

# **A SCOPING REPORT ON THE ENVIRONMENTAL IMPACT ASSESSMENT FOR MINERAL EXPLORATION ACTIVITIES ON EPL 5751, CENTRAL NAMIBIA**

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# ENVIRONMENTAL ASSESSMENT FOR MINERAL EXPLORATION ON EPL 5751, CENTRAL NAMIBIA

## EXECUTIVE SUMMARY

### 1. Introduction

#### 1.1 Overview

The proponent, Dynamic Geo-Consulting Services cc, was granted an exclusive prospecting licence (EPL) by the Ministry of Mines and Energy. The licence holder intends to explore for lithium in pegmatite rock units that are found within the vicinity of the area. Impala Environmental Consulting cc was appointed by the proponent to undertake the application process for the environmental clearance certificate. The map above shows the licence boundary with the underlying farms.

#### 1.2 Location

The mineral license is located 74 km South of Karibib and covers farms Nordenburg, Villa Rosa, Dorstrivier, Ukuib West, Tsoabis, Rooikuseb, Horebis North, Horebis South, Vredelus, Vlakteplaas, Marmor and Tsoasibmund. The coordinates for the centre of the licence are 15.561342 and -22.487684.

#### 1.3 Environmental Assessment Requirements

The Environmental Regulations procedure (GN 30 of 2012) stipulates that no mining and mineral exploration activities may be undertaken without an environmental clearance certificate. As such, an environmental clearance certificate must be applied for in accordance with regulation 6 of the 2012 environmental regulations. It is imperative that the environmental proponent must conduct a public consultation process in accordance with regulation 21 of the 2012 environmental procedure, produce an environmental scoping report and submit an Environmental Management Plan for the proposed mineral exploration activities.

# ENVIRONMENTAL ASSESSMENT FOR MINERAL EXPLORATION ON EPL 5751, SOUTHERN NAMIBIA

## FINAL SCOPING REPORT

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## 1. Project Background

### 1.1 Introduction

The proponent, Dynamic Geo-Consulting Services cc, was granted an exclusive prospecting licence (EPL) by the Ministry of Mines and Energy. The licence holder intends to explore for lithium within the pegmatite rock units that are found within the vicinity of the area. An outline of the area is shown in the image below.

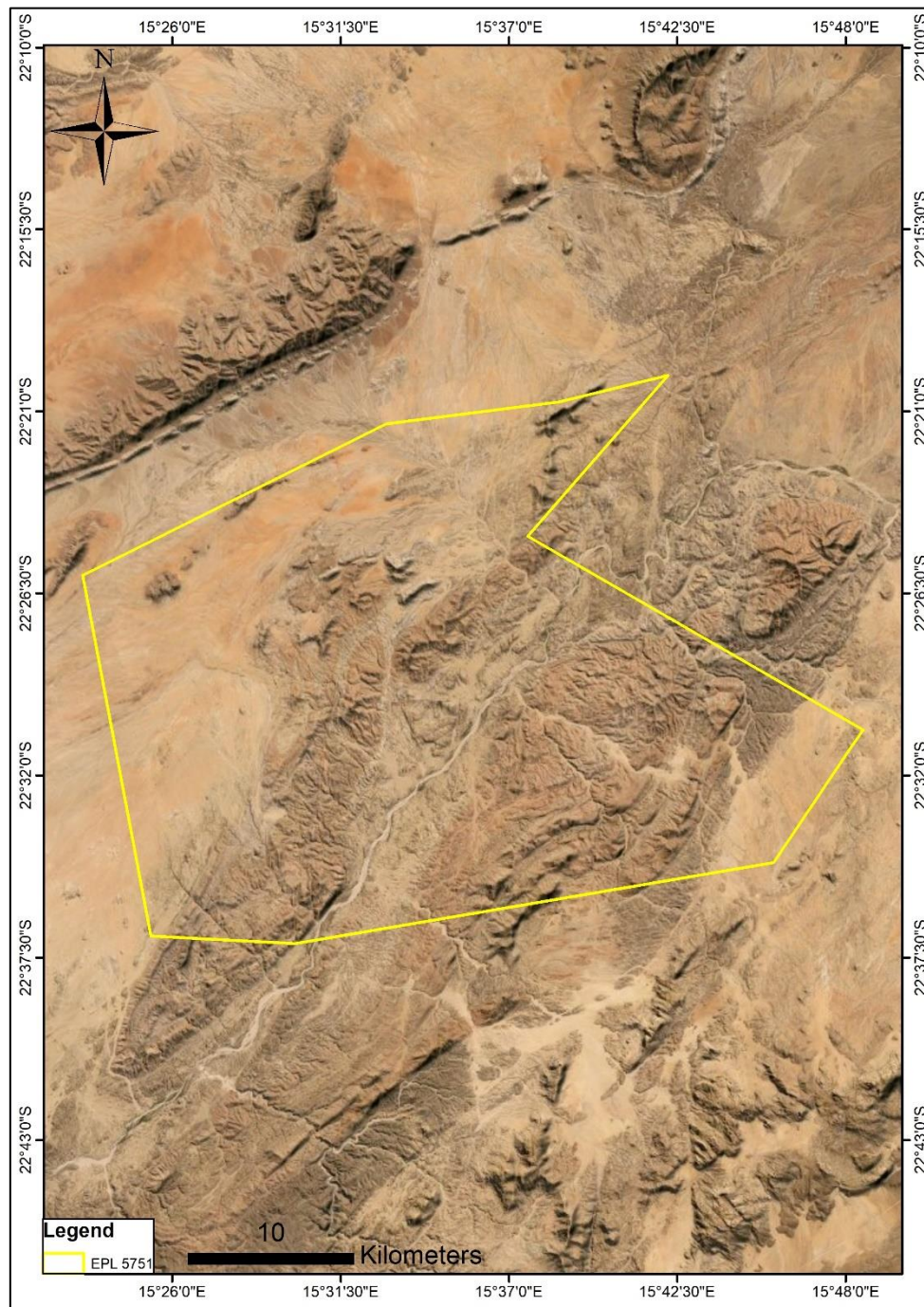


Figure 1 A satellite imagery showing the orientation of the mineral exploration licence.

Although mineral exploration is very costly and risky, environmentally friendly exploration is a cornerstone, yet the mineral exploration process must never be at the expense of people or the environment. The proponent believes that social and environmental responsibility is a prerequisite for providing a conducive environment for mineral exploration and future mining activities.

Impala Environmental Consulting cc was appointed by the proponent to undertake an Environmental Assessment (EA) and Environmental Management Plan (EMP) for the mineral exploration project. Figure 2 shows the surrounding farms of the project area. Some of the farms are resettlement farms while the rest are privately owned.





## 1.2 Project Location

The mineral licence is located 74 km South of Karibib and covers farms Nordenburg, Villa Rosa, Dorstrivier, Ukuib West, Tsoabis, Rooikuseb, Horebis North, Horebis South, Vredelus, Vlakteplaas, Marmor and Tsoasibmund. The coordinates for the centre of the licence are 15.561342 and -22.487684.

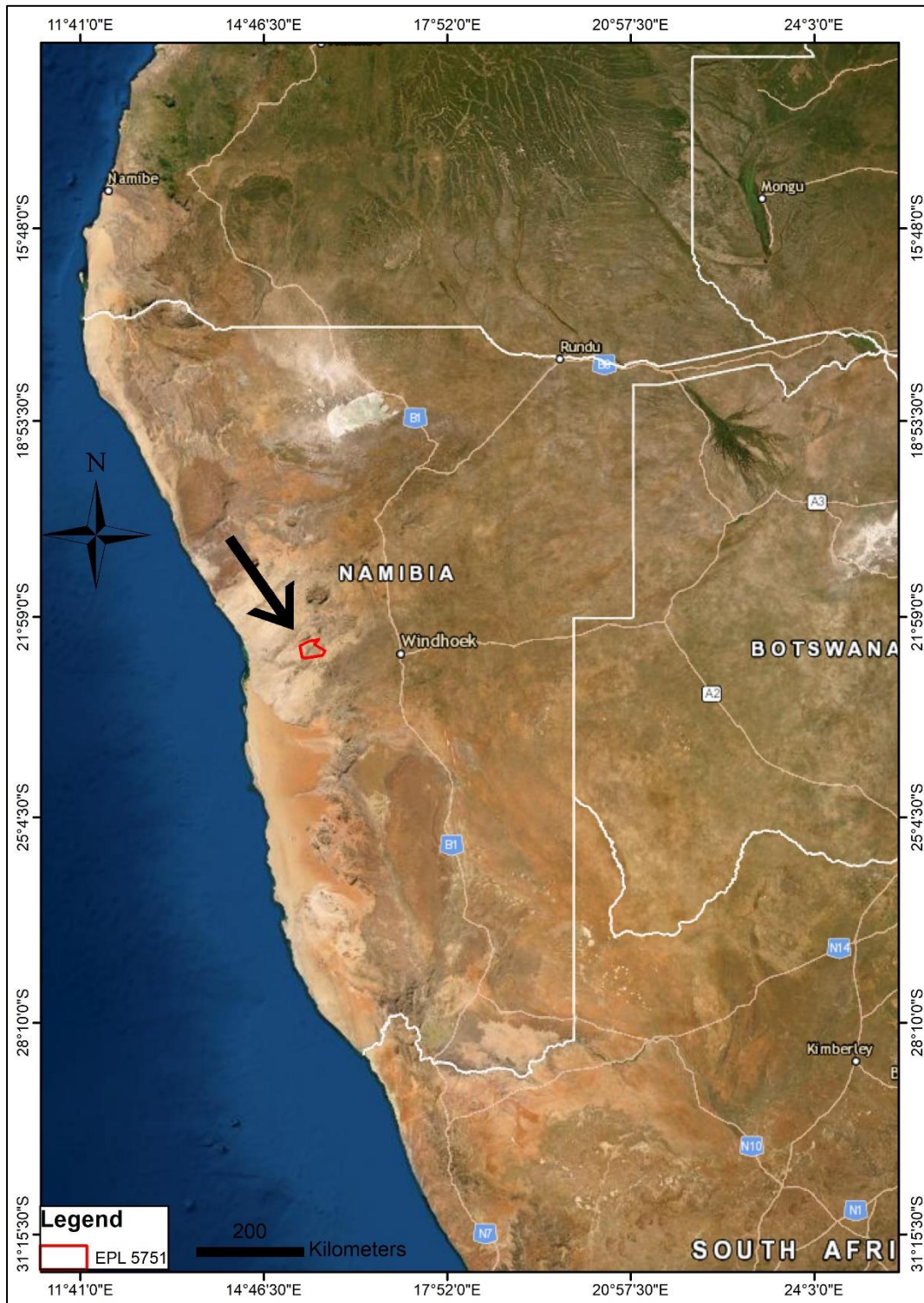


Figure 3 Locality map of the exclusive prospecting licence area

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### 1.3 Environmental Impact Assessment Requirements

The Environmental Regulations procedure (GN 30 of 2012) stipulates that no mineral exploration activities may be undertaken without an environmental clearance certificate. As such, an environmental clearance certificate must be applied for in accordance with regulation 6 of the 2012 environmental regulations. It is imperative that the environmental proponent must conduct a public consultation process in accordance with regulation 21 of the 2012 environmental procedure, produce an environmental scoping report and submit an Environmental Management Plan for the proposed mineral exploration activities.

