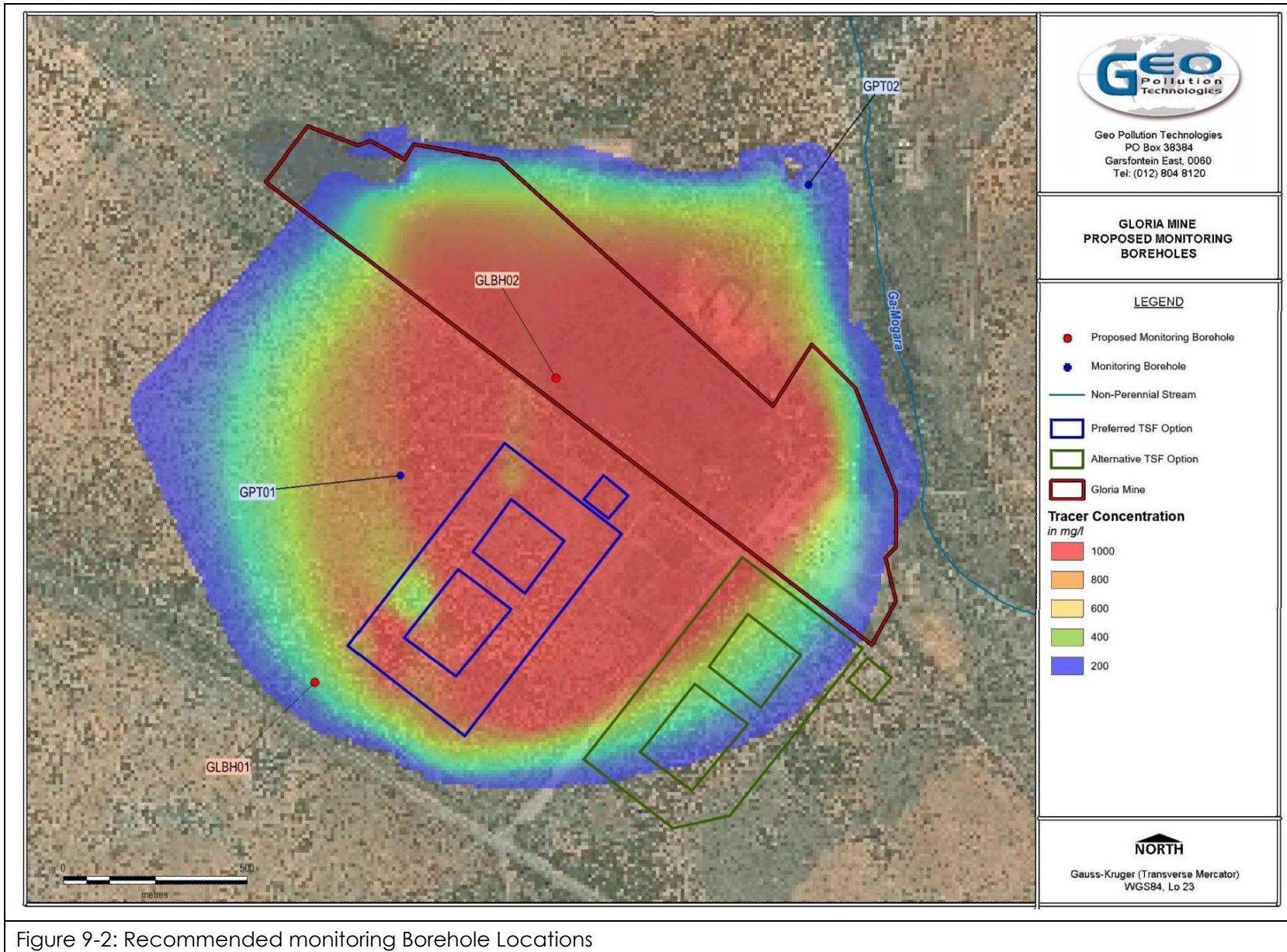


Figure 9-2: Recommended monitoring Borehole Locations

### 9.3 CLOSURE PHASE

No.	Management/Monitoring Measures	Units	Target	Responsible party(ies)	* Time-frames/ Frequency	Location(s)	Duration
1	Alien and invasive species must be identified for removal	Species count	All alien and invasive species removed and no edge propagation	Environmental Officer	Quarterly	Affected footprint	At least 5 years after decommissioning and closure to ensure habitat is not degraded further and that successful rehabilitation has resulted.
2	Dustfall out monitoring must be undertaken and reported on a monthly basis in accordance with the National Dust Control Regulations (GN.R 827 2013).	mg/m <sup>2</sup> /day	Less than 600 mg/m <sup>2</sup> /day at the BRMO Mine boundary – 30 day average	Environmental Specialist	Continuous	As per Figure 9-1 above.	At least 2 years after decommissioning or until compliance can be sustainably demonstrated.
3	Groundwater Quality		Compliance with the quaternary catchment water quality objectives or as set out in the Water Use Licence	Environmental Officer	Quarterly	As per Figure 9-2 above	At least 5 years after decommissioning and closure or until such time as the water quality can be shown to have stabilised with relation to potential sources on the site.
	Groundwater levels	mbgl					
	pH						
	Electrical conductivity	mS/m					
	Anions and cations (Ca, Mg, Na, K, NO <sub>3</sub> , Cl, SO <sub>4</sub> , F, Fe, Mn, Al, & Alkalinity)	mg/L					
4	Internal or external monitoring of compliance with the EMPr and related environmental authorisations and licences	N/A	Full compliance with the EMPr and related environmental authorisations and licences	Environmental Officer	Annual	Full project scope	At least 5 years after decommissioning and closure to ensure that successful rehabilitation has resulted.

# 10 PROCEDURES FOR ENVIRONMENTAL RELATED EMERGENCIES AND REMEDIATION

An effective, comprehensive, well-considered and tested environmental emergency preparedness and response plan has the potential to save lives, prevent unnecessary damage to the company and other property, as well as to manage environmental risk in the event of a large chemical spill, oil spill, fuel spill or explosives spill.

