



Final Rehabilitation, Decommissioning and Closure Plan, Incorporating an Annual Rehabilitation Plan and Environmental Risk Assessment

AROAMS 57 PROSPECTING RIGHT PROJECT

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Leaders in Environmental Management



BLACK MOUNTAIN MINING AROAMS 57 PROSPECTING RIGHT APPLICATION

FINAL REHABILITATION, DECOMMISSIONING AND CLOSURE PLAN

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1. INTRODUCTION

Black Mountain Mining (Pty) Ltd (the Applicant) has submitted an application for a Prospecting Right in terms of Section 16 of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA) and an Application for Environmental Authorization in terms of Chapter 6 of GNR 982 promulgated under the National Environmental Management Act (Act 107 of 1998) (NEMA) to prospect for ferrous & base metals (Copper Ore, Iron Ore, Zinc Ore, Lead Ore, Manganese Ore, Nickel and Molybdenum) and all associated metals and minerals, precious metals (Gold Ore, Silver Ore) and all associated metals and minerals.

The proposed project that will aim to ascertain if economically viable mineral deposits exist within the application area. In order to undertake prospecting activities, Black Mountain Mining will require a Prospecting Right in terms of the Mineral and Petroleum Resources Development Act (MPRDA, Act No.28 of 2002). The Applicant is also required to obtain an Environmental Authorisation (EA) in terms of the National Environmental Management Act (NEMA, Act No. 107 of 1998) which involves the submission of a Basic Assessment Report (BAR). Environmental Impact Management Services (Pty) Ltd (EIMS) has been appointed by Black Mountain Mining to compile the BAR in support of the Prospecting Right application submitted by EIMS on behalf of Black Mountain Mining, which in turn will be submitted to the DMR for adjudication.

In accordance with Section 24P of the NEMA the Applicant must, before the Minister responsible for mineral resources issues the EA, comply with the prescribed financial provision for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts. This Final Rehabilitation, Decommissioning and Closure Plan (FRDCP) aims to meet this requirement and has been prepared in accordance with the requirements of the NEMA Financial Provisioning Regulations (2015) (NEMA GNR 1147).

According to the regulations, financial provision must be made for rehabilitation and remediation; decommissioning and closure activities at the end of prospecting, exploration, mining or production operations; and remediation and management of latent or residual environmental impacts which may become known in the future. In order to address these requirements, this document includes an annual rehabilitation plan, a final rehabilitation, decommissioning and mine closure plan, and an environmental risk assessment report.

Table 1 below lists the specific requirements that must be contained in each of the three plans as per the NEMA GNR 1147 Appendices 3, 4 and 5, as well as the associated section in this report where each requirement is addressed.

TABLE 1: NEMA GNR 1147 APPENDIX 3, 4 AND 5 REQUIREMENTS AND ASSOCIATED SECTIONS WHERE THEY ARE ADDRESSED

No.	Requirement	Relevant Section
Annual Rehabilitation Plan – Appendix 3		
3 (a)	details of the person or persons that prepared the plan, and timeframes of implementation of the current, and review of the previous rehabilitation activities;	Section 2
3 (b)	the pertinent environmental and project context relating directly to the planned annual rehabilitation and remediation activity;	Section 3.1.1

No.	Requirement	Relevant Section
3 (c)	results of monitoring of risks identified in the final rehabilitation, decommissioning and mine closure plan with a view to informing rehabilitation and remediation activities;	To be confirmed after the first implementation of the Annual Rehabilitation Plan.
3 (d)	an identification of shortcomings experienced in the preceding 12 months;	Section 4
3 (e)	details of the planned annual rehabilitation and remediation activities or measures for the forthcoming 12 months;	Section 4
3 (f)	a review of the previous year's annual rehabilitation and remediation activities;	Section 4
3 (g)	costing;	Section 4
Final Rehabilitation, Decommissioning and Mine Closure Plan – Appendix 4		
3 (a)	details of the person or persons that prepared the plan;	Section 2
3 (b)	the context of the project, including material information and issues that have guided the development of the plan, an overview of the environmental context, the social context regarding closure activities and post-mining land use, stakeholder issues and comments, and the mine plan and schedule for operations;	Section 3.1
3 (c)	findings of an environmental risk assessment leading to the most appropriate closure strategy;	Section 3.2
3 (d)	design principles, including the legal and governance framework, the closure vision, objectives and targets, alternative closure and post closure options, a motivation for the preferred closure action, details of the closure and post closure period, details associated with any on-going research on closure options, and details of assumptions made to develop closure actions;	Section 3.4
3 (e)	a proposed final post-mining land use;	Section 3.5
3 (f)	closure actions required;	Section 3.6
3 (g)	a schedule of actions for final rehabilitation, decommissioning and closure;	Section 3.6
3 (h)	an indication of the organisational capacity that will be put in place to implement the plan, including the organisational structure;	Section 3.8
3 (i)	an indication of gaps in the plan;	Section 3.9
3 (j)	relinquishment criteria for each activity or infrastructure in relation to environmental aspects with auditable indicators;	Section 3.10
3 (k)	the closure cost estimation procedure;	Section 3.11
3 (l)	monitoring, auditing and reporting requirements which relate to the risk assessment, legal requirements and knowledge gaps;	Section 3.12
3 (m)	motivations for any amendments made to the final rehabilitation, decommissioning and mine closure plan, given the monitoring results in the previous auditing period and the identification of gaps as per 2(i).	Section 3.12
Environmental Risk Assessment – Appendix 5		

No.	Requirement	Relevant Section
3 (a)	details of the person or persons that prepared the plan;	Section 2
3 (b)	details of the assessment process used to identify and quantify the latent risks;	Section 5.1
3 (c)	management activities;	Section 5.2
3 (d)	costing;	Section 5.2
3 (e)	monitoring, auditing and reporting requirements.	Section 5.2

2. DETAILS OF THE SPECIALIST

The details of the professionals who contributed to the preparation of the annual rehabilitation plan (ARP), final rehabilitation, decommissioning and mine closure plan (FRDCP) and environmental risk assessment (ERA) are provided in Table 2.

TABLE 2: DETAILS OF SPECIALIST¹

Name	Role	Qualifications/ Experience	Professional Registrations
GP Kriel	Environmental Scientist / Project Manager / EAP	M.Env.Sci. ~9 years environmental consulting experience.	South African Council for Natural Scientific Professions- Registered Professional Natural Scientist (Environmental Science 400202/09) Water Institute of Southern Africa - Member
Liam Whitlow	Environmental Scientist	BSc Hons Environmental Management. ~15 years environmental consulting experience.	South African Council for Natural Scientific Professions- Registered Professional Natural Scientist (Environmental Science 400148/08)

3. FINAL REHABILITATION, DECOMMISSIONING AND CLOSURE PLAN (FRDCP)

According to the NEMA GNR 1147 the objective of the final rehabilitation, decommissioning and closure plan, is to identify a post-mining land use that is feasible through-

- a) Providing the vision, objectives, targets and criteria for final rehabilitation, decommissioning and closure of the project;
- b) Outlining the design principles for closure;
- c) Explaining the risk assessment approach and outcomes and link closure activities to risk rehabilitation;

¹ According to the 2015 Financial Provisioning Regulations "Specialist" is defined as "specialist" means an independent person or persons who is qualified by virtue of his or her demonstrable knowledge, qualifications, skills or expertise in the mining, environmental, resource economy and financial fields.

- d) Detailing the closure actions that clearly indicate the measures that will be taken to mitigate and/or manage identified risks and describes the nature of residual risks that will need to be monitored and managed post closure;
- e) Committing to a schedule, budget, roles and responsibilities for final rehabilitation, decommissioning and closure of each relevant activity or item of infrastructure;
- f) Identifying knowledge gaps and how these will be addressed and filled;
- g) Detailing the full closure costs for the life of project at increasing levels of accuracy as the project develops and approaches closure in line with the final land use proposed; and
- h) Outlining monitoring, auditing and reporting requirements.

This section of the report aims to achieve these objectives.

3.1. PROJECT AND ENVIRONMENTAL CONTEXT

This section aims to provide context and focus attention on the material information and issues that have guided the development of this FRDCP. Further details on the project and environmental context can be obtained from the Basic Assessment Report.

3.1.1. PROJECT CONTEXT

Please refer to the detailed description of the project as provided for in Section 2 of the BAR. The planned invasive prospecting activities, which would require inclusion in the FRDCP are extracted and described in Section 3.1.1.2 to Section 3.1.1.5.

3.1.1.1. LOCATION

Aroams covers an area of 3837.7102 hectares. The area is located approximately 8 kilometres northeast of the town of Aggeneys and 48 kilometres west-south-west of the town of Pofadder, Namaqua District, Northern Cape Province and includes the following farm portion: Portion 1 of the farm Aroams 57.

The table below indicates the farm portions that fall within the Prospecting Right Application Area.

TABLE 3: LOCALITY DETAILS

Farm Name (s)	Aroams 57 Portion 1
Application Area (Ha)	The area is 3837.7102 (three thousand eight hundred and thirty seven hectares)
Magisterial District	Namakwaland
Distance and direction from nearest town	The area is located approximately 8 kilometres northeast of the town of Aggeneys and 48 kilometres west-south-west of the town of Pofadder, Namaqua District, Northern Cape Province.
21 digit Surveyor General Code for each Portion	C0530000000005700001

The prospecting right application boundary is described by the following coordinates.

TABLE 4: APPLICATION AREA BOUNDARY COORDINATES

FARM	POINT No.	X-COORDINATE	Y-COORDINATE
Portion 1 of Aroams 57	A	18.9085	-29.1401
	B	18.9481	-29.1641
	C	18.9122	-29.2002
	D	18.9094	-29.2439
	E	18.8797	-29.2460
	F	18.8848	-29.1801

