ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR THE PROPOSED EXPLORATION ACTIVITIES ON EPL 7280 ,ERONGO REGION, KARIBIB DISTRICT

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CLIENT:

Geo Experts Consulting
Services cc

P O Box 2155
Windhoek
Namibia

CONSULTANCY:

Centre for Geosciences Research cc
PO Box 31423
Pioneerspark
Windhoek
Namibia

CEGEOR cc

PROJECT DETAILS

TITLE: Environmental Impact Assessment and Environmental Management Plan for the proposed exploration activities for the Exclusive Prospecting License (EPL) 7280, **Karibib District, Erongo Region, Namibia.**

AUTHORS:

- Mr Siyambango Mulife (Centre for Geosciences Research cc)

CLIENT: Geo Experts Consulting Services cc

P O Box 2155
Windhoek
Namibia

CONSULTANCY: Centre for Geosciences Research cc
PO Box 31423
Pioneerspark
Windhoek, Namibia
cell: 0856419511
Email:cegeornam@gmail.com

NAME	Mulife Siyambango
RESPONSIBILITY	Director of Centre for Geosciences Research cc
QUALIFICATIONS	B. Sc. in analytical, inorganic and physical chemistry Geography and Environmental studies, M. Sc. in Industrial Rocks and Minerals, MBA in Banking, Accounting and Strategic Management.
PROFESSIONAL REGISTRATION	Pr.Sci.Nat
EXPERIENCE	Mr Siyambango is the director and founder of Centre for Geosciences Research cc Mr Siyambango is a qualified geologist, and specialist in industrial minerals and rocks. Obtained an **MSc in Industrial Rocks and Minerals** with majors in Mineral Resource Assessment & Estimation; Mineral Extraction & Management Marketing of Industrial Rocks and Minerals, Geology and Technology of Industrial Rocks and Minerals. **Mr Siyambango** is a fully trained and qualified Chemist with a **BSc in analytical, inorganic and physical chemistry**. Extensively trained and experienced in analytical instruments that are essential for mineral exploration and mineral processing. Academically and experienced trained Manager, with an

	MBA in Banking, Accounting and Strategic Management. The qualification supplements the economic assessment of commerciality of mineral resources for assessment of the bankability.

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Executive Summary

Geo Experts Consulting Services cc holds rights over EPL 7280 in the Erongo region. This rationale for the exploration is based upon the increasing demand for dimension stone in Namibia, SADC and the rest of the world. Therefore Geo Experts Consulting Services cc sees this as an opportunity to unveil the potential that the dimension stone industry in Namibia has to offer. The EPL 7280 is located in the Erongo region in west –central Namibia. The deposit is located in the Karibib District of the Erongo region. The license hosts industrial minerals such as marble for the use as dimension stone, along side potential for base and rare earth metals and precious metals. The company intends to implement an exploration programme of the potential economic mineral commodities that may be identified. The intended exploration programme will cover scoping, pre-feasibility and feasibility studies. The activities to be undertaken will include geological mapping, drilling and sampling.

Geo Experts Consulting Services cc is required to undertake an Environmental Impact Assessment (EIA) for the proposed exploration within the framework of the existing environmental assessment process as described in the Environmental Management Act (2007) and its Regulation (2012), published by the Ministry of Environment and Tourism (MET). As part of the fulfilment of the requirements, Geo Experts Consulting Services cc has requested Centre for Geosciences Research cc as the Environmental Consultants to undertake the Environmental Impact Assessment (EIA) with respect to the proposed exploration activities under the EPL 7280.

The objectives of the EIA include an investigation and assessment of the likely short and long-term positive and negative environmental impacts of the proposed exploration activities. The EIA also aims at clearly stipulating and determining the legal and regulatory framework and assess the relevance that these legislations will have with regard to the proposed project. The EIA also aims at addressing the public participation process where all Interested and Affected Parties (I&APs) comments/questions and concerns with regard to the proposed project are raised.

1. INTRODUCTION

1.1. Project Background

1.1.1. General Overview

In general marble deposits are found on an enormous scale in the vicinity of Karibib. Stratigraphically they belong to the Swakop Group. The area around Karibib is to a large extent characterized by inselberg topography. Many of the residual hills and mountains are built by marble which is more resistant to weathering than the surrounding schist (Hills &Porada, 1974).

The dimension stone industry in Namibia has been in existence for many years; however its potential has not yet been fully developed. The demand for dimension stone is increasing in Namibia, SADC and the rest of the world.

According to Namibia Statistic agency, (2011), majority of the people in the area of Karibib are heavily depended on dimension stone (i.e. Marble) industry for their livelihood. The area (Karibib Town) has many small scale miners that operate mining for dimension stone at small scale. Most of the small scale miners are previous disadvantage people.

Geo Experts Consulting Services cc holds rights over the EPL 7280 **(Figure 1)** and they are proposing to carry out exploration activities for quarrying marble on the EPL which is situated in the Karibib District of the Erongo region. In line with the provisions of the Environmental Management Act (2007) and the Environmental Impact Assessment Regulations (2012) an Environmental Impact Assessment (EIA) is required for “Mining and Prospecting Activities”. In that regard Centre for Geosciences Research cc has been appointed by Geo Experts Consulting Services cc to conduct an EIA and to develop an Environmental Management Plan (EMP) for the proposed exploration activities for marble on the EPL 7280.

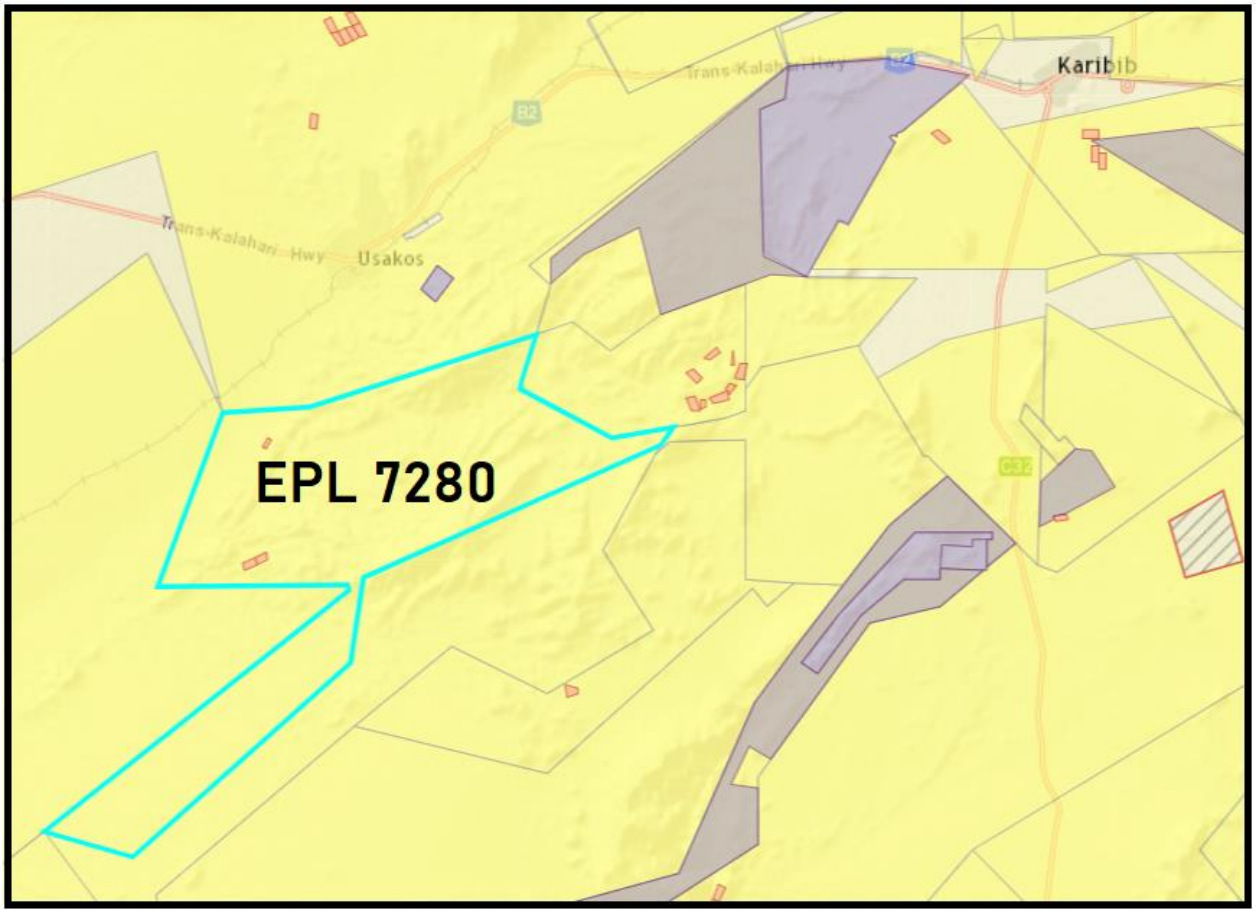

Figure 1: EPL 7280 in the Karibib District, Erongo Region

1.2. Location of the Project

The EPL 7280 is located in the Erongo region in west –central Namibia. The deposit is located in the Karibib-Usakos Districts of the Erongo region **(Figure 2)**. The license hosts industrial minerals such as marble for the use as dimension stone. The license is located on the farm land comprising mainly of farms Narubis 67, Gross-aukas 68 and Naob 69. The coordinates of the exact location are given in **(Table 1)** above.

Table 2: List of farms covered by area applied for

No	Name	No	Name
67	Narubis		
68	Gross-aukas		
69	Naob		

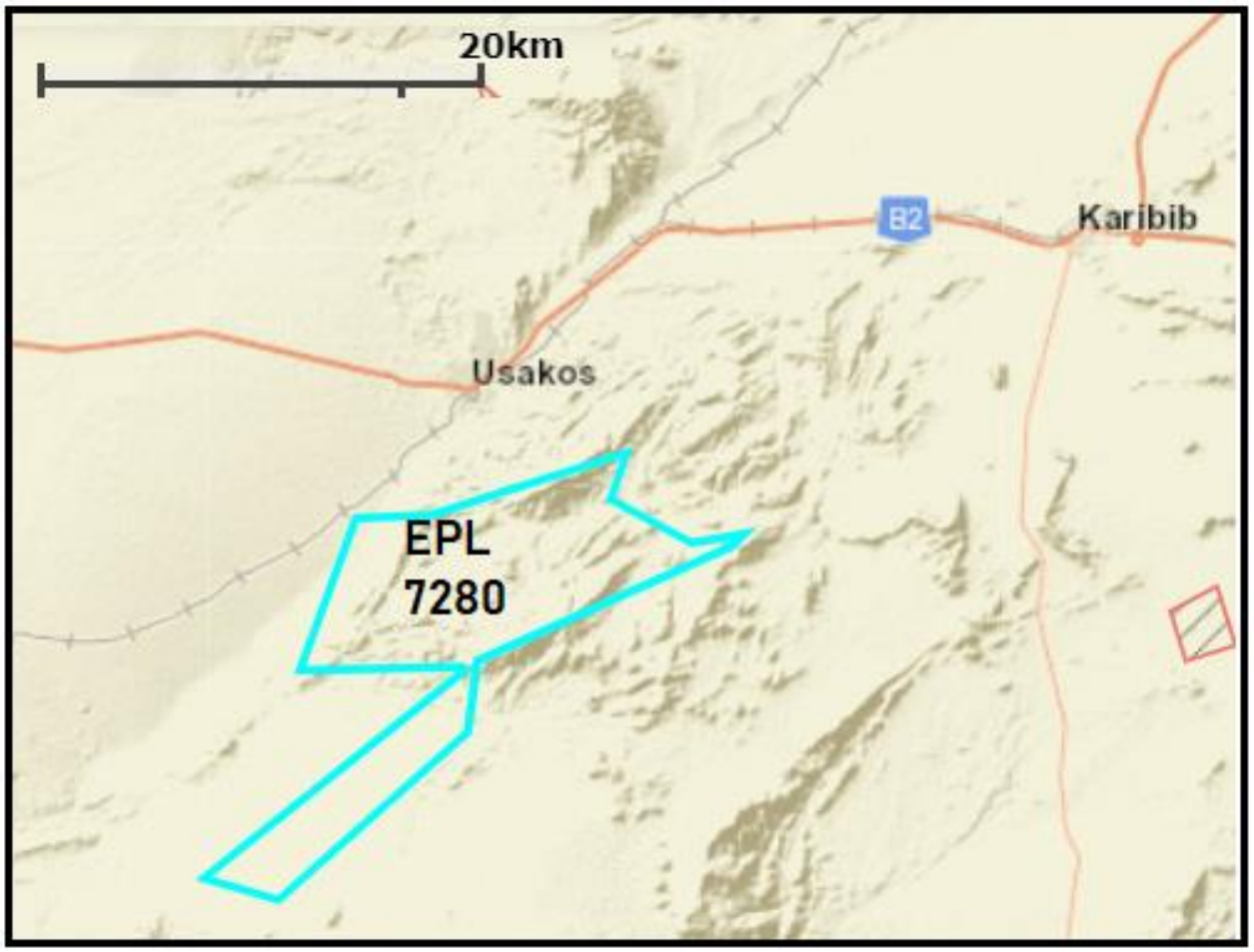

Figure 2: Location of the study area in Usakos- Karibib District, Erongo Region (Source: Google Earth map, 2015)

1.3. The objectives of the Environmental Assessment Process

The study will involve a process of investigating and assessing the possible long and short-term positive and negative environmental impacts that the proposed exploration activities on the EPL 7280 will impose.

