EIMS | ENVIRONMENTAL IMPACT MANAGEMENT SERVICES

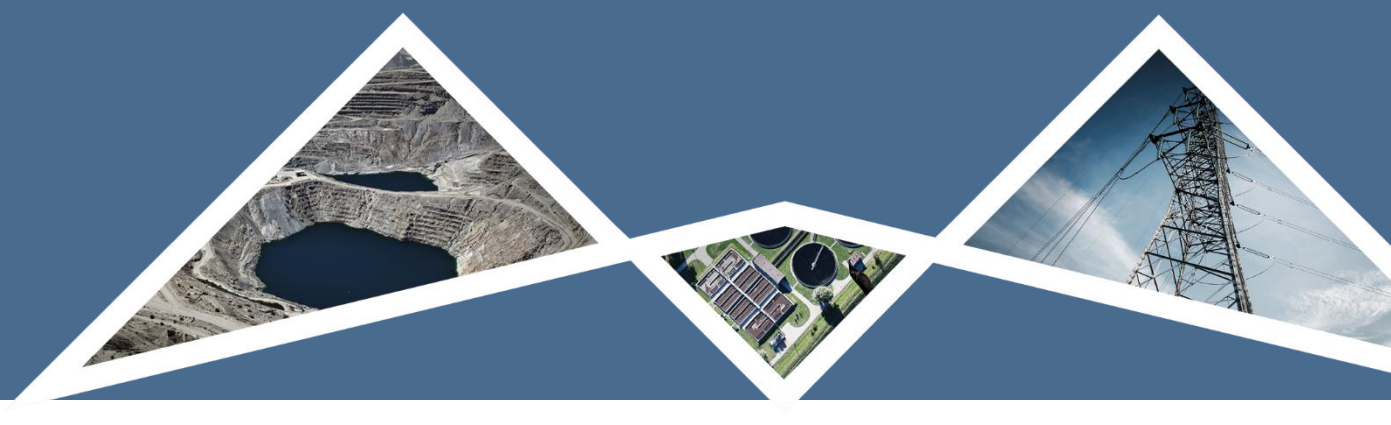
T 011 789 7170 E info@eims.co.za W www.eims.co.za

FINAL REHABILITATION, DECOMMISSIONING AND CLOSURE PLAN, INCORPORATING AN ANNUAL REHABILITATION PLAN AND ENVIRONMENTAL RISK ASSESSMENT

BLACK MOUNTAIN MINING- GROOT KOLK PROSPECTING RIGHT PROJECT

DMR REFERENCE NUMBER:

NC30/5/1/1/2/12392PR



DOCUMENT DETAILS

EIMS REFERENCE:	1304-5
DOCUMENT TITLE:	BLACK MOUNTAIN MINING- GROOT KOLK PROSPECTING RIGHT PROJECT

DOCUMENT CONTROL

	NAME	SIGNATURE	DATE
COMPILED:	Andisiwe Stuurman		2020/02/10
CHECKED:	GP Kriel		2020/02/10
AUTHORIZED:	Liam Whitlow		2020/02/10

REVISION AND AMENDMENTS

REVISION DATE:	REV #	DESCRIPTION
2020/02/10	ORIGINAL DOCUMENT	BLACK MOUNTAIN MINING- GROOT KOLK PROSPECTING RIGHT PROJECT

SUMMARY DATA

Project	Groot Kolk Prospecting Right Project
Location:	Northern Cape
Applicant:	Black Mountain Mining
Consultant:	Environmental Impact Management Services (Pty) Ltd (EIMS)
Contact:	GP Kriel
Contact Details:	PO Box 19731, Tecoma, 5214
	Tel: (043) 722 7572
	Fax: (086) 571 9047
	E-mail: gp@eims.co.za

Table of Contents

List of Figures

List of Tables

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 4 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) have been appointed by Black Mountain Mining to compile the BAR (this report) 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.

EIMS has been appointed as the independent consultants to assess the environmental impacts and requirements in terms of the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002, MPRDA) and the National Environmental Management Act (Act No.107 of 1998, NEMA). This includes submitting an application for a prospecting right and environmental authorisation as well as preparation of a Basic Assessment Report and EMPR for the proposed prospecting activity to the DMR.

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
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.

No.	Requirement	Relevant Section
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 **0**
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		
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**

No.	Requirement	Relevant Section
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 Specialist[1]

Name	Role	Qualifications/ Experience	Professional Registrations
GP Kriel	Environmental Scientist / Project Manager / EAP	M.Env.Sci. ~12 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. ~18 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-prospecting 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;

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.

[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.

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 prospecting activities, which would require inclusion in the FRDCP are extracted and described in Section 3.1.1.1 to Section 3.1.1.4.

3.1.1.1 LOCATION

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

Table 3: Locality Details

Farm Name (s)	Please refer to Table 4 below.
Application Area (Ha)	The area is approximately 30 150,5 Ha (Thirty Thousand One Hundred and Fifty Hectares)
Magisterial District	Kenhardt
Distance and direction from nearest town	The area is located approximately 187 kilometres South West of the town of Upington and 193 km kilometres South East of the town of Aggeneys, Kenhardt District, Northern Cape Province.
21 digit Surveyor General Code for each Portion	Please refer to Table 4 below.

Table 4: Properties within the Application Area

Nr.	Registered Land Description	Magisterial District	Extent (Ha)	Title Deed/Diagram Deed	SG Code
1	Farm De Tuin Noord 161 Portion 0 RE	Kenhardt Rd	3316,574775	T57793/2016CTN	C0360000000016100000
2	Farm De Tuin Noord 161 Portion 4	Kenhardt Rd	3322,791447	T57792/2016CTN	C0360000000016100004
3	Farm De Tuin Zuid 163 Portion 0 RE	Kenhardt Rd	3471,292509	T24554/1971CTN	C0360000000016300000
4	Farm Groot Kolk 190 Portion 0 RE	Kenhardt Rd	4565,285821	T67338/2007CTN	C0360000000019000000
5	Farm Groot Kolk 190 Portion 1	Kenhardt Rd	4629,074162	T55618/1996	C0360000000019000001
6	Farm Annex Groot Kolk 191 Portion 0 RE	Kenhardt Rd	5322,130701	T1681/1987CTN	C0360000000019100000
7	Farm Annex Groot Kolk 191 Portion 1	Kenhardt Rd	5523,361777	T23349/1986	C0360000000019100001
	TOTAL AREA (HA)		**30 150,5**		

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

Table 5: Application Area Boundary Coordinates

Point ID	Y Coordinate	X Coordinate
1	-29,488217	20,648306
2	-29,498184	20,611271
3	-29,506432	20,558680
4	-29,511749	20,539340
5	-29,489692	20,503832
6	-29,489692	20,503832
7	-29,468451	20,468982
8	-29,434621	20,494708
9	-29,432928	20,495995
10	-29,352686	20,556926
11	-29,352686	20,556927
12	-29,345901	20,557054
13	-29,313876	20,557660
14	-29,372269	20,679041
15	-29,372486	20,679494

Point ID	Y Coordinate	X Coordinate
16	-29,372842	20,679463
17	-29,373359	20,679477
18	-29,374001	20,679663
19	-29,374747	20,679823
20	-29,375125	20,679864
21	-29,375142	20,679857
22	-29,375779	20,680181
23	-29,377614	20,680988
24	-29,378779	20,683260
25	-29,429446	20,720556
26	-29,467826	20,691082
27	-29,471032	20,684359
28	-29,488217	20,648306
29	-29,488217	20,648306

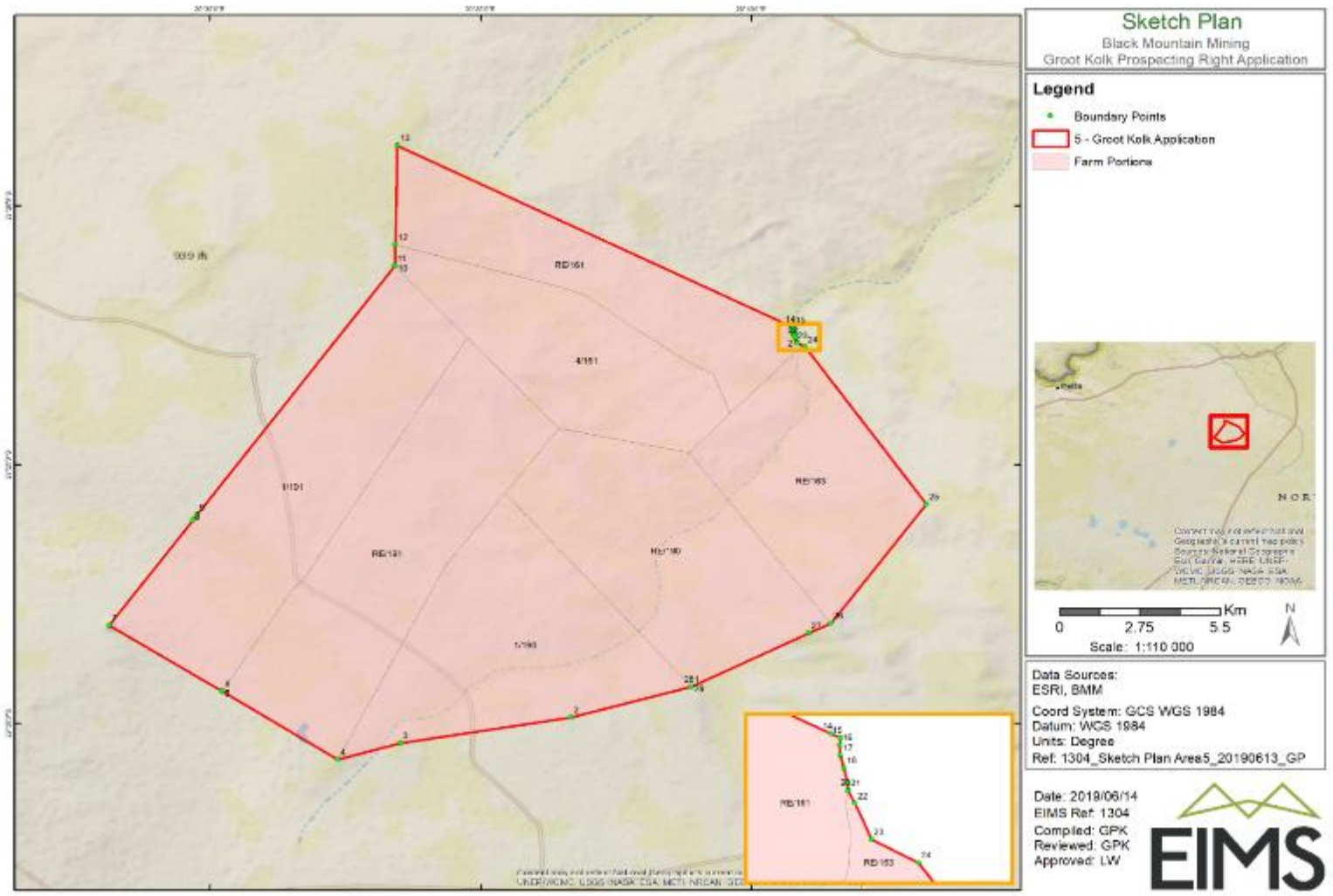


Figure 1: Locality Map

3.1.1.2 DESCRIPTRION OF PROPOSED ACTIVITIES

Both non-invasive and invasive prospecting activities will be undertaken as part of the proposed Prospecting Work Programme (PWP). The application will follow a phased approach, where the prospecting work program is divided into several sequential phases.

Figure 1 above depicts the proposed prospecting area, the proposed areas of interest within the application area will be defined within the course of prospecting activities. It is anticipated that the invasive program will consist of 10 boreholes with a footprint of approximately 300 m^2 each. Vegetation will be cleared at the borehole locations within the application area. Minor access tracks will be created to access the proposed borehole sites where there are no existing roads. The total length of the access routes is anticipated to be 5 000 m and the approximate width is 3 m.

At the end of each phase there will be a brief period of compiling and evaluating results. The results will not only determine whether prospecting proceeds, but also the manner in which it will go forward. The applicant will only action the next phase of prospecting, once satisfied with the results obtained in the previous phases. In addition, smaller, non-core parts of the prospecting work program will be undertaken, if warranted. A description of the planned invasive and non-invasive activities is detailed below.

DESCRIPTION OF PLANNED NON-INVASIVE ACTIVITIES

These activities do not disturb the land where prospecting will take place e.g. aerial photography, desktop studies, aeromagnetic surveys, etc.

Phase 1: Desktop study

- Compilation of historical prospecting data;
- Analysis of existing data and maps to further understand prospecting area structure & geology; and
- Initial targeting and ranking of prospective areas

Phase 2: Regional Airborne Geophysical Survey

- Airborne Gravity survey at 1 km flight line spacing
- Airborne Magnetics and Radiometrics at 100 m flight line spacing
- Airborne EM at 200m flight line spacing.

Phase 3: Semi-Regional Geophysical Survey (ground based)

The field mapping will be focused on potentially prospective areas (Bushmanland Group rocks) to improve understanding of the structure & geology in order to define targets for ground based geophysics as well as to be able to interpret geophysical results. Geological mapping will be on a scale suitable for the observed geological variability and will be conducted by an in-house well-trained and highly experienced geologist. During the geological field mapping activity soil and litho-sampling along with analysis (XRF & or assaying) may be conducted to determine prospective horizons.

