

# A SCOPING REPORT ON THE ENVIRONMENTAL IMPACT ASSESSMENT FOR PROPOSED DEVELOPMENT OF A MARBLE MINE

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## **EXECUTIVE SUMMARY**

### **1. Introduction**

#### **1.1 Overview**

The proponent, Sunsand Investments (Pty) Ltd acquired four mining claims, namely MC 71542, 71543, 71546 and 71545, with the Ministry of Mines and Energy. The applicant intends to convert these mining claims into a mining licence. The proponent intends to mine (quarry) dimension stone (marble) in the area. The area of interest sits predominantly on marble rock units of the Karibib Formation, within the Damara Orogen.

Impala Consulting was appointed by the proponent to undertake an Environmental Assessment (EA) and Environmental Management Plan (EMP) for the quarrying project.

#### **1.2 Location**

The proposed development is located 15 km northeast of Karibib on farm Okawayo, Erongo Region. The coordinates for the centre of the mining claims are -21.476477 and 16.020252.

#### **1.3 Environmental Assessment Requirements**

The Environmental Regulations procedure (GN 30 of 2012) stipulates that no mining and quarrying 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 quarrying activities.

#### **1.4 Project Alternatives**

An alternative to the proposed quarrying activity would be to allocate the land-usage to other income generating activities such as tourism and farming. Although the above-mentioned activities may generate revenue for the government and provide employment to a few individuals, they may not have a significant impact on the



community in comparison to the proposed project. The proposed project will strictly employ locals from nearby towns and settlements.

## **2. Summary of Applicable acts**

All mineral rights, related to mining and quarrying 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 quarrying activities in Namibia are:

- Environmental Management Act of 2007
- Minerals Prospecting and Mining Act of 1992
- Water Resources Management Act of 2004
- Nature conservation ordinance, ordinance No. 4 of 1995
- National Heritage Act, 2004 (Act No. 27 of 2004)
- Petroleum Products and Energy Act No.13 of 1990
- Forest Act, No. 12 of 2001
- Atmospheric Pollution Prevention Ordinance (1976)
- Hazardous Substance Ordinance No. 14 of 1974
- Namibian Water Corporation (Act 12 of 1997)

## **3. Description of the proposed quarrying project**

There are various options for mining out a marble deposit. In choosing a method, important considerations are the kind of material, the shape and size of the geologic formation, the thickness of the overburden, the topography, the production level, the locality of the quarry and imposed restrictions by the government. If the calcitic marble proves to be homogeneous, the quarrying method will be by a regular bench design with the aid of diamond-based cutting technologies. Diamond-based cutting technologies are the best methods to use these days.

### **3.1 Services**

#### **3.1.1 Electricity requirements**

The bulk of the power supply to the 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 quarrying process
- Power supply for office block or container.

### **3.1.2 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. Water containers will be brought on site and utilised whenever necessary. The water will mostly be used for general consumption and cleaning.

## **4. Description of the current Environment**

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. The project area is positioned at the interface of the Nama Karoo, Desert Biome and Savannah in Namibia (Barnard, 1998). As such, this area represents a high fauna diversity.

### **4.1 Climate conditions**

In the proposed quarrying area, December is the warmest month with an average temperature of 32-34°C at noon. July is the coldest month with an average temperature of 11-13°C at night. Karibib, which is in the vicinity of the project area, has distinct temperature seasons, the temperature varies during the year.

In the quarrying area, the highest rainfall is usually experienced in October which may reach 75 mm with average rainfall days of 7. In January months, rainfall may reach about 50 mm with average rainfall days.

### **4.2 Geology**

The Project is situated within the Southern Central Zone of the Damara Supergroup in Central Namibia. The Damara Supergroup is Neo-Proterozoic in age and is comprised of continental margin carbonates and silts which grade into turbidite sequences representing continental shelf and basin deposits.



### **4.3 Hydrogeology**

The project area is underlain by a low-medium permeability aquifer with a low-medium productivity (yield).

### **4.4 Flora**

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 considered to be of “medium” to “high” sensitivity against external conditions. The growing season is very short due to the semi-arid climate.

### **4.5 Fauna**

The proposed quarrying 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 very rare in this area. There are no species which are exclusively endemic to the area. Based on literature review, development of a quarrying project in the area will not have a negative impact on any of the species in the project area.

### **4.6 Avifauna (birds)**

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.

### **4.7 Heritage Sites**

No rock art sites appear to be protected by National Council. No rock art sites appear to be in the area reserved exclusively for quarrying at this stage of the project. Should the proponent find any archaeological/rock art sites during the next project phase, these will be acknowledged, and proper guidelines will be followed to have them protected.

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# ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED DEVELOPMENT OF A MARBLE MINE

## FINAL SCOPING REPORT

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## 1. Project Background

### 1.1 Introduction

The proponent, Sunsand Investments (Pty) Ltd acquired four mining claims, namely MC 71542, 71543, 71546 and 71545, with the Ministry of Mines and Energy. The applicant intends to convert these mining claims into a mining licence. The proponent intends to mine (quarry) dimension stone (marble) in the area. The area of interest sits predominantly on marble rock units of the Karibib Formation, within the Damara Orogen. An outline of the area is shown in the image below.

Although quarrying is costly, environmentally friendly quarrying is a cornerstone, yet the mineral quarrying process must never be at the expense of people or the environment. Sunsand Investments (Pty) Ltd believes that social and environmental responsibility is a prerequisite for providing a conducive environment for mineral quarrying and future mining activities.

Impala Consulting was appointed by the proponent to undertake an Environmental Assessment (EA) and Environmental Management Plan (EMP) for the quarrying project. Figure 3 below shows the surrounding farms of the project area.

The coordinates for the centre of the mining claims are:

Claim Number	Latitude	Longitude
<b>71542</b>	-21,887245	15,90862
<b>71543</b>	-21,876923	15,92505
<b>71546</b>	-21,870457	15,93566
<b>71545</b>	-21,857386	15,96425





## 1.2 Project Location

The proposed development is located 15 km northeast of Karibib on farm Okawayo, Erongo Region (figure 3). A map showing the surrounding farms is shown in figure 4.