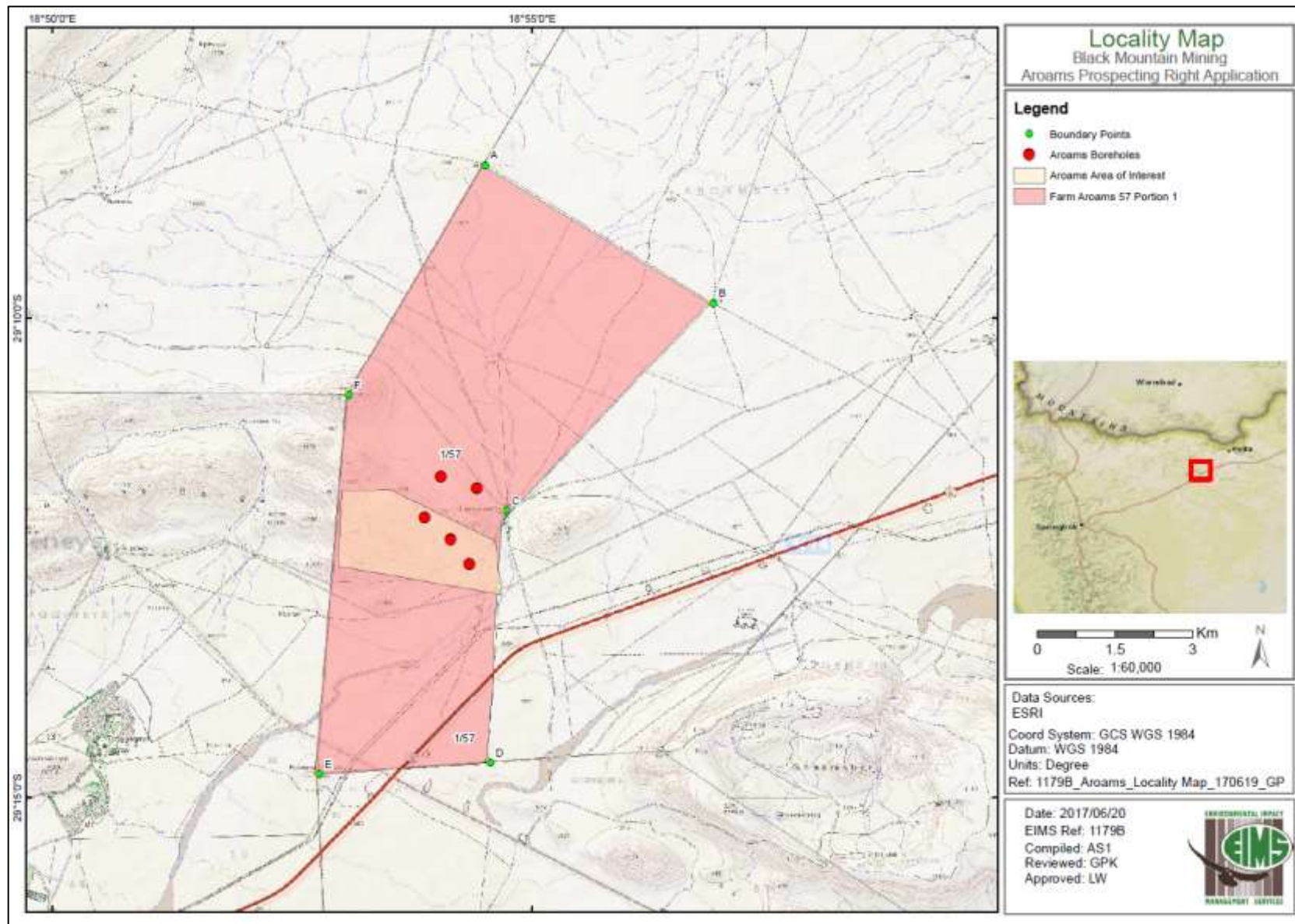


FIGURE 1: LOCALITY MAP SHOWING THE PROPOSED APPLICATION AREA AND PROPOSED BOREHOLE LOCATIONS

3.1.1.2. DESCRIPTION OF PLANNED INVASIVE ACTIVITIES

These activities result in land disturbances e.g. sampling, drilling, bulk sampling, etc. Please refer to the Project Schedule in Table 5 below.

a) Drilling

The targeting of all drilling activities will be dependent on the results obtained during the preceding phases of prospecting, namely the geological mapping and geophysical surveying. Diamond drilling will be of the standard HQ or NQ size. Down hole surveys will be done every 50m in each hole. Core will be marked, logged, photographed and sampled according to the standard of the applicants logging and sampling procedures.

Down the hole geophysical surveying will take place upon completion of the exploratory boreholes along with Ground Electro Magnetic (EM) surveys to determine positions of conductors.

Rehabilitation of drill sites will be done according to an approved EMPR.

Percussion Rotary Air Blast (RAB) drilling may be carried out for pre-collaring of diamond drill boreholes or for obtaining samples if significant depth of cover is encountered over particular targets.

b) Assaying

Rock chip / soil samples will be sent to a laboratory to be crushed, split, pulverized and assayed. Samples from core will be split using a core cutter before being sent to the laboratory for analysis.

c) Metallurgical Test Work

Metallurgical test work would start during phase 7 of the prospecting work programme. These tests will be done by and in consultation with a preferred and accredited laboratory.

Phase 4: Boreholes

The initial planned invasive prospecting activities will consist of diamond drill boreholes drilled to appropriate depths to target any anomalies identified during Phases 2 and 3 of the non-invasive portion of the prospecting work plan. The work will consist of:

- ✎ Access and drill site preparation.
- ✎ Diamond core drilling.
- ✎ Sampling and assaying.
- ✎ Quality assurance and quality control programs.
- ✎ Down hole geophysics.
- ✎ Rehabilitation of drill sites.
- ✎ Recording and Integration of data.

Phase 7: Boreholes

This phase of boreholes would determine the continuity of mineralization and potential deposit size. The work will consist of:

- ✎ Access and drill site preparation.

- ✎ Widely spaced diamond drilling and analyses to confirm grade / tonnage potential.
- ✎ Sampling and assaying.
- ✎ Quality assurance and quality control programs.
- ✎ Metallurgical test work.
- ✎ Rehabilitation of drill sites.
- ✎ Recording and Integration of data.

Phase 8: Boreholes

This phase of boreholes would provide enough information to be able to calculate an inferred resource. The work would consist of:

- ✎ Access and drill site preparation.
- ✎ Close spaced infill diamond drilling and analyses to determine actual grade / tonnage.
- ✎ Sampling and assaying.
- ✎ Quality assurance and quality control programs.
- ✎ Metallurgical test work.
- ✎ Geotechnical drilling program.
- ✎ Rehabilitation of drill sites.
- ✎ Recording and Integration of data.

3.1.1.3. PROPOSED PROSPECTING SCHEDULE

The proposed prospecting project schedule is summarised Table 5.

TABLE 5: TIMEFRAMES EACH OF THE PROPOSED ACTIVITIES

Phase	Year 1	Year 2	Year 3	Year 4	Year5
Phase 1 (0-6months) Desktop Study: Literature Survey / Review / acquisition of data	X				
Phase 2 (6-12 months) Geological field mapping	X				
Phase 3 (12-24 months) Regional Ground geophysical Surveys		X			
Phase 4 (24-34 months) Target Prospecting Boreholes			X		
Phase 5 (34-36 months) Data Compilation			X		
Phase 6 (36-42 months) Detailed Ground geophysical Surveys				X	

Phase	Year 1	Year 2	Year 3	Year 4	Year5
Phase 7 (42-48 months) Widely Spaced Prospecting Boreholes				X	
Phase 8 (48-60 months) Closely Spaced Prospecting Boreholes					X

As per the Financial Provisioning Regulations (2015) this FRDCP will require regular review, amendment and updating. Such updating will include a review of the status of prospecting activities completed, underway and planned. At present no prospecting right has been issued to the applicant and consequently there are no previous prospecting activities or disturbed areas which can be reported on.

3.1.2. ENVIRONMENTAL AND SOCIAL CONTEXT

The description and definition of the pre-prospecting environmental context is critical to ensure that the ultimate closure objectives and associated end land-use are achieved. In this regard please refer to Section 6 of the BAR for a detailed description of the receiving environment applicable to this specific project. Based on the description of the receiving environmental and social context, this FRDCP is based on the understanding that no invasive prospecting activities will be undertaken within the following constraint areas:

- ✎ Watercourses and Wetlands;
- ✎ Heritage sites or features;
- ✎ Protected areas;
- ✎ Existing servitudes for pipelines, powerlines; and
- ✎ Residential Areas.

The description of the baseline environment (on site and surrounding) was obtained from the studies undertaken by the specialist team and in conjunction with EIMS. All specialist studies undertaken for the proposed Aroams 57 Prospecting Right project are included as supporting technical appendices to the BAR. The key environmental aspects related to the prospecting right area are summarised in the remainder of this Section.

3.1.2.1. GEOLOGY, TOPOGRAPHY AND SOILS

The proposed Aroams prospecting project on portion 1 of Aroams 57, Northern Cape Province is in mountainous terrain. The mountains raise some 100m above the plain and are capped by massive white quartzite. The development footprint is underlain by the Mid Proterozoic (Mokolian) basement rocks of the Namaqua-Natal Metamorphic Province (Bushmanland Group) and Cenozoic superficial deposits. The Namaqua-Natal Province is primarily highly metamorphosed sediments and volcanic rocks (e.g. gneisses, schists, quartzites, amphibolites) plus major granitic and gabbroic (norite) intrusions, which are dated between 2050 and 1000 Ma (million years ago). The prospecting right development footprint falls in the Achab Suite and Hartebeest pan granite (Keimoes Suite), while the rock successions on the Aroams 57 farm consists of intrusive Stalhoek and Khurisberg Subgroup.

Various types of superficial deposits of Late Caenozoic (Miocene to Pliocene to Recent) age occur throughout the Karoo Basin. In palaeontological terms the Quaternary superficial deposits have been relatively neglected. They contain pedocretes (e.g. calcretes), colluvial slope deposits, down wasted surface gravels, river alluvium,

wind-blown sands as well as spring and pan sediments. Hill slopes are usually covered with a layer of colluvium or slope deposits (for example sandstone and dolerite scree).

Khai-Ma LM is characterized by undulating landscapes. The NDM is characterised by considerable variation in the types of soils. The area is characterised as semi-arid to arid and this indicates that the soil moisture deficit is high. The soil characteristics over most of the area are a function of insitu weathering. NDM is characterized by generally poor quality soils due to scarce or no water retaining capabilities. Due to the sandy nature of the soils within the region, many areas in the District are prone to wind erosion when the natural vegetation cover is disturbed. The erosion levels within an area depend on slopes' steepness, rainfall patterns and land-use activities in the area. Soils on steep gradients are subject to geological erosion. Extreme topography and soil characteristics within the NDM indicate that soil erosion is an important factor that limits development options.

3.1.2.1. HYDROLOGY

The prospecting area is located in the Lower Orange Water Management Area within the D82D quaternary catchment. The Lower Orange WMA is the furthest downstream in the Orange River Basin and as such is affected by upstream activities. Flows are largely supported by means of releases from Gariep and Vanderkloof dams in the Upper Orange WMA. Ninety percent of the runoff generated in the two Orange River WMAs is generated in the Upper Orange WMA. Approximately 60% of the runoff generated in the Lower Orange comes from the Fish River in Namibia which enters the Orange River close to the river mouth.

A number of non-perennial streams traverse the application area, however, none of these streams are within 100m of the proposed borehole locations. The northern part of the site drains towards the south, while the southern part of the site drains towards the south-west.

Livestock farming is practised over most of the area. Large parts of the WMA contain conservation areas. Cultivation is restricted to isolated patches where higher rainfall occurs, and extensive irrigation is practised in the fertile alluvial soils along the Orange River valley. Irrigation water is supplied by releases from the Vanderkloof Dam.

Large mining operations occur in various parts of the WMA. There are no large urban developments or power stations. Groundwater plays a major role in meeting the water requirements of the towns and rural settlements along the tributaries of the Orange.

Irrigation is the dominant water use sector in the Lower Orange WMA, representing 94% of the total requirement for water of 1 130 million m³/a. Water requirements for urban, rural and mining use respectively represents 3%, 2% and 1% of the total water requirements in the WMA. Virtually all of the irrigation developments are situated along the main stem of the Orange River, with most of the irrigation being for high-value orchard crops (DWAF, 2004). Water is transferred from the Orange River for urban and mining use. Water requirements in this regard are small and are associated with towns such as Springbok, Steinkopf and Port Nolloth, as well as the mines in the area.

The Lower Orange WMA is in surplus which is available for allocation to users or to large projects and also ecological reserve at Orange River mouth Ramsar site.

3.1.2.2. FLORA

The Khai Ma Local Municipality contains 11 vegetation types of which 3 are entirely endemic and one endangered, the Lower Gariep Alluvial Vegetation. There are 854 recorded plant species with 41 endemic

species (i.e. *Conophytum ratum* and *Trachyandra* species), 20 potentially endemic species, 5 threatened species and 3 Near Threatened species. Some of the local plant species include *Conopithum burgheri* (Burger's onion), *Lithops dorotheae* (Pella se bababoudtjie) and *Pachypodium namakwanum* (halfmens). The bushmanland inselbergs have 429 plant species with 67 only found in the inselbergs and 87 red listed species (NDM Biodiversity Sector Plan Draft, 2008). The vegetation of the general area and the proposed site consists of the following vegetation units that are all considered least threatened in terms of conservation status (Mucina & Rutherford 2006):

- Bushmanland Arid Grassland;
- Busmanland Inselberg Shrubland; and
- Busmanland Sandy Grassland.