### 1.4 Purpose of the Scoping Report

The scoping report is prepared for the Environmental Impact Assessment for mineral exploration on an area which is located 74 km South of Karibib and covers farms Nordenburg, Villa Rosa, Dorstrivier, Ukuib West, Tsoabis, Rooikuseb, Horebis North, Horebis South, Vredelus, Vlakteplaas, Marmor and Tsoasibmund. The coordinates for the centre of the licence are 15.561342 and -22.487684.

Environmental scoping is a critical step in the preparation of an EIA for the proposed mineral exploration activities. The scoping process identifies the issues that are likely to be most important during the EIA and eliminates those that are of little concern. The scoping process shall be concluded with the establishment of terms of reference for the preparation of an EIA, as set out by the Ministry of Environment and tourism. The purpose of this scoping report is to:

- Identify any important environmental issues to be considered before commencing with mineral exploration activities on the proposed mineral exploration sites.
- To identify appropriate time and space boundaries of the EIA study.
- To identify information required for decision-making.

As such, the key objectives of this scoping study are to:

- Inform the public about the proposed mineral exploration activities.
- Identify the main stakeholders, their comments and concerns.

- Define reasonable and practical alternatives to the proposal.
- To establish the terms of reference for an EIA study.

### **1.5 Project Alternatives**

An alternative to the proposed mineral exploration activities would be to allocate the land-usage to other income generating activities such as farming and tourism activities. Although the above-mentioned activities may generate revenue for the government and provide employment to a few individuals, the mineral exploration project and potential mine might have a significant impact on the surrounding community. The proposed project will strictly employ locals from nearby towns and settlements.

## **2. Summary of applicable legislation**

All mineral rights, related to mineral exploration activities in Namibia, are regulated by the Ministry of Mines and Energy whereas the environmental regulations are regulated by the Ministry of Environment and Tourism. The acts that affect the implementation, operation and management of mineral exploration activities in Namibia are shown below.

### **2.1 Environmental Management Act of 2007**

**Line Ministry:** Ministry of Environment and Tourism

The regulations that accompany this act lists several activities that may not be undertaken without an environmental clearance certificate issued in terms of the Act. The act further states that any clearance certificate issued before the commencement of the act (6 February 2012) remains in force for one year. If a person wishes to continue with activities covered by the act, he or she must apply for a new certificate in terms of the Environmental Management Act.

### **2.2 The Minerals Prospecting and Mining Act of 1992**

**Line Ministry:** Ministry of Mines and Energy

The Minerals Prospecting and Mining Act No.33 of 1992 approves and regulates mineral rights in relation to exploration, reconnaissance, prospecting, small scale mining, mineral exploration, large-scale mining and transfers of mineral licences.

### **2.3 Water Resources Management Act of 2004**

**Line Ministry:** Ministry of Agriculture, Water and Forestry

The act provides for the management, protection, development, usage and conservation of water resources; to provide for the regulation and monitoring of water resources and to provide for incidental matters.

### **2.4 Nature conservation ordinance, ordinance No. 4 of 1975**

**Line Ministry:** Ministry of Environment and Tourism

The Nature Ordinance 4 of 1975 covers game parks and nature reserves, the hunting and protection of wild animals (including reptiles and wild birds), problem animals, fish, and the protection of indigenous plants. It also establishes a nature

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conservation board. The basic set of regulations under the ordinance is contained in GN 240/1976 (OG 3556). The topics covered in the regulations include tariffs (game parks), regulations relating to game parks, swimming baths, use of boats in game parks, inland fisheries, keeping game and other wild animals in capturing. In addition, the ordinance also regulates game dealers, game skins, protected plants, birds kept in cages, trophy hunting of hunt-able game, hunting at night, export of game and game meat, sea birds, private game parks, nature reserves, regulations of wildlife associations and registers for coyote getters.

## **2.5 National Heritage Act, 2004 (Act No. 27 of 2004)**

**Line Ministry/Body:** National Heritage Council

The National Heritage Act provides for the protection and conservation of places and objects of heritage significance and the registration of such places and objects; to establish a National Heritage Council; to establish a National Heritage Register; and to provide for incidental matters.

## **2.6 Petroleum Products and Energy Act No. 13 of 1990**

**Line Ministry/Body:** Ministry of Mines and Energy

The act regulates the importation and usage of petroleum products. The act reads as “To provide measures for the saving of petroleum products and an economy in the cost of the distribution thereof, and for the maintenance of a price thereof; for control of the furnishing of certain information regarding petroleum products; and for the rendering of services of a particular kind, or services of a particular standard; in connection with motor vehicles; for the establishment of the National Energy Fund and for the utilization thereof; for the establishment of the National Energy Council and the functions thereof; for the imposition of levies on fuel; and to provide for matters incidental thereof”.

## **2.7 Forest Act, No. 12 of 2001**

**Line Ministry/Body:** Ministry of Agriculture, Water and Forestry

The act regulates the cutting down of trees and reads as follows “To provide for the

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establishment of a Forestry Council and the appointment of certain officials; to consolidate the laws relating to the management and use of forests and forest produce; to provide for the protection of the environment and control and management of forest trees; to repeal the preservation of Bees and Honey proclamation 1923, preservation of Trees and Forests Ordinance, 1952 and the Forest Act, 1968; and to deal with incidental matters”.

The constitution defines the function of the Ombudsman and commits the government to sustainable utilization of Namibia’s natural resources for the benefit of all Namibians and describes the duty to investigate complaints concerning the over-utilization of living natural resources for the benefit of all Namibians and describes the duties to investigate complaints concerning the over-utilization of living natural resources, the irrational exploitation of non-renewable resources, the degradation and the destruction of ecosystem and failure to protect the beauty and character of Namibia. Article 95 states that “*the state shall actively promote and maintain the welfare of the people by adopting; inter-alia policies aimed at maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of natural resources on a sustainable basis for the benefit of all Namibians both present and future*”.

## **2.8 Atmospheric Pollution Prevention Ordinance (1976)**

**Line Ministry/Body:** Ministry of Health and Social Services

This ordinance provides for the prevention of air pollution and is affected by the Health Act 21 of 1988. Under this ordinance, the entire area of Namibia, with the exception of East Caprivi, is proclaimed as a controlled area for the purposes of section 4(1) (a) of the ordinance.

## **2.9 Hazardous Substance Ordinance, No. 14 of 1974**

**Line Ministry/Body:** Ministry of Safety and Security

The ordinance provides for the control of toxic substances. It covers manufacture, sale, use, disposal and dumping as well as import and export. Although the

environmental aspects are not explicitly stated, the ordinance provides for the importing, storage and handling.

## **2.10 Namibian Water Corporation (Act 12 of 1997)**

**Line Ministry/Body:** Namibian Water Corporation

The act caters for water rehabilitation of prospecting and mineral exploration areas, environmental impact assessments and for minimising or preventing pollution.



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### 3. Description of Proposed Mineral exploration Project

#### 3.1 Introduction

Lithium is an alkali metal, has a high specific heat capacity and is the lightest metal. Lithium is produced from a variety of geological sources, e.g., minerals such as spodumene, clays such as hectorite, salt lakes, and underground brine reservoirs etc. There are two broad categories of lithium sources, namely Rock and Brine sources. Rock sources include mineral sources such as spodumene, amblygonite, lepidolite, jadarite, as well as clay sources of lithium such as hectorite (Mohr, et al., 2012).

Typical mineral deposits have a lithium content of around 0.5%–2% Li. Often the lithium from minerals is concentrated to around 2%–4% Li and used in the ceramics and glass industry. The pegmatitic deposits of lithium, beryllium and cesium minerals in Namibia occur mainly in the Karibib - Usakos pegmatite district. The lithium minerals mined in this area, currently and in the past, include petalite, amblygonitemontebrazite, spodumene and lepidolite. Spodumene and eucryptite are associated with some rare metal pegmatites within the Cape Cross - Uis pegmatite belt. Most beryl has been produced from zoned rare metal pegmatites in the Karibib-Usakos and Karasburg Districts. The cesium aluminosilicate, pollucite, is a rare constituent of highly fractionated lithium pegmatites and has been mined at Helikon and Rubikon (Miller, 1992).

Brine sources, includes lithium found in salt water deposits, and include lakes, salars, oilfield brines, and geothermal brines. Due to uncertainty surrounding the viability of extraction lithium from seawater, seawater is currently excluded from brines. Typically, the brines are concentrated via evaporation ponds before the lithium is precipitated in the form of lithium chloride or lithium carbonate. Oilfield brines are underground brine reservoirs that are located with oil. Geothermal brines are underground brines naturally heated. Hectorite is a lithium bearing clay. Finally, jadarite is a newly discovered lithium-boron containing mineral. In determining the amount of lithium that can be produced from these sources, the terms Resource, Recoverable Resources and Ultimately Recoverable Resources will be used. First, the term Resource is the amount of lithium that is physically in a geologic deposit, and the deposit is either currently commercially feasible for extraction or is likely to

be in the future. The Recoverable Resources is the amount of the resource that is assumed to be extracted in the future (accounting for mining losses, and resources left in the deposit due to issues such as depth, grade, etc.). The Ultimately Recoverable Resources is the Recoverable resources plus all historic cumulative production. There are formal guidelines for calculating reserve and resource estimates in some countries, such as the JORC Code in Australia, NI 43-101 in Canada and SAMREC in South Africa, which all use the terms of ore reserves and mineral resources in distinct ways. In strict terms, ore reserves are profitably mineable at present, based on consideration of mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. Mineral resources are similar to ore reserves but have had less assessment of the above factors and are hence less certain as to profitability. In general, most mineral resources are converted to ore reserves over time once a project is developed, mineral demands grow and so on (Mohr, et al., 2012).

## **3.2 Mineral Exploration Method**

### **3.2.1 Target Generation**

Lithium target generation involves certain stages, such as mapping, geochemical survey, geophysical survey, and remote sensing. Mapping includes development of the geological, topographical (base), geochemical, geophysical, and structural maps. Geological map focuses on identifying and mapping outcrops, describing mineralization and alteration zones, and making geological cross sections. In other words, it relies on the identification of rocks and minerals and the understanding of the environment in which they form. It aims to find what rock types occur at or close to the surface and how these rock types are related to each other, e.g., by defining their boundaries, ages, and structure. Topographical map, which is a base map, depicts the topographical features (contour, hill, stream, etc.). Geochemical map includes surface sample locations and results, including analyses of rock, silt, and soil samples. Geophysical map depicts the geology and results obtained from geophysical survey. Structural map shows the orientation data (strike, dip, type, etc.) of bedding planes, faults, folds, joints and other structural features. They are all gathered to be used for the interpretation in lithium mineral exploration (Mentes, 2012).