The primary ground-based geophysical technique that will be employed will be time-domain electromagnetics (TDEM) utilizing a new state-of-the-art SQUID electromagnetic sensor. Existing airborne EM and aeromagnetic coverage will guide the ground follow-up strategy. Additional techniques, such as controlled source audio magnetotellurics (CSAMT) and direct current resistivity / induced polarization, might be employed over prospective targets. Please refer to Section 6 of the PWP for further details on these methods. No bulk sampling work is to be carried out during this prospecting program.

Initial prospecting will be carried out by the company itself, utilizing its own in-house geologists to conduct and oversee the work. Drilling will be outsourced to a local drilling company.

DESCRIPTION OF PLANNED INVASIVE ACTIVITIES

These activities result in land disturbances e.g. sampling, drilling, etc.

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 EM surveys to determine positions of conductors.

Rehabilitation of drill sites will be done according to an approved Environmental Management Programme.

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 of the applicant's choice 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 of the applicant's choice.

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 & 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 & Integration of data

Phase 7: Boreholes

This phase of boreholes would determine the continuity of mineralization & 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 & 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 & Integration of data

DESCRIPTION OF PRE/FEASIBILITY STUDIES

Activities in this section includes but are not limited to: initial, geological modelling, resource determination, possible future funding models, etc.

Phase 5: Compilation, interpretation and modelling of data

This phase will focus on compiling all the data gathered to date along with 3D modelling of any mineralized intersections. Any positively mineralized targets will be ranked. Should Phase 5 confirm mineralization with economic potential, then that target will advance to Phase 6.

Phase 9: Desktop Pre-Feasibility Study

This phase is designed to utilize the inferred resource to determine and would include:

- Closely spaced diamond drilling (Phase 8)
- 3D-modelling of the mineralized ore body
- Resource estimation
- A risk assessment to calculate if a full feasibility study is warranted
- Risk assessment studies

Table 6: Timeframes each of the proposed activities

Phase	Activity	Year 1	Year 2	Year 3	Year 4	Year 5
Phase 1 (Month 0-6)	**Non-Invasive Prospecting** Desktop Study: Literature Survey / Review / acquisition of data	**X**				
Phase 2 (Month 6-12)	**Non-Invasive Prospecting** Regional Airborne Geophysical Survey	**X**				
Phase 3 (Month 12-24)	**Non-Invasive Prospecting**		**X**			

Phase	Activity	Year 1	Year 2	Year 3	Year 4	Year 5
	Ground Geophysical Survey and Geological Field Mapping					
Phase 4 (Month 24-34)	**Invasive Prospecting** Exploration Boreholes			**X**		
Phase 5 (Month 34-36)	**Non-Invasive Prospecting** Compilation, interpretation and modelling of data			**X**		
Phase 6 (Month 36-42)	**Non-Invasive Prospecting** Detailed Ground Geophysical Survey on individual positively mineralized targets to define possible extent				**X**	
Phase 7 (Month 42-48)	**Invasive Prospecting** Boreholes to confirm continuity of mineralization & potential deposit size				**X**	
Phase 8 (Month 48-60)	**Invasive Prospecting** Resource definition drilling					**X**
Phase 9 (Month 54-60)	**Non-Invasive Prospecting** Analytical Desktop Pre-Feasibility Study					**X**

3.1.1.3 LISTED AND SPECIFIED ACTIVITIES

Name of Activity	Aerial extent of the Activity	Listed Activity	Applicable Listing Notice	Waste Management Authorisation
Activities directly related to prospecting of a mineral resource, including the operation of that activity which requires a prospecting right in terms of section 16 of the Mineral and Petroleum	30 150,5 Ha	X	GNR 983 Activity 20	N/A

Name of Activity	Aerial extent of the Activity	Listed Activity	Applicable Listing Notice	Waste Management Authorisation
Resources Development Act, 2002 (Act No. 28 of 2002), including associated infrastructure, structures and earthworks.				
Desktop Study: Literature Survey / Review / acquisition of data	N/A	N/A	N/A	N/A
Regional Airborne Geophysical Surveys	30 150,5 Ha	N/A	N/A	N/A
Ground Geophysical Surveys and Geological Field Mapping	30 150,5 Ha	N/A	N/A	N/A
Target Exploration Boreholes: **10 drill sites, each site covering a total area of 300 m^2**	3000 m^2 (0.3 ha)	X	GNR 983 Activity 20 GNR 985 Activity 12 g ii	N/A
Data Compilation	N/A	N/A	N/A	N/A
Detailed Ground Geophysical Surveys	30 150,5 Ha	N/A	N/A	
Environmental Screening by ECO	30 150,5 Ha	N/A	N/A	N/A
Ablutions - Chemical Toilets	5 m^2	N/A	N/A	N/A
Temporary Fuel storage	5 m^2 less than 80 cubic metres	N/A	N/A	N/A
Sample storage **(Existing BMM exploration office. No new infrastructure to be constructed)**	N/A	N/A	N/A	N/A
Access Route **(Mostly existing roads to be utilised. Access tracks will be made where there are no existing routes.)** **Approximate total length : 5000 m** **Approximate width: 3m)**	15000 m^2 (1.5 ha)	X	GNR 985 Activity 12 g ii	N/A
Temporary general waste storage **(General/domestic waste - Wheelie bin)**	1m^2 less than 100 cubic metres	N/A	N/A	N/A
Temporary hazardous waste storage **(Hazardous waste – Sealed Wheelie bin)**	1m^2 less than 30 cubic metres	N/A	N/A	N/A
Compilation of geological plans	N/A	N/A	N/A	N/A
Undertake rehabilitation of drill sites as per the rehabilitation plan **(Drill sites + Access tracks)**	18000 m^2 (1.8 ha)	N/A	N/A	N/A
Monitoring of rehabilitation efforts	18000 m^2	N/A	N/A	N/A

Name of Activity	Aerial extent of the Activity	Listed Activity	Applicable Listing Notice	Waste Management Authorisation
	(1.8 ha)			

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 prospecting activities will be undertaken within the following constraint areas:

- Watercourses and Wetlands;
- Heritage sites or features;
- Existing servitudes for 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 project are included as supporting technical appendices to the BAR. The key environmental aspects related to the application area are summarised in the remainder of this Section.

3.1.2.1 TOPOGRAPHY

The topography is mainly flat and rolling. As can be seen in Figure 2 below, the average elevation is approximately 901 m and the average slope is 0.9%. The area is located approximately 50 kilometres west of the town of Kenhardt, Northern Cape, South Africa. It covers seven farms, over an area of 30 150.5 Ha (301.51 km^2). Surface drainage is towards the north-east with altitudes around 900 m amsl in the south-west and west, lowering to 860 m amsl in the north-east. Multiple non-perennial streams originate in the area flowing north-east, joining the perennial Tuinsrivier.

.

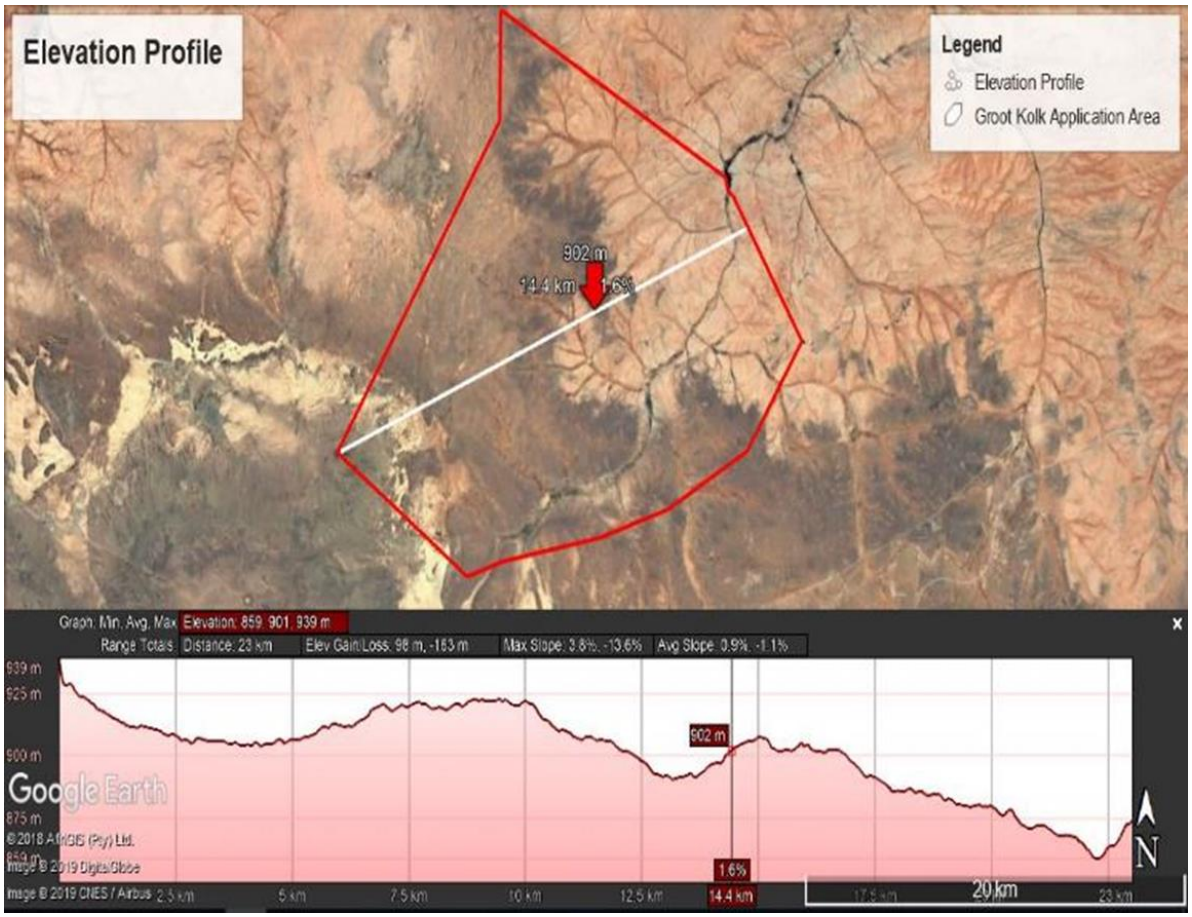


Figure 2: Elevation profile of the proposed sites.

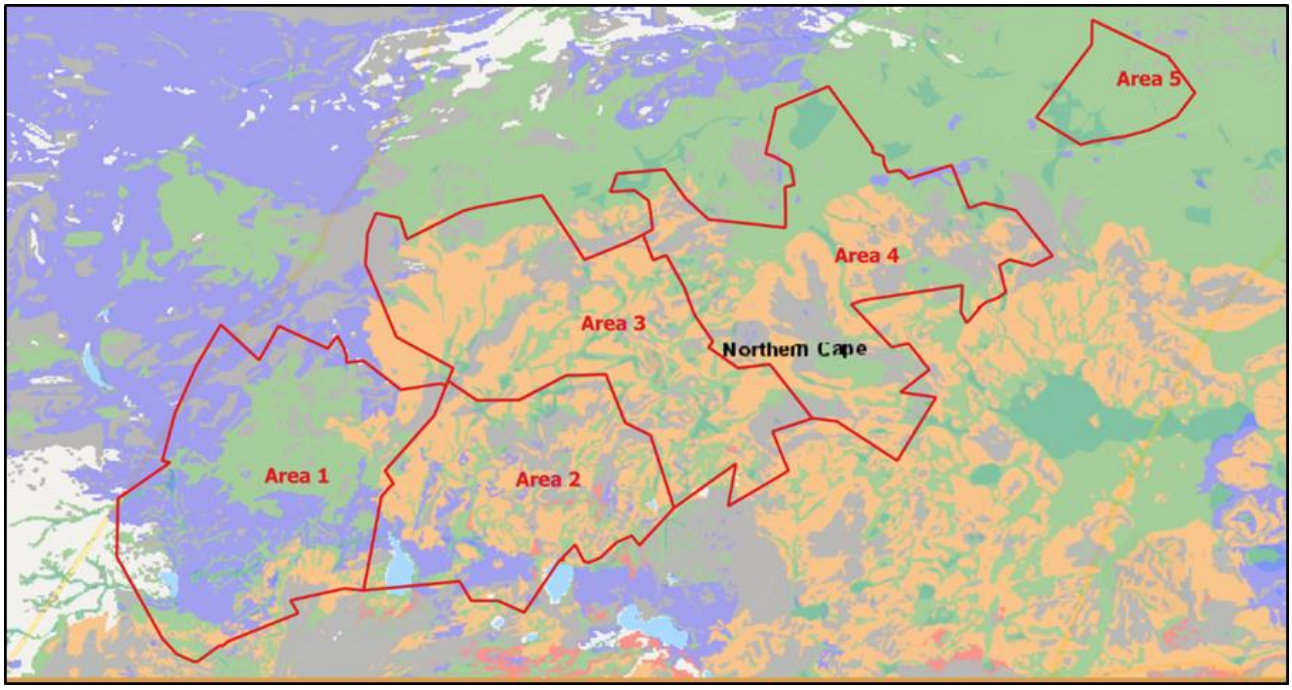


Figure 3: Extract of the 1: 250 000 SAHRIS Palaeosensitivity Map (Groot Kolk Application =Area 5)