Bushmanland Arid Grassland

Spanning about one degree of latitude from around Aggeneys in the west to Prieska in the east. The southern border of the unit is formed by edges of the Bushmanland Basin while in the northwest this vegetation unit borders on desert vegetation (northwest of Aggeneys and Pofadder). The northern border (in the vicinity of Upington) and the eastern border (between Upington and Prieska) are formed with often intermingling units of Lower Gariiep Broken Veld, Kalahari Karroid Shrubland and Gordonias Duneveld. Most of the western border is formed by the edge of the Namaqualand hills. Altitude varies mostly from 600–1 200 m.

Vegetation and landscape features are characterized by extensive to irregular plains on a slightly sloping plateau sparsely vegetated by grassland dominated by white grasses (*Stipagrostis* species) giving this vegetation type the character of semidesert 'steppe'. In places low shrubs of *Salsola* change the vegetation structure. In years of abundant rainfall rich displays of annual herbs can be expected.

Important taxa that occur in this vegetation unit include (^WWestern and ^EEastern regions of the unit only)
 Graminoids: *Aristida adscensionis* (d), *A. congesta* (d), *Enneapogon desvauxii* (d), *Eragrostis nindensis* (d), *Schmidtia kalahariensis* (d), *Stipagrostis ciliata* (d), *S. obtusa* (d), *Cenchrus ciliaris*, *Enneapogon scaber*, *Eragrostis annulata*^E, *E. porosa*^E, *E. procumbens*, *Panicum lanipes*^E, *Setaria verticillata*^E, *Sporobolus nervosus*, *Stipagrostis brevifolia*^W, *S. uniplumis*, *Tragus berteronianus*, *T. racemosus*^E. Small Trees: *Acacia mellifera* subsp. *detinens*^E, *Boscia foetida* subsp. *foetida*. Tall Shrubs: *Lycium cinereum* (d), *Rhigozum trichotomum* (d), *Cadaba aphylla*, *Parkinsonia africana*. Low Shrubs: *Aptosimum spinescens* (d), *Hermannia spinosa* (d), *Pentzia spinescens* (d), *Aizoon asbestinum*^E, *A. schellenbergii*^E, *Aptosimum elongatum*, *A. lineare*^E, *A. marlothii*^E, *Barleria rigida*, *Berkheya annectens*, *Blepharis mitrata*, *Eriocephalus ambiguus*, *E. spinescens*, *Limeum aethiopicum*, *Lophiocarpus polystachyus*, *Monechma incanum*, *M. spartioides*, *Pentzia pinnatisecta*, *Phaeoptilum spinosum*^E, *Polygala seminuda*, *Pteronia leucoclada*, *P. mucronata*, *P. sordida*, *Rosenia humilis*, *Senecio niveus*, *Sericocoma avolans*, *Solanum capense*, *Talinum arnotii*^E, *Tetragonia arbuscula*, *Zygophyllum microphyllum*. Succulent Shrubs: *Kleinia longiflora*, *Lycium bosciifolium*, *Salsola tuberculata*, *S. glabrescens*. Herbs: *Acanthopsis hoffmannseggiana*, *Aizoon canariense*, *Amaranthus praetermissus*, *Barleria lichtensteiniana*^E, *Chamaesyce inaequilatera*, *Dicoma capensis*, *Indigastrium argyraeum*, *Lotononis platycarpa*, *Sesamum capense*, *Tribulus pterophorus*, *T. terrestris*, *Vahlia capensis*. Succulent Herbs: *Gisekia pharnacioides*^E, *Psilocaulon coriarium*, *Trianthema parvifolia*. Geophytic Herb: *Moraea venenata*.

The biogeographically important taxon (Bushmanland endemic) Succulent Herb, *Tridentea dwequensis* also occurs within the vegetation unit. Endemic Taxa within the vegetation unit include: Succulent Shrubs: *Dinteranthus pole-evansii*, *Larryleachia dinteri*, *L. marlothii*, *Ruschia kenhardtensis*. Herbs: *Lotononis oligocephala*, *Nemesia maxii*.

Busmanland Inselberg Shrubland

A group of prominent solitary mountains (inselbergs) and smaller koppies towering over surrounding flat plains in northern Bushmanland in the Aggeneys and Pofadder regions. The most important inselbergs include Achab se Berg, Aggeneys se Berg, Ghaamsberg, Goob se Berg, Naib se Berg and Namiesberge. Altitude ranges from 600–1 180 m (most of the area 700–1 120 m).

Vegetation and landscape features are characterized by Shrubland with both succulent (Aizoaceae, Asphodelaceae, Crassulaceae, Didiereaceae, Euphorbiaceae, Zygophyllaceae) as well as nonsucculent (mainly Asteraceae) elements and with sparse grassy undergrowth (*Aristida*, *Eragrostis*, *Stipagrostis*) on steep slopes of the inselbergs.

Important taxa that occur in this vegetation unit include: Succulent Shrubs: *Adromischus diabolicus* (d- dominant), *Euphorbia gregaria* (d), *Ihlenfeldtia vanzylii* (d), *Ruschia divaricata* (d), *Schwantesia pillansii* (d), *Tylecodon sulphureus* (d), *Euphorbia gariepina*, *Kleinia longiflora*, *Othonna euphorbioides*, *Psilocaulon subnodosum*, *Tetragonia reduplicata*, *Tylecodon rubrovenosus*. Tall Shrub: *Boscia foetida*. Low Shrubs: *Eriocephalus pauperrimus* (d), *Pteronia unguiculata*. Woody Succulent Climber: *Sarcostemma viminale* (d). Herb: *Acanthopsis hoffmannseggiana*. Succulent Herbs: *Anacampseros baeseckeii* (d), *A. karasmontana* (d), *Avonia ruschii* (d), *Conophytum fulleri* (d), *Avonia quinaria* subsp. *alstonii*, *Conophytum marginatum* var. *haramoepense*. Graminoids: *Aristida adscensionis* (d), *Eragrostis annulata*, *Stipagrostis obtusa*.

The biogeographically important taxa (^{NQ}Namaqualand endemic, ^GGariep endemic) Succulent Shrubs: (d), *Ceraria fruticulosa*^G, *Cheiridopsis pillansii*^G. Geophytic Herb: *Whiteheadia bifolia*^{NQ}. Succulent Shrub: *Hoodia alstonii*^G occur within the vegetation unit. Endemic Taxa within the vegetation unit include: Succulent Herb: *Huernia barbata* subsp. *ingae*.

Busmanland Sandy Grassland

Surrounds of Aggeneys (northern Bushmanland) and a few isolated patches south of Copperton on the eastern edge of the Bushmanland Basin suggesting the course of the paleoriverine system of the Orange River and its tributaries. The largest continuous patch of this vegetation type fills the shallow valley of the intermittent Koa River southeast and west of Aggeneys. Altitude varies mostly from 500–1 200 m.

Vegetation and landscape features are characterized by Dense, sandy grassland plains with dominating white grasses (*Stipagrostis*, *Schmidtia*) and abundant drought-resistant shrubs. After rainy winters rich displays of ephemeral spring flora (*Grielum humifusum*, *Gazania lichtensteinii*) can occur.

Important taxa that occur in this vegetation unit include: Graminoids: *Schmidtia kalahariensis* (d), *Stipagrostis brevifolia* (d), *S. ciliata* (d), *S. obtusa* (d), *Aristida adscensionis*, *A. congesta*, *Centropodia glauca*, *Enneapogon desvauxii*, *Stipagrostis anomala*. Herbs: *Gazania lichtensteinii* (d), *Grielum humifusum* (d), *Tribulus zeyheri* (d), *Dicoma capensis*, *Hirpicium echinus*, *Manulea nervosa*, *Requienia sphaerosperma*, *Sesamum capense*. Succulent Herb: *Crassula muscosa*. Tall Shrubs: *Rhigozum trichotomum*, *Sisyndite spartea*. Low Shrubs: *Zygophyllum microphyllum* (d), *Barleria rigida*, *Berkheya spinosissima* subsp. *namaensis*, *Eriocephalus*

microphyllus var. *pubescens*, *E. pauperrimus*, *Galenia fruticosa*, *Hermannia spinosa*, *Monechma incanum*, *Peliostomum leucorrhizum*, *Pentzia spinescens*, *Plinthus karoocicus*, *Pteronia mucronata*, *P. sordida*, *Rosenia humilis*, *Tetragonia arbuscula*. Succulent Shrubs: *Aridaria noctiflora* subsp. *straminea*, *Lycium bosciifolium*, *Ruschia robusta*, *Salsola tuberculata*, *Senecio cotyledonis*, *Zygophyllum flexuosum*, *Z. foetidum*. Woody Succulent Climber: *Sarcostemma viminale*.

3.1.2.1. FAUNA

The NDM has a rich biodiversity, it contains all, or the majority of, five of the nine Succulent Karoo Ecosystem Programme's geographic priority areas. The majority of these five areas are outside of formally protected areas, therefore in order to conserve these areas, favourable land-use practices must be implemented.

The Succulent Karoo is a biodiversity hotspot. There are 115 reptile species, 36 of which are endemic. The majority of the reptile species are lizards. There are 70 recorded lizard species, 30 of these are endemic. Four of the recorded 38 snake species are endemic. There are eight tortoise species in the Succulent Karoo hotspot and three of these species are endemic. Of the 17 recorded frog species, five are endemic, this includes the Desert Rain Frog (*Breviceps macrops*). Eighteen out of the 70 scorpion species are endemic. There are also several insect groups with high endemism; Monkey Beetles (*Rutelinae: Hoplini*), wasps and various specialised bees. The Namakwa Pollen Wasp (*Ceramius rex*) is confined to small refuge populations. There are 269 recorded bird species and 24 are near-endemic. There are 78 mammal species including four small endemic mammals.

The Succulent Karoo and Nama Karoo provide habitats for the Riverine Rabbit (*Bunolagus monticularis*). The Riverine Rabbit is endemic to the semi-arid Great Karoo and parts of the Klein Karoo, and is Critically Endangered. The Riverine Rabbit is a habitat specialist that occupies the discontinuous and dense vegetation associated with the seasonal rivers of the Karoo. These areas along the rivers are however favoured for livestock grazing and crop growing. The fauna that inhabits the Khai Ma Local Municipality include, amongst others, the endemic Red Lark which occurs in the Koa River Valley. It is also expected that a wide variety of unique invertebrates are found in the area especially the south-facing slopes of the inselbergs and kloofs that have a much more moderated micro-climate. The aquatic pans in the region provide habitat for wading birds when inundated. Domestic animals within the NDM include sheep, goats, cattle, horses and donkeys. Stock farming is one of the major economic sectors within the NDM and it includes sheep, goat and cattle farming. Horses and donkeys are used for agricultural activities and as a mode of transport by the local people. Karoo Hoogland and Hantam Local Municipalities are the main agricultural centres where stock farming is the main economic activity.

The application area is also located next to an Important Bird Area (IBA), i.e. the Haramoep and Black Mountain Mine Nature Reserve. This IBA is one of only a few sites protecting the globally threatened Red Lark (*Calendulauda burra*), which inhabits the red sand dunes and sandy plains with a mixed grassy dwarf shrub cover; and the near-threatened Sclater's Lark (*Spizocorys sclateri*), on the barren stony plains. It also holds 16 of the 23 Namib-Karoo biome-restricted assemblage species as well as a host of other arid-zone birds. At the time of this IBA's assessment, its 27 pentads had been poorly atlased for SABAP2. The total number of species recorded for the IBA is 198. Ludwig's Bustard (*Neotis ludwigii*) and Kori Bustard (*Ardeotis kori*) are regularly seen. Martial Eagle (*Polemaetus bellicosus*), Secretarybird (*Sagittarius serpentarius*), Verreaux's Eagle (*Aquila verreauxii*), Booted Eagle (*Hieraaetus pennatus*), Cape Eagle-Owl (*Bubo capensis*) and Spotted Eagle-Owl (*B.*

africanus) are present. On occasion Hooded Vulture (*Necrosyrtes monachus*) can be spotted close to the Orange River. The IBA is seasonally important for nomadic larks, such as Stark's Lark (*Spizocorys starki*), and sparrow-larks, which are abundant after good rains.

