

# Lepidico Chemicals Namibia (Pty) Ltd

Updated Final Scoping and Environmental Management Plan  
(EMP) Report to Support the Application for Renewal and  
Transfer of Environmental Clearance Certificate (ECC) for the  
Proposed Minerals Exploration / Prospecting in the Exclusive  
Prospecting License (EPL) No. 5439, Karibib District,  
**ERONGO REGION, WEST CENTRAL NAMIBIA**



**April 2023**

Lepidico Chemicals Namibia (Pty) Ltd  
Karibib site, Karibib  
P. O Box 90898,  
**KLEIN WINDHOEK, NAMIBIA**

# PROPONENT, LISTED ACTIVITIES AND RELATED INFORMATION SUMMARY

## TYPE OF AUTHORISATIONS

Renewal and Transfer of Environmental Clearance Certificate (ECC)

## MINISTRY OF ENVIRONMENT, FORESTRY AND TOURISM (MEFT)

ECC REFERENCE APPLICATION No.

APP-001119

## NAME AND ADDRESS OF THE PROPONENT

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P. O Box 90898,  
**KLEIN WINDHOEK, NAMIBIA**

## COMPETENT AUTHORITY

Ministry of Mines and Energy (MME)

## PROPOSED PROJECT

Proposed / Ongoing  
Minerals Exploration in the Exclusive Prospecting License (EPL) No. 5439,  
Karibib Project, Karibib District, Erongo Region, Namibia

## PROJECT LOCATION

Karibib District, Erongo Region, West Central Namibia  
Latitude: -22.073333, Longitude: 16.092778

## ENVIRONMENTAL CONSULTANTS



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# Contents List

<b>NON-TECHNICAL EXECUTIVE SUMMARY</b> .....	<b>VII</b>
<b>1. BACKGROUND</b> .....	<b>- 1 -</b>
1.1 INTRODUCTION .....	- 1 -
1.2 LOCATION, LAND USE, AND INFRASTRUCTURE.....	- 3 -
1.2.1 Location.....	- 3 -
1.2.2 Current Land Uses.....	- 3 -
1.2.3 Supporting Infrastructure and Services .....	- 3 -
1.3 REGULATORY REQUIREMENTS .....	- 8 -
1.4 PROJECT MOTIVATION .....	- 8 -
1.5 ASSUMPTIONS AND LIMITATIONS.....	- 10 -
1.6 STRUCTURE OF THE REPORT .....	- 10 -
<b>2. DESCRIPTION OF THE EXPLORATION PROGRAMME</b> .....	<b>- 11 -</b>
2.1 GENERAL OVERVIEW .....	- 11 -
2.2 INITIAL DESKTOP EXPLORATION ACTIVITIES .....	- 11 -
2.3 REGIONAL RECONNAISSANCE FIELD-BASED ACTIVITIES.....	- 12 -
2.4 INITIAL LOCAL FIELD-BASED ACTIVITIES.....	- 12 -
2.5 DETAILED LOCAL FIELD-BASED ACTIVITIES .....	- 12 -
2.6 PREFEASIBILITY AND FEASIBILITY STUDIES.....	- 13 -
<b>3. LEGISLATIVE FRAMEWORK</b> .....	<b>- 14 -</b>
3.1 OVERVIEW .....	- 14 -
3.2 KEY APPLICABLE LEGISLATION .....	- 14 -
3.2.1 Minerals Exploration and Mining Legislation .....	- 14 -
3.2.2 Environmental Management Legislation .....	- 14 -
3.2.3 Water Legislation.....	- 14 -
3.2.4 Forest Regulations and Permit Requirements.....	- 15 -
3.2.5 Atmospheric Pollution Prevention Legislation .....	- 15 -
3.2.6 Labour, Health and Safety Legislations .....	- 15 -
3.2.7 Other Applicable National Legislations .....	- 15 -
3.3 KEY REGULATORS / COMPETENT AUTHORITIES.....	- 18 -
3.4 INTERNATIONAL AND REGIONAL TREATIES AND PROTOCOLS .....	- 19 -
3.5 STANDARDS AND GUIDELINES .....	- 20 -
3.6 RECOMMENDATIONS ON PERMITTING REQUIREMENTS .....	- 22 -
<b>4. SUMMARY OF NATURAL ENVIRONMENT</b> .....	<b>- 23 -</b>
4.1 CLIMATE.....	- 23 -
4.3 VERTEBRATE FAUNA AND FLORA DIVERSITY .....	- 24 -
4.3.1 Introduction .....	- 24 -
4.3.2 Fauna Diversity .....	- 24 -
4.3.2.1 Overview.....	- 24 -
4.3.2.2 Reptiles.....	- 25 -
4.3.2.3 Amphibians .....	- 25 -
4.3.2.4 Mammals .....	- 25 -
4.3.2.5 Birds.....	- 26 -
4.3.3 Flora Diversity .....	- 26 -
4.2.3.1 Overview.....	- 26 -
4.2.3.2 Trees/shrubs and Grasses.....	- 27 -
4.2.3.3 Others Important Flora Species .....	- 27 -
4.2.3.4 Invasive Alien Species .....	- 28 -
4.3.4 Fauna and Flora Conclusions .....	- 28 -
4.4 SOCIOECONOMIC SETTING .....	- 31 -
4.4.1 Overview .....	- 31 -
4.4.2 Agriculture .....	- 31 -
4.4.4 Safety, Security and Obstructions .....	- 31 -
4.5 GROUND COMPONENTS .....	- 31 -
4.5.1 Regional Geology .....	- 31 -
4.5.2 Local Geology .....	- 32 -
4.5.4 Geotechnical Engineering Considerations.....	- 34 -
4.5.5 Water Sources .....	- 34 -
4.5.6 Evaluation of Water Vulnerability.....	- 35 -

<b>5.</b>	<b>IMPACT ASSESSMENT AND RESULTS</b>	<b>- 36 -</b>
5.1	IMPACT ASSESSMENT PROCEDURE	- 36 -
5.2	ALTERNATIVES AND ECOSYSTEM ASSESSMENTS	- 36 -
5.3	KEY ISSUES CONSIDERED IN THE ASSESSMENT PROCESS	- 37 -
5.3.1	<i>Sources of Impacts (Proposed Project Activities)</i>	- 37 -
5.3.2	<i>Summary of Receptors Likely to be Negative Impacted</i>	- 38 -
5.4	IMPACT ASSESSMENT METHODOLOGY	- 38 -
5.4.1	<i>Impact Definition</i>	- 38 -
5.4.2	<i>Knowledge-Based Impact Assessment Process</i>	- 39 -
5.4.2.2	Climatic Data Sets/Components Inputs	- 40 -
5.4.2.3	Environmental Data Sets/Components Inputs	- 40 -
	ENVIRONMENTAL	- 41 -
5.4.2.4	Ground Data Sets/Components Inputs	- 42 -
5.4.2.5	Source-Pathway-Receptor Risk Assessment, Harm and Monitoring	- 42 -
5.4.2.6	Individual Components Impact Assessment Criteria	- 44 -
5.4.3	<i>Overall Component and Significant Impact Assessment</i>	- 44 -
5.4.3.1	Overall Component Impact Assessment	- 44 -
5.4.3.2	Overall Significant Impact Assessment	- 46 -
5.4.4	<i>Proposed Project Activities Summary of Impacts Results</i>	- 46 -
5.5	EVALUATION OF SIGNIFICANT IMPACTS	- 55 -
5.5.1	<i>Overview</i>	- 55 -
5.5.2	<i>Significance Criteria</i>	- 55 -
5.5.3	<i>Assessment Likely Significant Impacts</i>	- 55 -
5.6	ASSESSMENT OF OVERALL IMPACTS	- 58 -
5.6.1	<i>Summary of the Results of the Impact Assessment</i>	- 58 -
<b>6.</b>	<b>THE EMP</b>	<b>- 59 -</b>
6.1	SUMMARY OF THE EMP OBJECTIVES	- 59 -
6.2	IMPLEMENTATION OF THE EMP	- 59 -
6.2.1	<i>Roles and Responsibilities</i>	- 59 -
6.2.2	<i>Proponent's Representative (PR) / Project Manager (PM)</i>	- 59 -
6.2.3	<i>Project Health, Safety and Environment (Project HSE)</i>	- 60 -
6.2.4	<i>Contractors and Subcontractors</i>	- 60 -
6.3	SPECIFIC MITIGATION MEASURES	- 61 -
6.3.1	<i>Hierarchy of Mitigation Measures Implementation</i>	- 61 -
6.3.2	<i>Mitigation Measures Implementation</i>	- 61 -
<b>7.</b>	<b>REHABILITATION AND MONITORING COMMITMENTS</b>	<b>- 78 -</b>
7.1	REHABILITATION PROCESS	- 78 -
7.2	MONITORING OF THE ENVIRONMENTAL PERFORMANCE	- 80 -
7.2.1	<i>Rehabilitation Evaluation and Performance Monitoring</i>	- 80 -
7.2.2	<i>Overall Environmental Performance Monitoring and Reporting</i>	- 81 -
<b>8.</b>	<b>CONCLUSION AND RECOMMENDATION</b>	<b>- 82 -</b>
8.1	CONCLUSIONS	- 82 -
8.2	RECOMMENDATIONS	- 82 -
8.3	SUMMARY TOR FOR TEST MINING AND MINING STAGES	- 83 -

## List of Figures

Figure 1.1:	Regional location of the EPL.....	- 2 -
Figure 1.2:	Detailed regional location of the EPL 5439 showing all the corner coordinates .....	- 4 -
Figure 1.3:	Topographic settings of the EPL 5439 Area.....	- 5 -
Figure 1.4:	Key agricultural farmlands covered by the EPL 5439.....	- 6 -
Figure 1.5:	Overview of the old mines and potential exploration pegmatite targets within the EPL 5439.....	- 7 -
Figure 1.6:	Copy of the ECC valid from the 11 <sup>th</sup> June 2020 and will expire on 11 <sup>th</sup> June 2023 and granted to the previous Proponent, and need to be renewed and transferred to current Proponent, Lepidico Chemicals Namibia (Pty) Ltd .....	- 9 -
Figure 4.1:	Regional climatic patterns of Namibia showing the location of the study area .....	- 23 -
Figure 4.2:	Rare metal pegmatite belts of Namibia showing the location of the EPL 5439 .....	- 33 -
Figure 5.1:	Detailed outline of the technical methodology based on a complete looped Knowledge-Based System Model Methodology (KBSMM) used in the impact assessment, risk assessment and determination of the monitoring and reporting strategy. The system model methodology has a built-in looping that allows for the evaluation of a phased onshore minerals exploration process project lifecycle. ....	- 41 -
Figure 5.2:	A Knowledge-Based System Model Methodology (KBSMM) source-pathways-target characterised interactive risk assessment system output field-based and tested / validated Artificial Intelligent (AI) framework windows for onshore phased minerals exploration process implementation project lifecycle.....	- 43 -
Figure 5.3:	A Knowledge-Based System Model Methodology (KBSMM) characterised system output research-based and tested / validated Artificial Intelligent (AI) framework risk consequences (harm) pathways to the receiving target/receptors windows for onshore phased minerals exploration process project implementation lifecycle .....	- 44 -

## List of Tables

Table 3.1:	Legislation relevant to the proposed exploration operations.....	- 16 -
Table 3.2:	Government agencies regulating environmental protection in Namibia. ....	- 18 -
Table 3.3:	Summary of the permit register applicable to the proposed minerals exploration activities.....	- 19 -
Table 3.4:	R553 Regional Standards for Industrial Effluent, in Government Gazette No 217 dated 5 April 1962.....	- 20 -
Table 3.5:	Comparison of selected guideline values for drinking water quality (after Department of Water Affairs, 2001).....	- 21 -
Table 3.6:	Liquid effluent emission levels (MIGA /IFC). ....	- 22 -
Table 3.7:	Noise emission levels (MIGA /IFC). ....	- 22 -
Table 4.1:	Partial Lithostratigraphy of the Damara Sequence in Central Namibia (Karibib-Swakopmund Area) .....	- 32 -
Table 4.2:	General rock structure scheme .....	- 34 -
Table 5.1:	Definition of impact categories used in this report. ....	- 39 -
Table 5.2:	Scored on a scale from 0 to 5 for impact magnitude.....	- 45 -
Table 5.3:	Scored time over which the impact is expected to last. ....	- 45 -
Table 5.4:	Scored geographical extent of the induced change.....	- 46 -
Table 5.5:	Summary of the qualitative scale of probability categories (in increasing order of likelihood).....	- 46 -
Table 5.6:	Results of the sensitivity assessment of the receptors (Physical, Socioeconomic and Biological environments) with respect to the proposed exploration / prospecting activities. ....	- 47 -
Table 5.7:	Results of the scored time period (duration) over which the impact is expected to last.....	- 49 -

Table 5.8:	Results of the scored geographical extent of the induced change.....	- 51 -
Table 5.9:	Results of the qualitative scale of probability occurrence. ....	- 53 -
Table 5.10:	Scored impact significance criteria.....	- 55 -
Table 5.11:	Significant impact assessment matrix for the proposed exploration activities. ....	- 56 -
Table 6.1:	Project planning and implementation. ....	- 63 -
Table 6.2:	Implementation of the EMP.....	- 63 -
Table 6.3:	Public and stakeholders relations.....	- 64 -
Table 6.4:	Measures to enhance positive socioeconomic impacts. ....	- 64 -
Table 6.5:	Environmental awareness briefing and training.....	- 65 -
Table 6.6:	Erection of supporting exploration infrastructure. ....	- 65 -
Table 6.7:	Use of existing access roads, tracks and general vehicle movements. ....	- 66 -
Table 6.8:	Mitigation measures for preventing flora and ecosystem destruction and promotion of conservation.....	- 67 -
Table 6.9:	Mitigation measures for preventing faunal and ecosystem destruction and promotion of conservation.....	- 68 -
Table 6.10:	Mitigation measures to be implemented with respect to the exploration camps and exploration sites.....	- 69 -
Table 6.11:	Mitigation measures for surface and groundwater protection as well as general water usage.....	- 70 -
Table 6.12:	Mitigation measures to minimise negative socioeconomic impacts. ....	- 71 -
Table 6.13:	Mitigation measures to minimise health and safety impacts. ....	- 72 -
Table 6.14:	Mitigation measures to minimise visual impacts.....	- 73 -
Table 6.15:	Mitigation measures to minimise vibration, noise and air quality. ....	- 74 -
Table 6.16:	Mitigation measures for waste (solid and liquid) management. ....	- 75 -
Table 6.17:	Rehabilitation plan. ....	- 76 -
Table 6.18:	Environmental data collection. ....	- 77 -

## List of Plates

Plate 4.1:	Cyphostemma currorii individuals are viewed as the most important plants occurring in the area .....	- 27 -
Plate 4.2:	Lichens observed on rocky substrate found within the EPL area .....	- 29 -
Plate 4.3:	<i>Opuntia spp.</i> , found within the EPL 5439 area, typically close to old ruins in area .....	- 29 -
Plate 4.4:	<i>Prosopis spp.</i> , found within the EPL area.....	- 30 -
Plate 4.5:	<i>Ricinus communis</i> found within the EPL area. ....	- 30 -

## NON-TECHNICAL EXECUTIVE SUMMARY

Lepidico Chemicals Namibia (Pty) Ltd, “the Proponent”, holds mineral rights under Exclusive Prospecting License (EPL) No. 5439 situated in the Karibib District, Erongo Region, west central Namibia. The Proponent is 80% owned by Lepidico Limited (“Lepidico”) a lithium exploration and development company focused on unlocking the value of hard rock lithium-rich mica deposits.

Lepidico is listed on the Australian Securities Exchange and 100% owner and developer of the L-Max® process technology and has the exclusive rights to the LOH-Max™ technology; proprietary processes which have the potential to commercially extract lithium chemicals and other valuable by-products from unconventional mineral sources.

The 22530.6374 Ha area of the EPL 5439 was granted on the 11/02/2016 and will expire on the 09/06/2024. The Proponent is exclusively authorised to explore for base and rare metals, industrial minerals and precious metals. The prospecting activities covering mapping, geophysical surveys, drilling and sampling for laboratory test will be undertaken in phases starting with the desktop studies, followed by regional and local field-based activities.

The proposed minerals prospecting activities are listed in the Environmental Impact Assessment Regulations, 2012 and the Environmental Management Act, 2007, (Act No. 7 of 2007) and cannot be undertaken without an Environmental Clearance Certificate (ECC). The proponent is required to have undertaken an Environmental Assessment comprising Environmental Scoping and Environmental Management Plan (EMP) for the proposed / ongoing minerals prospecting activities in order to support the application for the ECC.

The current ECC which will expire on the 11<sup>th</sup> June 2023 was granted to the previous Proponent, Desert Lion Energy (Pty) Ltd on the 11<sup>th</sup> June 2020. This updated Scoping and Environmental Management Plan (EMP) Report has been prepared by Risk-Based Solutions (RBS) CC in order to support the applications for renewal and transfer of the ECC from Desert Lion Energy (DLE) (Pty) Ltd to Lepidico Chemicals Namibia (Pty) Ltd.

The EPL 5439 falls within the hot semiarid climatic zone of Namibia with mean annual gross evaporation of about 3300 mm and highly variable mean annual rainfall ranging between 200 - 300 mm. The distribution of rainfall is extremely seasonal with almost all the rain falling in summer - from November to April.

It is estimated that at least 81 species of reptile, 9 amphibian, 74 mammal and 183 bird, 74-101 of larger trees and shrubs (>1m) and 52-72 (approximately 80 species) grasses occur in the general Karibib, central western Namibia.

The Town of Karibib which is the district capital of the Karibib electoral constituency is nearest town situated about 30 km to the southwest of the EPL area. The Town of Karibib covering about 97 square kilometres of the townland has 3,800 inhabitants. The key socioeconomic activities of the town include: Trading, framing and services that all highly dependent on the operations Navachab Gold Mine as well as other mining related activities.

The impacts that the proposed / ongoing exploration activities will have on the receiving environment (physical, biological, socioeconomic environments and ecosystem functions, services, use and non-use values or passive uses) will depend on the extent of the proposed / ongoing activities over the development area, management of the area and how the mitigations as detailed in the EMP report are eventually implemented and monitored by the Proponent to the satisfaction of the landowners and the Government regulators.

Avoiding sensitive habitats such as Ephemeral River channels, rock heads and mountainous terrains as well as track discipline (including not killing/poaching of fauna and unnecessarily cutting down of trees) must be adhered to and/or enforced at all times.

The following is the assessment summary of the likely environmental impacts that the proposed / ongoing exploration / prospecting activities will have on the receiving environment (physical, biological,

socioeconomic environments and ecosystem functions, services, use and non-use values or passive uses) without mitigations:

- (i) Initial desktop exploration activities: Overall likely negative impact on the receiving environment will be negligible with extremely unlikely probability of occurrence without mitigations. Overall significant impacts will be negligible;
- (ii) Regional reconnaissance field-based activities: Overall likely negative impact on the receiving environment will be negligible with extremely unlikely probability of occurrence without mitigations. Overall significant impacts will be negligible. Some field-based activities will have localised low impacts with low probability of occurrence without mitigations and negligible with mitigations. Overall significant impacts will be negligible;
- (iii) Initial local field-based activities: Initial field-based activities will have localised low impacts with low probability of occurrence without mitigations and negligible with mitigations. Overall significant impacts will be negligible. All desktop related activities and laboratory assessments will have negligible impacts with extremely unlikely probability of occurrence without mitigations. Overall significant impacts will be negligible;
- (iv) Detailed local field-based activities: Overall likely negative impact on the receiving environment will be high and localised impacts without mitigations and localised low impacts with mitigations. Overall significant impacts will be medium without mitigations and low with mitigations, and;
- (v) Prefeasibility and feasibility studies to be implemented on a site-specific area if the local field-based studies prove positive: Overall likely negative impact on the receiving environment will be high and localised impacts without mitigations and localised medium impacts with mitigations. Overall significant impacts will be high without mitigations and low with mitigations for bulk sampling, test mining and field logistics including exploration camp.

Based on the findings of this updated Scoping and EMP Report, it is hereby recommended that the proposed / ongoing exploration activities be issued with a new Environmental Clearance Certificate (ECC). The Proponent shall take into consideration the following key requirements for implementing the proposed exploration programme:

- (i) The Proponent shall negotiate Access Agreements with the land owner/s as may be applicable;
- (ii) The Proponent shall adhere to all the provisions of the EMP and conditions of the Access Agreement to be entered between the Proponent and the land owner/s in line with all applicable national regulations;
- (iii) Before entering any private or protected property/ area such as a private farm, the Proponent must give advance notices and obtain permission from the land owners to access the EPL area at all times, and;
- (iv) Where possible, and if water is found during the detailed exploration boreholes drilling operations, the Proponent shall support other land uses in the area in terms of access to freshwater supply for both human consumption, wildlife and agricultural support as may be requested by the local community / land owner/s. The abstraction of fresh groundwater resources shall include water levels monitoring, sampling and quality testing on a bi-annual basis, and that the affected landowners must have access to the results of the water monitoring analyses as part of the ongoing stakeholder disclosure requirements on shared water resources as may be applicable.

Once and if economic minerals resources are discovered, a separate field-based and site-specific Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) reports shall be



prepared as part of the feasibility study with respect to the test mining or possible mining operations. The site-specific EIA and EMP shall cover the area identified to have potential economic minerals resources including the pit area/s, waste rock, access, office blocks and all infrastructure support areas (water, energy and road / access).

In addition to the Terms of Reference (ToR) to be developed during the Environmental Scoping study phase for the test mining / mining stages, the following field-based and site-specific specialist studies shall be considered in the TOR for the EIA and EMP for possible test mining or mining operations in an event of a discovery of economic resources and possible development of a mining project within the EPL No. 5439:

- (i) Groundwater studies including modelling as maybe applicable;
- (ii) Field-based flora and fauna diversity;
- (iii) Dust, noise and sound modelling linked to engineering studies;
- (iv) Socioeconomic assessment, and;
- (v) Others as may be identified / recommended by the stakeholders/ land owners/ Environmental Commissioner or specialists.

# 1. BACKGROUND

## 1.1 Introduction

Lepidico Chemicals Namibia (Pty) Ltd (“**Proponent**”) holds mineral rights for the Karibib Project under the Exclusive Prospecting License (EPL) No. 5439, situated in the Karibib District, Erongo Region, west-central Namibia (Fig. 1.1).

The Proponent is 80% owned by Lepidico Limited (“**Lepidico**”) a lithium exploration and development company focused on unlocking the value of hard rock lithium-rich mica deposits. Lepidico is listed on the Australian Securities Exchange and 100% owner and developer of the L-Max® process technology and has the exclusive rights to the LOH-Max™ technology; proprietary processes which have the potential to commercially extract lithium chemicals and other valuable by-products from unconventional mineral sources.

The following is the summary of the Exclusive Prospecting License (EPL) No. 5439:

- ❖ **Type of License:** Exclusive Prospecting License (EPL) No. 5439.
- ❖ **EPL Holder:** Lepidico Chemicals Namibia (Pty) Ltd.
- ❖ **Granted Date:** 11/02/2016.
- ❖ **Expiry Date:** 09/06/2024.
- ❖ **Commodities:** Base and rare metals, industrial minerals, and precious metals.
- ❖ **Size of the EPL:** 22530.6374 Ha, and.
- ❖ **Current Environmental Clearance Certificate (ECC):** Granted on the 11<sup>th</sup> June 2020 and will expire on 11<sup>th</sup> June 2023.

The overall aim of the proposed / ongoing project activities (exploration / prospecting programme) is to search for potential economic minerals resources (base and rare metals, industrial and precious metals) within the EPL area. Lepidico Chemicals Namibia (Pty) Ltd intend to continue with minerals exploration / prospecting activities within the EPL 5439 covering the following phases:

- (i) Initial desktop exploration activities (no field-work undertaken);
- (ii) Regional reconnaissance field-based mapping and sampling activities (Subject to the positive results of (i);
- (iii) Initial local field-based mapping and sampling activities (Subject to the positive results of (i) and (ii) above),
- (iv) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling (Subject to the positive results of (i) - (iii) above), and;
- (v) Prefeasibility and feasibility studies (Subject to the positive results of (i) - (iv) above).

The scope of the required field-based support and logistical activities will depend on the scale of proposed exploration activities to be undertaken. The proposed exploration activities will be supported by existing tracks and campsites as well as existing accommodation in the area. In the absence of existing tracks, the field team will create such new tracks with the permission of the land owner/s and depending on the scale of exploration.



Figure 1.1: Regional location of the EPL.

## **1.2 Location, Land Use, and Infrastructure**

### **1.2.1 Location**

The 22530.6374 Ha Exclusive Prospecting Licence (EPL) No. 5439 is located about 30 km to the southeast of the Town of Karibib, Karibib District, Erongo Region, west central Namibia (Figs. 1.1 – 1.3).

The EPL area covers the following farms: Otjua, Otjozondu, Ombujomenge, Okongava Ost, Okakoara, Meyesrust, Kansimba, Kaliombo and Neu Schwaben (Figs. 1.4). The area covered by the EPL 5439 is not pristine and is dominated by a number of old mines as well as excavations, shafts, waste rock and tailings dumps linked to the historical exploration and mining operations (Fig. 1.5).

According to Diehl, (1992), exploration of the pegmatite, mainly for beryl, started in 1930 and since 1951, Rubikon has been selectively mined for petalite, amblygonite, lepidolite, beryl, quartz and accessory pollucite and bismuth as well as the oxidation products of the latter.

The proposed exploration and possible mining operation of these pegmatites within the EPL 5439 will address some of the current poor state of the local environment that has not been rehabilitated over many years of historical exploration and mining operations.

### **1.2.2 Current Land Uses**

The general land use of the area is mainly dominated by agriculture (cattle and small stock farming) and game farming that support tourism and conservation in the local area and region. Game farms are important conservation areas for endemic and protected flora and are key sanctuaries for endangered and problem faunal species.

Game farms offers visitors the opportunity to be close to nature with a variety of tailor-made tourism products such game viewing, trails, and hunting activities. The summary of other land uses activities found in the general areas includes: prospecting, small-scale mining operations and restricted national security infrastructure.

### **1.2.3 Supporting Infrastructure and Services**

Swakopmund, the regional centre of the Erongo Region and Walvis Bay the main Port are situated about 180 km and 210 km to the west of the EPL area. Namibia's capital city, Windhoek, is located approximately 124 km southeast of EPL 5439 Area (Figs. 1.1 and 1.2).

The EPL area is dominated by commercial farmland (Fig. 1.4). The land use of this EPL area is mainly dominated by agriculture including cattle and small stock farming in some areas. Minerals exploration and mining operations are well known activities in the area (Fig. 1.5). A number of lodges are found in the areas surrounding the EPL but not necessary within the EPL boundary.

Bush thickening or encroachment is viewed as an economic problem in the general area but does not seem to be an issue within the EPL area. The area is not part of the communal conservancy system in Namibia with no protected area nearby the EPL area.

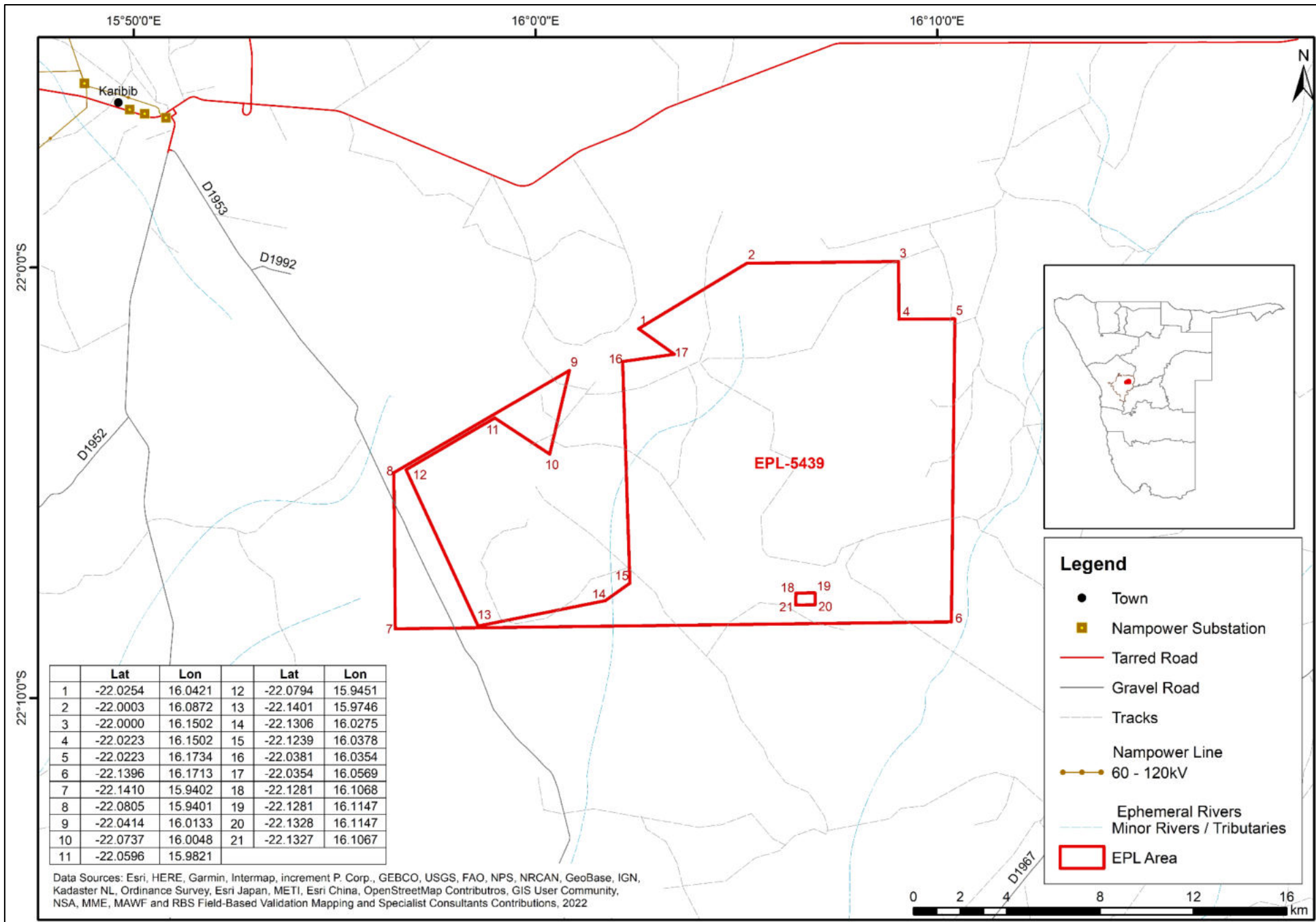


Figure 1.2: Detailed regional location of the EPL 5439 showing all the corner coordinates.