The MPRDA requires in the Regulations Section 51 (b) iii that the mine implement procedures to environmental related emergencies and remediation. Refer to the Black Rock Mine (BRMO) Emergency Preparedness and Response Plan included.

Some specific legal requirements were identified for the emergency response activities in the mining industry. A number of SABS standards apply, such as the SANS10232 - the minimum requirements for emergency responses. Legislation requires that relevant government departments are kept informed of incidents and accidents that occur within the mining area in terms of the following acts:

- Regulation 51 of Regulations under the MPRDA - Procedure for environmental related emergency and remediation;
- Mine Health & Safety Act (Act 29 of 1996) - Manner of reporting and keeping of information regarding incidents & emergencies; and
- Occupational Health & Safety Act (Act 85 of 1993) - Employee requirements to report incidents where activity has occurred.

## 10.1 OBJECTIVES OF AN ENVIRONMENTAL EMERGENCY RESPONSE PLAN

Environmental emergencies occur over the short-term and require an immediate response. A mine, as part of its management tools, especially if it is ISO 9000 and ISO 14001 compliant, should have an Emergency Response Plan. If one does not exist then one should be compiled and disseminated to all employees and contractors and in the event of an emergency, the emergency response plan should be consulted.

This plan should be placed around the mine where it will be easily viewed. The plan should contain a list of procedures, evacuation routes and a list of emergency contact numbers. It is advisable that the mine tests the emergency response plan in order to identify any areas for improvement.

If the emergency has the potential to affect surrounding communities, they should be alerted via alarm signals or contacted in person. The surrounding community will be informed, prior to mining taking place, of the potential dangers and emergencies that exist, and the actions to be taken in such emergencies.

Communication is vital in an emergency and thus communication devices, such as mobile phones, two-way radios or telephones must be placed around the mine. A checklist of emergency response units must be consulted and the relevant units notified.