3.1.2.2. CULTURAL AND HERITAGE AND PALEONTOLOGY

Prospecting on Farm Aroams 1/57 is proposed by means of a phased approach, including a desktop study, geological field mapping, semi-regional geophysical ground based survey and invasive techniques, including assaying and drilling. Only the impact of invasive techniques is to be considered with reference to requirements of the NHRA 1999. The impact of assaying, rock chip and soil sample collection, is negligible with reference to the recorded archaeological and cultural heritage of the greater terrain. The Phase 1 AIA focussed on field assessment of the five (5) identified drill positions, including BH0281, BH0291, BH0261, BH0301 and BH0271, and relevant access roads and tracks in the vicinity of the drill positions. All 5 drill positions were assessed. Surface visibility across the study site proved to be very good.

Archaeological assessment of the drill positions aimed to assess a minimum 50x50m area to accommodate drilling activities, but in all cases extended beyond these parameters based on the findings of the field assessment, the presence of lithic artefacts in surface gravel lenses at all five (5) of the assessed drill positions. Field assessment resulted in findings contributory to the current general understanding of specifically the Stone Age archaeology of the greater terrain. The majority of archaeological assessments in the area focussed on study sites situated on the peneplains, where low density Stone Age occurrences often feature, including primarily MSA and LSA deposits, and to a lesser extend the ESA, in general described as of low archaeological significance, based on low artefact ratios (artefacts: m²) and a general amorphous, substandard typology. Such MSA-LSA low density occurrences have for example been identified by Webley & Halkett (2012) on the peneplain of Aroams 1/57, just south of the prospecting application area. Field assessment for the proposed Black Mountain Mining prospecting application resulted in the identification of much richer Stone Age deposits at the foot of the inselberg, the eastern foothills of the Aggeneys mountains, with continuing Stone Age deposits characterising varying ESA-MSA-LSA and MSA-LSA lenses intersecting one another. Stone Age lenses flow into one another and it is not possible to demarcate individual lenses. The identification of an ESA at the prospecting application area is of significance, and more importantly the possibility of an ESA Victoria West Industry, supporting identification of the Industry by Morris (2013d) at the Bloemhoek study site. In general, the notably richer archaeological deposits at the Aroams 1/57 prospecting application study site, and including ESA, MSA and LSA, supports the findings of Morris (2013a) at Gamsberg, based on which Morris concluded that mountainous areas, the inselbergs and associated foothills are archaeologically of higher significance than the surrounding peneplains.

In addition to Stone Age archaeological resources two (2) Colonial Period farmsteads have been documented. A summary of the findings at each borehole location are provided in Table 6.

TABLE 6: HERITAGE FINDINGS SUMMARY (ARCHAEOMAPS, 2017)

Drill Location	Site Number	Site Description	Co-ordinates	Recommendations
Aroams 1/57				
BH0281	Site ARS-01	MSA & LSA Lithic Scatter	S29.20951°; E18.90576°	*Drilling impact on identified lithic scatter

Drill Location	Site Number	Site Description	Co-ordinates	Recommendations
BH0291	Site ARS-02	ESA, MSA & LSA Lithic Scatter	S29.20519°; E18.90244°	*Drilling impact on identified lithic scatter
BH0261	Site ARS-03	ESA, MSA & LSA Lithic Scatter	S29.20137°; E18.89798°	*Drilling impact on identified lithic scatter
BH0301	Site ARS-04	MSA & LSA Lithic Scatter	S29.19630°; E18.90701°	*Drilling impact on identified lithic scatter
BH0271	Site ARS-05	ESA, MSA & LSA Lithic Scatter	S29.19426°; E18.90080°	*Drilling impact on identified lithic scatter
-	Site ARS-06	Colonial Period Farmstead	S29.20019°; E18.91069°	Temporary heritage signage
-	Site ARS-07	Colonial Period Farmstead	S29.20331°; E18.91306°	Temporary heritage signage
*Drilling impact on identified lithic scatters recommended without the developer having to comply with additional heritage compliance requirements				

The broader area near Aggeneys is underlain by the Mid Proterozoic (Mokolian) basement rocks of the Namaqua-Natal Metamorphic Province (Bushmanland Group), and Cenozoic superficial deposits. The Proterozoic granite-gneiss basement rocks of the Namaqua-Natal Metamorphic Province do not contain any fossils because they are igneous in origin or too highly metamorphosed and their palaeontological sensitivity is similarly low. The low palaeontological sensitivity of the Cenozoic superficial deposits can be attributed to the scarcity of fossil heritage in this deposits. In Palaeontological terms the significance is thus rated as LOW (negative). Consequently, pending the discovery of significant new fossil material here, no further specialist studies are considered to be necessary.

Thus, the proposed Aroams prospecting right project, may be authorised as the whole extent of the development footprint is not considered as sensitive in terms of palaeontological resources.

3.1.2.3. SOCIO-ECONOMIC

The proposed Aroams Prospecting Project will be situated on Portion 1 of the Farm Aroams 57. The area is located approximately 8 kilometres northeast of the town of Aggeneys and 48 kilometres west-south-west of the town of Pofadder. The application area falls within the Khai-Ma Local Municipality (LM), within the Namakwaland Magisterial District in the Northern Cape Province. The prospecting area falls within ward 4 of Khai-Ma LM within Namakwa District Municipality (NDM).

According to the Census conducted in 2011, the Khâi-Ma Municipality has a total population of 12 465 people, of which 75,1% are coloured, 17,6% are black African, and 6,0% are white. Other groups make up 0,4% of the population. Of those aged 20 years and older, 46,3% have some secondary schooling, 17,5% have some primary schooling, 18,1 % completed Grade 12/matric, 5 8% have some higher education, 8,4% completed some primary schooling and 3,9% of this municipality have no schooling.

The main economic activities within the Khai-Ma LM are agriculture and mining. Agricultural activities are dominated by livestock and poultry farming. Of the 5904 economically active people (employed and unemployed but looking for work), 22,1% are unemployed. 322 are classified as discouraged work-seekers. Of the youth (aged 15 – 34), 2 511 are employed, 776 are unemployed, 192 are classified as discouraged work-seekers, and 1 109 are not economically active.

There are 3 796 households in the municipality, with an average household size of 3,2 persons per household. Of the households in the municipality, 45,5% have access to piped (tap) water inside the dwelling/institution, and 46,5% have access to piped (tap) water inside the yard.

The education levels in the NDM are low. Approximately half of the population over 20 years old within the District have some secondary education and a very small percentage obtained Grade 12 qualification.

3.1.2.1. DESCRIPTION OF CURRENT LAND USES

The properties were previously largely undisturbed and were and are presently mainly used for grazing of sheep and cattle. Existing farm infrastructure such as windmills, boreholes, fencing and livestock pens are sparsely dotted across the properties. Only a few tracks or roads cross these properties. The existing land uses within the proposed Prospecting Right Application area include vacant and grazing land.

3.1.3. STAKEHOLDER ISSUES AND COMMENTS

A public participation process as required by the NEMA EIA Regulations, 2014 has been undertaken for the proposed prospecting. In this regard please refer to Section 6 and Appendix B of the BAR for a comprehensive record of the process followed and comments received. Once comments have been received, an extract from the Issues and Responses Report (IRR) which relate to final rehabilitation, decommissioning and closure activities will be provided in this section. The comments and issues raised through the public participation will be considered and inform the compilation of this FRDCP.

3.2. ENVIRONMENTAL RISK ASSESSMENT

Section 8 of the BAR provides a detailed description of the environmental impact/risk identification and assessment (including the methodology and findings) undertaken for the proposed prospecting. This risk assessment assesses each identified environmental impact by considering the consequence of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/likelihood of the impact occurring. The BAR further considers other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, to determine a prioritisation factor (PF) which is applied to the Environmental Risk to determine the overall significance.

Table 7 lists the environmental impacts and risks identified and assessed in the EIA/ Basic Assessment, which relate to final rehabilitation, decommissioning and closure of the prospecting. The EMPr addresses the management and mitigation of environmental impacts associated with the preceding phases whilst the annual environmental rehabilitation plan (to be prepared and reviewed annually) will provide for the planning and financial provisioning for the concurrent and progressive rehabilitation and remediation activities.

The applicable conceptual closure strategy to avoid, manage and mitigate the impacts and risks are also included in Table 7, together with the re-assessment of the environmental risk. The environmental risk assessment of the impacts associated with final rehabilitation, decommissioning and closure will inform the most appropriate closure strategy for the prospecting. It is expected that, in most cases, if all the management and mitigation measures identified in the EIA/ Basic Assessment and EMPr are adhered to and successfully implemented, then no latent or residual environmental impacts will remain. Impacts that are classified as high risk post-mitigation will be considered as latent environmental impacts and financial provision will be provided to remediate these specific impacts. Please see Section 5 for further details.

TABLE 7: IMPACT ASSESSEMENT FOR REHABILITATION, DECOMMISSIONING AND CLOSURE.

Aspect	Impact	Aspects Affected	Pre-Mitigation Risk	Suggested Mitigation Measures	Post-Mitigation Risk	Closure Options
Site Clearance	Impact on Fauna	Prospecting areas	-6.75	<ul style="list-style-type: none"> • Demarcation of sensitive areas in consultation with relevant specialists and ECO; • Minimise removal of vegetation as far as possible; • Implement alien vegetation management; • Ongoing identification of risks and impacts; • Emergency preparedness; and • Monitoring and review. • Avoid disturbance of fauna as much as possible, especially bird nesting sites. 	-6.00	Rehabilitate disturbed areas. On-going monitoring.
	Introduction/ invasion by alien species	Prospecting areas	-6.75	<ul style="list-style-type: none"> • Use of indigenous species for rehabilitation, immediate rehabilitation of areas where construction is completed, rehabilitation monitoring. 	-3.00	Rehabilitate disturbed areas. On-going monitoring.
Target Prospecting Boreholes	Compacting of Soils	Drilling	-5.25	<ul style="list-style-type: none"> • Compacting of soil must be avoided as far as possible, and the use of heavy machinery must be restricted in areas outside of the proposed exploration sites to reduce the compaction of soils. 	-3.75	Rehabilitate disturbed areas. On-going monitoring.
	Surface Water	Drilling	-6.00	<ul style="list-style-type: none"> • No invasive prospecting activities to be undertaken within 100m of a watercourse. • Should any watercourse be affected, then the necessary water use licences should be obtained from the Department of Water and Sanitation. • No ablation or site laydown areas are to be located within 100m of a watercourse. 	-3.50	Rehabilitate disturbed areas. On-going monitoring.
	Groundwater	Drilling	-6.00	<ul style="list-style-type: none"> • Where shallow aquifers are encountered, and a pollution event occurs at a particular borehole, a survey of the drinking water/ livestock watering boreholes should be undertaken (within 5km of the prospecting borehole sites). A detailed groundwater monitoring programme should be developed for 	-3.50	Rehabilitate disturbed areas. On-going monitoring.

