A. Speiser Environmental Consultants cc
VAT Reg. No.: 3452708015 Reg. No.: cc 2003/0606
Alexandra Speiser
MSc MPhil
P.O. Box 40386 Windhoek Namibia Tel:+264 61 244 782 Cell: 081 124 5655 e-mail:amspeiser@yahoo.com

SCOPING REPORT AND EMP FOR GERGARUB EXPLORATION AND MINING (PTY) LTD. EXPLORATION ACTIVITIES ON MDRL 2616

OCTOBER 2019

Compiled for:
Gergarub Mining and Exploration (Pty) Ltd
P.O. Box 90757
Windhoek
Namibia

Compiled by:
A. Speiser Environmental Consultants cc
PO Box 40386
Windhoek
Namibia

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ACRONYMS

Acronyms / Abbreviations	Definition
DigHem Airborn	Airborne Electromagnetic methods (frequency domain)
EAPAN	Environmental Assessment Professionals' Association of Namibia
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EM	Electro magnetic
IAPs	Interested and Affected Parties
ICP	Inductive Coupled Plasma
MET	Ministry of Environment and Tourism
MET: DEA	Ministry of Environment and Tourism: Department of Environmental Affairs
EMP	Environmental Management Plan
EPL	Exclusive Prospecting License
ML	Mining License
PPE	Personal Protection Equipment
RAB drilling	Reversed Air Blast drilling
RC drilling	Reversed Circulation drilling
SQIUD	Superconducting Quantum Interference Devices
TDEM	Time Domain Electromagnetic Method
TME	Trekport Mountain East
TMW	Trekport Mountain West
VTEM	Versatile Time Domain Electromagnetic System
XRF	X-Ray Fluorescence

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SCOPING REPORT AND EMP FOR ROSH PINAH ZINC CORPORATION'S (RPZC) EXPLORATION ACTIVITIES ON MDRL 2616

1 INTRODUCTION

The Ministry of Mines and Energy (MME) granted the Minerals Deposit Retention Licence (MDRL) 2616 to Rosh Pinah Zinc Corporation (RPZC) on 17 August 2017 (**Appendix 1**). Until than the area was part of the EPL 2616. **Figure 1** shows the MDRL 2616 and the EPL 2616. The MDRL 2616 area is 690.6038 hectares and mainly covers the Gergarub area. The coordinates of the MDRL 2616 are provided in **Table 1**. The MDRL is for precious, base and rare metals.

In the past years the MDRL 2616 area was explored in an JV agreement between Skorpion Zinc (SZ) and Rosh Pinah Zinc Corporation (RPZC) while it was still part of EPL 2616. The JV agreement applies to the new MDRL 2616 and the exploration activities are conducted by Gergarub Exploration and Mining (Pty) Ltd, which is owned by 51% by SZ and 49% by RPZC. On 17 June 2019 MME transferred the MDRL 2616 to Gergarub Mining and Exploration (Pty) Ltd (**Appendix 1**).

In January 2016 a Scoping Report and EMP for the Exclusive Prospecting Licence (EPL) 2616 were submitted in to MET:DEA to obtain the Environmental Clearance Certificate (ECC) which was obtained in May 2016. The ECC for EPL 2616 was renewed in June 2019.

The 2016 report was conducted in a Joint Venture agreement between A. Speiser Environmental Consultants cc (ASEC) and SLR Namibia. This JV does not exist anymore. The author of the 2016 report was A. Speiser of ASEC.

As the Scoping Report and EMP for EPL 2616 covered as well the new MDRL 2616, no new Scoping Report and EMP was conducted. The relevant information for the MDRL 2616 are taken from the January 2016 report.

Table 1: Corner coordinates of MDRL 2616.

No.	Lat Deg	Lat Min	Lat Sec		Long Deg	Long Min	Long Sec	
1	-27	50	56.00	S	16	41	30.00	E
2	-27	52	14.00	S	16	42	47.00	E
3	-27	52	34.00	S	16	42	21.00	E
4	-27	52	26.00	S	16	41	52.00	E
5	-27	52	43.00	S	16	41	24.00	E
6	-27	51	39.00	S	16	40	20.00	E

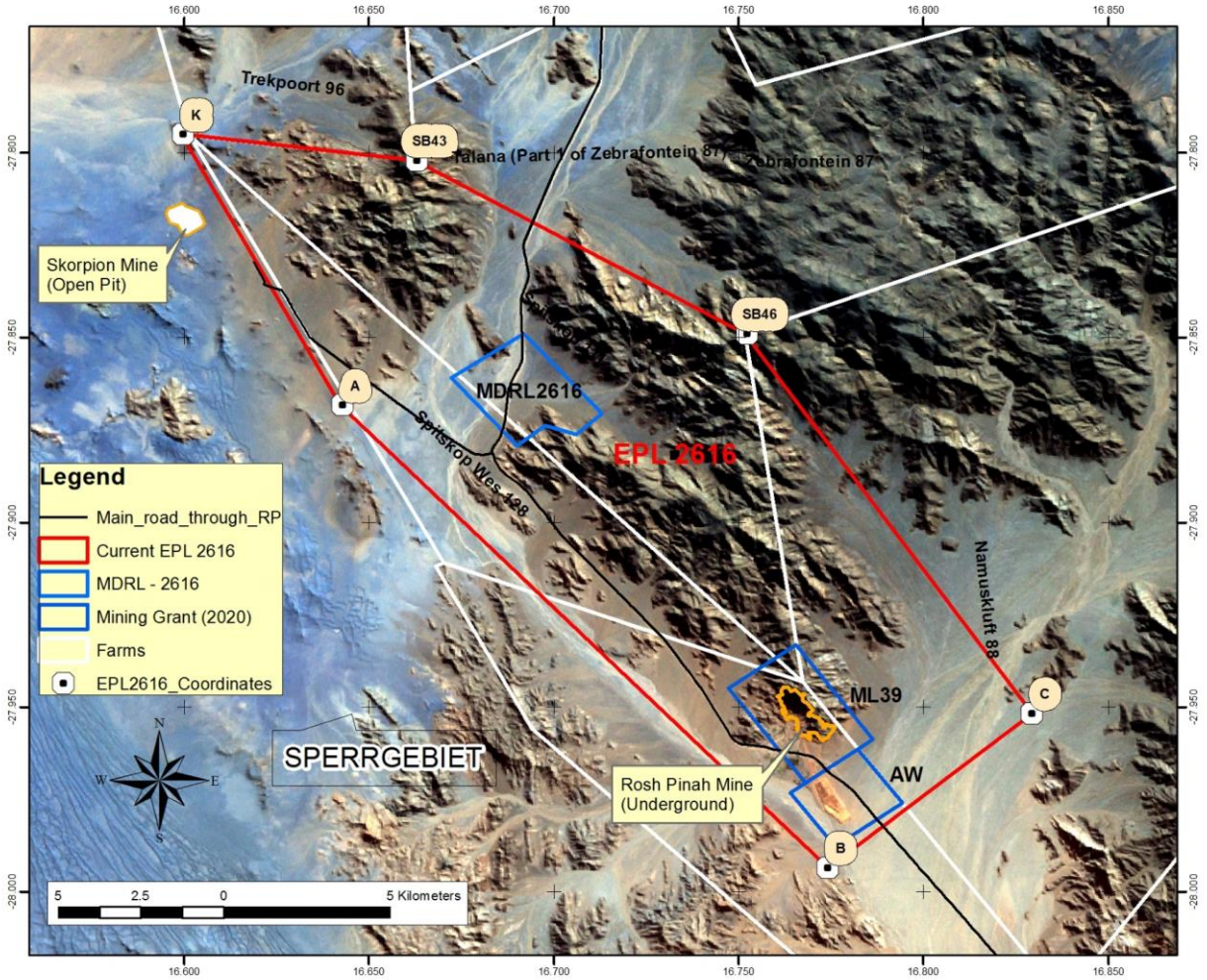

Figure 1: Location of MDRL 2616 (blue) and EPL 2616.

1.1 Motivation for the exploration activities

The Ministry of Mines and Energy (MME), Directorate of Mines undertakes to exploit the country's mineral resources in a manner which integrates mining into the various economic sectors for the socio-economic development of the country. In order to achieve this, MME issues EPLs to various entities for the exploration of minerals within the country.

Should a feasible resource be located, it could provide social and economic development within the region and the country, subject to a Mining Licence (ML) being issued by MME and a separate, comprehensive (full) environmental impact assessment (EIA) process. The EIA process for Gergarub was for most parts completed. The actual EEC was not issued as the authorities had some queries. Unfortunately, the project at that point was discontinued and project team dismantled before official correspondence between Project Team and Authorities could be concluded.

1.2 Introduction to the environmental impact assessment for the proposed exploration activities

Environmental Impact Assessments are regulated by the Ministry of Environment and Tourism (MET) in terms of the Environmental Management Act, 7 of 2007. This Act was gazetted on 27 December 2007 (Government Gazette No. 3966). The List of Activities that may not be undertaken without an Environmental Clearance Certificate and the Environmental Impact Assessment Regulations: Environmental Management Act, 2007 (Government Gazette No. 4878) were promulgated on 6 February 2012.

Mining and Quarrying Activities

3.1 The construction of facilities for any process or activities which requires a licence, right or other form of authorisation, and the renewal of a licence, right or other form of authorisation, in terms of the Minerals (Prospecting and Mining Act), 1992.

3.2 Other forms of mining or extraction of any natural resources whether regulated by law or not.

3.3 Resource extraction, manipulation, conservation and related activities.

The following listed activities are relevant to the exploration activities:

1.2.1 EIA process for the proposed exploration activities on MDRL 2616

The main purpose of this report is to provide information relating to RPZC's and SZ's (JV agreement) ongoing exploration activities and to list the environmental aspects and impacts that have been identified during the exploration activities and scoping process. This Scoping Report was developed through site observations and consultation with relevant stakeholders. An Environmental Management Plan (EMP) exists since 2003 (see **Appendix 2**) and additional management and mitigation measures are set out in Section 8 of the Scoping Report (Section 8).

1.2.2 EIA Scoping process

The EIA Scoping process and corresponding activities are outlined in **Table 2** below. This was conducted for EPL 2616, however, MDRL 2616 was part of the EPL.

Table 2: EIA Scoping process.

Objectives	**Corresponding activities**
September 2019	
Scoping report and EMP for MDRL 2616	
Scoping phase (including assessment of impacts) (December 2015 to February 2016)	
• Identify interested and/or affected parties (IAPs) (specifically relevant landowners) and involve them in the scoping process through information sharing. • List environmental issues associated with the ongoing project. • Provide a description of the affected environment. • Assessment of environmental impacts. associated with the proposed project. • Revise management and mitigation measures.	• Identify government authorities and IAPs and notify them of the project and EIA process. • IAP registration and initial comments period. • Compilation of Scoping Report and additional management and mitigation measures to the existing EMP. • Distribute Scoping Report and EMP to relevant authorities and IAPs for review. • Submission of Application form to MET. • Forward finalised Scoping Report and EMP with IAPs comments to MET for

Objectives	Corresponding activities
	decision making.

More details regarding the public participation process are provided in Section 2.3.

1.2.3 EIA team

ASEC and SLR Environmental Consulting (Namibia) (Pty) Ltd (SLR) in a JV agreement were appointed to undertake the environmental impact assessment processes. Alex Speiser, the EIA project manager, has fifteen years of relevant experience in conducting / managing EIAs, compiling EMPs and implementing EMPs and Environmental Management Systems. She's conducted work as an independent consultant for RPZC since 2003 and was involved in the exploration activities from the start. Werner Petrick is the reviewer and has more that seventeen years of experience in conducting / managing EIAs, compiling EMPs and implementing EMPs and Environmental Management Systems. Both Alex Speiser and Werner Petrick are certified as lead environmental practitioners and reviewers under the Environmental Assessment Professionals Association of Namibia (EAPAN). The relevant curriculum vitae documentation is attached in **Appendix 3**.

2 SCOPING AND METHODOLOGY

2.1 Information collection

The original Scoping Report and EMP for EPL 2616 including the new MDRL 2616 (January 2016) used various sources to identify the environmental issues associated with the exploration activities. The main sources of information for the preparation of this Scoping Report include:

- Project information provided by RPZC which includes:
  - Exploration activities
  - Maps outlining the EPL boundaries and target areas
  - Bi-annuals reports since 1999
- Experience of Alex Speiser, who worked in the area intensively since 2003
- Consultation with Interested and Affected Parties (IAPs) (i.e. relevant landowners, Roshkor, Skorpion Mine).
- Consultation with relevant local authorities.

2.2 Scoping Report

The main purpose of this Scoping Report was to state which environmental aspects relating to the exploration activities had and have an impact on the environment, to assess them and to revise management and mitigation measures to avoid or reduce these impacts. The scope of this EIA process included the impacts associated with the exploration activities being conducted by RPZC and their JV partner Skorpion, as described in section 4. **Table 3** outlines the Scoping Report requirements contained in Section 8 of the Environmental Impact Assessment Regulations promulgated in February 2012 under the Environmental Management Act, 7 of 2007. The table includes reference to the relevant sections in the report.

Table 3: Scoping report requirements stipulated in the EIA regulation.