The objectives of the environmental scoping study are to:

- To prepare a thorough Scoping Environmental Impact Assessment (EIA) report that:
  - Describes the details of the exploration activities to be undertaken.
  - Describes the current environmental conditions within the project area based on available information.

- Identifies potential positive and negative environmental impacts associated with the proposed project activities.

- To develop an Environmental Management Plan (EMP) based on the outcomes of this study in support of the environmental management of the proposed project.

- To secure a clearance for the proposed project from the Government. To engage other stakeholders as well as Interested and Affected Parties (I&APs) to ensure that all key impacts and concerns are incorporated into the final Scoping Environmental Impact Assessment Report.

1.4. Terms of Reference

The term of reference for the proposed project was set out based on the requirement by the Environmental Management Act (2007) and its Regulation (2012). The steps which were followed are described as follows:

a) a description of all tasks to be undertaken as part of the assessment process, including any specialist to be included if needed;

b) an indication of the stages at which the Environmental Commissioner is to be consulted;

c) a description of the proposed method of assessing the environmental issues and alternatives; and

d) The nature and extent of the public consultation processes to be conducted during the assessment process.

1.5. Scope of the Environmental Impact Assessment (EIA)

The particular objectives of the EIA in line with the Terms of Reference are to:

- Comply with Namibia's Environmental Assessment Policy, Environmental Management Act (2007) and its Regulations (2012).

- Confirm the justification of the project and to consider all alternatives that would meet the need;

- Consult all Interested and Affected Parties (I&APs) to ensure that their inputs are taken into account;

- Review the legal and policy framework and their relevant requirements for this project;

- Describe the biophysical and socio-economic environment of the project and determine the associated sensitivities to and suitability of the prospecting, mining, and transportation activities.

- Identify and assess impacts related to the construction, operation and decommissioning of the small scale surface mining and to propose suitable mitigation strategies;

- Compile an Environmental Management Plan for the construction; operation and decommissioning of the proposed small scale surface mining for marble.

The Environmental Assessment procedure as outlined in the Environmental Assessment Policy for Sustainable Development and Environmental Conservation (1995) is shown in **(Figure 3)** below:

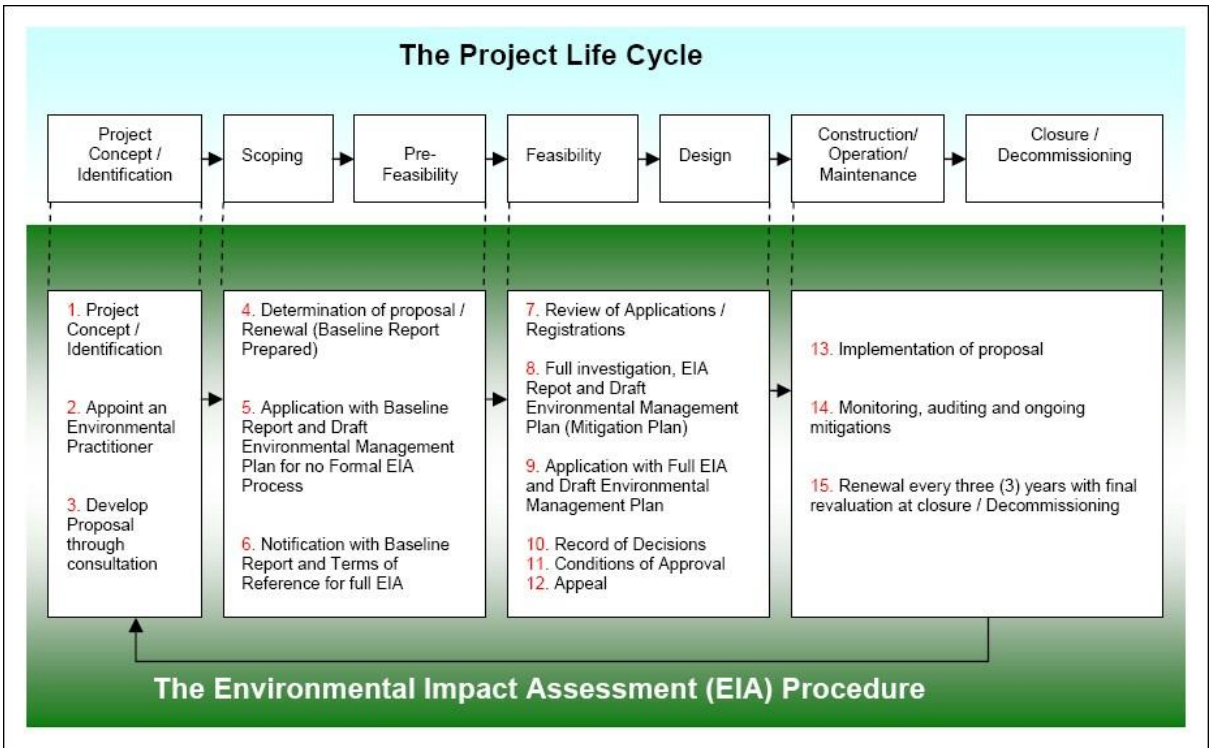

Figure 3: Environmental Assessment process in Namibia (Directorate of Environmental Affairs (DEA), 2008)

2. PROJECT DESCRIPTION

2.1. Rationale for the proposed project

Dimension stone can be defined as natural rock material quarried for the purpose of obtaining blocks or slabs that meet specifications as to size (width, length, and thickness) and shape (Barton, 1968). Although various igneous, metamorphic, and sedimentary rocks are used as dimension stone, the principal rock types are granite, limestone, *marble*, sandstone, and slate. In recent years, most dimension stone has been used in construction applications, with the largest portions being sold or used as rough block for building and construction, flagstone, curbing, and ashlars and partially squared pieces. Monumental stone, another major type, includes memorials of various kinds (Dolley, 2000).

With this background, Geo Experts Consulting Services ccsees a great opportunity for investment into the country, since annual production of marble has shown a rapid increase in tonnage since 2003. There has been an increase in the variety of dimension stone now available, which is mainly due to the upswing in dimension stone exploration, and mining in Namibia, with 28 exploration licenses, 19 Mining Licenses (2004) for dimension stone granted and several applications pending (Geological survey of Namibia, 2006).

Geo Experts Consulting Services cc is thus proposing to carry out exploration activities for quarrying marble. Upon commencement of the proposed project, employment will be created for the people within the vicinity of the project area such as those residing near Karibib.

2.2. Accessibility

Access to the property farm gate is via the D1952 gravel road which is about 50km south west of Karibib. This road is accessible to conventional cars. The license is located on the farm land comprising mainly of farms Narubis 67, Gross-aukas 68 and Naob 69.

2.3. Physiography

The area around Karibib is to a large extent characterised by inselberg topography. Many of the residual hills and mountains are built by marble which is more resistant to weathering than the surrounding schist (Hillls&Porada, 1974). Morphologically, the EPL area and surrounding can be said to be a steeply inclined plain, rising from sea level to 1000m in less than 100km **(Figure 4).** There is a conspicuous gap in the Great Escarpment in this area and in its place are isolated mountains and inselbergs (Christelis&Struckmeier, 2001).

Figure 4: Typical morphology within the area in the background.

2.4. Geology of the area

Regional Geology

Regionally the license is stratigraphically situated within the north-east trending intracontinental belt of the DamaraOrogen. The belt is a divergent orogen that formed during high-angle convergence between the Congo and Kalahari Craton (Miller, 1983). The belt is made up of fault – and shear zone bounded zones of varying structural style, ranging from north to south as a fold-thrust belt displaying complex fold interference, a granite dominated inner-zone with elongate, WNW-trending basement cored domes and Damara Sequence basins and in the south a transposed schist belt and another marginal fold-thrust zone with basement cored fold nappes (Gray, Foster, Meert, Goscombe, Armstrong, Trouw&Passchier, 2006).

The Karibib Marbles belong to the Swakop Group (739-650 Ma) which was formed during the DamaraOrogen. The Swakop Group was deposited when limestone and dolomite were precipitated in the submerged deeper parts of the volcano-related graben. The basement on which the Swakop Group rocks rest is made up of rocks of the Abbabis Metamorphic Complex (De Kock, 2001). The Swakopfacies are generally known to be deeper water

turbidites within the ocean basins and they form part of the major geologic components of the DamaraOrogen (Gray et. al., 2006).

The rocks of the Abbabis Metamorphic Complex form the oldest stratigraphic units in the area **(Figure 5)** and outcrop in domes and anticlines within the southern Central Swakop Zone. The Abbabis Metamorphic Complex is a granitic gneiss basement found within the central zone. It is largely composed of quartzo feldspathic gneiss with minor amphiboles, schist, marble and calc-silicates (Kinnaird &Nex, 2007).

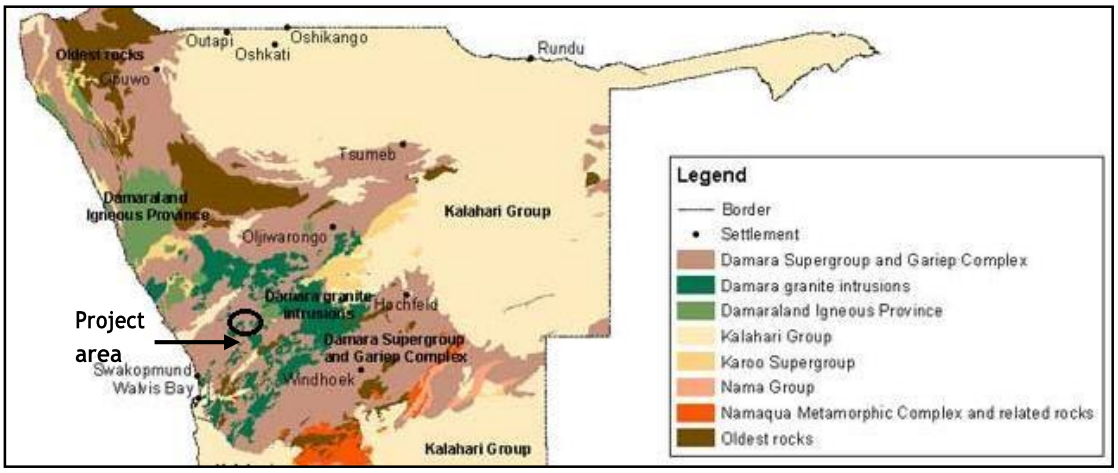

Figure 5: Geology of EPL 7280 according to the major geological divisions in Namibia (Source: Atlas of Namibia, 2003)

Local Geology

The marbles within the EPL belong to the Karibib Formation which is found within the Khomas Subgroup of the SwakopGroup**(Table 3).** The formation extends from the Northern Zone (NZ) to the southern Central Zone (sCZ) of Namibia and despite a broad similarity across this region it does however show considerable facies changes between each of the NZ, nCZ and sCZ (Miller, 2008).

The area is geologically mapped under the Walvis Bay sheet which largely falls into the central (Swakop) Zone, which is characterised by high temperature- low pressure metamorphism, numerous granitic intrusive and intense deformation typified by D3 domes (Schreiber, 2011).

The general geology of the license area consists mainly of crystalline marble, dolostone, limestone as well as mica schist, amphibolites and calc-silicate rocks of the Karibib Formation in Swakop Group which formed within the prominent Damaraorogen within the license area. In the northern portion of the license on the farm Navachab 58 fine to medium grained white marble which have been found to be bedded and laminated, with 10 to 50cm thick lenses of marble breccias in the lower part.

Quarternary sediments such as sand, gravel and calcrete prevail in the central parts of the license with outcrops of diorites (foliated) and diorite gneisses **(Figure 6)**.

The eastern and southern portion of the license on the farm Habis 71 hosts whitish-grey, coarse grained slightly porphyritic syntectonic Salem granite which has in the past been sporadically quarried and processed into tiles **(Figure 6)**. The granite has a fairly uniform texture and is composed of quartz, plagioclase, orthoclase, microcline-perthite, biotite partly replaced by slightly greenish chlorite, magnetite and zircon.