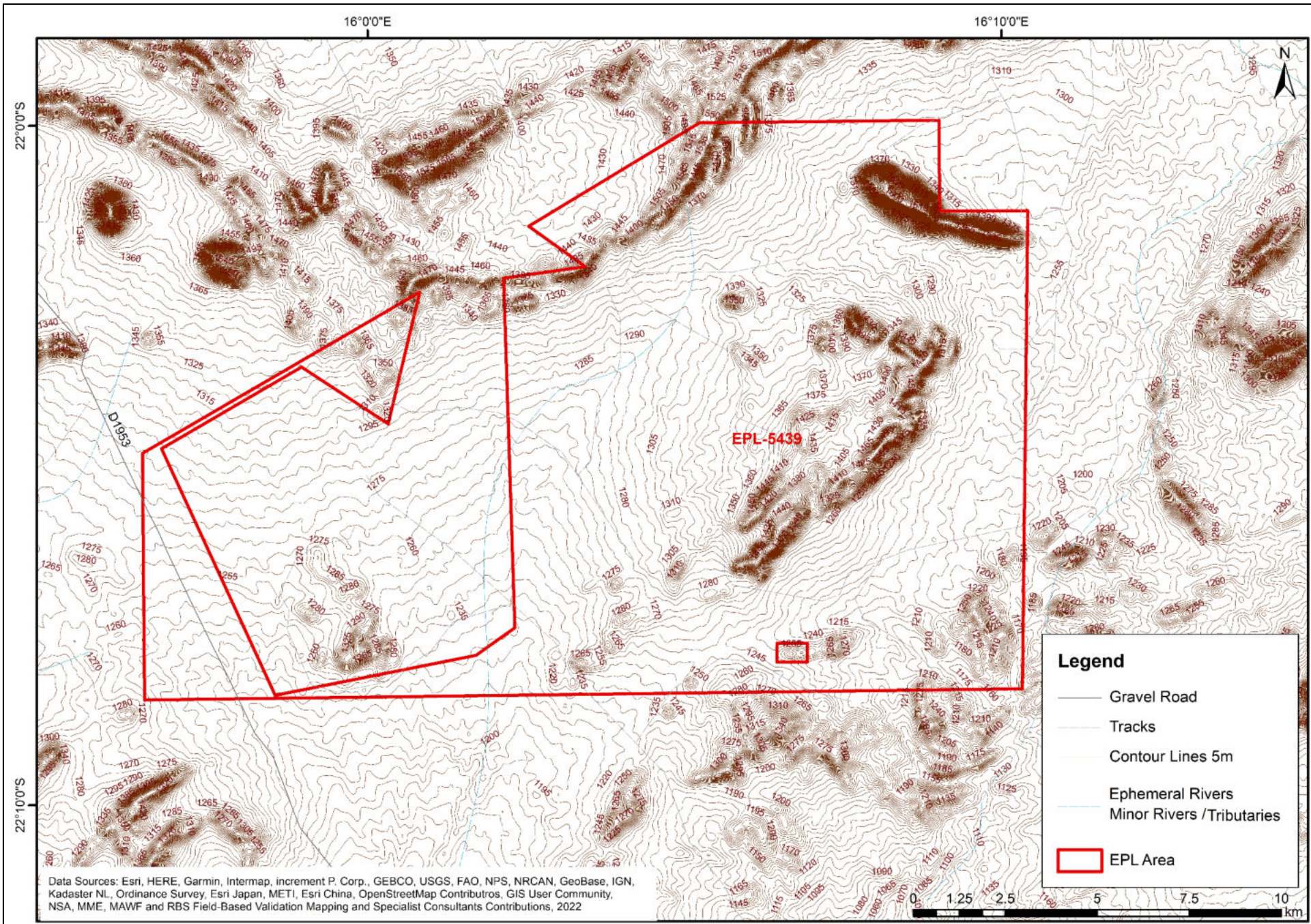


Figure 1.3: Topographic settings of the EPL 5439 Area.



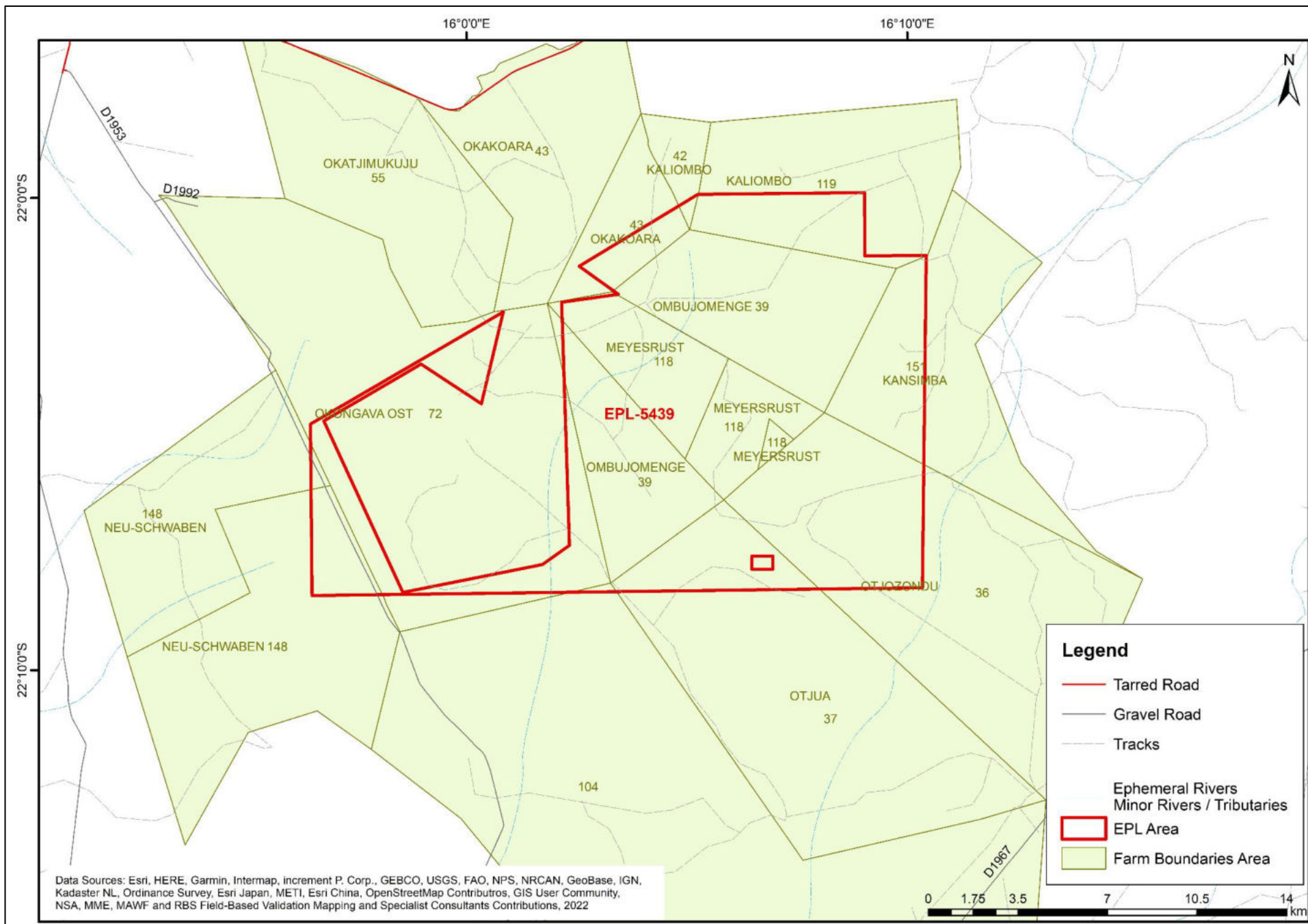


Figure 1.4: Key agricultural farmlands covered by the EPL 5439.



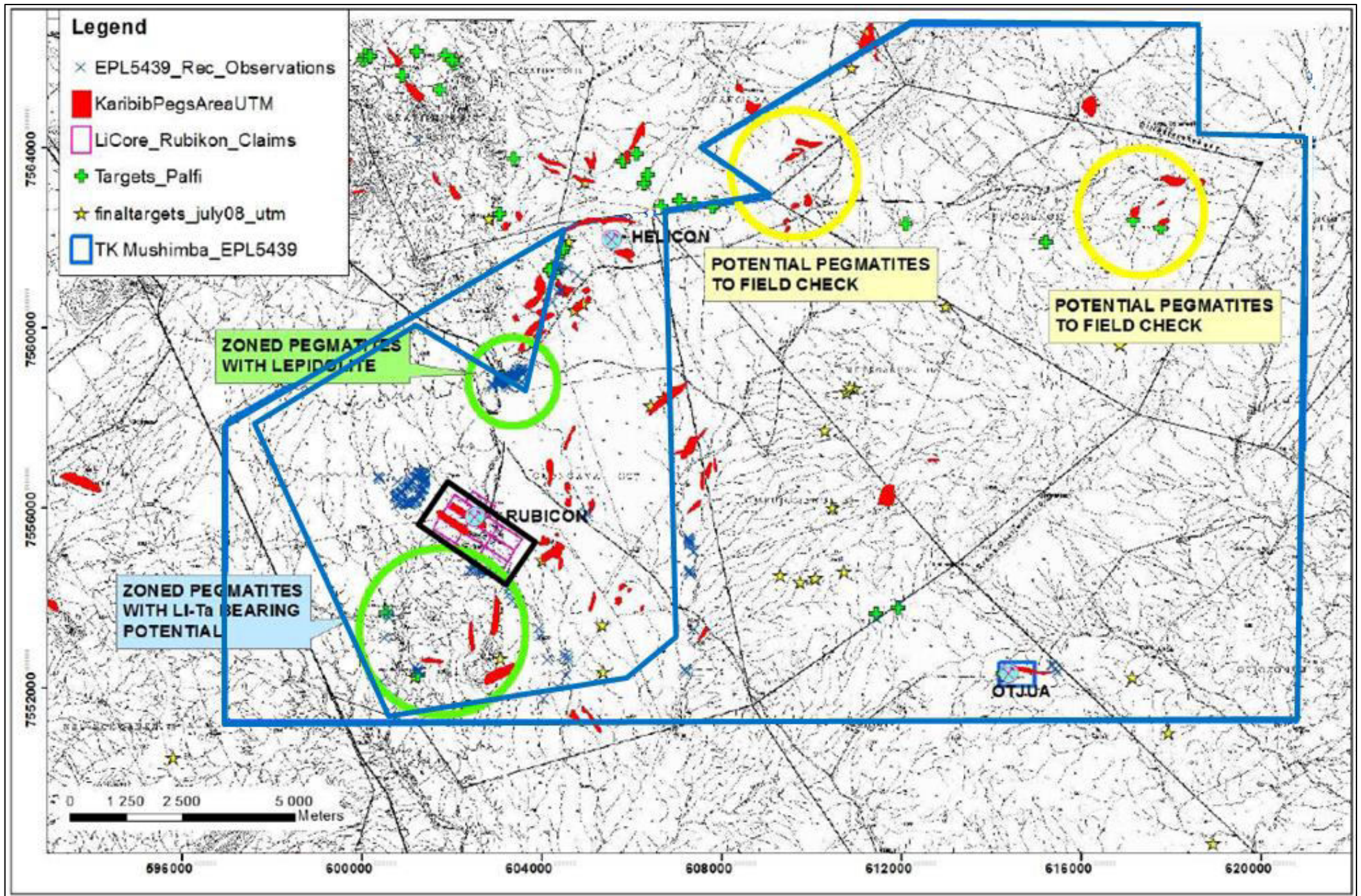


Figure 1.5: Overview of the old mines and potential exploration pegmatite targets within the EPL 5439.



### **1.3 Regulatory Requirements**

The proposed minerals exploration / prospecting activities in the EPL 5439 falls under the activities that are listed in the Environmental Management Act, 2007, (Act No. 7 of 2007) and cannot be undertaken without an Environmental Clearance Certificate (ECC).

To obtain the ECC for the listed activities, the Proponent is required to have undertaken Environmental Assessment comprising Environmental Scoping and Environmental Management Plan (EMP) for the proposed / ongoing minerals prospecting operations / activities.

In fulfilment of the environmental requirements, the Proponent appointed Risk-Based Solutions (RBS) CC as the Environmental Consultant, led by Dr Sindila Mwiya as the Environmental Assessment Practitioner (EAP) to undertake the Scoping and EMP to support the application for Environmental Clearance Certificate (ECC).

An application for ECC together with the supporting updated Scoping and Environmental Management Plan (EMP) Report was prepared by the Risk-Based Solutions (RBS) CC on behalf of the Proponent and submitted to the Environmental Commissioner in the Ministry of Environment, Forestry and Tourism (MEFT) in March 2020 and an ECC was granted on the 11<sup>th</sup> June 2020 and will expire on 11<sup>th</sup> June 2023 (Fig. 1.6).

This environmental monitoring covering the period June 202 to March 2023 has been prepared by Risk-Based Solutions on behalf of the Proponent to support the application for renewal and transfer of the Environmental Clearance Certificate (ECC) for ongoing and proposed exploration / prospecting activities in the Exclusive Prospecting License (EPL) No. 5439, Karibib District, Erongo Region.

The Environmental Assessment process for the previous and current processes have both been undertaken in accordance with the provisions of the Environmental Impact Assessment Regulations, 2012 and the Environmental Management Act, 2007, (Act No. 7 of 2007).

### **1.4 Project Motivation**

The EPL 5439 is situated in a highly perspective area for base and rare metals, industrial minerals and precious metals associated with local rock outcrops comprising pegmatites, limestones, dolomites and schists. Based on the historical and current exploration activities undertaken around the EPL area, lithium and associated rare metals are historically known to occur in the EPL area (Fig. 1.3). The implementation of the proposed / ongoing exploration activities and the potential to discover economic minerals resources and opening of an operational mine, will go a long way in addressing the current poor state of the environment around the EPL area associated with the historical exploration and mining activities.

The EPL areas covers parts of the two (2) of the main major pegmatites in Namibia: The Rubikon and Helikon pegmatites situated about 30 km southeast of Karibib on the farm Okongava 72 (Fig. 1.3). The pegmatite belongs to the group of internally zoned Lithium (Li) - Cesium (Cs)- Beryllium (Be)-Rubidium (Rb) pegmatites that reached the highest degree of alkali fractionation (Diehl, 1992). Potential for more deposits in the surrounding areas exist and the proponent is interested to explore the whole EPL area in much more detail.

The proposed / ongoing exploration activities has some limited socioeconomic benefits which are mainly centred around the payment of the annual license rental fees to the Central Government through the Ministry of Mines and Energy (MME) and value addition to the potential underground minerals resources in the area which otherwise would not have been known if the exploration in EPL 5439 did not take place. The potential for the discovery of additional economic minerals resources and the development of new mining project in the area will have much greater socioeconomic benefits to the local community and the Town of Karibib. Additional socioeconomic benefits will also be realised at regional and national socioeconomic benefits in terms of capital investments, license rental fees, royalties payable to Government, direct and indirect contracts and employment opportunities, export earnings, foreign direct investments and various taxes payable to the Government.



**REPUBLIC OF NAMIBIA  
MINISTRY OF ENVIRONMENT, FORESTRY AND TOURISM**

OFFICE OF THE ENVIRONMENTAL COMMISSIONER

**ENVIRONMENTAL CLEARANCE CERTIFICATE**

**ISSUED**

In accordance with Section 37(2) of the Environmental  
Management Act (Act No. 7 of 2007)

**TO**

**Desert Lion Energy (DLE) (Pty) Ltd  
P O Box 90898, Klein Windhoek**

**TO UNDERTAKE THE FOLLOWING LISTED ACTIVITY**

**Proposed / Ongoing Minerals Exploration / Prospecting Activities in the  
Exclusive Prospecting License (EPL) No. 5439, Karibib District, Erongo  
Region**

Issued on the date: **2020-06-11**  
Expires on this date: **2023-06-11**

**(See conditions printed over leaf)**



This certificate is printed without erasures or alterations



Figure 1.6: Copy of the ECC valid from the 11<sup>th</sup> June 2020 and will expire on 11<sup>th</sup> June 2023 and granted to the previous Proponent, and need to be renewed and transferred to current Proponent, Lepidico Chemicals Namibia (Pty) Ltd.

## 1.5 Assumptions and Limitations

The following assumptions and limitations underpin the approach adopted, overall outcomes and recommendations for this updated Scoping and EMP study:

- ❖ The proposed exploration activities as well as all the plans, maps, EPL Boundary / coordinates and appropriate data sets received from the proponent, project partners, regulators, Competent Authorities and specialist assessments are assumed to be current and valid at the time of conducting the studies and compilation of this environmental report;
- ❖ The impact assessment outcomes, mitigation measures and recommendations provided in this report are valid for the entire duration of the proposed exploration / prospecting activities;
- ❖ A precautionary approach has been adopted in instances where baseline information was insufficient or unavailable or site-specific locations of the proposed project activities is not yet available, and;
- ❖ Mandatory timeframes as provided for in the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 and the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007) have been observed and will apply to the review and decision of this report by the Competent Authority and the Environmental Commissioner.

## 1.6 Structure of the Report

The following is the summary structure outline of this scoping and EMP report.

1. **Section 1: Background** covering the proposed / ongoing project location with available infrastructure and services;
2. **Section 2: Project Description** covering the summary of the proposed / ongoing project exploration activities;
3. **Section 3: Regulatory Framework** covering the proposed / ongoing exploration with respect to relevant legislation, regulations and permitting requirements;
4. **Section 4: Receiving Environment** covering physical, biological and socioeconomic environments of the proposed / ongoing project area;
5. **Section 5: Impact Assessment** covering the likely positive and negative impacts the proposed / ongoing project activities are likely to have on the receiving environment;
6. **Section 6: Environmental Management Plan (EMP)** describing the detailed mitigation measures with respect to the identified likely impacts;
7. **Section 7: Conclusions and Recommendations-** Summary of the findings and way forward.

## **2. DESCRIPTION OF THE EXPLORATION PROGRAMME**

### **2.1 General Overview**

The overall aim of the proposed / ongoing project activities (exploration / prospecting programme) is to search for potential economic minerals resources (base and rare metals, industrial and precious metals) within the EPL area. The exploration activities to be undertaken as assessed in this environmental assessment are as follows:

- (i) Initial desktop exploration activities (no field-work undertaken);
- (ii) Regional reconnaissance field-based mapping and sampling activities (Subject to the positive results of (i));
- (iii) Initial local field-based mapping and sampling activities (Subject to the positive results of (i) and (ii) above),
- (iv) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling (Subject to the positive results of (i) - (iii) above), and;
- (v) Prefeasibility and feasibility studies (Subject to the positive results of (i) - (iv) above).

The scope of the required field-based support and logistical activities will depend on the scale of proposed exploration activities to be undertaken.

The proposed exploration activities will be supported by existing tracks and campsites / farmstead as well as existing accommodation in the area. In the absence of existing tracks, the field team will create such new tracks with the permission of the land owner/s and depending on the scale of exploration.

In the absence of existing suitable campsite / farmstead, temporary camp will be setup at suitable locations within the EPL area in line with the EMP provisions. The size of the exploration camp will be of very limited footprints during the exploration phase but may be expanded for the test mining and mine development phases in an event of a discovery of economic minerals resources.

### **2.2 Initial Desktop Exploration Activities**

The following is description of the proposed initial desktop exploration activities to be implemented by the Proponent as assessed in the EIA Report:

- (i) General evaluation of satellite, topographic, land tenure, accessibility, supporting infrastructures and socioeconomic environment data;
- (ii) Purchase and analysis of existing Government high resolution magnetic and radiometric geophysical data;
- (iii) Purchase and analysis of existing Government aerial hyperspectral, and;
- (iv) Data interpretation and delineating of potential targets for future reconnaissance regional field-based activities for delineated targets.

No field work is envisaged at this stage of the proposed exploration activities which can last between six (6) to twelve (12) months.

## 2.3 Regional Reconnaissance Field-Based Activities

The following is detailed outline of the proposed regional reconnaissance field-based exploration activities to be implemented by the Proponent as assessed in the EIA Report:

- (i) Regional geological, geochemical, topographical and remote sensing mapping and data analysis;
- (ii) Regional geochemical sampling aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical and remote sensing mapping and analysis undertaken;
- (iii) Regional geological mapping aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical and remote sensing mapping and analysis undertaken;
- (iv) Limited field-based support and logistical activities lasting between one (1) to two (2) days, and;
- (v) Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets for future detailed site-specific exploration if the results are positive and supports further exploration of the delineated targets.

Scope and scale of the possible field work is very limited to visiting specific delineated localities in order to validated the recommendations of the initial desktop activities.

## 2.4 Initial Local Field-Based Activities

The following is detailed outline of the proposed initial local field-based exploration activities to be implemented by the Proponent as assessed in the EIA Report:

- (i) Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during regional reconnaissance field activities;
- (ii) Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken;
- (iii) Ground geophysical survey (Subject to the positive outcomes of i and ii above);
- (iv) Possible Trenching (Subject to the outcomes of i - iii above);
- (v) Field-based support and logistical activities will be very limited focus on a site-specific area for a very short time (maximum five (5) days), and;
- (vi) Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets

Scope and scale of the possible field work is very limited working on specific delineated localities in order to assess the economic viable of the target/s.

## 2.5 Detailed Local Field-Based Activities

The following is detailed outline of the proposed detailed local field-based exploration activities to be implemented by the Proponent as assessed in the EIA Report if economic and viable targets are delineated within the EPL area:

- (i) Access preparation and related logistics to support activities;

- (ii) Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during the initial field-based activities;
- (iii) Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken, and;
- (iv) Ground geophysical survey, trenching, drilling and sampling (Subject to the positive outcomes of i and ii above).

Scope and scale of the possible field work is likely to be extensive over a localised specific delineated locality in order to assess the economic viable of the target/s.

## **2.6 Prefeasibility and Feasibility Studies**

The following is detailed outline of the proposed prefeasibility and feasibility studies related exploration activities to be implemented by the Proponent as assessed in the EIA Report if economic and viable targets are delineated within the EPL area:

- (i) Detailed site-specific field-based support and logistical activities, surveys, detailed geological mapping;
- (ii) Detailed drilling and bulk sampling and testing for ore reserve calculations;
- (iii) Geotechnical studies for mine design;
- (iv) Mine planning and designs including all supporting infrastructures (water, energy and access) and test mining activities;
- (v) EIA and EMP to support the ECC for mining operations, and;
- (vi) Preparation of feasibility report and application for Mining License

Field-based support and logistical activities will be very extensive because the local field-based activities will be undertaken on a specific area for a very long time (up to one year or more in some instances). The activities will be supported by existing tracks and campsites / lodging facilities available in the area.

### **3. LEGISLATIVE FRAMEWORK**

#### **3.1 Overview**

There are four sources of law in Namibia: (1) statutes (2) common law (3) customary law and (4) international law. These four kinds of law are explained in more detail in the other factsheets in this series. The constitution is the supreme law of Namibia. All other laws must be in line with it. The most important legislative instruments and associated permits/licenses/authorisations/consents/compliances applicable to the proposed exploration activities include: Minerals exploration and mining, environmental management, land rights, water, atmospheric pollution prevention and labour as well as other indirect laws linked to the accessory services of exploration and possible test mining operations.

#### **3.2 Key Applicable Legislation**

##### **3.2.1 Minerals Exploration and Mining Legislation**

The national legislation governing minerals prospecting and mining activities in Namibia fall within the authority of the Ministry of Mines and Energy (MME) as the Competent Authority (CA) responsible for granting authorisations. The Minerals (Prospecting and Mining) Act (No 33 of 1992) is the most important legal instrument governing minerals prospecting and mining activities in Namibia. A new Bill, to replace the Minerals (Prospecting and Mining) Act (No 33 of 1992) is being prepared and puts more emphasis on good environmental management practices, local participation in the mining industry and promotes value addition as prescribed in the Minerals Policy of 2003. The Minerals (Prospecting and Mining) Act (No 33 of 1992) regulates reconnaissance, prospecting (exploration) and mining activities. The Mining Commissioner, appointed by the Minister, is responsible for implementing the provisions of this Act including reporting requirements, environmental obligations as well as the associated regulations such as the Health and Safety Regulations

##### **3.2.2 Environmental Management Legislation**

The Environmental Assessment (EA) process in Namibia is governed by the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 gazetted under the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007) in the Ministry of Environment, Forestry and Tourism (MEFT). The objectives of the Act and the Regulations are, among others, to promote the sustainable management of the environment and the use of natural resources to provide for a process of assessment and control of activities which may have significant effects on the environment. The Minister of Environment, Forestry and Tourism (is authorised to list activities which may only be undertaken if an environmental clearance certificate has been issued by the environmental commissioner, which activities include those relating to exploration and mining operations. In addition to the requirements for undertaking Environmental Assessment prior to the project implementation, the Environmental Management Act and the EIA Regulations also provide for obligations of a license holder to provide for project rehabilitation and closure plan. In the regulations, the definition of “rehabilitation and closure plan” is a plan which describes the process of rehabilitation of an activity at any stage of that activity up to and including closure stage.

##### **3.2.3 Water Legislation**

Water Act 54 of 1956 under the Minister of Agriculture, Water and Land Reform (MAWLR) provides for the control, conservation and use of water for domestic, agricultural, urban and industrial purposes. In terms of Section 6, there is no right of ownership in public water and its control and use is regulated and provided for in the Act. In accordance with the Act, the proposed exploration must ensure that mechanisms are implemented to prevent water pollution. Certain permits will also be required to abstract groundwater as well as for “water works”. The broad definition of water works will include the reservoir on site (as this is greater than 20,000m<sup>3</sup>), water treatment facilities and pipelines. Due to the water scarcity of the area, all water will be recycled (including domestic wastewater). The Act requires the license holder to have a wastewater discharge permit for discharge of effluent. The Water Act 54 of 1956 is due to be replaced by the Water Resources Management Act 24 of 2004 which is currently

being revised. The Water Resource Management Act 2004 *provides for the management, development, protection, conservation and use of water resources.*

### **3.2.4 Forest Regulations and Permit Requirements**

All forms of trees and wood harvesting anywhere in Namibia, is governed by the Forest Act, 2001, (Act No. 12 of 2001). and its Regulations, 2015. The Act also governs activities which take place in classified forests, namely State Forests, Forestry Management Areas and Community Forests as well as non-classified forest areas. This Act is administered by the Directorate of Forestry (DoF) in the Ministry of Environment, Forestry and Tourism (MEFT).

### **3.2.5 Atmospheric Pollution Prevention Legislation**

The Atmospheric Pollution Prevention Ordinance, 11 of 1976 falling under the Ministry of Health and Social Services (MHSS) provide for the prevention of the pollution of the atmosphere, and for matters incidental thereto. Part III of the Act sets out regulations pertaining to atmospheric pollution by smoke. While preventative measures for dust atmospheric pollution are outlined in Part IV and Part V outlines provisions for Atmospheric pollution by gases emitted by vehicles.

### **3.2.6 Labour, Health and Safety Legislations**

The Labour Act, 1992, Act No. 6 of 1992 as amended in the Labour Act, 2007 (Act No. 11 of 2007), falling under the Ministry of Labour, Industrial Relations and Employment Creation (MLIREC) refers to severance allowances for employees on termination of a contract of employment in certain circumstances and health, safety, and welfare of employees. In terms of the Health Safety and Environment (HSE), the Labour Act, 2007 protects employees and every employer shall, among other things: provide a working environment that is safe, without risk to the health of employees, and that has adequate facilities and arrangements for the welfare of employees, provide and maintain plant, machinery and systems of work, and work processes, that are safe and without risk to the health of employees, and ensure that the use, handling, storage or transportation of hazardous materials or substances is safe and without risk to the health of employees. All hazardous substances shall have clear exposure limits and the employer shall provide medical surveillance, first-aid and emergency arrangements as fit for the operation.