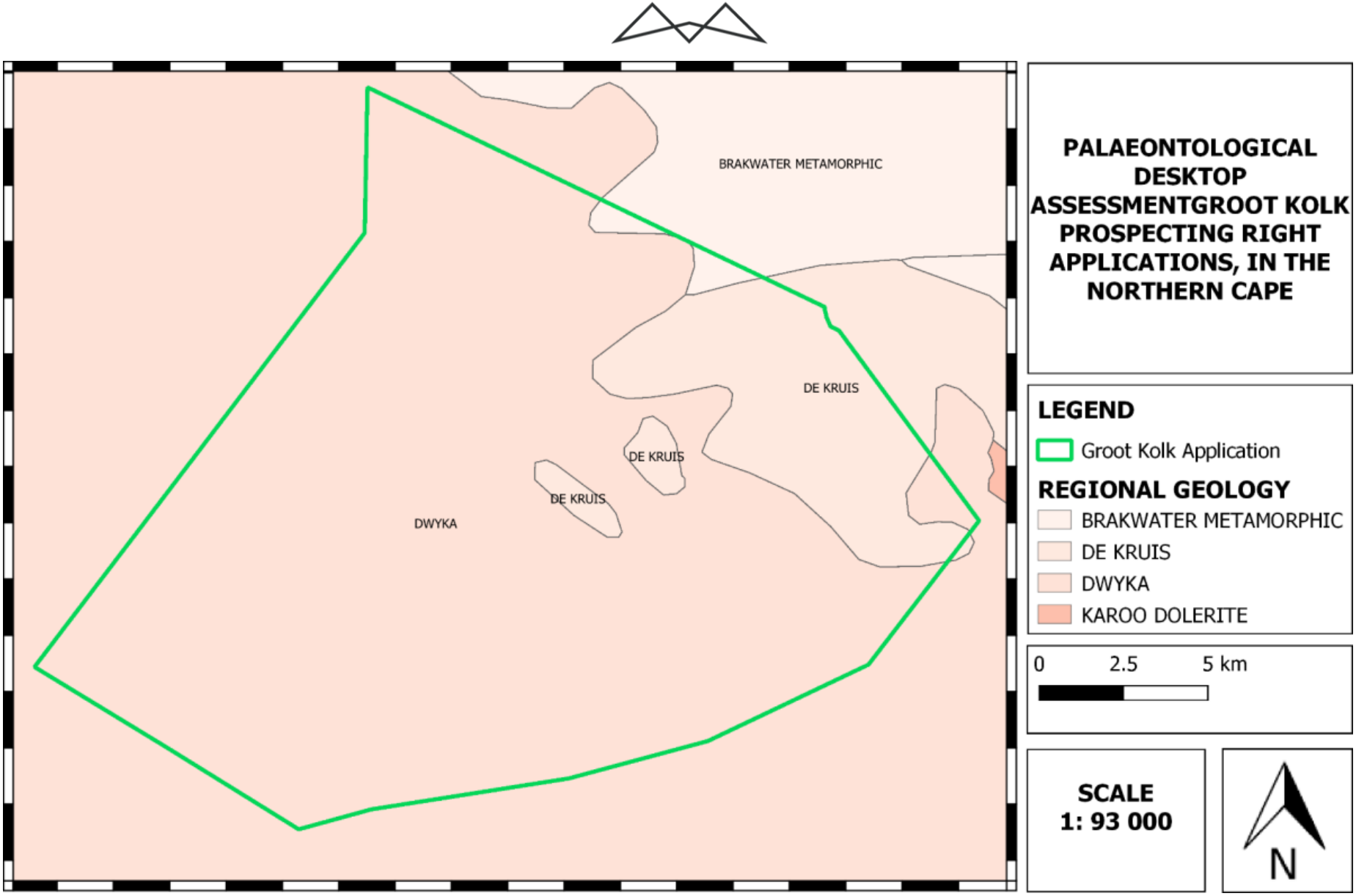


Figure 4: Geology of the application area.

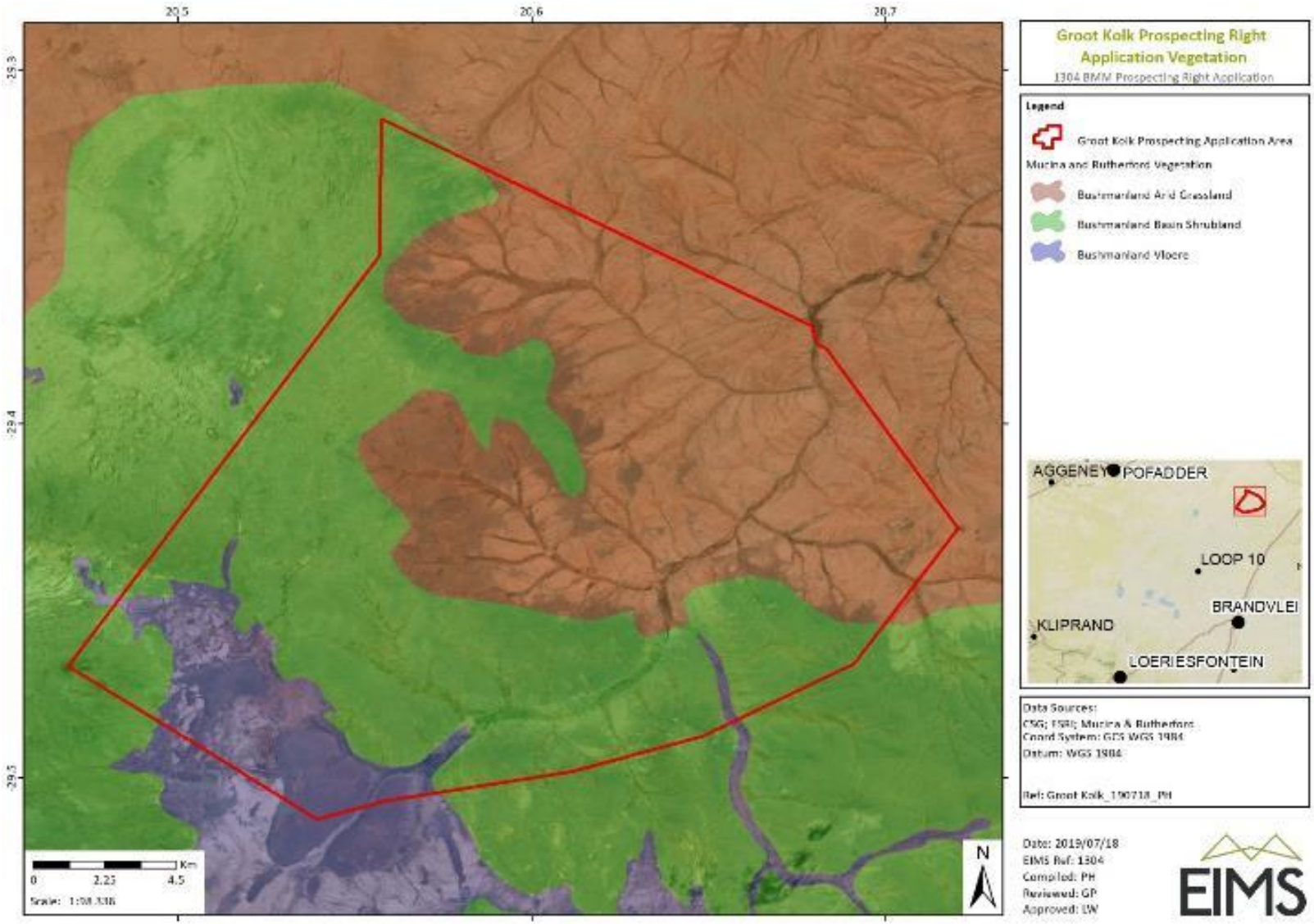


Figure 5: Vegetation types based on the Vegetation Map of South Africa, Lesotho & Swaziland (BGIS, 2018).