Table 3: The stratigraphy of the Swakop Group (Damara Sequence) based on Miller (2008)

GROUP	FORMATION	MEMBER	LITHOLOGY	COMMENT
SWAKOP GROUP	Damint Suite		Granite	Target Resource
	Kuiseb		Schist & minor amphibolite	Wide spread
	Karibib	Arises River	Calc-silicate rock, calc marble	
		Otjongeama	Main marble member	
		Oberwasser	Schist &phyllitic schist, metagreywacke	
		Okawayo	Discontinuous marble,biotite schist, calc-silicate rocks	
		Spes Bona	Calc- silicate rock, metagrewacke, schist, quartzite	

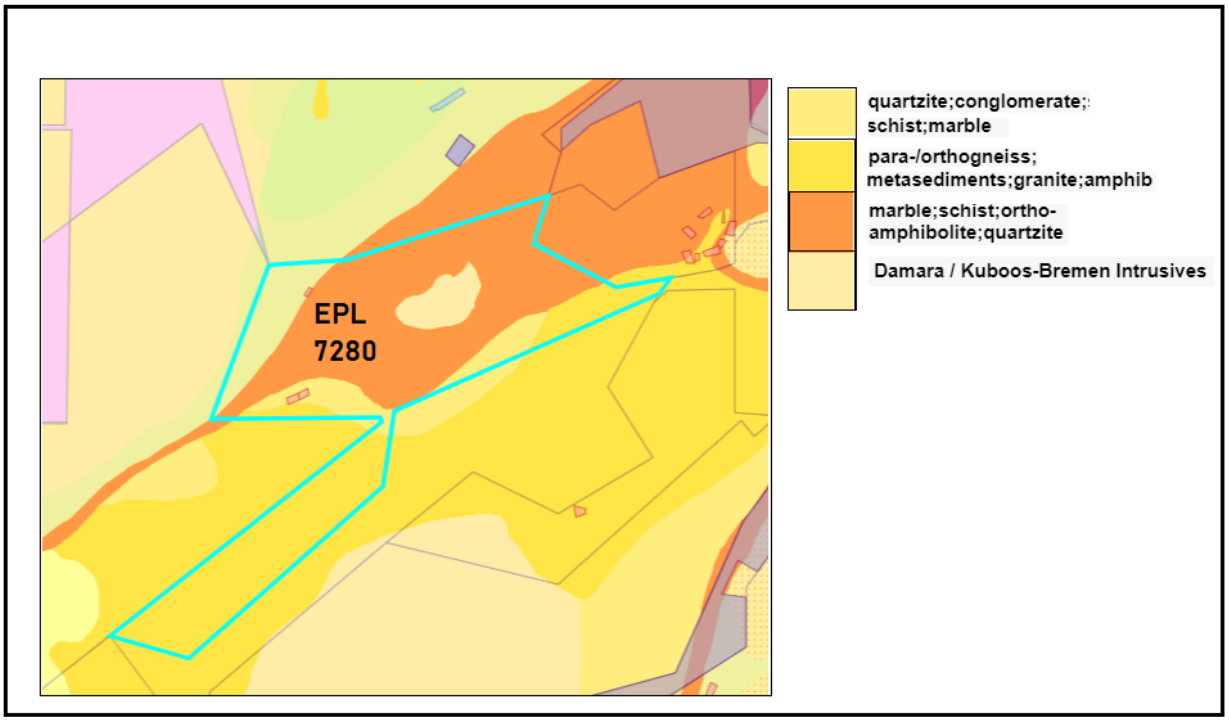

Figure 6: Geology of EPL 7280, Karibib District, Erongo Region

2.5. Climate

Annual precipitation in the project area ranges from 150mm to 300mm. The average temperature for EPL 7280 site is above 22°C

The area receives very little rainfall during wet season, and thus the possession of Marble potential. The relative humidity of the area range from 16% to 39% and the wind direction is predominantly dominated by southwest wind **(Figure 7).**

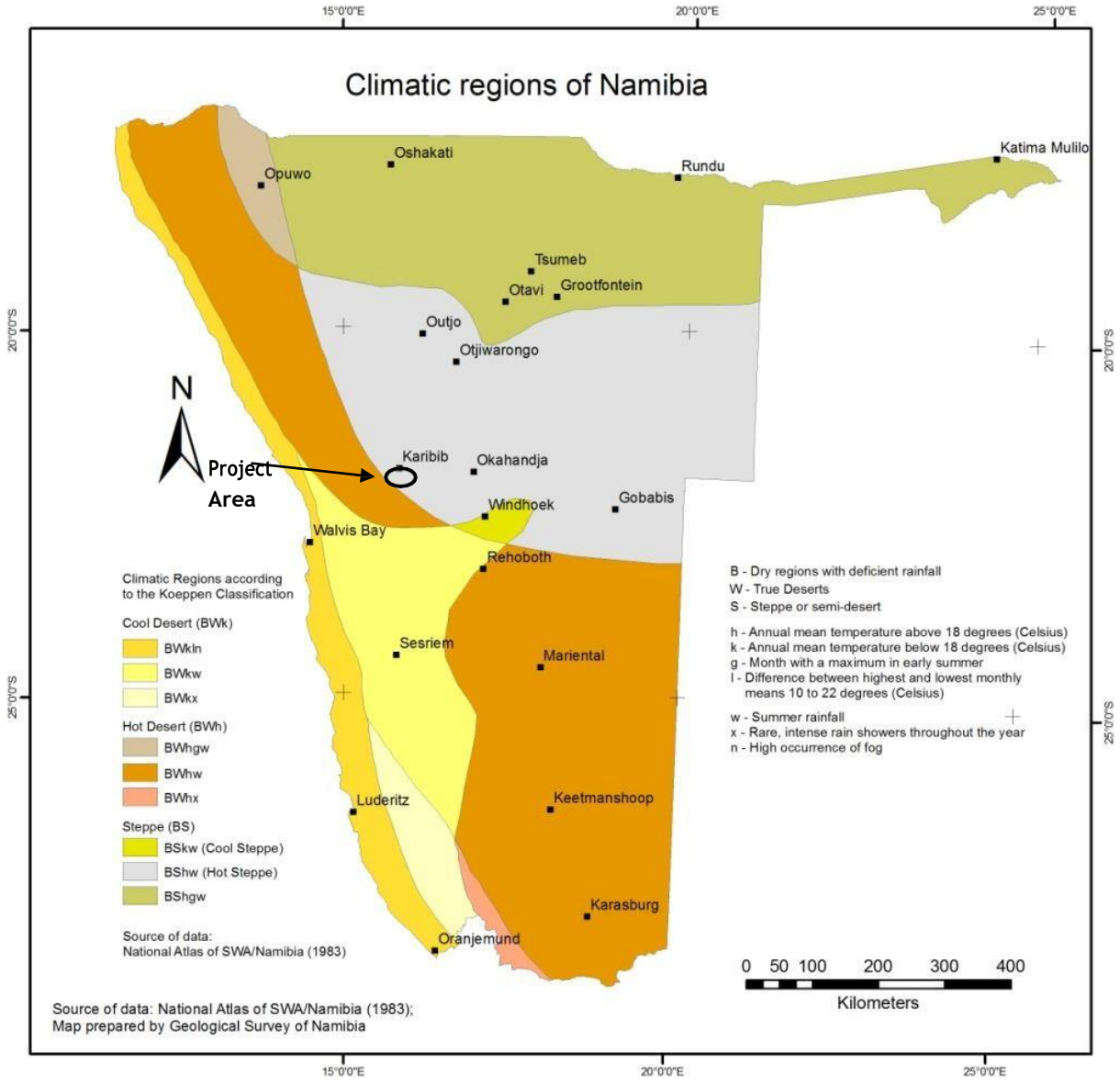

Figure 7: Climatic regions of Namibia indicating the climate in the project area (Geological Survey of Namibia).

2.6. Infrastructure and exploration equipment required for the project

2.6.1. Infrastructure requirements

a) Access Roads

Regionally the EPL area is linked to the national road network by the B2 main road. The B2 road will thus be used for transportation of equipment to and from the site and also the bulk samples collected for testing. The secondary road D1952 connects the main road to the entrance gates. To get to the site small stretches of roads will need to be made from the entrance gate to the site. The roads length will be about +- 3km long.

b) Electrical Requirements

The site has no access to the main electrical grid. Therefore during the exploration process, a diesel generator will be used as a source of power. The diesel to be used will be purchased from the nearby town which is Karibib. Alternatively, solar power can also be used on site.

c) Water Requirements

Water is available in limited amounts from underground aquifers (Karibib Marble Aquifer). However, the EPL owner shall source water from Karibib and supply the water to the site via a portable water tanker during exploration and store it in a temporary water storage with capacity of 10 000 litres. Temporal showers will be made available on site too (Figure 8).

d) Waste disposal infrastructure

Bins will be provided, and all litter will be disposed of at the nearest municipal dumping site (i.e. Karibib Town Council Dumping site). Industrial waste will be mainly wire, cable, drill bits, these items will be collected and removed from the sites. No unused machines, part will remain on site. Chemical Toilets (Mobi Loo) will be erected on sites for the use of the workers.

Figure 8: On site temporary infrastructure such as the wind power generator and water storage tank

2.6.2. Exploration Equipment and Machinery Requirements

The list of machines/equipment that will be used in the exploration process is given in **(Table 4)** below.

Table 4: List of equipment that will be used during exploration

Item	Quantity
Jack Hummer	2
Perforater	1
Diamond Wire Saw	1
Compressor	2
Front End Loader	1
Generator	1
Water tank	1
4X4 vehicles	2
Diesel tank	1

Figure 9: Some exploration equipment that will be required A) Diamond wire saw and B) the front end loader

2.7. Exploration methods

During the exploration process, compressed air powered Jack Hummers will be used to drill 5 mm diameter holes to a depth of 200cm. In order to create weak points for bulk sampling, the holes will be drilled in rectangle pattern.

3. LEGAL AND REGULATORY FRAMEWORK

The national regulations governing prospecting and mining for dimension stone activities in Namibia fall within the jurisdiction of the Ministry of Mines and Energy (MME). The Minerals (Prospecting and Mining) Act (No 33 of 1992) is the most important legal instrument governing the mining and prospecting industry in Namibia. It is the responsibility of the proponent in this case Geo Experts Consulting Services cc to have a comprehensive inventory and understanding of all relevant legislations and determine the relevance of these legislations to the proposed project. The interpreted understanding of the legislation provides the background for management and mitigation of all environmental impacts. The Environmental Management Act 7 of 2007 requires due process to be followed, essentially that all project related regulatory requirements are identified, scoped (public consultation), mitigated and conformed with. The projects legal requirements are evaluated in terms of National and International legislation, guidelines and policies.

3.1 Namibian Legislation, Guidelines and Policies

3.1.1 The Namibian Constitution

The statutory governing environmental regulatory framework in Namibia is based on Article 95 of the Constitution of the Republic of Namibia (1990), which 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 utilisation of natural resources on a sustainable basis for the benefit of all Namibians both present and future".

3.1.2 Mineral Act of 1992

The Minerals (Prospecting and Mining) Act (No 33 of 1992) regulates reconnaissance license, prospecting license and mining of minerals and dimension stone or rocks. The Act details reporting requirements for monitoring of activities and compliance to environmental performance, such as disposal methods and rehabilitation. The Mining Commissioner, appointed by the Minister, is responsible for implementing the provisions of this Act as well as the associated regulations such as the Health and Safety Regulations. Several explicit references to the environment and its protection are contained in the Minerals Act, which provides for environmental impact assessments, rehabilitation of prospecting and mining areas and minimizing or preventing pollution.

Below is an outline of the Mineral Act, linking the type of license it regulates, project activities at every license stage and the environmental requirements are **(Table 5).**

Table 5: Types of license regulated by the Mineral Act of 1992, activities and Environmental requirements

Types of License	Activities	Environmental Requirements
Exclusive Reconnaissance License (ERL)	1. Project Identification, 2. Reconnaissance	None Complete Environmental Questionnaire
	Exploration based on the following steps: Desktop study,	

Exclusive Prospecting License (EPL)	Detailed Mapping, Geophysical Methods, Drilling and Bulk Sampling, Test a quarrying.	Scoping Report, Environmental Impact Assessment
Mining License	Preconstruction and Construction, Operation and, Ongoing Monitoring, Decommissioning, Closure, Restoration and Aftercare	Full Environmental Assessment ,covering, Scoping, Environmental Impact Assessment(EIA) and the development of and Environmental Management Plan (EMP)covering the complete project lifecycle including preconstruction, construction operation and ongoing, decommissioning and aftercare. Aspects of the Environmental Management Plan are usually incorporated into an Environmental Management Systems

3.2. Legal instruments relevant to this project

There are various legal instruments that advocates for the effects of small scale mining on the environment. Table 6 below shows the summaries of the legislation that are relevant to this project:

Table 6: Legal instruments relevant to this project

Topic	Legislation	Provisions	Regulatory Authority
Small scale Marble Mining	Mineral (Prospecting and Mining) Act of 1992	The Minerals Act of 1990 governs minerals prospecting and mining. The Act provides for the reconnaissance license, prospecting license and mining for, and disposal of, and the exercise of control over minerals in Namibia.	Ministry of Mines and Energy

Environmental Impact Assessment	Environmental Management Act of 2007 and EIA regulation of 2012	Provides list of activities that require an environmental assessment, including: Mining and Quarrying. Activities such as exploration or prospecting for minerals or dimension stone, mining for minerals or dimension stone. The Act also provides procedures for adequate public participation during the environmental assessment process for the interested and affected parties to voice and register their opinions and concern about a project.	Ministry of Environment and Tourism
Water Supply and Effluent Discharge	Water Resources Management Act 2004	This Act provides provisions for the control, conservation and use of water for domestic, agricultural, urban and industrial purposes. The Act states that a license or permit is required to abstract and use water, and also discharge effluent. In accordance with the Act, and due to the nature of the project, abstraction and use permits won't be required for this project as on site water tank (10000L) will be used. The capacity of the onsite tank is less than 20000m3 bench mark for water permit. Effluent (i.e. Human Waste) from the mobile toilet will be discharge at the Karibib Municipality sewage system. No effluent will be discharge in any water course. Waste water from dust suppression will be minimal and the water is expected to evaporate faster than it infiltrate. Therefore, no effluent discharge permits will be required for this project	Ministry of Agriculture Water and Forestry

Topic	Legislation	Provisions	Regulatory Authority
Hazardous Substance such as used oil which (e.g. diesel)	Hazardous Substance Ordinance 14 of 1974	The Act provides for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby in certain circumstances; to provide for the prohibition and control of the importation, sale, use, operation, application, modification, disposal or dumping of such substance; and to provide for matters connected therewith"	Ministry of Health and Social Services