### **3.2.7 Other Applicable National Legislations**

Other Important legislative instruments applicable to the proposed exploration operations include the following (Table 3.1):

- ❖ Explosives Act 26 of 1956 (as amended in SA to April 1978) – Ministry of Home Affairs, Immigration, Safety and Security (MHAISS).
- ❖ National Heritage Act 27 of 2004 – Ministry of Education, Arts and Culture (MEAC).
- ❖ Petroleum Products and Energy Act 13 of 1990 – Ministry of Mines and Energy (MME).
- ❖ Nature Conservation Ordinance, No. 4 of 1975 – Ministry of Environment, Forestry and Tourism (MEFT).
- ❖ Forest Act 12 of 2001 – Ministry of Environment, Forestry and Tourism (MEFT).
- ❖ Hazardous Substances Ordinance 14 of 1974 – Ministry of Health and Social Services (MHSS), and.
- ❖ Public Health Act 36 of 1919 – Ministry of Health and Social Services (MHSS).

Table 3.1 summarises the key selected legislations relevant applicable to the proposed exploration.



Table 3.1: Legislation relevant to the proposed exploration operations.

LAW	SUMMARY DESCRIPTION
<p><b>Constitution of the Republic of Namibia, 1990</b></p>	<p>The Constitution is the supreme law in Namibia, providing for the establishment of the main organs of state (the Executive, the Legislature, and the Judiciary) as well as guaranteeing various fundamental rights and freedoms. Provisions relating to the environment are contained in Chapter 11, article 95, which is entitled "promotion of the Welfare of the People". This article states that the Republic of Namibia shall – "Actively promote and maintain the welfare of the people by adopting, inter alia, policies aimed at ... maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilisation of living natural resources on a sustainable basis for all Namibians, both present and future. The Government shall provide measures against the dumping or recycling of foreign nuclear waste on Namibian territory."</p>
<p>Minerals (Prospecting and Mining) Act, 1992 <b>Ministry of Mines and Energy (MME)</b></p>	<p>The Minerals Act governs minerals prospecting and mining. The Act <i>provides for the reconnaissance, prospecting, and mining for, and disposal of, and the exercise of control over minerals in Namibia. and to provide for matters incidental thereto. A new Minerals Bills is currently under preparation.</i></p>
<p>Environmental Management Act (2007) - <b>Ministry of Environment, Forestry and Tourism (MEFT)</b></p>	<p>The purpose of the Act is <i>to give effect to Article 95(l) and 91(c) of the Namibian Constitution by establishing general principles for the management of the environment and natural resources. to promote the co-ordinated and integrated management of the environment. to give statutory effect to Namibia's Environmental Assessment Policy. to enable the Minister of Environment and Tourism to give effect to Namibia's obligations under international conventions.</i> In terms of the legislation, it will be possible to exercise control over certain listed development activities and activities within defined sensitive areas. The listed activities in sensitive areas require an Environmental Assessment to be completed before a decision to permit development can be taken. The legislation describes the circumstances requiring Environmental Assessments. Activities listed as per the provisions of the Act will require Environmental Assessment unless the Ministry of Environment, Forestry and Tourism, in consultation with the relevant Competent Authority, determines otherwise and approves the exception.</p>
<p>Water Act 54 of 1956 <b>Minister of Agriculture, Water and Land reform (MAWLR)</b></p>	<p>This Act provides for the control, conservation and use of water for domestic, agricultural, urban, and industrial purposes. In terms of Section 6, there is no right of ownership in public water and its control and use is regulated and provided for in the Act. In accordance with the Act, the proposed project must ensure that mechanisms are implemented to prevent water pollution. Certain permits will also be required to abstract groundwater (already obtained) as well as for "water works". The broad definition of water works will include the reservoir on Site (as this is greater than 20,000m<sup>3</sup>), water treatment facilities and pipelines. Due to the water scarcity of the area, all water will be recycled (including domestic wastewater) and the Mine will be operated on a zero-discharge philosophy. It will, therefore, not be necessary to obtain permits for discharge of effluent.</p> <p>Section 23 of the Act requires environment rehabilitation after closure of the Mine, particularly, in this instance to obviate groundwater pollution and potential pollution resulting from run-off. This Act is due to be replaced by the Water Resources Management Act 24 of 2004.</p>
<p><i>Forest Act 12 of 2001</i> - <b>Minister of Environment, Forestry and Tourism (MEFT)</b></p>	<p>The Act provide for the establishment of a Forestry Council and the appointment of certain officials. to consolidate the laws relating to the management and use of forests and forest produce. to provide for the protection of the environment and the control and management of forest fires.</p> <p>Under Part IV Protection of the environment, Section 22(1) of the Act, it is unlawful for any person to: cut, destroy, or remove:</p> <p>(a) any vegetation which is on a sand dune or drifting sand or in a gully unless the cutting, destruction or removal is done for the purpose of stabilising the sand or gully or</p> <p>(b) any living tree, bush or shrub growing within 100m of a river, stream, or watercourse.</p> <p>Should either of the above be unavoidable, it will be necessary to obtain a permit from the Ministry. Protected tree species as listed in the Regulations shall not be cut, destroyed, or removed.</p>
<p>Hazardous Substance Ordinance 14 of 1974 <b>Ministry of Health and Social Services</b></p>	<p>Provisions for hazardous waste are amended in this act as it provides <i>"for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby in certain circumstances. to provide for the prohibition and control of the importation, sale, use, operation, application, modification, disposal or dumping of such substance. and to provide for matters connected therewith"</i></p>

Table 3.1: *Cont.*

<p>Agricultural (Commercial) Land Reform Act, 1995, Act No.6 of 1995 <b>Ministry of Agriculture, Water and Land Reform (MAWLR)</b></p>	<p>This Act provide for the acquisition of agricultural land by the State for the purposes of land reform and for the allocation of such land to Namibian citizens who do not own or otherwise have the use of any or of adequate agricultural land, and foremost to those Namibian citizens who have been socially, economically or educationally disadvantaged by past discriminatory laws or practices. to vest in the State a preferent right to purchase agricultural land for the purposes of the Act. to provide for the compulsory acquisition of certain agricultural land by the State for the purposes of the Act. to regulate the acquisition of agricultural land by foreign nationals. to establish a Lands Tribunal and determine its jurisdiction. and to provide for matters connected therewith.</p>
<p>Explosives Act 26 of 1956 (as amended in SA to April 1978) - <b>Ministry Home Affairs, Immigration, Safety and Security (MHAISS)</b></p>	<p>All explosive magazines are to be registered with the Ministry of Mines and Energy as accessory works. In addition, the magazines must be licensed as required by Section 22. The quantity of explosives and the way it is stored must be approved by an inspector. The inspector has powers to enter the premises at any time to conduct inspections regarding the nature of explosive, quantity and the way it is stored. At closure, all explosives are to be disposed of accordingly.</p>
<p>Atmospheric Pollution Prevention Ordinance 11 of 1976. <b>Ministry of Health and Social Services (MHSS)</b></p>	<p>This regulation sets out principles for <i>the prevention of the pollution of the atmosphere and for matters incidental thereto</i>. Part III of the Act sets out regulations pertaining to atmospheric pollution by smoke. While preventative measures for dust atmospheric pollution are outlined in Part IV and Part V outlines provisions for Atmospheric pollution by gases emitted by vehicles.</p>
<p>The Nature Conservation Ordinance, Ordinance 4 of 1975, <b>Ministry of Environment, Forestry and Tourism (MEFT)</b></p>	<p>During the Mine's activities, care must be taken to ensure that protected plant species and the eggs of protected and game bird species are not disturbed or destroyed. If such destruction or disturbance is inevitable, a permit must be obtained in this regard from the Minister of Environment, Forestry and Tourism. Should the Proponent operate a nursery to propagate indigenous plant species for rehabilitation purposes, a permit will be required. At this stage, however, it is envisaged that this type of activity will be contracted out to encourage small business development.</p>
<p>Labour Act, 1992, Act No. 6 of 1992 as amended in the Labour Act, 2007 (Act No. 11 of 2007 <b>Ministry of Labour, Industrial Relations and Employment Creation (MLIREC)</b></p>	<p>The labour Act gives effect to the constitutional commitment of Article 95 (11), to promote and maintain the welfare of the people. This Act is aimed at establishing <i>a comprehensive labour law for all employees. to entrench fundamental labour rights and protections. to regulate basic terms and conditions of employment. to ensure the health, safety and welfare of employees</i> under which provisions are made in chapter 4. <i>Chapter 5</i> of the act improvises on the <i>protection of employees from unfair labour practice</i>.</p>
<p>Petroleum Products and Energy Act 13 of 1990 <b>Ministry of Mines and Energy (MME)</b></p>	<p>Any consumer installation as envisaged in this Act must be licensed. Appropriate consumer installation certificate will need to be obtained from the Ministry for each fuel installation. The construction of the installation must be designed in such a manner as to prevent environmental contamination.</p> <p>Any certificate holder or other person in control of activities related to any petroleum product is obliged to report any major petroleum product spill (defined as a spill of more than 200ℓ per spill) to the Minister. Such person is also obliged to take all steps as may be necessary in accordance with good petroleum industry practices to clean up the spill. Should this obligation not be met, the Minister is empowered to take steps to clean up the spill and to recover the costs thereof from the person.</p> <p>General conditions apply to all certificates issued. These include conditions relating to petroleum spills and the abandonment of the Site. The regulation further provides that the Minister may impose special conditions relating to the preparation and assessment of environmental assessments and the safe disposal of petroleum products.</p>
<p>National Heritage Act 27 of 2004 <b>Ministry of Education, Arts and Culture (MEAC)</b></p>	<p>This Act provides provisions for the protection and conservation of places and objects of heritage significance and the registration of such places and objects. The proposed activities will ensure that if any archaeological or paleontological objects, as described in the Act, are found during the implementation of the activities, such a find shall be reported to the Ministry immediately. If necessary, the relevant permits must be obtained before disturbing or destroying any heritage</p>

### 3.3 Key Regulators / Competent Authorities

Government agencies with permits responsibilities over the proposed project activities are shown in Tables 3.2 and 3.3. Table 3.3 shows the relevant permits / licenses required with respect to the proposed minerals exploration activities.

Table 3.2: Government agencies regulating environmental protection in Namibia.

AUTHORITY	TYPE OF AUTHORISATION
Office of the Environmental Commissioner (OEC), Ministry of Environment, Forestry and Tourism	Issue of Environmental Clearance Certificate (ECC) based on the review of the Environmental Assessments (EA) Reports prepared in accordance with the Environmental Management Act (2007) and the Environmental Impact Assessment Regulations, 2012
Directorate of Forestry Ministry of Environment, Forestry and Tourism	<p>Issues the following permits under the Forest Act (Act 12 of 2001) and the Regulations, 2015:</p> <ul style="list-style-type: none"> <li>❖ A Harvesting Permit is required for any tree cutting and/or harvesting of wood in an area greater than 15 hectares per annum as stated under Section 22 (1), 23 (1), 24 (2 and 3) and 33 (1 and 2) of the Forest Act (Act 12 of 2001). The permit is issued by a Licensing officer, and stipulates conditions of the harvesting on the reverse side of the permit. Inspection of an area to be harvested is done before the permit is issued, and when an application for renewal is made every 3 months.</li> <li>❖ A Transport Permit is required to convey any wood or wood products (e.g., droppers, planks, charcoal, and firewood). It is obtainable from any Forestry Office, and is valid for 7 days.</li> <li>❖ An Export Permit is required to send any wood or wood products outside Namibia. It is obtainable from any Forestry Office, and is valid for 7 days.</li> <li>❖ A Marketing permit is required to enable the producer to sell his/her products to any other party. The permit is valid for 3 months in commercial areas while in communal areas the permit is valid for 1 month only.</li> </ul> <p>The National Botanical Research Institute's (NBRI) mandate is to study the flora and vegetation of Namibia, to promote the understanding, conservation and sustainable use of Namibia's plants for the benefit of all.</p>
Ministry of Mines and Energy (MME)	Competent Authority overseeing all matters related to petroleum exploration and production activities in Namibia. MME is responsible for issuing of all types of Minerals Licenses / Authorisations.
Ministry of Agriculture, Water and Land Reform	The Directorate of Resource Management within the Department of Water Affairs (DWA) at the MAWLR is currently the lead agency responsible for management of surface and groundwater utilisation through the issuing of abstraction permits and waste water disposal permits. DWA is also the Government agency responsible for water quality monitoring and reporting.

Table 3.3: Summary of the permit register applicable to the proposed minerals exploration activities.

ACTIVITY	APPLICABLE LEGISLATION	PERMITTING AUTHORITY	ASSESSMENT RESULTS
Exclusive Prospecting License (EPL)	Petroleum (Exploration and Production) Act 1991 (Act 2 of 1991) As Amended	Ministry of Mines and Energy (MME)	Issued by MME
Environmental Clearance Certificate (ECC)	Environmental Management Act (2007) and the Environmental Impact Assessment Regulations, 2012	Ministry of Environment, Forestry and Tourism (MEFT)	Proponent to Apply for ECC for mineral exploration activities
Land rights covering the proposed project location	Agricultural (Commercial) Land Reform Act, Act 6 of 1995	Private Commercial Farmland	Proposed exploration does not require any Lease Agreement. Access Agreements and Consents shall always be concluded with individual land owners as applicable
Abstraction of water	Water Resources Management Act, 2004 (No. 284 of 2004).	Ministry of Agriculture, Water and Land Reform (MAWLR)	Freshwater Abstraction and Waste Water Discharge Permits to be Applied for once required.
Discharge of effluents or construction of effluent facility			
Removal, disturbances, or destruction of bird eggs	Nature Conservation Ordinance 4, 1975.	Ministry of Environment, Forestry and Tourism (MEFT)	No removals of protected species or mature trees anticipated during the early stages of exploration. Land clearance might be required during the trenching and drilling operation that might form part of the prefeasibility and feasibility stages and if economic resources are discovered and the Proponent decide to apply for a Mining License. The creation of new access shall be undertaken with the consent of the land owners and the physical land clearance must always be done in line with the provisions of the Forest Act, 2001, Act No. 12 of 2001 and the Regulations 2015
Removal, disturbance of protected plants.			
Removal, harvesting, destruction of indigenous trees, bushes, or plants	Forest Act, 2001, Act No. 12 of 2001 and Regulations (2015)		

### 3.4 International and Regional Treaties and Protocols

Article 144 of the Namibian Constitution provides for the enabling mechanism to ensure that all international treaties and protocols are ratified. All ratified treaties and protocols are enforceable within Namibia by the Namibian courts and these include the following:

- ❖ The Paris Agreement, 2016.
- ❖ Convention on Biological Diversity, 1992.
- ❖ Vienna Convention for the Protection of the Ozone Layer, 1985.
- ❖ Montreal Protocol on Substances that Deplete the Ozone Layer, 1987.
- ❖ United Nations Framework Convention on Climate Change, 1992.

- ❖ Kyoto Protocol on the Framework Convention on Climate Change, 1998.
- ❖ Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and Their Disposal, 1989.
- ❖ World Heritage Convention, 1972.
- ❖ Convention to Combat Desertification, 1994. and
- ❖ Stockholm Convention of Persistent Organic Pollutants, 2001.
- ❖ Southern Africa Development Community (SADC) Protocol on Mining, and.
- ❖ Southern Africa Development Community (SADC) Protocol on Energy.

### 3.5 Standards and Guidelines

Industrial effluent likely to be generated by the proposed activities must comply with provisions of the Government Gazette No 217 dated 5 April 1962 (Table 3.4) while the drinking water quality comparative guideline values are shown in Table 3.5. The only key missing components to the regulatory frameworks in Namibia are the standards, and guidelines with respect to gaseous, liquid, and solid emissions. However, in the absence of national gaseous, liquid, and solid emission limits for Namibia, the proposed project shall target the Multilateral Investment Guarantee Agency (MIGA) gaseous effluent emission level and liquid effluent emission levels (Table 3.6). Noise abatement measures must target to achieve either the levels shown in Table 3.7 or a maximum increase in background levels of 3 dB (A) at the nearest receptor location off-site (MIGA guidelines).

Table 3.4: R553 Regional Standards for Industrial Effluent, in Government Gazette No 217 dated 5 April 1962.

Colour, odour and taste	The effluent shall contain no substance in concentrations capable of producing colour, odour or taste	
pH	Between 5.5 and 9.5	
Dissolved oxygen	At least 75% saturation	
Typical faecal coli	No typical faecal coli per 100 ml	
Temperature	Not to exceed 35 °C	
Chemical demand oxygen	Not to exceed 75 mg/l after applying a correction for chloride in the method	
Oxygen absorbed	Not to exceed 10 mg/l	
Total dissolved solids (TDS)	The TDS shall not have been increased by more than 500 mg/l above that of the intake water	
Suspended solids	Not to exceed 25 mg/l	
Sodium (Na)	The Na level shall not have been increased by more than 50 mg/l above that of the intake water	
Soap, oil and grease	Not to exceed 2.5 mg/l	
Other constituents	Residual chlorine	0,1 mg/l as Cl
	Free and saline ammonia	10 mg/l as N
	Arsenic	0,5 mg/l as As
	Boron	1,0 mg/l as B
	Hexavalent Cr	0,05 mg/l as Cr
	Total chromium	0,5 mg/l as Cr
	Copper	1,0 mg/l as Cu
	Phenolic compounds	0,1 mg/l as phenol
	Lead	1,0 mg/l as Pb
	Cyanide and related compounds	0,5 mg/l as CN
	Sulphides	1,0 mg/l as S
	Fluorine	1,0 mg/l as F
	Zinc	5,0 mg/l as Zn

Table 3.5: Comparison of selected guideline values for drinking water quality (after Department of Water Affairs, 2001).

Parameter and Expression of the results			WHO Guidelines for Drinking-Water Quality 2 <sup>nd</sup> edition 1993		Proposed Council Directive of 28 April 1995 (95/C/13-1/03) EEC		Council Directive of 15 July 1980 relating to the quality intended for human consumption 80/778/EEC		U.S. EPA Drinking water Standards and Health Advisories Table December 1995		Namibia, Department of Water Affairs Guidelines for the evaluation of drinking-water for human consumption with reference to chemical, physical and bacteriological quality July 1991			
			Guideline Value (GV)	Proposed Parameter Value	Guideline Level (GL)	Maximum Admissible Concentration (MAC)	Maximum Contaminant Level (MCL)	Group A Excellent Quality	Group B Good Quality	Group C Low Health Risk	Group D Unsuitable			
Temperature	t	°C	-	-	12	25	-	-	-	-	-	-	-	
Hydrogen ion concentration	pH, 25° C	-	R <8.0	6.5 to 9.5	6.5 to 8.5	10	-	-	6.0 to 9.0	5.5 to 9.5	4.0 to 11.0	<4.0 to >11.0		
Electronic conductivity	EC, 25° C	mS/m	-	280	45	-	-	-	150	300	400	>400		
Total dissolved solids	TDS	mg/l	R 1000	-	-	1500	-	-	-	-	-	-		
Total Hardness	CaCO <sub>3</sub>	mg/l	-	-	-	-	-	-	300	650	1300	>1300		
Aluminium	Al	µ g/l	R 200	200	50	200	S	50-200	150	500	1000	>1000		
Ammonia	NH <sub>4</sub> <sup>+</sup>	mg/l	R 1.5	0.5	0.05	0.5	-	-	1.5	2.5	5.0	>5.0		
	N	mg/l	-	1.0	0.04	0.4	-	-	1.0	2.0	4.0	>4.0		
Antimony	Sb	µ g/l	P 5	3	-	10	C	6	50	100	200	>200		
Arsenic	As	µ g/l	10	10	-	50	C	50	100	300	600	>600		
Barium	Ba	µ g/l	P 700	-	100	-	C	2000	500	1000	2000	>2000		
Beryllium	Be	µ g/l	-	-	-	-	C	4	2	5	10	>10		
Bismuth	Bi	µ g/l	-	-	-	-	-	-	250	500	1000	>1000		
Boron	B	µ g/l	300	300	1000	-	-	-	500	2000	4000	>4000		
Bromate	BrO <sub>3</sub> <sup>-</sup>	µ g/l	-	10	-	-	P	10	-	-	-	-		
Bromine	Br	µ g/l	-	-	-	-	-	-	1000	3000	6000	>6000		
Cadmium	Cd	µ g/l	3	5	-	5	C	5	10	20	40	>40		
Calcium	Ca	mg/l	-	-	100	-	-	-	150	200	400	>400		
	CaCO <sub>3</sub>	mg/l	-	-	250	-	-	-	375	500	1000	>1000		
Cerium	Ce	µ g/l	-	-	-	-	-	-	1000	2000	4000	>4000		
Chloride	Cl <sup>-</sup>	mg/l	R 250	-	25	-	S	250	250	600	1200	>1200		
Chromium	Cr	µ g/l	P 50	50	-	50	C	100	100	200	400	>400		
Cobalt		µ g/l	-	-	-	-	-	-	250	500	1000	>1000		
Copper after 12 hours in pipe	Cu	µ g/l	P 2000	2	100	-	C	TT##	500	1000	2000	>2000		
		µ g/l	-	-	3000 <sup>1</sup>	-	S	1000	-	-	-	-		
Cyanide	CN <sup>-</sup>	µ g/l	70	50	-	50	C	200	200	300	600	>600		
Fluoride	F <sup>-</sup>	mg/l	1.5	1.5	-	at 8 to 12 °C: 1.5	C	4	1.5	2.0	3.0	>3.0		
		mg/l	-	-	-	at 25 to 30 °C: 0.7	P,S	2	-	-	-	-		
Gold	Au	µ g/l	-	-	-	-	-	-	2	5	10	>10		
Hydrogen sulphide	H <sub>2</sub> S	µ g/l	R 50	-	-	undetectable	-	-	100	300	600	>600		
Iodine	I	µ g/l	-	-	-	-	-	-	500	1000	2000	>2000		
Iron	Fe	µ g/l	R 300	200	50	200	S	300	100	1000	2000	>2000		
Lead	Pb	µ g/l	10	10	-	50	C	TT#	50	100	200	>200		
Lithium	Li	µ g/l	-	-	-	-	-	-	2500	5000	10000	>10000		
Magnesium	Mg	mg/l	-	-	30	50	-	-	70	100	200	>200		
	CaCO <sub>3</sub>	mg/l	-	-	7	12	-	-	290	420	840	>840		
Manganese	Mn	µ g/l	P 500	50	20	50	S	50	50	1000	2000	>2000		
Mercury	Hg	µ g/l	1	1	-	1	C	2	5	10	20	>20		
Molybdenum	Mo	µ g/l	70	-	-	-	-	-	50	100	200	>200		
Nickel	Ni	µ g/l	20	20	-	50	-	-	250	500	1000	>1000		
Nitrate*	NO <sub>3</sub> <sup>-</sup>	mg/l	P 50	50	25	50	-	45	45	90	180	>180		
	N	mg/l	-	-	5	11	C	10	10	20	40	>40		
Nitrite*	NO <sub>2</sub> <sup>-</sup>	mg/l	3	0.1	-	0.1	-	3	-	-	-	-		
	N	mg/l	-	-	-	-	C	1	-	-	-	-		
Oxygen, dissolved	O <sub>2</sub>	% sat.	-	50	-	-	-	-	-	-	-	-		
Phosphorus	P <sub>2</sub> O <sub>5</sub>	µ g/l	-	-	400	5000	-	-	-	-	-	-		
	PO <sub>4</sub> <sup>3-</sup>	µ g/l	-	-	300	3350	-	-	-	-	-	-		
Potassium	K	mg/l	-	-	10	12	-	-	200	400	800	>800		
Selenium	Se	µ g/l	10	10	-	10	C	50	20	50	100	>100		
Silver	Ag	µ g/l	-	-	-	10	S	100	20	50	100	>100		
Sodium	Na	mg/l	R 200	-	20	175	-	-	100	400	800	>800		
Sulphate	SO <sub>4</sub> <sup>2-</sup>	mg/l	R 250	250	25	250	S	250	200	600	1200	>1200		
Tellurium	Te	µ g/l	-	-	-	-	-	-	2	5	10	>10		
Thallium	Tl	µ g/l	-	-	-	-	C	2	5	10	20	>20		
Tin	Sn	µ g/l	-	-	-	-	-	-	100	200	400	>400		
Titanium	Ti	µ g/l	-	-	-	-	-	-	100	500	1000	>1000		
Tungsten	W	µ g/l	-	-	-	-	-	-	100	500	1000	>1000		
Uranium	U	µ g/l	-	-	-	-	P	20	1000	4000	8000	>8000		
Vanadium	V	µ g/l	-	-	-	-	-	-	250	500	1000	>1000		
Zinc after 12 hours in pipe	Zn	µ g/l	R 3000	-	100	-	S	5000	1000	5000	10000	>10000		
		µ g/l	-	-	5000	-	-	-	-	-	-	-		

P: Provisional  
R: May give reason to complaints from consumers  
C: Current. P: Proposed. S: Secondary.  
T#: Treatment technique in lieu of numeric MCL.  
TT##: treatment technique triggered at action level of 1300 µ g/l

Table 3.6: Liquid effluent emission levels (MIGA /IFC).

<b>Pollutant</b>	<b>Max. Value</b>
pH	6-9
Total suspended solids	50 mg/l
Total metals	10 mg/l
Phosphorous (P)	5 mg/l
Fluoride (F)	20 mg/l
Cadmium (Cd)	0.1 mg/l

Table 3.7: Noise emission levels (MIGA /IFC).

	<b>Maximum Allowable Leq (hourly), in dB(A)</b>	
	Day time (07:00 – 22:00)	Night time (22:00 – 07:00)
Receptor		
Residential, institutional, educational	55	45
Industrial, commercial	70	70

### 3.6 Recommendations on Permitting Requirements

It is hereby recommended that the Proponent must follow the provisions of all relevant national regulatory throughout the proposed project lifecycle and must obtain the following permits/authorisations as maybe applicable / required as the proposed project develops:

- (i) Valid EPL as may be applicable from Department of Mines in the MME.
- (ii) Valid ECC from the Department of Environmental Affairs in the MEFT.
- (iii) The Proponent shall apply for a fresh water abstraction and waste water discharge permits from the Department of Water Affairs (DWA) in the MAWLR before drilling a water borehole and discharge wastewater into the environment respectively, and.
- (iv) All other permits as may be applicable for the proposed exploration operations.

## 4. SUMMARY OF NATURAL ENVIRONMENT

### 4.1 Climate

The EPL 5439 is located in the Karibib District, Erongo Region in central Namibia with daytime warm to hot temperatures throughout the year, while the nights are mild to cool in winter. The mean annual rainfall is highly variable and may range between 200 - 300 mm in some parts of the EPL Area (Fig. 4.1). The distribution of rainfall is extremely seasonal with almost all the rain falling in summer - from November to April with occasional with mean annual gross evaporation of about 3300 mm (Fig. 4.1). The local project area has the following three distinct seasons:

- ❖ A dry and relatively cool season from April to August with average daytime highs of 23°C and virtually no rainfall during this period;
- ❖ A hot and dry season from September to December with minimal and variable rainfall falling (<20mm per month) and average daytime highs of 30°C, which regularly exceed 40°C, and;
- ❖ A hot and rainy season from January through to March with >50mm per month falling during this period (although this is extremely variable) and average high temperatures of 29°C.

The project area does not have a weather station with reliable wind records. However, based on the regional wind patterns, the prevailing wind in the area seems to be dominated by winds from the north eastern and southwest quadrants. Locally, the situation may be different due to various influences including topographic effects.

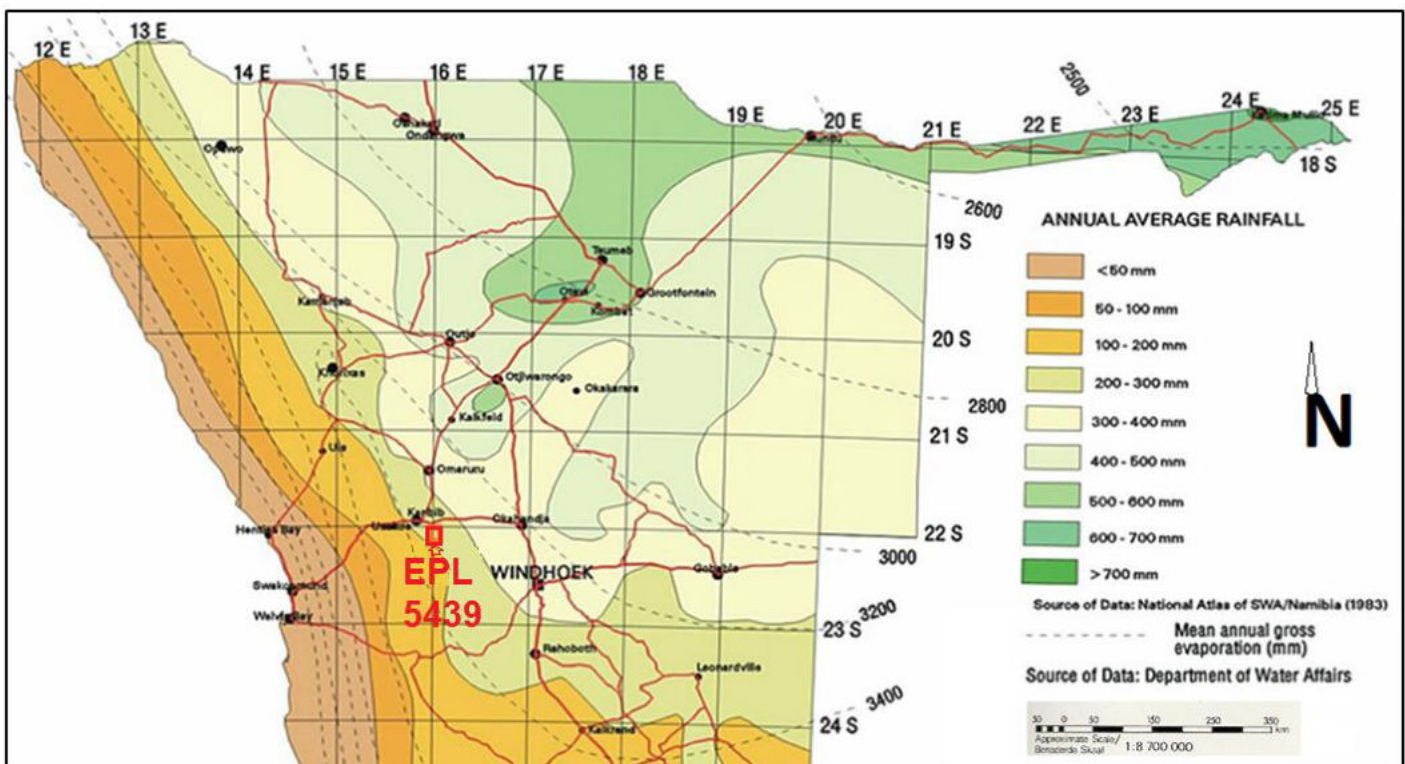


Figure 4.1: Regional climatic patterns of Namibia showing the location of the study area (Directorate of Environmental Affairs, 2002).