Requirements for a Scoping Report in terms of the February 2012 regulations	Reference in report
(a) the curriculum vitae of the EAP who prepared the report;	Appendix 3
(b) a description of the exploration activity;	Section 4

Requirements for a Scoping Report in terms of the February 2012 regulations	Reference in report
(c) a description of the site on which the activity is undertaken and the location of the activity on the site	Section 1 & 4
(d) a description of the environment that may be affected by the proposed activity and the manner in which the geographical, physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed listed activity;	Sections 5 & 7
(e) an identification of laws and guidelines that have been considered in the preparation of the Scoping Report;	Section 3
(f) details of the public consultation process conducted in terms of regulation 7(1) in connection with the application, including - (i) the steps that were taken to notify potentially interested and affected parties of the proposed application; (ii) proof that notice boards, advertisements and notices notifying potentially interested and affected parties of the proposed application have been displayed, placed or given; (iii) a list of all persons, organisations and organs of state that were registered in terms of regulation 22 as interested and affected parties in relation to the application; and (iv) a summary of the issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues;	Section 2.3 & Appendices 4, 5, 6, 7 & 8
(g) a description of the need and desirability of the proposed listed activity and any identified alternatives to the proposed activity that are feasible and reasonable, including the advantages and disadvantages that the proposed activity or alternatives have on the environment and on the community that may be affected by the activity;	Section 1.1
(h) a description and assessment of the significance of any significant effects, including cumulative effects, that may occur as a result of the undertaking of the activity or identified alternatives or as a result of any construction, erection or decommissioning associated with the undertaking of the proposed listed activity;	Section 7
(i) terms of reference for the detailed assessment; and	
(j) a draft management plan, which includes - (i) information on any proposed management, mitigation, protection or remedial measures to be undertaken to address the effects on the environment that have been identified including objectives in respect of the rehabilitation of the environment and closure; (ii) as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of the activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and (iii) a description of the manner in which the applicant intends to modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation remedy the cause of pollution or degradation and migration of pollutants.	Section 8 & Appendix 2

2.3 Public participation process

The public participation process for the exploration activities aimed to ensure that all persons (i.e. relevant landowners) and/or organisations that have been affected by, or interested in, the ongoing activities were informed of the project and could register their views and concerns. By consulting with IAPs the range of environmental issues to be considered in the Scoping Report (including the assessment of impacts) has been given specific context and focus.

Included below is a summary of the people consulted, the process that was followed, and the issues that were identified.

2.3.1 RPZC stakeholders

Table 4 provides a broad list of stakeholders that were and are relevant to the exploration activities on MDRL 2616. They were informed about the exploration activities and the public consultation process.

Table 4: Stakeholders

Stakeholder Grouping	Organization
Government Ministries	• Ministry of Environment and Tourism (MET) ○ Department of Environmental Affairs • Ministry of Mines and Energy
Affected landowners	Farm owners, Roshkor, Skorpion Mine
Other interested and affected parties	Any other people with an interest in, or who may be affected by, the proposed project.

2.3.2 Steps in the consultation process

Table 5 sets out the steps in the consultation process that were conducted during the EIA Scoping process in 2016:

Table 5: Consultation process with IAPs.

TASK	DESCRIPTION	DATE
Notification - regulatory authorities and IAPs		
IAP identification	The existing stakeholder database created during previous EIAs for RPZC has been updated throughout the EIA Scoping process, where required.	January 2016
Distribution of background information document (BID) and telephone calls	ASEC/SLR contacted (telephonically) the two affected farm owners to explain the Scoping Report and EMP process, etc. BIDs were emailed to I&APs on the 13th of January 2014. Hard copies of the BID were made available at the RPZC library. The purpose of the BID was to inform IAPs about the exploration activities, the EIA (Scoping) process being followed, environmental impacts and means of providing input to the EIA (Scoping) process. Attached to the BID was a registration and response form, which provided IAPs with an opportunity to submit their names, contact details and comments on the project. A copy of the BID is attached in **Appendix 4**.	January 2016
Site notices	A Site notice was clearly displayed at the RPZC Mine and at the main focus area of the EPL. A photo of the site notice is attached in **Appendix 5**.	January 2016
Newspaper Advertisements	Block advertisements were placed as follows: • The Republikein (13 & 20 January 2016 • The Namibian (13 & 20 January 2016) Copies of the advertisements are attached in **Appendix 6**.	13 - 20 January 2016
Focus Group Meeting and submission of comments		
Focus group meeting Submission of Comments	No focus group meetings were held, as the project is ongoing since 1999 and no issues have been brought forward to Rosh Pinah Mine. Telephonic meetings were held with the two land owners	January 2016

TASK	DESCRIPTION	DATE
	and Skorpion Mine.	
Comments and Responses	All comments received by email, fax, telephone conversations are attached in **Appendix 7**. A Summary Issues and Response Report is attached in **Appendix 8**.	
Review of draft Scoping Report		
IAPs and authorities (excluding MET) review of Scoping Report and EMP	The Scoping Report has been distributed to all IAPs that are registered on the IAP database via e-mail. Authorities and IAPs have 13 working days to review the Scoping Report and submit comments in writing to SLR. The closing date for comments was 29 January 2016.	
MET review of Scoping Report and EMP	A copy of the final Scoping Report, including authority and IAP review comments, was delivered to MET on completion of the public review process, for their review and decision.	February 2016
Submission	ECC granted for EPL 2616 (including MDRL 2616 area)	May 2016
Scoping Report and EMP for MDRL 2616	Submission of Form 1 and Scoping Report and EMP for MDRL 2616 to MET:DEA	September 2019

2.3.3 Summary of issues raised

All issues that have been raised to date by IAPs are provided in **Appendix 7** of the Scoping Report. Issues raised pertain to:

- Additional information to flora description

An Issues & Responses Report is attached in **Appendix 8**.

3 LEGAL FRAMEWORK

The Republic of Namibia has five tiers of law and a number of policies relevant to environmental assessment and protection, which includes:

- The Constitution.
- Statutory law.
- Common law.
- Customary law.
- International law.

Key policies currently in force include:

- The EIA Policy (1995).
- Namibia's Environmental Assessment Policy for Sustainable Development and Environmental Conservation (1994).

As the main source of legislation, the Constitution of the Republic of Namibia (1990) makes provision for the creation and enforcement of applicable legislation. In this context and in

accordance with its constitution, Namibia has passed numerous laws intended to protect the natural environment and mitigate against adverse environmental impacts.

3.1 Applicable laws and policies

In the context of the proposed exploration activities, there are several laws and policies currently applicable. They are reflected in **Table 6**.

Table 6: Relevant Legislation and Policies for Exploration Activities on MDRL 2616

YEAR	NAME	Natural Resource Use (energy & water)	Emissions to air (fumes, dust & odours)	Emissions to land (non-hazardous & hazardous	Emissions to water (industrial & domestic)	Noise (remote only)	Visual	Vibrations	Impact on Land use	Impact on biodiversity	Impact on Archeology	Emergency situations	Socio-economic	Safety & Health
1990	The Constitution of the Republic of Namibia of 1990	X	X	X	X	X	X	X	X	X	X	X	X	X
1997	Namibian Water Corporation Act, 12 of 1997	X											X	
1992	The Minerals (Prospecting and Mining) Act 33 of 1992	X	X	X	X					X				
2001	The Forestry Act 12 of 2001	X							X	X				
2013	Water Resources Management Act 11 of 2013	X			X								X	
2004	National Heritage Act 27 of 2004										X			X
2007	Environmental Management, Act 7 of 2007	X	X	X	X	X	X	X	X	X	X		X	X
2012	Regulations promulgated in terms of the Environmental Management, Act 7 of 2007													
1975	Nature Conservation Ordinance 14 of 1975	X			X					X	X			
1976	Atmospheric Pollution Prevention Ordinance 11 of 1976		X											
1995	Namibia's Environmental Assessment Policy for Sustainable Development and Environmental Conservation	X	X	X	X	X	X	X	X	X	X	X		X

4 DESCRIPTION OF THE EXPLORATION ACTIVITIES

RPZC has been conducting exploration work in the MDRL 2616 area under EPL 2616 since 2009 and plans to continue with these activities. The various exploration activities which were and will continue to be carried out in future are provided below:

- Mapping;
- Geophysical surveys (airborne & ground);
- Grid line cutting;
- Sampling of soils and rocks
- Accessing the drill sites;
- Drilling and collecting of samples

4.1 Exploration Activities since 2009

In the following section a short summary of exploration activities in the area is provided. **Table 7**, **Table 8** and **Table 9** provide the exploration activities from 2009 – 2011, from 2011 – 2013 and 2013 to date. **Figure 2** provides a map of the MDRL 2616 area.

Table 7: Exploration Activities from 2009 - 2011.

Exploration Activities 2009 - 2011	
Activities	**Target Areas**
Geological Mapping	Gergarub Project - Core logging and Structural interpretation
Geochemistry	Gergarub Project - 2 reference lines of MMI
	Gergarub Project - Core Sampling
Geophysics	Gergarub Project - Down Hole EM Surveys
	Gergarub Project - Ground Magnetic Survey
	Gergarub Project - Squid Surveys
Drilling	Diamond drilling - Gergarub Project to upgrade Resources
	RC precollars - Gergarub Project
Rehabilitation	Rehabilitation of all drill sites, roads created and drill sumps

Table 8: Exploration Activities from 2011 – 2013.

Exploration Activities 2011 - 2013		
Activities	**Target Areas**	**Specific Activity**
Geological Mapping	Gergarub Project - Core Logging	Structural Analysis
Geochemistry	Gergarub Project - Diamond Drilling Core Samples	Geochemical Analysis - ICP and Niton XRF
Geophysics	None	
Drilling	Gergarub: Extensive RC and Diamond Drilling to upgrade inferred resources to Indicated	Prefeasibility infill drilling and metallurgical testwork
Rehabilitation	Rehabilitation of Drill sites, Roads created and Drill Sumps	

Table 9: Exploration Activities from 2013 – TO DATE.

	Exploration Activities 2013 - to date	
Activities	**Target Areas**	**Specific Activity**
Geological Mapping	Gergarub Project - Core Logging	Structural Analysis
Geochemistry	Gergarub Project - Diamond Drilling Core Samples,	Geochemical Analysis - ICP and Niton XRF
Geophysics	None	
Drilling	Gergarub: Extensive RC and Diamond Drilling to upgrade inferred resources to Indicated	Prefeasibility infill drilling and metallurgical testwork
	RAB Drilling Projects - Gergarub East	Bedrock Sampling
Rehabilitation	Rehabilitation of Drill sites, Roads created and Drill Sumps	

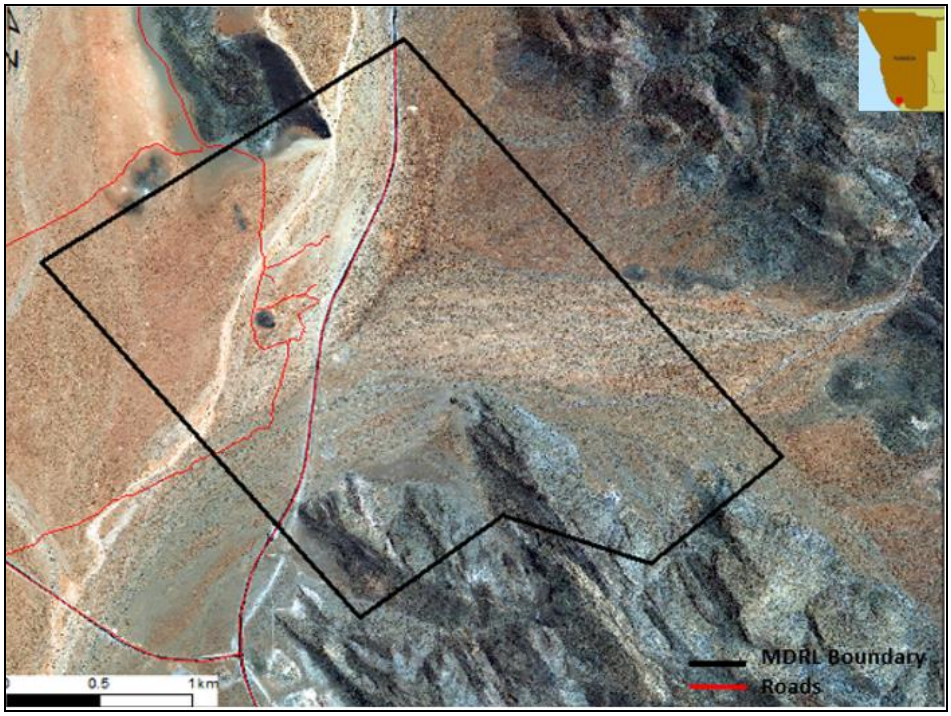

Figure 2: MDRL 2616 area.

4.1.1 Geological studies and field mapping

This included and will include the review of geological maps of the area and on-site ground traverses and observations. Small samples of rock (less than 500 g) have been and will be collected for analysis. This work is ongoing since 2009.

4.1.2 Geochemistry surveys (sampling)

With guidance from the geological mapping, samples of rocks and drill chips and cores were and are collected and sent for geochemical major and trace element analysis to determine if sufficient quantities of a base metal is present.

4.1.3 Geophysical surveys

Geophysical surveys were conducted in order to ascertain the mineralisation of a given area and entailed the collection of information of the substrata, by air or ground, through sensors such as radar, magnetic and electromagnetic to detect any mineralisation in the area. These surveys were conducted between 2009 and 2011.

Ground geophysical surveys were carried out on foot using sensors carried by staff.

Air surveys were conducted, sensors are mounted to an aircraft, which flies over the target area. These surveys are contracted out to companies specialising in aerogeophysical surveys.

4.1.4 Drilling

RC and diamond drilling are carried since 2009.