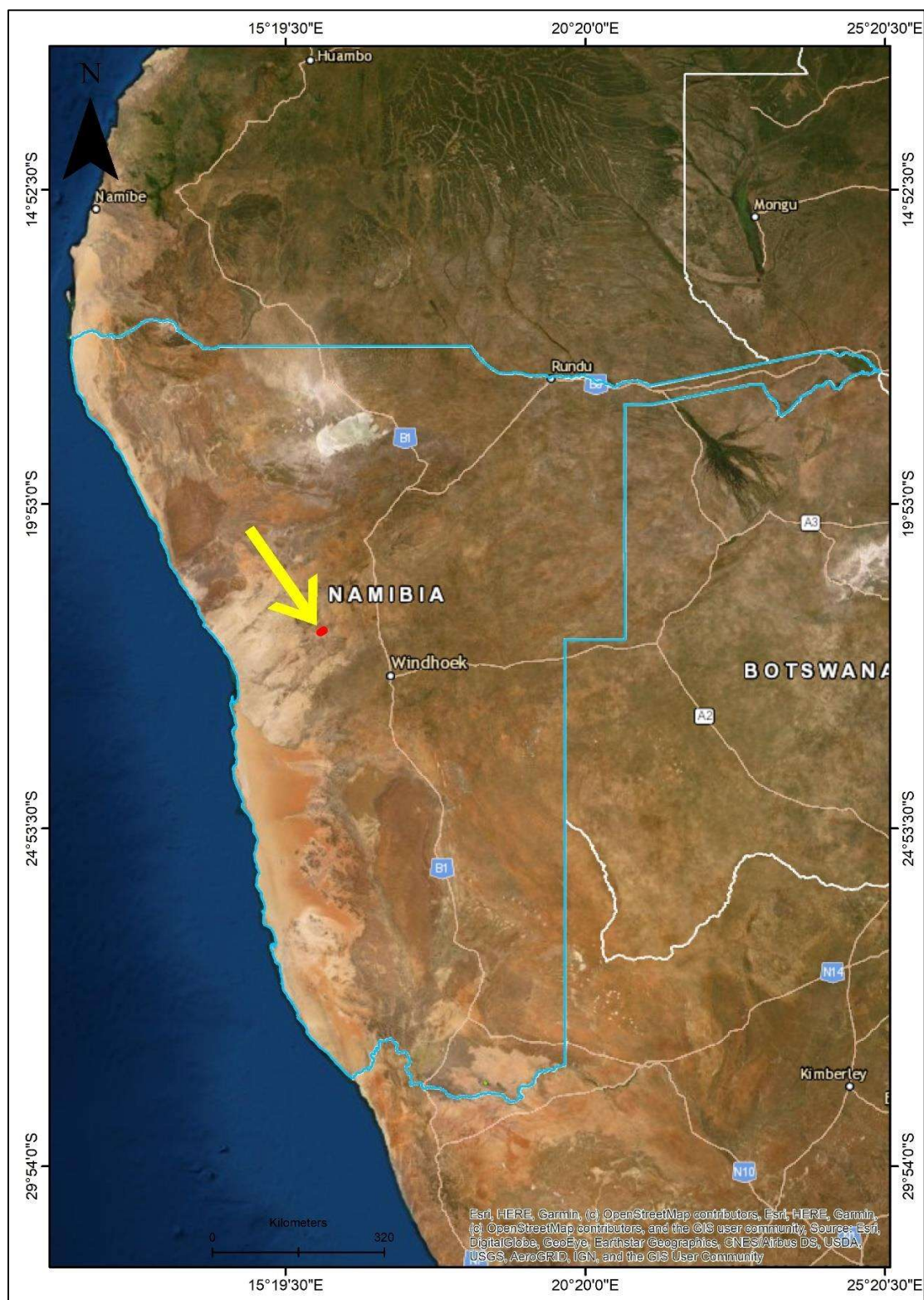
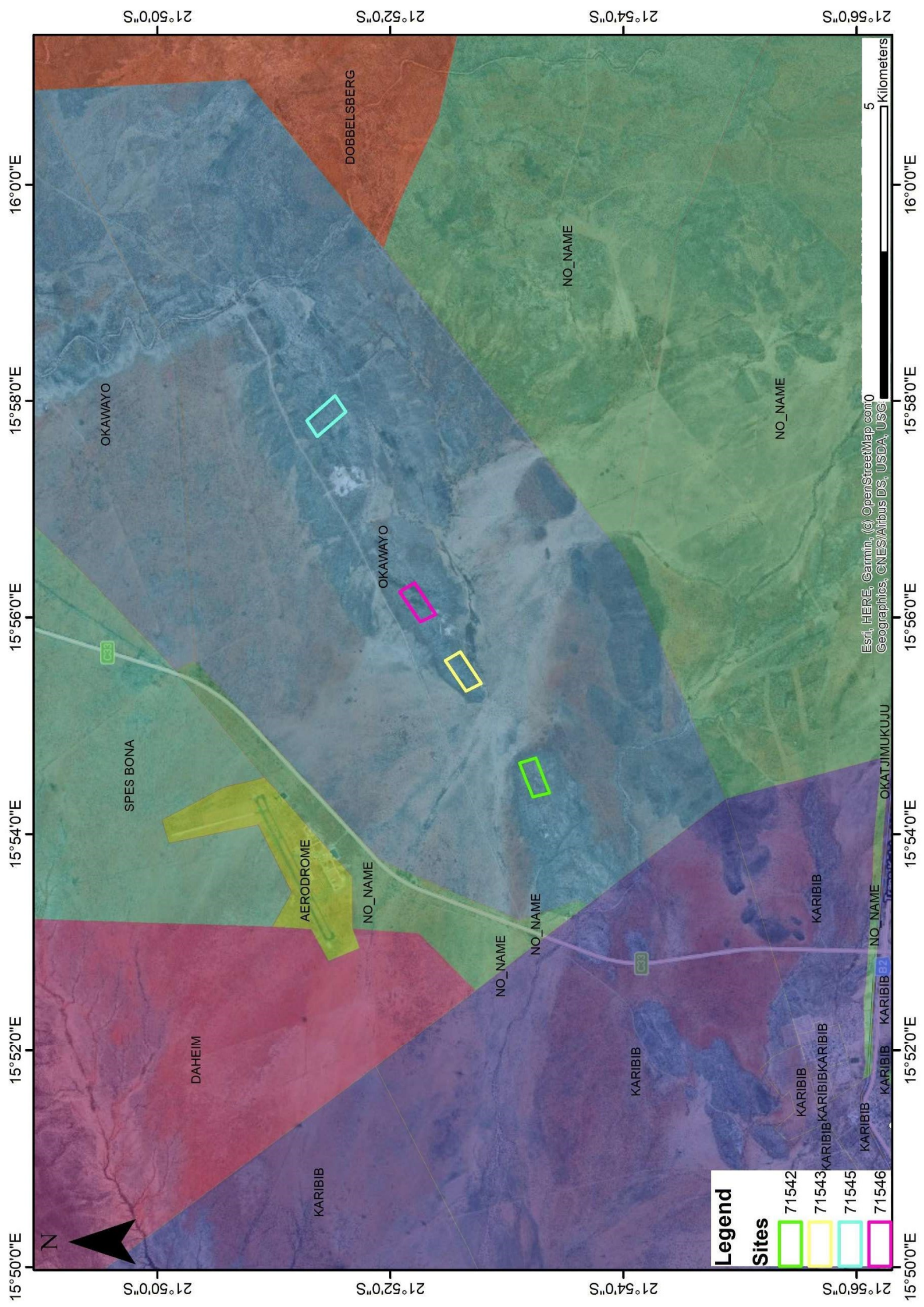