Fauna and flora	The Nature Conservation Ordinance, Ordinance of 1975,	In the course of the Mine's activities, care must be taken to ensure that protected plant species and the eggs of protected and game bird species are not disturbed or destroyed. If such destruction or disturbance is inevitable, a permit must be obtained in this regard from the Minister of Environment and Tourism. For this project, due to it areal extend and location outside a protected area a permit will not be required. .	Ministry of Environment and Tourism (MET)
Used oil	Petroleum Products and Energy Act 13 of 1990	The Act provides provisions for the any certificate holder or other person in control of activities related to any petroleum product is obliged to report any major petroleum product spill (defined as a spill of more than 200ℓ per spill) to the Minister. Such person is also obliged to take all steps as may be necessary in accordance with good petroleum industry practices to clean up the spill. Should this obligation not be met, the Minister is empowered to take steps to clean up the spill and to recover the costs thereof from the person. Used oil from this project will disposed at the Karibib Municipality Hazardous Waste Site. Permission will be required from the facility owner prior to the dumping of the used oil.	Ministry of Mines and Energy
Employees	The Labour Act, 2007 (Act No. 11 of 2007)	The Labour Act gives effect to the constitutional commitment of Article 95 (11), to promote and maintain the welfare of the people. This Act is aimed at establishing a comprehensive labour law for all employees; to entrench fundamental labour rights and protections; to regulate basic terms and conditions of employment; to ensure the health, safety and welfare of employees	Ministry of Labour and social welfare

Topic	Legislation	Provisions	Regulatory Authority
Archaeological sites	National Heritage Act 27 of 2004 Ministry of Youth	This Act provides provisions for the protection and conservation of places and objects of heritage significance and the registration of such places and objects. The proposed exploration project will ensure that if any archaeological or paleontological objects, as described in the Act, are found in the course of its construction, mining operations or closure that such find be reported to the Ministry immediately. If necessary, the relevant permits	National Service, Sport and Culture

		must be obtained before disturbing or destroying any heritage.	
Desertification	United Nation Convention to Combat Desertification 1992	The convention objective is to forge a global partnership to reverse and prevent desertification/land degradation and to mitigate the effects of drought in affected areas in order to support poverty reduction and environmental sustainability	United Nation Convention
Biodiversity	Convention on Biological Diversity (CBD) 1992	This convention advocates for the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.	United Nation Convention

3.2.1. Environmental Legislation

3.2.1.1. Environmental Management Act No. 7 of 2007

The Environmental Management Act No. 7 of 2007 is an important tool in terms of environmental protection. The Act requires adherence to the principle of optimal sustainable yield in the exploitation of all natural resources. The Act gives effect to Article 95 (l) of the Namibian Constitution by establishing general principles for the management of the environment and natural resources. It promotes the coordinated and integrated management of the environment The Act promotes inter-generational equity in the utilisation of all natural resources. Environmental impact assessments and consultations with communities and relevant regional and local authorities are provided for, to monitor the development of projects that potentially have an impact on the environment. According to the Act, Namibia's cultural and natural heritage is required to be protected and respected for the benefit of present and future generations. In order to promote the sustainable management of the environment and the use of natural resources, the Act has established a bundle of principles for decision-making on matters affecting the environment. The objective of the Act is laid down in its Section 2, which is to prevent and mitigate, on the basis of the principles set out in section 3, the significant effects of activities on the environment.

3.2.1.2. Environmental Impact Assessment Regulations No. 30 of 2012 of the Environmental Management of 2007

Environmental Impact Assessment Regulations No. 30 of 2012 of the Environmental Management Act No. 7 of 2007 lists activities which may not be undertaken without environmental clearance certificate and hence are subject to an environmental assessment process. It is for these reasons that an environmental assessment should be undertaken to identify the fatal flaws associated with the various activities to be undertaken. The act also provides procedures for adequate public participation during the environmental assessment process for the interested and affected parties to voice and register their opinions and concern about a project.

3.2.1.3. Environmental Assessment Policy for Sustainable Development and Environmental Conservation of 1995

Currently, the Environmental Assessment process in Namibia is governed by the cabinet approved Environmental Assessment Policy published by the Ministry of Environment and Tourism in 1995. (**Figure 3)** shows all the relevant stages that are required in an environmental assessment process. The Environmental Assessment policy for Sustainable Development and Environmental Conservation (1995) provides that all policies, projects and programmes should be subjected to an Environmental Assessment, regardless of where these originate. The assessment must aim for a high degree of public participation, and consider the environmental costs and benefits of projects proposed. In order to allow for identification and avoidance of adverse impacts in line with best practice, Environmental Assessments should be conducted at an early phase of project development. The Directorate of Environmental Affairs (DEA) provides guidelines for environmental assessments for all mining related projects. The guidelines address obvious environmental aspects such as pollution and waste management as well as operational procedures and rehabilitation measures.

3.1.3.4. Petroleum Products and Energy Act 13 of 1990

The Act provides provisions for the any certificate holder or other person in control of activities related to any petroleum product is obliged to report any major petroleum product spill (defined as a spill of more than 200ℓ per spill) to the Minister. Such person is also obliged to take all steps as may be necessary in accordance with good petroleum industry practices to clean up the spill. Should this obligation not be met, the Minister is empowered to take steps to clean up the spill and to recover the costs thereof from the person. Used oil from this project will disposed at the Walvis Bay Municipality Hazardous Waste Site. Permission will be required from the facility owner prior to the dumping of the used oil.

3.1.3.5. The National Environmental Health Policy

The exploration activities must be guided by the aim of this Policy, which includes the following:

- Facilitate the improvement of the living and working environments of all Namibians, through pro-active preventative means, health education and promotion and control of environmental health standards and risks that could result in ill-health; and
- Ensure provision of a pro-active and accessible integrated and co-ordinated environmental health services at national, regional, district and local levels.

3.2.2. Water Resources Legislation

The Water Resources Management Act, (No. 24 of 2004) which came into operation on 8 December 2004, makes provision for a number of functions pertaining to the management, control and use of water resources, water supply and protection of water resources. This Act repeals the Water Act No. 54 of 1956 referred to as the old Act. The Department of Water Affairs and Forestry (DWAF) in the Ministry of Agriculture, Water and Forestry (MAWF) has the mandate over the conservation and utilisation of the water resources in Namibia. A distinction is made between private and public water in terms of ownership, control and use. In accordance with the Water Resources Management Act, 2004, (Act No. 24 of 2004) and in view of the arid nature of the Namibian environment, the disposal of waste-water as well as all other type of waste is strictly controlled. In most cases and in particular wastewater is disposed off in evaporation ponds because no effluent may be discharged into the ephemeral, dry riverbeds in the interior of Namibia. The reclamation, re-use and recycling of waste is encouraged whenever an industry applies for a waste water disposal permit. The objective of the Act is to ensure that Namibia's water resources are managed, developed, protected, conserved and used in ways which are consistent with or conducive to fundamental principles set out in section 3 of the Act.

3.2.3. Health and safety legislation

3.2.3.1. Regulations for the Health and Safety of Employees at Work of the Labour Act of 2007 (amended 2011)

The Regulations relating to Health and Safety at the Workplace in terms of the Labour Act No. 11 of 2007 came into force on 31 July 1997. These regulations prescribe conditions at the workplace, and *inter alia* deal with the following:

- Welfare and facilities at work-places, including lighting, floor space, ventilation, sanitary and washing facilities, usage and storage of volatile flammable substances, fire precautions, etc.
- Safety of machinery.
- Hazardous Substances including precautionary measures related to their transport, labelling, storage, and handling. Exposure limits, monitoring requirements, and record keeping are also covered.
- Physical hazards including noise, vibration, ionizing radiation, non-ionizing radiation, thermal requirements, illumination, windows and ventilation.
- Requirements for protective equipment.
- Emergency arrangements.
- Electrical safety

Article 95 of Namibia's constitution provides that:

"The State shall actively promote and maintain the welfare of the people by adopting, inter alia, policies aimed at the following:

(l) management of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future; in particular the Government shall provide measures against the dumping or recycling of foreign nuclear and toxic waste on Namibian territory."

This article recommends that a relatively high level of environmental protection is called for in respect of pollution control and waste management.

3.2.4. National Heritage Act No. 27 of 2004

The Heritage Act of 2004 makes provision for the developer to identify and assess any archaeological and historical sites of significance. The existence of any such sites should be reported to the Monuments Council as soon as possible. The Council may serve notice that prohibits any activities as prescribed within a specified distance of an identified heritage/archaeology site.

3.2.4.1. Cradle to Grave Responsibility

This principle provides that those who manufacture potentially harmful products should be liable for their safe production, use and disposal and that those who initiate potentially polluting activities should be liable for their commissioning, operation and decommissioning.

Precautionary Principle

There are numerous versions of the precautionary principle. At its simplest it provides that if there is any doubt about the effects of a potentially polluting activity, a cautious approach should be adopted.

3.2.4.2. The Polluter Pays Principle

A person who generates waste or causes pollution should, in theory, pay the full costs of its treatment or of the harm, which it causes to the environment.

3.2.4.3. Public Participation and Access to Information

In the context of environmental management, citizens should have access to information and the right to participate in decisions making.

3.2.5. Hazardous Substance Ordinance 14 of 1974

The Ordinance applies to the manufacture, sale, use, disposal and dumping of hazardous substances, as well as their import and export and is administered by the Minister of Health and Social Welfare. Its primary purpose is to prevent hazardous substances from causing injury, ill-health or the death of human beings.

3.2.4. Legislations on Biodiversity

3.2.4.1. The Nature Conservation Ordinance, Ordinance of 1975

In the course of the exploration activities, care must be taken to ensure that protected plant species and the eggs of protected and game bird species are not disturbed or destroyed. If such destruction or disturbance is inevitable, a permit must be obtained in this regard from the Minister of Environment and Tourism. For this project, due to it areal extend and location outside a protected area a permit will not be required. Section 48 of Chapter 5 is relevant to the proposed project in that it stipulates that killing, injuring and wilfully disturbance or destroying the wildlife is prohibited. Chapter 6 of the ordinance deals with the protection of flora by prohibiting unpermitted possession of endangered flora species and picking or sale of protected flora species.

3.2.4.2. United Nation Convention to Combat Desertification 1992

The convention objective is to forge a global partnership to reverse and prevent desertification/ land degradation and to mitigate the effects of drought in the affected areas in order to support poverty reduction and environmental sustainability.

3.2.4.3. Convention on Biological Diversity (CBD) 1992

This convention advocates for the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

(Table 7) shows an extract from the legal instruments of the authorities with respect to the relevant permits/ licenses required for the proposed exploration activities.

Table 7: The regulatory authority and permitting

Activities list	Applicable Legislation	Permitting Authority	Current Status
EIA Clearance for Exploration	Environmental Policy and Environmental Management Act, (Act No. 7 of 2007)	Ministry of Environment and Tourism (MET)	To be applied on completion of this EIA and EMP Report for Exploration
EIA Clearance for Mining	Environmental Policy and Environmental Management Act, (Act No. 7 of 2007)	Ministry of Mines and Energy	To apply if Economic Resources are Discovered and Project Advances to Feasibility and if the Feasibility Proves Positive
Construction, alteration of waterworks with capacity to hold in excess of 20,000L. Abstraction of water other than that provided by Nam Water. Discharge of effluents or construction of effluent facility or disposal site	Water Resources Management Act, 2004 (No. 284 of 2004).	Ministry of Agriculture, Water and Forestry	To Apply when Required
Removal, disturbances or destruction of bird eggs	Nature Conservation Ordinance 4, 1975.	Nature Conservation Ordinance 4, 1975.	To Apply when Required
Removal, destruction of indigenous trees, bushes or plants within 100 yards of stream or watercourse	Forestry Act, 12 of 2001	Ministry of Water Affairs and Forestry (MWAF)	
Discarding or disposing of used oil	Petroleum Products and Energy Act 13 of 1990	Ministry of Mines and Energy (MME).	
Construction of waste Disposal sites.	Environmental Policy and Environmental Management Act, (Act No. 7 of 2007)	Ministry of Environment and Tourism (MET)	
License to Purchase, store and use of Explosive	Explosives Act 26 of 1956 (as amended in SA	Ministry of Safety and Security	
Magazines for Blasting	April 1978	consultation with Ministry of Mines and Energy (MME)	

4. AFFECTED ENVIRONMENT

4.1. General description of the project

The proposed project under EPL 7280 involves undertaking exploration activities for dimension stone in particular marble. The overall aim of the project is to evaluate the possible development of a viable quarry for marble that will not significantly affect the environment. The mineral commodity that is targeted in the EPL is dimension stone in particular marble.

4.2. Social Environment and archaeology

4.2.1. Social Environment

According to Namibia Statistic agency, (2011), majority of the people in the area of Karibib are heavily depended on dimension stone (i.e. Marble) industry for their livelihood. The area (Karibib Town) has many small scale miners that operate mining for dimension stone at small scale. Most of the small scale miners are previous disadvantage people. Residents of Karibib Town are concerned about small miners selling their exploration/mining license to foreigner investor due to lack of start-up capital for potential mining expansion. This could be seen as a threat and at the same time as an opportunity in the sense that local miners could negotiated for shareholding agreement instead of selling their licenses.

The report by Namibia Statistic agency, (2011) also revealed that the Karibib households depend mainly on wages and salaries, farming, business or non-farming activities, pension and cash remittance as their main income. About 58 % of the population depends on wages and salaries. Only a small percentage depends on farming, which is the lowest dependency in the area adding up to 6 % in the year 2011. About 9% of the population is depended on business or non-farming activities (Namibia Statistic agency, 2011). The dependency of the residents on pension only adds up 13% of the total population. The other 7% depends on the cash remittance (Namibia Statistic agency, 2011). Comparing to the Erongo region at large, the Karibib residence has the second highest unemployment rate in the region after the Daures constituency with an unemployment rate of 44% (Namibia Statistic agency, 2011).