### 4.2 Topography

The EPL 5439 falls within the foothills of the escarpment, more specifically within the Otjipatera Mountain Range which has a highest point of 1,989 mamsl. The terrain is rocky and rugged in nature with steep slopes characterising the mountainous sections whilst the foothills of the mountains are flat and gently undulating.



The drainage of the area is dendritic in nature with ephemeral streams, often steeply incised, forming small early-stage tributaries into the Swakop River which one of the major ephemeral rivers of western Namibia.

## **4.3 Vertebrate Fauna and Flora Diversity**

### **4.3.1 Introduction**

Approximately 261 species of reptiles are known or expected to occur in Namibia thus supporting approximately 30% of the continents species diversity (Griffin 1998a). At least 22% or 55 species of Namibian lizards are classified as endemic. The occurrence of reptiles of “conservation concern” includes about 67% of Namibian reptiles (Griffin 1998a). Emergency grazing and large-scale mineral extraction in critical habitats are some of the biggest problems facing reptiles in Namibia (Griffin 1998a).

It is estimated that at least 74-101 species of larger trees and shrubs (>1m) (Coats Palgrave 1983 [85sp.], Curtis & Mannheimer 2005 [101sp.], Van Wyk & Van Wyk 1997 [62sp. & 12sp. endemic]) occur in the general Karibib, central western Namibia, area.

### **4.3.2 Fauna Diversity**

#### **4.3.2.1 Overview**

It is estimated that at least 74 species of reptile, 7 amphibian, 87 mammal, 216 birds, 74-101 larger trees and shrubs and up to 80 grass species occur in the general/immediate Karibib area – including the Lithium mining area – of which a high proportion are endemic species. Endemics include at least 44.6% of the reptiles, 42.9% of the amphibians, 10.3% of the mammals and 5.6% (or 85.7% of all the Namibian endemics) known, or expected to occur in the general area. Although endemics are known to occur from the general area, it is currently not clear if any of these are associated with the proposed development area(s). The very high percentage of unique and/or endemic species underscores the importance of the general area for reptiles. The tortoises, *Stigmochelys pardalis* and *Psammobates oculiferus*, pythons *P. anchietae* and *P. natalensis*, monitor lizard *Varanus albigularis* and some of the endemic and little-known gecko species – e.g. *Pachydactylus* species – are viewed as the most important species potentially occurring in the area. However, none of the reptiles are exclusively associated with the proposed development area and occur more widespread throughout Namibia.

Amphibians of unique conservation value are the 2 endemics (*Poyntonophrynus hoeschi* and *Phrynomantis annectens*) and 1 species is classified as “near threatened” (*Pyxicephalus adspersus*). However, none of the amphibians are exclusively associated with the proposed development area and occur more widespread throughout Namibia. Mammals, especially small mammals (rodents and bats) and carnivores are well represented in the area. The little-known bats are probably underrepresented in the area due to a lack of surveying from the area. Species of greatest concern in the general area are those viewed as “rare” in Namibia – i.e. Namibian Wing-gland Bat and Southern African Hedgehog – and species classified as “near threatened” – i.e. Commerson’s Roundleaf Bat, Striped Leaf-nosed Bat & Brown Hyena, Leopard – and “vulnerable” by the IUCN (2013) – i.e. Cheetah & Hartmann’s Mountain Zebra. However, none of the mammals are exclusively associated with the proposed development area and occur more widespread throughout Namibia.

Endemic birds are well represented in the general area (85.7% of all Namibian endemic species or 5.6% of all the species expected to occur in the area). The most important bird species from the general area are those classified as endemic to Namibia of which the Damara Hornbill and Herero Chat are viewed as the most important species. Other species of concern are the various raptors as these are often directly persecuted as stock thieves (e.g. various eagles – Tawny, Booted & Martial) or indirectly affected by the use of poisons (e.g. vultures – White-backed & Lappet-faced) throughout Namibia. However, none of the birds are exclusively associated with the proposed development area and occur more widespread throughout Namibia.

### 4.3.2.2 Reptiles

At least 74 species of reptiles are expected to occur in the Karibib area with 33 species being endemic – i.e. 44.6% endemic species. These consist of at least 30 snakes (1 blind snake, 2 thread snake, 2 python, 2 burrowing snakes & 23 typical snakes), 11 of which are endemic (33.3%) to Namibia, 2 tortoises, 1 terrapin, 41 lizards (1 worm lizard, 10 skinks, 6 Old World lizards, 2 Plated lizards, 1 Girdled lizard, 1 Monitor lizard, 3 Agamas, 1 Chameleons & 16 Geckos), 22 (53.7%) of which are endemic to Namibia. Skink's (10 species), Old World Lizards (6 species) and Gecko's (16 species) are the most numerous lizards expected from the general area. Namibia with approximately 129 species of lizards (Lacertilia) has one of the continents richest lizard fauna (Griffin 1998a). Geckos have the highest occurrence of endemics in the general area with 12 of the 16 species (75%) expected and/or known to occur in the area, being endemic to Namibia. Due to the fact that reptiles are an understudied group of animals, especially in Namibia, it is expected that more species may be located in the general area than presented above.

### 4.3.2.3 Amphibians

According to Mendelsohn et al. (2002), the overall frog diversity in the general Karibib area is estimated at between 4-7 species. Griffin (1998b) puts the species richness in the general area at 10 species. According to the literature review, at least 7 species of amphibians can occur in suitable habitat in the general Karibib area. The area is under represented, with 2 toads, and 1 species each for rubber, puddle, bullfrog, sand and platanna known and/or expected (i.e. potentially could be found in the area) to occur in the area. Of these, 2 species are endemic (*Poyntonophrynus* (*Bufo*) *hoeschi* and *Phrynomantis annectens*) (Griffin 1998b) and 1 species is classified as “near threatened” (*Pyxicephalus adspersus*) (Du Preez and Carruthers 2009) – i.e. high level (42.9%) of amphibians of conservation value from the general area.

### 4.3.2.4 Mammals

Namibia is well endowed with mammal diversity with at least 250 species occurring in the country. These include the well-known big and hairy as well as a legion of smaller and lesser-known species. Currently 14 mammal species are considered endemic to Namibia of which 11 species are rodents and small carnivores of which very little is known. Most endemic mammals are associated with the Namib and escarpment with 60% of these rock-dwelling (Griffin 1998c). According to Griffin (1998c) the endemic mammal fauna is best characterized by the endemic rodent family *Petromuridae* (Dassie rat) and the rodent genera *Gerbillurus* and *Petromyscus*.

Overall terrestrial diversity and endemism – all species – is classified as “average” and “high” respectively in the general Karibib area (Mendelsohn et al. 2002). The overall diversity (5-6 species) and abundance of large herbivorous mammals is “high” in the general area with Kudu, Mountain Zebra and Oryx having the highest densities of the larger species (Mendelsohn et al. 2002). The overall abundance and diversity of large carnivorous mammals is “average” (4 species) in the general area with Leopard and Cheetah having the highest densities of the larger species (Mendelsohn et al. 2002). The overall mammal diversity in the general Karibib area is estimated at between 61-75 species with 5-6 species being endemic to the area (Mendelsohn et al. 2002). Griffin (1998c) puts the species richness distribution of endemic mammals between 7-8 species in the general area while the closest protected areas, the Skeleton Coast and Namib-Naukluft National Parks, at 87 and 80 species, respectively.

According to the literature at least 87 species of mammals are known and/or expected to occur in the general Karibib area of which 9 species (10.3%) are classified as endemic. The Namibian legislation classifies 5 species as “vulnerable”, 2 species as “rare”, 3 species as “specially protected game”, 9 species as “protected game”, 5 species as “insufficiently known”, 4 species as “hunnable game” and 4 species as “problem animals”. Five species of bat are not listed – i.e. according to Monadjem et al. (2010) these bats potentially could occur in the general Karibib area according to a habitat modelling programme although not yet actually confirmed.

At least 30.2% (38 species) of the mammalian fauna that occur or are expected to occur in the general Karibib area are represented by rodents of which 6 species (23.1%) are endemic. This is followed by

bats 27.9% (24 species) of which 1 species is classified as “rare”. Thirty five species (40.2%) have IUCN, CITES and SARDB international conservation status of which 1 species is classified as “endangered”, 1 species as “rare”, 3 species as “vulnerable”, 16 species as “near threatened”, 7 species as “data deficient”, 7 species as CITES Appendix 1 or 2. The House Mouse (*Mus musculus*) is viewed as an invasive alien species to the area. *Mus musculus* are generally known as casual pests and not viewed as problematic although they are known carriers of “plague” and can cause economic losses.

#### 4.3.2.5 Birds

Bird diversity and endemism is viewed as “high” in the general Karibib area with 171-200 species, of which 8 species being endemic, expected in the area (Mendelsohn et al. 2000). Simmons (1998a) suggests 7-9 endemic species and a “high” ranking for southern African endemics and “average” ranking for red data birds expected from the general area. Although the Karibib area is not classified as an Important Birding Area (IBA) in Namibia (Simmons 1998a) the closest such sites are located to the west at the coast – i.e. Walvis Bay, Sandwich and Mile 4 Saltworks – while the closest inland IBA’s are Brandberg and Naukluft.

At least 216 bird species [mainly terrestrial “breeding residents”] occur and/or could occur in the general Karibib area at any time (Hockey et al. 2006, Maclean 1985, Tarboton 2001). Twelve of the 14 Namibian endemics are expected to occur in the general area (85.7% of all Namibian endemic species or 5.6% of all the species expected to occur in the area). Fifty-seven species have a southern African conservation rating with 8 species classified as endemic (14% of southern African endemics or 3.7% of all the birds expected) and 49 species classified as near endemic (86% of southern African endemics or 22.7% of all the birds expected) (Hockey et al. 2006).

The only birds confirmed (i.e. actually observed and or other evidence – e.g. nests, feathers, etc.) to occur in the Lithium mining area during the fieldwork conducted between 4 and 6 September 2013 were 20 species with the most important being the endemic Monteiro’s Hornbill and Rosy-faced Lovebird. At least 77 other birds previously confirmed – author’s personal records – are expected to occur in the general area although not observed during the fieldwork. Of these 5 species are endemic; 2 species endangered; 2 species near threatened and 1 species vulnerable in Namibia.

The most important bird species from the general area are those classified as endemic to Namibia of which the Damara Hornbill and Herero Chat are viewed as the most important due to the overall lack of knowledge of these species. Although also viewed as important, Rüppels Korhaan is migratory throughout its range while the Rockrunner inhabits inaccessible terrain and is widespread throughout mountainous areas in Namibia. Other species of concern are the various raptors as these are often directly persecuted as stock thieves (e.g. various eagles – Tawny, Booted & Martial) or indirectly affected by the use of poisons (e.g. vultures – White-backed & Lappet-faced) throughout Namibia.

The low number of birds observed on site could be ascribed to extremely dry conditions – i.e. no open surface water – and little grass cover due to a recent veld fire in the area.

### 4.3.3 Flora Diversity

#### 4.2.3.1 Overview

The following vegetation types that occur in the Karibib area inclusive of the EPL 5439 area:

- (i) **Western Highlands:** The dominant vegetation structure is viewed as “grasslands and scattered trees” or “sparse shrubland” with a high variation in green vegetation biomass (>15%) (Mendelsohn *et al.* 2002);
- (ii) **Semi-desert savannah and transition zone:** This semi-desert and savannah transition zone as referred to by Giess (1971) is typified by shrubs (“fodder bushes”) such as *Blepharis pruinosa*, *Leucosphaera bainesii* and *Monechma genistifolia*. Larger woody species such as *Acacia erioloba* are confined to the drainage lines. The area west of Karibib is characterised by *A. senegal* shrubs and *Cyphostemma currorii* and *C. bainesii* also occurring

in this region. The trees common in the area are *Commiphora glaucescens*, *C. virgata* and *C. dinteri* as well as *Boscia albitrunca* and *B. foetida* (Giess 1971).

- (iii) **Thornbush Savannah:** This area is towards the west of Karibib and dominates the central parts of Namibia mainly dominated by Acacia species – e.g. *A. tortillis*, *A. reficiens*, *A. hebeclada*, *A. erubescens* and *A. fleckii* (Giess 1971). Other bigger trees include *Boscia albitrunca* and *Ziziphus mucronata*.

#### 4.2.3.2 Trees/shrubs and Grasses

At least 91 to 101 larger species of trees and shrubs are known and/or expected to occur in the general area of which 8 species (7.9%) are classified as endemics, 4 species as near endemics, 19 species (18.8%) are protected by Forestry (8 according to the Forestry Ordinance No. 37 of 1952 and 11 according to various Forestry laws – Curtis and Mannheimer 2005 and Mannheimer and Curtis 2009), 5 species (4.9%) are protected under the Nature Conservation Ordinance No. 4 of 1975 and 6 species (5.9%) are classified as CITES Appendix II species. All the trees with some kind of conservation and/or protected status are viewed as important in the general Karibib area. The most important species observed within the EPL 5439 area is *Cyphostemma currorii* (Plate 4.1). The endemic grass – *Eragrostis omahekensis* – is viewed as the most important species potentially occurring in the general area.



Plate 4.1: *Cyphostemma currorii* individuals are viewed as the most important plants occurring in the area (Source: Cunningham, 2013).

#### 4.2.3.3 Others Important Flora Species

Aloes are protected throughout Namibia and three (3) aloe species likely to occur in the general area and viewed as important are *Aloe asperifolia*, *A. hereroensis* and *A. zebrina* (Rothmann 2004). Many endemic *Commiphora* species are found throughout Namibia with Steyn (2003) indicating that *Commiphora crenato-serrata* potentially also occurring in the general area. Other species with

commercial potential that could occur in the general Karibib area include *Harpagophytum procumbens* (Devil's claw) – harvested for medicinal purposes and often over-exploited – and *Citrullus lanatus* (Tsamma melon) which potentially has a huge economic benefit (Mendelsohn *et al.* 2002). At least 64 species of ferns, of which 13 species being endemic, occur throughout Namibia. Ferns in the general Karibib area include at least 15 indigenous species (*Actiniopteris radiata*, *Asplenium cordatum*, *Cheilanthes dinteri*, *C. eckloniana*, *C. marlothii*, *C. parviloba*, *Marselia aegyptiaca*, *M. ephippiocarpa*, *M. farinosa*, *M. macrocarpa*, *M. nubica*, *M. unicornis*, *M. vera*, *Ophioglossum polyphyllum* & *Pellaea calomelanos*) (Crouch *et al.* 2011).

The overall diversity of lichens is poorly known from Namibia, especially the coastal areas and statistics on endemism is even sparser (Craven 1998). Lichens are known to occur on rocky mountainous terrain within the EPL Area (Plate 4.2).

#### 4.2.3.4 Invasive Alien Species

Prevent the planting of potentially invasive alien plant species (e.g. *Tecoma stans*, *Pennisetum setaceum*, etc.) for ornamental purposes as part of the landscaping – e.g. office buildings, etc. Alien species often “escape” and become invasive causing further ecological damage as is evident from previous human habitation in the area. Invasive alien species known to exist within the EPL area include *Opuntia* spp., *Prosopis* spp., and *Ricinus communis* (Plate 4.3 – 4.5).

#### 4.3.4 Fauna and Flora Conclusions

Species most likely to be adversely affected by the proposed exploration and possible mining operations within the EPL 5439 would be the variety of reptiles and birds specifically associated with the proposed development site(s) as well as the potential effect such development may have on carnivores as well as the protected and unique flora. As all development have potential negative environmental consequences, identifying the most important fauna and flora species including high risk habitats beforehand, coupled with environmentally acceptable mitigating factors, lessens the overall impact of such development. The following is the summary of the most important fauna and flora (habitat) areas within the EPL area:

- (i) Ephemeral spring: Potential ephemeral springs that might be found within the EPL area are viewed as important habitat for all vertebrate fauna;
- (ii) Ephemeral drainage lines: The various ephemeral drainage lines are important habitat to larger trees, especially *Acacia erioloba* (protected), and;
- (iii) Mountainous areas with unique flora: *Cyphostemma currorii* known to exist within the EPL area are protected (Plate 4.1).

The following is summary of the key aspect of the proposed exploration programme likely to have some negative impacts on the receiving environment:

- (i) Access routes - Localised disruption/destruction of the habitat and thus consequently fauna associated directly with the actual routes. This however, would be a relatively small area with localised implications because the proponent will utilise the already existing extensive access routes used during the previous exploration and mining operations dating back to the 1950s;
- (ii) Excavation, trenching/ drilling sites - Localised disruption/destruction of the habitat and thus consequently fauna associated directly with the actual sites. This however, would be a relatively small area and will depend on scale of the operations resulting in localised implications;
- (iii) Supporting Infrastructure including campsite - Localised disruption/destruction of the habitat and thus consequently fauna associated directly with the actual sites. This however, would be a relatively small area – especially if the existing (albeit ruins) infrastructure areas are used rather than affecting new sites – with localised implications.





Plate 4.2: Lichens observed on rocky substrate found within the EPL area (Source: Cunningham, 2013).



Plate 4.3: *Opuntia spp.*, found within the EPL 5439 area, typically close to old ruins in area (Source: Cunningham, 2013).





Plate 4.4: *Prosopis* spp., found within the EPL area (Source: Cunningham, 2013).



Plate 4.5: *Ricinus communis* found within the EPL area (Source: Cunningham, 2013).

## **4.4 Socioeconomic Setting**

### **4.4.1 Overview**

The nearest Town to the EPL 5439 is the mining Town of Karibib. The development of this project will have some socioeconomic contributions to the Town of Karibib which currently is dependent on the Navachab Gold Mine. There will be temporary employment opportunities and workers from the project area will be staying in the Town of Karibib. Potential for the development of a viable mining project will bring added local benefits and contribute to the national economy through taxes, royalty and direct investment.

### **4.4.2 Agriculture**

As an important cattle, game and small stock (goats and sheep) farming area (and consequently a source of employment) as well as renewed interest from a tourism point of view, the importance of the western central Namibia to the GDP of Namibia is invaluable. The area surrounding EPL 5439 area falls within the long established private commercial farming communities.

The carrying capacity for the general area is 10-20kg/ha (Mendelsohn et al. 2002) or 12-15LAU/ha (van der Merwe 1983) and the risk of farming is viewed as relatively high. Small stock farming is the dominant farming activity in the Karibib area with between 70-80% of stock farmed with being sheep and 20-30% goats and cattle, respectively (van der Merwe 1983). The stock density is estimated at <3sheep/km<sup>2</sup> (1.5% of total sheep in Namibia) and <1cattle/km<sup>2</sup> (1.3% of total cattle in Namibia) (van der Merwe 1983). There are numerous existing tourism ventures in the area with the tourism potential viewed as relatively high (Mendelsohn et al. 2002).

### **4.4.3 Conservation and Tourism**

The area does not fall within a Communal Conservancy with the closest being #Gaingu located in the Spitskoppe area to the west of Karibib, neither within a Freehold (i.e. commercial) Conservancy with Okawi being the closest, east of Karibib (Mendelsohn et al. 2002, NACSO 2006, 2010). The area is not well known for tourism and it does not have major tourism products such as unique natural landscapes, cultural resources or nature parks.

### **4.4.4 Safety, Security and Obstructions**

Current safety issues include unsecured old mine shafts, excavations, scattered scrap metals and unstable rock waste and tailings dumps. Generally, there will be a need to ensure that the mine site facilities are adequately secured for all employees and the general public and visitors to the EPL area. The entire proposed development will not cause any obstruction to human or fauna.

## **4.5 Ground Components**

### **4.5.1 Regional Geology**

The EPL 5439 falls within the Central Zone of the Damara Sequence which underlies most of Namibia. The oldest rocks within the Central Zone are the pre-Damara basement that consists of gneiss and granite lithologies found in different parts of the zone (Miller, 1992). According to Miller, (1983a), the sequence was deposited during successive phases of rifting, spreading, subduction and continental collision. Much of the basal succession (Nosib Group), laid down in or marginal to intracontinental rifts, consists of quartzite, arkose, conglomerate, phyllite, calc-silicate, subordinate, limestone and evaporitic rocks. Local alkaline ignimbrites with associated subvolcanic intrusions ranging from 840 to 720 million years in age also form part of the regional geology (Miller, 1992).

According to Miller, (1992), widespread carbonate deposition followed and overlapped far beyond early rift shoulders (Kudis, Ugab and basal Khomas Subgroups); interbedded mica and graphitic schist, quartzite (some ferruginous), massflow deposits, iron-formation and local within-plate basic lava point to fairly variable depositional conditions south of a stable platform where only carbonates with very minor clastics occur (Otavi Group). Near the southern margin of the orogen, deep-water fans, facies



equivalents of the carbonates were deposited on either side of a Southern Zone ocean separating Kalahari and Congo Cratons (Auas and Tinkas Formations). Thick schistose metagreywacke and metapelite (Kuseb Formation) overlie the above rocks.

The lithostratigraphy of the Damara Sequence in the Central Zone (CZ) in which the EPL 5439 falls has been reviewed and significantly revised by Badenhorst (1987), who has also correlated the stratigraphy across the Omaruru Lineament. The stratigraphy of the CZ taken from Steven (1993) as slightly modified after Badenhorst, (1987) and (1988) is given in Table 4.1.

Table 4.1: Partial Lithostratigraphy of the Damara Sequence in Central Namibia (Karibib-Swakopmund Area) (Source: Venmyn Deloitte, 2014).

GROUP	SUB-GROUP	FORMATION	THICKNESS (m)	LITHOLOGICAL DESCRIPTION
Swakop	Khomas	Kuseb	3,000	Biotite-rich quartzo-feldspathic schist, biotite-garnet-cordierite schist, minor amphibolite schist, quartzite, calc-silicate rock and marble.
		Karibib	700	Marble, biotite schist, quartz schist and calc-silicate rock.
		Chuosis	700	Diamictite, pebble- and boulder-bearing schist and minor quartzite
	<i>Discordance</i>			
	Ugab	Rössing	200	Very variable marble, quartzite, conglomerate, biotite schist, biotite cordierite schist and gneiss, aluminous gneiss, biotite-hornblende schist and calc-silicate schist.
<i>Unconformity or conformable transition</i>				
Nosib		Khan	1,100	Various gneisses, quartzite, schist, conglomerate, minor marble, amphibolite and calc-silicate rock.
		Etusis	3,500	Layered light-red to greyish-brown quartzites with high feldspar content. In-between para-gneisses, biotite schists and conglomerates occur.

#### 4.5.2 Local Geology

Pegmatites containing rare metals appear confined to narrow regional belts of metasediments of the Uis Formation within the Swakop Group, which are considered partially time equivalent to the Kuseb, Karibib and Chuosis Formations (Table 4.1), pegmatites which have been preserved in grabens active since Proterozoic times. The pegmatites found in the EPL 5439 are considered to be of the Uis type, named after the nearby Uis pegmatite and Uis Tin Mine, which ranks among the largest pegmatite deposit of its kind anywhere in the world (Fig. 4.2).

Helikon I and Helikon II, two large rare metal-bearing lithium-rich pegmatites, occur within the Helikon-Rubikon Pegmatite Belt (Fig. 4.2), both of which have been historically mined for lepidolite, amblygonite and petalite whilst beryl, pollucite, quartz and columbite-tantalite were minor by-products (Diehl, 1992). Broadly speaking the Helikon I and II pegmatites are a pair of east-west striking, steeply dipping, well zoned pegmatites which intruded a banded dolomitic marble and biotite-quartz schist country rock (Diehl, 1992). According to Diehl, (1992), the zoning in general consists of an outer albite-quartz-muscovite (perthite) zone, followed inwards by a lepidolite zone, a quartz core zone and a hanging-wall mineralised zone (amblygonite, pollucite and beryl-columbite-tantalite).



#### 4.5.4 Geotechnical Engineering Considerations

Rocks of varying geotechnical characteristics are expected within the pegmatite zones and alternating bands within the banded dolomitic marble and biotite-quartz schist country rock and covered by a variety of sediments in some places. No field and laboratory assessment of rock mass and detailed discontinuities survey were undertaken as part of this study. Table 4.2 outlines an indicative classification of the various discontinuities that are likely to be found in the area. Both low and high order discontinuities are likely to be found around the EPL area.

Generally, dolomitic marble and biotite-quartz schist have good bearing capacities and depending on the dip and intersections of the various discontinuities, can withstand near vertical steep slopes. The rocks are also suitable for coarse concrete aggregate and some of the more quartz-rich varieties of the country rocks can be used for rock fills in various mine support infrastructural construction activities. The fine aggregates are generally available. The alluvium in the surrounding ephemeral river channels could be used as fine concrete aggregate for potential future mine development. However, these alluvial materials may also be too fine-graded with possibly too high clay content, hence must be tested before final used in the construction of various structures. Clay and silt are quite common constituents of the alluvial terraces. Salt encrustations on the surface are indicating of the presence of a high content of soluble salts in these formations, which may endanger buried metal drainage pipes.

It's highly recommended that a field-based geotechnical engineering assessment followed by laboratory assessments must be undertaken before the implementation deep excavation in order to have accurate figures of all the key geotechnical parameters.

Table 4.2: General rock structure scheme (Source: Mwiya, 2004).

GEOMETRY				CHARACTERISTIC			EXAMPLE	INFLUENCE INDICATOR
DISCONTINUITY	LENGTH m	SPACING m	WIDTH m	TRANSMISSIVITY m <sup>2</sup> /s	HYDRAULIC CONDUCTIVITY m/s	INFILLING THICKNESS m		
<b>LOW ORDER DISCONTINUITIES; ZONES OUTCROPS</b>								
1 <sup>ST</sup> ORDER	>10 <sup>4</sup>	>10 <sup>3</sup>	>10 <sup>2</sup>	10 <sup>-5</sup> - 10 <sup>-2</sup>	10 <sup>-7</sup> - 10 <sup>-5</sup> AV. [10 <sup>-6</sup> ]	10 <sup>0</sup>	Regional major fault systems	4 V. High
2 <sup>ND</sup> ORDER	10 <sup>3</sup> - 10 <sup>4</sup>	10 <sup>2</sup> - 10 <sup>3</sup>	10 <sup>1</sup> - 10 <sup>2</sup>	10 <sup>-7</sup> - 10 <sup>-4</sup>	10 <sup>-8</sup> - 10 <sup>-6</sup> AV. [10 <sup>-7</sup> ]	10 <sup>-1</sup>	Local major fault zones	
3 <sup>RD</sup> ORDER	10 <sup>2</sup> - 10 <sup>3</sup>	10 <sup>1</sup> - 10 <sup>2</sup>	10 <sup>0</sup> - 10 <sup>1</sup>	10 <sup>-9</sup> - 10 <sup>-6</sup>	10 <sup>-9</sup> - 10 <sup>-7</sup> AV. [10 <sup>-8</sup> ]	≤10 <sup>-2</sup>	Local minor fault zones	
<b>HIGH ORDER DISCONTINUITIES: INDEPENDENT OUTCROPS</b>								
4 <sup>TH</sup> ORDER	10 <sup>1</sup> - 10 <sup>2</sup>	10 <sup>0</sup> - 10 <sup>1</sup>	-	-	10 <sup>-11</sup> - 10 <sup>-9</sup> AV. [10 <sup>-10</sup> ]	-	Local major joint set or bedding	3 High
5 <sup>TH</sup> ORDER	10 <sup>0</sup> - 10 <sup>1</sup>	10 <sup>-1</sup> - 10 <sup>0</sup>	-	-	10 <sup>-12</sup> - 10 <sup>-10</sup> AV. [10 <sup>-11</sup> ]	-	Local minor joints/ fractures	
6 <sup>TH</sup> ORDER	10 <sup>-1</sup> - 10 <sup>0</sup>	10 <sup>-2</sup> - 10 <sup>-1</sup>	-	-	10 <sup>-13</sup> - 10 <sup>-11</sup> AV. [10 <sup>-12</sup> ]	-	Local minor fissures / schistosity	2 Low
7 <sup>TH</sup> ORDER	<10 <sup>-1</sup>	<10 <sup>-2</sup>	-	-	<10 <sup>-13</sup>	-	Crystalline voids	1 V. Low

#### 4.5.5 Water Sources

Groundwater as well as surface water (only during the rainy season) from ephemeral river channels is the sources of water supply in the area as well as much of the Erongo Region. According to the

Department of Water Affairs, (2001), the Erongo Region and in particular the Karibib and the EPL area generally has a low groundwater potential. The area with aquifer potential, more or less reflects the rainfall distribution, decreasing westwards. Knowledge of the aquifers in this area is sparse, due to the low number of boreholes and few on groundwater.