Figure 2 Locality map of the mining claim licence area





### **1.3 Environmental Impact Assessment Requirements**

The Environmental Regulations procedure (GN 30 of 2012) stipulates that no mining and quarrying 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 quarrying activities.

### **1.4 Purpose of the Scoping Report**

The scoping report is prepared for the Environmental Impact Assessment for marble quarrying on an area which is located 15 km northeast of Karibib on farm Okawayo. Environmental scoping is a critical step in the preparation of an EIA for the proposed quarrying 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 quarrying activities on the proposed mining 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 quarrying 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 quarrying 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, they may not have a significant impact on the surrounding community in comparison to the proposed marble quarrying project. The proposed project will strictly employ locals from Karibib.

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

All mineral rights, related to quarrying 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 mining and quarrying 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, quarrying, prospecting, small scale mining, quarrying, 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

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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 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 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 quarrying areas, environmental impact assessments and for minimising or preventing pollution.



### 3. Description of Proposed Quarrying Project

#### 3.1 Introduction

The Erongo region, especially the area around Karibib, is known for vast occurrences of marble units of the Karibib formation and Swakop group (Miller, 1992). The region contains world-class historical quarries such as Palisandro Marble quarry near Karibib, the Dernburg quarry and the Capra Hill quarry north of Karibib. Near Usakos, large reserves of white, reddish, brownish-yellowish and grey marble of dimension stone quality are present. These marble units appear to be mostly unicoloured, banded, folded, flamed or brecciated (Miller, 1992). The first attempts to quarry marble in Namibia date back to the early years of the century when the Koloniale Marmorsyndikat was founded.



Figure 4 An image of a marble block from the site.

#### 3.2 Marble Quarrying Method

There are various options for mining out a marble deposit. In choosing a method, important considerations are the kind of material, the shape and size of the geologic formation, the thickness of the overburden, the topography, the production level, the locality of the quarry and imposed restrictions by the government. If the calcitic



marble proves to be homogeneous, the quarrying method will be by a regular bench design with the aid of diamond-based cutting technologies. Diamond-based cutting technologies are the best methods to use these days. The following operations will be carried out:

- Undercutting by using a diamond-wire saw.
- Vertical cuts with diamond wire
- Block shaping cuts with diamond wire or drill and shear techniques.

Basically, marble quarrying involves cutting channels on all sides of large, rectangular sections of marble called quarry blocks. These blocks usually have an open face, and once the ends and backs of the doorstep-like ledges are channelled loose, horizontal lift holes are drilled along the bottom of the open face. These long quarry blocks are being freed from the surrounding mass, with diamond wire sawing. The diamond saw which basically consists of an engine pulling wire cable through a system of pulleys and return wheels. The wire is a steel cable on which diamond grit-impregnated beads are held in place by plastic spacers.

The wire saw strand is threaded through intersecting vertical and horizontal holes; the wire is jointed together making a large loop which simultaneously cuts the top, bottom, and one end of the granite mass. Water is fed continuously through the narrow cuts to cool the wire. If a ledge has two open sides, the wire saw can cut the entire block free. However, the attached side must still be channelled by way of drilling or light blasting. This entire block will now be moved over with a water bag jacking plant. The big block is then cut with dressing diamond wire saws into smaller blocks of 10 – 35 tons.

### **3.2.1 Mineral Processing**

The smaller marble blocks will then be moved to the dressing yard. The yard is in very close proximity to the mining activities itself. While most dimension stone mine merely “rough-dress” the cut block by jack hammer trimming, the produced at this mining area will mostly be diamond wire dressed. A derrick boom is slowly raised, tightening the hooks in their holes and the block is lifted from the quarry to be placed on a waiting truck for transporting to the dressing yard. After final dressing and



quality control these dimensioned saw blocks are removed by mobile crane onto trucks and shipped to monument plants for processing.

### **3.2.2 Quarry Residue and rehabilitation**

The only noticeable mine residue will be the “waste” marble material not usable. This material can be used for rehabilitation purposes during decommissioning. The overburden removed during the opencast operation will be used to fill the excavations during rehabilitation with the result that on completion of mining no waste dumps will remain.

## **3.4 Labour Requirements**

The proponent intends to employ more than 26 personnel, including 4 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.

## **3.5 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



Since the area is located on privately-owned farm, all waste will be transported and disposed out of the area.