Karibib district is also one the constituency with a high rate of no proper sanitation, ranking in second after the Daures constituency. Therefore Karibib Town is in a crisis as far as

employment, and thus development of the town is concern. However, any developmental activity that is needed should not take advantage of the unemployment situation in the Town at an expense of the environment and thus sustainable developmental project are needed for this town.

It should also be noted that, the population of the Karibib Town is about 13 320, and the town consist of only 9% of the Erongo Region population which is at 150 809 (Namibia Statistics Agency, 2011). The population growth rate is only 1%, depicting a slow growth rate which could be due to the little economic activities in the area to attract more inhabitants. According to the statistics the labour force participation rate is at 76.3% in Karibib, (Namibia Statistics Agency, 2011), were more men are economically active than women.

It anticipated that this project will have little adversely negative impacts on the communities living in Karibib Town, and nearby farms. Instead, the project poses a significantly positive impact to the people living in the area such Karibib. The positive impacts are mainly, job creation, support to local retailers and payment of export tax and VAT to the government of Namibia. The little negative impacts identified are on the issues of health and safety of the employees, and the potential spread of HIV/AIDS by the employees. Mitigation measures for the negatives impacts and enhancement measures for positive impacts are all addressed in Section 6 of this document and in the EMP.

4.2.2. Archaeology

There are various archaeological sites within and outside the boundary of the EPL. The available archaeological sites are mainly rock arts. Rock arts are of historical importance to the people it belongs to and the nation at large. These arts are protected by laws in Namibia such as the National Heritage Act of 27 of 2004, hosted under the Ministry of Youth. It's widely spread that every project operating within an area where there are lots of archaeological sites is obliged not to destroy or temper with the sites. Therefore, the existing rock arts located in and outside the boundary where this project will be operating should not be destroyed or tempered with during the duration of the project. The mitigations measures for the protection of archaeological sites are addressed in Sub-section 6 of this document and the EMP.

4.3. Biophysical Environment

4.3.1. Biodiversity (Fauna and Flora)

A desktop study (literature review) was conducted on the flora and the vertebrate fauna expected to occur in the Karibib area (Erongo Region) in central western Namibia. An extensive literature review of the plant species as well as the reptiles, amphibians, mammals and birds expected to occur in the general Karibib area was conducted using as many relevant literature as possible.

Flora

The EPL area falls within the semi-desert and savanna transition **(Figure 10)** which is characterised by a mix of savanna and desert species. While *Acacia* species are dominant in many parts, various stem-succulents such as *Commiphora* and *Cyphostemma* species occur. Various *Stipagrostis* species form the most important grass component.

According to Van der Merwe (1983) the Thornbush savannah and the Semi-desert savannah transition comprise 5% and 6% of the natural vegetation in Namibia, respectively. A small percentage – 7%, of the Savannah biome are formally protected in Namibia (Barnard 1998). The Erongo Mountains north of Karibib are also viewed as an area with special ecological importance in Namibia due to its botanical richness (Curtis & Barnard 1998). The ≠Gaingu communal conservancy is located to the west of Karibib in the Spitskoppe area and a number of freehold conservancies are located in the general area (Mendelsohn *et al.* 2002, NACSO 2006).

The generally Karibib area is viewed as an area of importance for local endemic plant species, especially the Erongo Mountains with between 26-35 endemic species (Mendelsohn *et al.* 2002). The overall plant diversity (all species) in the general Karibib area is estimated at between 150-299 species and the Erongo Mountain area between 400-499 species (Mendelsohn *et al.* 2002). These estimates are limited to “higher” plants as information regarding “lower” plants is sparse. The greatest variants affecting the diversity of plants are habitat and climate with the highest plant diversity generally associated with high rainfall areas. Pockets of high diversity are found throughout Namibia in “unique” habitat – often transition zones – e.g. mountains, inselbergs, etc. Plant endemism, other than the Erongo Mountains, is viewed as “medium to high” – with between 6-15 endemics expected from the general area (Mendelsohn *et al.* 2002).

Furthermore, Mendelsohn *et al.* (2002) views the overall plant production as medium to low in the general Karibib area and high in the Erongo Mountains, the availability of hardwoods as medium and the grazing and browse as average in the general area. Bush thickening (encroachment) is viewed as problematic between Karibib and Omaruru with *Acacia reficiens* the problem species and patchy between Karibib and Okahandja with *A. mellifera* dominating (Bester 1996, Cunningham 1998, Mendelsohn *et al.* 2002).

The various inselbergs in the Karibib area make this an important site from a vegetation point of view **(Figure 11).** Areas with unique vegetation should be avoided and measures should be in place so as to limit the potential destruction associated with the exploration activities to be undertaken by Geo Experts Consulting Services cc .

Tree & Shrub Diversity

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

The following vegetation types occur in the Karibib area:

Western Highlands

The dominant vegetation structure is viewed as “grasslands and scattered trees” or “sparse shrubland” with a high variation in green vegetation biomass (>15%) (Mendelsohn *et al.* 2002).

Semi-desert savannah and transition zone

This semi-desert and savannah transition zone as referred to by Giess (1971) is typified by shrubs (“fodder bushes”) such as *Blepharis pruinosa*, *Leucosphaera bainesii* and *Monechma genistifolia*. Larger woody species such as *Acacia erioloba* are confined to the drainage lines. The area west of Karibib is characterised by *A. senegal* shrubs and *Cyphostemma currorii* and *C. bainesii* also occurring in this region. The trees common in the area are *Commiphora glaucescens*, *C. virgata* and *C. dinteri* as well as *Boscia albitrunca* and *B. foetida* (Giess 1971).

Thornbush Savannah

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

Table 1 in Appendix A indicates the trees & shrubs known and/or expected to occur in the general Karibib area and are derived from Curtis & Mannheimer (2005). Some species indicated to possibly occur in the area according to Coats Palgrave (1983) and Van Wyk & Van Wyk (1997) are excluded here.

Six species of trees and shrubs (5.9%) expected to occur in the Karibib area are classified as endemics, 16 species (15.8%) are protected under the Forestry Ordinance No. 37 of 1952 or Forest Act No. 72 of 1968, 5 species (4.9%) are protected under the Nature Conservation Ordinance No. 4 of 1975 while 6 species (5.9%) are classified as table 1 appendix A species. All the trees with some kind of conservation and/or protected status are viewed as important in the general Karibib area.

Nine species of *Commiphora* potentially occur in the Karibib area of which 3 (33.3%) are endemic to Namibia (Curtis & Mannheimer 2005, Steyn 2003) and all 4 *Euphorbia* species expected in the area have some kind of conservation status, making these species important plants in the general area.

Grass Diversity

It is estimated that at least 52-72 grasses (Müller 2007 [72sp.], Van Oudshoorn 1999 [52sp.]) – approximate total of 80 species – occur in the general Karibib, central western, Namibia area.

Appendix A, Table 2 summarises the grasses expected to occur in the general Karibib area:

Western Highlands

Mendelsohn *et al.* (2002) does not specify grass species but generally refers to the area as “grasslands and scattered trees”.

Semi-desert savannah and transition zone

The grass cover is sparse and consists of the climax grasses *Stipagrostis obtusa* and *S. uniplumis* (Giess 1971).

Thornbush Savannah

The grass cover varies depending on the soil type with the climax grasses being *Anthephora pubescens*, *Brachiaria nigropedata*, *Digitaria* spp. and *Urochloa bolbodes* with other species such as *Stipagrostis uniplumis* and *Schmidtia pappophoroides* also common (Giess 1971).

Table 2 in appendix A indicates the grasses known and/or expected to occur in the general Karibib area and are derived from [1]Müller (2007) and [2]Van Oudtshoorn (1999).

Important Species

Important tree and shrub species in the general Karibib area are the 6 endemics (i.e. *Commiphora dinteri*, *C. saxicola*, *C. virgata*, *Cyphostemma bainesii*, *Erythrina decora* & *Euphorbia damarana*) as well as the species protected under the Forestry Ordinance No. 37 of 1952, Forest Act No. 72 of 1968, Nature Conservation Ordinance No. 4 of 1975

Another important plant species in central western Namibia (including the Karibib area) that could also occur in the general central western area is the Quiver Tree (*Aloe dichotoma* – protected under the Nature Conservation Ordinance No. 4 of 1975 (Mendelsohn *et al.* 2002). *Aloe dichotoma* are associated with rocky outcrops in the general area although are not as abundant as further south. Their flowers and associate nectar is an important source of food for insects and birds throughout their range. All aloe species are protected in Namibia and thus viewed as important plants (Mendelsohn *et al.* 2002). Of the 27 Aloe species known from Namibia at least 6 species (*Aloe asperifolia, A. dinteri, A. hereroensis*, *A. litoralis*, *A. namibensis,* and *A. zebrina*) occur in the Karibib area (Rothman 2004). Illegal collecting and during drought periods when baboons often destructively feed on many aloes, are some of the threats they face (Rothman 2004).

An important grass is the endemic – *Eragrostis omahekensis* – which occurs mainly further westwards in Namibia may also be present in the general Karibib area, especially towards Okahandja.

It is certain that many other plant species will be viewed as economically important in the future, especially if viewed as medicinally important.

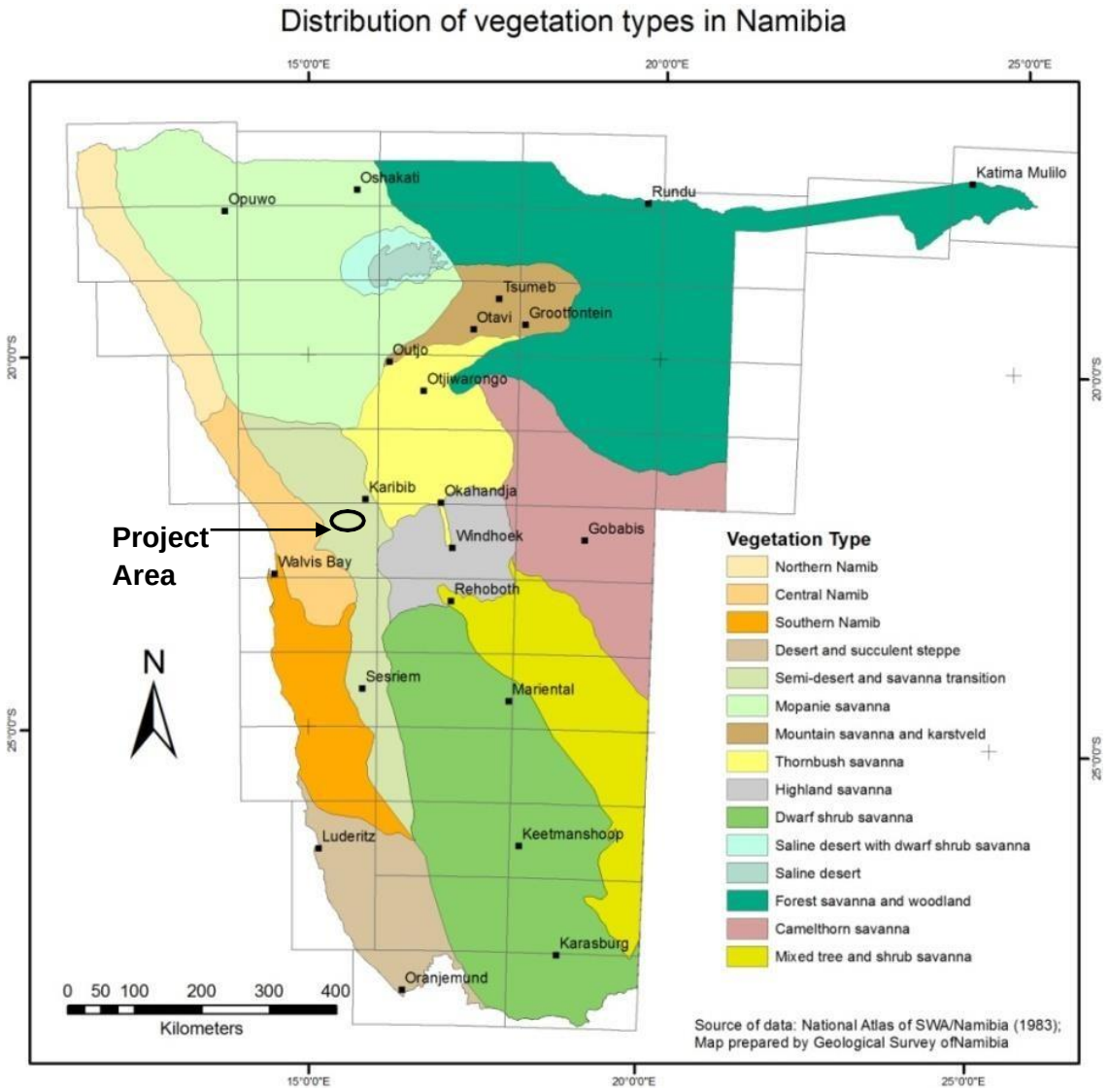

Figure 10: Distribution of vegetation types in Namibia indicating the project area in a semi-desert and savanna transition setting (Geological Survey of Namibia)

Figure 11: Vegetation within the project area indicating the inselberg topography and vegetation of the semi-desert and savanna transition setting.