Aspect	Impact	Aspects Affected	Pre-Mitigation Risk	Suggested Mitigation Measures	Post-Mitigation Risk	Closure Options
				<p>these drinking water/ livestock watering boreholes and pre- and post-prospecting water quality samples should be taken.</p> <ul style="list-style-type: none"> Where drinking water/ livestock watering boreholes are to be affected then the advice of a geohydrologist should be sought with regards to the need for plugging and casing of the prospecting boreholes. 		
<p>Undertake rehabilitation as per the annual and final rehabilitation plan</p>	<p>Introduction/invasion by alien species</p>	<p>Rehabilitation</p>	<p>-6.75</p>	<ul style="list-style-type: none"> Only indigenous plant species must be used during revegetation of disturbed areas, a plant specialist must be consulted for this purpose. Any excess or waste material or chemicals, including drilling muds etc. must be removed from the site and must preferably be recycled (e.g. oil and other hydrocarbon waste products). Any waste materials or chemicals that cannot be recycled must be disposed of at a suitably licensed waste facility. Restoration and rehabilitation of disturbed areas must be implemented as soon as prospecting activities are completed; Sites must be restored to the original condition with vegetation cover (where applicable) equalling the surrounding vegetation cover; All debris and contaminated soils must be removed and suitably disposed of; Contours and natural surrounding must be reformed; Natural drainage patterns must be restored; All surface infrastructure on site must be removed; Temporary access routes/roads must be suitably rehabilitated; and Sites must be monitored by the ECO (including relevant specialist's inputs if, necessary) for 	<p>-3.00</p>	<p>Rehabilitate disturbed areas. On-going monitoring.</p>

Aspect	Impact	Aspects Affected	Pre-Mitigation Risk	Suggested Mitigation Measures	Post-Mitigation Risk	Closure Options
				adequate rehabilitation until the desired rehabilitation objectives have been achieved		
Monitoring of rehabilitation efforts	Erosion due to improper rehabilitation	Closure and Rehabilitation	-5.25	<ul style="list-style-type: none"> The post-operational monitoring and management period following decommissioning of prospecting activities must be implemented by a suitable qualified independent party for a minimum of one (1) year unless otherwise specified by the competent authority. The monitoring activities during this period will include but not be limited to: <ul style="list-style-type: none"> Biodiversity monitoring; and Re-vegetation of disturbed areas where required. Provision must be made to monitor any unforeseen impact that may arise as a result of the proposed prospecting activities and incorporated into post closure monitoring and management. 	-2.50	Rehabilitate disturbed areas. On-going monitoring.

It is important to note that the environmental risk assessment will be revised and updated on an annual basis to ensure that this FRDCP remains applicable to the actual and predicted environmental impacts and risks.

3.3. ENVIRONMENTAL INDICATORS AND MONITORING

Table 8 provides a list of the identified environmental impacts identified for the rehabilitation, decommissioning and closure of the Prospecting. In addition, environmental indicators are identified for each impact, together with proposed monitoring requirements. The indicators and monitoring will aim to inform ongoing rehabilitation and remediation activities. These indicators will also inform the assessment of whether the closure objectives have been adequately met.

TABLE 8: ENVIRONMENTAL INDICATORS AND MONITORING REQUIREMENTS

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures	Compliance with Standards	Time Period for Implementation
<p>Prospecting boreholes:</p> <p>5 sites , with a footprint of 200 m² each</p>	<p>Construction and Operation</p> <p>Decommissioning</p>	<p>0.1 ha, short term</p>	<ul style="list-style-type: none"> • Vegetation clearing for prospecting sites should be kept to a minimum in order to reduce the disturbance footprint; • Compaction of soil must be avoided as far as possible, and the use of heavy machinery must be restricted in areas outside of the proposed prospecting sites to reduce the compaction of soils; • All measures should be implemented to minimize the potential of dust generation; • Local residents should be notified of any potentially noisy activities or work and these activities should be undertaken at reasonable times of the day. These works should not take place at night or on weekends; • Noise attenuation on engines must be adequate, and the noisy activities must be restricted as far as is possible to times and locations whereby the potential for noise nuisance is reduced; • When working near to a potential sensitive area, the contractor must limit the number of simultaneous activities to the minimum; • Ensure proper storage of fuels; • On-site vehicles must be limited to approved access routes and areas on the site so as to minimize excessive environmental disturbance to the soil and vegetation on site, and to minimize disruption of traffic; • Workforce should be kept within defined boundaries and to agreed access routes. • No invasive prospecting activities to be undertaken within 100m of a watercourse. • Should any watercourse be affected, then the necessary water use licences should be obtained from the Department of Water and Sanitation. 	<p>SANS 10103</p> <p>ECA Noise Regulations</p> <p>NEMAQA</p> <p>Dust Regulations</p> <p>NWA</p>	<p>Throughout Construction and operation and decommissioning</p>

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures	Compliance with Standards	Time Period for Implementation
			<ul style="list-style-type: none"> • No abluent of site laydown areas are to be located within 100m of a watercourse. • Where shallow aquifers are encountered, a survey of the drinking water/ livestock watering boreholes should be undertaken (within 5km of the prospecting borehole sites). A detailed groundwater monitoring programme should be developed for these drinking water/ livestock watering boreholes and pre- and post-prospecting water quality samples should be taken. • Where drinking water/ livestock watering boreholes are to be affected, and where a pollution event occurs at a particular borehole, then the advice of a geohydrologist should be sought with regards to the need for plugging and casing of the prospecting boreholes. 		
Borehole Closure	Decommissioning and Closure	Short term and localized	<ul style="list-style-type: none"> • Where groundwater is encountered during drilling, all affected prospecting boreholes that will not be required for later monitoring or other useful purposes should be plugged and sealed with cement to prevent possible cross flow and contamination between aquifers; • Cement and liquid concrete are hazardous to the natural environment on account of the very high pH of the material, and the chemicals contained therein. As a result, the contractor shall ensure that: <ul style="list-style-type: none"> ○ Concrete shall not be mixed directly on the ground; ○ The visible remains of concrete, either solid, or from washings, shall be physically removed immediately and disposed of as waste, (Washing of visible signs into the ground is not acceptable); and ○ All excess aggregate shall also be removed. 	NWA DWAf BPG	Throughout Decommissioning and Closure

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures	Compliance with Standards	Time Period for Implementation
Removal of surface infrastructure	Decommissioning	Short term and localized	<ul style="list-style-type: none"> All infrastructure, equipment, and other items used during prospecting will be removed from the site. Compaction of soil must be avoided as far as possible. The use of heavy machinery must be restricted in areas outside of the proposed prospecting sites to reduce the compaction of soils. 	MPRDA Rehab Plan	Decommissioning
Removal of waste	Decommissioning	Small scale and localized	<ul style="list-style-type: none"> Any excess or waste material or chemicals, including drilling muds etc. must be removed from the site and must preferably be recycled (e.g. oil and other hydrocarbon waste products). Any waste materials or chemicals that cannot be recycled must be disposed of at a suitably licensed waste facility. 	NWA DWAF BPG	Decommissioning
Rehabilitation	Rehabilitation	All disturbed areas	<ul style="list-style-type: none"> Restoration and rehabilitation of disturbed areas must be implemented as soon as prospecting activities are completed; Sites must be restored to the original condition with vegetation cover (where applicable) equalling the surrounding vegetation cover; All debris and contaminated soils must be removed and suitably disposed of; Contours and natural surrounding must be reformed; Natural drainage patterns must be restored; All surface infrastructure on site must be removed; Temporary access routes/roads must be suitably rehabilitated; and Sites must be monitored by the ECO (including relevant specialist's inputs if, necessary) for adequate rehabilitation until the desired rehabilitation objectives have been achieved. 	MPRDA Rehab Plan NEMA	Rehabilitation
Monitoring	Post-Operational	All rehabilitated areas	The post-operational monitoring and management period following decommissioning of prospecting activities must be implemented by a suitable qualified independent party for a minimum of one (1) year unless otherwise specified by the competent authority.	MPRDA Rehab Plan	Post-operation

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures	Compliance with Standards	Time Period for Implementation
			<p>The monitoring activities during this period will include but not be limited to:</p> <ul style="list-style-type: none"> • Biodiversity monitoring; and • Re-vegetation of disturbed areas where required. <p>Provision must be made to monitor any unforeseen impact that may arise as a result of the proposed prospecting activities and incorporated into post closure monitoring and management.</p>		

3.4. DESIGN PRINCIPLES

3.4.1. LEGISLATIVE AND GOVERNANCE FRAMEWORK

The requirement for final rehabilitation, decommissioning and closure stems primarily from the legislative requirements of the MPRDA and the NEMA. The relevant extracts from each of these are presented in this section. Please also refer to Section 3 of the BAR for an overview of other enviro-legal requirements which may influence closure planning.

3.4.1.1. MINERALS AND PETROLEUM RESOURCES DEVELOPMENT ACT, ACT 28 OF 2002

The following extracts relate to the principle of closure for any right issued under the MPRDA:

- ✎ Section 43(1): The holder of a prospecting right, mining right, retention permit, mining permit, or previous holder of an old order right or previous owner of works that has ceased to exist, remains responsible for any environmental liability, pollution, ecological degradation, the pumping and treatment of extraneous water, compliance to the conditions of the environmental authorisation and the management and sustainable closure thereof, until the Minister has issued a closure certificate in terms of this Act to the holder or owner concerned.
- ✎ Section 43(4): An application for a closure certificate must be made to the Regional Manager in whose region the land in question is situated within 180 days of the occurrence of the lapsing, abandonment, cancellation, cessation, relinquishment or completion contemplated in subsection (3) and must be accompanied by the required information, programmes, plans and reports prescribed in terms of this Act and the National Environmental Management Act, 1998.
- ✎ Section 43 (5): No closure certificate may be issued unless the Chief Inspector and each government department charged with the administration of any law which relates to any matter affecting the environment have confirmed in writing that the provisions pertaining to health and safety and management pollution to water resources, the pumping and treatment of extraneous water and compliance to the conditions of the environmental authorisation have been addressed.
- ✎ Section 43 (7): The holder of a prospecting right, mining right, retention permit, mining permit, or previous holder of an old order right or previous owner of works that has ceased to exist, or the person contemplated in subsection (2), as the case may be, must plan for, manage and implement such procedures and such requirements on mine closure as may be prescribed.
- ✎ Section 43 (8): Procedures and requirements on mine closure as it relates to the compliance of the conditions of an environmental authorisation, are prescribed in terms of the National Environmental Management Act, 1998.

3.4.1.2. MINERAL AND PETROLEUM RESOURCES DEVELOPMENT REGULATIONS

The following extracts from the MPRDA Regulations are specifically applicable to the preparation of this FRDCP:

- ✎ Regulation 51 (a)(i): An environmental management programme contemplated in section 39(1) of the Act must include the following: A description of the environmental objectives and specific goals for mine closure;

✎ Regulation 54: Quantum of financial provision:

- (1) The quantum of the financial provision as determined in a guideline document published by the Department from time to time, include a detailed itemization of all actual costs required for-
 - a. premature closure regarding- (i) the rehabilitation of the surface of the area; (ii) the prevention and management of pollution of the atmosphere; and (iii) the prevention and management of pollution of water and the soil; and (iv) the prevention of leakage of water and minerals between subsurface formations and the surface.
 - b. decommissioning and final closure of the operation; and
 - c. post closure management of residual and latent environmental impacts.
- (2) The holder of a prospecting right, mining right or mining permit must annually update and review the quantum of the financial provision –
 - a. in consultation with a competent person;
 - b. as required in terms of the approved environmental management programme or environmental management plan; or
 - c. as requested by the Minister.