### **3.6 Services**

#### **3.6.1 Electricity requirements**

At this stage, electricity requirements for the project are minimal. The bulk of the power supply to the quarrying 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 quarrying process
- Power supply for temporary office block or container if necessary.

#### **3.6.2 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 granite drilling or wire-saw cutting will be recycled.

### **3.7 Infrastructure**

#### **3.7.1 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 must be disposed 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. Domestic waste will be disposed of at a waste dump in Karibib. The Miner will undertake environmental rehabilitation, both during and at the conclusion of the quarrying operations. Unusable oil will be collected in drums and sold to dealers for recycling.

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### **3.7.2 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.

### **3.7.3 Security and Fencing**

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

### **3.7.4 Buildings**

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

### **3.7.5 Roads**

The access roads to the quarrying site are quite good. From Karibib, the quarrying sites will be accessed via the C33 and then the D1941 road. The sites are located 2 km's from the C36 road.

### **3.7.6 Mobile Equipment**

The proponent's vehicle fleet will be optimised during the next project phase. Provision will be made for 2 off-road vehicles, an excavator and a front-end loader. Other tools include a genset, wire saws, an electric compressor and a water jacking plant.

### **3.7.7 Storage of Fuel, Lubrication and consumables**

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. Diesel will be delivered to a small temporary on-site fuel storage facility by road transport and offloaded into the storage tanks by offloading pumps.

### **3.7.8 Fire Fighting Provision**

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



## **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. The project area is positioned at the interface of the Nama Karoo, Desert Biome and Savannah in Namibia (Barnard, 1998). 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). Rainfall in Erongo is usually both low and variable which implies that years of abundant rain are often followed by extreme dry conditions (Mendelsohn, et al., 2002). Mammals, birds, reptiles and amphibians are generally spaced out within the region due to low rainfall. The eastern parts of the Erongo region have more trees and grass than the Western, coastal areas (Mendelsohn, et al., 2002). As such, farming ventures are challenging with low livestock densities in most parts of the Erongo Region.

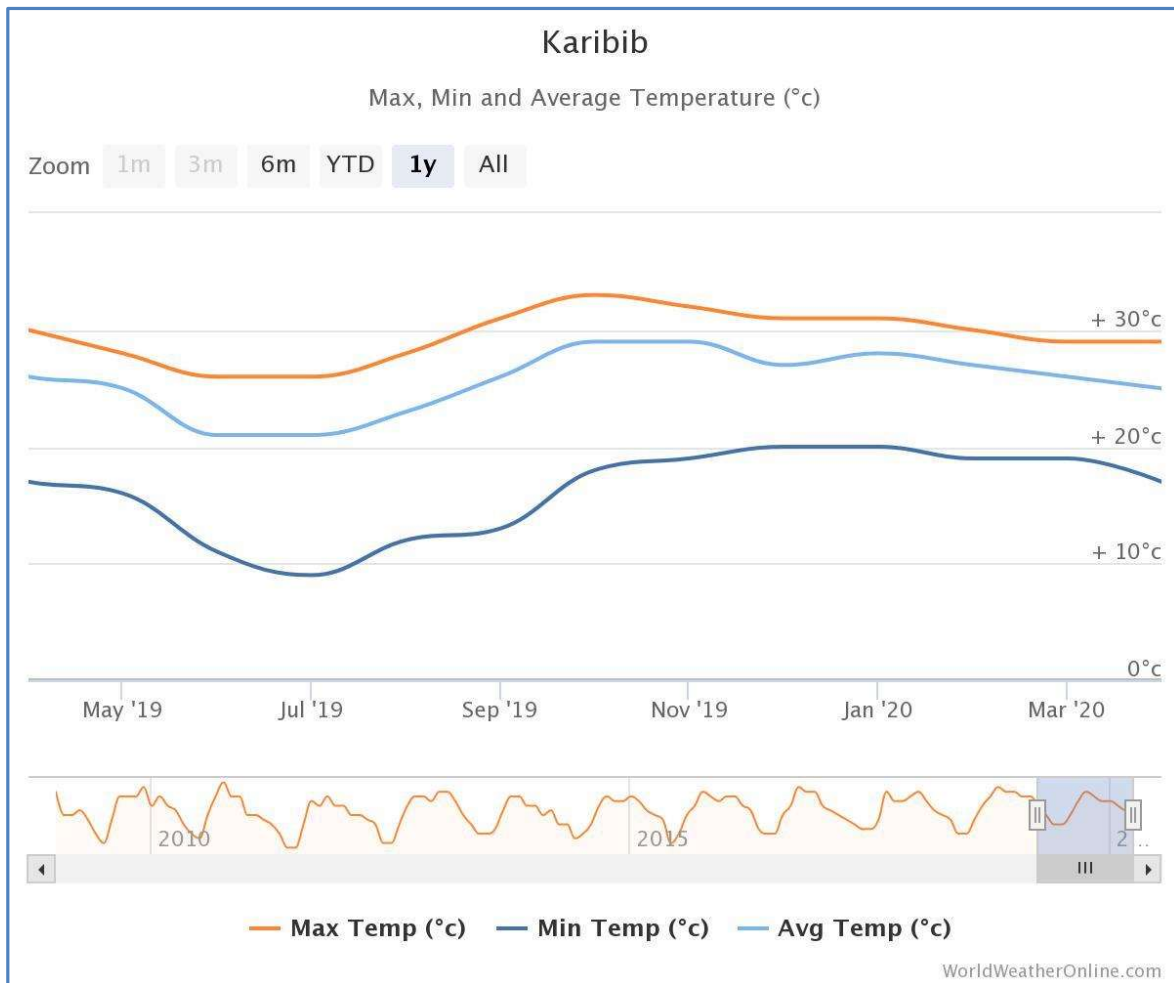
There is generally an absence of fences in most parts of the Erongo Region. This makes livestock farming easier which means that both wild and domestic animals can move widely in many places, migrating from areas of poor grazing to other places with more abundant pastures.