Recharge from rainfall is an important parameter determining the groundwater potential, but the degree of metamorphism affects the groundwater potential too. The groundwater potential of rocks decreases, as the degree of metamorphism increases. Crystalline rocks normally exhibit a very low tendency to store water, typical of the pegmatite zones and the alternating bands within the banded dolomitic marble and biotite-quartz schist found within the project area. The groundwater potential of these rock units is generally low, to locally moderate.

Possible targets for water resources in this area are mainly fractured zones and faults that outcrop on the surface without impermeable infillings. But the success rate and yields for these rock types are generally low. The area along major ephemeral rivers may be more promising due to well developed fractures and faults that give rise to good recharge potential during the rainy season, typical of the local ephemeral spring found within the EPL area.

There is a NamWater Navachab mine water supply pipeline from the Swakoppoort Dam in the area, which dams the ephemeral Swakop River. The water supply pipeline dedicated for Navachab Gold Mine is located within the close proximity of the EPL area.

#### **4.5.6 Evaluation of Water Vulnerability**

Vulnerability assessment of surface water covered possible runoff, the presence of source factors and major flow routes such as ephemeral river channels, valleys and gullies as pathways and the presence of surface water body as a target. The groundwater assessments covered hydraulic properties and thickness of the unsaturated and saturated zones derived from geological and hydrogeological data.

The assessment of the unsaturated characteristics was based on the ability for source factors to influence the system through known pathway factors such as discontinuities. The combined effects of unsaturated and saturated flow probabilities were used as indicator for groundwater vulnerability. However, groundwater or surface water will only be vulnerable to contamination if there are contaminant sources, if there are pathways for contaminant migration and there are targets (surface water or groundwater) present within the project area.

Overall, the limited local groundwater resources found in the area form part of the unconfined aquifer system that is highly vulnerable to any sources of pollution. During the rainy season, surface water bodies can be found along the major ephemeral river systems in the area with an active local spring. This surface water often recharges the local groundwater resources along the faults, solution holes and other discontinuities along the ephemeral rivers in the area.

Therefore, surface water in the area is also highly vulnerable to pollution sources from the proposed activities. It is important that all polluting activities must not be placed or undertaken in areas with high discontinuities, valleys or gullies connected to major ephemeral rivers systems in the area.

## 5. IMPACT ASSESSMENT AND RESULTS

### 5.1 Impact Assessment Procedure

The Environmental Assessment process that has been undertaken with respect to the proposed exploration programme for the EPL No. 5439 has been conducted in accordance with the provisions of the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 gazetted under the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007).

### 5.2 Alternatives and Ecosystem Assessments

The following alternatives have been considered:

- (i) **EPL Location:** A number of potential economic minerals deposits are known to exist in the general area and linked to the regional geology of the EPL area. The Proponent intend to explore / prospect for all the licensed minerals groups likely to be associated with the regional and local geology. The minerals occurrences are site-specific and related to the regional and local geology of a specific area to which there are no alternatives sites to consider with respect to the license location. The only other alternative is the no-action option (no exploration activities are implemented in a specific area).
- (ii) **The No-Action Alternative** - A comparative assessment of the environmental impacts of the 'no-action' alternative (a future in which the proposed exploration activities do not take place) has been undertake. An assessment of the environmental impacts of a future, in which the proposed exploration and possible discovery of economic minerals resources does not take place, may be good for the receiving environment because there will be no negative environmental impacts due to the proposed minerals exploration or possible mining operation that may take place in the EPL area.

The environmental benefits will include:

- ❖ No negative impacts as a result of no mineral exploration taking place, and.
- ❖ Potential future mining related negative environmental impact on the receiving environment.

However, it is important to understand that even if the proposed exploration activities do not take place, to which the likely negative environmental impacts are likely to be low and localised, the other current and future land uses such as agriculture and tourism will still have some negative impacts on the receiving environment. The likely negative environmental impacts of the other current and future land use that may still happen in the absence of the proposed minerals exploration activities includes:

- ❖ Land degradation due to drought and Climate Change.
- ❖ Overgrazing / over stocking beyond the land carrying capacity.
- ❖ Poor land management practices,
- ❖ Wildfires, and.
- ❖ Erosion and overgrazing.

Furthermore, it is important to understand what benefits might be lost if the proposed exploration activities do not take place. Key loses that may never be realised if the proposed project activities do not go-ahead include: Loss of potential added value to the unknown underground minerals resources that maybe found within the EPL No. 5439, socioeconomic benefits derived from current and future exploration, direct and indirect contracts and

employment opportunities, export earnings, foreign direct investments, license rental fees, royalties, and various other taxes payable to the Government.

- (iii) **Other Alternative Land Uses:** The EPL area fall within the well-known commercial agricultural land uses area dominated by cattle, game, and small stock farming activities. The growing game farming is also making tourism a vital socioeconomic opportunity in the general area. Minerals exploration and mining activities are well known land use options in Namibia and the surrounding EPL area. Due to the limited scope of the proposed exploration and the implementation of the EMP, it is likely that the proposed exploration can coexist with the current and potential future land uses within the general area.
- (iv) **Potential Land Use Conflicts:** Considering the current land use practices (agriculture and tourism) as well as potential other land uses including minerals exploration, it is likely that potential economic derivatives from any positive exploration outcomes leading to the development of a mine in the general area can still co-exist with the existing and potential future land use options of the general area. However, much more detailed assessments of any likely visual and other socioeconomic impacts will need to be included in the EIA that must be undertaken as part of the prefeasibility and feasibility studies if economic minerals resources are discovered. The use of thematic mapping and delineation of various land use zones for specific uses such as agriculture, conservation, mining, or tourism etc, within the EPL area will greatly improve the multiple land use practices and promote coexistence for all the possible land use options.
- (v) **Ecosystem Function (What the Ecosystem Does):** Ecosystem functions such as wildlife habitats, carbon cycling or the trapping of nutrients and characterised by the physical, chemical, and biological processes or attributes that contribute to the self-maintenance of an ecosystem in this area are vital components of the receiving environment. However, the proposed exploration activities will not affect the ecosystem function due to the limited scope of the proposed activities because the ecosystem of this EPL area is part of the larger local and regional ecosystems which are all interlinked.
- (vi) **Ecosystem Services:** Food chain, harvesting of animals or plants, and the provision of clean water or scenic views are some of the local ecosystem services associated with the EPL area. However, the proposed exploration activities will not affect the ecosystem services due to the limited scope and area of coverage of the proposed activities because the ecosystem of this EPL area is part of the larger local and regional ecosystems which are all interlinked.
- (vii) **Use Values:** The EPL area has direct values for other land uses such as agriculture, conservation and tourism as well as indirect values which includes: Watching a television show about the general area and its wildlife, food chain linkages that sustains the complex life within this area and bequest value for future generations to enjoy. The proposed exploration activities will not destroy the current use values due to the limited scope of the proposed activities as well as the adherence to the provisions of the EMP as detailed in the EMP report, and.
- (viii) **Non-Use or Passive Use:** The EPL area has an existence value that is not linked to the direct use / benefits to current or future generations. The proposed exploration activities will not affect the ecosystem current or future none or passive uses due to the limited scope of the proposed activities that will leave much of the EPL area untouched because the ecosystem of this EPL area is part of the larger local and regional ecosystems which are all interlinked.

## 5.3 Key Issues Considered in the Assessment Process

### 5.3.1 Sources of Impacts (Proposed Project Activities)

The proposed exploration activities covering initial desktop exploration activities (no field-work undertaken, regional reconnaissance, initial local field-based activities, detailed local field-based

activities, prefeasibility and feasibility studies related activities are the key sources both negative and positive impacts on the receiving environment.

### 5.3.2 Summary of Receptors Likely to be Negative Impacted

Based on the findings of this report, the following is the summary of the key environmental receptors that are may be negatively impacted by the proposed activities:

- ❖ **Physical environment:** Water quality, physical infrastructure and resources, air quality, noise and dust, landscape and topography, soil quality and, Climate change influences.
- ❖ **Biological environment:** Habitat, protected areas and resources, flora, fauna, and ecosystem functions, services, use values and non-use or passive use, and.
- ❖ **Socioeconomic, cultural and archaeological environment:** Local, regional and national socioeconomic settings, commercial and subsistence agriculture, community protection areas tourism and recreation cultural, biological and archaeological resources.

## 5.4 Impact Assessment Methodology

### 5.4.1 Impact Definition

In this report, a natural and/or human environmental impact is defined as: “Change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation’s environmental aspects.” (ISO 14001).

All proposed project activities (routine and non-routine) were considered during the Scoping, EIA and EMP Phases in terms of their potential to:

- ❖ Interact with the existing environment (physical, biological and social elements), and.
- ❖ Breach relevant national legislation, relevant international legislation, standards and guidelines, and corporate environmental policy and management systems.

Where a project activity and receptor were considered to have the potential to interact, the impact has been defined and ranked according to its significance. Table 5.1 provides the definition of different categories of impacts identified and used in this report.

This report has assessed the potential impacts resulting from routine Project activities, assuming that the Project activities that may cause an impact that will occur but the impact itself will be dependent on the likelihood (Probability) (Table 5.1).

Correct control measures through the implementation of the EMP and monitoring thereof, often reduce any negative significant impacts on the receiving environment as the results of the project activities. The assessment therefore, has focussed on the measures aimed at preventing the occurrence of an impact as well as mitigation measures that may be employed.



Table 5.1: Definition of impact categories used in this report.

<b>Nature of Impact</b>	Adverse	Considered to represent an adverse change from the baseline, or to introduce a new undesirable factor.
	Beneficial	Considered to represent an improvement to the baseline or to introduce a new desirable factor.
<b>Type of Impact</b>	Direct	Results from a direct interaction between a planned or unplanned Project activity and the receiving environment.
	Indirect	Results from the Project but at a later time or at a removed distance or which may occur as a secondary effect of a direct impact.
	Cumulative	Results from (i) interactions between separate Project-related residual impacts. and (ii) interactions between Project-related residual impacts in combination with impacts from other projects and their associated activities. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
<b>Duration of Impact</b>	Short-term	Predicted to last only for a limited period but will cease on completion of the activity, or as a result of mitigation/reinstatement measures and natural recovery typically within a year of the project completion.
	Medium-	Predicted to last only for a medium period after the Project finishing, typically one to five years.
	Long-term	Continues over an extended period, typically more than five years after the Project's completion.
	Permanent	Occurs during the development of the Project and causes a permanent change in the affected receptor or resource that endures substantially beyond the Project lifetime.
<b>Scale of Impact</b>	Local	Affects locally important environmental resources or is restricted to a single habitat/biotope, a single community.
	Regional	Affects nationally important environmental resources, or an area that is nationally important/protected or has macro-economic consequences.
	National	Affects nationally important environmental resources, or an area that is nationally important/protected or has macro-economic consequences.
	International	Affects internationally important resources such as areas protected by international Conventions
	Transboundary	Impacts experienced in one country as a result of activities in another.
<b>Probability</b>	Negligible	Possibility negligible
	Improbable	Possibility very low
	Probable	Distinct possibility
	Highly Probable	Most likely
	Definite	Impact will occur regardless of preventive measures

## 5.4.2 Knowledge-Based Impact Assessment Process

### 5.4.2.1 Characterisation of the Impact Assessment Inputs Variables

The impact assessment process for the proposed minerals exploration took into consideration the interactions of the proposed activities with respect to the Knowledge-Based System Model Methodology (KBSMM) characterised climatic, environmental, and ground model datasets of the receiving environment (physical, biological, socioeconomic and ecosystem services and functions).

The influence assessment of the characterised components of the environment has been based on a Knowledge-Based System Model Methodology (KBSMM), a PhD research-based and industry tested / validated Artificial Intelligent (AI) framework developed by Dr Sindila Mwiya.

The KBSMM model inputs variables covered characterised climatic, environmental, and ground model datasets. Source-Pathway-Receptor risk assessment approach was used to determine or validate the influence (impact assessment), and ultimate likely harm that may be linked to the various phased activities of each of the various stages of the proposed minerals exploration implementation process (Fig. 5.1).



### 5.4.2.2 Climatic Data Sets/Components Inputs

The climatic data sets that have been used in the regional and local site-specific assessment process comprised precipitation, temperature, evapotranspiration and wind data sets. The following is summary explanation of the roles that climatic data sets may have on the proposed minerals exploration implementation process (Fig. 5.1):

- ❖ Temperature: Temperature had a direct influence on the fluids that may influence the operation of the site by supporting evapotranspiration. It also has an influence on the planning, operation and implementation of the various project activities.
- ❖ Rainfall: Rainfall is one of the data sets used in the water balance assessments with respect to potential fluid production and flash flood occurrences. The data sets had some influence on mobilisation pollutants that may be associated with the proposed project activities.
- ❖ Evapotranspiration: This combined effect of evaporation and transpiration is important in water balance assessments with direct influences on the implementation of the various project activities, and.
- ❖ Wind Direction and Speed: The direction and speed of the prevailing winds may be critical to the site operations and determination of the optimum operational requirements. The data had a direct influence on the site operations including dust and noise management.

### 5.4.2.3 Environmental Data Sets/Components Inputs

The regional or local environmental data sets used in this project comprise:

- ❖ Economic activities (Proposed minerals exploration) and coordination support available in the area or area.
- ❖ Types and amounts of waste likely to be generated.
- ❖ Likely contaminants from the activities.
- ❖ Ecological, habitats and ecosystems including fauna and flora.
- ❖ Community considerations such, land ownership, social, health and safety, and.
- ❖ Archaeological, cultural and political issues.

The following is summary explanation of the role of the environmental data sets may have on the proposed minerals exploration implementation process (Fig. 5.2):

- ❖ Economic activities and logistic support: The types of economic activities and logistical support services and infrastructure for the proposed activities are a key source of impact component of the environmental data sets in the determination of the likely impacts on the receptors, and.
- ❖ The likely Types and amount of waste: Understanding the characteristics of the liquid and solid waste streams be handled is vital in the evaluation of the hazard exposure in terms of the overall risk assessment to the receptors.

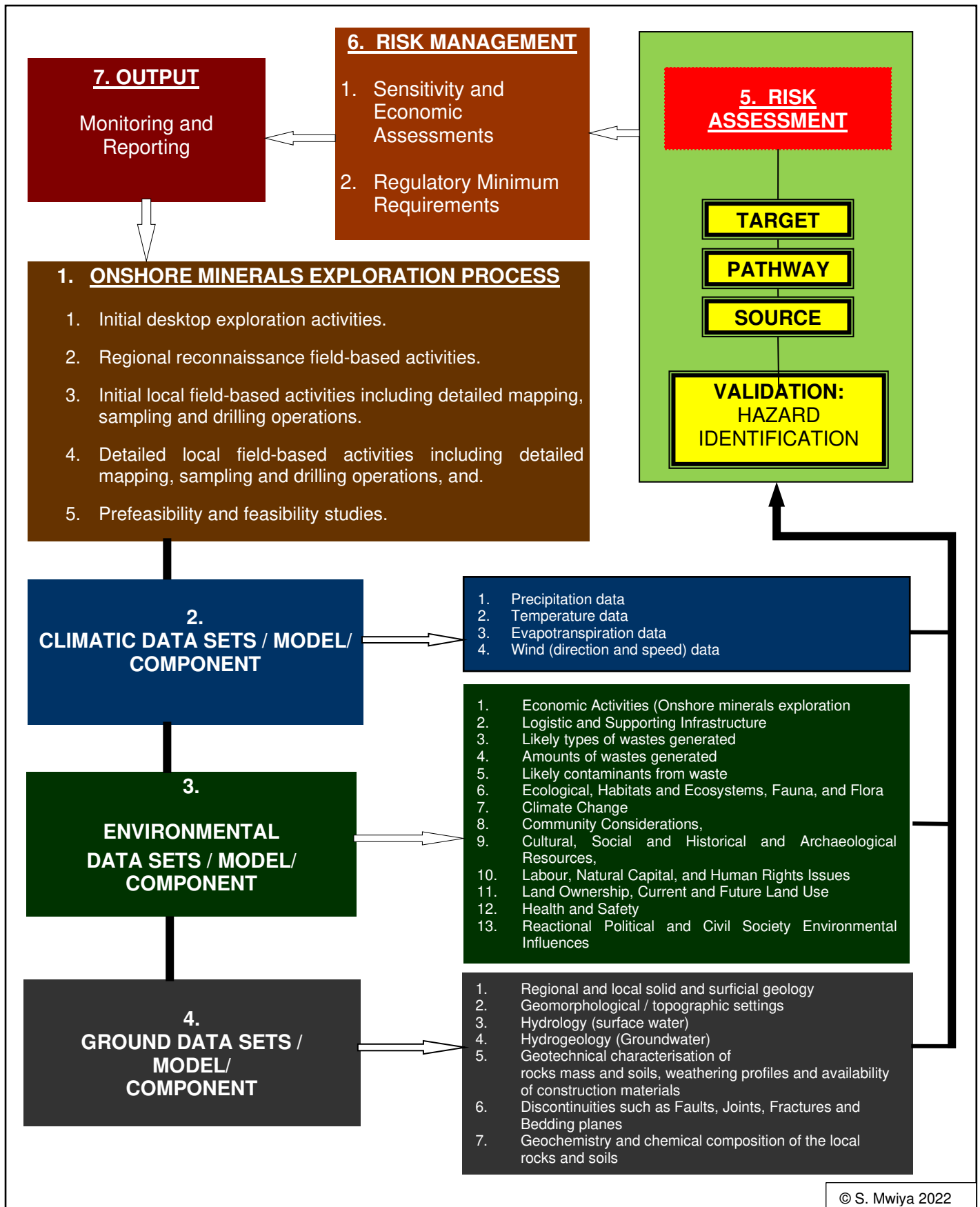


Figure 5.1: Detailed outline of the technical methodology based on a complete looped Knowledge-Based System Model Methodology (KBSMM) used in the impact assessment, risk assessment and determination of the monitoring and reporting strategy. The system model methodology has a built-in looping that allows for the evaluation of a phased onshore minerals exploration process project lifecycle.

- ❖ Likely contaminants: The state (solid, gas, liquid, or vapour) of any likely contaminants that may be associated with the proposed phased onshore minerals exploration activities play a major role in the determination of the likely harm, mitigation, monitoring and reporting strategies.
- ❖ Ecological, habitats, ecosystems, fauna, flora, and local, regional or global Climate Change influences: At national, regional and local levels, there are a number of unique and protected habitats, ecosystems, fauna and flora and highly vital as they support other sectors of the national economy such as tourism, agriculture, food security and services. Understanding the likely level of sensitivity of the regional or local areas is highly important to the successful determination of the likely impacts and harm, development mitigation measures, monitoring and reporting strategy to be implemented for the proposed phased onshore minerals exploration process, and.
- ❖ Community considerations: Local community issues and acceptability of the proposed activities by the local community is of vital importance. Other key components of the community considerations include: Land ownership (State land / Communal or Private), land use, local social settings, labour, natural capital, human rights, public and workers health and safety, archaeological, cultural, political, and civil society influences.

As part of the data collection, evaluation, influence and risk assessment process of the proposed phased onshore minerals exploration, determination of the mitigation measures, monitoring and reporting strategies, specialist assessments conducted as part of the EIA process provided vital recommendations incorporated in this report.

#### **5.4.2.4 Ground Data Sets/Components Inputs**

The ground data sets covered regional/local solid and surficial geology, geomorphological / topographic settings, hydrology (surface water), hydrogeology (groundwater), geotechnical and geochemical characterisation of rocks and soils, weathering profiles and availability of construction materials, and discontinuities such as faults, joints, fractures, and bedding planes of the drilled sites (Fig. 5.1). The geology (solid and superficial) and water (surface and groundwater resources) are all targets that may be influenced (impacted) by the various activities of the proposed phased minerals exploration process implementation. Other ground components which include the local terrain (geomorphology and topographic features), discontinuities, geotechnical as well as geochemical /mineralogy will aid the influence of sources in causing or minimising the impacts to be controlled through mitigations (Fig. 5.1). Regional/local solid and surficial geology, geomorphological and topographic settings also linked directly to the availability of local construction and operational materials in support of the proposed phased minerals exploration process project implementation lifecycle (Fig. 5.1).

#### **5.4.2.5 Source-Pathway-Receptor Risk Assessment, Harm and Monitoring**

To evaluate the level of influence (impact), risk, and harm that the proposed onshore phased minerals exploration process implementation, the assessment process was focused on the sources, pathways, and targets / receptor chains (Fig. 5.2). It is important to note that in the absence of any of the interlinked three (3) components (sources, pathways, or targets/ receptor) there is no harm or risk to mitigate, monitor or manage (Figs. 5.2 and 5.3).

The risk source/s refers to knowledge - based identified potential hazards that may be present and can cause harm to the exposed target/s / receptors (Fig. 5.3). The risk pathway refers to the route direct or indirect through which the risk source/s may be transferred and exposed to a target/s of concern. The risk target/s or receptor/s refers to the destination (area point of exposure) at which the source/s may cause harm. The characterisation of source/s, pathway/s and target/s chain has been undertaken for climatic, environmental and ground model data components with respect to the proposed phased onshore minerals exploration process.

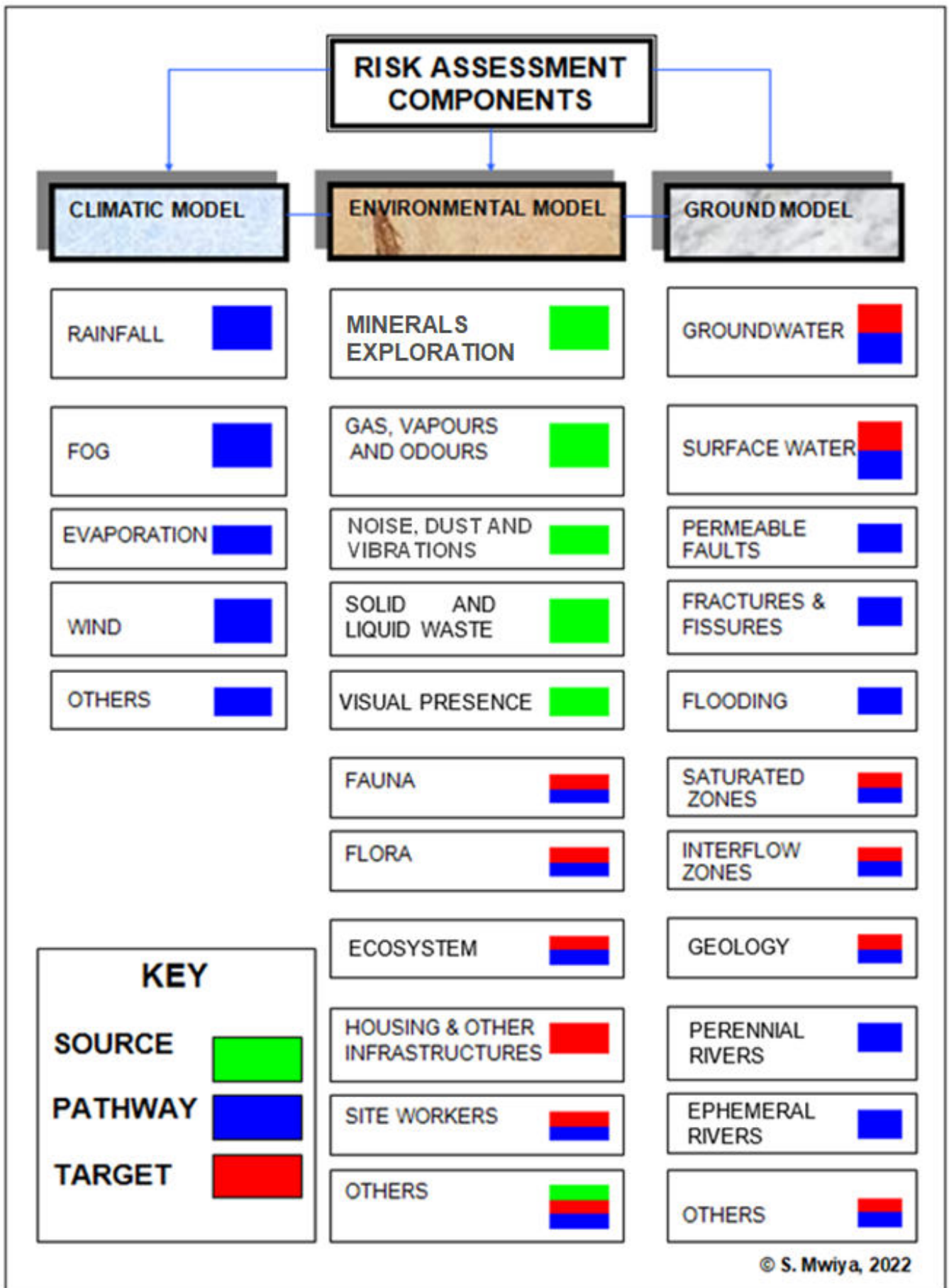


Figure 5.2: A Knowledge-Based System Model Methodology (KBSMM) source-pathways-target characterised interactive risk assessment system output field-based and tested / validated Artificial Intelligent (AI) framework windows for onshore phased minerals exploration process implementation project lifecycle.

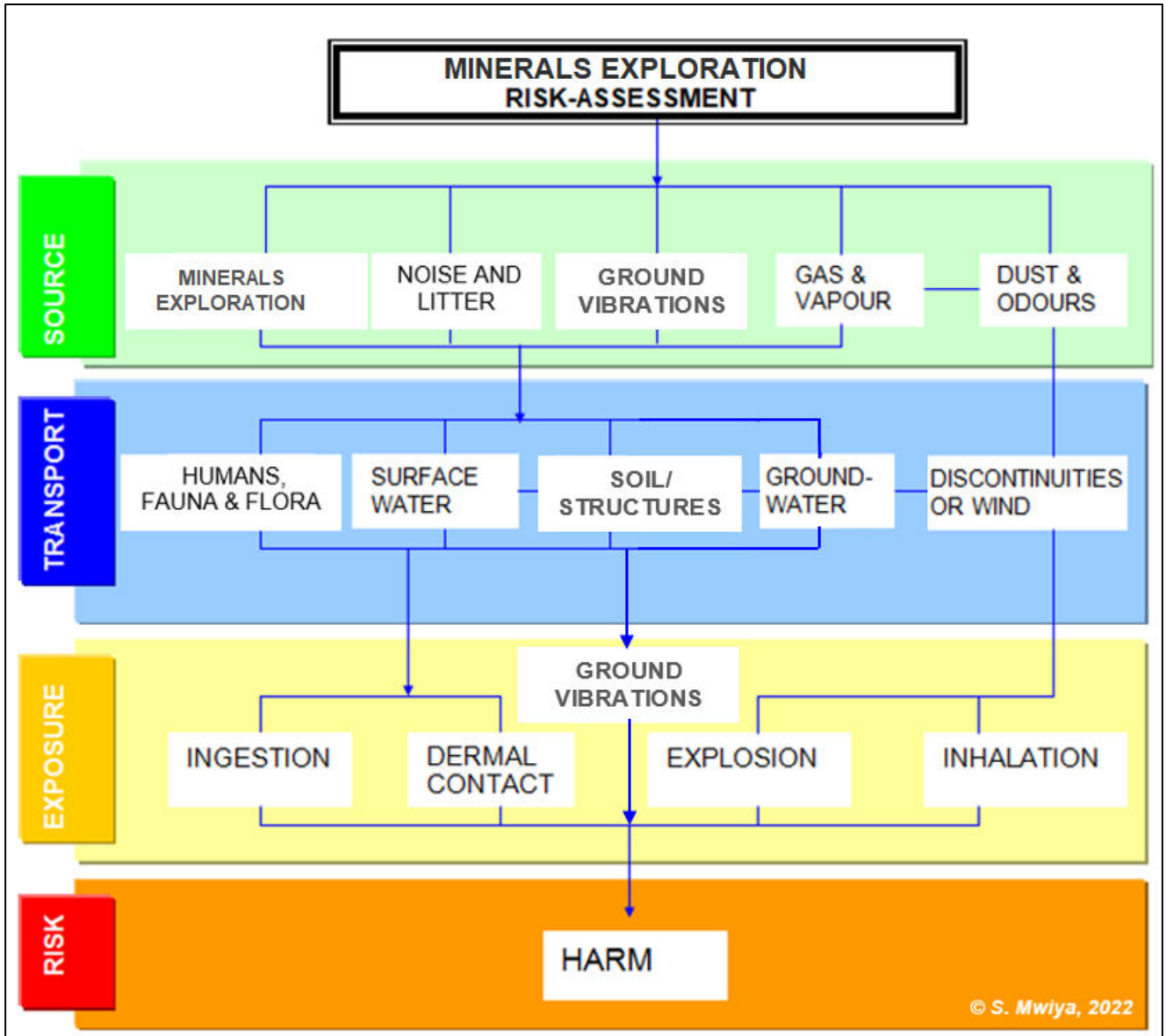


Figure 5.3: A Knowledge-Based System Model Methodology (KBSMM) characterised system output research-based and tested / validated Artificial Intelligent (AI) framework risk consequences (harm) pathways to the receiving target/receptors windows for onshore phased minerals exploration process project implementation lifecycle.