✎ Regulation 56: Principles for mine closure: In accordance with applicable legislative requirements for mine closure, the holder of a prospecting right, mining right, retention permit or mining permit must ensure that -

- (a) the closure of a prospecting or mining operation incorporates a process which must start at the commencement of the operation and continue throughout the life of the operation;
- (b) risks pertaining to environmental impacts must be quantified and managed pro-actively, which includes the gathering of relevant information throughout the life of a prospecting or mining operation;
- (c) the safety and health requirements in terms of the Mine Health and Safety Act, 1996 (Act No. 29 of 1996) are complied with;
- (d) residual and possible latent environmental impacts are identified and quantified;
- (e) the land is rehabilitated, as far as is practicable, to its natural state, or to a predetermined and agreed standard or land use which conforms with the concept of sustainable development; and
- (f) prospecting or mining operations are closed efficiently and cost effectively.

✎ Regulation 61: Closure objectives- Closure objectives form part of the draft environmental management programme or environmental management plan, as the case may be, and must –

- (a) identify the key objectives for mine closure to guide the project design, development and management of environmental impacts;
- (b) provide broad future land use objective(s) for the site; and

(c) provide proposed closure costs.

✎ Regulation 62: Contents of closure plan: A closure plan contemplated in section 43(3)(d) of the Act, forms part of the environmental management programme or environmental management plan, as the case may be, and must include -

- (a) a description of the closure objectives and how these relate to the prospecting or mine operation and its environmental and social setting;
- (b) a plan contemplated in regulation 2(2), showing the land or area under closure;
- (c) a summary of the regulatory requirements and conditions for closure negotiated and documented in the environmental management programme or environmental management plan, as the case may be;
- (d) a summary of the results of the environmental risk report and details of identified residual and latent impacts;
- (e) a summary of the results of progressive rehabilitation undertaken;
- (f) a description of the methods to decommission each prospecting or mining component and the mitigation or management strategy proposed to avoid, minimize and manage residual or latent impacts;
- (g) details of any long-term management and maintenance expected;
- (h) details of a proposed closure cost and financial provision for monitoring, maintenance and post closure management;
- (i) a sketch plan drawn on an appropriate scale describing the final and future land use proposal and arrangements for the site;
- (j) a record of interested and affected persons consulted; and
- (k) technical appendices, if any.

3.4.1.3. NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)


Prior to 8 December 2014, the environmental aspects of mining activities were regulated in terms of the MPRDA. Recent legislative amendments and the drive towards a 'one environmental system' have resulted in the inclusion of the requirement for rehabilitation, decommissioning and closure planning and associated financial provisions into the NEMA. Specific sections of the act are extracted below:

✎ Section 24P: Financial provision for remediation of environmental damage:

- (1) An applicant for an environmental authorisation relating to prospecting, exploration, mining or production must, before the Minister responsible for mineral resources issues the environmental authorisation, comply with the prescribed financial provision for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts.
- (2) If any holder or any holder of an old order right fails to rehabilitate or to manage any impact on the environment, or is unable to undertake such rehabilitation or to manage such impact,

the Minister responsible for mineral resources may, upon written notice to such holder, use all or part of the financial provision contemplated in subsection (1) to rehabilitate or manage the environmental impact in question.

- (3) Every holder must annually-
 - a. assess his or her environmental liability in a prescribed manner and must increase his or her financial provision to the satisfaction of the Minister responsible for mineral resources; and
 - b. submit an audit report to the Minister responsible for mineral resources on the adequacy of the financial provision from an independent auditor.
- (4) (a) If the Minister responsible for mineral resources is not satisfied with the assessment and financial provision contemplated in this section, the Minister responsible for mineral resources may appoint an independent assessor to conduct the assessment and determine the financial provision. (b) Any cost in respect of such assessment must be borne by the holder in question.
- (5) The requirement to maintain and retain the financial provision contemplated in this section remains in force notwithstanding the issuing of a closure certificate by the Minister responsible for mineral resources in terms of the Mineral and Petroleum Resources Development Act, 2002 to the holder or owner concerned and the Minister responsible for mineral resources may retain such portion of the financial provision as may be required to rehabilitate the closed mining or prospecting operation in respect of latent, residual or any other environmental impacts, including the pumping of polluted or extraneous water, for a prescribed period.
- (6) The Insolvency Act, 1936 (Act No. 24 of 1936), does not apply to any form of financial provision contemplated in subsection (1) and all amounts arising from that provision.
- (7) The Minister, or an MEC in concurrence with the Minister, may in writing make subsections (1) to (6) with the changes required by the context applicable to any other application in terms of this Act.

 Section 24R: Mine closure on environmental authorisation:

- (1) Every holder, holder of an old order right and owner of works remain responsible for any environmental liability, pollution or ecological degradation, the pumping and treatment of polluted or extraneous water, the management and sustainable closure thereof notwithstanding the issuing of a closure certificate by the Minister responsible for mineral resources in terms of the Mineral and Petroleum Resources Development Act, 2002, to the holder or owner concerned.
- (2) When the Minister responsible for mineral resources issues a closure certificate, he or she must return such portion of the financial provision contemplated in section 24P as the Minister may deem appropriate to the holder concerned, but may retain a portion of such financial provision referred to in subsection (1) for any latent, residual or any other

environmental impact, including the pumping of polluted or extraneous water, for a prescribed period after issuing a closure certificate.

- (3) Every holder, holder of an old order right or owner of works must plan, manage and implement such procedures and requirements in respect of the closure of a mine as may be prescribed.
- (4) The Minister may, in consultation with the Minister responsible for mineral resources and by notice in the Gazette, identify areas where mines are interconnected or their impacts are integrated to such an extent that the interconnection results in a cumulative impact.
- (5) The Minister may, by notice in the Gazette, publish strategies in order to facilitate mine closure where mines are interconnected, have an integrated impact or pose a cumulative impact.

3.4.1.4. FINANCIAL PROVISIONING REGULATIONS

On 20th November 2015 the Minister promulgated the Financial Provisioning Regulations under the NEMA. The regulations aim to regulate the determine and making of financial provision as contemplated in the NEMA for the costs associated with the undertaking of management, rehabilitation and remediation of environmental impacts from prospecting, exploration, mining or production operations through the lifespan of such operations and latent or residual environmental impacts that may become known in the future. These regulations provide for, inter alia:

- ✎ Determination of financial provision: An applicant or holder of a right or permit must determine and make financial provision to guarantee the availability of sufficient funds to undertake rehabilitation and remediation of the adverse environmental impacts of prospecting, exploration, mining or production operations, as contemplated in the Act and to the satisfaction of the Minister responsible for mineral resources.
- ✎ Scope of the financial provision: Rehabilitation and remediation; decommissioning and closure activities at the end of operations; and remediation and management of latent or residual impacts.
- ✎ Regulation 6: Method for determining financial provision – An applicant must determine the financial provision through a detailed itemisation of all activities and costs, calculated based on the actual costs of implementation of the measures required for:
 - Annual rehabilitation – annual rehabilitation plan
 - Final rehabilitation, decommission and closure at end of life of operations – rehabilitation, decommissioning and closure plan; and
 - Remediation of latent and residual impacts – environmental risk assessment report.
- ✎ Regulation 10: An applicant must-
 - ensure that a determination is made of the financial provision and the plans contemplated in regulation 6 are submitted as part of the information submitted for consideration by the Minister responsible for mineral resources of an application for environmental authorisation, the

associated environmental management programme and the associated right or permit in terms of the Mineral and Petroleum Resources Development Act, 2002; and

- Provide proof of payment or arrangements to provide the financial provision prior to commencing with any prospecting, exploration, mining or production operations.

✎ Regulation 11: Requires annual review, assessment and adjustment of the financial provision. The review of the adequacy of the financial provision including the proof of payment must be independently audited (annually) and included in the audit of the EMPR as required by the EIA regulations.

3.4.1.5. OTHER GUIDELINES

The following additional guidelines which relate to financial provisioning and closure have been published in the South African context:

✎ Best Practice Guideline G5: Water Management Aspects for Mine Closure: This guideline was prepared by the DWS and aims to provide a logical and clear process that can be applied by mines and the competent authorities to enable proper mine closure planning that meets the requirements of the relevant authorities. This guideline is aimed primarily at larger scale mines and does not specifically address closure issues related to closure of prospecting activities, however certain principles related to closure and water management are relevant. The following technical factors which should be considered during closure, and which are likely to relate to prospecting activities, have been considered:

- Land use plan: directly interlinked with water management issues insofar as water is required to support the intended land use- in this regard the surrounding communities and the land uses implemented rely on available ground and surface water to be sustained. Management of water quality and quantity has been identified as an aspect to be covered in this FRDCP.
- Public participation and consultation: consultation is fundamental to closure and there is a need for full involvement of stakeholders in the development of the final closure plans, and in the agreement of closure objectives- in this regard this FRDCP has been made available through the Basic Assessment public participation process for comment by relevant stakeholders.

✎ Guideline for the Evaluation of the Quantum of Closure Related Financial Provision Provided by a Mine: The objectives of the guideline include the need to improve the understanding of the financial and legal aspects pertaining to the costing of remediation measures as a result of mining activities. Whilst this guideline predates the recent NEMA Financial Provisioning Regulations, it does contain certain principles and concepts that remain valid and have been considered in this FRDCP.

3.4.2. CLOSURE VISION, OBJECTIVE AND TARGETS

The vision, and consequent objective and targets for rehabilitation, decommissioning and closure, aim to reflect the local environmental and socio-economic context of the project, and to represent both the corporate requirements and the stakeholder expectations.

The receiving environment within which the prospecting activities will be undertaken include the following key land-uses:

✎ Grazing land; and

➤ Vacant land.

With reference to Section 3.1.3, the stakeholders will be consulted during the public participation process for the BAR and their comments relating to closure, decommissioning and rehabilitation will be considered in terms of this document.

With reference to both the environmental context of the project and the feedback from the consultation process the vision for closure is to: Ensure that the post closure land use aligns with the surrounding land-use and does not affect the sustained utilisation of the land.

In practice the post closure land-use will depend on the pre-prospecting land-use applicable to the specific location of the invasive prospecting activities. This FRDCP aim to address the key closure objectives which are likely to remain consistent for the majority of the prospecting activities.

Driven by the closure vision and with due consideration of the project context the following closure objective are presented:

- Set the course for eventual ecosystem restoration, including the restoration of the natural vegetation community, hydrology, and wildlife habitats.
- Prevent future environmental issues related to lateral movement through the borehole.
- Protection of water resources.
- Ensure that land is usable, in alignment with surrounding land uses.

Please refer to Table 8 for the stipulated targets related to these closure objectives.

3.4.3. ALTERNATIVE CLOSURE AND POST CLOSURE OPTIONS

There are various alternative closure and post closure options available. The identification and consideration of the most suitable alternatives are driven by, inter alia the following considerations:

- The ability of the selected alternative to adequately meet the specified closure vision and objectives.
- The efficiency, viability, and practicality of the selected alternative.
- The alignment with the local environmental and socio-economic context and associated opportunities and constrains.

Table 9 presents some available options and alternatives related to the process of abandoning and closure of a prospecting site. This reassessment must be utilised to select the most appropriate and responsible closure option. The options in the table below that are marked with an “X” are considered the preferred options.

TABLE 9: CLOSURE ALTERNATIVES

Prospecting Activity	Aspect	Options	Comment
Prospecting Boreholes	Plugging	Yes	In line with the DWAF (2008). Best Practice Guideline A6: Water Management for Underground Mines, all prospecting boreholes that will not be required for later monitoring or other useful purposes should be plugged and

		Seal	sealed with cement to prevent possible cross flow and contamination between aquifers.
		No	The option of not plugging the borehole, but merely sealing the surface hole with cement.
	Surface Infrastructure	Complete removal	In order to allow unhindered land use of the prospecting area, it is suggested that all surface infrastructure be removed.
		Retain	Surface infrastructure would typically remain for possible future use by the landowner or the applicant.
	Access roads	Rehabilitate	The intention is to rehabilitate the area, including the access route, to the pre-prospecting condition.
		Retain	In certain instances, the landowner may request the retention of the access route.