A typical drilling pad/area will consist of a drill-rig, an area where the drill core and geological samples can be stored and a storage area for drill equipment, fuel and lubricants. This area is

cordoned off and off-limits to those not part of the exploration team. The drilling pad/area is usually cleared and levelled and is approximately 12 m x 12 m (**Plate 1**). All drill-water is (and will continue to be) collected in drill-sumps, which is managed to prevent overflows.

Plate 1: Typical layout of a drill area on MDRL 2616.

Reverse Circulation (RC) Drilling:

The drilling mechanism is a pneumatic reciprocating piston known as a "hammer" driving a tungsten-steel drill bit. RC drilling ideally produces dry rock chips, as large air compressors dry the rock out ahead of the advancing drill bit. The drilling rigs, compressor and generators used for RC drilling are mounted on trucks suitable for most terrains. Drill pads are kept to a minimum size and the working area is clearly demarcated. Where necessary, sumps are dug into the ground to hold the water which was encountered during drilling, as RC drilling does not need water. Fuel to power the drill rigs is brought to the site in drums or in a small truck. The percussion chip samples are funneled through a cyclone into 1m x 1m plastic bags. Smaller geological samples are taken from these bags for analysis. Percussion chips that are not needed are collected and disposed of at the Rosh Pinah waste rock site.It is also less costly than diamond coring.

Diamond-core Drilling:

Diamond core drilling uses an annular diamond-impregnated drill bit attached to the end of hollow drill rods to cut a cylindrical core of solid rock. Holes within the bit allow water to be delivered to the cutting face. This provides three essential functions — lubrication, cooling, and removal of drill cuttings from the hole. Diamond drilling is much slower than reverse circulation (RC) drilling due to the hardness of the ground being drilled. Drilling of 100 to 1800 metres is common and at these depths, ground is mainly hard rock.

In contrast to percussion drilling, diamond drilling needs water. All sumps are lined to avoid seepage of contaminated fluids, e.g. lubricants. Water is carted by truck on a daily basis from Rosh Pinah Mine. Continuous solid cores are recovered by diamond drilling. The core is stored in core trays, logged at RPZC's exploration office. After expiry of the EPL licence and the decision not to proceed, the cores will be available to the Geological Survey of Namibia.

4.2 Personnel and machinery / vehicles

Table 10 provides a summary of the personnel and machinery/vehicles required to conduct the above-mentioned exploration activities.

Table 10: Anticipated Personnel and Machinery and Vehicles during Exploration Activities.

Activity	Anticipated personnel	Machinery/vehicles (approximate)
Field mapping	RPZC Geologists and Field Assistants	1-2 light vehicles (i.e. 4x4)
Geochemistry	Up to 6 personnel (i.e. Geologists, Geo-technician and un-skilled workers)	1-2 light vehicles
Geophysical surveys	1 Geologist 1-3 Field Assistants	1 light vehicle
Drilling	• 1 Geologists • 3 Semi-skilled/un-skilled workers • 4 Drill Crew	• 1 Drill rig • 2 Support Trucks • 2-3 light vehicles

The exploration team is employed by RPZC mine and lives in Rosh Pinah town. The drilling teams (Major Drilling and JGM Drilling) had their camps on adjacent farms since 2011. Since then, only Major drilling is working for RPZC and staff is accommodated at the contractor camp at Skorpion Zinc.

4.3 Waste Management

The following types of waste are generated during the exploration activities, in small volumes:

- Domestic waste (non-hazardous)

Domestic waste is collected in a rubbish bin (with a lid) within the drill pad area. The waste is taken to RPZC mine or the driller's camp where it is put into skips, which are taken to the Rosh Pinah waste site.

Hydrocarbon contaminated soil from spills from vehicles and drilling equipment are collected in drums and taken to the RPZC mine bioremediation site.

4.4 Sanitation

At all drill pads chemical toilets are provided, which are cleaned and maintained by the provider.

4.5 Water supply

Water for diamond drilling is carted by truck on a daily basis from RPZC Mine.

4.6 Power supply

Fuel to power the drill rigs is brought to the site in drums or in a small truck depending on the drilling contractor.

4.7 Access routes

As far as is practicable, existing farm roads were and are used. Where necessary new tracks had and have to be established to access the identified drill sites. The position of the new tracks was and will be discussed between the exploration manager and the farm owner.

4.8 Rehabilitation

RPZC Mine has from the start of the exploration activities an Environmental Management Plan (EMP), which was revised by A. Speiser Consultants cc (ASEC) in August 2005. The EMP clearly states –

- **Definition of roles and responsibilities concerning the EMP**
- **Environmental Specifications -**
    - Management of Natural Habitat
    - Soil Management
    - Surface and Groundwater
    - Management of Hazardous Substances
    - Sanitation
    - Refuse/ Waste
    - Vehicular Access
    - Drill Site Area
    - Rehabilitation

The existing EMP is attached in **Appendix 2** and the new EMP is included in this document, see Section 8.

The affected areas have and will be in future rehabilitated on an on-going basis and rehabilitation aspects are clearly divided between the drilling company and RPZC. The following rehabilitation activities will be carried out:

- All drill chips and core cuttings are and will be removed from site or back filled into the boreholes. The remains will be disposed of at the Rosh Pinah Mine waste rock site;
- Cleaning and removal of diesel / oil spills. The contaminated soil is disposed of at an appropriate waste site (e.g. bioremediation site at RPZC Mine).
- Raking, ripping, etc. of track surface and re-vegetation of the area.
- If endemic plants are encountered, which cannot be avoided, these are relocated within the vicinity of the drill pad or newly created access tracks.

The aim was and is to avoid as much as possible any disturbance of the environment as rehabilitation of areas to its natural environment is always difficult.

Plate 2 shows an example of the rehabilitation results on MDRL 2616. Further rehabilitation results were submitted to MET:DEA in the bi-annual reports. The original documents are with MET:DEA.

Plate 2: Example of rehabilitation of one of the access tracks created during drilling activities (January 2010).

4.9 Environmental Work conducted by RPZC

RPZC conducted a number of environmental surveys in some of the sensitive areas of the EPL 2616. All these are included in the bi-annual reports, which are with the MET:DEA. For example, in November 2000 the National Botanical Research Institute (NBRI) conducted a 10-day field survey focusing of the distribution of *Aloe pilansii* in the Rosh Pinah Mountain. The survey revealed that all *Aloe pilansii* are found at the steep, rocky ridges and the summit of the Rosh Pinah Mountain (pers. comm., C. Mannheimer, NBRI). In a lesser degree *Aloe dichotoma*

and *A. ramossisima*, as well as a number of winter rainfall species were encountered in this area. The most important ones are listed below:

- *Pachypodium namaquanum*;

  The common names are Elephant's trunk or Halfmens. *Pachypodium namaquanum* is an erected, spiny succulent up to 5 m high. Leaves grow at the tip of the stem, obovate-oblong, grey-green, densely velvety, margin entire, very wavy. The only occur in the Richtersveld are (South Africa) and in the mountains between Rosh Pinah and Hunsberge along the Orange River (Namibia).[1]

- *Euphorbia dregeanga;*

  Is a spineless succulent shrub, which is branched at the base. It forms 1-2m high clumps. The flowering branches are pale-greyish green in colour and have prominent leaf scars. The yellow flowers grow in loose groups at the cuds.[2]

- *Zygophyllum prismatocarpum;*

  Is a succulent-like plant, which is characterized by its paired-leaves.

- *Eberlanzia schneideriana;*

  Is a shrubby mesemb. The plant is erect to flat growing thorny shrubs. The steams are almost white to light yellow. The greyish green leaves are short and fat with rounded sides, tipped with an abrupt point.[3]

- *Cephalohyllum ebracteatum;*

  Is a mat- or cushion-forming mesemb. The leaves are three-angled, spindle-shaped, quill-shaped, or club-shaped, ranging from light to dark green in colour, with a smooth surface throughout. Flower colour ranges from yellow, white orange, red, copper and commonly occur in large flower clusters. [3]

- *Hereroa hesperantha,*

  Is a dwarf succulent that grow in tufts or form short shrubs. The leaves are finger-like narrowing to a blunt tip and vary from bright to dark green in colour. Characteristics are dark dots on the hairless surface which are raised when the leaves are not fully swollen. Flowers are usually yellow, rarely white. [3]

- *Ruschia spp*;

  Are succulents which are mostly erected, and have rarely curving or creeping branches. The leaves are mostly three-sided, sometimes with teeth along the edges. The flowers are mainly pink top purple and rarely white. [3]

- *Conophytum spp.,*

  Are commonly named flowering stone mesembs. The plants are dwarf cushion-forming or single bodied succulents. The leaves can have a range of colours and are usually spotted or lined, often velvety, warted, or windowed. The plant is active in autumn and winter, drying into inert papery husks from which new bodies emerge in the subsequent autumn. [3]

Ms. C. Mannheimer from the NBRI emphasised that the disturbance of *A. pilansii* and *conophytum spp.* should be avoided at all costs, and if possible, the track be aligned in such a way that these species are not affected. However, plants which cannot be avoided should be replanted or be collected and transported to the NBRI in Windhoek. A list of plants, highlighting

[1] van Wyk B. et al. (2000) Photographic guide to Trees of Southern Africa. Briza Publications.

[2] Field Guide to Namqualand.

[3] Gideon, F. et al. (1998) Mesembs of the World. Briza Publications.

[3] Gideon, F. et al. (1998) Mesembs of the World. Briza Publications.

species which should be relocated or collected, was provided by Ms. C. Mannheimer after the completion of her half-day field survey (28 February 2003).

RPZC followed the recommendations of Mrs. C. Mannheimer and with help from Mr. S. Carr (nowadays NBRI) relocated the plants within the newly established 'Botanical Garden' at RPZC. Some plants were donated to the NBRI.

5 DESCRIPTION OF THE CURRENT ENVIRONMENT

The EIA regulations require a scoping report to include "a description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity".

In this section, information gathered at RPZC mine, existing literature, e.g. Atlas of Namibia and previously prepared specialist reports are used to provide an overview of the biophysical and socio-economic situation at and in the surroundings of RPZC mine. The specialist reports were conducted for the EIA 'Combined Scoping and Assessment Report - Environmental Impact Assessment for the new Nampower power line from Obib to Zincum substation for RPZC mine' (November 2013 by ASEC) and the flora specialist study for the 'Environmental and Social Impact Assessment (ESIA) for the proposed Development of the Gergarub Mine' (Mannheimer, September 2013).

5.1 Climate

MDRL 2616 is situated in a predominately winter-rainfall region. The winds of the south Atlantic anticyclone system and cold Benguela current are the main elements influencing the area's climate.

The climate of the wider Rosh Pinah area is arid with low unpredictable rainfall, mainly occurring between April and August. Summers are hot and winters are mild. A large diurnal temperature range is exhibited in the winter months resulting in early morning mist and heavy dew.

5.1.1 Rainfall

MDRL 2616 has received an average of 55.5 mm of rain per year over the last 20 years. The highest average rainfall events during these years usually occur between March and July. However, as Rosh Pinah falls within the southern part of the winter-summer rainfall area, rain events can be expected throughout the year. The highest rainfall event – 106.1 mm – was recorded in April 2006. The rainfall data shows that run-off events are uncommon. The ephemeral channel west of Rosh Pinah flowed in January 2000 for the first time in 11 years and a storm in 2001 on the mountain east of the town resulted in a flash flood, which eroded the tarred main road and swept through several houses belonging to Skorpion Zinc. It was predicted that as the higher ground in the area has little vegetative cover, run-off could occur if more than 5 - 10 mm of rain fell during any single rainfall event (Carr, 1998). **Table 11** provides rainfall data recorded at the rain gauge at RPZC mine, while **Table 12** provides the rain figures recorded at the mine weather station between 2005 - 2007.

Table 11: Mean Monthly Rainfall at Rosh Pinah (in mm), 1983 – 2002.

(Source: 1983 - 1989, Weather Bureau Windhoek; 1990 - 2002, RPZC)

Mm	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Mean	1.8	4.7	4.2	7.8	5.8	3.5	5.6	3.5	6.9	3.6	3.7	4.4
Max	12.0	23.0	19.1	36.0	16.9	13.0	18.0	17.0	28.7	28.8	23.0	75.1
No. of years with precipitation	9	10	14	13	13	12	15	11	15	11	11	8

Table 12: Monthly Rainfall at RPZC Mine Weather Station (in mm), 2005 – 2008.

(Source: Weather Bureau Windhoek; 1994 - 2007, RPZC)

Year	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Year total**
04/05	2	21.5	0	0	0	1.1	0.5	15.5	8.5	0	0	14	63.1
05/06	0	26	0	0	7	0	0	106.1	42.8	0	11.5	19.5	212.9
06/07	1.5	0	0	1	0	0	0	5.5	0	7.5	0	5.7	21.2
07/08	0	0	*	*	16.5	0	41.8	4	1.5	1.5	41.5	0	106.8

* no data

5.1.2 Evaporation

The potential annual evaporation in the Rosh Pinah area is approximately 3,000 mm. The maximum is during the summer months and progressively declines during the autumn, winter and spring. The evaporation decreases slightly – to approximately 2,600 mm – towards the coast due to the presence of fog (Pallet, 1995). Comparing the average annual precipitation figures – between 54 and 64 mm – with the potential annual evaporation it becomes clear that overall there is a net loss of water within the Rosh Pinah area. **Table 13** provides the mean gross evaporation at Sendlingsdrif.

Table 13: Mean Gross Evaporation Rate at Sendlingsdrift, 1975 to 1991.