### **3.2.1.1 Remote Sensing**

Remote Sensing, which is also useful for lithium exploration, is the collection of information about an object or area without being in physical contact with it. Data gathering systems used in remote sensing are photographs obtained from manned space flights or airborne cameras, and electronic scanner or sensors such as multispectral scanners in satellites or airplanes and TV cameras, all of which record data digitally. Aerial photography and satellites allow people to work with modern techniques. Aerial photography is used to sense the amount (quantity) of mineral in a particular area. The mineral exploration team collects information such as tracks, roads, fences, and habitation, as well as maps of outcrops, regolith, and vegetation cover across a region. Landsat image (satellite imagery) is used both for the visible light spectrum over mineral exploration (Mentes, 2012).

### **3.2.1.2 Geophysical Survey**

Geophysical survey focuses on measuring physical characteristics (e.g., magnetism, density, conductivity) of rocks at or near the Earth's surface and uses surface methods to measure these properties to designate a potential lithium ore body. The measured values are then used to compare with the values and models of known lithium deposits. The results obtained from this survey are gathered together to make a geophysical anomaly maps, which is a good way for evaluation.

### **3.2.1.3 Geochemical Survey**

Geochemical survey is a kind of sampling method in mineral exploration and results in 'Assay' after laboratory works. Exploration geochemistry has evolved from its early origins using the chemistry of the environment surrounding a deposit in order to locate it. A wide variety of lithium bearing pegmatites can be chemically analyzed in laboratory for this survey. In mineral exploration studies, geochemical methods involve the geochemical analysis of geological materials, including rock, soil, and stream sediment or silt sediment. In addition to these surface samples, any materials obtained from drilling can be analyzed for the evaluation. The results of sampling may reveal patterns that point to the location of a potential lithium deposit, which may be present either underground or at the surface. This survey provides physical results to be worked on for the further interpretation and is used for identifying

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geochemical anomalies, which are used for geochemical mapping (Mentes, 2012). During the first phase, the type of sampling methods that will be applied are soil sampling, stream sediment sampling, and bulk sampling.

### **3.2.2 Target Drilling**

Target drilling is the process whereby drill rigs are used to make boreholes to intercept a lithium ore body. It can be done by contractors with more experienced operators. This method is used to obtain very detailed information about rock types, mineral content, and rock fabric, and the relationships between rock layers close to the surface and those at depth. Then, subsurface geology in a particular area is evaluated after the results are obtained. That indicates if the potentially economic resources are present or not. In general, the purpose of drilling is to: determine the absence or presence of lithium ore bodies, define the volume of and depth to the ore body; estimate reserve of ore body reservoir. Then, ore deposit is discovered before it is decided to be mined (Mentes, 2012). During the first exploration phase, RC Drilling and Diamond Drilling methods will likely be employed.

### **3.2.3 Resource Evaluation**

It is an evaluation of tonnage (volume) and grade (concentration or weight percent) of the ore body. The volume is determined by using drill data to outline the deposit in the subsurface, and by using geometric models to calculate the volume. The grade is the average concentration determined from numerous assays of drill samples. The purpose of the resource evaluation is to understand the possibility to expand the known size of the deposit and mineralization. In this way, the economic standards of an ore body are obtained, which is needed for the next step. This step should give an information or idea about proceeding of mineral exploration activities. Resources at this work are determined during exploration and do not provide certain results of grade and tonnage. In order to get an exact size, quality of the commercial mineral, 'reserve definition', which is next step of mineral exploration studies, is used (Mentes, 2012).

### **3.2.4 Resource Definition**

Reserve definition is important to transform a lithium mineral resource into economic asset, which is an ore reserve and find the answer if it is valuable or not. 'Reserve' is

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more intensive, technical, and well characterized term with its exact quality and size relative to 'Resource'. Also, reserve estimation may be changed over time because of the assessments during and after the mining. The main purpose of this stage is the making decision on the techniques just before extraction as a result of the results. It includes technical, economic evaluation, geotechnical assessment, and engineering studies of the rocks surrounding the deposit to determine the potential parameters of open pit or underground mining methods. At the end of this process, a feasibility study is published, and the ore deposit is supposed either uneconomic or economic. At this stage, a decision is made whether to mine the mineral deposit from the surface, called as 'open-pit mining', or by tunneling, called as underground mining (Mentes, 2012).

### **3.3 Labour Requirements**

The proponent intends to employ about 5-15 personnel, including 3 management staff for the first phase of the project. The employees will be sourced from the local community including people from Karibib. All employees will undergo a safety induction, first aid training course and wildlife awareness program. The Labour Act of 2007 will always be adhered to.

### **3.4 Waste Dumps**

In choosing a waste dumpsite, the following aspects will be strongly considered by the explorer:

- Topography
- Land-use in the area
- The presence of any hazardous geological structures
- Groundwater considerations
- The prevailing wind direction in the area
- Visual impacts that the waste dump might have
- Presence of surface water in the vicinity of the area
- Presence of sensitive ecological areas

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Since the area contains a range of wildlife, all waste will be transported and disposed out of the area.

### **3.5 Services**

#### **3.5.1 Electricity requirements**

At this stage, electricity requirements for the project are minimal. The bulk of the power supply to the exploration site will be sourced from the proponent's own generator. The power requirements for the proposed project will be minimal as power will only be required for the following activities:

- Emergency lighting
- Powering small machinery during the mineral exploration process
- Power supply for temporary office block or container if necessary.

#### **3.5.2 Water Supply**

For the purpose of the scoping study costing requirements, a separate geo-hydrological study will be undertaken at an advanced stage of the EIA. The water requirements for the project are minimal. Water containers will be brought on site and utilised whenever necessary. The water will mostly be used for general consumption and cleaning. The water used for diamond drilling or RC drilling will be recycled.

### **3.6 Infrastructure**

#### **3.6.1 Refuse and waste removal**

The proponent will negotiate directly with all suppliers of consumables such as grease, oil etc. to remove these materials for disposal once they have been used and need to be discarded. The proponent will provide adequate temporary sanitary facilities and such facilities must be maintained in a hygienic condition. Sewerage will be disposed of in a manner not polluting the environment. The proponent will remove all refuse pertaining to the proponent's activities, domestic or otherwise, from the property. The Miner will undertake environmental rehabilitation, both during and at the conclusion of the mineral exploration operations.

### **3.6.2 IT Systems and communication**

Provision will be made for two-way radios to enable the drill rig operators and the on-site staff to communicate effectively.

### **3.6.3 Security and Fencing**

No provision has been made for fencing although strict access to and from the drilling site will be facilitated by personnel.

### **3.6.4 Buildings**

At this stage, no exploration camp will be set up and so provision will be made for prefabricated containers.

### **3.6.5 Roads**

Access to the mineral exploration sites is limited as there are currently no convenient roads, except for 4x4 tracks. From Karibib, the mineral exploration site will be accessed via the C33 road from the B2 main road.

### **3.6.6 Mobile Equipment**

The proponent's vehicle fleet will be optimised during the next project phase. Provision will be made 4x4 vehicles and a drill rig.

### **3.6.7 Fuel Distribution, storage and supply**

During the drilling phase, diesel will be delivered to the by road transport and offloaded into the vehicles by offloading pumps.

### **3.6.8 Storage of Lubrication and consumables**

During the drilling phase, consumables and lubricants will be stored in a designated area within a container. These substances will only be used for mechanical purposes and are assumed to be non-hazardous.

### **3.6.9 Fire Fighting Provision**

Portable fire-extinguishers will be fitted, as required, in vehicles and, as well as in the mobile containers where possible.

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## 4. Description of the Current Environment

### 4.1 Introduction

This section aims to document the present state of the environment, the likely impact of changes being planned and the regular monitoring to attempt to detect changes in the environment. As such, this area represents a high fauna diversity.

Namibia has four very large and arid regions which set them apart in various ways from the rest of the country; Kunene and Erongo region in the west and Karas and Erongo in the south (Mendelsohn, et al., 2002). Kunene Region occupies the north-west corner of Namibia. The Skeleton Coast Park forms its entire western boundary with the Atlantic Ocean. The Kunene River with its Epupa Falls forms an international boundary with Angola to the north. Nationally, Kunene is bordered by Omusati Region and the western boundary of Etosha National Park. In the south it forms the southern boundary of most of Etosha National Park and borders Erongo and Erongo regions. The region is home to the Skeleton Coast Park and many conservancies. Erongo is one of the central regions in Namibia with a size of 105,185 square kilometers, with vegetation ranging from open savanna around Karibib, to lush vegetation and massive bright red sandstone cliffs.

There is generally an absence of fences in most parts of the Erongo Region. This makes livestock farming easier which means that both wild and domestic animals can move widely in many places, migrating from areas of poor grazing to other places with more abundant pastures.

### 4.2 Climatic Conditions

#### 4.2.1 Temperature

In the mineral exploration area, September is the warmest month with an average temperature of 29°C at noon. June is the coldest month with an average temperature of 19°C at night. Karibib, which is in the vicinity of the project area, has distinct temperature seasons, the temperature varies during the year.



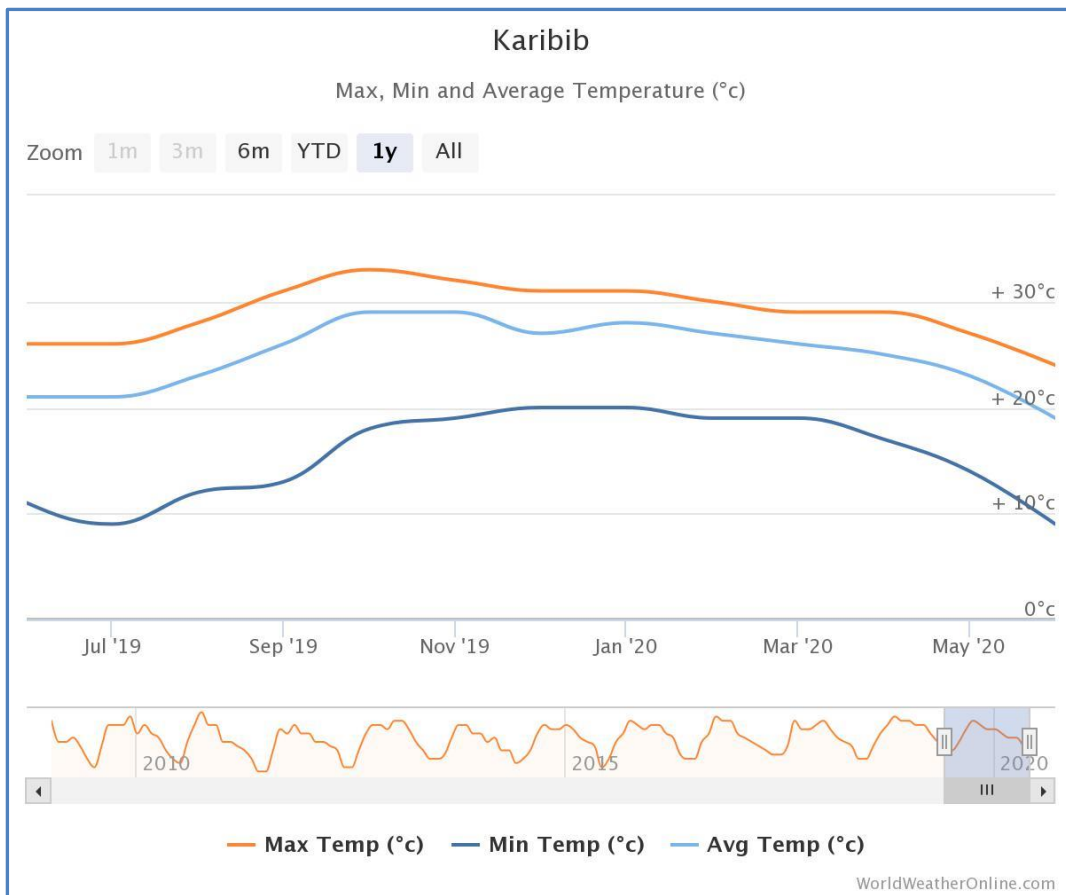


Figure 4 A graph showing the temperature patterns in Karibib, from [www.worldweatheronline.com](http://www.worldweatheronline.com)

In winter, temperatures can get to below degrees centigrade. Overall, winters are mild in temperature, with coldest month most often being June.