### **4.2 Climatic Conditions**

#### **4.2.1 Temperature**

In the proposed quarrying area, November is the warmest month with an average temperature of 28-30°C at noon. June is the coldest month with an average temperature of 22-24°C at night. Karibib, which is in the vicinity of the project area, has distinct temperature seasons, the temperature varies during the year.





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

In winter, temperatures can get to below degrees 10°C. Overall, winters are mild in temperature, with coldest month most often being July.

#### 4.2.2 Precipitation

In the quarrying area, the highest rainfall is usually experienced in February which may reach 160 mm with average rainfall days of 7. In January months, rainfall may reach about 100 mm with a few average rainfall days. The graph below shows the rainfall patterns in the area.



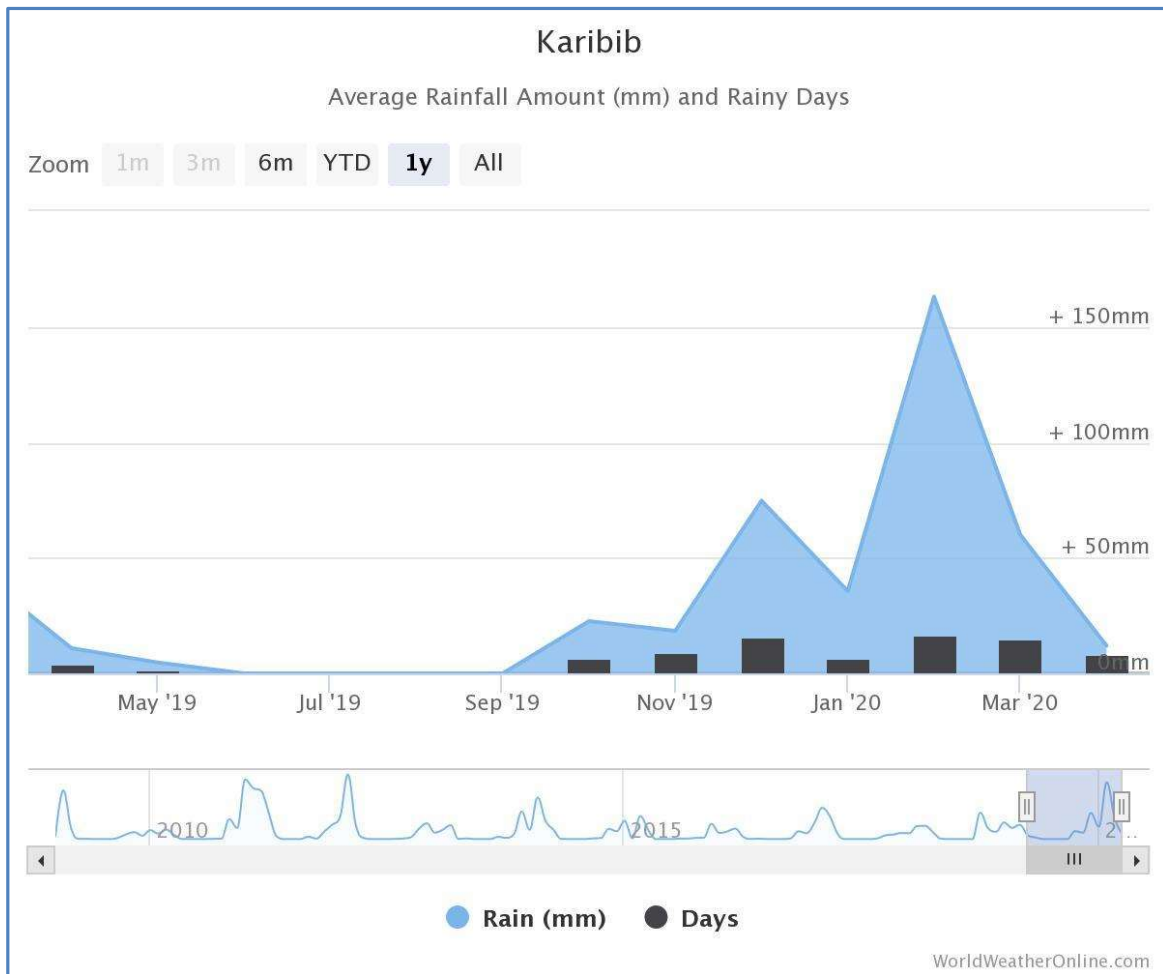


Figure 6 A graph showing rainfall patterns in Karibib, from [www.worldweatheronline.com](http://www.worldweatheronline.com)

#### 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 despite short distances, due to the hilly terrain. The graph below depicts the wind patterns in the area. The highest wind speeds are attained in July as shown by the graph below.

#### 4.2.4 Humidity

The relative humidity during the least humid months of the year, i.e. August and September, is around 20% and the most humid month is March with 46% 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.