#### 5.4.2.6 Individual Components Impact Assessment Criteria

Based on the Terms of Reference and individual components impact assessment outputs of the KBSMM for the proposed phased minerals exploration process and the lessons learned (created knowledge-base) from the previous phased minerals exploration processes operations undertaken and tested since 1999 when the KBSMM was developed, all key components of the receiving environment were identified and assessed with respect to the overall proposed activities and likely significant impacts on the receiving environment with the aim of developing appropriate mitigation measures as detailed in the EMP Report.

#### 5.4.3 Overall Component and Significant Impact Assessment

##### 5.4.3.1 Overall Component Impact Assessment

The overall component impact assessment and evaluation process has been undertaken by considering the activities of the proposed phased minerals exploration process operations as the



overall source of impact (Figs. 5.1-5.3). As illustrated in Figs. 5.1-5.3, the receiving environment has been considered as the receptor / target that may be impacted positively or negatively by the activities of the proposed phased minerals exploration process.

The characterised components of the receiving environment encompassed the following:

- ❖ Physical Conditions / Natural Environment – Air, noise, water, green space, climate change, built environment – houses, roads, transport systems, buildings, infrastructure, etc.
- ❖ Biological Conditions: fauna, flora, habitats, and ecosystem - services, function, use values and non-use etc., and.
- ❖ Socioeconomic Conditions: Social, economic, labour, gender, human rights, natural and social capital, archaeological, cultural resources, and cultural issues

In evaluating the individual degree of potential negative impacts, the following factors have been taken into consideration:

- ❖ Impact Severity: The severity of an impact is a function of a range of consideration, and.
- ❖ Likelihood of Occurrence (Probability): How likely is the impact to occur?

In evaluating the severity of potential negative environmental impacts, the following factors have been taken into consideration:

- ❖ Receptor/ Resource Characteristics: The nature, importance, and sensitivity to change of the receptors / target or resources that could be affected.
- ❖ Impact Magnitude: The magnitude of the change that is induced.
- ❖ Impact Duration: The time period over which the impact is expected to last.
- ❖ Impact Extent: The geographical extent of the induced change, and.
- ❖ Regulations, Standards and Guidelines: The status of the impact in relation to regulations (eg. discharge limits), standards (e.g. environmental quality criteria) and guidelines.

The overall impact severity has been categorised using a subjective scale as shown in Table 5.2 for magnitude, Table 5.3 for duration and Table 5.4 for extent.

Table 5.2: Scored on a scale from 0 to 5 for impact magnitude.

SCALE (-) or (+)	DESCRIPTION
0	no observable effect
1	low effect
2	tolerable effect
3	medium high effect
4	high effect
5	very high effect (devastation)

Table 5.3: Scored time over which the impact is expected to last.

SCALE (-) or (+)	DESCRIPTION
T	Temporary
P	Permanent

Table 5.4: Scored geographical extent of the induced change.

SCALE (-) or (+)	DESCRIPTION
L	limited impact on location
O	impact of importance for municipality.
R	impact of regional character
N	impact of national character
M	impact of cross-border character

The likelihood (probability) of the pre-identified events occurring has been ascribed using a qualitative scale of probability categories (in increasing order of likelihood) as shown in Table 5.5. Likelihood of an impact occurring is estimated on the basis of experience (existing knowledge-base) and/ or evidence that such an outcome has previously occurred. Impacts resulting from routine/planned events are classified under category (E).

Table 5.5: Summary of the qualitative scale of probability categories (in increasing order of likelihood).

SCALE (-) or (+)	DESCRIPTION
A	Extremely unlikely (e.g., never heard of in the industry)
B	Unlikely (e.g., heard of in the industry but considered unlikely)
C	Low likelihood (e.g., such incidents/impacts have occurred but are uncommon)
D	Medium likelihood (e.g., such incidents/impacts occur several times per year within the industry)
E	High likelihood (e.g., such incidents/impacts occur several times per year at each location where such works are undertaken)

The overall individual components impact assessment with respect to the impact duration, geographical extent and probability of occurrence have been categorised using a semi quantitative approach as shown in Table 5.6 and the results are presented under Subsection 5.4.4.

### 5.4.3.2 Overall Significant Impact Assessment

The determination of the significance of the negative impacts / key issues caused by the proposed phase minerals exploration activities as key sources of such impact has been based on the environmental baseline results such as the intensity and duration of the likely negative impact as assessed under individual components likely to be impacted. The assessment focused on the existence of potential pathways, and the degree to which the proposed project activities are likely to result in unwanted consequences on the receptor, covering the receiving environment (natural, built, socioeconomic, flora, fauna, habitat, and ecosystem).

### 5.4.4 Proposed Project Activities Summary of Impacts Results

The results of the impacts assessment and evaluation has adopted a matrix assessment framework linked to the KBSMM framework. Assessment results of the magnitude, duration, extent, and probability of the potential impacts due to the proposed project activities interacting with the receiving environment are presented in form of a matrix table as shown in Tables 5.6-5.9.

The overall severity of potential environmental impacts of the proposed project activities on the receiving environment will be of low magnitude (Table 5.6), temporally duration (Table 5.7), localised extent (Table 5.8) and low probability of occurrence (Table 5.9) due to the limited scope of the proposed activities and the use of step progression approach in advancing exploration. The step progressional approach will allow the Proponent to evaluate the results of exploration success and the implementation of the next stage of exploration will be subject to the positive outcomes of previous activities as graded (Tables 5.6-5.9). It is important to note that the assessment of the likely impacts as shown in Tables 5.6 - 5.9, have been considered without the implementation of mitigation measures as detailed in EMP Report. The need for implementation of the appropriate mitigation measures as presented in the EMP Report has been determined based on the results of the impact assessment (Tables 5.6 - 5.9) and the significant impacts as detailed in Tables 5.10 and 5.11.

Table 5.6: Results of the sensitivity assessment of the receptors (Physical, Socioeconomic and Biological environments) with respect to the proposed exploration / prospecting activities.

RECEPTOR SENSITIVITY			PHYSICAL ENVIRONMENT					BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL, AND ARCHAEOLOGICAL ENVIRONMENT					
SENSITIVITY RATING		CRITERIA	Water Quality	Physical Infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources
1	Negligible	The receptor or resource is resistant to change or is of little environmental value.																
2	Low	The receptor or resource is tolerant of change without detriment to its character, is of low environmental or social value, or is of local importance.																
3	Medium	The receptor or resource has low capacity to absorb change without fundamentally altering its present character, is of high environmental or social value, or is of national importance.																
4	High	The receptor or resource has moderate capacity to absorb change without significantly altering its present character, has some environmental or social value, or is of district/regional importance.																
5	Very High	The receptor or resource has little or no capacity to absorb change without fundamentally altering its present character, is of very high environmental or social value, or is of international importance.																
1. Initial Desktop Exploration Activities	(i) General evaluation of satellite, topographic, land tenure, accessibility, supporting infrastructures and socioeconomic environment data	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	(ii) Purchase and analysis of existing Government high resolution magnetics and radiometric geophysical data	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	(iii) Purchase and analysis of existing Government aerial hyperspectral	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	(iv) Data interpretation and delineating of potential targets for future reconnaissance regional field-based activities for delineated targets	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2. Regional Reconnaissance Field-Based Activities	(i) Regional geological, geochemical, topographical and remote sensing mapping and data analysis	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	4	4
	(ii) Regional geochemical sampling aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical and remote sensing mapping and analysis undertaken	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	4	4
	(iii) Regional geological mapping aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical and remote sensing mapping and analysis undertaken	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	4	4
	(iv) Limited field-based support and logistical activities including exploration camp site lasting between one (1) to two (2) days	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	4	4
	(v) Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets for future detailed site-specific exploration if the results are positive and supports further exploration of the delineated targets	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	4	4

Table 5.6: Cont.

RECEPTOR SENSITIVITY			PHYSICAL ENVIRONMENT					BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL AND ARCHAEOLOGICAL ENVIRONMENT					
SENSITIVITY RATING		CRITERIA	Water Quality	Physical Infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources
1	Negligible	The receptor or resource is resistant to change or is of little environmental value.																
2	Low	The receptor or resource is tolerant of change without detriment to its character, is of low environmental or social value, or is of local importance.																
3	Medium	The receptor or resource has low capacity to absorb change without fundamentally altering its present character, is of high environmental or social value, or is of national importance																
4	High	The receptor or resource has moderate capacity to absorb change without significantly altering its present character, has some environmental or social value, or is of district/regional importance.																
5	Very High	The receptor or resource has little or no capacity to absorb change without fundamentally altering its present character, is of very high environmental or social value, or is of international importance.																
3. Initial Local Field-Based Activities	(i)	Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during regional reconnaissance field activities	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4
	(ii)	Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4
	(iii)	Ground geophysical survey (Subject to the positive outcomes of i and ii above)	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4
	(iv)	Possible Trenching (Subject to the outcomes of i - iii above)	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4
	(v)	Field-based support and logistical activities will be very limited focus on a site-specific area for a very short time (maximum five (5) days)	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4
	(vi)	Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4
4. Detailed Local Field-Based Activities	(i)	Access preparation and related logistics to support activities	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4
	(ii)	Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during the initial field-based activities	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4
	(iii)	Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4
	(iv)	Ground geophysical survey, trenching, drilling and sampling (Subject to the positive outcomes of i and ii above).	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4
5. Prefeasibility and Feasibility Studies	(i)	Detailed site-specific field-based support and logistical activities, surveys, detailed geological mapping	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4
	(ii)	Detailed drilling and bulk sampling and testing for ore reserve calculations	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4
	(iii)	Geotechnical studies for mine design	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4
	(iv)	Mine planning and designs including all supporting infrastructures (water, energy and access) and test mining activities	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	4
	(v)	EIA and EMP to support the ECC for mining operations	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	4
	(vi)	Preparation of feasibility report and application for Mining License	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	4

Table 5.7: Results of the scored time period (duration) over which the impact is expected to last.

RECEPTOR SENSITIVITY		PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL AND ARCHAEOLOGICAL ENVIRONMENT										
		Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources						
<table border="1"> <thead> <tr> <th>SCALE</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>T</td> <td>Temporary</td> </tr> <tr> <td>P</td> <td>Permanent</td> </tr> </tbody> </table>		SCALE	DESCRIPTION	T	Temporary	P	Permanent																
SCALE	DESCRIPTION																						
T	Temporary																						
P	Permanent																						
<b>1. Initial Desktop Exploration Activities</b>	(i) General evaluation of satellite, topographic, land tenure, accessibility, supporting infrastructures and socioeconomic environment data	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T						
	(ii) Purchase and analysis of existing Government high resolution magnetics and radiometric geophysical data	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T						
	(iii) Purchase and analysis of existing Government aerial hyperspectral	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T						
	(iv) Data interpretation and delineating of potential targets for future reconnaissance regional field-based activities for delineated targets	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T						
<b>2. Regional Reconnaissance Field-Based Activities</b>	(i) Regional geological, geochemical, topographical and remote sensing mapping and data analysis	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P						
	(ii) Regional geochemical sampling aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical and remote sensing mapping and analysis undertaken	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P						
	(iii) Regional geological mapping aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical and remote sensing mapping and analysis undertaken	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P						
	(iv) Limited field-based support and logistical activities including exploration camp site lasting between one (1) to two (2) days	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P						
	(v) Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets for future detailed site-specific exploration if the results are positive and supports further exploration of the delineated targets	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P						



Table 5.7: Cont.

DURATION OF IMPACT		PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL, AND ARCHAEOLOGICAL ENVIRONMENT				
		Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources
SCALE		DESCRIPTION															
T		Temporary															
P		Permanent															
<b>3. Initial Local Field-Based Activities</b>	(i) Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during regional reconnaissance field activities	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P
	(ii) Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P
	(iii) Ground geophysical survey (Subject to the positive outcomes of i and ii above)	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P
	(iv) Possible Trenching (Subject to the outcomes of i - iii above)	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P
	(v) Field-based support and logistical activities will be very limited focus on a site-specific area for a very short time (maximum five (5) days)	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P
	(vi) Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P
<b>4. Detailed Local Field-Based Activities</b>	(i) Access preparation and related logistics to support activities	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P
	(ii) Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during the initial field-based activities	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P
	(iii) Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P
	(iv) Ground geophysical survey, trenching, drilling and sampling (Subject to the positive outcomes of i and ii above).	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P
<b>5. Prefeasibility and Feasibility Studies</b>	(i) Detailed site-specific field-based support and logistical activities, surveys, detailed geological mapping	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P
	(ii) Detailed drilling and bulk sampling and testing for ore reserve calculations	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P
	(iii) Geotechnical studies for mine design	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P
	(iv) Mine planning and designs including all supporting infrastructures (water, energy and access) and test mining activities	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P
	(v) EIA and EMP to support the ECC for mining operations	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P
	(vi) Preparation of feasibility report and application for Mining License	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	P

Table 5.8: Results of the scored geographical extent of the induced change.

GEOGRAPHICAL EXTENT OF IMPACT		PHYSICAL ENVIRONMENT					BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL AND ARCHAEOLOGICAL ENVIRONMENT																	
		Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources												
<table border="1"> <thead> <tr> <th>SCALE</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>L</td> <td>limited impact on location</td> </tr> <tr> <td>O</td> <td>impact of importance for municipality</td> </tr> <tr> <td>R</td> <td>impact of regional character</td> </tr> <tr> <td>N</td> <td>impact of national character</td> </tr> <tr> <td>M</td> <td>impact of cross-border character</td> </tr> </tbody> </table>		SCALE	DESCRIPTION	L	limited impact on location	O	impact of importance for municipality	R	impact of regional character	N	impact of national character	M	impact of cross-border character																
SCALE	DESCRIPTION																												
L	limited impact on location																												
O	impact of importance for municipality																												
R	impact of regional character																												
N	impact of national character																												
M	impact of cross-border character																												
<b>1. Initial Desktop Exploration Activities</b>	(i) General evaluation of satellite, topographic, land tenure, accessibility, supporting infrastructures and socioeconomic environment data	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(ii) Purchase and analysis of existing Government high resolution magnetic and radiometric geophysical data	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(iii) Purchase and analysis of existing Government aerial hyperspectral	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(iv) Data interpretation and delineating of potential targets for future reconnaissance regional field-based activities for delineated targets	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
<b>2. Regional Reconnaissance Field-Based Activities</b>	(i) Regional geological, geochemical, topographical and remote sensing mapping and data analysis	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	N												
	(ii) Regional geochemical sampling aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical and remote sensing mapping and analysis undertaken	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	N												
	(iii) Regional geological mapping aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical and remote sensing mapping and analysis undertaken	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	N												
	(iv) Limited field-based support and logistical activities including exploration camp site lasting between one (1) to two (2) days	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	N												
	(v) Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets for future detailed site-specific exploration if the results are positive and supports further exploration of the delineated targets	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	N												

Table 5.8: *Conti.*

GEOGRAPHICAL EXTENT OF IMPACT		PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL AND ARCHAEOLOGICAL ENVIRONMENT						
		Water Quality	Physical Infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources		
SCALE		DESCRIPTION																	
L		limited impact on location																	
O		impact of importance for municipality																	
R		impact of regional character																	
N		impact of national character																	
M		impact of cross-border character																	
<b>3. Initial Local Field-Based Activities</b>	(i)	Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during regional reconnaissance field activities																	
	(ii)	Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken																	
	(iii)	Ground geophysical survey (Subject to the positive outcomes of i and ii above)																	
	(iv)	Possible Trenching (Subject to the outcomes of i - iii above)																	
	(v)	Field-based support and logistical activities will be very limited focus on a site-specific area for a very short time (maximum five (5) days)																	
	(vi)	Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets																	
<b>4. Detailed Local Field-Based Activities</b>	(i)	Access preparation and related logistics to support activities																	
	(ii)	Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during the initial field-based activities																	
	(iii)	Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken																	
	(iv)	Ground geophysical survey, trenching, drilling and sampling (Subject to the positive outcomes of i and ii above).																	
<b>5. Prefeasibility and Feasibility Studies</b>	(i)	Detailed site-specific field-based support and logistical activities, surveys, detailed geological mapping																	
	(ii)	Detailed drilling and bulk sampling and testing for ore reserve calculations																	
	(iii)	Geotechnical studies for mine design																	
	(iv)	Mine planning and designs including all supporting infrastructures (water, energy and access) and test mining activities																	
	(v)	EIA and EMP to support the ECC for mining operations																	
	(vi)	Preparation of feasibility report and application for Mining License																	

Table 5.9: Results of the qualitative scale of probability occurrence.

IMPACT PROBABILITY OCCURRENCE		PHYSICAL ENVIRONMENT					BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL AND ARCHAEOLOGICAL ENVIRONMENT																	
		Water Quality	Physical Infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources												
<table border="1"> <thead> <tr> <th>SCALE</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>Extremely unlikely (e.g. never heard of in the industry)</td> </tr> <tr> <td>B</td> <td>Unlikely (e.g. heard of in the industry but considered unlikely)</td> </tr> <tr> <td>C</td> <td>Low likelihood (egg such incidents/impacts have occurred but are uncommon)</td> </tr> <tr> <td>D</td> <td>Medium likelihood (e.g. such incidents/impacts occur several times per year within the industry)</td> </tr> <tr> <td>E</td> <td>High likelihood (e.g. such incidents/impacts occurs several times per year at each location where such works are undertaken)</td> </tr> </tbody> </table>		SCALE	DESCRIPTION	A	Extremely unlikely (e.g. never heard of in the industry)	B	Unlikely (e.g. heard of in the industry but considered unlikely)	C	Low likelihood (egg such incidents/impacts have occurred but are uncommon)	D	Medium likelihood (e.g. such incidents/impacts occur several times per year within the industry)	E	High likelihood (e.g. such incidents/impacts occurs several times per year at each location where such works are undertaken)																
SCALE	DESCRIPTION																												
A	Extremely unlikely (e.g. never heard of in the industry)																												
B	Unlikely (e.g. heard of in the industry but considered unlikely)																												
C	Low likelihood (egg such incidents/impacts have occurred but are uncommon)																												
D	Medium likelihood (e.g. such incidents/impacts occur several times per year within the industry)																												
E	High likelihood (e.g. such incidents/impacts occurs several times per year at each location where such works are undertaken)																												
1. Initial Desktop Exploration Activities	(i) General evaluation of satellite, topographic, land tenure, accessibility, supporting infrastructures and socioeconomic environment data	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	E												
	(ii) Purchase and analysis of existing Government high resolution magnetics and radiometric geophysical data	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	E												
	(iii) Purchase and analysis of existing Government aerial hyperspectral	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	E												
	(iv) Data interpretation and delineating of potential targets for future reconnaissance regional field-based activities for delineated targets	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	E												
2. Regional Reconnaissance Field-Based Activities	(i) Regional geological, geochemical, topographical and remote sensing mapping and data analysis	A	A	A	A	A	A	A	A	A	A	A	A	D	D	E													
	(ii) Regional geochemical sampling aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical and remote sensing mapping and analysis undertaken	A	A	A	A	A	A	A	A	A	A	A	D	D	E														
	(iii) Regional geological mapping aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical and remote sensing mapping and analysis undertaken	A	A	A	A	A	A	A	A	A	A	A	D	D	E														
	(iv) Limited field-based support and logistical activities including exploration camp site lasting between one (1) to two (2) days	A	A	A	A	A	A	A	A	A	A	A	D	D	E														
	(v) Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets for future detailed site-specific exploration if the results are positive and supports further exploration of the delineated targets	A	A	A	A	A	A	A	A	A	A	A	D	D	E														

Table 5.9: Cont.

IMPACT PROBABILITY OCCURRENCE		PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL AND ARCHAEOLOGICAL ENVIRONMENT				
		Water Quality	Physical Infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources
SCALE		DESCRIPTION															
A		Extremely unlikely (e.g. never heard of in the industry)															
B		Unlikely (e.g. heard of in the industry but considered unlikely)															
C		Low likelihood (egg such incidents/impacts have occurred but are uncommon)															
D		Medium likelihood (e.g. such incidents/impacts occur several times per year within the industry)															
E		High likelihood (e.g. such incidents/impacts occurs several times per year at each location where such works are undertaken)															
<b>3. Initial Local Field-Based Activities</b>	(i)	Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during regional reconnaissance field activities															
	(ii)	Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken															
	(iii)	Ground geophysical survey (Subject to the positive outcomes of i and ii above)															
	(iv)	Possible Trenching (Subject to the outcomes of i - iii above)															
	(v)	Field-based support and logistical activities will be very limited focus on a site-specific area for a very short time (maximum five (5) days)															
	(vi)	Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets															
<b>4. Detailed Local Field-Based Activities</b>	(i)	Access preparation and related logistics to support activities															
	(ii)	Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during the initial field-based activities															
	(iii)	Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken															
	(iv)	Ground geophysical survey, trenching, drilling and sampling (Subject to the positive outcomes of i and ii above).															
<b>5. Prefeasibility and Feasibility Studies</b>	(i)	Detailed site-specific field-based support and logistical activities, surveys, detailed geological mapping															
	(ii)	Detailed drilling and bulk sampling and testing for ore reserve calculations															
	(iii)	Geotechnical studies for mine design															
	(iv)	Mine planning and designs including all supporting infrastructures (water, energy and access) and test mining activities															
	(v)	EIA and EMP to support the ECC for mining operations															
	(vi)	Preparation of feasibility report and application for Mining License															



## 5.5 Evaluation of Significant Impacts

### 5.5.1 Overview

The significance of each impact has been determined by assessing the impact severity against the likelihood (probability) of the impact occurring as summarised in the impact significance assessment matrix provided in Table 5.10.

### 5.5.2 Significance Criteria

Significance criteria for negative/adverse impacts (i.e., relative ranking of importance) are defined in Table 5.10. It is important to note that impacts have been considered without the implementation of mitigation measures. The need for appropriate mitigation measures as presented in the EMP report has been determined based on the basis of the impact assessment presented in this report.

Table 5.10: Scored impact significance criteria.

<b>IMPACT SEVERITY</b> [ Magnitude, Duration, Extent, Probability ]	<b>RECEPTOR CHARACTERISTICS (SENSITIVITY)</b>				
	<b>Very High (5)</b>	<b>High (4)</b>	<b>Medium (3)</b>	<b>Low (2)</b>	<b>Negligible (1)</b>
<b>Very High (5)</b>	Major [5/5]	Major [4/5]	Moderate [3/5]	Moderate [2 /5]	Minor 1/5
<b>High (4)</b>	Major [5/4]	Major [4/4]	Moderate [3/4]	Moderate [2/4]	Minor [1/4]
<b>Medium (3)</b>	Major [5/3]	Moderate [4/3]	Moderate [3/3]	Minor [2/3]	None [1/3]
<b>Low (2)</b>	Moderate [5/2]	Moderate [4/2]	Minor [3/2]	None [2/2]	None [1/2]
<b>Negligible (1)</b>	Minor [5/1]	Minor [4/1]	None [3/1]	None [2/1]	None [1/1]

### 5.5.3 Assessment Likely Significant Impacts

The assessment of significant impacts depended upon the degree to which the proposed project activities are likely to result in unwanted consequences on the receptor covering physical and biological environments (Table 5.11). Overall, the assessment of significant impacts has focused on the ecosystem-based approach that considers potential impacts to the ecosystem. The main key sources of impacts that have been used in the determination of significant impacts posed by the proposed minerals exploration comprised activities. Each of the main areas of impact have been identified and assessed as follows:

- ❖ Positive Impacts are classified under a single category. they are then evaluated qualitatively with a view to their enhancement, if practical.
- ❖ Negligible or Low Impacts will require little or no additional management or mitigation measures (on the basis that the magnitude of the impact is sufficiently small, or that the receptor is of low sensitivity).
- ❖ Medium or High Impacts require the adoption of management or mitigation measures.
- ❖ High Impacts always require further management or mitigation measures to limit or reduce the impact to an acceptable level.

Overall, the results of the significant impact assessment matrix for the proposed minerals exploration activities on the physical and biological environments are shown in Tables 5.11.

Table 5.11: Significant impact assessment matrix for the proposed exploration activities.

SIGNIFICANT IMPACT						PHYSICAL ENVIRONMENT					BIOLOGICAL ENVIRONMENT				SOCIOECONOMIC, CULTURAL AND ARCHAEOLOGICAL ENVIRONMENT								
IMPACT SEVERITY [ Magnitude, Duration, Extent, Probability ]	RECEPTOR CHARACTERISTICS (SENSITIVITY)					Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources		
	Very High (5)	High(4)	Medium (3)	Low (2)	Negligible (1)																		
Very High (5)	Major [5/5]	Major [4/5]	Moderate [3/5]	Moderate [2 /5]	Minor 1/5																		
High (4)	Major [5/4]	Major [4/4]	Moderate [3/4]	Moderate [2/4]	Minor[1/4]																		
Medium (3)	Major [5/3]	Moderate[4/3]	Moderate[3/3]	Minor[2/3]	None[1/3]																		
Low (2)	Moderate [5/2]	Moderate[4/2]	Minor[3/2]	None[2/2]	None[1/2]																		
Negligible (1)	Minor [5/1]	Minor [4/1]	None [3/1]	None [2/1]	None [1/1]																		
1. Initial Desktop Exploration Activities	(i) General evaluation of satellite, topographic, land tenure, accessibility, supporting infrastructures and socioeconomic environment data					1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1		
	(ii) Purchase and analysis of existing Government high resolution magnetics and radiometric geophysical data					1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1		
	(iii) Purchase and analysis of existing Government aerial hyperspectral					1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1		
	(iv) Data interpretation and delineating of potential targets for future reconnaissance regional field-based activities for delineated targets					1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	
2. Regional Reconnaissance Field-Based Activities	(i) Regional geological, geochemical, topographical and remote sensing mapping and data analysis					1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	4/4		
	(ii) Regional geochemical sampling aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical and remote sensing mapping and analysis undertaken					1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	4/4	
	(iii) Regional geological mapping aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical and remote sensing mapping and analysis undertaken					1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	4/4	
	(iv) Limited field-based support and logistical activities including exploration camp site lasting between one (1) to two (2) days					1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	4/4
	(v) Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets for future detailed site-specific exploration if the results are positive and supports further exploration of the delineated targets					1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	4/4

Table 5.11: Cont.

SENSITIVITY						PHYSICAL ENVIRONMENT					BIOLOGICAL ENVIRONMENT				SOCIOECONOMIC, CULTURAL AND ARCHAEOLOGICAL ENVIRONMENT							
IMPACT SEVERITY  [ Magnitude, Duration, Extent, Probability ]	RECEPTOR CHARACTERISTICS (SENSITIVITY)					Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources	
	Very High (5)	High(4)	Medium (3)	Low (2)	Negligible (1)																	
Very High (5)	Major [5/5]	Major [4/5]	Moderate [3/5]	Moderate [2 /5]	Minor 1/5																	
High (4)	Major [5/4]	Major [4/4]	Moderate [3/4]	Moderate [2/4]	Minor[1/4]																	
Medium (3)	Major [5/3]	Moderate[4/3]	Moderate[3/3]	Minor[2/3]	None[1/3]																	
Low (2)	Moderate [5/2]	Moderate[4/2]	Minor[3/2]	None[2/2]	None[1/2]																	
Negligible (1)	Minor [5/1]	Minor [4/1]	None [3/1]	None [2/1]	None [1/1]																	
<b>3. Initial Local Field-Based Activities</b>	(i) Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during regional reconnaissance field activities	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	4/4	
	(ii) Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	4/4	
	(iii) Ground geophysical survey (Subject to the positive outcomes of i and ii above)	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	4/4	
	(iv) Possible Trenching (Subject to the outcomes of i - iii above)	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	4/4
	(v) Field-based support and logistical activities will be very limited focus on a site-specific area for a very short time (maximum five (5) days)	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	4/4
	(vi) Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	4/4
<b>4. Detailed Local Field-Based Activities</b>	(i) Access preparation and related logistics to support activities	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	3/2	3/2	3/2	3/2	3/2	2/2	2/2	3/3	3/3	3/3	4/4	
	(ii) Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during the initial field-based activities	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	3/2	3/2	3/2	3/2	3/2	2/2	2/2	3/3	3/3	3/3	4/4	
	(iii) Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	3/3	3/3	3/3	4/4	
	(iv) Ground geophysical survey, trenching, drilling and sampling (Subject to the positive outcomes of i and ii above).	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	3/2	3/2	3/2	3/2	3/2	2/2	2/2	3/3	3/3	3/3	4/4
<b>5. Prefeasibility and Feasibility Studies</b>	(i) Detailed site-specific field-based support and logistical activities, surveys, detailed geological mapping	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	3/3	3/3	3/3	4/4	
	(ii) Detailed drilling and bulk sampling and testing for ore reserve calculations	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	4/4	
	(iii) Geotechnical studies for mine design	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	3/3	3/3	3/3	4/4	
	(iv) Mine planning and designs including all supporting infrastructures (water, energy and access) and test mining activities	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	4/4	
	(v) EIA and EMP to support the ECC for mining operations	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	3/3	3/3	3/3	4/4	
	(vi) Preparation of feasibility report and application for Mining License	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	3/3	3/3	3/3	4/4	

## 5.6 Assessment of Overall Impacts

### 5.6.1 Summary of the Results of the Impact Assessment

In accordance with Tables 5.6 - 5.11, the following is the summary of the overall likely negative and significant impacts of the proposed exploration activities on the receiving environment (physical, biological and socioeconomic environments) without:

- (i) Initial desktop exploration activities: Overall likely negative impact on the receiving environment will be negligible with extremely unlikely probability of occurrence without mitigations. Overall significant impacts will be negligible **[1/1]** (Table 5.11). Except for the socioeconomic components which carry a **(+)**, the rest of the likely impacts are negative **(-)**.
- (ii) Regional reconnaissance field-based activities: Overall likely negative impact on the receiving environment will be negligible with extremely unlikely probability of occurrence without mitigations. Overall significant impacts will be negligible **[1/1]**. Some field-based activities will have localised low impacts with low probability of occurrence without mitigations and negligible with mitigations. Overall significant impacts will be negligible **[1/1]** (Table 5.11). Except for the socioeconomic components which carry a **(+)**, all the other likely impacts are negative **(-)**.
- (iii) Initial local field-based activities: Initial field-based activities will have localised low impacts with low probability of occurrence without mitigations and negligible with mitigations. Overall significant impacts will be negligible **[2/2]**. All desktop related activities and laboratory assessments will have negligible impacts with extremely unlikely probability of occurrence without mitigations. Overall significant impacts will be negligible **[2/2]** (Table 5.11). Except for the socioeconomic components which carry a **(+)**, all the other likely impacts are negative **(-)**. Cultural, biological, and archaeological resources will have high significant negative impacts **[4/4]**.
- (iv) Detailed local field-based activities: Overall likely negative impact on the receiving environment will be high and localised impacts without mitigations and localised low impacts with mitigations. Overall significant impacts will be medium **[2/2]** without mitigations and low with mitigations (Table 5.11). Except for the socioeconomic components which carry a **(+)**, all the other likely impacts are negative **(-)**. Tourism and recreation will have medium significant negative impacts **[3/3]**, and cultural, biological, and archaeological resources will have high significant negative impacts **[4/4]** and.
- (v) Prefeasibility and feasibility studies to be implemented on a site-specific area if the local field-based studies prove positive: Overall likely negative impact on the receiving environment will be high and localised impacts without mitigations and localised medium impacts with mitigations. Overall significant impacts will be medium **[3/3]** without mitigations and low with mitigations for bulk sampling, test mining and field logistics (Table 5.11). Except for the socioeconomic components which carry a **(+)**, all the other likely impacts are negative **(-)**. Tourism and recreation will have medium significant negative impacts **[3/3]**, and cultural, biological, and archaeological resources will have high significant negative impacts **[4/4]**.