#### 4.2.2 Precipitation

In the mineral exploration area, the highest rainfall is usually experienced in February which may reach 152 mm with average rainfall days. In January months, rainfall may reach about 50 mm with average rainfall days. The graph below shows the rainfall patterns in the area.

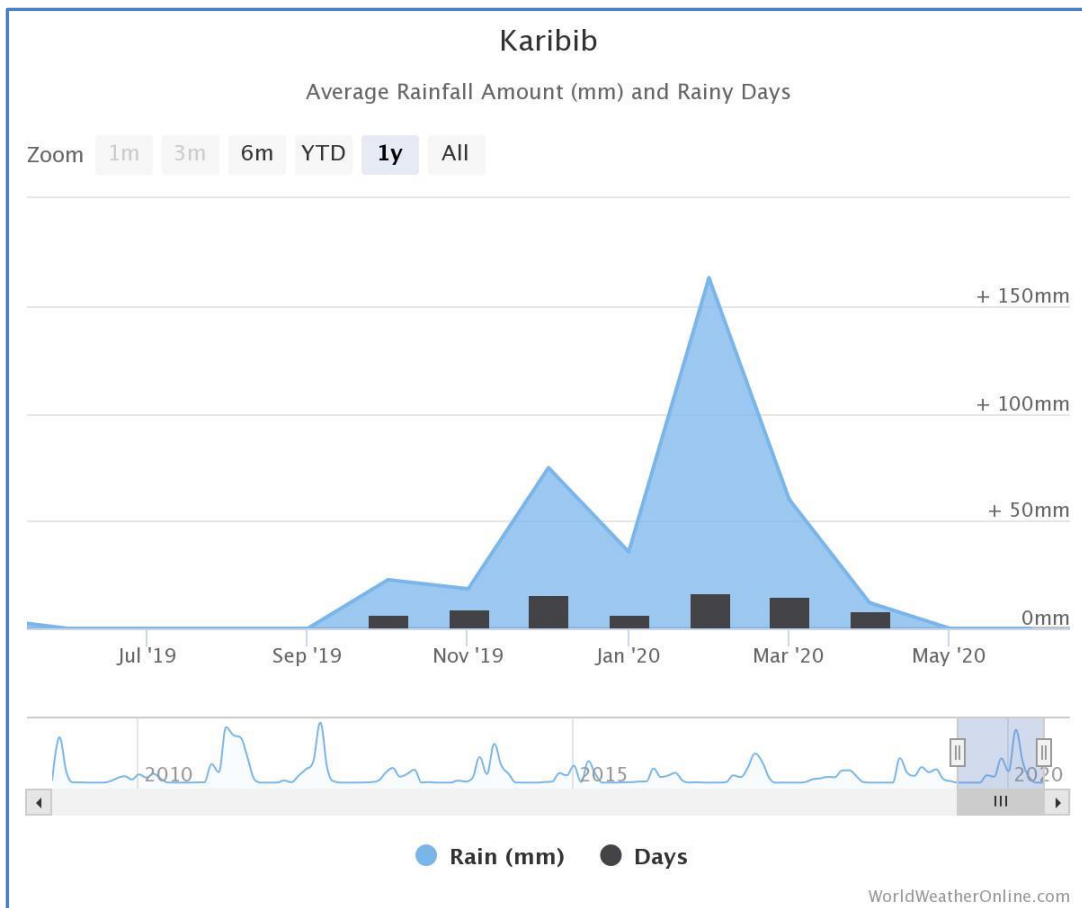
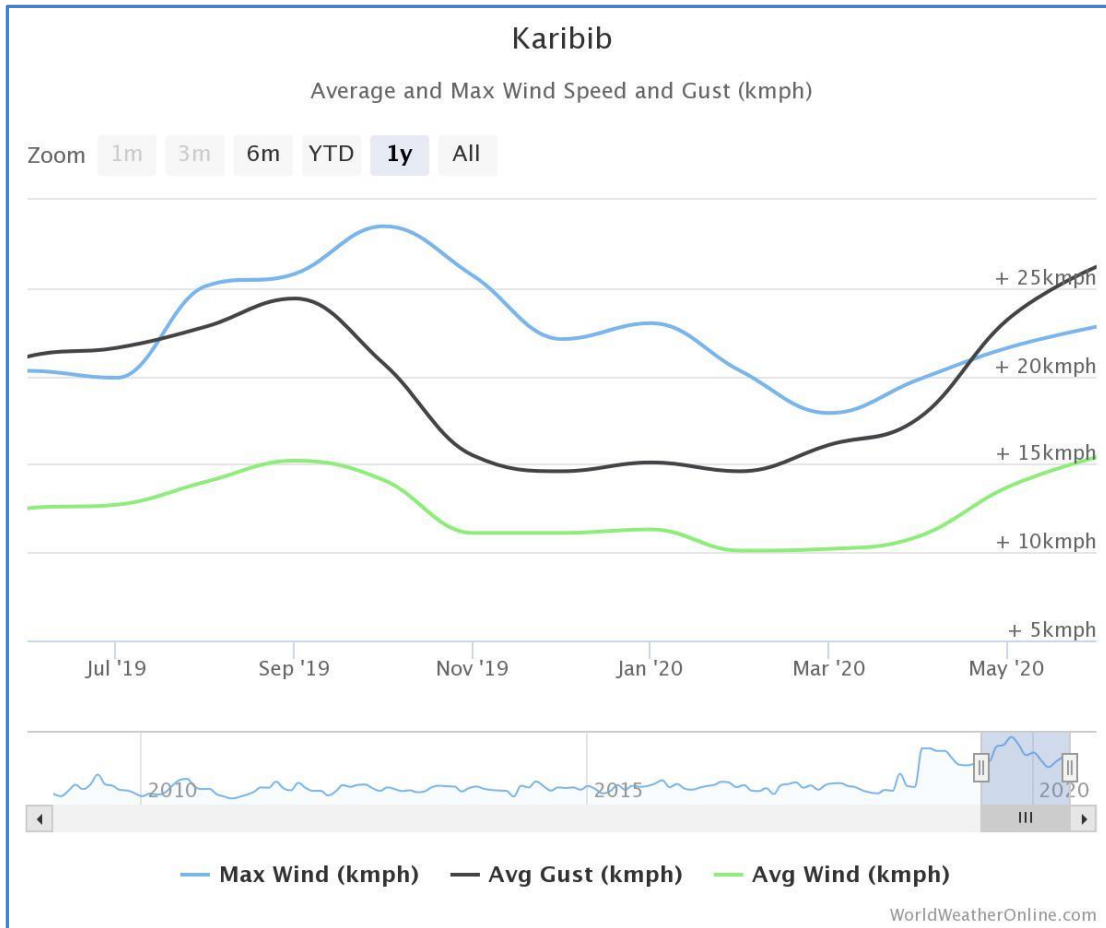


Figure 5 A graph showing rainfall patterns in Karibib, from [www.worldweatheronline.com](http://www.worldweatheronline.com)

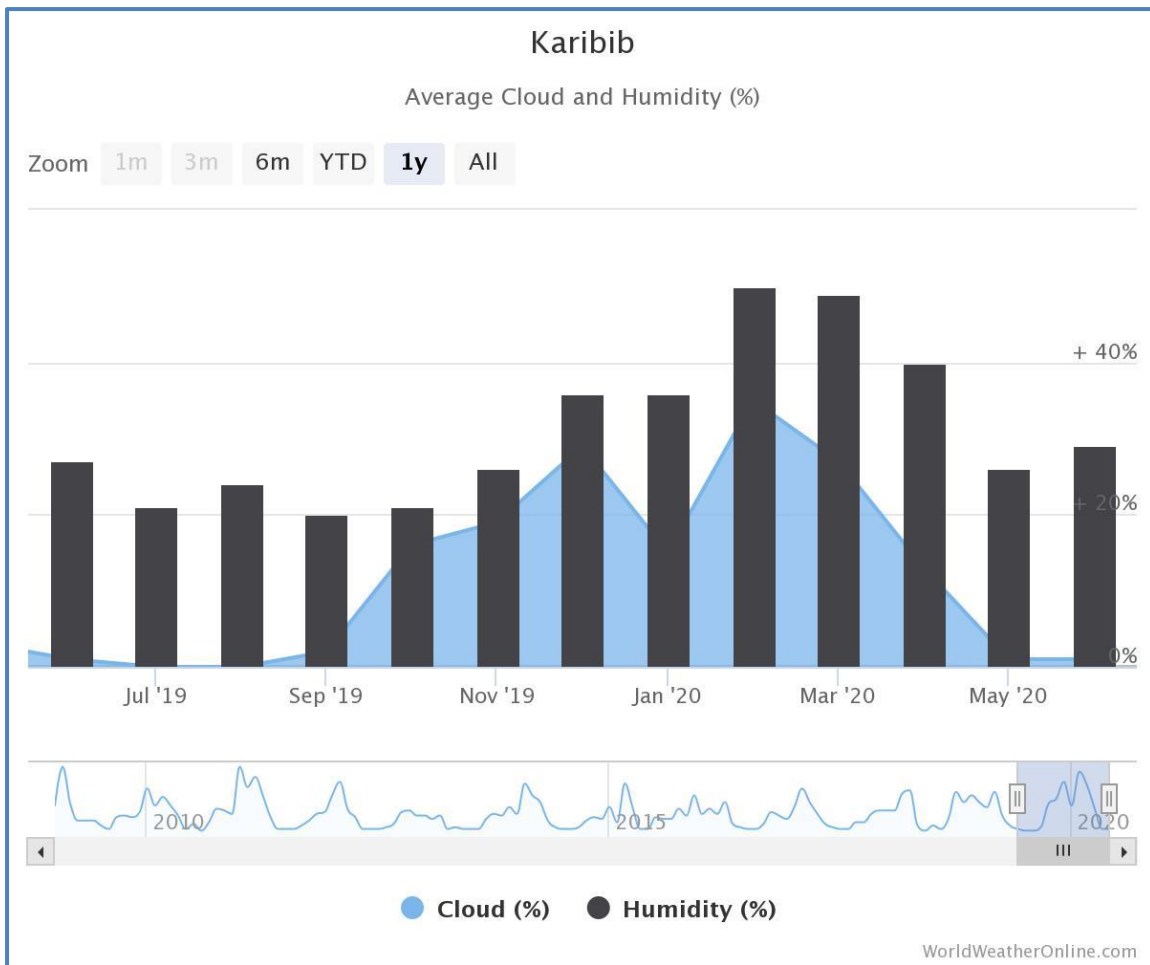
#### 4.2.3 Wind

Predominantly south easterly. Southerly, easterly and northerly airflow is common. The Karibib area is subject to erratic winds and considerable discrepancies in spite of short distances, due to the hilly terrain. The graph below depicts the wind patterns in the area. The highest wind speeds are attained in October as shown by the graph below.