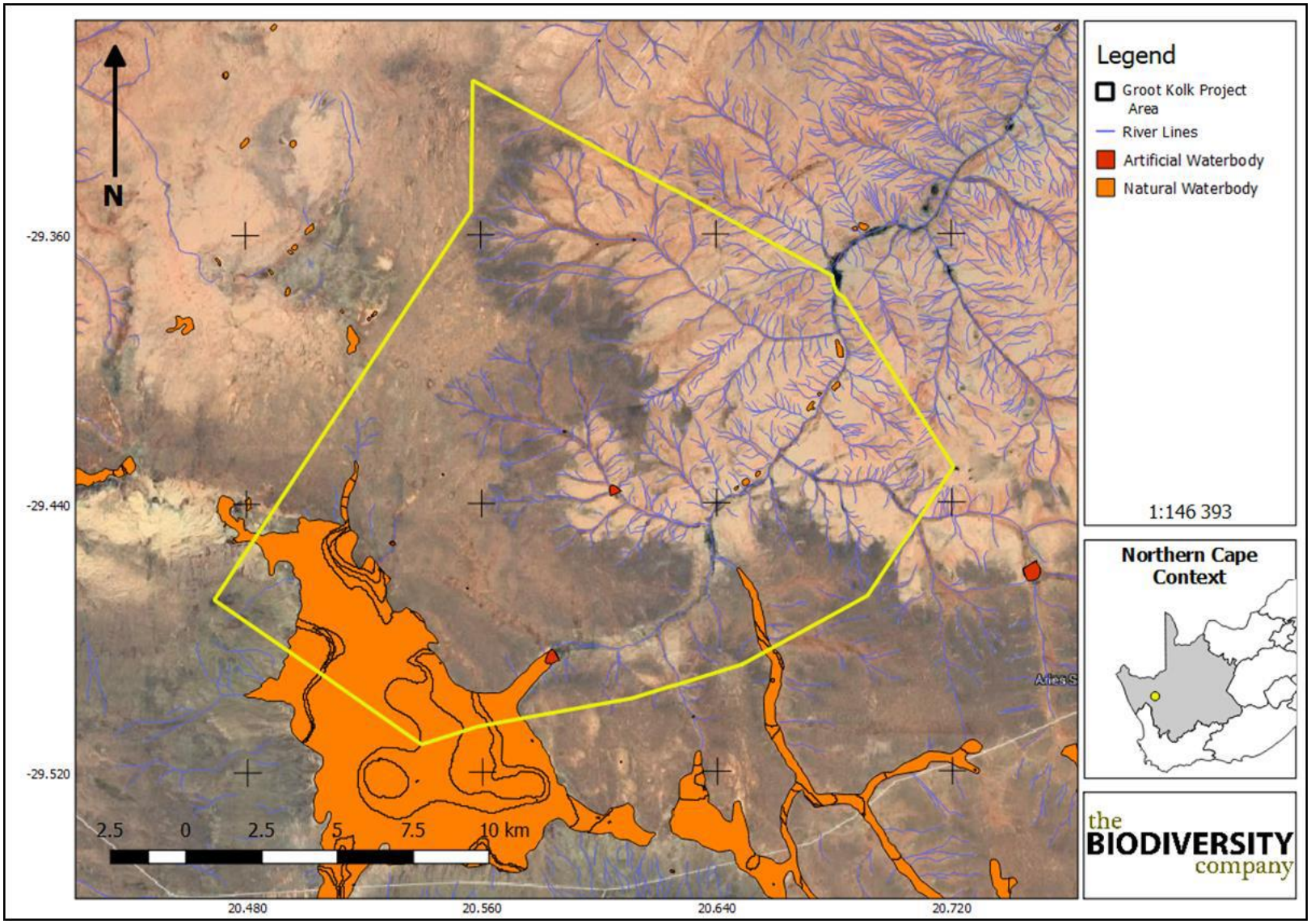


Figure 6: Watercourses identified within the application area

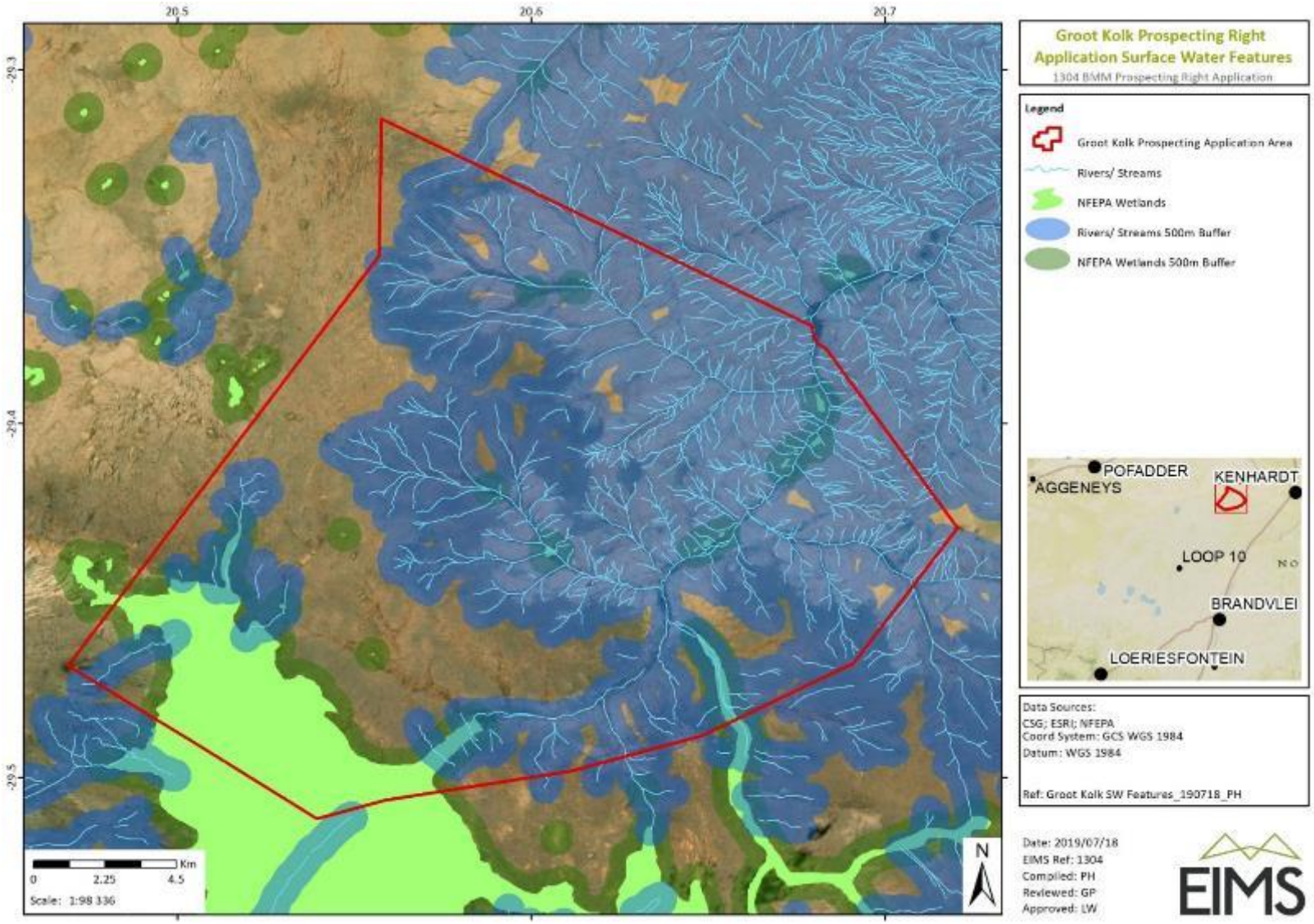


Figure 7: Surface water features in the application area

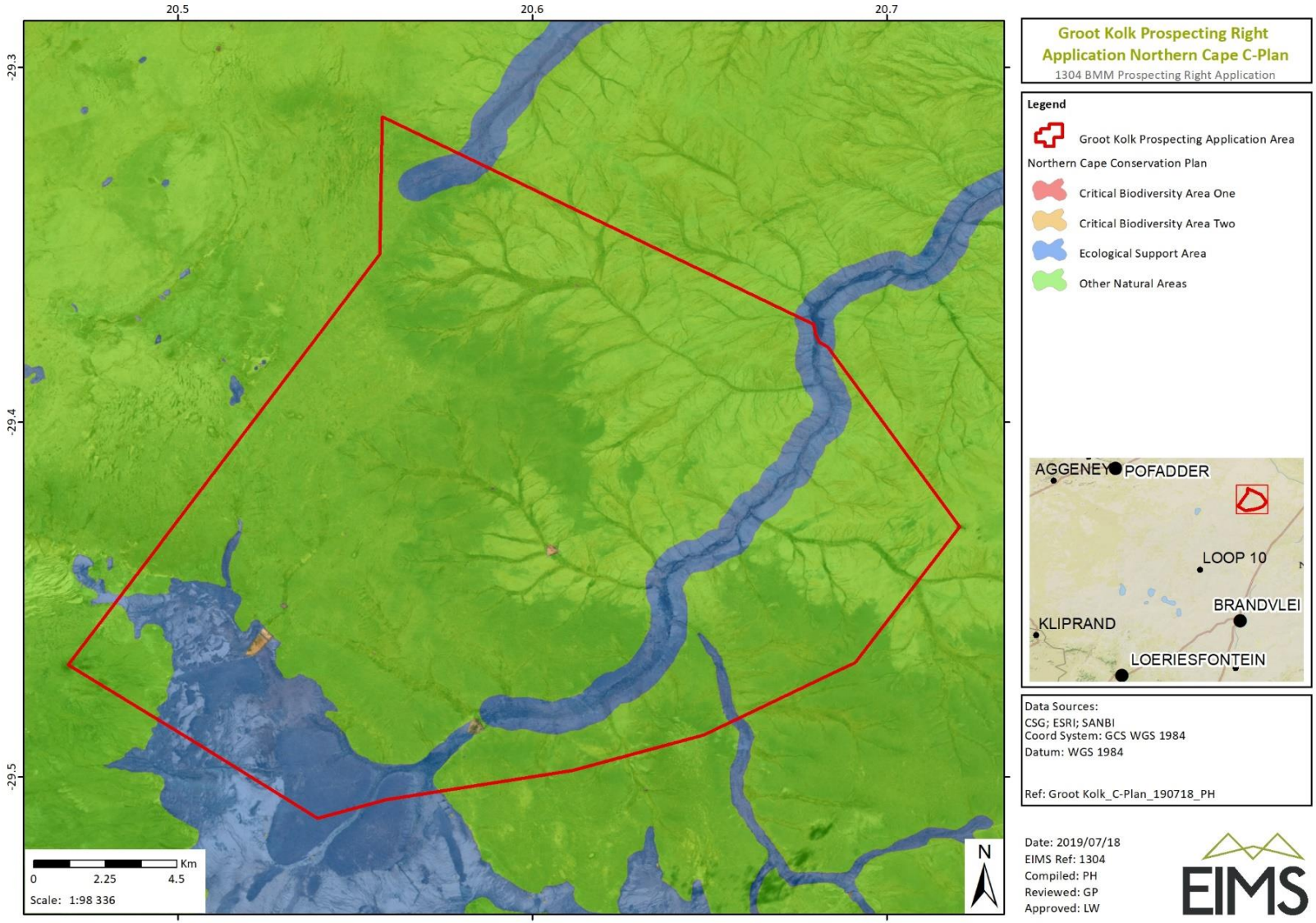


Figure 8: Northern Cape Conservation Plan

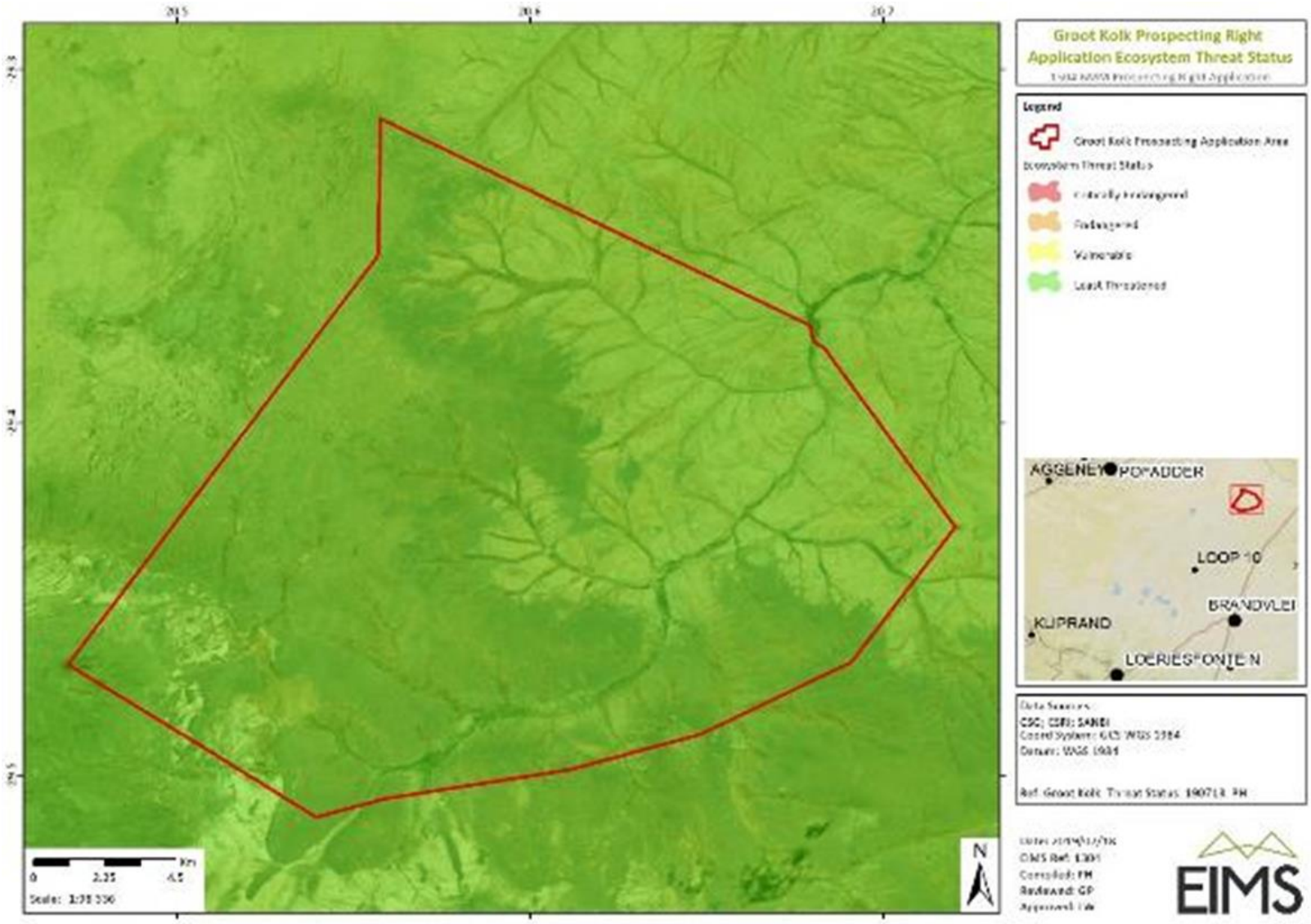


Figure 9:Ecosystem Threat Status

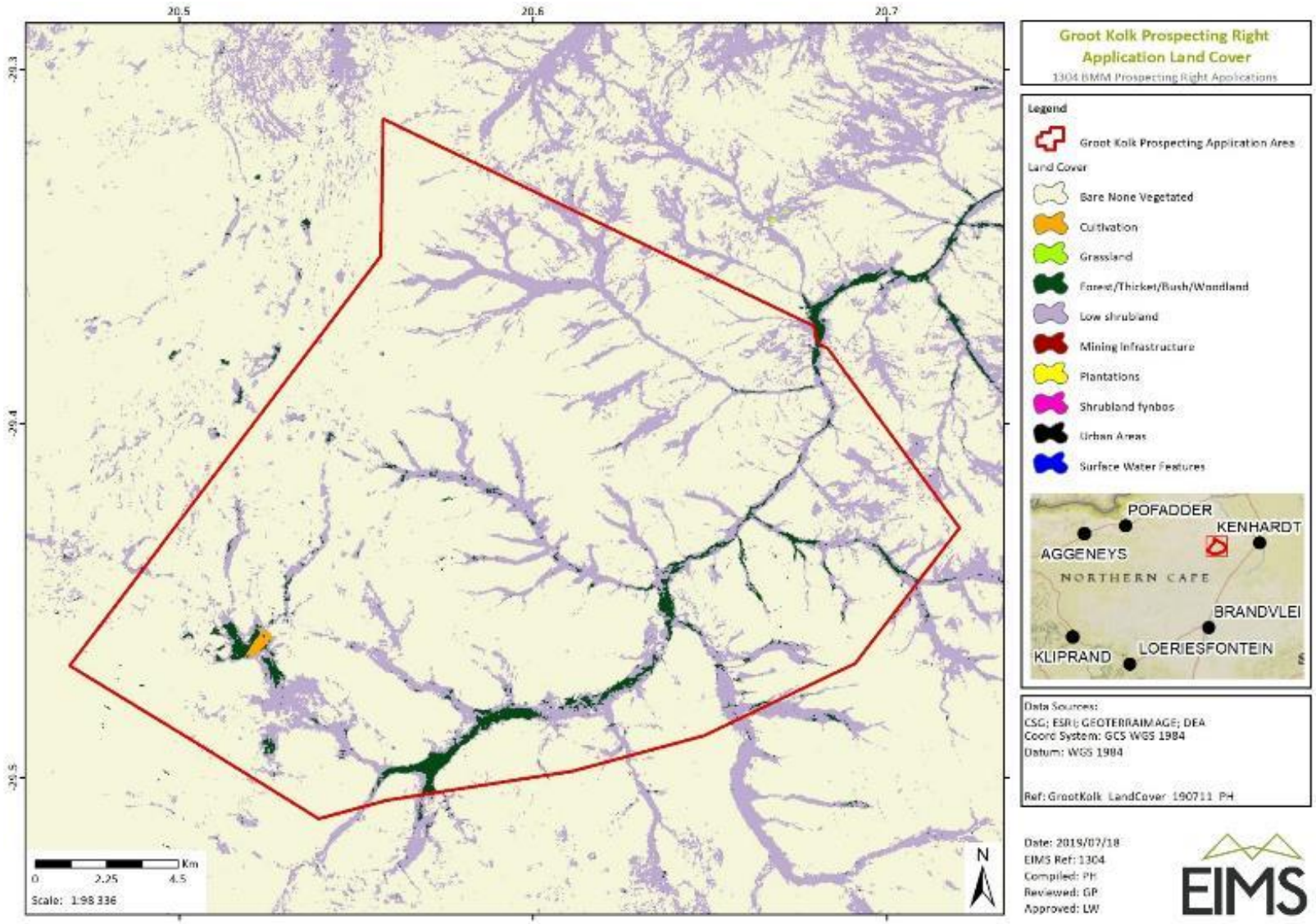