As mentioned previously the final closure and decommissioning of a prospecting borehole site must be pre-empted by a site specific assessment and where applicable the implementation of the most appropriate rehabilitation and closure strategy. Furthermore, the annual review of this FRDCP must where applicable include an assessment and adjustment of the closure strategy to reflect the most recent technical development and industry best practice, as well as any lessons learnt from the implementation of closure on this project.

3.4.4. MOTIVATION FOR PREFERRED CLOSURE OPTION

With reference to Sections 3.4.2 and 3.4.3, the preferred closure option is as follows:

- ✎ In line with the DWAF (2008). Best Practice Guideline A6: Water Management for Underground Mines, all prospecting boreholes that will not be required for later monitoring or other useful purposes should be plugged and sealed with cement to prevent possible cross flow and contamination between aquifers;
- ✎ In order to allow unhindered land use of the prospecting area, it is suggested that all surface infrastructure be removed; and
- ✎ Rehabilitate access routes.

It is anticipated that the closure option presented above, together with monitoring over a 2 year post closure period, will achieve the stipulated closure objective. This closure option is in line with industry best practice and the requirements of the MPRDA Regulations.

3.4.5. CLOSURE PERIOD AND POST CLOSURE REQUIREMENTS

The closure period is defined as the period between the cessation of prospecting activities, and the completion of active rehabilitation actions on the applicable site. It is important to note that the nature of prospecting drilling is such that closure may be implemented for individual boreholes as and when the analysis ends.

Following successful completion of the active closure actions it is suggested that a further post closure period be assigned to allow for monitoring of the success of closure. It is anticipated that a period of 2 years be permitted for ongoing post closure monitoring. This post closure monitoring will include the following:

- ✎ Inspection of borehole plug integrity; and
- ✎ Vegetation composition.

3.4.6. ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply to this FRDCP:

- ✎ The following assumptions have been made and used as the basis for the financial provision calculations:
 - Post closure land use to resemble the pre-prospecting land use and vegetative cover;
 - Depth per borehole: ~600m;
 - Distance of access track (requiring rehabilitation): ~2 000 m total;
 - The access roads prepared for the prospecting activities will be rehabilitated during closure;
 - The closure actions and associated period will commence as soon as a borehole is abandoned; and
 - It is assumed that the entire length and diameter of the prospecting borehole will be plugged/ cemented.
- ✎ It is assumed that the management and mitigation measures suggested in the BAR relating to ongoing environmental management will be complied with. This includes post drilling clean-up and rehabilitation; and
- ✎ It is assumed that the drilling, will be carried out in accordance with industry best practice and that permeable zones are adequately isolated (including the usable ground water aquifers).

3.5. FINAL POST PROSPECTING LAND USE

As discussed above the final post closure land use will depend on the specific site circumstances. It is proposed that prior to initiating closure that a suitably qualified specialist is appointed to undertake an assessment and consult with the landowner, and prepare a site specific decommissioning plan for submission to DMR for review and approval. For the purposes of this FRDCP it is assumed that the post closure land use will be natural grassland utilised for livestock grazing.

3.6. CLOSURE ACTIONS

3.6.1. INTEGRATED REHABILITATION AND CLOSURE PLAN

The main aim in developing this rehabilitation plan is to mitigate the impacts caused by the prospecting activities and to restore land back to a satisfactory standard. It is best practice to develop the rehabilitation plan as early as possible so as to ensure the optimal management of rehabilitation issues that may arise. It is important that the project's closure plan is defined and understood before starting the process and is complementary to the

rehabilitation goals. Rehabilitation and closure objectives need to be tailored to the project at hand and be aligned with the EMPR. The overall rehabilitation objectives for this project are as follows:

- ✎ Maintain and minimise impacts to the ecosystem within the study area;
- ✎ Re-establishment of the pre-developed land capability to allow for a suitable post-mining land use;
- ✎ Prevent soil, surface water and groundwater contamination;
- ✎ Comply with the relevant local and national regulatory requirements; and
- ✎ Maintain and monitor the rehabilitated areas.

Successful rehabilitation must be sustainable, and requires an understanding of the basic baseline environment, as well as project management to ensure that the rehabilitation program is a success.

It is noted that a separate application for environmental authorisation must be submitted for closure in accordance with EIA Regulations, 2014 Listing Notice 1 Activity 22:

The decommissioning of any activity requiring –

- I. a closure certificate in terms of Section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002); or
- II. A prospecting right, mining permit, production right or exploration right, where the throughput of the activity has reduced by 90% or more over a period of 5 years excluding where the competent authority has in writing agreed that such reduction in throughput does not constitute closure.

3.6.2. PHASE 1: MAKING SAFE

In line with the DWAF (2008). Best Practice Guideline A6: Water Management for Underground Mines. All prospecting boreholes that will not be required for later monitoring or other useful purposes should be plugged and sealed with cement to prevent possible cross flow and contamination between aquifers. Cement and liquid concrete are hazardous to the natural environment on account of the very high pH of the material, and the chemicals contained therein. As a result, the contractor shall ensure that:

- ✎ Concrete shall not be mixed directly on the ground;
- ✎ The visible remains of concrete, either solid, or from washings, shall be physically removed immediately and disposed of as waste, (Washing of visible signs into the ground is not acceptable); and
- ✎ All excess aggregate shall also be removed.

3.6.3. PHASE 2: LANDFORM DESIGN, EROSION CONTROL AND REVEGETATION

Landform, erosion control and re-vegetation is an important part of the rehabilitation process. Landform and land use are closely interrelated, and the landform should be returned as closely as possible to the original landform. Community expectations, compatibility with local land use practices and regional infrastructure, or the need to replace natural ecosystems and faunal habitats all support returning the land as closely as possible to its original appearance and productive capacity. This requires the following:

- ✎ Shape, level and de-compact (where necessary) the final landscape after removing all the project infrastructure, dress with topsoil and, where necessary, vegetate with indigenous species. Commission specialists to assist in planning re-vegetation and the management of environmental impact, as required.

- ✎ Remove access roads with no beneficial re-use potential by deep ripping, shaping and levelling after the removal and disposal of any culverts, drains, ditches and/or other infrastructure. Natural drainage patterns are to be reinstated as closely as possible.
- ✎ Shape all channels and drains to smooth slopes and integrate into the natural drainage pattern.
- ✎ Construct contour banks and energy dissipating structures as necessary to protect disturbed areas from erosion prior to stabilisation.
- ✎ Promote re-vegetation through the encouragement of the natural process of secondary succession.
- ✎ Natural re-vegetation is dependent on de-compaction of subsoils and adequate replacement of the accumulated reserves of topsoil (for example, over the borehole sites), so as to encourage the establishment of pioneer vegetation.
- ✎ Remove alien and/or exotic vegetation.
- ✎ Undertake a seeding programme only where necessary, and as agreed with the re-vegetation specialist.

3.6.4. PHASE 3: MONITORING AND MAINTENANCE

The post-operational monitoring and management period following decommissioning of prospecting activities must be implemented by a suitable qualified independent party for a minimum of two (2) year unless otherwise specified by the competent authority.

The monitoring activities during this period will include but not be limited to:

- ✎ Biodiversity monitoring; and
- ✎ Re-vegetation of disturbed areas where required.

Provision must be made to monitor any unforeseen impact that may arise as a result of the proposed prospecting activities and incorporated into post closure monitoring and management.

3.6.5. POST-CLOSURE MONITORING AND MAINTENANCE

Prior to decommissioning and rehabilitation activities, a monitoring programme shall be developed and submitted to the relevant authority for approval, as a part of the Final Rehabilitation Plan. The programme is to include proposed monitoring during and after the closure of the prospecting borehole sites and related activities. It is recommended that the post-closure monitoring include the following:

- ✎ Confirmation that any waste, wastewater or other pollutants that is generated as a result of decommissioning will be managed appropriately, as per the detailed requirements set out in the Final Rehabilitation Plan;
- ✎ Confirmation that all de-contaminated sites are free of residual pollution after decommissioning;
- ✎ Confirmation that acceptable cover has been achieved in areas where natural vegetation is being re-established. 'Acceptable cover' means re-establishment of pioneer grass communities over the disturbed areas at a density similar to surrounding undisturbed areas, non-eroding and free of invasive alien plants; and
- ✎ Confirmation that the prospecting borehole sites are safe and are not resulting in a pollution hazard.

Annual environmental reports will be submitted to the Designated Authority and other relevant Departments for at least one year post-decommissioning. The frequency and duration of this reporting period may be increased to include longer term monitoring, at intervals to be agreed with the Designated Authority.

The monitoring reports shall include a list of any remedial action necessary to ensure that infrastructure that has not been removed remains safe and pollution free and that rehabilitation of project sites are in a stable, weed and free condition.

3.7. FINAL REHABILITATION, DECOMMISSIONING AND CLOSURE SCHEDULE

Table 10 presents the forecast Schedule of actions related to the final rehabilitation, decommissioning and closure, in relation to the overall forecast prospecting schedule. It should be noted that this schedule represents a cautious approach and therefore doesn't take into consideration the recommendation that final rehabilitation, decommissioning and closure may be initiated earlier in the prospecting process for individual borehole sites.

TABLE 10: SCHEDULE OF THE PROPOSED ACTIVITIES

Phase	Year 1	Year 2	Year 3	Year 4	Year5
Phase 1 (0-6months) Desktop Study: Literature Survey / Review / acquisition of data	X				
Phase 2 (6-12 months) Geological field mapping	X				
Phase 3 (12-24 months) Regional Ground geophysical Surveys		X			
Phase 4 (24-34 months) Target Prospecting Boreholes			X		
Phase 5 (34-36 months) Data Compilation			X		
Phase 6 (36-42 months) Detailed Ground geophysical Surveys				X	
Phase 7 (42-48 months) Widely Spaced Prospecting Boreholes				X	
Phase 8 (48-60 months) Closely Spaced Prospecting Boreholes					X

3.8. ORGANISATIONAL CAPACITY

Capacity of the following key roles and responsibilities must be provided for:

- ✎ The Applicant: The applicant is ultimately responsible for ensuring compliance with all the provisions of the prospecting right and associated plans, as well as other relevant legal requirements. The Applicant must ensure knowledge and understanding of the applicable legislation, guidelines and industry best practices. Where necessary the applicant must appoint suitably qualified specialists, engineers, and

other internal and external resources to adequately comply with the applicable commitments and requirements. Relevant commitments made and obligations contained within the legal requirements must be adequately planned and budgeted for. The applicant must also ensure that suitable structures are put in place to effectively communicate with the affected landowners and relevant stakeholders.

- ✎ Independent Environmental Assessment Practitioner: This individual will be appointed to ensure compliance with the requirements of the FRDCP and specifically to undertake the following tasks:
 - Undertake the required pre-closure environmental site assessment, risk assessment, and landowner consultations.
 - Prepare a site specific final closure and decommissioning plan.
 - Undertake the required periodic compliance monitoring and reporting during the closure period.
- ✎ Prospecting specialist: This individual must be a suitably qualified professional who must have relevant experience in Prospecting. Key attributes must include experience and qualifications related to the technologies applicable to prospecting site closure, as well as a thorough understanding of internationally accepted closure standards and guidelines. This specialist will be responsible for ensuring that the closure plan is implemented to ensure that the risks to the environment and surrounding communities are prevented or limited.

Further education, training and capacity building is critical to ensure that the prospecting activities align with evolving internally accepted best practice and research. In this regard the Applicant must ensure that regular review of international best practice is undertaken and where applicable implemented throughout the prospecting programme.