Fauna

The study area in general is regarded as “relatively low to moderate” in overall (all terrestrial species) diversity (Mendelsohn *et al.* 2002). Overall terrestrial endemism in the area on the other hand is “moderate to high” (Mendelsohn *et al.* 2002). The overall diversity and abundance of large herbivorous mammals (big game) is viewed as “moderate” with 3-4 species while overall diversity and density of large carnivorous mammals (large predators) is determined as “moderate” with 4 species expected – e.g. leopard, cheetah, spotted & brown hyena (Mendelsohn *et al.* 2002).

It is estimated that at least 81 species of reptile, 9 amphibian, 74 mammal and 183 bird species occur in the general/immediate Karibib area of which a high proportion are endemics.Endemics include at least 41% of the reptiles, 33% of the amphibians, 16% of the mammals and 6% (or 79% of all the Namibian endemics) known, or expected to occur in the general area. Although endemics are known to occur from the general area, it is currently not clear if any of these are associated with the proposed development area(s).

The effect that the proposed exploration activities and associated infrastructure development would have on the fauna would depend on the extent of the development,

area of development, management of the area and how the proposed mitigations are eventually implemented. Access and maintenance routes would have the most impact on the surroundings although these would also be negligible if constructed properly, avoided sensitive habitats and track discipline (including no killing/poaching along these routes) is adhered to and/or enforced.

Reptile Diversity

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

The overall reptile diversity and endemism in the general Karibib area is estimated at between 41-70 species and 21-28 species, respectively (Mendelsohn *et al.* 2002). Griffin (1998a) presents figures of between 21-30 and 7-8 for endemic lizards and snakes, respectively, from the general central-western part of Namibia. According to Griffin (2005b) at least 76 species of reptiles are known, reported and/or expected to occur in the Valencia Uranium Mine area to the west of Karibib. Of these, 31 are snakes (including worm, blind & pythons) and 43 are lizards (17 Gecko's, 11 old world lizards, 7 skinks, 3 plated lizards, 2 agama's and 1 each for chameleon, monitor & worm lizard) while 1 tortoise and 1 terrapin are also expected from the general area. Cunningham (2007) identified and confirmed 12 species of reptiles in the Valencia Mine area during recent fieldwork there during late 2007. According to Henschel *et al* (2000) at least 20 species of lizards (12 geckos, 5 lizards & 3 skinks) have been recorded on the gravel plains at Gobabeb (Desert Research site approximately 200km southwest of Karibib). A pilot study conducted by Kavari (2007) on the reptile diversity associated with the future expansion of the Rössing Uranium Mine (approximately 100km west of Karibib) indicated the presence of 6 reptile species (3 geckos, 1 lizard, 1 chameleon & 1 snake). A survey of the reptiles associated with the Trekkopje Uranium Mining area (approximately 100km northwest of Karibib) conducted by Cunningham (2006b) indicated the presence of 22 reptile species (8 snakes, 1 skink, 2 lizards, 2 agamas, 1 chameleon & 8 geckos).

At least 81 species of reptiles are expected to occur in the Karibib area with 33 species being endemic – i.e. 41% endemic. These consist of at least 30 snakes (1 blind snake, 2

thread snake, 2 python, 2 burrowing snakes & 23 typical snakes), 8 of which are endemic (27%) to Namibia, 2 tortoises, 1 terrapin, 48 lizards (1 worm lizard, 10 skinks, 11 Old World lizards, 2 Plated lizards, 1 Girdled lizard, 1 Monitor lizard, 2 Agamas, 1 Chameleons & 19 Geckos), 25 (52%) of which are endemic to Namibia. Skink's (10 species), Old World Lizards (11 species) and Gecko's (19 species) are the most numerous lizards expected from the general area. Namibia with approximately 129 species of lizards (Lacertilia) has one of the continents richest lizard fauna (Griffin 1998a). Geckos have the highest occurrence of endemics in the general area with 15 of the 19 species (79%) expected and/or known to occur in the area, being endemic to Namibia. Due to the fact that reptiles are an understudied group of animals, especially in Namibia, it is expected that more species may be located in the general area than presented above.

Some of the species tabled above occur in specific habitats such as the Web-footed Gecko which inhabits the dunes further west in the Namib Naukluft Park or the tortoises and terrapin (water pools & dams as well as temporary pools in the Khan and Swakop River systems) which inhabit the better vegetated areas.

Table 3 of Appendix A indicates the reptile diversity known and/or expected to occur in the general Karibib area:

1.3.2 Amphibian Diversity

Amphibians are declining throughout the world due to various factors of which much has been ascribed to habitat destruction. Basic species lists for various habitats are not always available with Namibia being no exception in this regard while the basic ecology of most species is also unknown. Approximately 4 000 species of amphibians are known worldwide with just over 200 species known from southern Africa and at least 57 species expected to occur in Namibia. Griffin (1998b) puts this figure at 50 recorded species and a final species richness of approximately 65 species, 6 of which are endemic to Namibia. This "low" number of amphibians from Namibia is not only as a result of the generally marginal desert habitat, but also due to Namibia being under studied and under collected. Most amphibians require water to breed and are therefore associated with the permanent water bodies, mainly in northeast Namibia. The diversity of amphibians closely follows patterns of average rainfall with fewer species in the dry western parts of Namibia (Mendelsohn *et al.* 2002).

The ephemeral Khan River and its tributaries such as the Ebony, Wildehond, Naab and Chouxab Rivers drain the central western region of Namibia although all of these rivers only flow sporadically after heavy local thundershowers. Other water bodies in the area include temporary pools in afore mentioned rivers as well as any other suitable natural water holding features. Artificial ground dams and reservoirs hold water temporarily and could serve as a short term habitat for amphibians in the area. No permanent natural surface water exists in the general area. This lack of natural long term surface water (i.e. amphibian breeding places) affects the amphibian diversity in the area. According to Mendelsohn *et al.* (2002), the overall frog diversity in the general Karibib area is estimated at between 1-7 species.

According to the literature, at least 9 species of amphibians occur in the general area of which 3 species are endemic to Namibia. Griffin (1998b) also puts the species richness in the general area around 2-6 species. The general area is under represented, with 2 bull/sand frogs, 3 toads and 1 species each for platanna, kassina, rain and rubber frog expected (i.e. potentially could be found in the area) to occur in the general area. *Phrynomantis annectens* (Cape River Frog) is known from pools in the Naukluft Mountains to the south west and the Fish River Canyon further towards the south, but not confirmed from the Karibib area although could potentially occur there. *Bufo hoeschi*, *Bufo dombensis* and *Phrynomantis annectens* are endemic to Namibia (i.e. 33% of the amphibians expected in the area).

Table 4 of appendix A indicates the amphibian diversity known and/or expected to occur in the general Karibib area:

Mammal Diversity

Namibia is well endowed with mammal diversity with at least 250 species occurring in the country. These include the well known big and hairy as well as a legion of smaller and lesser-known species. Currently 14 mammal species are considered endemic to Namibia of which 11 species are rodents and small carnivores of which very little is known. Most endemic mammals are associated with the Namib and escarpment with 60% of these rock-dwelling (Griffin 1998c). According to Griffin (1998c) the endemic mammal fauna is best characterized by the endemic rodent family *Petromuridae* (Dassie rat) and the rodent genera *Gerbillurus* and *Petromyscus*. The overall mammal diversity in the general Karibib area is estimated at between 31-75 species with 3-8 species being endemic to the area (Mendelsohn *et al.* 2002).

According to the literature at least 73 species of mammals are expected to occur in the general area of which 12 species (16%) are classified as endemic, 11 species as near threatened and 4 species as vulnerable. Two species are viewed as potentially invasive alien species to the area - House Mouse (*Mus musculus*) and House Rat (*Rattus rattus*). Mammal species probably underrepresented in the above mentioned table for the general area are bats and rodents, as these groups have not been well documented from the arid rocky western parts of Namibia. Other species such as Cheetah, Duiker and Spotted Hyena may not necessarily occur in the area throughout the year, but may venture into the area from time-to-time depending on rainfall, prey and disturbance elsewhere. Species such as Hedgehog, Pangolin and Dik-Dik would also only be found on the eastern part of the Karibib area (i.e. towards Omaruru & Okahandja).

The general area – especially the mountainous parts – is understudied and under collected especially regarding the bat and rodent fauna. Overall terrestrial diversity – all species – is classified as “low to medium” in the central-western parts of Namibia (Mendelsohn *et al.* 2002). The overall diversity (1-4 species) and abundance of large herbivorous mammals is “low to average” in the general area with Springbok and Oryx having the highest density of the larger species (Mendelsohn *et al.* 2002). The overall abundance and diversity of large carnivorous mammals is relatively high (4 species) in the general area with Brown Hyena and Leopard having the highest density of the larger species (Mendelsohn *et al.* 2002). At least 30%, 23% and 19% of the mammalian fauna that occur or are expected to occur in the general area are represented by rodents (22 species), carnivores (17 species) and bats (13 species). Important habitats often not realised and/or neglected include mountains and hills (including inselbergs) as well as ephemeral rivers and drainage lines and their associated vegetation. Habitat alteration and overutilization are the two primary processes threatening most mammals (Griffin 1998c).

Table 5 of Appendix A indicates the mammal diversity known and/or expected to occur in the general Karibib area:

Avian Diversity

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 and unique group of arid endemics (Brown *et al.* 1998, Maclean 1985). Fourteen species of birds are endemic or near endemic to Namibia with the majority of Namibian endemics occurring in the savannas (30%) of which ten species occur in a north-south belt of dry savannah in central Namibia (Brown *et al.* 1998). Bird diversity is

viewed as medium in the Karibib area with 141-170 species (this would include migrant species) estimated with at least 4-7 species being endemic to the general area (Mendelsohn *et al.* 2000).

At least 183 species of terrestrial ["breeding residents"] birds occur and/or could occur in the general Karibib area at any time (Hockey *et al.* 2006, Maclean 1985, Tarboton 2001). At least 11 species are classified as endemic to southern Africa and 42 species as near endemic (Hockey *et al.* 2006).

Eleven of the 14 Namibian endemic bird species (79% of all Namibian endemic species or 6% of the species expected to occur in the area) can or are likely to occur in the general Karibib area. The Cape Vulture (VU - Vulnerable) and Herero Chat (LR - Lower Risk) are also listed by the IUCN.

Rainfall (or lack thereof) would affect bird species distribution and abundance. This however excludes all aquatic species (freshwater & marine) and migrant species (e.g. cuckoo & swift/swallow species) that could also be found in the area depending on rainfall and temporary pools, season, etc. in the area.

The general Karibib area does not fall within one of the 21 Important Birding Areas (IBA's) as determined for Namibia (Simmons 1998a) although the Naukluft (Namib-Naukluft Park) towards the southwest, Walvis Bay (Ramsar site), Sandwich (Namib-Naukluft Park), Mile 4 Saltworks and Cape Cross (Capr Cross Seal Reserve) are such IBA at the coast to the west of Karibib.

Table 6 of Appendix A indicates the avian diversity known and/or expected to occur in the general Karibib area. This table excludes aquatic and migratory birds and/or birds only attracted to the area after localized rain showers, but rather focus on birds that are breeding residents or can be found in the area during any time of the year. This would imply that many more birds could occur in the area depending on "favourable" environmental conditions.

Important Species

Reptiles

The high percentage of endemic reptile species (41%) associated with the rocky escarpment region of central western Namibia underscores the importance of this area without formal state protection. Reptile species of concern are the various endemic geckos (e.g. *Pachydactylus* species) and lizards associated with rocky substrates and of which very little is known about their ecological role and actual status in Namibia. The endemic Husab Sand Lizard (*Pedioplanis husabensis*) is a unique species to the region as its distribution is limited to the area between the Khan and Kuiseb Rivers to the west of Karibib.

Snakes are often killed outright due to the "fear factor" associated with all snakes as well as local beliefs and negative folklore. The most problematic snake species is probably the endemic Anchieta's Dwarf Python often collected illegally for the pet industry and the endemic Namibian Wolf Snake of which virtually nothing is known (Haacke and Branch pers. com.). Indiscriminate killing of snakes does not bode well for rare and endemic snake species. Tortoises consumed as food has resulted in them often becoming locally extinct. Tortoises are viewed as the reptile family of greatest concern (Griffin 1998a) and the collection and eating of tortoises are of grave concern.

Afroedura africana africana (100% endemic), *Pedioplanis husabensis* (100% endemic) and *Rhoptropus bradfieldi* (100% endemic) are viewed as the most important species due to their restricted range in Namibia. Other important species include the restricted range species – *Pachydactylus kockii* with an expected distribution between the Hoanib River and the Kuiseb River (Griffin 2003). The species probably least known and unstudied include the *Telescopus* sp. *nov.* (Damara Tiger Snake) not yet even properly classified. Snakes face direct persecution by humans throughout Namibia due to being perceived as dangerous. An increase in human activity in the general area does not bode well for this species should it occur here unless a strategy of no killing of any snake is encouraged during the construction and maintenance phases.

The high percentage of endemic reptile species known and/or expected to occur in the general area underscores the importance of this area for reptiles. Development and recreation often affect these species negatively.

Amphibians

Of the nine species of amphibians that potentially could occur in the general area, 3 species (i.e. 33%) are classified as endemic to Namibia. With the exception of the endemics – *Bufo* hoeschi, *Bufo dombensis* and *Phrynomantis annectens* – and due to the fact that the rivers in the area are ephemeral and don't hold water for very long after showers (including artificial farm dams), amphibians are not viewed as very important in the general area.