(Source: Department of Water Affairs purification works, Orange River. Period March 1975 - September 1991)

Mm	**Jan**	**Feb**	**Mar**	**Apr**	**Ma**	**Ju**	**Jul**	**Aug**	**Sep**	**Oct**	**No**	**Dec**	**Year**
Mean gross evaporation	329	274	285	215	170	147	145	182	211	269	312	336	

5.1.3 Temperature

MDRL 2616 area experiences hot to very hot summers, with temperatures averaging between 30°C and 40°C, and mild winters with maximum temperatures averaging between 20 and 25°C and with a minima range from 5-10°C. Snow has been recorded at Aus about 165 km north of the area and Witputs approximately 45 km to the north (pers. comm., Mr. G Hinders). Snow was also recorded on the mountains south-east of Rosh Pinah in July 2000 (pers. Comm. Ms. S Coleman).

The large diurnal and seasonal variations are caused by a number of factors, such as the high incidence of sunshine (>90% at Keetmanshoop), latitude and distance from the coast. There is

rapid cooling of the ground surface at night due to high surface reflectance (rocky terrain, thin soils, and lack of vegetative cover) and clear skies, allowing for strong outgoing radiation.

Data collected at the Skorpion Zinc Project shows that the warmest period of the year is between October and April (Walmsley, EMS for Skoprion Mine, 2000). Maximum monthly averages range between 30-33°C, dropping overnight to minima ranging between 11-15°C.

Exceptionally high temperatures may occur during Berg wind conditions with maxima of over 40°C being recorded, but these conditions seldom last for more than a day (Walmsley, EMS for Skorpion Mine, 2000). The months from May to September are cooler, with maximum daytime average temperatures ranging between 21-25°C, while night-time temperatures range between 6-9°C.

5.1.4 Fog

Namdeb has recorded an average of 100 days of fog per annum at Oranjemund. Along the coastal areas of the Sperrgebiet, fog occurs most often in February and March. Often the fog also moves many kilometres inland along the Orange River and calculations conducted for the Rosh Pinah Landfill Study (WSP Walmsley, 2001) suggested that fog occurs about five or more times per month during February and March at Rosh Pinah.

5.1.5 Wind Direction and Velocity

Table 14 shows data recorded on site over a period of 12 months (Crowther, 1999). It shows that the prevailing wind direction for moderate winds occurs from ESE to SSE (highlighted rows). Higher wind events above 8.0 ms^{-1} occur mainly from WNW. The northerly and north-easterly winds are the strong Berg winds which occur during the winter due to the persistence of strong high pressure over the interior and depressions along the coast. Wind data measured between 2005 and 2007 at the Rosh Pinah Mine weather station confirm this trend.

Table 14: Wind direction and speed measured at Rosh Pinah over a period of 12 months, recorded 1999).

Direction	1,2-3,4 ms^{-1} (%)	3,5-7,9 ms^{-1} (%)	8,0-13,9 ms^{-1} (%)	>14,0 ms^{-1} (%)	Total (%)
	0	0.14	0.07	0	0.21
NNE	0	0	0	0	0
NE	0	0.07	0.07	0	0.14
ENE	0	0.07	0	0	0.07
E	3.96	1.22	0	0	5.18
ESE	8.78	2.95	0.14	0	11.87
SE	5.04	7.27	0.14	0	12.45
SSE	6.12	9.86	1.22	0	17.20
S	0.58	2.66	0	0	3.24
SSW	0.14	0	0	0	0.14
SW	0.43	0.65	0.22	0	1.30
WSW	0.36	1.73	0	0	2.09
W	1.73	3.6	0.29	0	5.62
WNW	1.51	4.03	1.80	0.07	7.41

Direction	1,2-3,4 ms^{-1} (%)	3,5-7,9 ms^{-1} (%)	8,0-13,9 ms^{-1} (%)	>14,0 ms^{-1} (%)	Total (%)
NW	1.44	1.37	0.07	0	2.88
NNW	0.58	0.14	0.07	0	0.79

5.2 Topography / Soils

Due to the arid and semi-arid climatic conditions mechanical weathering predominates. This results in residual soils above the rock which are usually thin. Transported soils are predominantly aeolian sands during strong wind events or coarse colluvial talus from the surrounding mountain ranges. The soils are mainly developed on the gravel plains and in depressions/valleys, which provide some geomorphological stability (Pallett, 1995).

Desert soils are often stabilised by an organic or inorganic layer, which protects the underlying soils from erosion in areas devoid of macro-vegetation (Daneel, 1992). Soil algae and/or the inorganic surface gravel layer, usually a small pebble layer or desert pavement, protects the underlying soil from erosion. Disturbance to this fragile protective layer will result in erosion, by wind, of the soil fines, which are important for moisture retention and nutrient adherence. Recovery from structural damage by disruption to surface micro-topography and compaction may take as long as soil formation – several thousand years (Daneel, 1992).

The soils in the Rosh Pinah area are predominately surface alluvial sediments that support mainly sparse grassland and have a low agricultural value (Rosh Pinah Landfill Study, Walmsley, 2001). Typically the soils have a pH of ±9, high salinity and sodicity and low clay and organic-matter content (RPZC, 1999). The soils have no agricultural potential.

In the mountainous rock outcrop areas, no soil development usually occurs and all weathered particles are eroded to the sandy and gravely desert floor and flood plain areas. Soils consist mostly of medium-to-coarse sand or gravel, with thickness varying from zero to approximately 40 m in the valley bottoms (Steenekamp, 2003).

Although thin, the soil layer must be protected, for it is presumed to contain the valuable seedbed for the Succulent Karoo and Nama Karoo Biomes, especially since soil formation takes such a long time. Some of the plant species that are found within the Rosh Pinah Mining Licence are endemic to the area. Disturbance of the organic and inorganic protective layers can lead to increased wind and water erosion; reduced infiltration rates; reduced soil moisture content; and the inhibition of plant germination.

5.3 Groundwater and Surface water

No detailed groundwater study has been conducted in the EPL area. However, groundwater is monitored within the mine area and south of the mine, as the general groundwater flow is towards the Orange River. The Orange River lies approximately 20km towards the south of Rosh Pinah town. According to the Atlas of Namibia (Medelsohn et al., 2002) little or no groundwater is expected in the wider Rosh Pinah area. Except for the Orange River no permanent surface water exists in the area. Seasonal rivulets run mainly southwards after rain events.

5.4 Flora

A specialist vegetation study was conducted to identify potential impacts on the Namibian flora of the proposed power line alignment by Ms C. Mannheimer in July 2013. The study included a site visit between the 01 – 05 July 2013. Information for the Gergarub area was obtained from

the flora specialist study for the 'Environmental and Social Impact Assessment (ESIA) for the proposed Development of the Gergarub Mine' (Mannheimer, September 2013). Information from these studies are used in this Scoping Report as the EPL 2616 and the powerline are in the same general area.

MDRL 2616 lies within the Namib Desert and escarpment, which harbour numerous endemic and near endemic plant species, of which many are of restricted distribution or habitat and/or are protected. This makes them extremely vulnerable to disturbance, particularly because many occur in small patches of suitable substrate where quite restricted damage may cause the loss of the whole or a large proportion of a population.

5.4.1 Botanical sensitivity of MDRL 2616

Although it has some floral affinities with the Nama-Karoo, the project area falls within the Succulent Karoo Biome, which is regarded as a global hotspot of biological diversity (Myers et al. 2000), including both plants and animals, and is extremely sensitive in terms of near-endemic, endemic and protected plant and animal species. It is important in global as well as regional and national terms. This makes only absolutely unavoidable damage acceptable.

Approximately 17% of the Namibian flora as a whole is thought to consist of endemic species (Barnard 1998), and over 30% of plants that occur in the Namibian section of the Desert Biome are believed to be endemic to that area. This is a remarkably high figure, and the areas of highest plant endemicity in the Namib are the Kaokoveld and the southern Namib, both regarded as major centres of endemicity in Namibia (Maggs et al. 1998). Furthermore, recent assessment by Burke and Mannheimer (2004) indicated that the Sperrgebiet (which excludes Aus) carries nearly 25% of the plant species known to occur in Namibia, making it a national biodiversity hotspot. Elevated areas such as mountains and koppies are known to harbour many species of conservation concern, making them sensitive to environmental disturbance, some more than others. In addition to on-site damage the creation of obvious access roads promotes illegal access and plant removal by criminal collectors, and is of particular concern as it perpetuates and aggravates existing damage ad infinitum. An additional concern of great importance is the negative visual impact of roads and other infrastructure. This factor is of particular importance in an area such as the southern Namib, where open and relatively unspoilt vistas may be regarded as a major tourist attraction that will provide long-term income to the country. Although the proposed route lies outside the Sperrgebiet it still harbours many of the same species of conservation concern.

The section of this particular area that falls into the Sperrgebiet (i.e. just to the east of Skorpion) has been categorised by Burke (2006) as of High to Very High conservation importance. Flora studies for the Environmental Impact Assessment for the Skorpion Zinc Project found a high plant diversity in the area (over 220 species), with approximately 12% of those being Namibian endemic species, some of very restricted distribution.

5.4.2 Description of Habitats within the Gergarub Area of MDRL 2616

The Gergarub area consists of plains interrupted by koppies and rocky outcrops and partly bordered by mountain slopes incised by several deep gorges. The area lies on Farm Spitzkop, which is well known for its high plant diversity, including many species of restricted distribution and conservation concern. Four major habitat zones were identified, and are shown in **Plate 3**: Sandy plain in northern part of MDRL 2616.

Figure 3.

Broadly speaking, four habitats are traversed:

1. Sandy, gravel plains and foothills
2. Stoney gravelly plains
3. Succulent plains
4. Mountains, koppies, rocky outcrops and footslopes

5.4.2.1 Sandy, gravelly plains & footslopes

These red sand plains are characterised by dominance of *Stipagrostis spp.* and *Brownanthus spp.,* with *Tetragonia reduplicata*, *Asparagus capensis*, *Phyllobolus oculatus* and *Othonna cylindrica* also common and *Zygophyllum prismatocarpum*, *Sisyndite spartea*, *Searsia populifolia* and *Euphorbia dregeana* defining the many shallow washes that cut through them. Despite being the zone of lowest sensitivity in the context of this project, these plains are known to harbour relatively high plant diversity, more after rain events when geophytes (lilies) and annual herbs and grasses are present. A number of range-restricted, endemic, near-endemic and protected species occur, including, but not limited to, *Euphorbia melanohydrata*, *Dracophilus dealbatus*, *Cheiridopsis robusta*, *Mesembryanthemum pellitum*, *Hoodia gordonii* and *Ruschia spp.*. **Plate 3** shows the sandy plain in the northern part of MDRL 2616.

The sensitivity of the area is rated as low to medium.

Plate 3: Sandy plain in northern part of MDRL 2616.

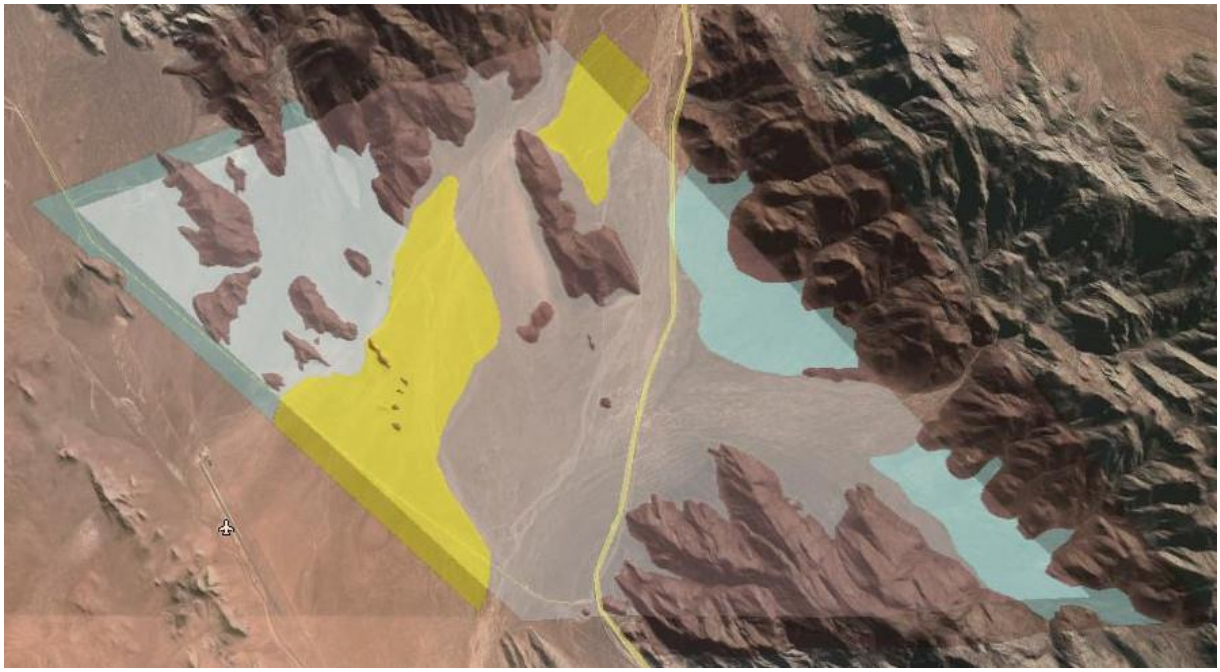

Figure 3: Overview of the habitats within the Gergarub Area. Yellow = sandy gravelly plains; whitish = stony Gravelly plains; blue = succulent plains; dark grey = mountains, koppies & rocky outcrops & Footslopes.