Figure 10: Land Cover

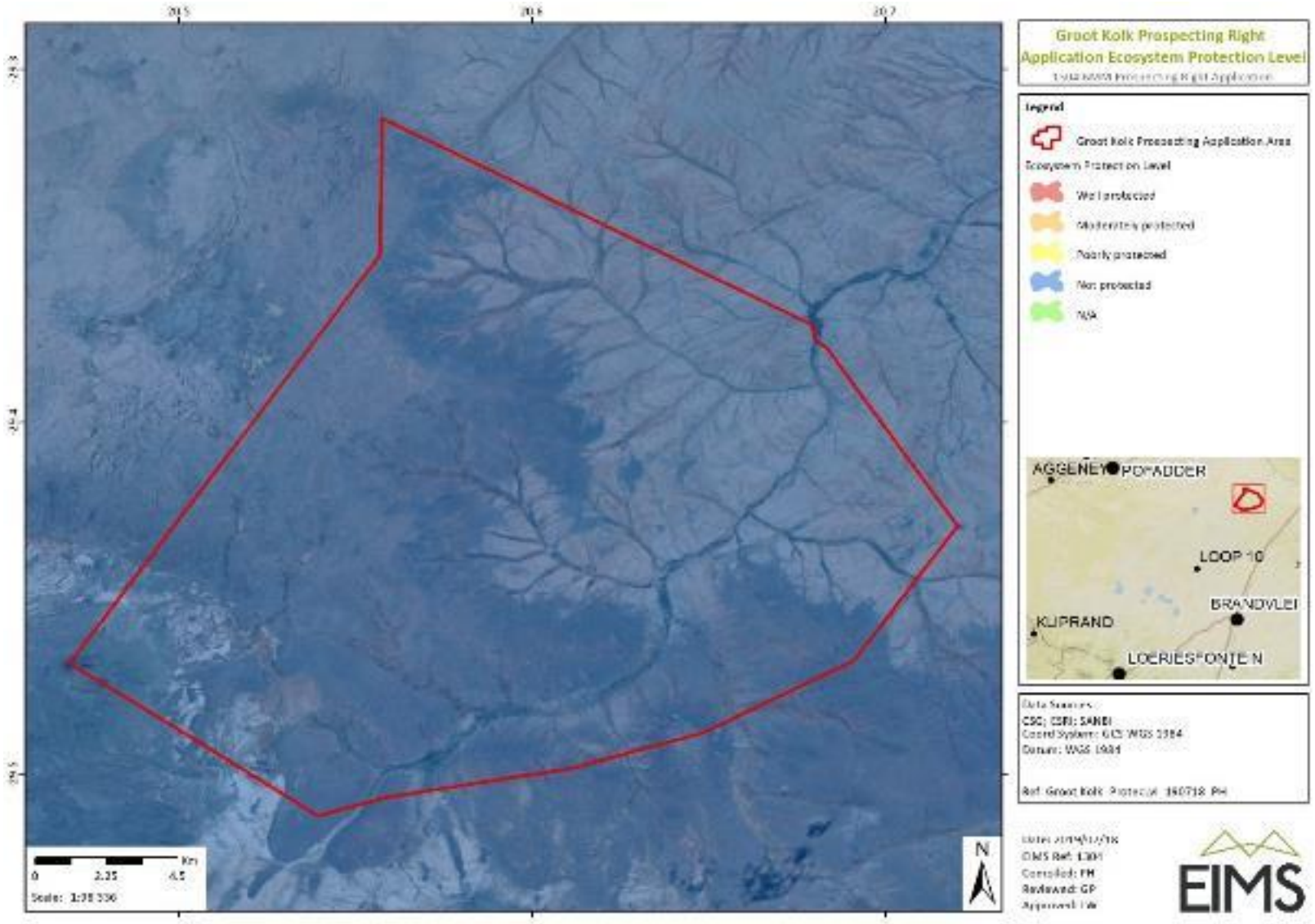


Figure 11: Ecosystem Protection Level

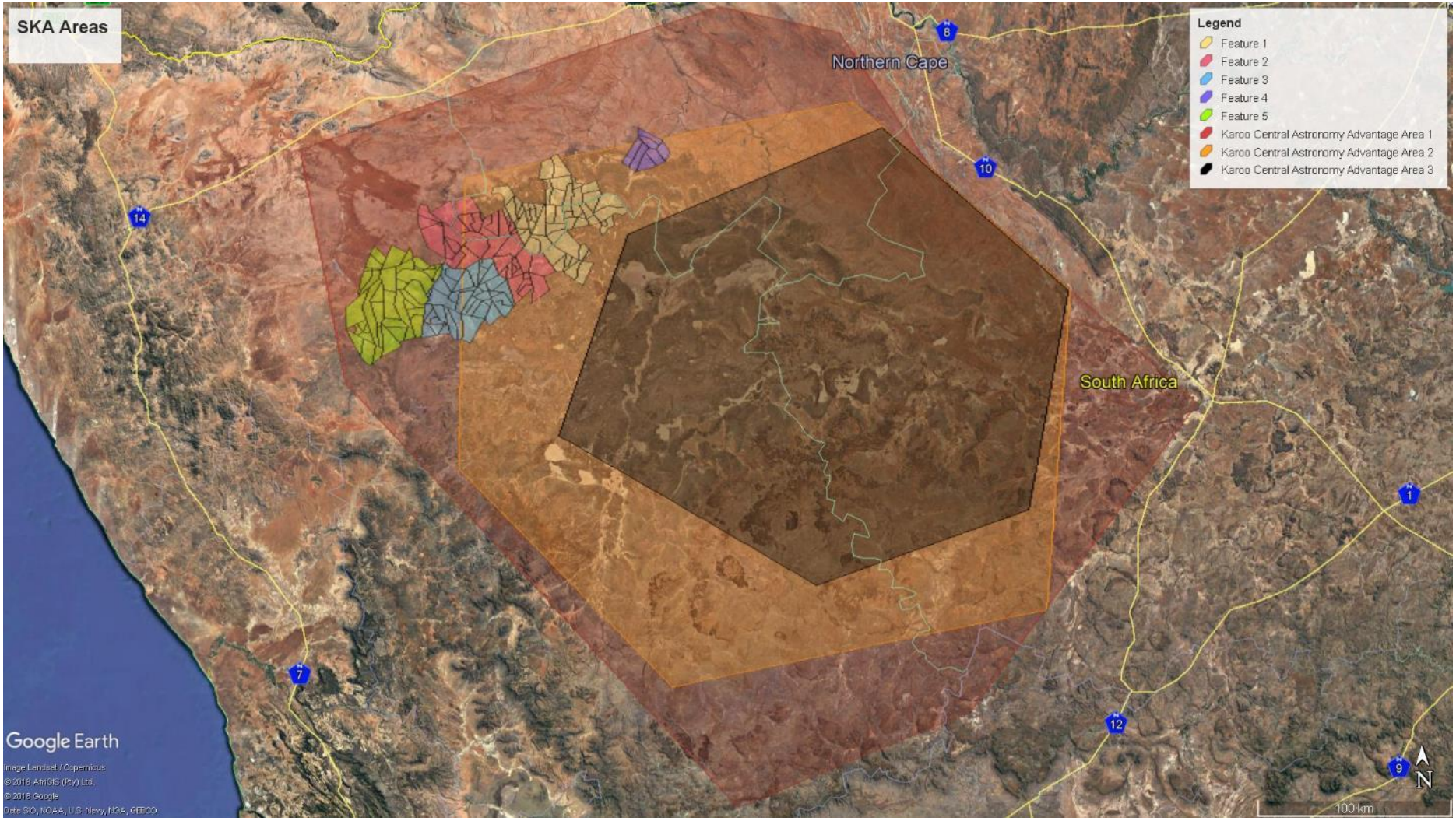


Figure 12: Location of Groot Kolk Application area (Purple polygon) within Karoo Central Astronomy Advantage Area 1 and 2.

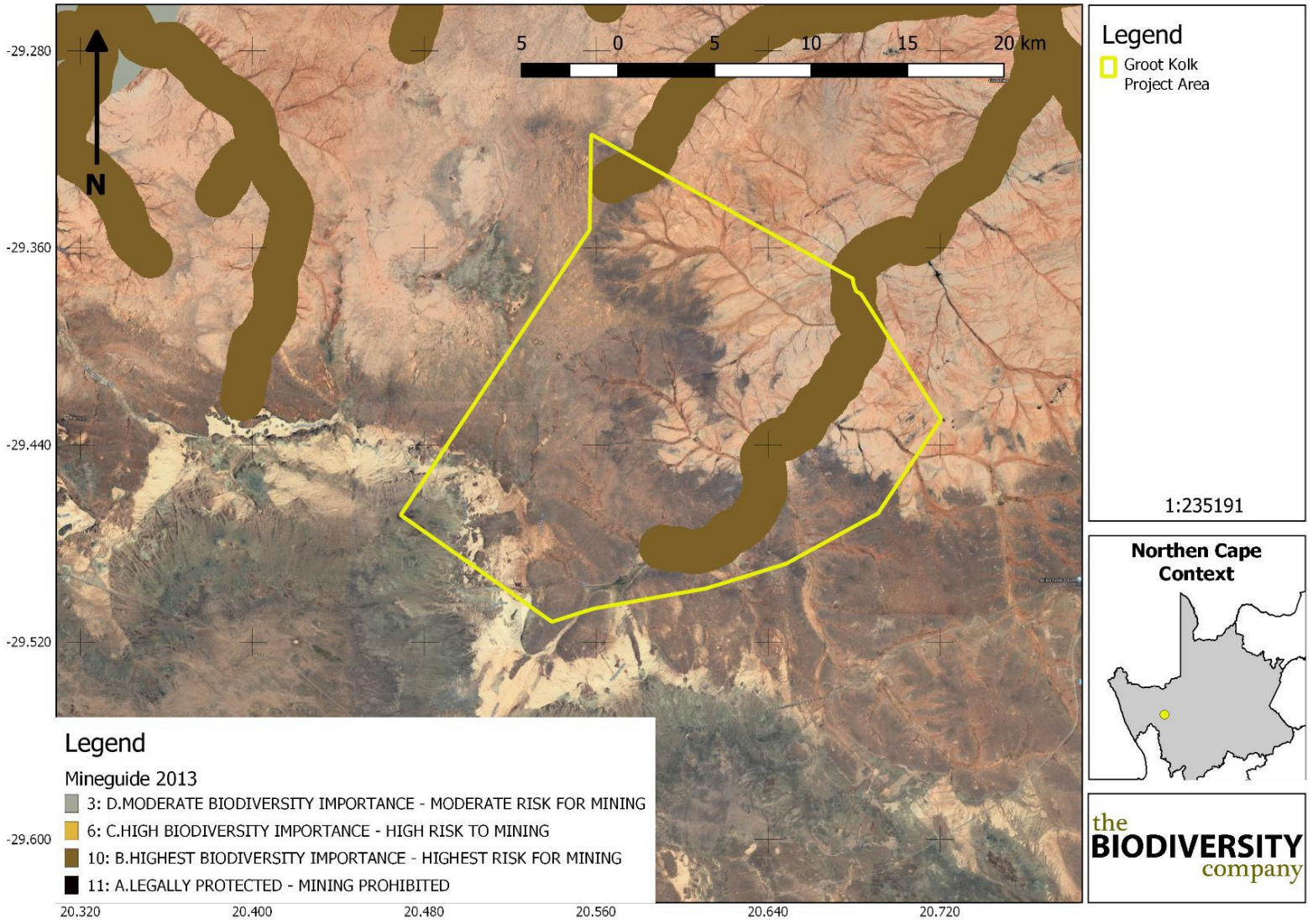


Figure 13 The prospecting area superimposed on the Mining and Biodiversity Guidelines spatial dataset (2013)