Mammals

Endemic mammals expected to occur in the general area make up a relatively large percentage (16%) of the mammals expected from the area. Mammal species of concern are most often predators e.g. Cheetah (*Acinonyx jubatus*) – classified internationally as Vulnerable (CITES Appendix A table) and the Dassie Rat and Mountain Ground Squirrel, both of which are endemic and classified as near threatened (SARDB 2004). Interbreeding of doestic cats and the African Wild Cat at farmsteads and around towns affects the genetic viability of the latter.

The Black Mongoose (*Galerella nigrata*) is probably the most important small carnivore species from the general area due to it being almost exclusively endemic to Namibia (Griffin 2005a). It is known from the Erongo Mountains and Spitskope areas and probably also occurs in the Khan River drainage line although this still has to be confirmed. The Black Mongoose is viewed as being 100% endemic to Namibia (Grifin 2003).

Other species of concern include the Pangolin which is classified as vulnerable (SARDB 2004) and listed as CITES Appendix II, Hedgehog – near threatened (SARDB 2004) and the various endemic bats. Pangolin and Hedgehog are however not common in the general area, finding the harsh environment rather marginal habitat.

Bats are unfortunately often viewed with undeserved revulsion and exterminated for such reasons. The most important bat species are *Cistugo seabrai* and *Laephotis namibensis*, both being endemic and also classified as vulnerable and/or endangered. Very little is known about the rodents throughout Namibia including the general Karibib area.

Birds

Although only 6% of the breeding resident birds expected in the Karibib area are viewed as endemic, this is 79% or 11 of the 14 Namibian endemic species. The Namibian endemics, endemics from southern Africa as well as the near endemics are the most important birds.

The Herero Chat, White-tailed Shrike, Rüppels Korhaan and Gray's Lark are viewed as the most important species in the Karibib area.

4.3.2. Groundwater and surface water hydrogeology

The fact that most towns in the western Central Region are situated on or near ephemeral rivers is a reflection of ground water availability in the area. Sufficient water for larger settlements can only be obtained by surface water storage in dams or from alluvial aquifers, while the potential of bedrock aquifers is very limited. This is partly due to the low rainfall and lack of recharge, and partly to the generally unfavourable aquifer properties of Damara Sequence rocks (Christelis and Struchmier, 2001).

The Exclusive Prospecting Licence (EPL) 7280 is geologically situated on rocks of the Swakop Group in the DamaraSpergroup and the area is hydrogeologically situated in the Central Namib-Windhoek Strip **(Figure 12).** These basins were demarcated based mainly on geological structures and groundwater flow.

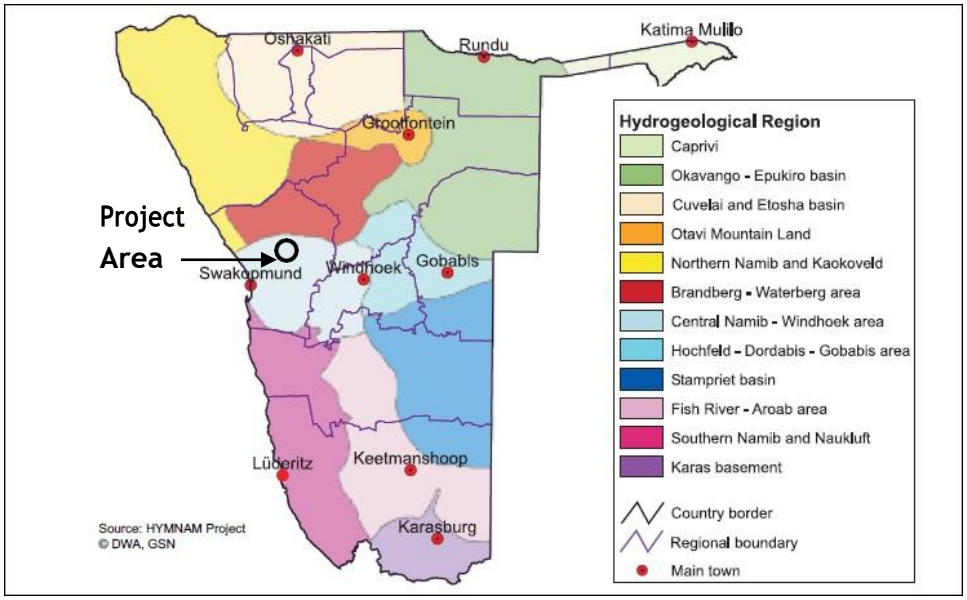

Figure 12: Hydrogeological Regions of Namibia (Christelis and Struchmier, 2001).

Main targets for geological site selection are steeply dipping north-south trending fractures and joint zones, if possible in competent rocks, although feldspathicquartzites should be avoided. Moderate yields are also encountered in the marble and schist aquifers around Karibib.

Locally, Karibib Formation (**Figure 13**) which consists of the Arises River Member (*coarse grained white calcitic marble beds*), the Otjongema Member (*Calc-silicate dolomitic marble beds*) and the Harmonie Member (*Calc-silicate minor marble beds*) is a source of water supply to local settlements and towns. However, the hydraulic yield of the aquifer is closely

related to fracture storage, and is therefore highly variable and dependent on annual recharge.

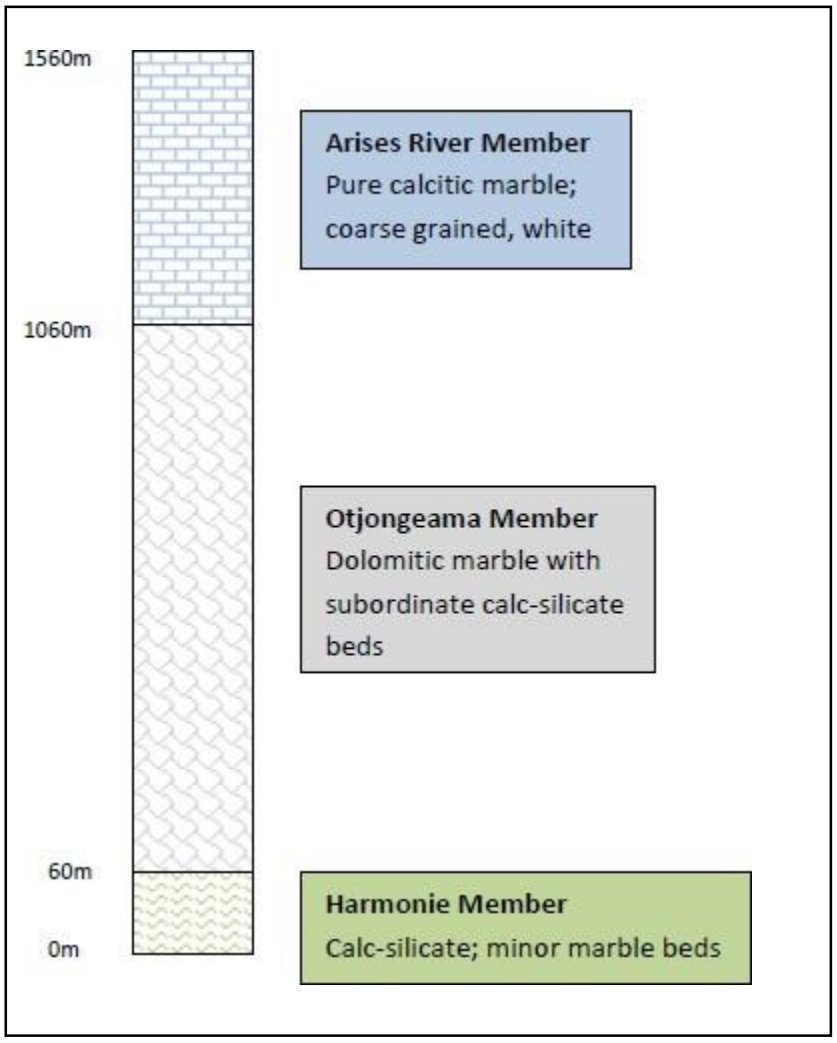

Figure 13: Figure 5: The Karibib Formation (Tordiffe, 2013)

Due to its carbonate nature, the Karibib Formation maintains good quality water with a dominant calcium magnesium bicarbonate hydrochemical facie (Ca-Mg-HCO3).

4.4. Potential impacts identified

Social impacts at the exploration stage are likely to be minimal and tend to be positive. A clear understanding of these impacts may help communities understand and anticipate the effects of the exploration. One of the major possible impacts of exploration may be the unrealistic expectations of about the development of a mine or a quarry. It is thus important for local communities to bear in mind that not all exploration activities will advance to mine or quarry development. The following is the summary of the likely positive and negative social, economic and cultural impacts:

(i) Social

- ❑ Opportunities for social shift work / rotational work associated with the exploration programme;
- ❑ Less time to spend on traditional activities such as farming;
- ❑ Workers and their families are separated for several days or weeks resulting in some marital stress;
- ❑ Members leaving the community (because they now have money and good-paying jobs);
- ❑ Members leaving their skilled jobs in the community to take exploration related temporal jobs because of good temporal returns;
- ❑ Effect of the spread of HIV/AIDS

(ii) Economic

- ❑ Increased employment levels;
- ❑ Increased income levels;
- ❑ Increased training and skill development opportunities;
- ❑ More money flowing into a community could result in more liquor;
- ❑ and/or drugs coming into the community;
- ❑ Use the positive working role models within the community;
- ❑ Export taxes and VAT payment

(iii)Cultural

- ❑ Cultural strangers in the community;
- ❑ Increased population;
- ❑ Strains existing services;
- ❑ Worsens existing social problems.

Apart from cultural, economic, and social positive and negative impacts the following below are also some of the negative impacts which may arise from the project.

Negatives impacts

- ❑ Effect of oil spillage on groundwater and surface water
- ❑ Solid waste: wires, drill bites, and human waste
- ❑ Land and soil disturbance: on site and the proposed road
- ❑ Loss of biodiversity: fauna and flora
- ❑ Effect of dust that will be generated on-site

5. PUBLIC CONSULTATION PROCESS

5.1. Legal and policy requirement

5.1.1. Environmental management act (2007) and it EIA regulations (2012)

Public consultation is a crucial part of the EIA process. This provides an opportunity to stakeholders or interested member of the public to find out more about what is being proposed, and to raise any issues or concerns. The Environmental Management Act 2007 and its EIA regulations of 2012 are the key documents governing environmental impact assessment in Namibia.

One of the key objectives of the Act is to prevent and mitigate the significant effects of activities on the environment by:

"Ensuring that there are opportunities for timeous participation of interested and affected parties throughout the assessment process; and ensuring that the findings of an assessment are taken into account before any decision is made in respect of activities."

The key principle of the Environmental Management Act 2007 advocates for public participation. The principles states that *"the participation of all interested and affected parties must be promoted and decisions must take into account, the interest, needs and values of interested and affected parties*".

Section 21 of the EIA Regulations outlines procedure on public participation process as follows:

"(2).The person conducting a public consultation process must give notice to all potential interested and affected parties of the application which is subjected to public consultation by:

a) Fixing a notice board at a place conspicuous to the public at the boundary or on the fence of the site where the activity to which the application relates is or is to be undertaken;

(3) A notice, notice board or advertisement referred to in sub regulation (2) must -

a) Give details of the application which is subjected to public consultation; and

b) State:

i. That the application is to be submitted to the Environmental Commissioner in

terms of these regulations;

ii. The nature and location of the activity to which the application relates;

iii. Where further information on the application or activity can he obtained: and

c) The manner in which and the person to whom representations in respect of the application may be made.

(6) When complying with this regulation, the person conducting the public consultation process must ensure that a) information containing all relevant facts in respect of the application is made available to potential interested and affected parties; and b) consultation by potential interested and affected parties is facilitated in such a manner that all potential interested and affected parties are provided with a reasonable opportunity to comment on the application.

28. For the purpose of the Act and these regulations a notice is given to a person or a person is informed of a decision, if a document to that effect is:

(a) Delivered personally to that person;

(b) Sent by registered post to the persons last known address;

(c) Left with an adult individual apparently residing at or occupying or employed at the person's last known address; or

(d) In the case of a business-

(i) Delivered to the public officer of the business;

(ii) Left with an adult individual apparently residing at or occupying or employed at its registered address;

(iii) Sent by registered post addressed to the business or its public officer at their last known addresses; or

(iv) Transmitted by means of a facsimile transmission to the person concerned at the registered office of the business.

5.2. Consultation process followed during the EIA process

Communication with stakeholders about the proposed exploration project was facilitated through the following ways

- Identification of stakeholders
- Newspaper adverts
- Written notices
- Notice boards
- Information documents
- Stakeholder meetings
- Reasonable opportunity for the public to register and comment on the project

(Table 8) below explains how the communication process was facilitated using the above mentioned ways.

Table 8: Public consultation process

Steps	Description of the process	Time allowed
Identification of stakeholders	Key stakeholders were identified and included in the register. Contact details for some I&APs were obtained from their offices and others at the meeting	The registration process was maintained throughout the EIA process
Newspaper adverts	Notices were placed in the press, briefly explaining the project and its locality, inviting the public to register as stakeholders and informing them of the time and venue of the public meeting (Appendix F)	In the Observer Newspaper Newspaper as attached
Background Information Document	A Background Information Document (BID) was compiled. The BID contained the information of the project (Appendix D). The BID was forwarded to all authorities and registered stakeholders.	Continued throughout the process every time someone registered.

5.3. Limitation of the public consultation process

- The place where the area is situated, locals seem not interested in the project, Might not have received invitation.
- Delivery of letters, Notice Board Posters and BID by hand is timing consuming.
- Most people were on leave and sometimes not reachable on the contact numbers when the Centre for Geosciences research cc was contacting them.
- Some stakeholders don't have access to email.