3.9. IDENTIFICATION OF CLOSURE PLAN GAPS

The key gaps applicable to this closure plan are as follows:

- ✎ The geological stratigraphy and nature of the borehole profiles is unknown. The specific geological stratigraphy will be a determining factor in the planning for closure and decommissioning.
- ✎ The impact that any existing boreholes may have on the receiving environment is unknown.

The following actions have been proposed to address these gaps:

- ✎ A detailed drilling log will be prepared and maintained for each of the boreholes to ensure that the specific geological stratigraphy and sub-surface conditions are considered and inform the final site specific closure and decommissioning plan.
- ✎ A site specific closure and decommissioning plan will be prepared for each invasive activities and will where applicable be informed by a specialist environmental site assessment, and risk assessment, as well as a specialist assessment and plan for borehole plugging and decommissioning.

Furthermore, the financial provisioning regulations requires that the FRDCP be revisited, assessed, and revised on an annual basis. This annual review must aim to ensure that the gaps identified above are addressed, as applicable, and the relevant financial provisioning updated.

3.10. RELINQUISHMENT CRITERIA

Relinquishment can be defined as the formal approval by the relevant regulating authority indicating that the completion criteria for the prospecting activity have been met to the satisfaction of the authority. In this regard, the relinquishment criteria are driven by the objectives of closure and consequently the indicators applicable to each impact associated with the closure and decommissioning of the prospecting. In this regard reference is made to Table 8 which presents each identified environmental impact, the associated indicators and proposed closure targets. In summary, the proposed relinquishment criteria include:

- ✎ Biodiversity and soils: The vegetation cover of the affected areas must be consistent with surrounding vegetative cover. There must be ecosystem functionality which is consistent with the surroundings. There must be no faunal mortalities associated with the prospecting.
- ✎ Social: There must be no unattended complaints. Where possible written confirmation from the affected landowner must be solicited confirming that outstanding issues have been addressed and closed out.
- ✎ Waste: There must be no waste materials remaining on site.

3.11. CLOSURE COST - FRDCP

At any time funds must be available for the amount of 10 years of the calculation of the sum of the rehabilitation calculation. The remainder of this section provides details on the proposed closure cost. The assumptions and limitations stated in Section 3.4.6 and Section 3.11.3, also underpin the basis of this closure cost determination.

3.11.1. CLOSURE COST METHODOLOGY

The closure cost has been calculated through the following steps:

- ✎ Applicable prospecting activities are listed;
- ✎ Applicable closure actions listed for each activity;
- ✎ Cost items are listed for each action;
- ✎ Cost units and rates determined for each item; and
- ✎ Total cost is calculated.

3.11.2. CLOSURE COST ESTIMATION

This closure cost is based on 2017 values and will require annual reassessment, revision and escalation. Table 11 provides a summary of the closure cost estimation. Please refer to Appendix B for the detailed breakdown of the anticipated closure cost for 5 boreholes.

TABLE 11: CLOSURE COST ESTIMATION

Item	Sum of Cost (Excl VAT)
Phase 1: Preparation for closure	
Environmental Site Inspection and assessment	R 2 640.00
Phase 2: Closure and rehabilitation	
Access road rehabilitation	R 126 000.00
Borehole plugging	R 50 000.00
Borehole Surface Rehabilitation	R 57 525.00
Phase 3: Monitoring, Maintenance and Relinquishment	

Vegetation monitoring

R 23 313.00

Grand Total**R 259 478.00****3.11.3. CLOSURE COST ASSUMPTIONS AND LIMITATIONS**

In accordance with the prospecting works programme the following activities are included, and their associated cost assumptions:

- ✎ The following assumptions/ Limitation have been made and used as the basis for the financial provision calculations:
 - Post closure land use to resemble the pre-prospecting land use and vegetative cover.
 - Average depth of boreholes: ~600 m.
 - Distance of access tracks (requiring rehabilitation): 2 000 m.
 - The access roads prepared for the prospecting activities will be rehabilitated during closure.
 - The closure actions and associated period will commence as soon as a borehole is abandoned.
 - It is assumed that the entire length and diameter of the prospecting borehole will be plugged/ cemented in the event that ground water intersects the borehole.

3.12. MONITORING, AUDITING AND REPORTING

The requirement to monitor and audit should be carried through all phases of the proposed prospecting. In this regard the following monitoring and auditing requirements for the pre-closure phases have been specified in the BAR and EMPr (please refer to the BAR and EMPR for further detail):

- ✎ Compliance monitoring and auditing:
 - In accordance with Regulation 26 of the NEMA EIA regulations the competent authority will indicate the extent and frequency of required environmental audits in any consequent environmental authorisations. For the purposes of this submission the following is proposed:
 - The Site Manager (normally the Project Geologist) will be responsible for daily monitoring, culminating in weekly reports which will be filed in support of an overall monthly report, which is to be submitted to the BMM Environmental Officer. Compliance with the BAR & EMPR will be audited quarterly by the BMM Environmental Officer. The officer will be responsible for quarterly site inspections and reports, culminating in the compilation of the annual performance assessment report which is to be submitted to the DMR, as per legal requirement. The results of these inspections will be documented and kept on record for the life of the prospecting operation. External audits in the form of EMP performance assessments will be conducted every two years by an independent consultant and submitted to the DMR.

✎ Environmental Monitoring (as detailed in the BAR and EMPR):

- Waste Management; and
- Progressive rehabilitation.

✎ Review and update of Final Rehabilitation, Decommissioning and Closure Plan:

- In accordance with Regulation 11 of the NEMA Financial Provisioning Regulations the Applicant must ensure annual review of the annual rehabilitation plan, the final rehabilitation decommissioning and closure plan, as well as the environmental risk assessment. This annual review must be audited by an independent auditor.

It is critical to continue monitoring through to the post- closure phase of the prospecting. The aim of this being to ensure that the objectives of the rehabilitation and closure plan are met. In this regard the following actions, to be adjusted based on the completion of the pre-closure site assessment, are proposed:

- ✎ Compliance monitoring and auditing: Annual (or as agreed) environmental reports will be submitted to the competent authority and other relevant stakeholders for at least 2 years post-decommissioning. The monitoring reports shall include a list of any remedial action necessary to ensure that infrastructure that has not been removed remains safe and pollution free and that rehabilitation of project sites are in a stable, weed free condition.
- ✎ Environmental Monitoring:
 - Flora: Biodiversity assessments mid wet season should be undertaken by the ECO to monitor the rehabilitation progress with regards to flora. Confirmation that acceptable cover has been achieved in areas where natural vegetation is being re-established. 'Acceptable cover' means re-establishment of pioneer grass communities over the disturbed areas at a density similar to surrounding undisturbed areas, non-eroding and free of invasive alien plants.

4. ANNUAL REHABILITATION PLAN

The annual rehabilitation plan aims to:

- a) review concurrent rehabilitation and remediation activities already implemented;
- b) establish rehabilitation and remediation goals and outcomes for the forthcoming 12 months, which contribute to the gradual achievement of the post-mining land use, closure vision and objectives identified in the holder's final rehabilitation, decommissioning and mine closure plan;
- c) establish a plan, schedule and budget for rehabilitation for the forthcoming 12 months;
- d) identify and address shortcomings experienced in the preceding 12 months of rehabilitation; and
- e) evaluate and update the cost of rehabilitation for the 12 month period and for closure, for purposes of supplementing the financial provision guarantee or other financial provision instrument.

The proposed prospecting schedule (see Figure 4) indicates that no invasive work will be commenced within the first 12 months. Activities during the first year include desktop studies and database development. As such, no rehabilitation or remediation will be planned for during this period and consequently no financial provision can be costed for at present.

Within the third, fourth and fifth years of the proposed prospecting works, core drilling is planned. The nature of drilling is such that closure may be implemented for individual sites as and when the analysis is complete, or alternatively at the end of the prospecting programme. Please see Section 3.4.5 for more details. It is therefore anticipated that the annual review of the annual rehabilitation plan, as required under Section 11 of the NEMA

GNR 1147, will consider the more detailed works programme at that time and provide for, schedule and budget for rehabilitation for the forthcoming 12 month period.

5. ENVIRONMENTAL RISK ASSESSMENT – LATENT AND RESIDUAL ENVIRONMENTAL IMPACTS

According to the Financial Provisioning Regulations (2015) the objective of the environmental risk assessment report that relates to latent and residual impacts is to:

- a) ensure timeous risk reduction through appropriate interventions;
- b) identify and quantify the potential latent environmental risks related to post closure;
- c) detail the approach to managing the risks;
- d) quantify the potential liabilities associated with the management of the risks; and
- e) outline monitoring, auditing and reporting requirements.

This section of the report aims to address these objectives separately in cases where they have not been considered in previous sections.

5.1. THE ASSESSMENT PROCESS USED AND DESCRIPTION OF LATENT ENVIRONMENTAL RISK

Section 7 of the BAR provides a detailed description of the environmental impact/risk identification and assessment (including the methodology and findings) undertaken for the proposed prospecting. Further details of the risk assessment methodology are detailed in the Environmental Risk Assessment under Section 3.2 of this report. As mentioned under Section 3.2, the BAR and EMPr have identified mitigation measures which, once implemented successfully, will result in the avoidance or acceptable reduction of the associated impact.

The drivers that could result in the manifestation of the latent risk are largely defined by the specifics of the site location and the geological profile surrounding each specific site. It is suggested that further investigations are conducted during annual revisions, as well as during the proposed site specific environmental assessment detailed in Section 3.9 of this document to provide more clarity on this specific issue. These investigations must include regular revision of the environmental risk assessment and consequently inform the responsible management of latent and residual impacts.

5.2. MANAGEMENT ACTIVITIES, COSTING AND MONITORING REQUIREMENTS

New international best practice guidelines that may be developed in the future (Section 3.4.3), will be considered in all annual updates of the financial provisions and changes to the risk assessment will be reported on. In addition, monitoring results and auditing reports, as described under Section 3.6.3, for two years after closure will inform the revised risk assessment further.

APPENDIX A: DETAILED CLOSURE COST ESTIMATION

Cost Estimate

Item #	Activity	Item	Type	Cost Item	Comments	Number	Unit Price	Cost (Excl VAT)
1	Phase 1: Preparation for closure	Environmental Site Inspection and assessment	Work	BMM Senior Environmental Officer	Hours	25	R 0,00	R 0,00
			Material	Mileage	km	480	R 5,50	R 2 640,00
2	Phase 2: Closure and rehabilitation	Borehole plugging	Material	Groundworks & Rehabilitation - Plugging and grouting the borehole	Possible 1 deeps DD@ 600 m, RC/RAB boreholes only 10m into bedrock, no groundwater expected	5	R 10 000,00	R 50 000,00
			Material	Equipment & Crew Mobilisation		5	R 6 400,00	R 32 000,00
		Material	Equipment & Crew Demobilisation		5	R 3 575,00	R 17 875,00	
		Material	Waste bin transport	Bin placement and collection	2	R 450,00	R 900,00	
		Material	Waste bin rental	per day	15	R 450,00	R 6 750,00	
		Material	Waste disposal (per ton)	Disposal at BMM Licenced waste disposal facility	1	R 0,00	R 0,00	
		Access road rehabilitation	Material	Equipment- Earth moving	BMM equipment utilised for rehabilitation work	14	R 9 000,00	R 126 000,00
3	Phase 3: Monitoring, Maintenance and Relinquishment	Vegetation monitoring	Work	Specialist: Ecology	SACNASP registered ecologist/ botanist. Survey undertaken once per annum , Kathu based practitioner	24	R 750,00	R 18 000,00
			Material	Mileage	2 Return trips to site.	966	R 5,50	R 5 313,00
Professional Fees								R 18 000,00
Expenses								R 241 478,00
TOTAL COST (EXCL VAT)								R 259 478,00
TOTAL COST + 10% CONTINGENCY (EXCL VAT)								R 285 425,80