The checklist includes:

- Fire department;
- Police;



- Emergency health services such as ambulances, paramedic teams, poisons centres;
- Hospitals, both local and further afield, for specialist care;
- Public health authorities;
- Environmental agencies, especially those responsible for air, water and waste issues;
- Other industrial facilities in the vicinity with emergency response facilities;
- Public works and highways departments; and
- Public information authorities and media organisations.

### **10.1.1 EMERGENCY PROCEDURES**

The following is an Accident Handling Procedure (AHP) for Duty Officials:

1. Take down details from reportee including the following:
  - a) Telephone number of reportee;
  - b) Nature of injuries to accident victim;
  - c) If assistance is required from the paramedic;
  - d) Where the accident victim is located;
  - e) If transport is required to CASEVAC patient; and
  - f) Instruct reportee to leave a messenger by the phone.
2. If the injuries are serious contact the relevant emergency services who will notify the paramedics.
3. Await paramedics and instruct them to proceed to the accident site.
4. Notify security and inform them of ambulance arrangements and where the said vehicle must go to.
5. Inform the paramedic called out on the following:
  - a) Telephone number of reportee;
  - b) Nature of injuries to accident victim or victims;
  - c) Where is the injury, part of body (arm, leg, head, etc.);
  - d) Where the accident victim is presently;
  - e) What is the condition of victim (breathing, stable, etc.); and
  - f) If an ambulance is required to CASEVAC victim from surface location to hospital.
6. If necessary provide a guide, at security gate, to escort the ambulance or paramedics to the required location.
7. Inform manager of the accident.

**NOTE:**

The procedure does not change because there is more than one accident victim. One victim or 20 victims must be handled in the same manner.

Emergency Procedure for Duty Officials:

In the event of an explosion or fire occurring in the underground environment, the following action must be taken by the duty official as a first phase:

**10.1.1.1 First Phase:**

1. Take down the following details of the incident from the reportee:
  - a) Nature of the incident, explosion, fire etc.;
  - b) Location of the incident, explosion, fire etc.;
  - c) If there are casualties and the nature and extent of their injuries;
  - d) Ask if the reportee requires assistance (rescue team, doctor, paramedic, Transport etc.);
  - e) If the reportee and his team are going to, or are in the rescue chamber;
  - f) The phone number of the reportee; and
  - g) Name of person reporting the incident.
2. Based on the above-mentioned information, the official on duty will take a decision whether to evacuate any or all other work areas of the mine, making use of the current escape plan for the section or area.
3. Report the incident to the mine manager and the Sub-ordinate Manager.
4. If the mine manager is unobtainable then report the incident to the next lowest level of
5. Official (engineer, mine overseer, etc.).
6. Contact and call out the following personnel:
  - a) The mine doctor and paramedics;
  - b) Occupational hygienist (Ventilation Officer);
  - c) The mine overseer for the incident area;
  - d) The mine engineer; and
  - e) The safety manager.
7. Begin a logbook or record of events putting in detail of times and who said what, where and when, going back to the original reportee.

**NOTE:**

- i. The official will assume the position of the incident controller until relieved of that position by the newly appointed incident controller, i.e. (mine manager, engineer, etc.).
- ii. It is important to ensure that all phone messages are kept to a minimum duration throughout the incident period.

### 10.1.1.2 Second Phase:

1. Appoint lamp room attendant as required in terms of this emergency standard procedure to conduct shaft clearance of evacuates.
2. If necessary send for emergency service, fire brigade, police, etc.
3. Give feedback to newly appointed incident coordinator once he is present on the mine and hand over role to new incident coordinator.
4. Follow instructions of Mine Manager.
5. Refer all media enquiries to head office legal department.
6. Remain in position at control room until relieved.
7. Brief official on current situation.

#### **NOTE:**

Remember to maintain the logbook at all times throughout the duration of the incident.

## 10.2 EMERGENCIES, PROCEDURES AND REMEDIAL ACTION

The following define the most likely potential environmental emergencies

### 10.2.1 FIRES

Veld fires and fires resulting from other sources must be handled with extreme caution. Fire Extinguishers should be placed at easily accessible locations around the mine.