5.4.2.2 Stony gravelly plains

These plains are set apart from the sandy-gravelly plains by the presence of coarse gravel and calcrete (easily visible on the surface), slightly more compacted substrate and by a slightly different complement of plant species, with low-growing *Zygophyllum* spp. (including endemic and range-restricted species) and succulents such as *Drosanthemum albens, Galenia pruinosa, Tetragonia reduplicata, Lampranthus hoerleinianus, Jordaaniella cuprea, Eberlanzia clausa* and *Cheiridopsis robusta* relatively more common. There is considerable overlap in plant species with the sandy-gravelly plains and the footslopes, with many of the species of concern in that zone present here too.

West of the drill camp and the track travelling past it there is an unusually dense concentration of *Hoodia gordonii*, a protected species.

The sensitivity of the area is rated as medium.

5.4.2.3 Succulent plains

The structure of the mountains that semi-surround and 'cup' the valley wherein the exploration area lies is conducive to the 'gathering' of wind-borne moisture in the form of fog from the south-west. This phenomena is the reason that these unique succulent plains are found in Namibia. This makes them a highly restricted habitat.

The substrate in the succulent plains east of the main road (**Plate 4**) is a relatively stabilised, rocky, grey to red-brown sandy loam, often interspersed with weathered limestone rocks. Dominant plant species include *Brownanthus arenosus, Euphorbia chersina, E. cibdela, E. gummifera, E. dregeana* and *Ceraria fruticulosa*. A number of species of conservation concern are present, including, *inter alia*, *Dracophilus dealbatus, Cheiridopsis robusta, Ruschia* spp., *Cephalophyllum ebracteatum, Aridaria noctiflora, Tylecodon reticulatus* and *Hoodia gordonii*. The succulent plains west of the main road are composed of red sand far more stabilised than that in the sandy- and stony-gravelly plains. There species composition is somewhat different,

as mentioned before, but still includes species of conservation concern, *inter alia, Jordaaniella cuprea, Cheiridopsis robusta, Dracophilus dealbatus, Pelargonium klinghardtense* and *Tylecodon reticulatus*. In small quartz areas that are scattered within this zone rarely-encountered species, such as *Psammophora longifolia* and *Zygophyllum schreiberianum,* were observed.

The sensitivity of this habitat is high. A note from Mr. C. Mannheimer "Critical habitat according to IFP guidelines - habitat of significant importance to endemic and/or restricted-range species".

Plate 4: Succulent plain north of the Gergarub target area.

5.4.2.4 Mountains, Koppies, Rocky Outcrops and Footslopes

The mountains, koppies and outcrops that are scattered in and around the Gergarub area collectively exhibit a relatively diverse structure and surface geology. They vary from quite gentle base slopes to quartz outcrops and steep, rocky schistose slopes incised by deep gullies, and provide high niche diversity by virtue of substrate, moisture and aspect variability. As a result, they generally exhibit higher species diversity than the plains, and harbour a number of endemic, near-endemic, range-restricted and protected species, both on their slopes and on their footslopes. These include numerous protected species of high conservation concern and/or very restricted distribution including, *inter alia*, *Hartmanthus hallii, Aloe dichotoma, A. gariepensis, Pachypodium namaquanum, Crassula* spp. and *Conophytum* spp., as well as many other highly restricted-range species, such as *Sarcocaulon inerme, Dracophilus dealbatus, Cheiridopsis robusta* and *Zygophyllum* spp.. A number of these species show a tendency to congregate in small patches of suitable habitat on footslopes (pers. obs.), or near the tops of mountains and koppies, making the impact on them higher than on those species that are more randomly distributed. A good example of this is the protected 'halfmens' (*Pachypodium namaquanum*), which favours the moisture-collecting upper slopes of the koppies and mountains. Plant species diversity is generally higher on south and south-west facing slopes (**Plate 5**) than on north and north-east facing slopes, and the former also tend to harbour more species of conservation concern. The vulnerable Red Data species, *Stapeliopsis neronis* has been recorded on low mountain slopes on Farm Spitzkop.

In the west of the study area there are a number of marble-limestone koppies and outcrops. These, to a large extent, harbour a different species complement, including *Crassula sladenii,* which is protected and has a highly restricted known distribution in Namibia (this quarter-degree square only), and also harbours several other highly restricted species.

The sensitivity of this habitat is high to very high. A note from Mr. C. Mannheimer "Critical habitat according to IFP guidelines - habitat of significant importance to endemic and/or restricted-range species".

Plate 5: South-west facing slopes are highly diverse, with many species of conservation concern.

Table 15 is an annotated list of species of conservation concern that were found during this study.

Table 15: Annotated List of Species of highest Concern found within MDRL 2616.

Species	Endemism	Protected	Red Data	Comments
Aloe gariepensis	NE	X	LC	Restricted distribution
Cephalophyllum ebracteatum	NE	X	LC	Reasonably widespread
Cheiridopsis robusta		X	LC	Reasonably common and widespread
Dracophilus dealbatus	NE		DD	Reasonably common and widespread, but already has been impacted by mining
Hartmanthus hallii	E	X	LC	Highly restricted occurrence and habitat
Jordaaniella cuprea		X	LC	Restricted distribution

Species	Endemism	Protected	Red Data	Comments
Mesembryanthemum pellitum	E			Limited distribution but weedy species that readily recolonises disturbed
Crassula		X	R	
Crassula brevifolia		X		
Crassula cotyledonis		X		
Crassula fusca		X		
Crassula macowaniana		X		
Crassula subaphylla subsp. *subaphylla*		X		
Sarcocaulon inerme	E		LC	Restricted habitat
Sarcocaulon	NE		LC	Reasonably widespread
Zygophyllum schreiberianum	NE			Restricted distribution
Larryleachia	NE			Reasonably widespread

CR = critically endangered; VU = vulnerable; R = rare; LC = least concern; DD = data deficient.

5.5 Fauna

5.5.1 Reptiles and Mammals

Associated with the unique vegetation habitats within the MDRL, there are a large number of animal species which are of conservation importance or endemic to the region. The Nama Karoo Biome supports 131 desert vertebrates. Of this total, 16 species (nine reptiles, five mammals, two birds) are endemic to the biome (Lovegrove, 1993). The Succulent Karoo Biome has 88 desert vertebrates, of which 25 occur nowhere else. There are nine endemic reptiles in the Nama Karoo Biome.

Common wild mammals, such as kudu, zebra, baboons, gemsbok and springbok occur on the farms and the state land. However, mammals and reptiles will move away during construction activities.

5.6 Social / Economic

5.6.1 Directly Affected Parties

The owner of Farm Spitskop Wes 128 and Spitskop 111 does not reside on his farms, they are managed by his farm manager. RPZC mine has a landowner compensation agreement in place. The BID and the Comments Sheet were emailed to the farm owner.

5.6.2 The Karas Region

Rosh Pinah is situated 376 kilometres south west of Keetmanshoop in the Karas Region, which is the largest of Namibia's regions (161,086 km^2), the most arid and has a density of 0.5 people per

square km. 60% of the region is private property, mainly used for farming and the remaining 40% of the land is controlled by the government (NPC 2007). According to the 2011 Census results, 77 421 people live in the region (about 3.5% of the national population). While the number of households in the region has increased from 16,839 in 2001 to 21,283 in the 2011, the average size of household in the region has decreased from 4.7 to 4.2. The population is fairly balanced regarding gender, with only 1,400 more men than women (39,400 male compared to 38,000 females) (NPC 2012).

In-migration to the Karas Region has been greatly influenced by mining, irrigation, fishing and industrial type developments. Only 60% of the people living in the Karas Region were born there (NPC 2007) often resulting in higher unemployment for the local people. Employment is dominated by men (two-thirds versus one-third for women) in almost all kinds of work. About 61% of all employed persons work in the private sector while the government employs about 27%, and a small proportion work in other sectors (PLANUNG+UMWELT / SAIEA. 2011).

5.6.3 Rosh Pinah

The town of Rosh Pinah came into being in 1968 when the first major mining operation, Rosh Pinah Zinc Corporation (RPZC) was set up in the area. When Skorpion Zinc opened in 2000, Rosh Pinah's population continued to increase rapidly. If one or both mines for whatever reason have to decrease their activity or close altogether, Rosh Pinah is likely to shrink considerably.

In 2011, the population census registered 2,835 people in Rosh Pinah whereas RoshSkor, the town's management body, is confident that approximately 7,000 people live there (split about 50:50 between the main town and the informal settlement of Tutengeni (Pers. comm. RoshSkor, July and October 2013)[1]. RoshSkor is in the process of conducting a full population count in October 2013.

Figure 4: Aerial View of Rosh Pinah, showing some Suburbs; 2008.

[1] The author notes that there have been a lot of complaints from across the country with the 2011 census data, especially in towns and this may be because the census was close to a public holiday so many people had left the towns for the rural areas.

The town's economy is driven by the two mines, with tourism and business providing further opportunities. In Tutengeni, the town's informal settlement, approximately 40% of the adult population is employed by the two mines and their contractors whilst 54% are unemployed[2]; the rest of town has almost a zero rate of unemployment (UTN 2009).

5.6.4 Rosh Pinah Town Management

Rosh Pinah is not a proclaimed town and does not have a municipality. The town falls under the control of the two mines, RPZC and Skorpion Zinc, who manage the town via RoshSkor Township (Pty) Ltd.

The land on which Rosh Pinah is situated falls within the two mines' accessory works area – land made available by Government for a mine to develop accommodation and other facilities in an attempt to improve the quality of life of their employees.

One of the main challenges faced by the town is access to freehold land. Currently private individuals have the opportunity to acquire right of lease for a piece of land and some have done so to build their homes. Apart from the right to freehold land, Rosh Pinah offers all other benefits and drawbacks of a small town.

5.6.5 Tutungeni

Tutungeni lies approximately 1 km to the north of Rosh Pinah Town within the EPL 2616. In 2006, after consultations with the informal settlement of Sands Hotel, RoshSkor invested approximately N$1.6 million in town planning and roads to move the settlement away from the proximity of the enlarging waste rock dumps. The resulting township, Tutungeni, has 1350 plots and RoshSkor estimates it is home to approximately 3,000 people.

The 2009 SEAT survey, which reached 428 individuals in 319 households, found clear socio-economic differences between Tutungeni and the rest of Rosh Pinah. The majority of the town residents consulted earned an income between N$5,001 and N$10,000/month. In Tutungeni, however, virtually nobody earned an income above N$5,000. Almost 80% of the respondents staying in Tutungeni stated that they earn a monthly income of N$2,000 or less, compared to 30% of the respondents staying in town (UTN 2009).

Priorities for future social investment also reflected significant requirements. People living in Tutungeni wanted investment to meet their basic needs - electricity, increased accessibility to water, flushing toilets and more/improved housing. Residents in town wanted a secondary school, more opportunities for gaining entrepreneurial skills such as through skills training projects, entertainment and housing.

5.6.6 Education and Health

Rosh Pinah has a government school, Hoeksteen Primary, which provides Grade 1 – 7 and is in the process of expanding to provide a new secondary grade each year up to Grade 10. There is also a private primary and two pre-primary schools. Both mines offer hostel and transport costs for family members to travel to secondary schools within a 1,000km radius. They also offer bursaries for Namibian students and also offer opportunities for employees to gain further skills training. Other social responsibility contributions in the region include support to Namibian Institution of Mining and Technology, (NIMT) Keetmanshoop, the OBIB Training Centre in Rosh Pinah and various Karas schools such as Bethanie.

Rosh Pinah has a state clinic staffed by two nurses and two community counsellors which provides health care to approximately 80-90 people per day; a doctor visits twice monthly. The Ministry of Health has listed the upgrading of this clinic to a Health Centre, as a high priority. There is also a private healthcare company which runs Sidadi clinic in town, staffed by 2 doctors, 6 nurses and other para-medics which provides health care to mine employees and the general public.

5.6.7 Security

As in all informal settlements, crime incidents are much higher in Tutungeni than in Rosh Pinah, and the Tutungeni Committee (a resident's committee) recommended installing street lighting, more police patrols and a faster police response time. The Rosh Pinah police station is staffed by 20 full time NamPol police officers and provides police services twenty-four hours a day. Private security activities are carried out by G4S, which employs 142 persons (pers. comm. Mr Movirongo, CAM, Skorpion Zinc, Oct 2011).

5.6.8 Tourism

The Rosh Pinah area is nestled between the Ai-Ais / Richtersveld Transfrontier Park in the East, and the Sperrgebiet National Park in the West. This places Rosh Pinah right on the meeting edge of two amazingly contrasting geological areas and the landscape that surrounds the town, all the way along the road from Sendelingsdrif to Aus, is phenomenally beautiful.

The Sperrgebiet is currently still closed to the public, although it is a nature reserve. Hopefully negotiations will succeed in opening it up as concession areas in the not too distant future, which will change the allure of the town to tourism radically. Through concession holders, the southernmost dunes of the Namib, as well as the historical site of the Roter Kamm Meteorite Crater will be available.

5.6.9 Business and Development

A number of businesses cater for most of the community's needs. However, all infrastructure and most of the buildings and recreational facilities belong to the mines. Small and medium enterprises are dependent on the support of the residents and tourism is still limited. Services delivered by institutions like Telecom, Namibian Police, Immigration, NamWater, NamPower, Namcol and NamPost are available.