#### 4.2.4 Humidity

The relative humidity during the least humid months of the year, i.e. October and September, is around 20 % and the most humid month is February with 45% humidity. Namibia has a low humidity in general, and the lack of moisture in the air has a major impact on its climate by reducing cloud cover and rain and increases the rate of evaporation.



## 4.3 Geology

### 4.3.1 Geological setting

The EPL area falls at the boundary of the Okahandja Lineament Zone (“OLZ”) and the Southern Zone (“SZ”) of the Damara Orogen. The Okahandja Lineament zone represents a major suture within the Damara Belt, located on the Congo Craton and the Southern Zone, having formed above the Kalahari Plate. The lineament zone is a long-lived major crustal structure in the Damara Belt that has controlled early sedimentation and volcanism of the Nosib Group and later faulting during Karoo times. The Southern Zone is made up of a several thousand-meter-thick sequence of metaturbidites and represents the remnants of an accretionary prism, forming above the subduction zone of the Kalahari plate below the Congo Plate. Units or lithologies that underlie the EPL area include predominantly various granodiorite or diorite gneiss rocks with subordinate reddish salem granites that flank the north-south trending Karibib-Otjimbingwe road. Contact schists flank the low-lying granites before being crapped by more resistant quartzites and metasediments. Some parts of

the exploration area are covered by more resistant quartzites and metasediments. Some parts of the exploration area are covered with a thin pavement of loose gravel and partial sand debris.

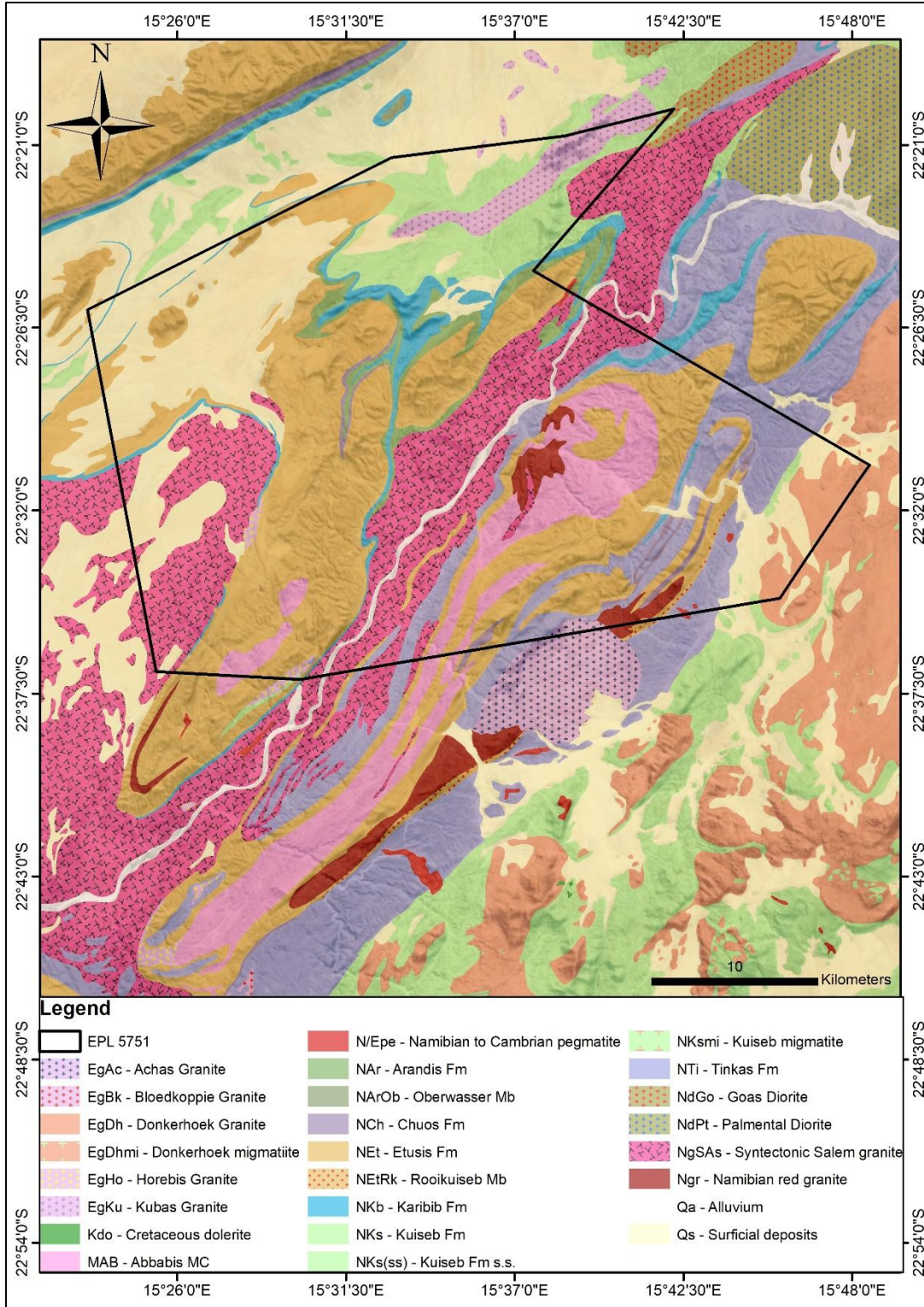
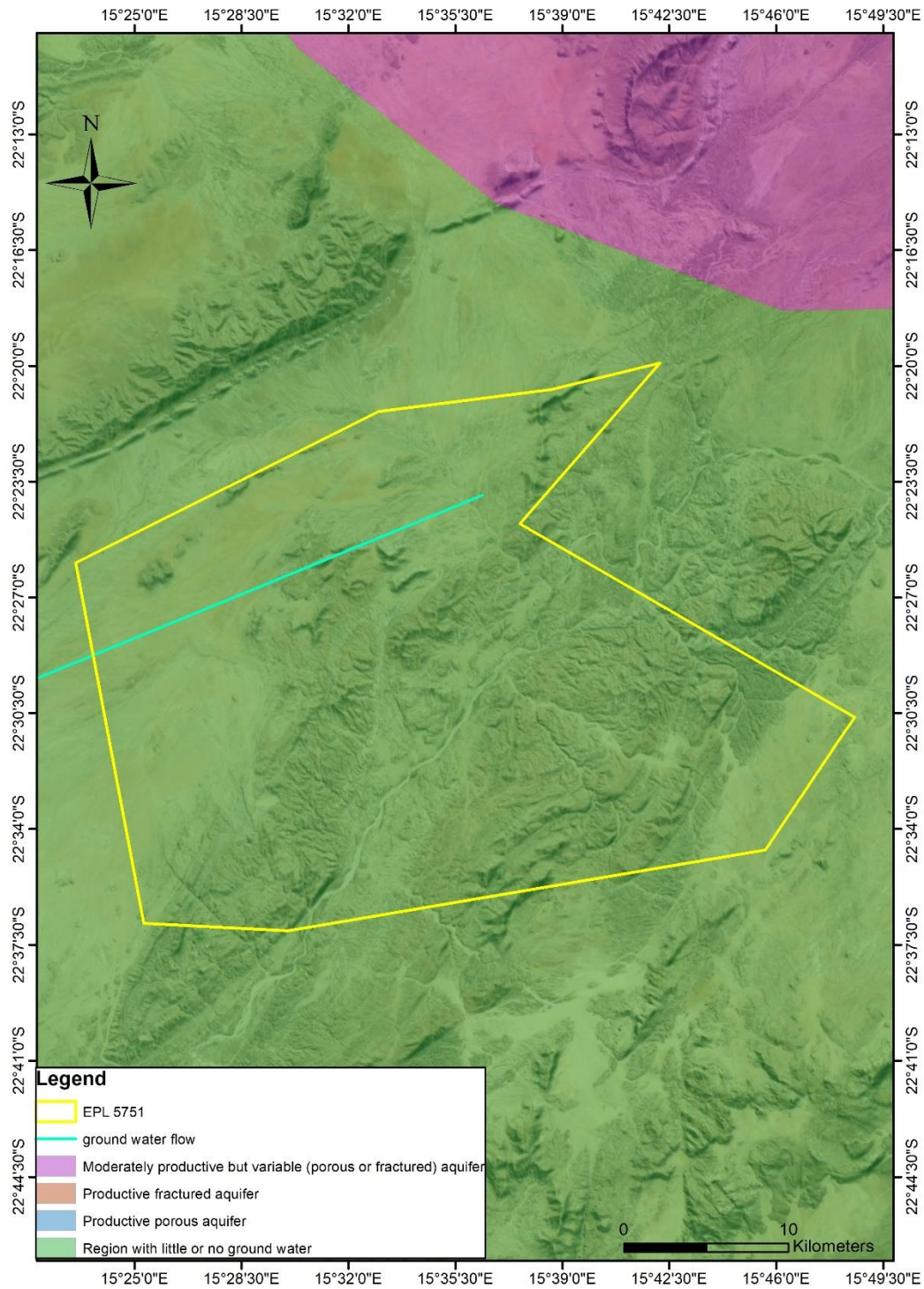


Figure 6 A geological map of the area

### 4.4 Hydrogeology and Water Resources

There are no known aquifers underlying the area. The project area is mostly made up of a region with little or no ground water. There is however a region with groundwater flow towards the north-western boundary of the licence. Numerous small springs sustain wildlife, man and livestock.



## 4.5 Flora

Rainfall in the Erongo Region is usually both low and extremely variable which means that years of abundant rain often followed by extreme dry conditions (Mendelsohn, et al., 2002). In form, vegetation is generally sparse, with few trees and a thin variety of grass. Plant cover varies in relation to rainfall and so the eastern parts of Erongo have more grass and trees than the Western, coastal areas (Christian, 2005). The surrounding area is characterised by high botanical diversity. Based on the literature review, all the vegetation that are found within the vicinity of the area are of “medium” to “high” sensitivity against external conditions. The growing season is very short due to the semi-arid climate.