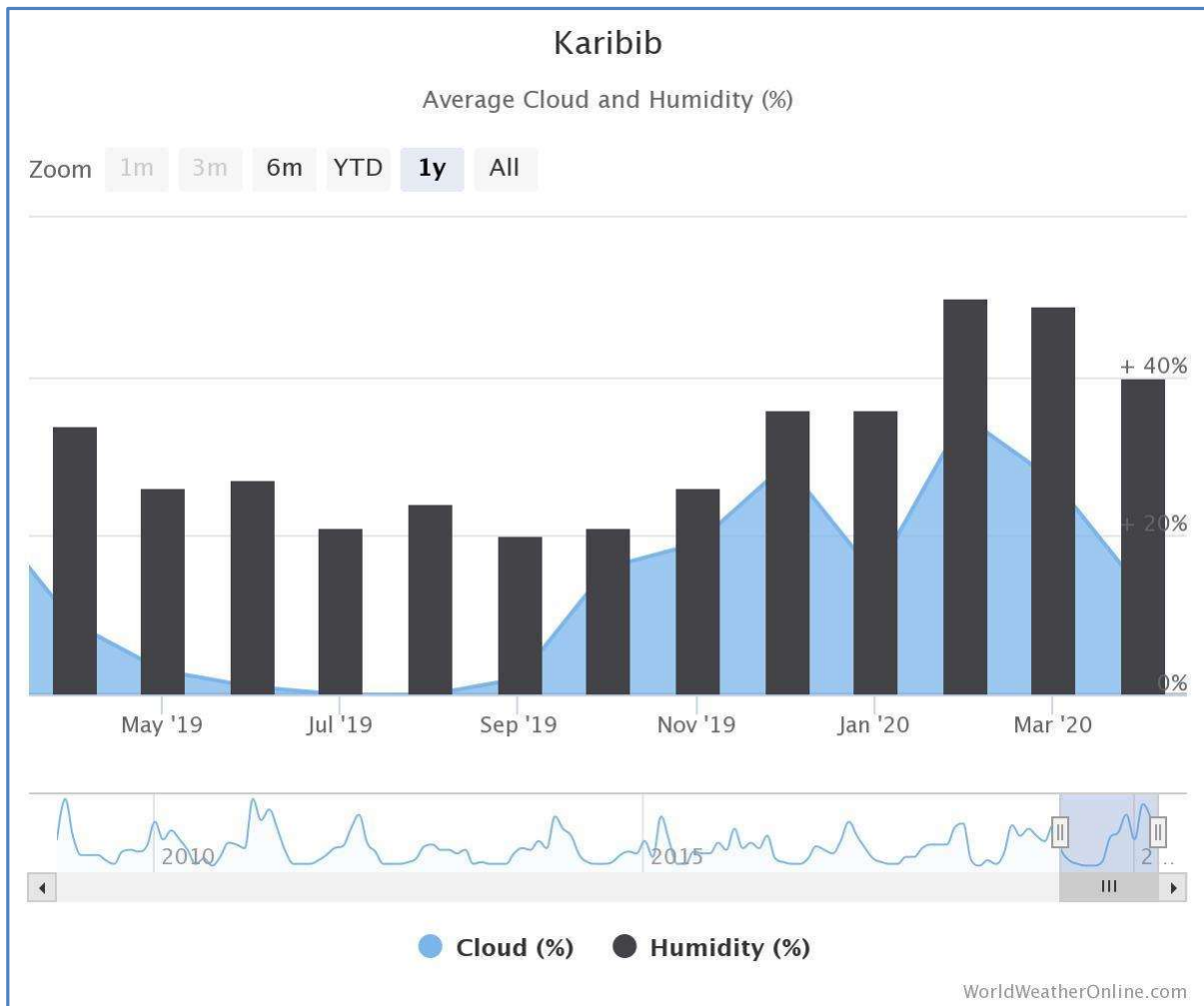


Figure 7 A graph showing the humidity patterns in Karibib, from [www.worldweatheronline.com](http://www.worldweatheronline.com)

## 4.3 Geology

### 4.3.1 Geological setting

The Project is situated within the Southern Central Zone of the Damara Supergroup in Central Namibia. The Damara Supergroup is Neo-Proterozoic in age and is comprised of continental margin carbonates and silts which grade into turbidite sequences representing continental shelf and basin deposits.

The Damara underwent a major orogenic event at 550 – 500Ma when the sea closed along a series of major ENE structures. The Karibib Formation is underlain by Arandis schists in the core of the area. There are granitic intrusions to the east of the mining claim area and pegmatitic dykes, sills and blows are common. Units or lithologies that underlie the area include predominantly various granodiorite or diorite gneiss rocks.