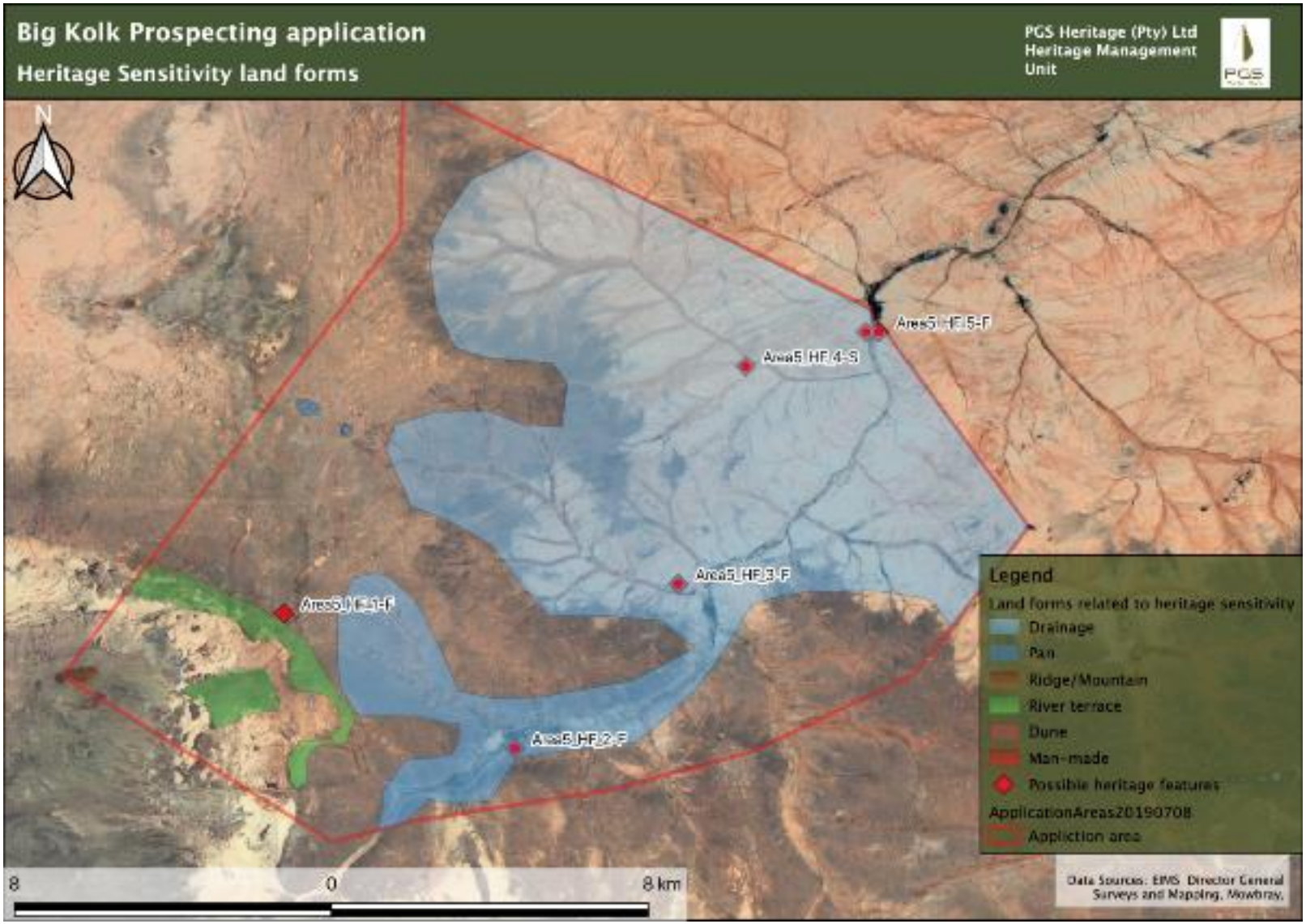


Figure 14: Heritage sensitivity (PGS, 2019)

3.1.2.2 CLIMATE

The climate of the Northern Cape is semi-arid with a late summer-autumn rainfall regime. Average rainfall of the area varies from 50 mm to 400 mm per year. Evaporation levels within this province exceed the annual rainfall. Climate conditions are extreme (i.e. very cold in winter and extremely hot in summer).

The Kenhardt area (in which the proposed projects fall) has a very low rainfall level, 183 mm per annum, with a standard deviation of 71 mm, according to the South African Rain Atlas (Water Research Commission, undated). Most rainfall in Kenhardt occurs mainly during autumn. Kenhardt typically receives the lowest rainfall (0 mm) in June and the highest (23 mm) in March (GEOSS, 2015). Since the area receives most of its rainfall during autumn it has a semi-arid to arid climate (as noted above). The relevance of this information is that the rainfall occurs whilst temperatures are quite high still and associated evaporation rates will be high. This implies that groundwater recharge will be very low.

The highest temperatures are reached in the summer months (December to January) and the lowest in the winter months (June to August). The average temperature of the area is 19.6°C, with an annual average high temperature of 28°C and an annual average low temperature of 11°C (GEOSS, 2015).

3.1.2.3 GEOLOGY AND SOILS

The terrain consists of flat lying plains with Cenozoic and Karoo-aged sediments overlying Namaquan granite gneiss and meta sediments. The majority of the Groot Kolk area comprises diamictite, tillite, subordinate sandstone, mudstone and dolomitic limestone of the Dwyka Group. Sand, red brown sandy soil and alluvium (along drainages) occur in the northern and north-eastern parts. Two fault zones are mapped in the north-eastern parts of the area, striking east west.

3.1.2.4 HYDROGEOLOGY

The Groot Kolk Area falls entirely within the Lower Orange WMA. The EWR report of 2016 covers the Lower Orange WMA and from this report the following information is deemed relevant to the Groot Kolk Area:

- The Groot Kolk Area have an estimated 30 – 60 % dependency of groundwater (i.e. domestic use, irrigation, stock watering, bulk supply, mining).
- Groot Kolk Area falls within the D53D Quaternary Catchments and can, according to the EWR report, described as “metamorphic terrain with poor groundwater quality”.

Existing Groundwater Users

A data search on the NGA revealed 42 existing boreholes, of which:

- 13 boreholes had water level data – the average groundwater level was 21.56 m bgl2;
- 13 boreholes had recorded yields - the average yield being 2.42 L/s and the maximum recorded yield 11.36 L/s;
- 42 boreholes had recorded boreholes depths – the average depth being 56 m bgl and the deepest 96 m bgl (refer to Map 4 for a plot of the NGA dataset); and
- 13 boreholes had recorded water strike depths – the average strike depth being 35 m bgl and the maximum strike depth 61 m bgl.

The data that was obtained from the NGA however dates back to 1944, with the most recent data being from 1984. Although this data provides some information on the use of groundwater at the time, it does not necessarily reflect the current number of boreholes and current use. As GPS (Global Positioning System) technology was not readily available prior to the 1980’s the coordinates of the boreholes are not deemed very accurate and would have to be field-verified. This information will have to be obtained by means of a hydrocensus across the entire area.

Future Groundwater Users

The drivers for future groundwater development usually include the following:

- Existing boreholes that dry up;
- Increase in groundwater demand (e.g. population growth, economic growth, agricultural growth);
- Insecurity of bulk water supplies;
- Surface water shortages (as result of global warming, increased demand); and
- Prolonged droughts.

From a desktop study it is not possible to determine the future demand on groundwater, as the existing use and growth factors have to be taken into account.

Groundwater as a Natural resource

Groundwater falls under the protection of the National Water Act and may not be polluted.

3.1.2.5 LAND COVER

The proposed properties are situated mainly south of the R358 tar road from Pofadder to Nuwerus. Several farm roads and servitude gravel roads cross these properties. Existing power lines are also situated across these properties. As illustrated in Figure 10, the proposed properties are expected to be generally flat, with a few drainage lines, quartzite ridges and outcrops, as well as a few pans occurring across some parts of these properties. The areas proposed for the prospecting project are expected to have red Kalahari Aeolian sands of various thickness on top of a general calcrete layer. The vegetation of the general area and the proposed site is expected to be typical of the Upper Karoo which consists mainly of Karoo scrub and grass and the occasional Karoo Acacia and forms part of the vegetation in the Nama-Karoo biome (Mucina & Rutherford 2006). The properties are expected to be previously largely undisturbed and mainly used for grazing of sheep and cattle. Existing farm infrastructure such as windmills, boreholes, fencing and livestock pens are expected to be sparsely dotted across the properties. Only a few tracks or roads cross these properties.

3.1.2.6 ECOSYSTEM PROTECTION LEVEL

Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as not protected, poorly protected, moderately protected or well protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Driver et al., 2011).

The area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the development (Figure 11). Based on this the terrestrial ecosystems associated with the proposed prospecting area are rated as not protected. This means that these ecosystem types (and associated habitats) are not protected anywhere in the country (such as in nationally protected areas).

3.1.2.7 RAMSAR SITES & WORLD HERITAGE SITES

There are no Ramsar sites or World heritage sites within the application area.

3.1.2.8 TERRESTRIAL ECOSYSTEMS

The site falls within the Succulent Karoo biome, with small sections in the southern part of the prospecting area found in the Nama Karoo and Azonal vegetation biomes. Vegetation types which intersect with application area are Bushmanland Arid Grassland, Bushmanland Basin Shrubland and Bushmanland Vloere (Figure 5). These are described in Section 8 of the Ecological Specialist Report (Appendix F). The prospecting area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the development. Based on this the terrestrial ecosystems associated with the proposed project area is rated as not protected.

According to Mucina and Rutherford (2006), these vegetation types is classified as Least Threatened. Based on the Plants of Southern Africa (BODATSA-POSA, 2016) database, 599 plant species are expected to occur in the prospecting area. Of the 599-plant species, three (3) species are listed as being SCCs. These species are *Aloidendron dichotomum*, *Calobota lotononoides* and *Conophytum achabense*. These are described in Section 8 of the Ecological Specialist Report (Appendix F).

Table 7: Plant Species of Conservation Concern expected to occur in the prospecting area (BODATSA-POSA, 2016)

Family	Taxon	Author	IUCN	Endemic	Likelihood of Occurrence
Asphodelaceae	*Aloidendron dichotomum*	(Masson) Klopper & Gideon F.Sm.	**VU**	Indigenous; Endemic	Moderate
Fabaceae	*Calobota lotononoides*	(Schltr.) Boatwr. & B.-E.van Wyk	**NT**	Indigenous; Endemic	Moderate
Aizoaceae	*Conophytum achabense*	S.A.Hammer	**VU**	Indigenous; Endemic	High

3.1.2.8.1 ECOSYSTEM THREAT STATUS

Ecosystem threat status outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends (Driver et al., 2011).

Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), based on the proportion of each ecosystem type that remains in good ecological condition (Driver et al., 2011).

The prospecting area was superimposed on the terrestrial ecosystem threat status (Figure 9 above). As seen in this figure the area falls across one ecosystem which is listed as LT (TBC, 2019).

3.1.2.8.2 CRITICAL BIODIVERSITY AREAS (CBA)

The prospecting area falls almost completely in an area classified as ONA, with only small portions of the prospecting area being classified as ESA and CBA2 (Figure 8).

CBAs are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (BGIS, 2017).

ONAs consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs (TBC, 2019). Please refer to the specialist reports for more detail regarding the CBAs.

3.1.2.8.3 FAUNA

a. <u>Avifauna</u>

Based on the South African Bird Atlas Project, Version 2 (SABAP2) database, 133 bird species are expected to occur in the vicinity of the prospecting area. Of the expected bird species, twelve (12) species are listed as SCC either on a regional scale or international scale. The SCC include the following:

- Two (2) species that are listed as EN on a regional basis;
- Five (5) species that are listed as VU on a regional basis; and
- Four (4) species that are listed as NT on a regional basis.

Table 8: List of bird species of regional or global conservation importance that are expected to occur in the pendants mentioned above (SABAP2, 2019, ESKOM, 2015; IUCN, 2017).

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Afrotis afra	Korhaan, Southern Black	**VU**	**VU**	High
Aquila verreauxii	Eagle, Verreaux's	**VU**	LC	Low
Ardeotis kori	Bustard, Kori	**NT**	**NT**	High
Calendulauda burra	Lark, Red	**VU**	**VU**	High
Calidris ferruginea	Sandpiper, Curlew	LC	**NT**	Low
Cursorius rufus	Courser, Burchell's	**VU**	LC	Moderate
Eupodotis vigorsii	Korhaan, Karoo	**NT**	LC	High
Falco biarmicus	Falcon, Lanner	**VU**	LC	High
Neotis ludwigii	Bustard, Ludwig's	**EN**	**EN**	High
Oxyura maccoa	Duck, Maccoa	**NT**	**NT**	Low
Polemaetus bellicosus	Eagle, Martial	**EN**	**VU**	High
Spizocorys sclateri	Lark, Sclater's	**NT**	**NT**	High

Important Bird & Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife, 2017). The closest IBA to this area is the Matteus Gat Conservation Area IBA, which is 85km away from the prospecting area.

b. Mammals

The IUCN Red List Spatial Data (IUCN, 2017) lists 56 mammal species that could be expected to occur within the vicinity of the prospecting area. Of these species, 4 are medium to large conservation dependant species, such as *Ceratotherium simum* (Southern White Rhinoceros) that, in South Africa, are generally restricted to protected areas such as game reserves. These species are not expected to occur in the prospecting area and are removed from the expected SCC list.