Grass is dependable on rainfall, which in-turn causes livestock and other animals to suffer during periods of minimal rainfall (Burke, 2003). The mineral exploration area, which is semi-arid, contains diverse vegetation species which include a number of species endemic to Namibia. Table 1 below lists the different plant species which are most likely to occur within the project area.

Table 1 A table showing plant species which are likely to occur in the area

SCIENTIFIC NAME	COMMON NAME	STATUS IN NAMIBIA
<i>Acacia erioloba</i>	Camel thorn	Protected
<i>Acacia mellifera</i>	Black thorn	Secure
<i>Acacia reficiens</i>	False umbrella thorn	Secure
<i>Acacia haematoxylon</i>	Grey camel thorn	Protected
<i>Acacia erubescens</i>	Blue thorn	Secure
<i>Acacia karroo</i>	Sweet thorn	Secure
<i>Acacia tortolis</i>	Umbrella thorn	Secure
<i>Acacia hereroensis</i>	False hook-thorn	Secure
<i>Commiphora tenuipetiolata</i>	White-stem corkwood	Secure
<i>Aloe littoralis</i>		Protected
<i>Ozoroa crassinervia</i>	Namibian resin tree	Near endemic, protected
<i>Boscia albitrunca</i>	Shepherd's tree	Protected
<i>Albizia anthelmintica</i>	Worm-bark false-thorn	Protected
<i>Ziziphus mucronata</i>	Buffalo-thorn	Protected
<i>Catophractes alexandri</i>	Trumpet thorn	Secure
<i>Combretum apiculatum</i>	Red bush willow	Secure
<i>Commiphora dinteri</i>		Endemic
<i>Commiphora glandulosa</i>	Tall common corkwood	Secure
<i>Commiphora glaucescens</i>	Blue-leaved corkwood	Nearendemic
<i>Croton gratissimus</i>	Lavender fever-berry	Secure

<i>Cyphostemma bainesii</i>		Endemic, protected
<i>Dichrostachys cinerea</i>	Sickle bush	Secure
<i>Diospyros lycioides</i>	Blue bush	Secure
<i>Dombeya rotundifolia</i>	Common wild pear	Endemic
<i>Ehretia alba</i>		Secure
<i>Elephantorrhiza suffruticosa</i>		Secure
<i>Euclea pseudebenus</i>	Ebony tree	Protected
<i>Euclea undulata</i>	Common guarri	Secure
<i>Euphorbia guerichiana</i>	Western woody milk bush	Secure
<i>Euphorbia virosa</i>		Secure
<i>Ficus cordata</i>	Namaqua fig	Protected
<i>Ficus ilicina</i>	Laurel fig	Secure
<i>Ficus sycomorus</i>	Common cluster fig	Protected
<i>Grewia bicolor</i>	White raisin	Secure
<i>Grewia flava</i>	Velvet raisin	Secure
<i>Grewia flavescens</i>	Sand paper raisin	Secure
<i>Gymnosporia senegalensis</i>	Red spike-thorn	Secure
<i>Ipomoea adenioides</i>		Secure
<i>Lycium bosciifolium</i>		Secure
<i>Lycium cinereum</i>		Secure
<i>Lycium eenii</i>		Secure
<i>Lycium hirsutum</i>		Secure
<i>Lycium villosum</i>		Secure
<i>Maerua juncea</i>		Secure
<i>Maerua schinzii</i>	Ringwood tree	Protected
<i>Manuleopsis dinteri</i>		Endemic
<i>Melianthus comosus</i>		Secure
<i>Obetia carruthersiana</i>		Near endemic
<i>Pechuel-Loeschea leubnitziae</i>		Secure
<i>Sterculia africana</i>	African star-chestnut	Protected
<i>Tarchonanthus camphoratus</i>		Secure
<i>Tetragonia schenckii</i>		Secure
<i>Vernonia cinerascens</i>		Secure
<i>Searsia (Rhus) ciliata</i>		Secure
<i>Searsia (Rhus) lancea</i>	Karree	Protected
<i>Searsia (Rhus) marlothii</i>		Secure

The density of vegetation in the vicinity of the mineral exploration site is sparse. Every effort will be made to protect the existing trees and shrubs, as these are very important to the ambience and visual appeal of the mineral exploration site. A vegetation expert will be consulted throughout the lifecycle of the mineral exploration



program. The protected plant species in the project area are shown in the table below.

**Table 2 Table of plant species which are protected under the Forestry Act and likely to occur in the area.**

SCIENTIFIC NAME	COMMON NAME
<i>Acacia erioloba</i>	Camel thorn
<i>Acacia haematoxylon</i>	Grey camel thorn
<i>Albizia anthelmintica</i>	Worm-bark false-thorn
<i>Boscia albitrunca</i>	Shepherd's tree
<i>Euclea pseudebenus</i>	Ebony tree
<i>Ficus cordata</i>	Namaqua fig
<i>Ficus sycomorus</i>	Common cluster fig
<i>Maerua schinzii</i>	Ringwood tree
<i>Ozoroa crassinervia</i>	Namibian resin tree
<i>Searsia (Rhus lancea)</i>	Karree
<i>Sterculia Africana</i>	African star-chestnut

## 4.6 Fauna

### 4.6.1 Introduction

The information is based on a detailed literature review and a site visit which was carried out. The purpose of the Fauna literature review is to identify all potential amphibians, reptiles, and mammals expected on the project area and the surrounding farms in the vicinity of the mineral exploration area. The proposed mineral exploration area supports numerous faunal species but there are no species that are exclusive to the study area.

Larger types of animals such as zebras, giraffes, lions and elephants are rare in this area. There are no species which are exclusively endemic to the exploration area. Based on literature review, development of a mineral exploration project in the area will not have a negative impact on any of the species in the project area.

### 4.6.2 Amphibians

Based on the literature review, there are generally 14 types of amphibian species that occur in project area. Nine of these amphibian species occur abundantly, two

occur rarely and six of them occur uncommonly. Griffin (1998) highlighted that amphibian species are declining throughout the world due to various factors such as climate change and habitat destruction. There are approximately 4000 species of amphibians worldwide of which over 200 species are present in Southern Africa and 57 in Namibia (Griffin, 1998). However, this low figure may be due to the lack of detailed studies carried out on amphibians. The table below shows the different amphibian species that are likely to occur within the study area.

**Table 3 A list of amphibian species which may occur in the project area**

SCIENTIFIC NAME	COMMON NAME	STATUS	OCCURRENCE	REFERENCE
<b>PLATANNAS</b>				
<i>Xenopus laevis</i>	COMMON PLATANNA	<b>SECURE</b>	ABUNDANTLY	(Daudin, 1802)
<b>TOADS</b>				
<i>Breviceps adpersus</i>	BUSHVELD RAIN FROG	<b>SECURE</b>	ABUNDANTLY	Peters, 1882
<i>Bufo dombensis</i>	DOMBE DWARF TOAD	<b>ENDEMIC &amp; INADEQUETLY KNOWN</b>	ABUNDANTLY	Bocage, 1895
<i>Bufo poweri</i>	MOTTLED TOAD	<b>SECURE</b>	ABUNDANTLY	Hewitt, 1935
<b>FOSSORIAL FROGS</b>				
<i>Phrynomantis affinis</i>	SPOTTED RUBBER FROG	<b>AMBIGUOUS (RARE?)</b>	RARELY	(Boulenger, 1901)
<i>Phrynomantis bifasciatus</i>	BANDED RUBBER FROG	<b>SECURE</b>	ABUNDANTLY	(Smith, 1848)
<b>SAND FROGS, BULLFROGS, RIDGED FROGS, CACOS, PUDDLE FROGS etc.</b>				
<i>Cacosternum boettgeri</i>	COMMON CACO	<b>SECURE</b>	ABUNDANTLY	(Boulenger, 1882)
<i>Hildebrandtia ornata</i>	ORNATE FROG	<b>SECURE</b>	UNCOMMONLY	(Peters, 1878)
<i>Phrynobatrachus mababiensis</i>	MABABE PUDDLE FROG	<b>SECURE</b>	UNCOMMONLY	FitzSimons, 1932
<i>Phrynobatrachus natalensis</i>	SNORING PUDDLE FROG	<b>SECURE</b>	UNCOMMONLY	(A. Smith, 1849)
<i>Pyxicephalus adpersus</i>	GIANT BULLFROG	<b>SECURE</b>	ABUNDANTLY	Tschudi, 1838
<i>Tomopterna krugerensis</i>	KNOCKING SAND FROG	<b>SECURE</b>	RARELY	Passmore et al, 1975

<i>Tomopterna tandyi</i>	TANDY'S SAND FROG-	<b>SECURE</b>	ABUNDANTLY	Channing et al, 1996
<b>TREE FROGS, REED FROGS &amp; KASSINAS</b>				
<i>Kassina senegalensis</i>	BUBBLING KASSINA	<b>SECURE</b>	ABUNDANTLY	(Dumèril et al, 1841)

#### 4.6.3 Mammals

Based on the literature review, there are generally about 68 species of mammals expected to occur within the immediate area. There are generally 25 species which rarely occur, 2 species that occur seasonally, 4 that occur occasionally, and 33 that occur abundantly within the project area. Considering the relative size of the mineral exploration area, the mammal fauna will not be affected by the mineral exploration activities of the proponent. Namibia is seemingly well endowed with mammal diversity with around 250 species known to be present within the country (Griffin, 1998). There are currently 14 mammal species which are considered to be endemic to Namibia, including 11 species of rodents and small carnivores which are not well known. Griffin (1998), points out that most of these endemic mammals are associated with the Namib and Escarpment with 60% of these appearing to be rock-dwelling species. The author, Griffin (1998) further highlights that the endemic mammal fauna is best characterized by the endemic rodent family *Petromuridae* (Dassie rat) and the rodent genera *Gerbillurus* and *Petromyscus*. The table below shows the mammal species which are likely to occur within the study area. A full list, of mammal species that are likely to occur within the area, is in the appendix section at the end.