## 6. THE EMP

### 6.1 Summary of the EMP Objectives

The Environmental Management Plan (EMP) provides a detailed plan of action required in the implementation of the mitigation measures for minimising and maximising the identified negative and positive impacts respectively. The EMP gives commitments including financial and human resources provisions for effective management of the likely environmental liabilities during and after the exploration. Regular assessments and evaluation of the environmental liabilities during the exploration will need to be undertaken and will ensure adequate provision of the necessary resources towards good environmental management at various stages of the project development.

### 6.2 Implementation of the EMP

#### 6.2.1 Roles and Responsibilities

Management of the environmental elements that may be affected by the different activities of the proposed / ongoing exploration is an important element of the proposed / ongoing exploration activities. The EMP also identifies the activity groups / environmental elements, the aspects / targets, the indicators, the schedule for implementation and who should be responsible for the management to prevent major impacts that the different exploration activities may have on the receiving environment (physical and biological environments).

#### 6.2.2 Proponent's Representative (PR) / Project Manager (PM)

The Proponent is to appoint a **Proponent's Representative (PR) / Project Manager (PM)** with the following responsibilities with respect to the EMP implementation:

- ❖ Act as the site project manager and implementing agent;
- ❖ Ensure that the Proponent's responsibilities are executed in compliance with the relevant legislation;
- ❖ Ensure that all the necessary environmental authorizations and permits have been obtained;
- ❖ Assist the exploration contractor/s in finding environmentally responsible solutions to challenges that may arise;
- ❖ Should the PR be of the opinion that a serious threat to, or impact on the environment may be caused by the exploration activities, he/she may stop work; the Proponent must be informed of the reasons for the stoppage as soon as possible;
- ❖ The PR has the authority to issue fines for transgressions of basic conduct rules and/or contravention of the EMP;
- ❖ Should the Contractor or his/her employees fail to show adequate consideration for the environmental aspects related to the EMP, the PR can have person(s) and/or equipment removed from the site or work suspended until the matter is remedied;
- ❖ Maintain open and direct lines of communication between the landowners and Proponent, as well as any other identified Interested and Affected Parties (I&APs) with regards to environmental matters, and;
- ❖ Attend regular site meetings and inspections as may be required for the proposed / ongoing exploration programme.



### 6.2.3 Project Health, Safety and Environment (Project HSE)

The Proponent is to appoint a Project Health, Safety and Environment (Project HSE) with the following responsibilities with respect to the EMP implementation:

- ❖ Assist the PR in ensuring that the necessary environmental authorizations and permits have been obtained;
- ❖ Assist the PR and Contractor in finding environmentally responsible solutions to challenges that may arise;
- ❖ Conduct environmental monitoring as per EMP requirements;
- ❖ Carry out regular site inspections (on average once per week) of all exploration areas with regards to compliance with the EMP; report any non-compliance(s) to the PR as soon as possible;
- ❖ Organize for an independent internal audit on the implementation of and compliance to the EMP to be carried out half way through each field-based exploration activity; audit reports to be submitted to the PR;
- ❖ Continuously review the EMP and recommend additions and/or changes to the EMP document;
- ❖ Monitor the Contractor's environmental awareness training for all new personnel coming onto site;
- ❖ Keep records of all activities related to environmental control and monitoring; the latter to include a photographic record of the exploration activities, rehabilitation process, and a register of all major incidents, and;
- ❖ Attend regular site meetings.

### 6.2.4 Contractors and Subcontractors

The responsibilities of the **Contractors and Subcontractors** that may be appointed by the Proponent to undertake certain field-based activities of the proposed / ongoing exploration programme include:

- ❖ Comply with the relevant legislation and the EMP provision;
- ❖ Preparation and submission to the Proponent through the Project HSE of the following Management Plans:
  - Environmental Awareness Training and Inductions;
  - Emergency Preparedness and Response;
  - Waste Management, and;
  - Health and Safety.
- ❖ Ensure adequate environmental awareness training for senior site personnel;
- ❖ Environmental awareness presentations (inductions) to be given to all site personnel prior to work commencement; the Project HSE is to provide the course content and the following topics, at least but not limited to, should be covered:
  - The importance of complying with the EMP provisions;
  - Roles and Responsibilities, including emergency preparedness;

- Basic Rules of Conduct (Do's and Don'ts);
  - EMP: aspects, impacts and mitigation;
  - Fines for Failure to Adhere to the EMP, and;
  - Health and Safety Requirements.
- ❖ Record keeping of all environmental awareness training and induction presentations, and;
  - ❖ Attend regular site meetings and environmental inspections.

## **6.3 Specific Mitigation Measures**

### **6.3.1 Hierarchy of Mitigation Measures Implementation**

A hierarchy of methods for mitigating significant adverse effects has been adopted in order of preference and as follows:

- (i) Enhancement, e.g. provision of new habitats;
- (ii) Avoidance, e.g. sensitive design to avoid effects on ecological receptors;
- (iii) Reduction, e.g. limitation of effects on receptors through design changes, and;
- (iv) Compensation, e.g. community benefits.

### **6.3.2 Mitigation Measures Implementation**

The Environmental Management Plan (EMP) provides a detailed plan of action required in the implementation of the mitigation measures for minimising and maximising the identified negative and positive impacts respectively. The EMP also provides the management actions with roles and responsibilities requirements for implementation of environmental management strategies by the Proponent through the Contractors and Subcontractors who will be undertaking the exploration activities. The EMP gives commitments including financial and human resources provisions for effective management of the likely environmental liabilities during and after the implementation of the proposed / ongoing exploration programme.

Based on the findings of the Scoping work, Table 6.1 – 6.18 provides the detailed specific mitigations measures to be implemented by the Proponent with respect to the proposed / ongoing exploration programme activities and in particular for the field-based exploration activities. The following is the summary of the key areas of the migration measures provided in Tables 6.1-6.18:

1. Project planning and implementation;
2. Implementation of the EMP;
3. Public and stakeholders relations;
4. Measures to enhance positive socioeconomic impacts;
5. Environmental awareness briefing and training;
6. Erection of supporting exploration infrastructure;
7. Use of existing access roads, tracks and general vehicle movements;
8. Mitigation measures for preventing flora destruction;

9. Mitigation measures for preventing faunal destruction;
10. Mitigation measures to be implemented with respect to the exploration camps and exploration sites;
11. Mitigation measures for surface and groundwater protection as well as general water usage;
12. Mitigation measures to minimise negative socioeconomic impacts;
13. Mitigation measures to minimise health and safety impacts;
14. Mitigation measures to minimise visual impacts;
15. Mitigation measures to minimise vibration, noise and air quality;
16. Mitigation measures for waste (solid and liquid) management;
17. Rehabilitation plan, and;
18. Environmental data collection.

Table 6.1: Project planning and implementation.

OBJECTIVES	INDICATOR	SCHEDULE	RESPONSIBILITY
<p>Establish a strong environmental awareness protocol from project implementation to final closure in order to ensure the least possible impact to the environment.</p>	<ol style="list-style-type: none"> <li>1. Resources (Human and Financial) are provided for the Environmental Awareness and Training, Regular Safety, Health and Environment meetings and for internal and external Environmental Monitoring Costs as well as for any rehabilitation costs that may arise.</li> <li>2. Appointment of a senior and experienced persons as Proponent's Representative (PR), Project Manager (PM) and Project HSE to assume responsibility for environmental issues.</li> <li>3. All individuals including sub-contractors who work on, or visit, the sites are aware of the contents of the Environmental Policy and the EMP.</li> <li>4. The EMP and Environmental Policy will be included in Tender Documents.</li> <li>5. Field visit will take place during which main access tracks will be discussed in cooperation with the land owner/s</li> </ol>	<ol style="list-style-type: none"> <li>1. Regional reconnaissance field-based mapping and sampling activities;</li> <li>2. Initial local field-based mapping and sampling activities;</li> <li>3. Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</li> <li>4. Prefeasibility and feasibility studies.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Proponent's Representative (PR)</li> <li>(ii) Project Manager (PM)</li> <li>(iii) Project HSE</li> <li>(iv) Contractor</li> <li>(v) Subcontractors</li> </ol>

Table 6.2: Implementation of the EMP.

OBJECTIVES	INDICATOR	SCHEDULE	RESPONSIBILITY
<ol style="list-style-type: none"> <li>1. Define roles and responsibilities in terms of the EMP. To make all personnel, contractors and subcontractors aware of these roles and responsibilities to ensure compliance with the EMP provisions.</li> <li>2. Implement environmental management that is preventative and proactive.</li> <li>3. Establish the resources, skills, etc. required for effective environmental management.</li> </ol>	<ol style="list-style-type: none"> <li>1. Senior staff and senior contractors are aware of, and practice the EMP requirements. These persons shall be expected to know and understand the objectives of the EMP and will, by example, encourage suitable environmentally friendly behaviour to be adopted during the exploration</li> <li>2. Recognition will be given to appropriate environmentally acceptable behaviour.</li> <li>3. Inappropriate behaviour will be corrected. An explanation to why the behaviour is unacceptable must be given, and, if necessary, the person will be disciplined. e.g. fees set out for non-compliance</li> </ol>	<ol style="list-style-type: none"> <li>(i) Regional reconnaissance field-based mapping and sampling activities;</li> <li>(ii) Initial local field-based mapping and sampling activities;</li> <li>(iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</li> <li>(iv) Prefeasibility and feasibility studies.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Proponent's Representative (PR)</li> <li>(ii) Project Manager (PM)</li> <li>(iii) Project HSE</li> <li>(iv) Contractor</li> <li>(v) Subcontractors</li> </ol>

Table 6.3: Public and stakeholders relations.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
Maintain sound relationships with the Other land users/ land owner/s and another stakeholders / public	<ol style="list-style-type: none"> <li>No littering or any other activity prohibited</li> <li>Permission to utilise water as well as all applicable permits are obtained.</li> </ol>	<ol style="list-style-type: none"> <li>Regional reconnaissance field-based mapping and sampling activities;</li> <li>Initial local field-based mapping and sampling activities;</li> <li>Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</li> <li>Prefeasibility and feasibility studies.</li> </ol>	<ol style="list-style-type: none"> <li>Proponent's Representative (PR)</li> <li>Project Manager (PM)</li> <li>Project HSE</li> <li>Contractor</li> <li>Subcontractors</li> </ol>

Table 6.4: Measures to enhance positive socioeconomic impacts.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Measures to enhance positive socioeconomic impacts in order to:</p> <ol style="list-style-type: none"> <li>Avoid exacerbating the influx of unemployed people to the area.</li> <li>Develop a standardised recruitment method for sub-contractor and field workers.</li> </ol>	<ol style="list-style-type: none"> <li>Stipulate a preference for local contractors in its tender policy. Preference to local contractors should still be based on competitive business principles and salaries and payment to local service providers should still be competitive;</li> <li>Develop a database of local businesses that qualify as potential service providers and invite them to the tender process;</li> <li>Scrutinise tender proposals to ensure that minimum wages were included in the costing;</li> <li>Stipulate that local residents should be employed for temporary unskilled/skilled and where possible in permanent unskilled/skilled positions as they would reinvest in the local economy;</li> <li>Must ensure that potential employees are from the area, they need submit proof of having lived in the area for a minimum of 5 years;</li> <li>Must ensure that contractors adhere to Namibian Affirmative Action, Labour and Social Security, Health and Safety laws. This could be accomplished with a contractual requirement stipulating that monthly proof should be submitted indicating payment of minimum wages to workers, against their ID numbers, payment of social security and submission of affirmative action data;</li> <li>Encouraged to cater for the needs of employees to increase the spending of wages locally.</li> </ol>	<ol style="list-style-type: none"> <li>Regional reconnaissance field-based mapping and sampling activities;</li> <li>Initial local field-based mapping and sampling activities;</li> <li>Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</li> <li>Prefeasibility and feasibility studies.</li> </ol>	<ol style="list-style-type: none"> <li>Proponent's Representative (PR)</li> <li>Project Manager (PM)</li> <li>Project HSE</li> <li>Contractor</li> <li>Subcontractors</li> </ol>



Table 6.5: Environmental awareness briefing and training.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Implement environmental awareness briefing / training for individuals who visit, or work, on site.</p>	<ol style="list-style-type: none"> <li>1. Every senior/supervisory member of the team shall familiarise themselves with the contents of the EMP. They shall understand their roles and responsibilities with regard to personnel and project compliance with the EMP.</li> <li>2. Subject to agreement of the parties, the Environmental Coordinator will hold an Environmental Awareness Briefing meeting, which shall be attended by all contractors before the start of the mineral exploration activities.</li> <li>3. Briefings on the EMP and Environmental Policy shall discuss the potential dangers to the environment of the following activities: public relations, littering, off-road driving, waste management, poaching and plant theft etc. The need to preserve soil, conserve water and implement water saving measures shall be presented.</li> <li>4. Individuals can be questioned on the Environmental Philosophy and EMP and can recall contents.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Regional reconnaissance field-based mapping and sampling activities;</li> <li>(ii) Initial local field-based mapping and sampling activities;</li> <li>(iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</li> <li>(iv) Prefeasibility and feasibility studies.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Proponent's Representative (PR)</li> <li>(ii) Project Manager (PM)</li> <li>(iii) Project HSE</li> <li>(iv) Contractor</li> <li>(v) Subcontractors</li> </ol>

Table 6.6: Erection of supporting exploration infrastructure.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<ol style="list-style-type: none"> <li>1. Get Environmental Clearance before implementation</li> <li>2. Establishment of the supporting exploration infrastructure done on an area with the least disturbance to the environment and within the non-sensitive areas</li> </ol>	<ol style="list-style-type: none"> <li>1. Documented Environmental Clearance from MET.</li> <li>2. All on site exploration infrastructure (e.g. water tanks, sewage tanks, waste disposal) are not situated on environmental sensitive area and have disturbed as less as possible.</li> <li>3. No littering.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Regional reconnaissance field-based mapping and sampling activities;</li> <li>(ii) Initial local field-based mapping and sampling activities;</li> <li>(iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</li> <li>(iv) Prefeasibility and feasibility studies.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Proponent's Representative (PR)</li> <li>(ii) Project Manager (PM)</li> <li>(iii) Project HSE</li> <li>(iv) Contractor</li> <li>(v) Subcontractors</li> </ol>

Table 6.7: Use of existing access roads, tracks and general vehicle movements.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>1. Plan a road/track network that considers the environmental sensitivity of the area and a long-term tourism potential, and which is constructed in a technically and environmentally sound manner.</p> <p>2. Stick to the recommended track and sensitivity management zones.</p>	<p>1. Avoid unnecessary affecting areas viewed as important habitat – i.e. Ephemeral River and its network of tributaries of ephemeral rivers; rocky outcrops; clumps of protected tree species;</p> <p>2. Make use of existing tracks/roads as much as possible throughout the area;</p> <p>3. Do not drive randomly throughout the area (could cause mortalities to vertebrate fauna and unique flora; accidental fires; erosion related problems, etc.);</p> <p>4. Avoid off-road driving at night as these increases mortalities of nocturnal species;</p> <p>5. Implement and maintain off-road track discipline with maximum speed limits (e.g.30km/h) as this would result in fewer faunal mortalities and limit dust pollution;</p> <p>6. Use of "3-point-turns" rather than "U-turns";</p> <p>7. Where tracks have to be made to potential exploration sites off the main routes, the routes should be selected causing minimal damage to the environment – e.g. use the same tracks; cross drainage lines at right angles; avoid placing tracks within drainage lines; avoid collateral damage (i.e. select routes that do not require the unnecessary removal of trees/shrubs, especially protected species);</p> <p>8. Leave vehicles on tracks and walk to point of interest, when possible;</p> <p>9. Rehabilitate all new tracks created.</p>	<p>(i) Regional reconnaissance field-based mapping and sampling activities;</p> <p>(ii) Initial local field-based mapping and sampling activities;</p> <p>(iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</p> <p>(iv) Prefeasibility and feasibility studies.</p>	<p>(i) Proponent's Representative (PR)</p> <p>(ii) Project Manager (PM)</p> <p>(iii) Project HSE</p> <p>(iv) Contractor</p> <p>(v) Subcontractors</p>

Table 6.8: Mitigation measures for preventing flora and ecosystem destruction and promotion of conservation.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>1. Prevent flora and ecosystem destruction and promote conservation</p>	<ol style="list-style-type: none"> <li>1. Limit the development and avoid rocky outcrops throughout the entire area;</li> <li>2. Avoid development and associated infrastructure in sensitive areas – e.g. Ephemeral River, in/close to drainage lines, cliffs, boulder and rocky outcrops in the area, etc. This would minimise the negative effect on the local environment especially unique features serving as habitat to various species;</li> <li>3. Avoid placing access routes (roads and tracks) through sensitive areas – e.g. over rocky outcrops/ridges and along drainage lines. This would minimise the effect on localised potentially sensitive habitats in the area;</li> <li>4. Avoid driving randomly through the area (i.e. “track discipline”), but rather stick to permanently placed roads/tracks – especially during the detailed field-based exploration phase. This would minimise the effect on localised potentially sensitive habitats in the area;</li> <li>5. Stick to speed limits of maximum 30km/h as this would result in less dust pollution which could affect certain flora – e.g. lichen species. Speed humps could also be used to ensure the speed limit;</li> <li>6. Remove unique and sensitive flora (e.g. all Aloe sp.) before commencing with the development activities and relocate to a less sensitive/disturbed site if possible;</li> <li>7. Prevent and discourage the collecting of firewood as dead wood has an important ecological role – especially during the development phase(s). Such collecting of firewood, especially for economic reasons, often leads to abuses – e.g. chopping down of live and/or protected tree species such as <i>Acacia erioloba</i> which is a good quality wood;</li> <li>8. Attempt to avoid the removal of bigger trees during the development phase(s) – especially with the development of access routes – as these serve as habitat for a myriad of fauna;</li> <li>9. Prevent and discourage fires – especially during the development phase(s) – as this could easily cause runaway veld fires causing problems (e.g. loss of grazing and domestic stock mortalities, etc.) for the neighbouring farmers;</li> <li>10. Rehabilitation of the disturbed areas – i.e. initial development access route “scars” and associated tracks as well as temporary accommodation sites. Preferably workers should be transported in/out to the EPL area on a daily basis to avoid excess damage to the local environment (e.g. fires, wood collection, poaching, etc.). Such rehabilitation would not only confirm the company’s environmental integrity, but also show true local commitment to the environment;</li> <li>11. Implement erosion control. The area(s) towards and adjacent the drainage line(s) are easily eroded and further development may exacerbate this problem. Avoid undertaking any exploration activities including supporting activities such as camping within 20m of the main drainage line(s) to minimise erosion problems as well as preserving the riparian associated fauna;</li> <li>12. Conduct a thorough investigation on the flora associated with the proposed exploration site(s);</li> <li>13. Prevent the introduction of potentially invasive alien plant species (e.g. <i>Tecoma stans</i>, <i>Pennisetum setaceum</i>, etc.) for ornamental purposes as part of the landscaping should mining activities eventually commence. Alien species often “escape” and become invasive causing further ecological damage;</li> <li>14. A thorough investigation of water use and ground water extraction should take place before actual mining activities commence as this would affect the local flora, especially the ephemeral riparian vegetation, not only locally, but downstream as well.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Regional reconnaissance field-based mapping and sampling activities;</li> <li>(ii) Initial local field-based mapping and sampling activities;</li> <li>(iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</li> <li>(iv) Prefeasibility and feasibility studies.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Proponent’s Representative (PR)</li> <li>(ii) Project Manager (PM)</li> <li>(iii) Project HSE</li> <li>(iv) Contractor</li> <li>(v) Subcontractors</li> </ol>

Table 6.9: Mitigation measures for preventing faunal and ecosystem destruction and promotion of conservation.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Prevent faunal and ecosystem destruction and promote conservation</p>	<ol style="list-style-type: none"> <li>1. Limit the development and avoid rocky outcrops throughout the entire area;</li> <li>2. Avoid development &amp; associated infrastructure in sensitive areas – e.g. in/close to drainage lines, cliffs, boulder and rocky outcrops in the area, etc. This would minimise the negative effect on the local environment especially unique features serving as habitat to various species;</li> <li>3. Avoid placing access routes (roads &amp; tracks) through sensitive areas – e.g. over rocky outcrops/ridges and along drainage lines. This would minimise the effect on localised potentially sensitive habitats in the area;</li> <li>4. Avoid driving randomly through the area (i.e. “track discipline”), but rather stick to permanently placed roads/tracks – especially during the detailed field-based exploration phase. This would minimise the effect on localised potentially sensitive habitats in the area;</li> <li>5. Stick to speed limits of maximum 30km/h as this would result in fewer faunal road mortalities. Speed humps could also be used to ensure the speed limit;</li> <li>6. Remove (e.g. capture) unique fauna and sensitive fauna before commencing with the development activities and relocate to a less sensitive/disturbed site if possible;</li> <li>7. Prevent and discourage the setting of snares (poaching), illegal collecting of veld foods (e.g. tortoises, etc.), indiscriminate killing of perceived dangerous species (e.g. snakes, etc.) and collecting of wood as this would diminish and negatively affect the local fauna – especially during the development phase(s);</li> <li>8. Attempt to avoid the removal of bigger trees during the development phase(s) – especially with the development of access routes – as these serve as habitat for a myriad of fauna;</li> <li>9. Prevent and discourage fires – especially during the development phase(s) – as this could easily cause runaway veld fires affecting the local fauna, but also causing problems (e.g. loss of grazing &amp; domestic stock mortalities, etc.) for the neighbouring farmers;</li> <li>10. Rehabilitation of the disturbed areas – i.e. initial development access route “scars” and associated tracks as well as temporary accommodation sites. Preferably workers should be transported in/out to the EPL area on a daily basis to avoid excess damage to the local environment (e.g. fires, wood collection, poaching, etc.). Such rehabilitation would not only confirm the company’s environmental integrity, but also show true local commitment to the environment;</li> <li>11. Implement erosion control. The area(s) towards &amp; adjacent the drainage line(s) are easily eroded and further development may exacerbate this problem. Avoid undertaking exploration activities including supporting activities such as camping within 20m of the main drainage line(s) to minimise erosion problems as well as preserving the riparian associated fauna;</li> <li>12. Conduct a thorough investigation on the fauna associated with the proposed exploration site(s);</li> <li>13. Prevent the number of domestic pets – e.g. cats &amp; dogs – accompanying the workers during the field-based exploration activities as cats decimate the local fauna and interbreed &amp; transmit diseases to the indigenous African Wildcat found in the area. Dogs often cause problems when bonding on hunting expeditions thus negatively affecting the local fauna. The indiscriminate and wanton killing of the local fauna by such pets should be avoided at all costs.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Regional reconnaissance field-based mapping and sampling activities;</li> <li>(ii) Initial local field-based mapping and sampling activities;</li> <li>(iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</li> <li>(iv) Prefeasibility and feasibility studies.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Proponent’s Representative (PR)</li> <li>(ii) Project Manager (PM)</li> <li>(iii) Project HSE</li> <li>(iv) Contractor</li> <li>(v) Subcontractors</li> </ol>

Table 6.10: Mitigation measures to be implemented with respect to the exploration camps and exploration sites.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Promotion of conservation through preservation of flora, fauna and ecosystem around the exploration camps and exploration sites</p>	<ol style="list-style-type: none"> <li>1. Select camp sites and other temporary lay over sites with care – i.e. avoid important habitats;</li> <li>2. Use portable toilets to avoid faecal pollution around camp and exploration sites;</li> <li>3. Initiate a suitable and appropriate refuse removal policy as littering could result in certain animals becoming accustomed to humans and associated activity and result in typical problem animal scenarios – e.g. baboon, black-backed jackal, etc.;</li> <li>4. Avoid and/or limit the use of lights during nocturnal exploration activities as this could influence and/or affect various nocturnal species – e.g. bats and owls, etc. Use focused lighting for least effect;</li> <li>5. Prevent the killing of species viewed as dangerous – e.g. various snakes – when on site;</li> <li>6. Prevent the setting of snares for ungulates (i.e. poaching) or collection of veld foods (e.g. tortoises) and unique plants (e.g. various Aloe and Lithop) or any form of illegal hunting activities;</li> <li>7. Avoid introducing dogs and cats as pets to camp sites as these can cause significant mortalities to local fauna (cats) and even stock losses (dogs);</li> <li>8. Remove and relocate slow moving vertebrate fauna (e.g. tortoises, chameleon, snakes, etc.) to suitable habitat elsewhere on property;</li> <li>9. Avoid the removal and/or damaging of protected flora potentially occurring in the general area – e.g. various Aloe, Commiphora and Lithop species;</li> <li>10. Avoid introducing ornamental plants, especially potential invasive alien species, as part of the landscaping of the camp site, etc., but rather use localised indigenous species, should landscaping be attempted, which would also require less maintenance (e.g. water);</li> <li>11. Remove all invasive alien species on site, especially Prosopis sp., which is already becoming a major ecological problem along various water courses throughout Central Namibia. This would not only indicate environmental commitment, but actively contribute to a better landscape;</li> <li>12. Inform contractors/workers regarding the above-mentioned issues prior to exploration activities and monitor for compliance thereof throughout;</li> <li>13. Rehabilitate all areas disturbed by the exploration activities – i.e. camp sites, exploration sites, etc.;</li> <li>14. Implement a policy of replacing 2 tree species (preferably the same species) for every 1 protected tree species having to be removed (if necessary);</li> <li>15. Although fires are not expected to be a major issue in the general area due to the overall lack of grass cover, some years it may be necessary to consider fire prevention. Ensure that adequate firefighting equipment (e.g. fire beaters; extinguishers, etc.) is available at camp sites and clear kitchen areas to avoid accidental fires;</li> <li>16. Employ an independent environmental auditor to ensure compliance, especially of the rehabilitation of all the affected areas.</li> </ol>	<p>(i) Regional reconnaissance field-based mapping and sampling activities;</p> <p>(ii) Initial local field-based mapping and sampling activities;</p> <p>(iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</p> <p>(iv) Prefeasibility and feasibility studies.</p>	<p>(i) Proponent's Representative (PR)</p> <p>(ii) Project Manager (PM)</p> <p>(iii) Project HSE</p> <p>(iv) Contractor</p> <p>(v) Subcontractors</p>



Table 6.11: Mitigation measures for surface and groundwater protection as well as general water usage.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Effective management / protection of surface and groundwater resources and general water resources usage</p>	<ol style="list-style-type: none"> <li>1. Always use as little water as possible. Reduce, reuse and re-cycle water where possible;</li> <li>2. All leaking pipes / taps must be repaired immediately they are noticed;</li> <li>3. Never leave taps running. Close taps after you have finished using them.</li> <li>4. Never allow any hazardous substance to soak into the soil;</li> <li>5. Immediately tell your Contractor or Environmental Control Officer / Site Manager when you spill, or notice any hazardous substance being spilled during the field-based exploration activities or around the camp site;</li> <li>6. Report to your Contractor or Environmental Control Officer / Site Manager when you notice any container, which may hold a hazardous substance, overflow, leak or drip;</li> <li>7. Immediately report to your Contractor or Environmental Control Officer / Site Manager when you notice overflowing problems or unhygienic conditions at the ablution facilities;</li> <li>8. No washing of vehicles, equipment and machinery, containers and other surfaces;</li> <li>9. Limit the operation to a specific site and avoid sensitive areas and in particular the Ephemeral River Channel. This would sacrifice the actual area for other adjacent Ephemeral River areas and thus minimise any likely negative effect on water resources;</li> <li>10. Disposal of wastewater into any public stream is prohibited;</li> <li>11. The Proponent must obtain permission of the land owners before utilising any water resources or any associated infrastructure;</li> <li>12. If there is a need to drilling a water borehole to support the exploration programme the Proponent must obtain permission form the land owner and Department of Water Affairs in the Ministry of Agriculture and Forestry. In an event of discovery of economic minerals resources, the sources of water supply for the mining related operations will be supplied by NamWater;</li> <li>13. If there are any further (larger scale) exploration/drilling activities and/or mining activities to follow from the initial planned drill holes, groundwater monitoring must be implemented to include water level monitoring and also water sampling on a bi-annual basis. In order to have greater transparency on the water monitoring activities, the affected landowners / farmers must be given full access to the results of the water monitoring analyses.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Regional reconnaissance field-based mapping and sampling activities;</li> <li>(ii) Initial local field-based mapping and sampling activities;</li> <li>(iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</li> <li>(iv) Prefeasibility and feasibility studies.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Proponent's Representative (PR)</li> <li>(ii) Project Manager (PM)</li> <li>(iii) Project HSE</li> <li>(iv) Contractor</li> <li>(v) Subcontractors</li> </ol>