Of the remaining 52 small to medium sized mammal species, five (5) are listed as being of conservation concern on a regional or global basis. The list of potential species includes:

- Two (2) that are listed as VU on a regional basis; and
- Two (2) that are listed as NT on a regional scale.

Table 9: List of mammal species of conservation concern that may occur in the prospecting area as well as their global and regional conservation statuses (IUCN, 2017; SANBI, 2016)

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	

Eidolon helvum	African Straw-colored Fruit Bat	LC	**NT**	Low
Felis nigripes	Black-footed Cat	**VU**	**VU**	High
Graphiurus ocularis	Spectacular Dormouse	**NT**	LC	Low
Panthera pardus	Leopard	**VU**	**VU**	Low
Parotomys littledalei	Littledale's Whistling Rat	**NT**	LC	High

c. Reptiles

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the ReptileMap database provided by the Animal Demography Unit (ADU, 2017) 47 reptile species are expected to occur in the prospecting area. One (1) reptile SCC is expected to be present in the prospecting area.

Table 10: Expected reptile species of conservation concern that may occur in the prospecting area

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Psammobates tentorius verroxii	Tent Tortoise	**NT**	**NT**	High

d. Amphibians

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the AmphibianMap database provided by the Animal Demography Unit (ADU, 2017) seven (7) amphibian species are expected to occur in the prospecting area. One amphibian SCCs could be present in the prospecting area according to the above-mentioned sources.

Table 11: Expected amphibian species of conservation concern that may occur in the prospecting area

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Pyxicephalus adspersus	Giant Bullfrog	**NT**	LC	Moderate

3.1.2.9 WATERCOURSES

Two FEPA upstream management areas can be found in the prospecting area. No true FEPA wetlands can be found in the prospecting area. The inland water shapefile (DLA-CDSM, 2007) shows various water sources, including dams, lakes, rivers, streams, pans, mudflats, pools, marshvlei and swamps all these are classified as natural water bodies. Artificial water bodies that could occur in the project area are dams, fish farms, reservoirs, sewage works, water tanks, and purification plants (Nel, 2011). Natural waterbodies can be found in the south western corner of the project area, while three artificial waterbodies are present in the central portion of the prospecting area. Mostly natural water bodies can be found in the project area, with only a few artificial waterbodies present as can be seen in Figure 7 above.

3.1.2.10 ASTRONOMY GEOGRAPHICAL ADVANTAGE AREAS

The application area falls within the Karoo Central Astronomy Advantage Area 1 and 2 (Figure 12). It is understood that there are limitations on the radio frequencies and activities within this area, that could affect the SKA activities. Further engagement with the SKA officials will be undertaken as part of the public participation process in order to solicit inputs into the compilation of the EMP.

It is further understood that all electrical an electromagnetic (EM) geophysical techniques that will be employed for mineral exploration fall well below the frequencies stated in the Regulations on the Protection of the Karoo Central Astronomy Advantage Areas in Terms of the Astronomy Geographic Advantage Act (Act No. 21 of 2007). Higher frequencies don't penetrate the earth and is not used in EM induction or electrical techniques.

For time-domain EM the proposal is to inject current in a transmitter loop (either in the air or on the ground). The current will then be switched off and the secondary EM fields induced in the nearby subsurface will be measured. These fields can take up to 1 second to decay. Attempts are made to switch the current off

quickly to generate higher frequency content to image the near surface well. The highest frequencies, however, are well below the MHz Range, as detailed above.

For electrical techniques it is propped to effectively transmit a DC current between 2 electrodes. The corresponding voltage deference measured with electrodes at the surface of the earth is then used to calculate an apparent resistivity of the subsurface.

In the Induced polarisation method the DC current is switched off. The presence of polarisable and conductive material is mapped if the current doesn't directly decay to zero. In the Magnetotelluric method, measurements of the passive (natural) EM fields generated by telluric and lightning activity are made. Occasionally a source / transmitter is used, but typically transmit below 1 kHz.

The applicant has requested a Risk Assessment for the proposed activities within the Karoo Central Astronomy Advantage Area 1 and 2.

3.1.2.11 MINING AND BIODIVERITY GUIDELINES

According to the Mining and Biodiversity Guidelines spatial dataset (2013), the majority of the prospecting area is considered to be unclassified. Portions in the south western region of the prospecting area is classified as highest biodiversity importance, respectively and there is therefore a correlating highest risk for mining Figure 13. This is along the Ecological Support Area (Upstream Management Area) identified in the ecological specialist report.

3.1.2.12 CULTURAL AND HERITAGE

The desktop heritage impact assessment identified various potential heritage resources within the study area, including burial grounds and graves, historical structures, palaeontological resources and archaeological resources that could be impacted during invasive prospecting activities.

In total, six potential heritage features were identified in the location of the study area as depicted on the topographical maps (Figure 4). The majority are depicted as several single structures and groups of structures (yellow icons). Since the first edition of the topographic maps for the area date to between 1970 the potential heritage features are likely to be 49 years or older. The identification of the features will have to be confirmed during the field work phase.

In the event that heritage resources are discovered during site clearance, construction activities must stop, and a qualified archaeologist must be appointed to evaluate and make recommendations on mitigation measures.

All the relevant sources of heritage information used in this study have been summarised in a heritage sensitivity map. This map provides a zoned depiction of the study area wherein areas of heritage sensitivity are indicated.

3.1.2.12.1 BURIAL GROUNDS AND GRAVES

No burial grounds or graves are depicted on the historical topographic maps for the study area. However, it is possible that unknown burial grounds and graves are present (Figure 14). Burial grounds and graves have high heritage significance and are given a Grade IIIA significance rating in accordance with the system described in the HIA report.

The impact of the proposed activities on burial grounds and graves is rated as LOW negative significance before mitigation, but with the implementation of the required mitigation measures the post-mitigation impact would be LOW negative.

3.1.2.12.2 HISTORICAL STRUCTURES

The impact of the proposed prospecting activities on potential historical structures is rated as MODERATE negative significance before mitigation and with the implementation of the mitigation measures the impact significance is reduced to LOW negative.

Any identified historical structures should be avoided with a buffer of 30m to avoid damage during the prospecting activities.

3.1.2.12.3 PALAEONTOLOGY

desktop study of the palaeontology of the study area was commissioned from Banzai Environmental. The Groot Kolk Prospecting Right Applications area is mainly underlain by the Dwyka Group with small isolated outcrops of De Kruis Group and Bayswater Metamorphic rocks. According to the Palaeosensitivity Map available on the South African Heritage Resources Information System database (SAHRIS), the Palaeontological Sensitivity of the Kalahari Group is rated as Low, The igneous rocks of the Bushmanland and Karoo Dolerite is insignificant or zero, while the Ecca sediments of the Karoo Supergroup have a High Paleontological Sensitivity (Banzai environmental, 2019).

3.1.2.12.4 ARCHAEOLOGY

Previous studies conducted in the surroundings of the study area have identified a number of archaeological sites. These include Stone Age (ESA, MSA and LSA) sites including find spots, surface scatters and rock art sites.

The impact of the proposed project on potential archaeological resources is rated as MODERATE negative significance before mitigation and with the implementation of the mitigation measures the impact significance is reduced to LOW negative.

Several previous heritage studies undertaken in the area did identify a few isolated historical structures or farmsteads and graves or burial grounds that date to the historical period (Fourie 2016; Fourie 2017; Webley L & Halkett, D. 2012). This is in addition to the structures depicted on the historic topographic map sheets dating to 1972 and 1973.

Figure 15: Tangible heritage site in the study area

Name	Description	Legislative protection
Architectural Structures	Possibly older than 60 years	NHRA Sect 3 and 34
Burial grounds	Graves	NHRA Sect 3 and 36 and MP Graves Act
Archaeological finds	Such as stone age sites	NHRA Sect 35

When physical prospecting is planned an archaeologist must first visit and assess the areas of impact and make recommendations on any finds made. In the event that archaeological artefacts are discovered during any phase of the proposed prospecting activities, the Chance Find Protocol must be implemented by the ECO in charge of these developments..

3.1.2.13 DESCRIPTION OF CURRENT LAND USES

The northern section of prospecting area lies 31km from the R358 road, while the south eastern section is 32km from the R27 road and is located close to the Aggeneys - Gamsberg base metal mines. The prospecting area consists of 7 farm portions in the Kenhardt Rd magisterial district. Several farm roads and servitude gravel roads cross these properties. Existing power lines are also situated across these properties.

The proposed properties are expected to be generally flat, with a few drainage lines, quartzite ridges and outcrops, as well as a few pans occurring across some parts of these properties. The areas proposed for the prospecting project are expected to have red Kalahari Aeolian sands of various thickness on top of a general calcrete layer.

The properties are expected to be previously largely undisturbed and mainly used for grazing of sheep and cattle. Existing farm infrastructure such as windmills, boreholes, fencing and livestock pens are expected to be sparsely dotted across the properties. Only a few tracks or roads cross these properties (PGS, 2019).

3.1.2.14 DESCRIPTION OF SPECIFIC ENVIRONMENTAL FEATURES AND INFRASTRUCTURE ON SITE

The most notable infrastructure located within the application area includes the following:

- Roads;
- Windmills;

- Boreholes;
- Fencing; and
- Livestock pens.

3.1.2.15 SOCIO-ECONOMIC

The proposed Groot Kolk Prospecting Project will be situated on Farm De Tuin Noord 161- Portion 0 RE, Portion 4; Farm De Tuin Zuid 163 Portion 0 RE; Farm Groot Kolk 190- Portion 0 RE, Portion 1; Farm Annex Groot Kolk 191- Portion 0 RE, Portion 1. The area is located approximately 187 kilometres South West of the town of Upington and 193 km kilometres South East of the town of Aggeneys, Kenhardt District, Northern Cape Province. The application area falls within the Kai! Garib Local Municipality, within the Nomalakwa Magisterial District in the Northern Cape Province. The prospecting area falls within ward 9 of Kai! Garib LM within ZF Mgcawu District Municipality.

According to Census 2011, the Kai! Garib Local Municipality has a total population of 65 869 people, of which 62.24% are coloured, 28.32% are black African, 0.80% Indian or Asian and 6.34% are white. Other groups make up 2,30% of the population. Of those aged 20 years and older, 44% have some secondary schooling, 15% have some primary schooling, 15,5 % completed Grade 12/matric, 3.9% have some higher education, 8% completed some primary schooling and 9% of this municipality have no schooling.

The main economic activities within the Kai! Garib LM are agriculture and mining. Agricultural activities are dominated by livestock and poultry farming. Of the 46 438 economically active (70.5%) people (employed and unemployed but looking for work), 10% are unemployed. 322 are classified as discouraged work-seekers. Of the youth (aged 15 – 34), 60% are employed, 7% are unemployed, 2% are classified as discouraged work-seekers, and 31% are not economically active.

There are 16 703 households in the municipality, with an average household size of 2,9 persons per household. Of the households in the municipality, 41% have access to piped (tap) water inside the dwelling/institution, and 47% 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.

3.1.3 STAKEHOLDER ISSUES AND COMMENTS

A public participation process as required by the NEMA 2014 EIA regulations will be undertaken for the proposed prospecting activities. In this regard please refer to Section 6.2 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 Comments and Responses Report (CRR) 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 activity. 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 12 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 activity. 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 12 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 activity. 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 12: Impact Assessment For Rehabilitation, Decommissioning And Closure.

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
Site Clearance and establishment	Displacement of faunal community (including possible threatened or protected species) due to habitat loss, disturbance (noise, dust and vibration) and/or direct mortalities;	Prospecting areas	Construction Operation Decommissioning	-10,50	• All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the prospecting area to inform contractors and site staff of the presence of Red / Orange List species, their identification, conservation status and importance, biology, habitat requirements and management requirements; • Prospecting site footprints should be kept to a minimum; • Schedule prospecting activities and operations during least sensitive periods, in order to avoid migration, nesting and breeding seasons of SCC; • Clearing of vegetation should be minimized and avoided where possible.	-8,75	Rehabilitate disturbed areas. On-going monitoring.

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
					Maintain small patches of natural vegetation within the prospecting site to accelerate restoration and succession of cleared patches; • When vegetation is cleared, hand cutting techniques should be used as far possible in order to avoid the use of heavy machinery; • Construction vehicles must be restricted to existing roads and new pathways must be restricted; • Prior and during vegetation clearance any larger fauna species noted should be given the opportunity to move away from the construction machinery • Implement alien vegetation management; • Herpetofauna observed while rock sampling, should be carefully and safely removed to a suitable location beyond the extent of the development footprint by		

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
					a suitably qualified environmental control officer (ECO) trained in the handling and relocation of animals. • A qualified ECO must be on site when construction begins to identify species that will be directly disturbed and to relocate fauna/flora that are found during the prospecting activities. • No trapping, killing or poisoning of any wildlife is to be allowed on site, including snakes, birds, lizards, frogs, insects or mammals. • Rehabilitation of the disturbed areas existing in the prospecting area must be made a priority. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are endemic to this vegetation type.		