RoshSkor is constantly involved with the implementation and support of SMEs through both mine's social investment programmes. A primary asset is water from the Orange River, approximately 30km away from the town, but increased electricity prices and long distances from potential markets, jeopardize agriculture projects. In an attempt to compensate for limited industrial potential, a lot of effort is put into skills development.

Training programs include welding, sewing, weaving, gardening, catering and brick-making. Partnerships with Namcol and the Ministry of Education help to extend formal education.

5.7 Archaeology

A specialist archaeological study was conducted by Dr. J. Kinahan (QRS) As part of the above-mentioned EIA within the EPL 2616 area, also covering the new MDRL 2616. Information in this section was derived from this specialist study. The study comprised a desktop study and a site visit carried out between 01 to 05 July 2013.

The local archaeological sequence as determined by previous surveys and excavations in the Rosh Pinah area comprises the following four main elements:

a) Early to mid-Pleistocene (ca. 2my to 0.128my; OIS 6, 7, 19 &c): represented by surface scatters of stone tools and artefact debris, usually transported from original context by fluvial action, and seldom occurring in sealed stratigraphic context.
b) Mid- to upper Pleistocene (ca. 0.128my to 0.040my; OIS 3, 4 & 5a-e): represented by dense surface scatters and rare occupation evidence in sealed stratigraphic context, with occasional associated evidence of food remains.
c) Late Pleistocene to late Holocene (ca. 0.040my to recent; OIS 1 & 2): represented by increasingly dense and highly diverse evidence of settlement, subsistence practices and ritual art, as well as grave sites and other remains.
d) Historical (the last ca. 250 years): represented by remains of crude buildings, livestock enclosures, wagon routes and watering points. Some evidence of trade with indigenous communities, including metals, ceramics and glass beads.

Archaeological sites in the Rosh Pinah area are strongly associated with low rocky ridges and isolated outcrops where rock overhangs provide a degree of shelter from the prevailing winds. Evidence of small-scale activities such as artefact raw material quarrying, the use of hunting blinds in strategic locations and the positioning of burial sites on outwash fans, combines with the rock shelter sites to present a relatively high local site concentration. Within this terrain approximately 80% of archaeological sites are associated with low rocky hills and outcrops, and about 12% with sandy gravel outwash fans. **Figure 5**, below shows the distribution of existing archaeological site locations, as well as additional site locations noted in the course of the present survey, in relation to the proposed RPZC infrastructure developments.

Table 16 lists the archaeological sites that were encountered during the field survey conducted as part of the 2013 EIA (see **Figure 5** for illustration). QRS 187/1 lies within the MDRL 2616.

Table 16: Newly encountered Archaeological Sites during the 2013 survey.

Site No.	Co-ordinates	Significance / Vulnerability	Description
QRS 187/1	S27.87943 E16.68567	2/3	Schist hill spur with dispersed scatter ¬20 pieces/m^2 hydrothermal vein quartz artefact flaking debris.
QRS 187/2	S27.90844 E16.70812	2/3	Schist outcrop with localized scatter of fine-grained quartzite flaking debris. Distance from centerline 116m.
QRS 187/3	S27.90224 E16.70531	1/3	Valley-fill sediments with hydrothermal vein quartz artefact flaking debris on streambank. Distance from centerline 95m.
QRS 12/34	S27.85349 E16.635232	2/2	Isolated schist outcrop, rock shelter, facing 160° mag, talus has flaked quartz

Site No.	Co-ordinates	Significance / Vulnerability	Description
			Distance from centreline 127m.
QRS 12/37	S27.88245 E16.68288	2/2	Isolated schist outcrop, rock shelter, talus has flaked quartz Distance from centreline 193m.
QRS 177/14	S27.88245 E16.68288	2/2	Isolated schist outcrop, rock shelter, facing 160° mag, talus has flaked quartz Distance from centreline 209m.

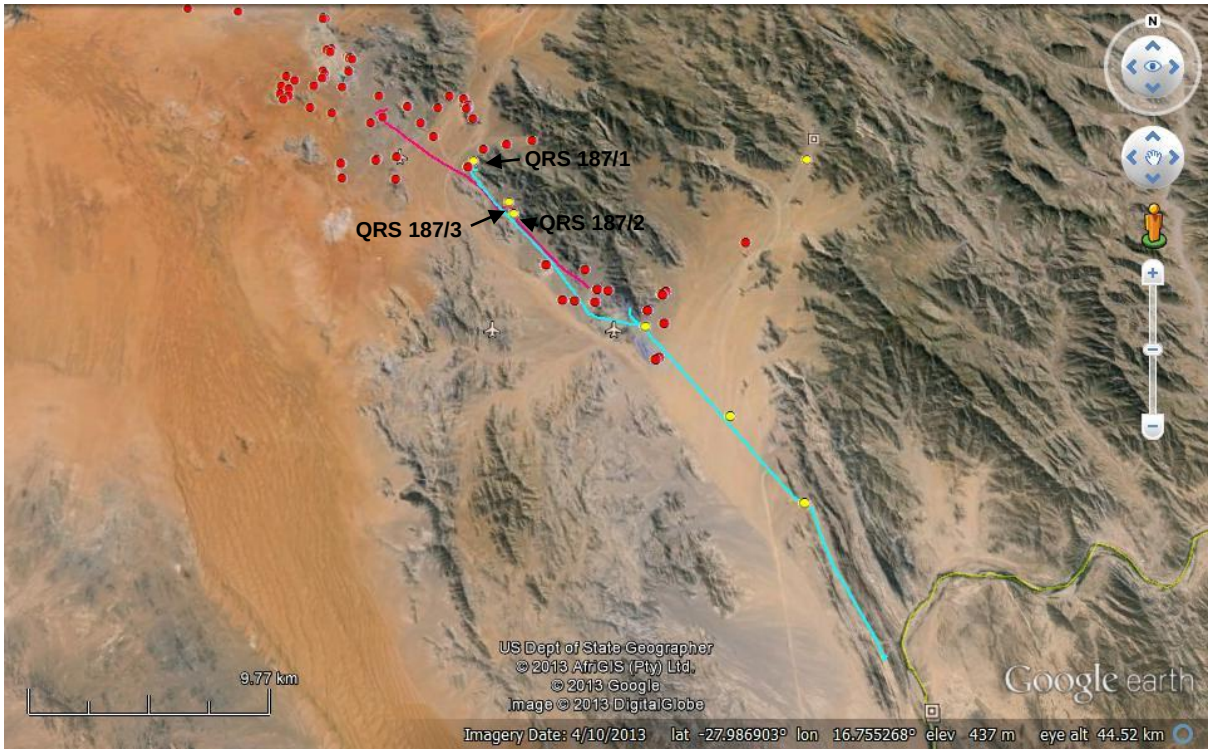

Figure 5: Existing Archaeological Site Locations (Red) and Additional Site Locations Noted in the course of the 2013 Survey (yellow).

6 ALTERNATIVES

6.1 General Discussion

As the project is ongoing since 2009 it is difficult to describe alternatives. One option would be that exploration is stopped, see below.

6.2 Termination of the Project

This option entails that no further activities are undertaken on the EPL and upon expiration it will revert back to the Ministry of Mines and Energy. Should this happen, the economic and social

growth associated with the potential resource will not reach fruition, and Namibian economy will fail to benefit from a potential mineral resource, an EIA is currently conducted on the Gergarub target area.

7 IDENTIFICATION OF ENVIRONMENTAL ASPECTS AND IMPACTS AND IMPACT ASSESSMENT

Exploration activities have the potential to impact on the environment. Environmental aspects and potential impacts were identified prior the exploration activities started in 2009 and during exploration in the following years updated and amended. Given the relatively small scale of the proposed project and taking the existing environment into consideration, the potential impacts were also qualitatively assessed by ASEC/SLR in the section below.

Table 18 below provides a summary of the activities associated with the exploration activities, the associated environmental aspects and potential impacts on the environment and also a qualitative assessment of these impacts (before and after mitigation). The aspect identification and impact assessment is based on the “worst case scenario”.

Table 17 shows the methodology used to conduct the qualitative assessment.

Table 17: Criteria for Assessing Impacts.

PART A: DEFINITION AND CRITERIA		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of severity, spatial extent and duration**
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action. Irreplaceable loss of resources.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints. Noticeable loss of resources.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints. Limited loss of resources.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national

PART B: DETERMINING CONSEQUENCE					
SEVERITY = L					
DURATION	Long term	**H**	**Medium**	**Medium**	**Medium**
	Medium term	**M**	**Low**	**Low**	**Medium**
	Short term	**L**	**Low**	**Low**	**Medium**
SEVERITY = M					
DURATION	Long term	**H**	**Medium**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**High**
	Short term	**L**	**Low**	**Medium**	**Medium**
SEVERITY = H					
DURATION	Long term	**H**	**High**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**High**
	Short term	**L**	**Medium**	**Medium**	**High**
			L	**M**	**H**
			Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/ national
			SPATIAL SCALE		

PART C: DETERMINING SIGNIFICANCE					
PROBABILITY (of exposure to impacts)	Definite/ Continuous	**H**	**Medium**	**Medium**	**High**
	Possible/ frequent	**M**	**Medium**	**Medium**	**High**
	Unlikely/ seldom	**L**	**Low**	**Low**	**Medium**
			L	**M**	**H**
			CONSEQUENCE		

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
High	It would influence the decision regardless of any possible mitigation.
Medium	It should have an influence on the decision unless it is mitigated.
Low	It will not have an influence on the decision.

Table 18: Environmental aspects and potential impacts associated with the exploration activities.

ACTIVITY	ASPECT	POTENTIAL ENVIRONMENTAL IMPACT	SIGNIFICANCE DISCUSSION	MITIGATION (with &	SEVERITY	DURATION	SPATIAL	CONSEQUENC	PROBABILITY	SIGNIFICANCE	REFERENCE
Field mapping and geophysical surveys											
Field mapping and ground surveys	Socio-economic	Inconvenience to landowners	On farm Spitzkop Wes 128 and Spitskop 111 sheep are farmed. During the exploration activities these are herded into another camp. Over the years landowner agreements have been put in place. Any inconvenience are discussed immediately and addressed by RPZC mine.	Without	M	M	L	M	M	**M**	1
				With	L	L	L	L	L	**L**	
	Biodiversity	Potential impact on fauna and flora (General disturbance and clearing of vegetation)	During geological mapping no off-road driving was and is allowed. All target areas have been accessed on foot. No disturbance of fauna has been reported.	Without	L	L	L	L	L	**L M**	2
				With	L	L	L	L	L	**L**	
	Air quality	Increase in dust levels (nuisance & health impacts)	Air pollution through vehicle emissions (i.e. exhaust fumes) is negligible due to the small scale of the project.	Without	L	L	L	L	L	**L**	3
				With	L	L	L	L	L	**L**	
	Heritage	Activities could result in possible damage to/destruction of heritage resources.	Heritage sites have been avoided during exploration. The newly found during the 2013 archaeological survey lie on the MDRL, but not within the current target area. The map will be consulted should any exploration activities be carried out in these area.	Without	L	H	L	M	M	**M**	4
				With	L	H	L	M	L	**L**	

ACTIVITY	ASPECT	POTENTIAL ENVIRONMENTAL IMPACT	SIGNIFICANCE DISCUSSION	MITIGATION (with &	SEVERITY	DURATION	SPATIAL	CONSEQUENC	PROBABILITY	SIGNIFICANCE	REFERENCE
			A chance find procedure has also been included in the additional management and mitigation measures to the existing EMP.								
Sampling											
Soil sampling	Socio-economic	Inconvenience to landowners	Impact reference: 1	Without	M	L	M	M	M	**M**	1
				With	M	L	M	L	L	**L**	
	Biodiversity	Potential impact on fauna and flora (General disturbance and clearing of vegetation)	Impact reference: 2	Without	L	M	L	L	M	**M**	2
				With	L	L	L	L	L	**L**	
				With	L	L	L	L	L	**L**	
Drilling											
Drill site establishment: Access the drill site using a new access track Set-up drilling machine with drip trays and groundsheets Establish temporary	Noise	Noise generated by the establishment of access tracks and site clearing/ establishment activities.	Over the years none of the activities was close to any residence.	Without	L	L	L	L	L	**L**	5
				With	L	L	L	L	L	**L**	
	Biodiversity	Potential impact on fauna and flora. (General disturbance and clearing of vegetation) Drilling contractors and employees that are not well managed can impact on the biodiversity through illegal collection of firewood, poaching, road kills etc. Loss of economic function of disturbed area during exploration activities and	Due to the fact that the activities are relatively small and the fact that the exploration team is employed and accommodated in Rosh Pinah or in the case of the drillers at the Skorpion contractor camp, potential poaching and collection of firewood is not an impact. This resulted in temporary loss of land available for livestock farming on farm Spitzkop. The drill team has a list of endemic plants,	Without	M	M	M	H	M	**H**	6
				With	M	L	M	M	L	**M**	