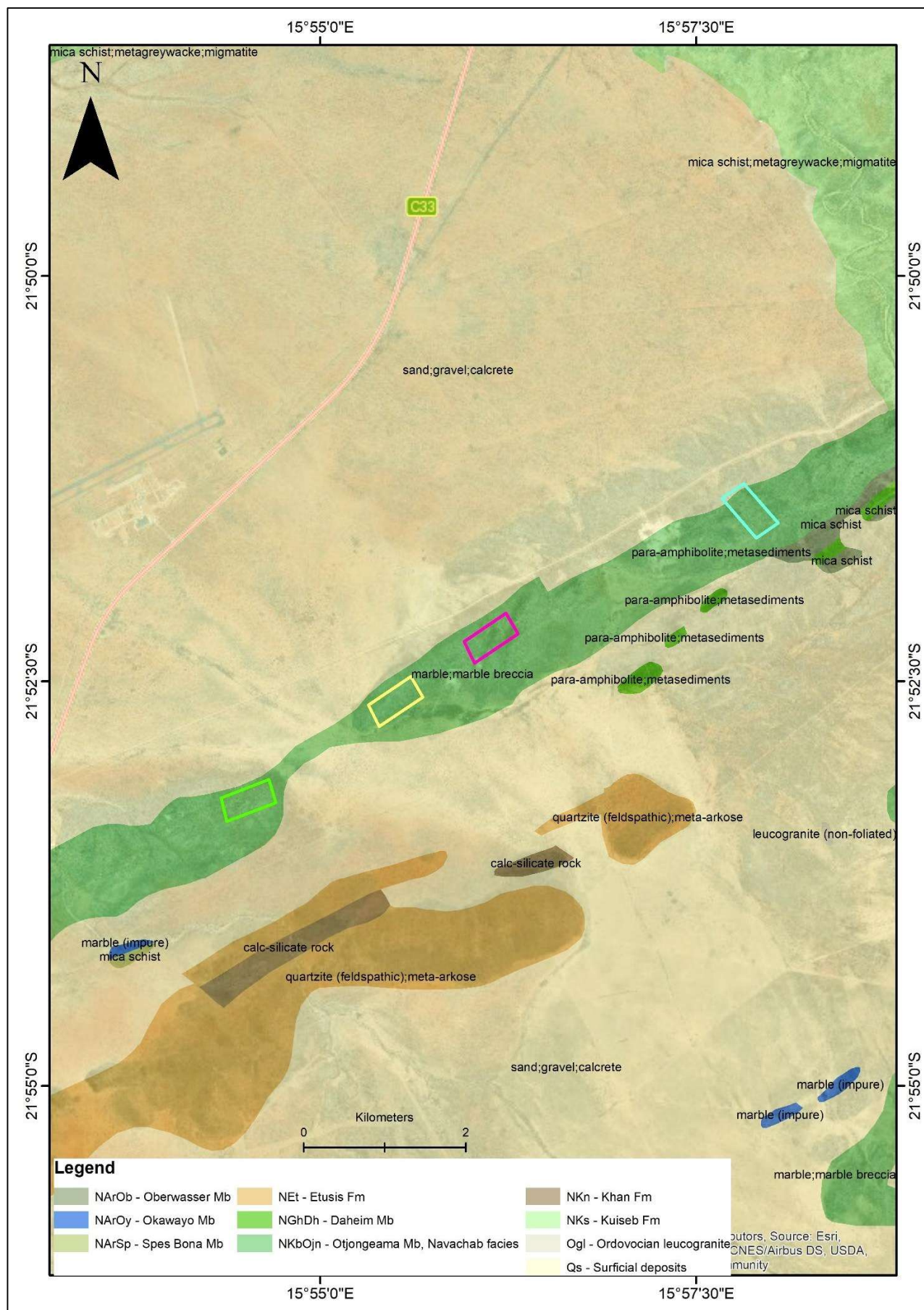


Figure 8 A geological map of the area



## 4.4 Hydrogeology and Water Resources

There are no river systems which pass through the mining site areas. The project area is underlain by a moderately productive but variable (porous or fractured) aquifer.

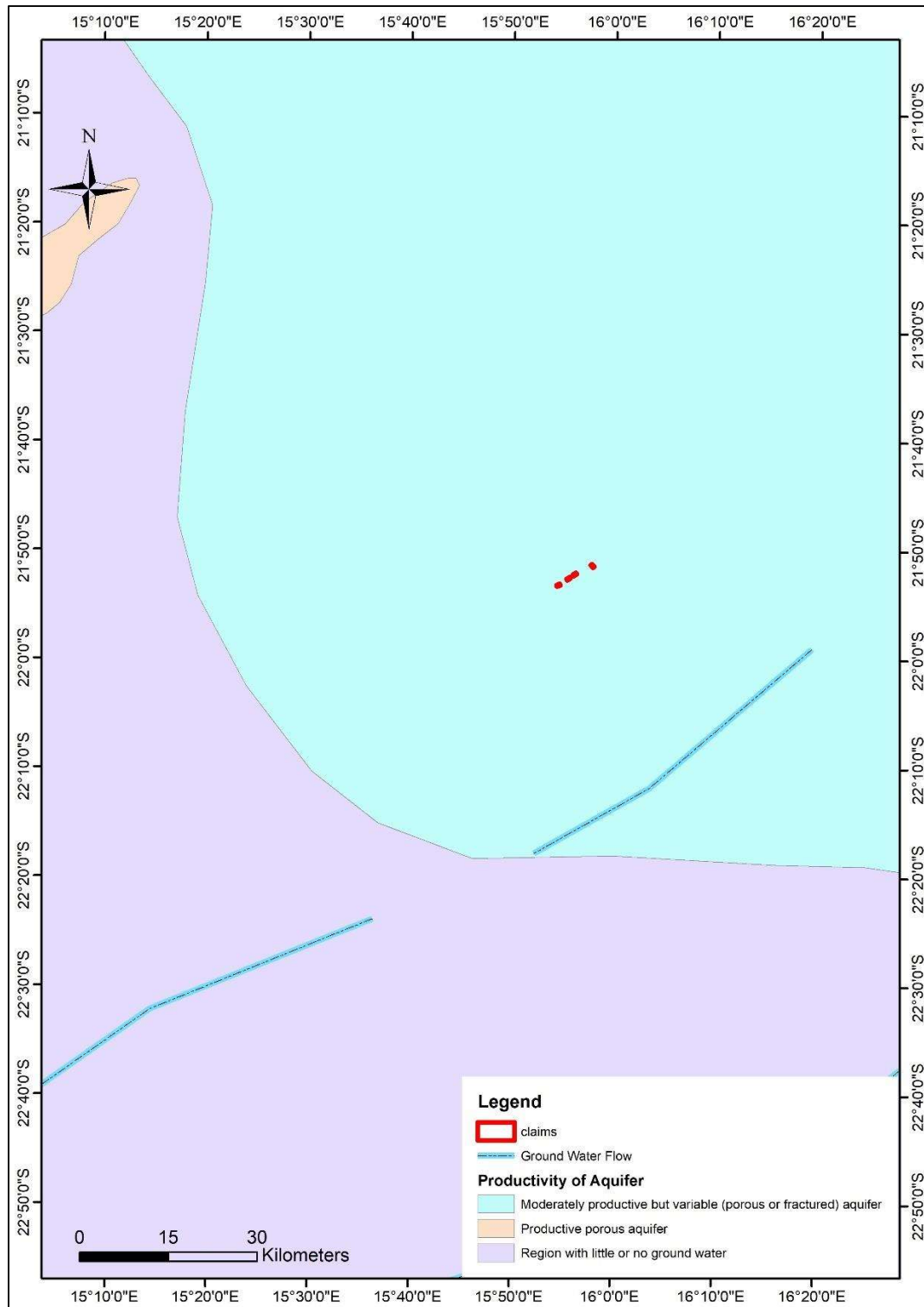


Figure 9 Map showing the groundwater flow in the area.