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
	Encroachment by alien invasive plant species	Prospecting areas	Construction Operation Rehabilitation	-7.00	• Clearing of vegetation should be minimized and avoided where possible. Maintain small patches of natural vegetation within the prospecting site to accelerate restoration and succession of cleared patches; • Use of indigenous species for rehabilitation • Rehabilitation of the disturbed areas existing in the prospecting area must be made a priority. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are endemic to this vegetation type; • Rehabilitation efforts must be monitored by a suitably qualified ECO until adequate vegetation cover is achieved.	-4,50	Rehabilitate disturbed areas. On-going monitoring.
Target Prospecting Boreholes &	Impacts on surface water features	Drilling	Construction Operation	-6.50	• No invasive prospecting activities to be undertaken within 150m of a watercourse.	-4.50	Rehabilitate disturbed areas.

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
Widely Spaced Boreholes			Decommissioning		• To reduce the risk of the drilling activities having a negative impact on any existing groundwater user (i.e. boreholes) and surface water that may be linked to groundwater, a detailed hydrocensus, followed by a geohydrological assessment would be required for the exploration area. The geohydrological report must include a risk assessment (source-pathway-receptor) of every drill site with nearby boreholes / springs and surface water features in mind. • Should any watercourse be affected, then the necessary water use licences should be obtained from the Department of Water and Sanitation. • No ablution of site laydown areas are to be located within 150m of a watercourse. • Any possible contamination of watercourses by		On-going monitoring.

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
					hydrocarbons, concrete or concrete water must be avoided. • Should any major spills of hazardous materials take place, such should be reported in terms of the Section 30 of the NEMA.		
	Groundwater: Degradation of aquifers Impacts on existing groundwater users	Drilling	Construction Operation Decommissioning	-10.50	The following mitigation measures should be implemented as standard during the prospecting phase in order to limit the impact on groundwater resources: • Ensure vehicles and equipment are in good working order. • Place oil traps under stationary machinery, only re-fuel machines at fuelling station, construct structures to trap fuel spills at a fuelling station, immediately clean oil and fuel spills and dispose contaminated material (soil, etc.) at licensed sites only. • Ensure that good housekeeping rules are applied.	-6.75	Rehabilitate disturbed areas. On-going monitoring.

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
					• A procedure for the storage, handling and transport of different hazardous materials must be drawn up and strictly enforced. • Implement and follow water saving procedures and methodologies. • If boreholes are to be drilled to supply water for the staff or drilling processes; o Ensure the location of the borehole/s is selected to prevent a negative effect on the groundwater levels of existing boreholes. o Ensure the abstraction from the borehole/s is determined scientifically to prevent over abstraction. o Liaise with potentially affected		

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
					groundwater water users and monitor any potential impact. o The distance between a planned exploration drill hole and a privately owned borehole is important to note, as it also affects the distance (pathway) that any potential pollutant must migrate to reach the borehole o Monitoring of the groundwater quality during and after activities are completed. • Portable chemical toilets must be used during the exploration phase. • Mud pits (if to be used) must be lined and properly covered with impermeable		

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
					material after completion of exploration boreholes • Cap and seal all exploration boreholes to prevent surface water from entering the borehole. It is not currently known whether groundwater from boreholes is considered to be utilised during the prospecting phase. It is anticipated that local water sources will be located or created in consultation with nearby landowners. During exploration drilling the following information must be recorded and reported on: • Aquifer type; • Depths to first water strike; • Depths to deeper water zones; • Salinity of water strike zones (EC measurement with field probe); • Strike yields;		

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
					• Standing water level (allow several hours after completion); and • Hole completion details (e.g. cement / bentonite plug, backfill material, bore cap, bore number and coordinates). • Once the drilling sites are identified and prior to any invasive prospecting work, a detailed hydrocensus must of the entire application area be completed by a geohydrologist / geohydrological technician who has experience in the collection of geosite data, as prescribed by the DWS. • A detailed geohydrological assessment of expected aquifers is required prior to any invasive exploration work. • To reduce the risk of the drilling activities having a negative impact on any existing groundwater user (i.e. boreholes) and surface water that may be linked		

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
					to groundwater, a detailed hydrocensus, followed by a geohydrological assessment would be required for the exploration area. The geohydrological report must include a risk assessment (source-pathway-receptor) of every drill site with nearby boreholes / springs and surface water features in mind. • A qualified geohydrologist must form part of the exploration project team during drilling phases to provide the necessary input and scientific support in terms of preventing / mitigating degradation of aquifers. • A Geohydrological Management Plan (GMP) can be compiled for the Groot Kolk Area once a hydrocensus has been completed, also taking cognisance of the specific drilling positions and potential receptors.		

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
					Site specific information / instructions that will ultimately have to be included in the final GMP and overseen by an experienced and qualified geohydrologist (Pr. Sci. Nat. registered) must include: • A description of the expected geological formations that will be penetrated and the expected aquifer characteristics associated with each geological formation – depth of the borehole will dictate the potential risks; • Expected water qualities of each aquifer (associated with the different geological formations) that will be penetrated – depth of the exploration borehole will dictate the potential risks; • An assessment of the potential degradation of the aquifers should variable water qualities mix; • Surrounding groundwater users and the protection		

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
					thereof: positions of boreholes, depths, abstraction rates, water quality and dependency of the owner of his/her borehole.		
Ablutions - Chemical Toilets	Impacts on surface water features	Drilling	Construction Operation Decommissioning	-6.50	• No invasive prospecting activities to be undertaken within 150m of a watercourse. • To reduce the risk of the drilling activities having a negative impact on any existing groundwater user (i.e. boreholes) and surface water that may be linked to groundwater, a detailed hydrocensus, followed by a geohydrological assessment would be required for the exploration area. The geohydrological report must include a risk assessment (source-pathway-receptor) of every drill site with nearby boreholes / springs and surface water features in mind.	-4.50	Rehabilitate disturbed areas. On-going monitoring.

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
					• Should any watercourse be affected, then the necessary water use licences should be obtained from the Department of Water and Sanitation. • No ablution of site laydown areas are to be located within 150m of a watercourse. • Any possible contamination of watercourses by hydrocarbons, concrete or concrete water must be avoided. • Should any major spills of hazardous materials take place, such should be reported in terms of the Section 30 of the NEMA.		
Undertake closure and rehabilitation as per the annual and final rehabilitation plan	Encroachment by alien invasive plant species Abandonment of construction equipment	Rehabilitation	Operation Rehabilitation	-7.00	• Only indigenous plant species must be used during revegetation of disturbed areas, a plant specialist must be consulted for this purpose. • Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass	-4,50	Rehabilitate disturbed areas. On-going monitoring.

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
	Appropriate waste removal and documentation thereof				species which are endemic to this vegetation type; • Rehabilitation efforts must be monitored by a suitably qualified ECO until adequate vegetation cover is achieved. • 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.		

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
					• No permanent structures will be permitted at the camp; • All structure footprints to be rehabilitated and landscaped after prospecting is complete; • 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. • The boreholes need to be sealed to ensure that no		

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
					fauna species can fall in the drill hole. • During decommissioning, compacted surfaces should be broken-up and covered with brush, leaf litter or reseeded with site specific grass species.		
Monitoring of rehabilitation efforts	Erosion due to improper rehabilitation	Closure and Rehabilitation	Rehabilitation Post-rehabilitation	-5.25	• 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: • Biodiversity monitoring; and • Re-vegetation of disturbed areas where required. • Provision must be made to monitor any unforeseen	-2.50	Rehabilitate disturbed areas. On-going monitoring.

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated	CLOSURE OPTIONS
					impact that may arise as a result of the proposed prospecting activities and incorporated into post closure monitoring and management. • Restoration success should be monitored through a follow-up site visit during the next growing season in order to identify remedial actions		

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 13 provides a list of the identified environmental impacts identified for the rehabilitation, decommissioning and closure of the prospecting activity. 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 13: Environmental Indicators and Monitoring Requirements

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures	Compliance with Standards	Time Period for Implementation
Prospecting boreholes: **10 sites. with a footprint of 300 m^2 each**	Construction and Operation Decommissioning	0.3 ha, short term	• 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;	SANS 10103 ECA Noise Regulations NEMAQA Dust Regulations NWA	Throughout Construction and operation and decommissioning

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures	Compliance with Standards	Time Period for Implementation
			• 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 150m 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 ablution of site laydown areas are to be located within 150m 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		

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures	Compliance with Standards	Time Period for Implementation
			need for plugging and casing of the prospecting boreholes.		
Borehole Closure	Decommissioning and Closure	Short term and localized	• 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: o Concrete shall not be mixed directly on the ground; o 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 o All excess aggregate shall also be removed.	NWA DWAF BPG	Throughout Decommissioning and Closure
Removal of surface infrastructure	Decommissioning	Short term and localized	• 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

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures	Compliance with Standards	Time Period for Implementation
Removal of waste	Decommissioning	Small scale and localized	• 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	• 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

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures	Compliance with Standards	Time Period for Implementation
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. 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.	MPRDA Rehab Plan	Post-operation

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 prospecting 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 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 prospecting areas.
- Protection of water resources.
- Ensure that land is usable, in alignment with surrounding land uses.

Please refer to Table 13 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 14 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 14: Closure Alternatives

Prospecting Activity	Aspect	Options	Comment
Prospecting Boreholes	Closure	Yes	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 projects closure plan is defined and understood from 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- prospecting 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.

Prospecting Activity	Aspect	Options	Comment
		No	The option of not rehabilitating the mined areas, leaving the risks such as contamination of watercourses, establishment and spread of alien vegetation, safety risk to humans and animals unmitigated.
	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 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): ~5 000 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 or else vacant land.

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- prospecting 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 an application for environmental authorisation must be submitted for closure in accordance with Activity 22 Listing Notice 1:

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 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 15 below 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 15: Timeframes each of the proposed activities

Phase	Activity	Year 1	Year 2	Year 3	Year 4	Year 5
Phase 1 **(Month 0-6)**	**Non-Invasive Prospecting** Desktop Study: Literature Survey / Review / acquisition of data	**X**				
Phase 2 **(Month 6-12)**	**Non-Invasive Prospecting** Regional Airborne Geophysical Survey	**X**				
Phase 3 **(Month 12-24)**	**Non-Invasive Prospecting** Ground Geophysical Survey and Geological Field Mapping		**X**			
Phase 4 **(Month 24-34)**	**Invasive Prospecting** Exploration Boreholes			**X**		
Phase 5	**Non-Invasive Prospecting**			**X**		

(Month 34-36)	Compilation, interpretation and modeling of data					
Phase 6 **(Month 36-42)**	**Non-Invasive Prospecting** Detailed Ground Geophysical Survey on individual positively mineralized targets to define possible extent				**X**	
Phase 7 **(Month 42-48)**	**Invasive Prospecting** Boreholes to confirm continuity of mineralization & potential deposit size				**X**	
Phase 8 **(Month 48-60)**	**Invasive Prospecting** Resource definition drilling					**X**
Phase 9 **(Month 54-60)**	**Non-Invasive Prospecting** Analytical Desktop Pre-Feasibility Study					**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 considering 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 boreholes. In this regard reference is made to Table 13 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 activities.
- 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 (where possible on the basis of actual quotations); and
- Total cost is calculated.

3.11.2 CLOSURE COST ESTIMATION

This closure cost is based on 2020 values and will require annual reassessment, revision and escalation. The preliminary estimate of the Rehabilitation Cost is (inclusive of contingencies and VAT): R 653 473.70. Please refer to Appendix A for the detailed breakdown of the anticipated closure cost for 10 boreholes.

3.11.3 CLOSURE COST ASSUMPTIONS AND LIMITATIONS

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

- 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): ~5 000 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).

3.12 MONITORING, AUDITING AND REPORTING

The requirement to monitor and audit should be carried through all phases of the proposed prospecting activities. 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 activities. 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-prospecting 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.

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 activities. 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.

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 Offcier	Hours	50	R 0.00	R 0.00
			Material	Mileage	km	960	R 5.50	R 5 280.00
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	10	R 10 000.00	R 100 000.00
		Borehole Surface Rehabilitation	Material	Equipment & Crew Mobilisation		10	R 6 400.00	R 64 000.00
			Material	Equipment & Crew Demobilisation		10	R 3 575.00	R 35 750.00
			Material	Waste bin transport	Bin placement and collection	4	R 450.00	R 1 800.00
			Material	Waste bin rental	per day	30	R 450.00	R 13 500.00
			Material	Waste disposal (per ton)	Disposal at BMM Licenced waste disposal facility	2	R 0.00	R 0.00
		Access road rehabilitation	Material	Equipment- Earth moving	BMM equipment utilised for rehabilitation work	28	R 9 000.00	R 252 000.00
3	Phase 3: Monitoring, Maintenance and Relinquishment	Vegetation monitoring	Work	Specialist: Ecology	SACNASP registered ecologist/ botanist. Survey undertaken once per annum , Kathu based practitioner	48	R 750.00	R 36 000.00
			Material	Mileage	2 Return trips to site.	1500	R 5.50	R 8 250.00
Professional Fees								R 36 000.00
Expenses								R 480 580.00
TOTAL COST (EXCL VAT)								**R 516 580.00**
TOTAL COST + 10% CONTINGENCY (EXCL VAT)								**R 568 238.00**
TOTAL COST + 10% CONTINGENCY (INCL VAT)								**R 653 473.70**