Procedure:

- In the event of a fire, an alarm should be activated to alert all employees and contractors;
- Identify the type of fire and the appropriate extinguishing material. For example, water for a grass fire, and mono ammonium phosphate based fire extinguisher for chemical and electrical fires.
- In the event of a small fire the fire extinguishers placed around the mine should be used to contain and extinguish the fire.
- In the event of a large fire, the local area council's fire department will be notified and should react timeously.
- All staff will receive training in response to a fire emergency on site.
- A Fire Association should be set up with the mine and surrounding landowners to facilitate communication during fire events and assist in fighting fires, where necessary.
- In case of a chemical or petroleum fire, run-off from the area should be contained as far as possible using the most appropriate measures e.g. spill absorbent cushions, sand or a physical barrier.
- Contaminated run-off must be diverted into an oil sump, or cleaned up.

## 10.2.2 MAJOR HYDROCARBON/HAZARDOUS MATERIAL SPILLAGE

Hydrocarbon, or any other chemical spills, must be handled in an appropriate manner in order to minimize the environmental impacts and rectify the damages done to the environment.

### 10.2.2.1 Spill Clean Up

All employees, especially machine operators, are responsible for the immediate spillage containment (control from spreading), application of a spill absorbent and spill cleaning for all spills resulting from machines in their control.

The steps for any clean-up operation are:

- Contain the spill, to stop it from spreading;
- Remove, block or stop the source of the pollution, i.e. close any taps or valves;
- Clean up the affected areas; and
- Rehabilitate the area.

Personal Protective Equipment must be worn when handling oil, diesel, solvents or any other chemicals.

### 10.2.2.2 Spills on Concrete Surfaces

- Mop up liquid chemical spills on concrete or cement floors with loose, absorbent materials;
- Put used fibre into a 210 L drum or container marked for that purpose;
- Once it is full, send the drum to the hazardous waste management yard;
- All diesel, oil, petrol, chemical and acid contaminated fibre sorbs or soil should be handled as hazardous waste;
- Extra caution must be taken with drums filled with flammable substances (e.g. petrol, oil) – if using metal drums, care must be taken not to cause sparks;
- Contain large oil spills with fibre booms, bio-tube or sand filled plastic bags (depending on which is available);
- Ensure that all efforts are taken to prevent the spread of the substance;
- Pump up or scoop excess oil, diesel or liquid chemicals into a holding tank/drum marked for that purpose;
- Avoid the use of chemicals to absorb oil; and
- Use the biological degreaser to remove traces of oil left on the concrete surface.

### 10.2.2.3 Spills on Tar Surfaces

- As for the spills on concrete, speed is important, because oil and diesel softens the tar surface;
- Soak up oil and/or chemicals with a suitable absorbent (loose fibre); and
- Clean the remaining or stains with biological cleaner that should be in stock.

#### **10.2.2.4 Spills on Soil**

- Unless otherwise removed from location and disposed of at a hazardous waste disposal facility, use a bio-remediation agent containing oil/diesel degrading bacteria;
- Remove the excess oil and or diesel as quickly as possible to prevent further penetration into the ground, by scooping up excess with shovels;
- Use plastic sheeting where necessary to divert and pick up the oil/diesel;
- Place any excess oil/diesel/chemical into a drum marked for that purpose; and
- Bio-remediation of oil/diesel polluted soil on site must be undertaken as follows:
  - Determine the depth and width that the oil/diesel has penetrated into the soil as far as possible, by digging up the polluted soil;
  - Remove the polluted ground to one side and mix it thoroughly with the bio-remediation powder;
  - One spade remediation powder per cubic metre of polluted ground;
  - Replace the mixture of bioremediation powder and contaminated soil back into the excavated site and water thoroughly – note the ground must be saturated, but not so wet that the water drains through;
  - Leave for two to three weeks;
  - Conduct a visual inspection by checking the colour of the ground, contact the Environmental Management Section located within the SHEQ Department for advice if necessary; and
  - It may be necessary to add more bio-remediation agent. The bioremediation process depends on the temperature, moisture content and the presence of air in the soil. The clean-up process occurs faster in warmer weather. It is necessary to send the soil sample to a laboratory to test for hydrocarbon content, to determine if the clean-up has been successful.