**Table 4 Mammal species which are likely to occur within the project area.**

<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>
<i>Acinonyx jubatus</i>	Cheetah
<i>Antidorcas marsupialis</i>	Springbok
<i>Atelerix frontalis angolae</i>	Southern African Hedgehog
<i>Canis mesomelas</i>	Black-backed Jackal
<i>Caracal caracal</i>	Caracal
<i>Crocuta crocuta</i>	Spotted Hyena
<i>Cynictis penicillata</i>	Yellow Mongoose
<i>Equus zebra hartmannae</i>	Hartmann's Mountain Zebra
<i>Felis nigripes</i>	Black-footed Cat
<i>Felis silvestris/lybica</i>	African Wild Cat
<i>Galerella sanguinea</i>	Slender Mongoose

<i>Genetta genetta</i>	Small Spotted Genet
<i>Ictonyx striatus</i>	Striped Polecat
<i>Lepus capensis</i>	Cape Hare Secure
<i>Lepus saxatilis</i>	Scrub Hare
<i>Manis temminckii</i>	Ground Pangolin
<i>Mellivora capensis</i>	Honey Badger/Ratel
<i>Oreotragus oreotragus</i>	Klipspringer
<i>Oryx gazella</i>	Gemsbok
<i>Otocyon megalotis</i>	Bat-eared Fox
<i>Panthera pardus</i>	Leopard
<i>Parahyaena (Hyaena) brunnea</i>	Brown Hyena
<i>Phacochoerus africanus</i>	Common Warthog
<i>Proteles cristatus</i>	Aardwolf
<i>Raphicerus campestris</i>	Steenbok
<i>Suricata suricatta marjoriae</i>	Suricate
<i>Sylvicapra grimmia</i>	Common Duiker
<i>Tragelaphus strepsiceros</i>	Greater Kudu
<i>Vulpes chama</i>	Cape Fox

#### 4.6.4 Reptiles

The literature review showed that there are approximately 60 reptile species that are expected to occur in the site area. According to the Namibia Conservation Ordinance of 1975, there are four reptile species protected, namely:

**Table 5 Protected reptile species in the project area**

SCIENTIFIC NAME	COMMON NAME	STATUS
<i>Psammobates Oculiferus</i>	Kalahari Tent Tortoise	Protected
<i>Python Natalis</i>	Southern African Python	Protected
<i>Geochelone Pardalis</i>	Leopard Tortoise	Protected
<i>Varanus Albigularis</i>	Veld Leguaan	Protected

Griffin (1998) highlighted the presence of 261 species of reptiles which are present in Namibia. These reptiles make up 30% of the reptile species found on the continent. 55 species of Namibian Lizards are classified as endemic (Griffin, 1998). The author, Griffin (1998), describes that more than 60% of the reptiles found in Namibia are protected by the conservation Ordinance. Although mineral exploration activities do affect reptile habitat, the project will not have any significant impact on the reptile species within the proposed mineral exploration area. Namibia, with 129 species of lizards, has one of the continent's richest lizard Fauna. The table in the appendix

shows the reptile species which are likely to occur within the vicinity of the mineral exploration area.

#### 4.7 Avifauna (Birds)

Simmons et al (2003) points that although Namibia's Avifauna is comparatively sparse compared to the high rainfall equatorial areas elsewhere in Africa, approximately 658 species have already been recorded with a diverse unique group of arid endemics. There are approximately 650 species of birds that have been recorded in Namibia, although the country's avifauna is comparatively sparse compared to the high rainfall equatorial areas in Africa (Brown & Lawson, 1989). Brown et al (1989) mentions that 14 species of birds are endemic or near endemic to Namibia with the majority of Namibian endemics occurring in the Savannah of which ten species occur in a north-south belt of dry Savannah in Central Namibia. Simmons (2003) recorded 63 species of birds within the vicinity of the project area. 650 bird species are recorded in Namibia, of which 160 species are present in area, especially after good rains fall (Christian, 2005). These birds consist of raptors, chats, larks and karoid species. Christian (2005) recorded the presence of the following bird species in the vicinity of the area, which include:

**Table 6 Bird species which are likely to occur within the site area.**

SCIENTIFIC NAME	COMMON NAME
Agapornis roseicollis	Rosy-faced Lovebird
Eupodotis rueppellii	Rüppell's Korhaan
Lanioturdus torquatus	White-tailed Shrike
Parus carpi	Carp's Tit
Phoeniculus damarensis	Violet Wood-Hoopoe
Poicephalus rueppellii	Rüppell's Parrot
Pternistis hartlaubi	Hartlaub's Spurfowl
Tockus damarensis	Damara Hornbil
Tockus monteiri	Monteiro's Hornbill

A full list of bird species within the area is shown in the appendix.

## 4.8 Archaeology and Heritage Sites

No rock art sites or declared heritage sites appear to be in the area reserved exclusively for mineral exploration at this stage of the project. The closest declared heritage sites are Regimental Badges, Kubas Station Building, Proviantamt, Haus Woll, Hälbich and Kaiserbrunnen structures which are at least 50 km away from the project area.

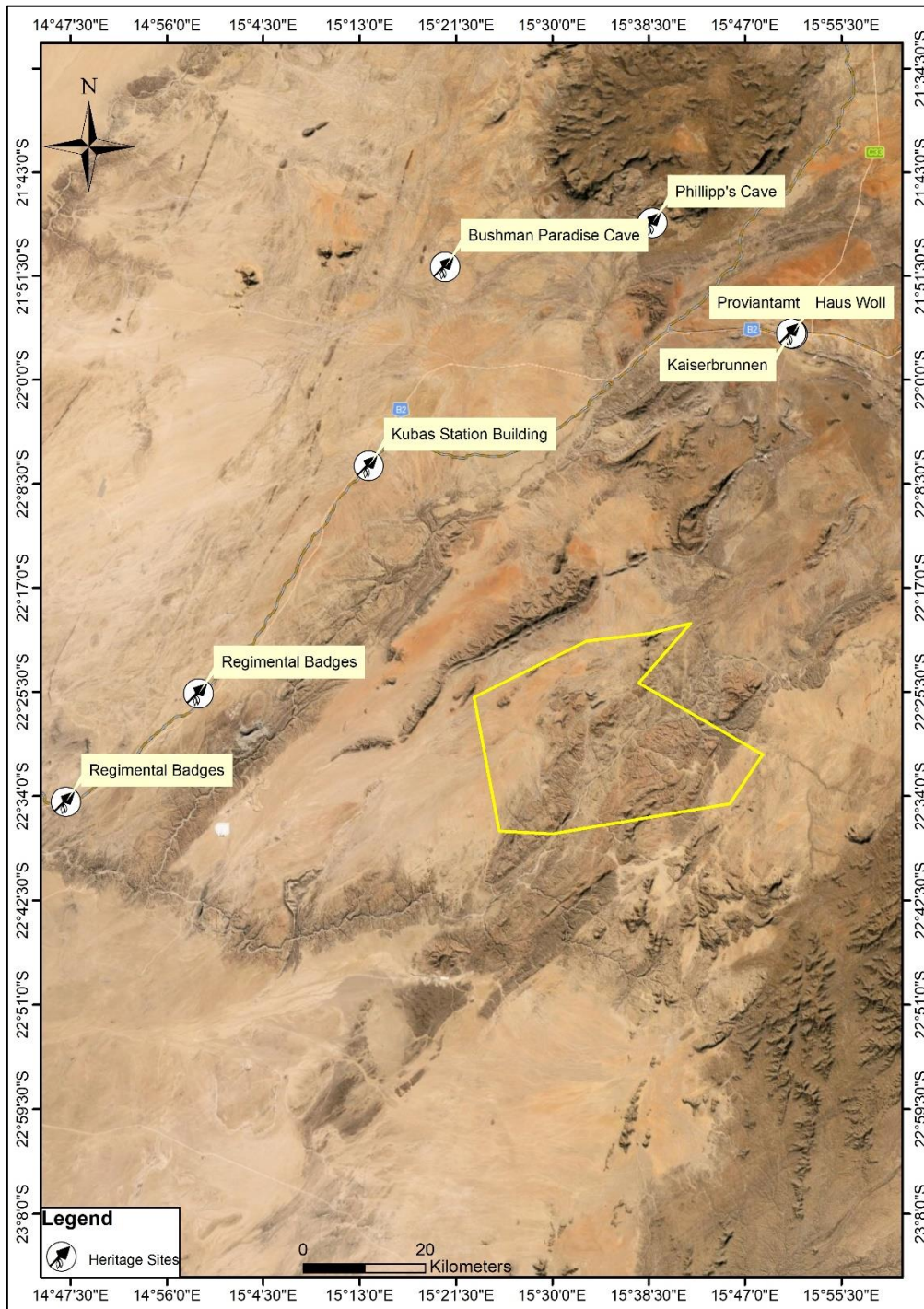


Figure 7 Figure 8 Declared heritage sites which are outside the project area

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## 4.9 Socio-Economic Environment

### 4.9.1 Demographics of Karibib

The closest town to the project is Karibib. It has 3,800 inhabitants and owns 97 square kilometres of town land. Karibib is the district capital of the Karibib electoral constituency. It is situated on the Khan River, halfway between Windhoek and Swakopmund on the B2 (Trans-Kalahari Highway), the main road between the Walvis Bay and Johannesburg. The town is known for its aragonite marble quarries and the Navachab Gold Mine.

Karibib is connected to the TransNamib railway network; Karibib Railway Station is situated downtown. The next station to the west is Kranzberg, the junction for the branch railways to Tsumeb and Grootfontein from the line to the capital Windhoek.

North of the town is the location of the headquarters of the Namibian Air Force at the Karibib Air Base, housing the Command of the Air Force. The air base has an 2,600 metres asphalt runway, parallel paved taxiways and apron. Karibib was downgraded from municipal to town status in 2010. It is now governed by a town council that has seven seats.

4.9.2 Employment within the Erongo Region.

Despite the high unemployment rate in the region, people in Erongo region are doing their best to provide for their living. Farming is the main source of income in this region, while other people operate their own businesses. Mining companies, such as QKR Namibia, have created additional jobs for the inhabitants of this town.

### 4.9.3 Social Economic Impact

Although a few people (including farmers) and animals might be negatively affected by dust and noise, the explorer will ensure that these aspects are properly mitigated. With the potential employment of 15 people, this means that 15 families will benefit from the project during the exploration phase. The project has great potential to improve livelihoods and contribute to sustainable development within the surrounding community. Community meetings will be held from time to time by the proponent wherever possible, with the purpose of effectively communicating with the local community and to avoid any unexpected social impacts.

## 5. Assessment of Impacts

The purpose of this assessments of impacts section is to identify and consider the most pertinent environmental impacts and to provide possible mitigation measures that are expected from the mineral exploration activities on EPL 5751. Two different phases are associated with the proposed development. Firstly, the target generation (mapping and sampling) phase, and secondly the drilling phase are being covered by this assessment. Should the mineral exploration activities cease in the future, an EIA will need to be conducted to deal with the associated changes to environment. Mitigation measures for the identified impacts are also provided in this Section.