Table 6.12: Mitigation measures to minimise negative socioeconomic impacts.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Effective management of socioeconomic benefits of the proposed / ongoing project activities</p>	<ol style="list-style-type: none"> <li>1. The employment of local residents and local companies should be a priority. To ensure that potential employees are from the area, they need submit proof of having lived in the area for a minimum of 5 years;</li> <li>2. Providing information such as the number and types of jobs available, availability of accommodation facilities and rental costs and living expenses, could make potential job seekers wary of moving to the area;</li> <li>3. Addressing unrealistic expectations about large numbers of jobs would be created;</li> <li>4. Exploration camp if required should be established in close consultation with the land owners;</li> <li>5. Exploration camp should consider provision of basic services;</li> <li>6. When employees' contracts are terminated or not renewed, contractors should transport the employees out of the area to their hometowns within two days of their contracts coming to an end;</li> <li>7. Tender documents could stipulate that contractor have HIV/Aids workplace policies and programmes in place and proof of implementation should be submitted with invoicing;</li> <li>8. Develop strategies in coordination with local health officers and NGO's to protect the local communities, especially young girls.</li> <li>9. Contract companies could submit a code of conduct, stipulating disciplinary actions where employees are guilty of criminal activities in and around the vicinity of the EPL. Disciplinary actions should be in accordance with Namibian legislation;</li> <li>10. Contract companies could implement a no-tolerance policy regarding the use of alcohol and workers should submit to a breathalyser test upon reporting for duty daily;</li> <li>11. Request that the Roads Authority erect warning signs of heavy exploration vehicles on affected public roads;</li> <li>12. Ensure that drivers adhere to speed limits and that speed limits are strictly enforced;</li> <li>13. Ensure that vehicles are road worthy and drivers are qualified;</li> <li>14. Train drivers in potential safety issues.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Regional reconnaissance field-based mapping and sampling activities;</li> <li>(ii) Initial local field-based mapping and sampling activities;</li> <li>(iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</li> <li>(iv) Prefeasibility and feasibility studies.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Proponent's Representative (PR)</li> <li>(ii) Project Manager (PM)</li> <li>(iii) Project HSE</li> <li>(iv) Contractor</li> <li>(v) Subcontractors</li> </ol>

Table 6.13: Mitigation measures to minimise health and safety impacts.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Promotion of health and safe working environment in line with national Labour Laws</p>	<ol style="list-style-type: none"> <li>1. Physical hazards: Follow national and international regulatory and guidelines provisions, use of correct Personal Proactive Clothing at all times, training programme, as well as the implementation of a fall protection program in accordance with the Labour Act;</li> <li>2. Some of the public access management measures that may be considered in an event of vandalism occurring are: <ul style="list-style-type: none"> <li>• All exploration equipment must be in good working condition and services accordingly;</li> <li>• Control access to the exploration site through using gates on the access road(s) if required;</li> <li>• The entire site, must be fenced off; the type of fencing to be used would, however, be dependent on the impact on the visual resources and/or cost; and;</li> <li>• Notice or information boards relating to public safety hazards and emergency contact details to be put up at the gate(s) to the exploration area.</li> </ul> </li> <li>3. There is a comprehensive First Aid Kit on site and that suitable anti-histamine for bee stings / snake bites should be available.</li> <li>4. Rubber gloves are used in case of an accident to reduce the risk of contracting HIV/AIDS;</li> <li>5. All individuals have received instructions concerning the dangers of dehydration or hyperthermia. Encourage all to drink plenty of clean water not directly from the surface water bodies.</li> <li>6. No person under the influence of alcohol or drugs is allowed to work on site.</li> <li>7. The Exploration Manager ensures compliance with the requirements of the relevant Namibian Labour, Mining and Health and Safety Regulations.</li> <li>8. Dangerous or protected / sensitive areas are clearly marked and access to these areas is controlled or restricted.</li> <li>9. Due care must be taken when driving any vehicles on any roads particularly the gravel roads. ALL Drivers must drive with their headlights switched on when travelling on the gravel roads (day and night).</li> <li>10. Persons driving a vehicle must be in possession of a valid driver's license</li> <li>11. Awareness on HIV/AIDS among workers is raised</li> </ol>	<ol style="list-style-type: none"> <li>(i) Regional reconnaissance field-based mapping and sampling activities;</li> <li>(ii) Initial local field-based mapping and sampling activities;</li> <li>(iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</li> <li>(iv) Prefeasibility and feasibility studies.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Proponent's Representative (PR)</li> <li>(ii) Project Manager (PM)</li> <li>(iii) Project HSE</li> <li>(iv) Contractor</li> <li>(v) Subcontractors</li> </ol>

Table 6.14: Mitigation measures to minimise visual impacts.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Preserve the landscape character in the development of supporting infrastructure and choice of visual screening</p>	<ol style="list-style-type: none"> <li>1. Consider the landscape character and the visual impacts of the exploration area including camp site from all relevant viewing angles, particularly from public roads;</li> <li>2. Use vegetation screening where applicable. Do not cut down vegetation unnecessary around the site and use it for site screening;</li> <li>3. Avoid the use of very high fencing;</li> <li>4. Minimise access roads and no off-road that could result in land scarring is allowed;</li> <li>5. Minimise the presence of secondary structures: remove inoperative support structures;</li> <li>6. Remove all infrastructure and reclaim, or rehabilitate the project site after exploration activities are completed.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Regional reconnaissance field-based mapping and sampling activities;</li> <li>(ii) Initial local field-based mapping and sampling activities;</li> <li>(iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</li> <li>(iv) Prefeasibility and feasibility studies.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Proponent's Representative (PR)</li> <li>(ii) Project Manager (PM)</li> <li>(iii) Project HSE</li> <li>(iv) Contractor</li> <li>(v) Subcontractors</li> </ol>

Table 6.15: Mitigation measures to minimise vibration, noise and air quality.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Promote of effective management of vehicle movement, drilling and blasting operations and use of Personal Protective Equipment (PPE) in mitigating air quality and vibrations impacts in line with national laws</p>	<ol style="list-style-type: none"> <li>1. Limit vehicle movements and adhere to the speed of 60 km/h;</li> <li>2. Vehicles and all equipment must be properly serviced to minimise noise pollution;</li> <li>3. Use of Personal Protective Equipment (PPE) to minimise Occupational Health Safety impacts dues to noise pollution around the site;</li> <li>4. National or international acoustic design standards must be followed.</li> <li>5. Drilling and blasting operations can major sources of vibration, noise and dust and where required the following mitigation measure shall be implemented;               <ul style="list-style-type: none"> <li>• Drilling and blasting operations shall only be done by a qualified person who must at all times adhere to the required blasting protocol;</li> <li>• Prior warning shall be given to all persons, neighbour and visitors before the blasting takes place;</li> <li>• Careful planning and timing of the blast program to minimise the size of the charge;</li> <li>• Where practicable, use of explosive products with lower detonation velocities, but noting that this would require more explosives to achieve the same blast result;</li> <li>• Use of detonating caps with built-in time delays, as this effectively reduces each detonation into a series of small explosions;</li> <li>• Use of a procedure ("decking the charge") which subdivides the charge in one blast hole into a series of smaller explosions, with drill patterns restricted to a minimum separation from any other loaded hole;</li> <li>• Over-drilling the holes to ensure fracturing of the rock;</li> <li>• Stagging the detonation for each blast hole in order to spread the explosive's total overpressure over time;</li> <li>• Matching, to the extent possible, the energy needed in the "work effort" of the borehole to the rock mass to minimise excess energy vented into the receiving environment.</li> </ul> </li> </ol>	<ol style="list-style-type: none"> <li>(i) Regional reconnaissance field-based mapping and sampling activities;</li> <li>(ii) Initial local field-based mapping and sampling activities;</li> <li>(iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</li> <li>(iv) Prefeasibility and feasibility studies.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Proponent's Representative (PR)</li> <li>(ii) Project Manager (PM)</li> <li>(iii) Project HSE</li> <li>(iv) Contractor</li> <li>(v) Subcontractors</li> </ol>



Table 6.16: Mitigation measures for waste (solid and liquid) management.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Promotion of effective waste (solid and liquid) management through the adoption of sound and hierarchical approach to waste management, which would include waste minimisation, re-use, recovery, recycling, treatment, and proper disposal.</p>	<ol style="list-style-type: none"> <li>1. Burial of waste on anywhere within the EPL area is not allowed and all generated solid waste must be disposed at the at an approved municipal waste disposal site;</li> <li>2. Toilet and ablution facilities must be provided on site and should not be located close to Ephemeral Rivers or visible discontinuities (fractures, joints or faults);</li> <li>3. Provide site information on the difference between the two main types of waste, namely: <ul style="list-style-type: none"> <li>• General Waste; and</li> <li>• Hazardous Waste.</li> </ul> </li> <li>4. Sealed containers, bins, drums or bags for the different types of wastes must be provided. Never dispose of hazardous waste in the bins or skips intended for general waste;</li> <li>5. All solid and liquid wastes generated from the proposed / ongoing project activities shall be reduced, reused, or recycled to the maximum extent practicable;</li> <li>6. Trash may not be burned or buried, except at approved sites under controlled conditions in accordance with the municipal regulations;</li> <li>7. Never overfill any waste container, drum, bin or bag. Inform your Contractor or the Environmental Control Officer / Site Manager if the containers, drums, bins or skips are nearly full;</li> <li>8. Never litter or throwaway any waste on the site, in the field or along any road. No illegal dumping;</li> <li>9. Littering is prohibited.</li> <li>10. Latrines and French drains built &gt;100m from watercourses or pans to avoid pollution of primary and secondary aquifers.</li> <li>11. Chemical toilets or suitable waste water management system shall be provided on site and around the camp as may be required.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Regional reconnaissance field-based mapping and sampling activities;</li> <li>(ii) Initial local field-based mapping and sampling activities;</li> <li>(iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</li> <li>(iv) Prefeasibility and feasibility studies.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Proponent's Representative (PR)</li> <li>(ii) Project Manager (PM)</li> <li>(iii) Project HSE</li> <li>(iv) Contractor</li> <li>(v) Subcontractors</li> </ol>

Table 6.17: Rehabilitation plan.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Contributions toward environmental preservation and sustainability through rehabilitation of disturbed areas such as exploration sites and remove all unwanted part of the fixtures and restore the sites to close an approximation of the pristine state as is technically, financially and reasonably possible.</p>	<ol style="list-style-type: none"> <li>1. The following rehabilitation actions are practiced: <ul style="list-style-type: none"> <li>• Small samples are preferably removed from site to avoid additional scars in the landscape;</li> <li>• Litter from the site has been taken to the appropriate disposal site.</li> <li>• Debris, scrap metal, etc is removed before moving to a new site or closure of the mine.</li> <li>• Water tanks are dismantled and removed if not need for after use.</li> <li>• Tracks on site and the access road are rehabilitated by smoothing the 'middle mannetjie'(middle ridge between the tracks) and raking the surface.</li> </ul> </li> <li>2. The following should be undertaken at all disturbed areas that require further rehabilitation: <ul style="list-style-type: none"> <li>• if applicable the stockpiled subsoil to be replaced (spread) and/or the site is neatly contoured to establish effective wind supported landscape patterns;</li> <li>• Replace the stored topsoil seed bank layer.</li> <li>• Five (5) years after rehabilitation the sites are not visible from 500 m away.</li> </ul> </li> </ol>	<ol style="list-style-type: none"> <li>(i) Regional reconnaissance field-based mapping and sampling activities;</li> <li>(ii) Initial local field-based mapping and sampling activities;</li> <li>(iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</li> <li>(iv) Prefeasibility and feasibility studies.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Proponent's Representative (PR)</li> <li>(ii) Project Manager (PM)</li> <li>(iii) Project HSE</li> <li>(iv) Contractor</li> <li>(v) Subcontractors</li> </ol>

Table 6.18: Environmental data collection.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>1. Collect data that will add value to environmental monitoring and reporting to the regulators</p> <p>2. Collect data that will add to the general scientific and geographic knowledge of the environment in which the exploration process takes place.</p> <p>3. Acknowledged that the required skills and knowledge to collect all the suggested data may not be available within the mine /exploration team, however, as much data as is practical should be collected.</p>	<p>1. Environmental Monitoring Report Compiled and submitted by the Environmental Coordinator to the regulators</p> <p>2. The following types of information should be gathered:</p> <ul style="list-style-type: none"> <li>• Fauna. What tracks or signs of animal activity have been seen? (photographs and GPS recording) What animals, birds etc were identified? Alternatively provide a description and/ or photo if unidentified.</li> <li>• Unusual weather conditions, e.g. records of the prevailing wind direction and the direction from which storm events come. Was there fog or rain, frost overnight or intense heat? Preferably have a thermometer and rain gauge on site.</li> <li>• Vegetation. Record trees, shrubs, grass, etc. that are found in the vicinity along each of the profiles. Some plants do only occur after rainfall and might not have been seen for decades.</li> <li>• Any archaeological, cultural or historical sites that may be found. GPS coordinates, photograph and plot the position on a 1: 50 000 map.</li> <li>• other including surface water, spring, large scale geological features etc</li> </ul>	<p>(i) Regional reconnaissance field-based mapping and sampling activities;</p> <p>(ii) Initial local field-based mapping and sampling activities;</p> <p>(iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling;</p> <p>(iv) Prefeasibility and feasibility studies.</p>	<p>(i) Proponent's Representative (PR)</p> <p>(ii) Project Manager (PM)</p> <p>(iii) Project HSE</p> <p>(iv) Contractor</p> <p>(v) Subcontractors</p>

## 7. REHABILITATION AND MONITORING COMMITMENTS

### 7.1 Rehabilitation Process

The following is the summary of key rehabilitation process to be implemented by the proponent:

#### ❖ **Step 1: Backfilling the mining void:**

- Transporting all stockpiled overburden, whether being stockpiled or used as berms, back to the mining voids;
- Backfilling the trenches, pits and quarries using this material;
- If applicable, backfill the various layers of overburden in the reverse order in which they were removed, i.e. Last out should be first in as far as possible, and;
- When backfilling, bear in mind that some space must be left for the backfilling of the soil on top of the overburden.

#### ❖ **Step 2: Remove all waste and unwanted materials:**

- Once the slimes ponds have dried sufficiently, scrape out the slimes and transporting back to the mining voids during the overburden backfilling stage;
- Bulldoze the slimes pond walls over and contour;
- Allow the pollution control dam to evaporate completely, scrape all waste that has collected in the pond and dispose of these and the pond lining at a suitable site;
- Bulldoze the walls of the pollution control pond over and contour;
- Collect remaining domestic waste on site and transport to an approved municipal waste disposal site;
- Clean out the oil traps, collect the waste material in drums and transport to a suitable site for disposal, and;
- Manually remove all weedy species that are present at the site (the entire plant can easily be removed because the plants tend not to root deeply).

#### ❖ **Step 3: Remove all structures:**

- Sell all permanent structures such as houses to the farmer or another private person for using as a tourist camp;
- Disassemble all building structures including the washing plant structures and pre-fabricated buildings and transport them to a new exploration /mining test site or storage facility or sell by auction;
- Remove all building materials from the exploration / test mining site and either:
  - Transporting to a new site if it is to be used or stored elsewhere; or
  - Disposing at a suitable approved municipal waste disposal site; or
  - Making them available to the farmer or local persons; or
  - Selling at an auction.

- Remove all machinery from the site and transport to a new site where it is to be used or stored or sell at an Auction;
- Remove all fences that have been constructed and either make the material available to the local persons/farmer, dispose at a suitable site or sell at an Auction;
- Remove the generators from the sites from site and either transport to a new site for storage or sell it to the farmer or an Auction;
- Seal all petrol, diesel, oil and grease containers and remove from the site to a storage facility or make it available to the farmer;
- Collect all scrap metal and dispose at a suitable site or sell at an Auction;
- Break up all concrete slabs and structures on site and transport the fragments to a suitable site for disposal;
- The concrete reservoirs can probably remain intact provided that the farmer wishes to utilize them at some stage - this will need to be negotiated;
- The future of the water pipeline can be negotiated with the farmer or a new owner/lender of the site, because if he chooses to use the pipeline it will not be necessary to remove it and rehabilitate the route, and;
- If the pipeline is to be removed, disassemble and transport the component parts to a storage site or sell at an Auction.

❖ **Step 4: Rehabilitate the excavated voids:**

- Replace the subsoil layer by backfilling the soil on top of the overburden and contour cap the subsoil with a topsoil layer about 10cm deep, and;
- Cap the topsoil containing the seedbank with a layer of gravel by manually spreading the fragments across the surface using a rake.

❖ **Step 5: Rehabilitate site-specific storm-water channel:**

- Remove the Hyson cells or gabions;
- Dispose of the plastic/wire and use the fill material to backfill the storm-water channel;
- Cap with a layer of topsoil to a depth of about 10cm, and;
- Cap the topsoil containing the seedbank with a gravel layer by manually spreading the fragments across the surface using a rake.

❖ **Step 6: Rehabilitate all adjacent exploration / test mining sites affected:**

- Compaction of the substrate will result from utilisation of these areas or the pressure of overlying structures;
- Rip the surfaces to a depth of 40 cm to 50 cm using a multi-toothed ripper and tractor;
- Cover with a layer of topsoil to a depth of about 10 cm, and;
- Cap the topsoil containing the seedbank with a layer of gravel by manually spreading the fragments across the surface using a rake.



### ❖ **Step 7: Rehabilitate all unwanted access roads created:**

- Compaction of the road will result from the continuous passage of heavy vehicles so it will be necessary to break up the road surface;
- Rip the road surface to a depth of at least 50 cm using a multi-toothed ripper and tractor;
- Disk the ripped surface to break up the clods;
- Cover with a layer of topsoil to a depth of about 10 cm, and;
- Cap the topsoil containing the seedbank with a gravel layer by manually spreading the fragments across the surface using a rake.

## **7.2 Monitoring of the Environmental Performance**

### **7.2.1 Rehabilitation Evaluation and Performance Monitoring**

The following is the summary of key rehabilitation evaluation and performance monitoring to be implemented by the proponent:

- ❖ **Monitoring:** Monitoring program is instituted to ensure that the requirements of the mining site rehabilitation program are met. Rehabilitation program may be subjected to various natural or man-made forces that can hinder the progress and lead to problems or failure of the rehabilitation program. Regular monitoring will ensure that these factors are identified early so they may be resolved through appropriate recommendations;
- ❖ **Frequency:** All rehabilitated areas should be monitored over a three (3) years period from the onset of the rehabilitation procedures. The frequency of monitoring suggested above is dependent on satisfactory performance. If, however, the requirements are not being met, the frequency of monitoring can be increased. It is suggested that the monitoring be conducted once a year around September when the grasses and forbs are flowering;
- ❖ **Methods:** The rehabilitated areas might be monitored by the sampling randomly located 1m<sup>2</sup> quadrates. Approximately 10 quadrates per hectare (or a minimum of 3) should be sampled per plant community. The factors that will be examined in each quadrate include:
  - Percentage basal cover;
  - Percentage aerial cover;
  - Species composition and diversity;
  - Vigor and health of plants;
  - Presence of and evidence of fauna, and;
  - Nature of the substrate.
- ❖ **Controls:** To enable a comparison, control plots located within the surrounding un-mining areas should also be monitored. This will give an indication of the progress of rehabilitated areas versus the natural vegetation and will set the goals, which ultimately should be achieved. By monitoring the natural vegetation annually, it will also be possible to assess the natural changes that are taking place. These findings can then be applied to the rehabilitated areas so as to account for the changes, which may have resulted from natural events. Approximately 5 to 10 quadrates of 1m<sup>2</sup> should be sampled per community type to set the controls;

- ❖ Maintenance: Maintenance requirements may include seeding (if there is poor germination of the seedbank), fertiliser applications, correcting erosion problems, removing weeds, etc. Maintenance of the rehabilitated areas will be necessary periodically. The need for and extent of maintenance activities will be determined during the regular monitoring of the site, and;
- ❖ Qualified Personnel: The rehabilitation procedures from implementation to monitoring should be overseen by qualified personnel. Any persons involved in the rehabilitation of the mining site should be trained in the techniques involved.

## **7.2.2 Overall Environmental Performance Monitoring and Reporting**

The monitoring of the environmental performances for the proposed / ongoing exploration project can be divided into two (2) parts and these are:

- (i) Routine / ongoing daily monitoring activities to be undertaken by the Project HSE Officer with the support of the external specialist consultants as maybe required, and;
- (ii) Preparation of annual Environmental Monitoring Report and Environmental Closure covering all activities related to the Environmental Management Plan during exploration / prospecting stages and at closure of the proposed / ongoing exploration to be undertaken by the Project HSE Officer with the support of the external specialist consultants as maybe required.

The proponent will be required to report regularly (twice in a year or as the case maybe) to the Environmental Commissioner in the Ministry of Environment and Tourism (MET), the environmental performances as part of the ongoing environmental monitoring programme. Environmental monitoring programme is part of the EMP performances assessments and will need to be compiled and submitted as determined by the Environmental Commissioner. The process of undertaking appropriate monitoring as per specific topic (such as fauna and flora) and tracking performances against the objectives and documenting all environmental activities is part of internal and external auditing to be coordinated by the Project HSE Officer.

The second part of the monitoring of the EMP performance will require a report outlining all the activities related to effectiveness of the EMP at the end of the planned mineral exploration to be undertaken by the Project HSE Officer with the support of the external specialist consultants as maybe required. The objective will be to ensure that corrective actions are reviewed and steps are taken to ensure compliance for future EIA and EMP implementation.

The report shall outline the status of the environment and any likely environmental liability after the completion of the proposed / ongoing project activities. The report shall be submitted to the Environmental Commissioner in the Ministry of Environment and Tourism and will represent the final closure and fulfilment of the conditions of the Environmental Clearance Certificate (ECC) issued by the Environmental Commissioner and the conditions of the Pro-Forma Environmental Contract signed by the Proponent, Environmental Commissioner and the Mining Commissioner.

## 8. CONCLUSION AND RECOMMENDATION

### 8.1 Conclusions

DLE (**the Proponent**) intends to undertake exploration activities in the Exclusive Prospecting Licence (EPL) No. 5439 covering base and rare metals, industrial minerals and precious metals. The exploration activities to be undertaken as assessed in this environmental assessment are as follows:

- (i) Initial desktop exploration activities;
- (ii) Regional reconnaissance field-based activities;
- (iii) Initial local field-based activities including detailed mapping, sampling and drilling operations;
- (iv) Detailed local field-based activities including detailed mapping, sampling and drilling operations, and;
- (v) Prefeasibility and feasibility studies including possible test mining.

The overall severity of potential environmental impacts of the proposed / ongoing project activities on the receiving environment (physical, biological, socioeconomic environments and ecosystem functions, services, use and non-use values or passive uses) will be of low magnitude, temporally duration, localised extent and low probability of occurrence. Mitigation measures must be implemented as detailed in Section 6 (EMP) of this report. The Proponent must obtain permission of the land owners (surface rights holders) before exercising their subsurface rights in all the farms covered by the EPL 5439.

### 8.2 Recommendations

It's hereby recommended that the proposed / ongoing exploration activities be issued with an Environmental Clearance Certificate (ECC). The Proponent shall take into consideration the following key requirements for implementing the proposed exploration programme:

- (i) Mitigation measures must be implemented as detailed in Section 6 (EMP) of this Scoping and EMP report;
- (ii) The Proponent shall negotiate Access Agreements with the land owner/s as may be applicable;
- (iii) The Proponent shall adhere to all the provisions of the EMP and conditions of the Access Agreement to be entered between the Proponent and the land owner/s in line with all applicable national regulations;
- (iv) Before entering any private or protected property/ area such as a private farm, the Proponent must give advance notices and obtain permission to access the EPL area at all times, and;
- (v) Where possible, and if water is found during the detailed exploration boreholes drilling operations, the Proponent shall support other land uses in the area in terms of access to freshwater supply for both human consumption, wildlife and agricultural support as may be requested by the local community / land owners/s. The abstraction of the groundwater resources shall include water levels monitoring, sampling and quality testing on a bi-annual basis, and that the affected landowners must have access to the results of the water monitoring analyses as part of the ongoing stakeholder disclosure requirements on shared water resources as maybe applicable.

The Proponent must take all the necessary steps to implement all the recommendations of the EMP for the successful implementation and completion of the proposed / ongoing exploration programme covering the EPL 5439. Recommended actions to be implemented by the Proponent through implementations of the EMP are:

- (i) The Proponent must implement precautionary measures / approach to environmental management. Once a viable and potential economic resource have been identified, the Proponent must develop and implement a separate EIA and EMP inclusive of the specialist studies such as fauna and flora to be undertaken by specialist consultants as part of the feasibility study stage;
- (ii) Before detailed site-specific exploration activities such as extensive drilling operations and access routes are selected, the Project HSE Officer with the support of the external specialist consultants as maybe required, should consider the flora, fauna and archaeological sensitivity of the area and commission a field survey in advance of any site development as may be required based on the assessment undertaken;
- (iii) The Project HSE Officer shall lead, implement and promote environmental culture through awareness raising of the workforce, contractors and sub-contractors in the field during the whole duration of the proposed / ongoing exploration period;
- (iv) The Proponent to provide all the necessary support including human and financial resources, for the implementation of the proposed / ongoing mitigations and effective environmental management during the planned exploration activities for the EPL 5439;
- (v) Project HSE Officer with the support of the external specialist consultants as maybe required to develop a simplified environmental induction and awareness programme for all the workforce, contractors and sub-contractors;
- (vi) Where contracted service providers are likely to cause environmental impacts, these will need to be identified and contract agreements need to be developed with costing provisions for environmental liabilities;
- (vii) Implement monitoring of the actions and management strategies developed during the mineral exploration process. Final Environmental Monitoring report shall be prepared by the Project HSE Officer with the support of the external specialist consultants as maybe required to be submitted to the regulators and to mark the closure of the proposed / ongoing mineral exploration, and;
- (viii) Develop and implement a monitoring programme that will fit into the overall company's Environmental Management Systems (EMS) as well as for any future EIA for possible mining projects.

### **8.3 Summary ToR for Test Mining and Mining Stages**

In an even that economic minerals resources are discovered within the EPL 5439 area and could lead to the development of mining project, a new Environmental Clearance Certificate (ECC) for mining will be required. The ECC being supported by this Scoping and EMP report only covers the exploration phase. A separate field-based and site-specific Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) reports supported by specialist studies as maybe applicable must be prepared in order to support the application for the new ECC for mining operations. The EIA and EMP studies shall form part of the prefeasibility and feasibility study with respect to the test mining or possible mining operations. The site-specific EIA and EMP shall cover the area identified to have potential economic minerals resources as well as all areas to be used for infrastructural support areas such as pit / shaft area/s, waste rock, tailings dump, access, office blocks, water and energy infrastructure support areas (water, energy and road / access). In addition to the Terms of Reference (ToR) to be developed during the Environmental Scoping study phase for the test mining / mining stages, the following field-based and site-specific specialist studies shall be undertaken as part of the

EIA and EMP for possible test mining or mining operations in an event of a discovery of economic minerals resources and possible development of a mining project:

- (i) Groundwater studies including modelling as maybe applicable;
- (ii) Field-based flora and fauna diversity;
- (iii) Noise and Sound modelling linked to engineering studies;
- (iv) Socioeconomic assessment, and;
- (v) Others as may be identified / recommended by the stakeholders/ land owners/ Environmental Commissioner or specialists.

The aims and objectives of the Environmental Assessment (EA) covering EIA and EMP to be implemented as part of the feasibility study if economic resources are discovered are:

- (i) To assess all the likely positive and negative short- and long-term impacts on the receiving environment (physical, biological and socioeconomic environments) at local (EPL Area), regional, national (Namibia) and Global levels using appropriate assessment guidelines, methods and techniques covering the complete project lifecycle. The EIA and EMP to be undertaken shall be performed with reasonable skill, care and diligence in accordance with professional standards and practices existing at the date of performance of the assessment and that the guidelines, methods and techniques shall conform to the national regulatory requirements, process and specifications in Namibia and in particular as required by the Ministry of Mines and Energy, Ministry of Environment and Tourism and Ministry of Agriculture, Water Affairs and Forestry, and;
- (ii) The development of appropriate mitigation measures that will enhance the positive impacts and reduce the likely negative influences of the negative impacts identified or anticipated. Such mitigation measures shall be contained in a detailed EMP report covering the entire project lifecycle.

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