ACTIVITY	ASPECT	POTENTIAL ENVIRONMENTAL IMPACT	SIGNIFICANCE DISCUSSION	MITIGATION (with &	SEVERITY	DURATION	SPATIAL	CONSEQUENC	PROBABILITY	SIGNIFICANCE	REFERENCE
safety fencing around the drill site Set-up chemical toilets Set-up fuel and lubricants storage area at the drill rig Waste management		potential loss of land capability	which were established by the NBRI in 2003, and is used when establishing new drill pads and access roads. Where it is unavoidable endemic plants will be relocated, either temporarily at the Skoprion nursery for replanting during rehabilitation, or close to the drill site.								
		Site clearance may allow for the establishment of invasive plants in the area.	Since 2009 no establishment of invasive plants due to the exploration activities have been reported. Some seeds are introduced by the water with is pumped to the mine from the Orange River, but should any grow at one of the drill pads these are taken out immediately. All drill sites at Gergarub (MDRL 2616) and access tracks have been rehabilitated.	Without	L	M	M	M	M	**M**	7
				With	L	L	L	L	L	**L**	
	Land use	Loss off land capability due site clearance.	None	Without	L	L	L	L	L	**L**	8
				With	L	L	L	L	L	**L**	
	Heritage	Exploration activities could result in possible damage to/destruction of heritage resources.	Impact reference: 4								4
Drilling	Spillages of hydrocarbons, lubricants, or possible spills	Soil pollution	Soil loss and contamination could have an impact on grazing animals. However, the area to be disturbed is very localise and on a small-scale, and impacts can be easily mitigated.	Without	H	M	L	M	M	**M**	9
				With	L	L	L	L	L	**L**	

ACTIVITY	ASPECT	POTENTIAL ENVIRONMENTAL IMPACT	SIGNIFICANCE DISCUSSION	MITIGATION (with &	SEVERITY	DURATION	SPATIAL	CONSEQUENC	PROBABILITY	SIGNIFICANCE	REFERENCE
	from ablution facilities	Surface water contamination	Given the small area to be impacted per hole and the lack of surface water resources, this impact is likely to be insignificant. Mitigation measures can be found in the additional management and mitigation measures to the EMP.	Without	L	L	L	L	L	**L**	10
				With	L	L	L	L	L	**L**	
		Groundwater could become polluted due to pollutants entering aquifers via surface water infiltration.	Given the small area to affected and the depth of the groundwater, per hole, this impact is likely to be insignificant.	Without	L	L	L	L	L	**L**	11
				With	L	L	L	L	L	**L**	
	Dust generation through using the access track. Air pollution from exhaust fumes. Dust generation through drilling activities	Air quality deterioration. Increase in dust levels (nuisance & health impacts)	Dust generation through the establishment of access tracks. Air pollution through vehicle entrainment is expected to be negligible due to the small scale of the project. Air pollution through vehicle emissions (i.e. exhaust fumes) is negligible due to the small scale of the project.	Without	L	L	L	L	L	**L**	3
				With	L	L	L	L	L	**L**	
	Noise generation	Noise generated by the drill could disturb nearby residences (nuisance).	Impact reference: 5								5
	Land use	Loss off land capability due site clearance.	Impact reference: 8								8

ACTIVITY	ASPECT	POTENTIAL ENVIRONMENTAL IMPACT	SIGNIFICANCE DISCUSSION	MITIGATION (with &	SEVERITY	DURATION	SPATIAL	CONSEQUENC	PROBABILITY	SIGNIFICANCE	REFERENCE
Relevant to all activities											
All exploration activities	Socio-economic and community safety	The proposed activities may have the potential to result in an increase in crime and/or poaching on the farms. Given that access to explorations/drill sites may be gained through the use of community access roads, this could pose a threat to community safety.	Given the location of the exploration area and need for a close working relationship with the landowners, these potential impacts can be mitigated through the implementation of the existing and additional management and mitigation measures to the existing EMP.	Without	M	L	M	M	M	**M**	12
				With	M	L	M	L	L	**L**	
	Waste Management	The dumping of general waste within the exploration area and drilling sites could prove hazardous to wildlife and livestock, as well as impede agricultural production. This could also lead to general environmental degradation.	Waste generation is likely to be limited on site and will primarily be domestic waste. This material will be removed daily and disposed of properly off-site. Through the effective implementation of the management and mitigation measures, as described in the additional management and mitigation measures to the existing EMP (Section 8) the potential impacts relating to waste management can be avoided/mitigated.	Without	M	L	M	M	M	**M**	13
				With	M	L	M	L	L	**L**	
	Social – provision of toilet facilities	Health & safety issues	If suitable toilet facilities are not provided for the exploration team, they will relieve themselves in the environment which could lead to potential health and safety issues to 3rd parties	Without	L	L	M	L	M	**M**	14
				With	L	L	L	L	L	**L**	
Closure and rehabilitation of drill site											
Remove all waste and equipment from	Biodiversity and land use	Positive environmental impact as a result of rehabilitation.	The impacted sites will be rehabilitated in accordance with the additional management and mitigation measures to the existing EMP	Without	N/A						15
				With	M	H	L	M	H	M +	

ACTIVITY	ASPECT	POTENTIAL ENVIRONMENTAL IMPACT	SIGNIFICANCE DISCUSSION	MITIGATION (with &	SEVERITY	DURATION	SPATIAL	CONSEQUENC	PROBABILITY	SIGNIFICANCE	REFERENCE
site. Rip compacted areas (including access roads and paths).			requirements.								

With reference to **Table 17**, it can be seen that the activities and facilities associated with the exploration programme have no high significant impacts on the environment.

8 ADDITIONAL MANAGEMENT AND MITIGATION MEASURES TO THE EXISTING ENVIRONMENTAL MANAGEMENT PLAN

8.1 Aims

The aim of the Additional Management and Mitigation Measures to the existing Environmental Management Plan (EMP) is to detail the actions required to effectively implement mitigation and management measures. These actions are required to minimise negative impacts and enhance positive impacts associated with the operations.

This section and the existing EMP provide the commitments, which form the environmental contract between RPZC/SZ and the Government of the Republic of Namibia; represented by the Ministry of Environment and Tourism (MET).

It is important to note that an EMP is a living document in that it will be updated and amended as new information (e.g. environmental data), policies, authority guidelines, technologies and proposed activities develop. The conceptual management measures proposed to mitigate the potential impacts are detailed in the action plans below.

As mentioned above, RPZC has an EMP for the exploration activities on EPL 2616 since February 2003, which covered as well the new MDRL 2616.

8.2 Action Plans to Achieve Objectives

Action plans to achieve the objectives are listed in tabular format together, separated by activities. The action plans also include the frequency for implementing the mitigation measures as well as identifying the responsible party.

Table 19: Environmental Mitigation Measures and Comments – Filed Mapping, Geophysical Surveys and soil Sampling.

Activity	Potential Impact	Management and Mitigation Measures	Action Plan	
			Frequency	Responsible Parties
Ground survey, mapping and geophysical & geochemical sampling	Socio-economic	- Honour agreements set out in the site-access contracts - Consult and provide feedback regarding activities on the individual properties - Provide contact details to a designated RPZC/SZ person, who will serve as liaison between landowners and the exploration teams - Ensure gates are closed after entry and exit.	Duration of mapping and surveying	Project Manager Site supervisor
	Biodiversity	- The footprint of the area to be disturbed for surveying/mapping and for providing access to survey sites will be minimised as far as is practically possible. - RPZC/SZ has implemented a zero tolerance policy with regards to the killing or collecting of any biodiversity. This applies to people directly employed by RPZC/SZ as well as any contractors working on their behalf. - Employees and contractors have been shown the value of biodiversity and the need to conserve the species and systems that occur within the project area. - No open fires will be permitted on site. - Speed limits will be enforced so as to prevent road kills. - If bigger areas are affected, involve specialist prior to removing vegetation (see section 4.9 as an example) - Permits will be required for the removal of protected tree species.	Duration of mapping and surveying	Project Manager Site supervisor
	Air quality	- Vehicle speeds are limited to 40km/h on access routes to limit dust.	Duration of mapping and surveying	Project Manager Site supervisor
	Heritage	- In the event that archaeological resources are discovered, a chance find emergency procedure will be implemented which includes the following: o All work at the find will be stopped to prevent damage; o An appropriate heritage specialist will be appointed to assess the find and related impacts; and o Permitting applications will be made to the necessary authorities, if required. - In the event that any graves are discovered during the exploration activities, these will be avoided and preserved as a first priority. If	Duration of mapping and surveying	Project Manager Site supervisor

Activity	Potential Impact	Management and Mitigation Measures	Action Plan	
			Frequency	Responsible Parties
		damage is unavoidable, prior to damaging or destroying any identified graves, permission for the exhumation and relocation of graves must be obtained from the relevant descendants (if known) and the relevant local and provincial authorities.		

Table 20: Environmental Mitigation Measures and Comments – Drill Site Establishment.

Activities	Potential Impact	Management and Mitigation Measures	Action Plan	
			Frequency	Responsible Parties
- Access the drill site using a new access track where necessary - Set-up drilling machine with drip trays and groundsheets - Where possible leave all bigger plants at the drill site or relocate in the closer vicinity. - No stripping of topsoil - Provide chemical toilets - Waste management	Air quality – dust and gaseous emissions	- The movement of drilling related vehicles on the unpaved access track will be on a small scale - Vehicle speeds will be limited to 30km/h on site - Vehicles and the drilling rig will be maintained in good working order - Minimise new access route development (routes to be approved by land owners prior to development) - Slightly undulate the access track to minimise visibility	On-going	Project Manager Site supervisor
	Noise	- Vehicles will travel maximum 30 km/hour near houses/settlements	Ongoing	Project Manager Site supervisor
	Biodiversity	- Refer to biodiversity management measures relating to ground surveying, mapping and sampling (Error! Reference source not found.). - Honour agreements set out in the site-access contracts. - Chemical toilets are provide for the exploration workers on the site.	Ongoing	Project Manager Site supervisor
	Land use	- Access agreements are in place prior to drill site establishment. - The footprint of the area to be disturbed will be minimised as far as is practically possible. - Areas used as laydown areas are to be raked and/or ploughed to encourage re-vegetation - Agree on relevant compensation with land-owners where land uses are impacted	Ongoing	Project Manager Site supervisor
	Heritage	- Refer to heritage management measures relating to ground surveying, mapping and sampling (**Table 19**)	Ongoing	Project Manager Site supervisor
	Socio-economic	- Refer to socio-economic management measures relating to ground surveying, mapping and sampling **(Table 19**)	Ongoing	Project Manager Site supervisor

Table 21: Environmental Mitigation Measures and Comments – Drilling.

Activities	Potential Impact	Management and Mitigation Measures	Action Plan	
			Frequency	Responsible Parties
- Drill borehole - Contain all drilling water in the sump and allow to settle - Log the drill core and place on core trays - Maintain ablution facilities	Contamination of soil/Hydrocarbon spillages	- In all areas where there is storage of hazardous substances (i.e. hydrocarbons), there will be containment of spillages on impermeable floors and bunded trays that can contain 110% of the volume of the hazardous substances. - All refuelling and any maintenance of vehicles will take place EITHER IN Rosh Pinah or at the driller's storage site. - Pollution will be prevented through basic infrastructure design and through maintenance of equipment. - Spill kits will be readily available on site. Employees and/or contractors will be shown to use the spill kits to enable containment and remediation of pollution incidents. - Environmental awareness training of contractor - RPZC will establish environmental awareness in employees and contractors - A PVC lined sump will be used for collection of oils and silt contained in the drilling water - Any spills will be contained and cleaned up immediately - Non-toxic and biodegradable drilling lubricant will be used	On-going for all drilling activities	Project Manager Site supervisor
	Groundwater contamination	- Refer to management measures relating to contamination of soils. - Licenses in terms of the Water Resource Management Act (Act No. 11 of 2013) will be obtained for all drilled holes (not just boreholes). - Provide chemical toilets at the drill sites.	On-going for all drilling activities	Project Manager Site supervisor
	Air quality deterioration	- Vehicle speeds will be limited to 40km/h on access routes to limit dust. - The movement of drilling related vehicles on unpaved access track will be on a small scale.	On-going for all drilling activities	Project Manager Site supervisor
	Noise generation	- Vehicles will travel maximum 40 km/hour.	On-going for all drilling activities	Project Manager Site supervisor
	Land use	- Refer to land use management measures relating to drill site establishment (**Table 19)**	On-going for all drilling activities	Project Manager Site supervisor
Water abstraction	Groundwater quantity	- All water will be carted to site from Rosh Pinah Mine. - No water abstraction will take place during drilling.	On-going for all drilling activities	Project Manager Site supervisor

Table 22: Environmental Mitigation Measures and Comments – relevant to all Exploration Activities.

Activities	Potential Impact	Management and Mitigation Measures	Action Plan	
			Frequency	Responsible Parties
- All exploration activities	Social – provision of toilet facilities	- Provide chemical toilets at all drill sites.	On-going for all exploration activities	Project Manager Site supervisor
	Waste Management	- All waste generated will be taken to the Rosh Pinah landfill site. - Suitable receptacles for waste disposal will be provided at appropriate locations on site. These receptacles will have lids to avoid any windblown waste. - Employees and contractors will be shown the importance of correct waste disposal as well as waste minimisation and recycling. - Hazardous waste (including hydrocarbon contaminated material/soil) will be disposed of at the Rosh Pinah bioremediation site at the Mine.		Project Manager Site supervisor

Table 23: Environmental Mitigation Measures and Comments – Closure and Rehabilitation.