## 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 quarrying area, which is semi-arid, contains diverse vegetation species which include several 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 pseudobenus</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 quarrying 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 quarrying site. A vegetation expert will be consulted throughout the lifecycle of the quarrying 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 pseudobenus</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 on the 6<sup>th</sup> to 7<sup>th</sup> of May 2020. 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 quarrying area. The proposed quarrying 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 very rare in this area. There are no species which are exclusively endemic to the quarrying area. Based on literature review, development of a quarrying 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	SECURE	ABUNDANTLY	(Daudin, 1802)
<b>TOADS</b>				
<i>Breviceps adspersus</i>	BUSHVELD RAIN FROG	SECURE	ABUNDANTLY	Peters, 1882
<i>Bufo dombensis</i>	DOMBE DWARF TOAD	ENDEMIC & INADEQUETLY KNOWN	ABUNDANTLY	Bocage, 1895
<i>Bufo poweri</i>	MOTTLED TOAD	SECURE	ABUNDANTLY	Hewitt, 1935
<b>FOSSORIAL FROGS</b>				
<i>Phrynomantis affinis</i>	SPOTTED RUBBER FROG	AMBIGUOUS (RARE?)	RARELY	(Boulenger, 1901)
<i>Phrynomantis bifasciatus</i>	BANDED RUBBER FROG	SECURE	ABUNDANTLY	(Smith, 1848)
<b>SAND FROGS, BULLFROGS, RIDGED FROGS, CACOS, PUDDLE FROGS etc.</b>				
<i>Cacosternum boettgeri</i>	COMMON CACO	SECURE	ABUNDANTLY	(Boulenger, 1882)
<i>Hildebrandtia ornata</i>	ORNATE FROG	SECURE	UNCOMMONLY	(Peters, 1878)
<i>Phrynobatrachus mababiensis</i>	MABABE PUDDLE FROG	SECURE	UNCOMMONLY	FitzSimons, 1932
<i>Phrynobatrachus natalensis</i>	SNORING PUDDLE FROG	SECURE	UNCOMMONLY	(A. Smith, 1849)
<i>Pyxicephalus adspersus</i>	GIANT BULLFROG	SECURE	ABUNDANTLY	Tschudi, 1838
<i>Tomopterna krugerensis</i>	KNOCKING SAND FROG	SECURE	RARELY	Passmore et al, 1975
<i>Tomopterna tandyi</i>	TANDY'S SAND FROG-	SECURE	ABUNDANTLY	Channing et al, 1996



TREE FROGS, REED FROGS & KASSINAS				
<i>Kassina senegalensis</i>	BUBBLING KASSINA	SECURE	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 quarrying area, the mammal fauna will not be affected by the quarrying 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.**

SCIENTIFIC NAME	COMMON NAME
<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. 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 quarrying 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 Hornbill
Tockus monteiri	Monteiro's Hornbill



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

#### **4.8 Archaeology**

No rock art sites appear to be in the area reserved exclusively for quarrying at this stage of the project. Should the proponent find any archaeological/rock art sites during the next project phase, these will be acknowledged, and proper guidelines will be followed to have them protected.

#### **4.9 Socio-Economic Environment**

##### **4.9.1 Overview of the surrounding settlements**

The closest town to the mining claim sites is Karibib. Karibib is a town in the Erongo Region of western Namibia. 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. The Navachab Gold Mine owned by QKR Namibia is located 10 km from Karibib town. The mine is the major taxpayer, employer and property owner of the town, providing more than 750 jobs and owning 240 residential properties. 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 Social Economic Impact**

Although a few people and animals might be negatively affected by dust and noise, the miner will ensure that these aspects are properly mitigated. With the potential employment of 27 people, this means that 27 families will benefit from the project during the initial 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 quarrying activities on the proposed mining sites. Two different phases are associated with the proposed development. Two different phases are associated with the proposed development. Firstly, the construction phase, and secondly the operational phase is being covered by this assessment. Should the quarrying 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
Nature of impact:	P or N	Effect the proposed activity would have on the affected environment which is positive ( <b>P</b> ) or negative ( <b>N</b> )
Extent of impact:	O	<b>On-Site</b> (the site and it's immediate surrounds)
	L	<b>Local</b> (Quarrying Area)
	R	<b>Regional</b> (Erongo Region)
	N	<b>National</b> (Namibia)
	I	<b>International</b>
Duration of impact:	SD	Short Duration (0 to 5 years)
	MD	Medium Duration (5 to 15 years)
	LD	Long Duration (lifetime of the development)
Intensity of impact:	L	<b>Low</b> intensity where the natural, cultural and social functions and processes are not affected.
	M	<b>Medium</b> intensity where the affected environment is altered but natural, cultural and social functions and processes can continue.
	H	<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.
Probability of impact:	LP	<b>Low probability</b> is when the possibility of the impact occurring is low.
	P	<b>Probable</b> is when there is a distinct possibility that it will occur.
	HP	<b>Highly probable</b> is when the impact is most likely to occur.
	D	<b>Definite</b> where the impact will occur.



<b>Significance of Impact:</b> <b>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 27 people, this means that 27 families will benefit from the project during the construction 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 quarrying project will require a significant capital investment of at least N\$ 37 million. This will be used for purchasing plant and machinery required for the project.

**Stimulation of skills transfer:** Due to the nature of quarrying operations, 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 27 people, this means that 27 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 quarrying activities 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 farming, tourism 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 construction and operational phase of the quarrying 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. Quarrying phases and associated issues

### 5.2.1. Construction Phase of the Project

The following potential effects on the environment during the construction phase of the quarrying 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 construction 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 construction, 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 located 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 quarrying area is situated more than 1 km from any main road. As such, any visual impact that might be caused by the team are minimal. In some parts of the area, the topography of the quarrying site is slightly elevated.

**Table 9 Impact evaluation for the construction phase of the project**

Identified	Significance	Duration	Extent	Intensity	Probability



Impact	NMM	MM				
Dust	L	L	SD	L	L	P
Noise	M	L	SD	L	M	D
Safety & Security	L	L	SD	O	L	P
Visual	L	L	MD	O	L	LP

### 5.2.2. Operational phase of the Project

During the operation phase of the project, rock units will be cut by using a wire saw and sand will be excavated. For the purpose of conveniently refuelling company vehicles without driving long distances, a small fuel storage tank will be kept on site.

#### 5.2.2.1. Air Quality

In terms of air quality, emissions will be given off by 4x4 vehicles, excavators, front end loaders 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 sufficient water is available for 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 quarrying 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.

#### **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**

Quarrying activities may have minor disturbances on the habitat of a few species but

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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.

#### **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 quarrying 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

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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*
- *Harissia martini*

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	Significance		Duration	Extent	Intensity	Probability
Impact	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