#### **10.2.2.5 Spills of More Than 100 Litres of Diesel, Oil, Acid or any other Hazardous Substance**

- Report spill immediately to the SHEQ Department; and
- Follow procedures as above, depending on spill location

#### **10.2.2.6 Spills of Tailings**

- Report to the Plant Manager so that the necessary action can be taken according to the Mandatory Code of Practice for Tailings Disposal reference number COP - T – 01;
- Contain and pick up tailings spills where possible; and
- Dispose of the tailings spills to the current tailings facility.

### **10.2.3 REPORTING, TRAINING AND MANAGEMENT**

It is the responsibility of all employees to report all spillages through the NCR system and the incident reporting systems – this entails reporting to their supervisors, who shall then report to the Environmental Manager located in the SHEQ Department.

It is the responsibility of the relevant supervisors, in liaison with the SHEQ Department to make sure that immediate corrective actions are taken to remedy the damage caused to the environment.

It is the responsibility of the relevant supervisors with the assistance from the SHEQ Department personnel to evaluate the success of remedial and preventative action taken, and to record the results of the NCR or the Incident Reporting System, including any ISO14000 requirements.

The SHEQ Department, in conjunction with the Training Department, will generate a one page quick step-by-step reference (to be laminated and attached to all mobile machinery) for use by operators in a case of spillage.

It is the SHEQ Department's responsibility to ensure that all equipment necessary to implement the aforementioned response procedures is readily available on site.

# 11 ENVIRONMENTAL AWARENESS PLAN

## 11.1 INTRODUCTION

The environmental awareness plan must:

- Outline how employees will be informed of environmental risks which may result from their work; and
- State how employees will be able to prevent, reduce or remediate risks, in order to avoid pollution or the degradation of the environment.

### 11.1.1 SCOPE

This environmental awareness plan sets out the mine's training procedures and objectives regarding environmental awareness. It is a stand-alone procedure, which serves to improve awareness, training and competency in the environmental field. It contains no detail on the actual training initiatives but rather serves to ensure that a responsible person is appointed to deal with and increase environmental awareness on the mine.

### 11.1.2 RESPONSIBILITIES

It should be the responsibility of the environmental manager, within the existing SHEQ Department at BRMO, to implement the environmental awareness plan. If necessary, assistance from others at the BRMO, or external support, will be used to conduct the training.

### 11.1.3 OBJECTIVES

The objectives as defined by ISO14001 are as follows:

Competence, Training and Awareness:

1. The organisation shall ensure that any person(s) performing tasks for it or on its behalf that have the potential to cause a significant environmental impact(s) identified by the organisation is (are) competent on the basis of appropriate education, training or experience, and shall retain associated records.
2. The organisation shall identify training needs associated with its environmental aspects and its environmental management system. It shall provide training or take other action to meet these needs, and shall retain associated records.
3. The organisation shall establish, implement and maintain a procedure(s) to make persons working for it or on its behalf aware of:
  - The importance of conformity with the environmental policy and procedures and with the requirements of the environmental management system.
  - The significant environmental aspects and related actual or potential impacts associated with their work, and the environmental benefits of improved personal performance.
  - Their roles and responsibilities in achieving conformity with the requirements of the environmental management system.
  - The potential consequences of departure from specified procedures.

#### **11.1.4 REVISION**

The responsible person will revise these environmental awareness procedures from time to time. The date of commencement of the revised procedure will always be indicated to prevent confusion.