The following assessment methodology was used to examine each impact identified:

**Table 7 Assessment methodology used to examine the impacts identified**

Evaluation Criteria	Symbol	Significance of Rating
<b>Nature of impact:</b>	<b>P or N</b>	Effect the proposed activity would have on the affected environment which is positive ( <b>P</b> ) or negative ( <b>N</b> )
<b>Extent of impact:</b>	<b>O</b>	<b>On-Site</b> (the site and it's immediate surrounds)
	<b>L</b>	<b>Local</b> (Mineral exploration Area)
	<b>R</b>	<b>Regional</b> (Erongo Region)
	<b>N</b>	<b>National</b> (Namibia)
	<b>I</b>	<b>International</b>
<b>Duration of impact:</b>	<b>SD</b>	Short Duration (0 to 5 years)
	<b>MD</b>	Medium Duration (5 to 15 years)
	<b>LD</b>	Long Duration (lifetime of the development)
<b>Intensity of impact:</b>	<b>L</b>	<b>Low</b> intensity where the natural, cultural and social functions and processes are not affected.
	<b>M</b>	<b>Medium</b> intensity where the affected environment is altered but natural, cultural and social functions and processes can continue.
	<b>H</b>	<b>High</b> intensity where the affected environment is altered to the extent that natural, cultural and social functions and processes will temporarily or permanently cease.
<b>Probability of impact:</b>	<b>LP</b>	<b>Low probability</b> is when the possibility of the impact occurring is low.
	<b>P</b>	<b>Probable</b> is when there is a distinct possibility that it will occur.
	<b>HP</b>	<b>Highly probable</b> is when the impact is most likely to occur.
	<b>D</b>	<b>Definite</b> where the impact will occur.
<b>Significance of Impact: Further subdivided into impacts with mitigation (MM) measures and impacts with no mitigation measures (NMM).</b>	<b>L</b>	<b>Low Significance</b> is when natural, cultural, social and economic functions and processes are not affected. If the impacts are adverse, mitigation is either easily achieved or little will be required, or both. If impacts are beneficial, alternative means of achieving this benefit are likely to be easier, cheaper, more effective and less time-consuming



	<b>M</b>	<b>Medium Significance</b> is when the affected environment is altered but natural, cultural, social and economic functions and processes can continue. An impact exists but is not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of beneficial impacts, other means of achieving this benefit are about equal in time, cost and effort.
	<b>H</b>	<b>High Significance</b> is when the affected environment is altered to the extent that natural, cultural, social and economic functions and processes will temporarily or permanently cease. If impacts are adverse, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time consuming or a combination of these. In the case of beneficial impacts, the impact is of a Substantial order within the bounds of impacts that could occur.

## 5.1. Overall socio-economic benefits and issues

### 5.1.1. Socio-economic benefits

With the potential employment of 15 people, this means that 15 families will benefit from the project during the exploration phase. The project has great potential to improve livelihoods and contribute to sustainable development within the surrounding community. Community meetings will be held from time to time by the proponent wherever possible, with the purpose of effectively communicating with the local community and to avoid any unexpected social impacts.

#### 5.1.1.1. Potential Direct Benefits

**Direct capital investment:** The mineral exploration project will require a significant capital investment of at least N\$ 10 million. This will be used for mapping, sampling and drilling.

**Stimulation of skills transfer:** Due to the nature of mineral exploration projects, the proponent will implement ad-hoc training programme for some of its staff members. Training programmes will be well structured and staff members will permanently benefit from these training programmes.

**Job creation:** With the potential employment of 15 people, this means that 10 families will benefit from the project during the on-going phase. The project has a great potential to improve livelihoods and contribute to sustainable development within the surrounding community.

### 5.1.1.2. Potential Indirect Benefits

- The data generated from the exploration programme will be made available to the Ministry of Mines and Energy for future research purposes.
- General enhancement of the health conditions and quality of life for a few people in the surrounding settlements.
- Of significance is the prospect of diversification of the surrounding economy, which is presently mainly focussed on small-scale farming and small-scale mining of semi-precious stones.

### 5.1.1.3. General socio-economic concerns

Notwithstanding the above benefits there are a few concerns that could reduce or counteract the above benefits related to the project, as follows:

- As the movement of staff and contractors to and from the area increases, the risk of spread of HIV/AIDS increases.
- Increased influx of people to the area as people come in search of job opportunities during the target generation and drilling phase of the mineral exploration project; and
- Increased informal settlement and associated problems.

Table 8 Impact evaluation for socio-economy

Identified Impact	Significance		Duration	Extent	Intensity	Probability
	NMM	MM				
Increased spread of HIV/AIDS	M	L	LD	N	M	LP
Increased influx of people to the area	L	L	SD	L	L	P
Increased informal settlement in the area	M	L	MD	L	L	LP

## 5.2. Mineral Exploration phases and associated issues

### 5.2.1. Mapping and Geochemical Sampling Phase of the Project

The following potential effects on the environment during the target generation phase of the mineral exploration project have been identified:

### 5.2.1.1. Dust

Dust may be generated during this phase and might be aggravated during the winter months when strong winds occur. Dust will be generated by the vehicles moving in the area. Fall out dust settling on vegetation is likely to cause local disruptions in herbivorous and predatory complexes and should be minimised as far as possible.

### 5.2.1.2. Noise

Noise will most likely be generated by vehicles during the target generation phase. It is recommended that vehicle movement be limited to normal daytime hours to allow nocturnal animals to roam freely at night.

### 5.2.1.3. Safety and Security

During mapping and sampling, small tools and equipment will be used on site. This increases the possibility of injuries and the responsible manager must ensure that all staff members are briefed about the potential risks of injuries on site. The manager is further advised to ensure that adequate emergency facilities, including first aid kits, are available on site. All Health and Safety standards specified in the Labour Act should be complied with.

Should a camp be necessary at a later stage, it should be in such a way that it does not pose a risk to the community members and wildlife that roam the area.

### 5.2.1.4. Visual

The proposed exploration area is situated more than 1 km from any main road. As such, any visual impact that might be caused by the exploration team are minimal. In some parts of the area, the topography of the mineral exploration site is slightly elevated.

**Table 9 Impact evaluation for the target generation phase of the project**

Identified	Significance		Duration	Extent	Intensity	Probability
	NMM	MM				
Impact						
<b>Dust</b>	L	L	SD	L	L	P
<b>Noise</b>	M	L	SD	L	M	D
<b>Safety &amp; Security</b>	L	L	SD	O	L	P
<b>Visual</b>	L	L	MD	O	L	LP

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## 5.2.2. Drilling Phase of the Project

During the operation phase of the project, a few holes will be drilled into the orebody. For the purpose of conveniently refuelling company vehicles without driving long distances, a small portable fuel storage tank will be brought on site.

### 5.2.2.1. Air Quality

In terms of air quality, emissions will be given off by 4x4 vehicles and the drill rig but not to an extent that warrants concern. Dust will also be produced by the drill rig and the movement of vehicles in the area.

### 5.2.2.2. Fire and Explosion Hazard

Hydrocarbons are volatile under certain conditions and their vapours in specific concentrations are flammable. If precautions are not taken to prevent their ignition, fire and subsequent safety risks may arise.

All fuel storage and handling facilities in Namibia must however comply with strict safety distances as prescribed by SANS 10089. SANS 10089 is adopted by the Ministry of Mines and Energy as the national standard.

It must further be assured that enough water is available for fire firefighting purposes. In addition to this, all personnel must be sensitised about responsible fire protection measures and good housekeeping such as the removal of flammable materials including rubbish, dry vegetation, and hydrocarbon-soaked soil from the vicinity of the exploration area. Regular inspections should be carried out to inspect and test firefighting equipment and pollution control materials at the drilling site.

All fire precautions and fire control at the site must be in accordance with SANS 10089-1:1999, or better. A holistic fire protection and prevention plan is needed.

Experience has shown that the best chance to rapidly put out a major fire, is in the first 5 minutes. It is important to recognise that a responsive fire prevention plan does not solely include the availability of firefighting equipment, but more importantly, it involves premeditated measures and activities to timeously prevent, curb and avoid conditions that may result in fires. An integrated fire prevention plan should be drafted before drilling.

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### 5.2.2.3. Generation of Waste

Waste in the form of contaminated soil due to minor spillage might occur but should be prevented through the use of containment areas as provided. Solid waste will also be generated from contractors, staff members and other visitors to the area. Care should be taken when handling waste material.

### 5.2.2.4. Health and Safety

The drilling programme operations can cause serious health and safety risks to workers on site. Occupational exposures are normally related to the dermal contact with fuels and inhalation of fuel vapours during handling of such products. For this reason, adequate measures must be brought in place to ensure safety of staff on site, and includes:

- Proper training of operators;
- First aid treatment;
- Medical assistance;
- Emergency treatment;
- Prevention of inhalation of fumes;
- Protective clothing, footwear, gloves and belts; safety goggles and shields;
- Manuals and training regarding the correct handling of materials and packages should be in place and updated as new or updated material safety data sheets becomes available;
- And Monitoring should be carried out on a regular basis, including accident reports.

### 5.2.2.5. Fauna

Mineral exploration activities may have minor disturbances on the habitat of a few species but no significant impacts on the animals are expected. The proponent shall ensure that no animal shall be captured, killed or harmed by any of the employees in any way. Wildlife poaching will strongly be avoided as this is an offence and anyone caught infringing in this regard will face suspension from the project and will be liable for prosecution.

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#### **5.2.2.6. Vegetation**

The natural vegetation is seemingly undisturbed in the project area except for grasses, which have been grazed by livestock and wild animals. Some vegetation species in the area may be adversely impacted by the project. The type of vegetation that might be affected by the project are:

- Bushes
- Ephemeral grasses
- Small trees

Some of the sensitive vegetation types in the area include:

- Shallow drainage line vegetation
- Scrublands surrounding the mineral exploration area

Certain species regarded as particularly important for conservation may yet be identified and made known via an Addendum to this report. If particularly important species are found, they will be located by GPS and their locations communicated to the Ministry of Environment and Tourism. Such locations will then be demarcated and completely avoided.

#### **5.2.2.7. Avifauna**

Birds or Nest sites will not be disturbed by any employee, tourist or contractor. Should the employees observe any bird nesting sites for vultures, they will be reported to the Ministry of Environment and Tourism and the site will be avoided.

#### **5.2.2.8. Alien Invasive Plants**

Disturbance to the natural environment often encourages the establishment of alien invasive weed species. Some of the plant species that could become invasive in the area are listed below:

- *Prosopis glandulosa*
- *Lantana camara*
- *Cyperus esculentus*
- *Opuntia imbricate*

- *Cereus jamacara*
- *Melia azedarach*

There are numerous ways in which invasive species can be introduced deliberately or unintentionally.

### 5.2.2.9 Heritage Impacts

Although no archaeological sites have been identified yet in the project area, appropriate measures will be undertaken upon discovering any new archaeological sites. All archaeological remains are protected under the National Heritage Act (2004) and will not be destroyed, disturbed or removed. The Act also requires that any archaeological finds be reported to the Heritage Council Windhoek.

Table 10 Impact evaluation for the operational phase of the project

Identified Impact	Significance		Duration	Extent	Intensity	Probability
	NMM	MM				
Air Quality	M	L	LD	L	M	HP
Fire & Explosion Hazard	H	M	SD	O	M	LP
Generation of waste	M	L	LD	O	L	D
Health and Safety	H	M	MD	N	L	P
Fauna	M	L	MD	L	M	D
Vegetation	M	L	MD	L	M	D
Avifauna	M	L	MD	L	M	LP
Alien Invasive Plants	M	L	MD	L	M	P
Heritage	M	L	LD	O	H	LP