Activities	Potential Impact	Management and Mitigation Measures	Action Plan	
			Frequency	**Responsible Parties**
General closure activities: - Close drill holes - Remove water from the sump and drip trays - Remove oils and silt from drip trays and store until disposal to permitted hazardous landfill site - Backfill the sump once it has dried out (dome to allow for subsidence) and plug borehole - Move drill core trays, ablution facilities,	Groundwater and surface water contamination	- In all areas where there is storage of hazardous substances (i.e. hydrocarbons), there will be containment of spillages on impermeable floors and bunded trays that can contain 110% of the volume of the hazardous substances. - All refueling of vehicles will take place on impermeable surfaces. - Maintenance of vehicles and drill rigs will be carried out at Rosh Pinah or at the driller's storage camp. - Pollution will be prevented through basic infrastructure design and through maintenance of equipment. - Spill kits will be readily available on site. Employees and/or contractors will be shown how to use the spill kits to enable containment and remediation of pollution incidents. - Any spills will be contained and cleaned up immediately	Once- Closure of drill site	Project Manager Site supervisor
	Noise pollution	- Vehicles will travel maximum 40 km/hour.	On-going	Project Manager Site supervisor
	Contamination of soils	- Refer to management measures relating to contamination of water	On-going and closure	Project Manager Site supervisor

Activities	Potential Impact	Management and Mitigation Measures	Action Plan	
			Frequency	**Responsible Parties**
water bowser, stores and drill rig from the site - Dispose of any general waste to a permitted landfill site - Remove temporary fencing - Rip and plough compacted areas - Replace topsoil over disturbed area - Rehabilitate access track by ripping - GPS marker to identify drill site	Air quality deterioration	- Vehicle speeds will be limited to 40km/h on access routes to limit dust. - The movement of drilling related vehicles on unpaved access track will be on a small scale.	On-going	Project Manager Site supervisor
	Soil erosion	- Impacted footprints are to be raked and/or ploughed to encourage re-vegetation - In areas where plants have been removed, these will be replanted during the rainy season. - Access routes will be ripped unless the land owners wish for them to remain. - A monitoring program will be implemented to establish re-vegetation progress - Agree on relevant compensation with land-owners where land used for hunting purposes is impacted	Starts at closure, continues for a pre-determined time (as stated in agreements)	Project Manager Site supervisor
	Waste management	- Decommission ablution facilities - Ensure that all waste generated during activities is removed from the site and disposed of appropriately, either at the Rosh Pinah landfill site or in case of hazardous waste at the Rosh Pinah bioremediation site at the Mine.	Once off	Project Manager Site supervisor
	Land use	- Land owners will be invited to carry out site inspections following rehabilitation in order to ensure that it has been carried out suitably.	Post-closure	Project Manager Site supervisor

10 ENVIRONMENTAL IMPACT STATEMENT AND CONCLUSIONS

The environmental aspects associated with the exploration activities on MDRL 2616 have been successfully identified and assessed as part of this EIA Scoping process. Relevant mitigation measures have been provided in the existing EMP (**Appendix 4**) and additional management and mitigation measures have been added were appropriate in **section 8** that accompanies this scoping report. RPZC/SZ need to work with both documents to ensure their good environmental work during exploration activities in future.

ASEC believes that a thorough assessment of the proposed project has been achieved and that an environmental clearance certificate could be issued on condition that the management and mitigation measure in the EMP be adhered to.

A. Speiser

A. Speiser Environmental Consultants cc

9 REFERENCES

Crowther, P. 1999. Rosh Pinah Zinc Corporation, Environmental Management Plan.

Daneel, 1992. Impact of off-road vehicle traffic on the gravel plains of the central Namib desert, Namibia. Unpublished Masters Thesis, University of Natal, Pietermaritzburg.

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Steenekamp, G. 2003. Hydrological Report for EA and EMP Review 2003, RPZC.

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Walmsley, EMS for Skoprion Mine, 2000

WSP Walmsley, 2001. Rosh Pinah Landfill Site Selection Study.

Appendix 1 Mineral Deposit Retention Licence (MDRL) 2616 and Transfer of MDRL 2616 to Gergarub Exploration and Mining (Pty) Ltd.

Appendix 2: Original Environmental Management Plan (2003)

Appendix 3 CV of EIA consultant

A. Speiser Environmental Consultants cc
VAT Reg. No.: 3452708015 Reg. No.: cc 2003/0606
Alexandra Speiser
MSc MPhil
P.O. Box 40386 Windhoek Namibia Tel:+264 61 244 782 Cell: 081 124 5655 e-mail:amspeiser@yahoo.com

CURRICULUM VITAE

MARIE ALEXANDRA ANGELIKA SPEISER

A. PROFESSIONAL INFORMATION

First Names:	Marie Alexandra Angelika
Surname:	Speiser
Nationality:	German (Permanent Residence in Namibia 1999)
Countries worked:	Namibia, Mozambique, Angola, Botswana, Germany
Language:	German and English (fluent) Portuguese (reading, understanding: good; writing: poor) Afrikaans (fair)
Profession:	Environmental Scientists (MPhil), Geologist (MSc)
Contact details:	P.O. Box 40386 Windhoek – Namibia Tel +264 61 244782 Namibian cell 081 1245655; Portuguese mobile +351 966417696 E-mail: amspeiser@yahoo.com, aspeiser1910@gmail.com

B. EDUCATION

2000 **Master of Philosophy** in Environmental Science, University of Cape Town, South Africa.

Group Thesis Title: *Environmental Situation Analysis of the Orange and Fish River Catchments*

Individual Paper Title: *Small Scale Mining in Namibia*

1994 **Master of Science** in Geology and Paleontology, Georg-August University Göttingen/Germany.

Thesis Titles: *Fluid inclusion studies in vein quartz from the Kansanshi Mine (Zambia)* and *Geological mapping of the Kansanshi Mine and surroundings.*

C. RELEVANT COURSES

November 2004

Environmental Auditor Trainings Course, Institute of Environmental Impact Assessment (IEMA) approved, Crystal Clear Consulting & Merchants (Pty) Ltd, RSA

D. PROFESSIONAL ACTIVITIES

Professional Institutes & Membership:

- Lead Practitioner, Environmental Assessment Professionals of Namibia (EAPAN)
- Chamber of Mines of Namibia (member)
- Namibian Chamber of Environment (member)
- Geological Society of Namibia (member)

E. EMPLOYMENT HISTORY

2012 – to 2016 Associated Environmental Consultant to SLR Namibia

2003 - to date A. Speiser – Environmental Consultants cc, Director

Main work conducted and ongoing:

- Work packages 6 leader of the **HiTech AlkCarb Project** funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 689909 (Feb. 2016 to Feb. 2020)
- **Environmental Consultant** to Kerry McNamara Architects Inc: Combined Scoping & EIA Report & EMP for the proposed Edelweiss Development (part of Okahandja Extension 7) in Okahandja
- **Environmental Consultant** to Bannerman Resources (Namibia) (Pty) Ltd: EIA/EMP for the proposed Pilot Plant on Bannerman Resources (Namibia) (Pty) Ltd EPL 3345
- **Environmental Consultant** to RPZC (Glencore): EIA/EMP for the proposed expansion of water and power infrastructure for RPZC Mine
- **Environmental Consultant** to RPZC (Glencore): EIA/EMP for the proposed zinc concentrate Storage shed at Lüderitz harbour
- **Environmental Consultant** to Metals Namibia. EO and EMP for exploration activities
- **Environmental Consultant** for the bulk chemical store of Crest Chemical Pty Ltd at Walvis Bay harbour
- **Environmental Coordinator** for the Kassinga (Angola) North and South Iron Ore Project – Area 1 (SMP / AEMR). JV between ASEC and Environmental Resource Management
- **Environmental Coordinator** for the exploration phase at Lofdal, Namibian Rare Earth (Pty) Limited
- **Environmental Consultant** to conduct bi-annual environmental audit reports for Glencore, Bannerman Resources (Namibia) Pty Ltd, Okorusu Fluorspar Pty Ltd, Namibia Rare Earth Pty Ltd, Swakop Uranium,
- **ESIA Coordinator** (amendments to the approved ESIA & ESMP) for the proposed U-mine at Etango (Bannerman Mining Resources Namibia (Pty) Ltd)
- **External Environmental Consultant** to Rössing Uranium (Rio Tinto) – SEMP: exploration drilling in the ML area within the Namib Naukluft Park
- **Reviewer** of Swakop Uranium SEIA conducted by Metago
- **ESIA Coordinator** (scoping phase) for the proposed Cu mine at Omitiomire (Craton Mining & Exploration (Pty) Ltd)
- **Mine Closure Plan** for Okorusu Fluorspar (Okorusu Fluorspar Pty Ltd)
- **Preliminary Environmental Overview** for Omitiomire Cu-deposit (Craton Mining & Exploration (Pty) Ltd)
- **ESIA Coordinator** for the proposed U-mine at Etango (Bannerman Mining Resources Namibia (Pty) Ltd) (Scoping & final ESIA approved by Government)
- **ESIA Coordinator** for the proposed Au-mine at Otjikoto, Central Namibia (Teal Exploration & Mining Inc.)
- Environmental Consultant to Walvis Bay Bulk Terminal (Pty) Ltd (EIA to construct a bulk sulphur loading & storage facility at WB harbour

- **Environmental Consultant** providing input to set up ISO 14001 & OSHAS 18000 at Rosh Pinah Mine, Rosh Pinah Zinc Corporation (Pty) Ltd
- **EIA Coordinator** for the proposed change to bulk sulphur at Skorpion Zinc, Chemical Initiatives (Pty) Ltd
- **September 2005 – June 2006, Environmental Coordinator** for the construction phase of Langer Heinrich Uranium (Pty) Ltd
- **EIA and EMP Coordinator** for proposed exploration activities for dimension stones, relevant document to grant licence by the Ministry of Mines and Energy, Olea Investment Number One (Pty) Ltd.
- **Standard Environmental Guidelines** for exploration activities, Helio Resource Corp., Canada
- **Coordinator** to compile the **Initial EMP for construction and operation** of the Langer Heinrich Uranium Mine, Paladin Resources Ltd
- **EIA & EMP (Phase 1 & 2) Coordinator** for exploration activities in the NW Namib Naukluft Park, West Africa Gold Exploration (Namibia) Pty. Ltd
- **EMP Coordinator** for Sarusas Mine, Skeleton Coast Park, Namibia, Igneous Mining Projects (Pty) Ltd
- **EIA & EMP Coordinator** for current & proposed mariculture projects of Alexkor, Alexander Bay, RSA
- **Environmental Consultant –** updating the EA & EMS for infrastructure changes at Navachab Mine, Anglogold Namibia (Pty) Ltd.
- **Team Leader**, Environmental and social assessment for World Bank/GEF Project 'Integrated ecosystem management in Namibia through the national conservancy network'
- **Bi-annual monitoring reports** auditing environmental performance of exploration activities (RPZC, B2Gold, Swakop Uranium, Okorusu Fluorspar, Namibia Rare Earth) - **ongoing**

2000 - 2003 Environmental Scientist at eco.plan (Pty) Ltd.

During this period I conducted environmental assessments and developed environmental management plans for exploration and infrastructure projects. I further was involved in the project management, public participation processes and office administration.

1999 – 2000 University of Cape Town studying Environmental Science (MPhil degree)

1997 – 1999 Self employed, Contract Geologist Scientist

- RC drilling supervision – Apatite Project / Monapo, Mozambique, subcontracted by GeoAfrica Prospecting Services (Pty.) Ltd.
- Mapping and evaluation of possible talc deposits in Central Namibia, subcontracted by Dr. T. Smaley.
- Involvement in the preliminary fact finding phase to conduct an EIA to upgrade the Cement Factory in Otjiwarongo, Namibia.
- Several Desk Studies for Anglovaal Namibia (Pty) Ltd.
- Various investigations of diamondiferous gravels of the northern bank of the Orange River.
- Drilling Supervision in the Okavango Area for InterConsult Namibia (Pty) Ltd.
- Organization of the Public Meeting for the 'Proposed Klein Windhoek River Bridge and Upgrading of Mission Road.'

1995 to 1996 Project Assistant / Geologist at the German Technical Cooperation (GTZ)

- Participation in a six-week training course at the (GTZ) Headquarter in Eschborn/Frankfurt. Focus of the training course was on project management, rural public participation appraisal and social development workshops.
- Project Assistant to the GTZ-Adviser in the Ministry of Environment & Tourism. In cooperation with the Desert Research Foundation of Namibia (DRFN) the *Chemical Residue Analysis – Kavango Region* Project was conducted. The project assessed the environmental

impacts of irrigation schemes along the Okavango River, special attention was given to the use of fertilisers and pesticides.

- Project Assistant/Geologist in the *Mineral Prospecting Promotion Project*. This project was set up in cooperation with the Geological Survey of Namibia (GSN) and the Federal Institute for Geo-science and Natural Resources (BGR). The work comprised geophysical interpretation and detailed geological/geophysical ground follow-ups.

1994 – 1995 Contract Geologist

- Supervision of construction sites and conduction of soil surveys to establish possible hydrocarbon-contamination (Germany).

F. PUBLICATIONS

Speiser A., Hein U.F. and Porada H. (1995). The Kansanshi Copper Mine (Solwezi Area, northwestern Zambia): Geology, wall rock alteration and fluid inclusions, in Pasava J. Kirbek B. and Zak K. eds., Mineral deposits: From their origin to their environmental impacts: Third Biennial Society for Geology Applied to Ore Deposits Meetings, Rotterdam, Balkema, p. 289 – 392.

Du Plessis P., Eberle D. and Speiser A. Chapter 1: Enabling Host: Southern Namibia. in Eberle D. (eds.) (1997). Promising Patterns. A new approach to the Mineral Potential of Southern Namibia.

Boonzaier A., Kuiper S. and Speiser A. (1999). Community Benefits from the Richterveld National Park: The Golden Road to the future? in IAIAsa 1999 Conference Proceedings.

Appendix 4: Background Information Document

Appendix 5: Site Notice

Appendix 6: Newspaper advertisements

Appendix 7: Comments received

Appendix 8: Issue and Response Report