### **11.2 ENVIRONMENTAL RISKS AND PRIORITIES**

#### **11.2.1 OBJECTIVES**

The following requirements of ISO14001 have bearing:

1. The organisation shall establish, implement and maintain a procedure(s) to identify potential emergency situations and potential accidents that can have an impact(s) on the environment and how it will respond to them.
2. The organisation shall respond to actual emergency situations and accidents and prevent or mitigate associated adverse environmental impacts.
3. The organisation shall periodically review and, where necessary, revise its emergency preparedness and response procedures, in particular, after the occurrence of accidents or emergency situations.
4. The organisation shall also periodically test such procedures where practicable.

#### **11.2.2 IDENTIFYING ENVIRONMENTAL RISKS**

Environmental risks must be identified and procedures must be set in place to deal with risks, which could include:

- Fires;
- Spills of hazardous substances, including explosions;
- Leaks or breaks of pipes or vessels, including dam overflows;
- Accidents, especially during adverse weather;
- Slow environmental degradation related to continuous poor housekeeping;
- Damage to heritage or environment; and
- Social issues, either complaints about poor environmental management, or direct employment type issues.

Many of these environmental risks have been identified in the EIA Report associated with the development of this EMPr and therefore the risk assessment exercise will not be repeated here. Once the mitigation measures have been read in the EMPr chapter, it will be clear what training will assist with the prevention or reduction of each environmental risk.

### **11.3 INCREASING ENVIRONMENTAL AWARENESS**

#### **11.3.1 TRAINING NEEDS**

These shall be identified by:

- Management or staff through performance appraisal;
- At time of recruitment;
- In-task observation of performance;
- Additions to scope of work; and



- Changes to working procedures.

Training programmes and environmental awareness programmes will include:

- Environmental legislation and the BRMO EMS;
- Resource conservation, including recycling and cleaner production methods;
- Pollution prevention, including emergency procedures;
- General good house-keeping, storage and handling of chemicals;
- Spill prevention, clean-up and remediation;
- Ecological protection and nature conservation, including alien vegetation, protected trees; and
- Administrative procedures, such as reporting, data collection and input, sampling, etc.

The level of detail on these topics will depend upon the exposure of that person to the natural environment and the nature of their job. Contractors that are employed at BRMO must, prior to starting any work, complete the contractor's package. This package requires the contractor to perform SHEQ procedures, which include BRMO's SHEQ Policy, existing operational procedures and Incident Reporting. The contractor is required to brief and train all its employees on the BRMO SHEQ procedures prior to commencing with work. Training records must be available and auditable for auditing purposes.

Several different types of training programme can be developed, as follows:

- Induction training: for all new employees, aimed to acquaint the employee with the company, its rules and their new job; no employee may start work until they have completed the induction training;
- On-the-Job training: offered as needs be, but particularly as part of mentoring junior staff; to be largely conducted by supervisors and other senior staff;
- Internal training: may be similar to On-the-Job training, for topics such as machinery operation, but will be conducted as a discrete training event; other courses may also be offered such as First Aid. Outside service providers may be used, but training will take place on site;
- External training: can cover any topic, including leadership, life skills, management, etc. and should be aligned with the National Skills Strategy of the Department of Labour and the Mining Qualifications Authority;
- Educational assistance: this will encourage staff to study further, by possibly paying tuition and towards study materials, or allowing study leave; some payback system may be used for staff who fail, in order to provide motivation to pass and excel;
- Once training needs have been established it is up to the supervisor to notify the training department of the requirements. The training department will then identify pertinent and relevant courses (if not already done so by employee/supervisor) and schedule training accordingly. Identified and agreed training needs shall be included in budgets and processed as described below. Course attendance (other than at the internal induction courses) shall be scheduled on the basis of the scale of environmental risk; and

- Training expenses, including conferences and symposia should be checked and approved by the mine management. The training department shall complete a course authorisation form and ensure that the procedures are followed regarding course bookings, confirmations and payments. Planning of training for job specific training (done through training needs analysis) will be coordinated between the Training Superintendent and the relevant section heads. This will result in a training schedule for job specific training on the mine.

The trainee shall:

- Obtain approval from the mine management;
- Request training department to make official booking for him/her; and
- External training courses shall be assessed through:
  - Reports and recommendations of staff;
  - Recommendation by known competent external personnel; and
  - Review of course content, presenters, location and facilities by knowledgeable personnel.

### **11.3.2 EMS TRAINING**

All employees, current and new, and contractors will undergo induction, a part of which is environmental awareness training and includes the environmental policy of the mine. At the end of this training, personnel will be required to complete an awareness test and the level of awareness assessed by the training department. Re-testing, or re-induction, may be required. Computer Based Assessments can form part of this process.

All personnel performing tasks, which can cause significant or major environmental impacts, shall be competent on the basis of training, education and/or experience. This applies to, but is not limited to, supervisor level and above - i.e. operators, artisans.

#### **11.3.2.1 Type**

Awareness training must include the potential consequences of departure from specified operating procedures as well as significant environmental impacts, actual or potential, of their work activities. Training will be appropriate to the actual activity of individual employees.

#### **11.3.2.2 Evaluation**

Evaluation of awareness and competency training (implementation of training in the workplace) will be carried out by the environmental officers, section managers and staff in the training department. Senior management if required can also supplement the evaluation.

#### **11.3.2.3 Records**

The following records shall be maintained by the Training Department when relevant:

- Personnel qualifications;
- Training needs;
- Certificates;
- Licences;

- Training programmes/courses attended;
- Staff induction; and
- Performance appraisals (confidential).

## **11.4 ENVIRONMENTAL NON-COMPLIANCE**

Non-conformance is a term used for the ISO14001 EMS, whilst non-compliance typically relates to environmental law. Either way, these situations do occur and need to be dealt with suitably.

### **11.4.1 RESPONSE TO ENVIRONMENTAL NON-COMPLIANCE**

ISO14001 states that:

“The organisation shall establish, implement and maintain a procedure(s) for dealing with actual and potential non-conformity(ies) and for taking corrective action and preventative action”.

All employees and contractors must report non-compliances according to the EMS, which generally involves:

- Reporting to the supervisor of that area;
- Investigating the cause of the incident;
- Recording the incident;
- Reporting to authorities, if necessary;
- Ensuring remediation is done;
- Identifying corrective actions;
- Follow-up on corrective actions; and
- Drafting progress reports and keeping all records.

## **12 FINANCIAL PROVISIONS**

BRMO must comply with the regulations pertaining to the financial provision for prospecting, exploration, mining or production operations, promulgated in GN.R. 1147 On 20 November 2015, under the National Environmental Management Act (Act 107 of 1998).

The requirements thereto are submitted to the DMR separately and in compliance with the regulations.

## 13 UNDERTAKING

I, \_\_\_\_\_

The undersigned, and duly authorised thereto by Assmang (Pty) Ltd - Black Rock Mine Operations, have studied and understand the contents of this document in its entirety and hereby duly undertake to adhere to the conditions as set out therein.

Signed at \_\_\_\_\_

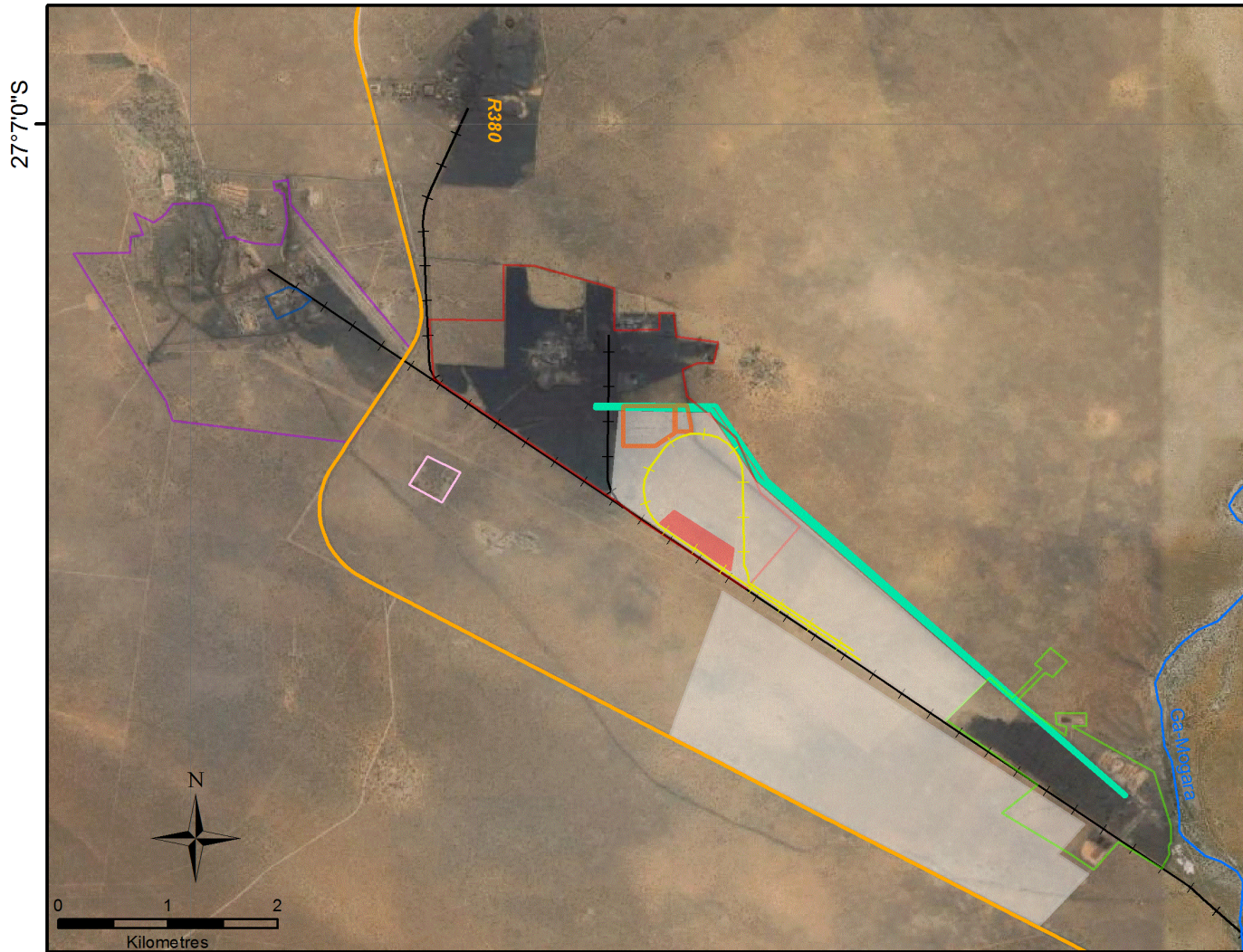
This \_\_\_\_\_ day of \_\_\_\_\_, 2016

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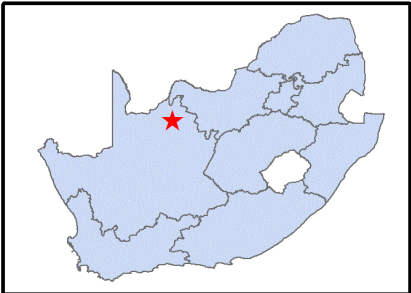


# AUTHORISED DEVELOPMENT AREA

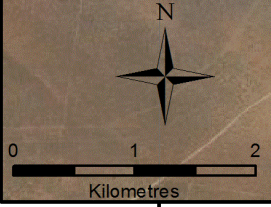


**Legend**

- Main Road
- Secondary/Arterial Road
- Railway Lines
- Rivers & Streams
- Railloop
- Stacking and Loading Activities
- Skoonspruit Village
- Black Rock Mine Activities
- Nchwane II Mine Activities
- Nchwane III Mine Activities
- Gloria Mine Activities
- Stacking and Loadout Station
- Proposed Tailings Facility
- Authorised area for proposed activities



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