5.4. The interested and affected parties (I&APs)

The I&APs for this project were identified using information from the existing Centre for Geosciences Research cc stakeholder database. Notices were placed in various newspapers inviting the public to register as interested and affected parties. Organizations were also selected whom the consultant considered to be interested in or affected by this particular project. An I&APS can be defined as '(a) any person, group ofpersons or organization interested in or affected by an activity; and (b) any organ of state that may have jurisdiction over any aspect of the activity.

5.5. Outcome of the public consultation meeting

The Chief Warden of Erongo Region Ministry of Environment and Tourism Mr K Shilongo was invited to the public meeting and he expressed his apologies as he was on leave at the time of the meeting. Numerous expression of interest was received via email, with no objections. There is no objection to the proposed exploration activities for marble in the Karibib District. The list of attendees to the meeting can be found in Appendix C. A second meeting was held with the farmers in Karibib.

6.1 Identification of key issues

Potentially significant impact identified from the baseline conditions and legal requirement were screened to obtain issues that require further investigation or assessment and those that doesn't required further investigation. The process shown in the flow chart below **(Figure 14)** was used for the screening of potential issues. **(Table 9)** below shows the screening process of the identified key impacts for the proposed exploration activities for marble quarrying.

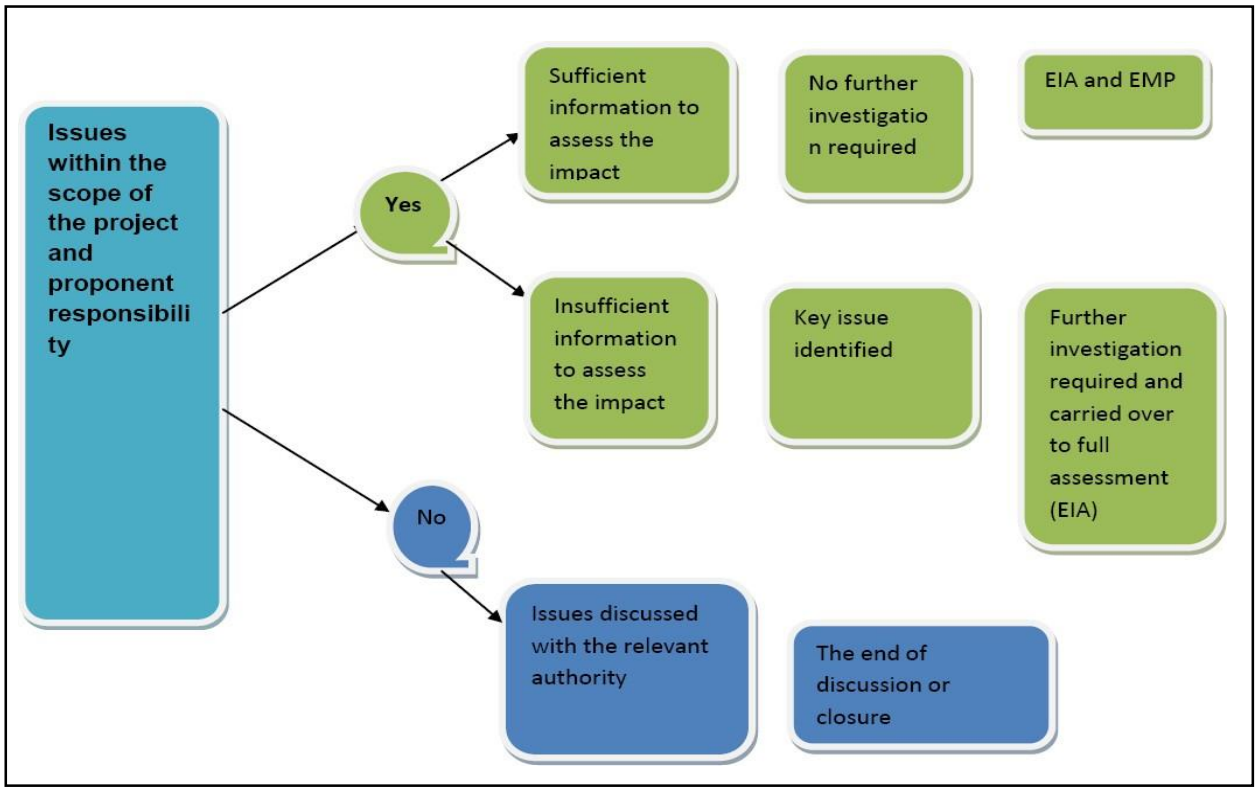

Figure 14: Flow chart that was used for screening of potential issues

Table 9: Process of determining the key impacts from certain aspects of the proposed exploration activities for marble quarrying

Environmental Feature	Potential impacts of project feature	Key impact	Degree of sensitivity	Issue addressed in
Fauna	Destruction of flora (vegetation) could result in loss of faunal biodiversity	Loss of faunal biodiversity	Lowto Medium sensitivity	Addressed in sub section 6.3.1: and EMP
Flora	Removal or damage to vegetation could result in loss of biodiversity and habitat destruction	Loss of biodiversity Habitat destruction	Lowto Medium sensitivity	Addressed in sub section 6.3.1: and EMP
	Damage or destruction of protected or high use value trees, shrubs or bushes	Loss of protected or high use value flora	Low to Medium sensitivity	Addressed in sub section 6.4.2: and EMP
Socio-economic environment	Employment or job creation	Permanent job creation for local people	Medium sensitivity	Addressed in sub section 6.4.1: and EMP
	Support to local retailers shops and Export taxes and VAT payment	Contribute to the Karibib town economic growth and the nation at large	Medium to low sensitivity	Addressed in sub section 7.4.1 and EMP
	Potential spread of HIV/AIDS	Spread	Medium sensitivity	Addressed in sub section 6.4.2: and EMP
Archaeology	Disturbance or destruction of archaeological sites as a result of earthmoving	Damage to existing or undiscovered archaeological sites in the area	High sensitivity	Addressed in subsection 6.4.3

Environmental Feature	Potential impacts of project feature	Key impact	Degree of sensitivity	Issue addressed in
	Operations and accelerated soil erosion.			
Solid waste	During exploration solid waste such as drill bites, plastic, and wire will be generated on site	Damage to the surrounding environment	Low sensitivity	Addressed in sub section 6.5 and EMP
Dust on site and gravel road	During sampling of marble dust will be generated	Effect the employees wellbeing and possible soil contamination and air pollution	High sensitivity	Addressed in sub section 6.3.3
Surface water and ground water	Contaminants during exploration process (e.g. oil spills etc)	Deterioration of groundwater quality	Low sensitivity	Addressed in sub section 6.3.2: and EMP
	Effluent discharge from mobile toilet		Low sensitivity	Addressed in EMP
	Contaminants resulting from the presence of workers		Low sensitivity	Addressed in EMP
Disturbance on soil or land	During exploration (sampling) top soil will be removed to access the marble	Loss of top soil that support vegetation growth	High sensitivity	Addressed in sub-section 6.6 and EMP

6.2 Methodology used or adopted for the impact assessment

The assessment process that was developed by Centre for Geosciences Research cc was formulated based on the collection and interpretation of the available literature pertaining to the industrial minerals field in particular marble. The process included the review of previous EIA's and EMP's done in the surrounding areas and those about industrial minerals in Namibia. Other relevant documents were identified and collected including:

- Environmental regulations covering environment, water, energy, health and safety as well as all the related policies and guidelines;
- Prospecting regulations and all the related introductory information obtained from the Office of the Mining Commissioner in the Ministry of Mines and Energy;
- Topographic maps, information and data sets about the location and characteristics of EPL 7280.
- Information and data sets about the environmental regulation, biodiversity, social economic and natural environment around the EPL 7280obtained from the Directorate of Environmental Affairs in the Ministry of Environment and Tourism; Namibia Statistic agency.
- Information and data sets about the regional and local geology, geological maps and all the related data sets, published materials and open file documents have all been located in the Directorate of the Geological Survey in the Ministry of Mines and Energy;

The following methods were used to determine the significance rating of impacts identified:

6.2.1 Description of Impact

The potential impacts for the proposed project on the receiving environment are identified for the proposed project and there are some concepts to take into consideration such as the type of effect and the extent of the effect the proposed activity might have on the environment. The sources of risk are, where possible, based on accepted scientific techniques. All potential impacts that result from the proposed project have been evaluated for the full life-cycle of the project (all exploration phases, depending on the duration of the project).

(Table 10) below shows the criteria for determining the significance of potential impacts which uses a balanced combination of nature, extent, duration, and intensity/magnitude, modified by probability, cumulative effects and confidence.

Table 10: definition of criteria for assessing significant impact

Criteria	Description
Nature	Reviews the type of effect that the proposed activity will have on the relevant component of the environment and includes "what will be affected and how?"
Extent	Indicates whether the impact will be site specific; local (limited to within 15 Km of the area); regional (limited to ~100 Km of the area); national (limited to the coastline of Namibia); or international (extending beyond Namibia's borders).
Duration	Reviews the lifetime of the impact, as being short (days, <1 month), medium (months, <1 year), long (years, <10 years), or permanent (generations, or >10 years).
Intensity	Establishes whether the magnitude of the impact is destructive or innocuous and whether or not it exceeds set standards, and is described as none (no impact); low (where natural/ social environmental functions and processes are negligibly affected); medium (where the environment continues to function but in a noticeably modified manner); or high (where environmental functions and processes are altered such that they temporarily or permanently cease and/or exceed legal standards/requirements).
Probability	Considers the likelihood of the impact occurring and is described as improbable (low likelihood), probable (distinct possibility), highly probable (most likely) or definite (impact will occur regardless of prevention measures).
Degree of Confidence in Predictions	Is based on the availability of specialist knowledge and other information

6.2.2 Sensitivity of the Affected Environment

In the description of the affected environment, an indication of the sensitivity of the affected environment was provided. Sensitivity, in this instance, refers to the 'ability' of an affected environment to tolerate disturbance (given existing cumulative impacts). For example, if very little disturbance results in the permanent loss of the biodiversity of a habitat, the affected environment could be categorized as having a low tolerance to disturbance and can consequently be described as being a 'high sensitivity' habitat. If, on the other hand, a habitat is able to withstand significant disturbance without a marked impact on its biodiversity the affected environment could be categorized as having a high tolerance to disturbance (i.e. 'low sensitivity' habitat).

Based on the above considerations, an overall evaluation of the significance of the potential impact was provided, which is described in **(Table 11)** below:

Table 11: Definitions of various significant rating or sensitivity.

Significance rating	Criteria
Low	Where the impact will have a negligible influence on the environment and no modifications or mitigations are necessary for the given development description. This would be allocated to impacts of any severity/ magnitude, if at a local scale/ extent and of temporary duration/time.
Medium	Where the impact could have an influence on the environment, which will require modification of the development design and/or alternative mitigation. This would be allocated to impacts of moderate severity/magnitude, locally to regionally, and in the short term.
High	Where the impact could have a significant influence on the environment and, in the event of a negative impact the activity(i.e.) causing it, should not be permitted (i.e. there could be a 'no-go' implication for the development, regardless of any possible mitigation). This would be allocated to impacts of high magnitude, locally for longer than a month, and/or of high magnitude regionally and beyond.

6.2.3 Mitigation and Enhancement Measures

Where negative impacts are identified, mitigation objectives have been set, and practical, attainable mitigation measures must be recommended that will minimise or eliminate the impacts. Where mitigation is not feasible, this has been stated and reasons given. In the case of positive impacts, enhancement measures are recommended for optimizing the benefit to be derived.

6.2.4 Monitoring

Monitoring requirements with quantifiable standards to assess the effectiveness of mitigation actions have been recommended where appropriate. These must indicate what actions are required, by whom, and the timing and frequency thereof. If further investigations must be undertaken and monitoring programmes implemented before, during and after operations, these have been recommended.

6.3 Biophysical Environment

6.3.1 Loss of Fauna and Flora diversity

6.3.1.1 Description

Biodiversity (i.e. fauna and flora) is likely to be affected by the project during the exploration process. But due to the size and duration of the project, the impact is manageable.

The types of vegetation found in this area are classified in medium value category. In addition to vegetation various invertebrates also host the area. Regardless of the low value of the existing vegetation on site and along the road, activities that will be undertaken during the exploration process is likely to have an effect on the vegetation and the invertebrates thereof. Therefore management measures will be considered to minimize the above impacts.

6.3.1.2 Sensitivity of the affected environment

(Table 12) below shows the significance that the exploration activities will have on the biodiversity (fauna and flora).

Table 12: Expected significance of the project on biodiversity: fauna and flora

Criteria	Biodiversity: fauna and flora
Extend	local
Duration	Long
Intensity	Medium
Probability	Definite
Significance before mitigation	High
Significance after mitigation	Medium
Degree of confidence in prediction	High

6.3.1.3 Mitigation and enhancement measures

- ❑ Avoid damage to protected or high use value trees during exploration and usage of heavy machines.
- ❑ Disturbance of marginal vegetation at the mountains should be limited.
- ❑ Avoid disturbance on invertebrate on site and along the gravel road stretch.
- ❑ During operation avoid the creation of multiples roads strips, which could result in the disturbance of breading sites for various mammals.

6.3.1.4 Monitoring

An ENC for Geo Experts Consulting Services ccshould accompany drivers or heavy machine operator so that the avoidance of trees and vegetation can be optimized. Other rules in the EMP to avoid vegetation destruction should be monitored monthly.

6.3.2 Impact of oil spills on groundwater aquifer and surface water streams (Oil spill concerns are addressed to insure no used oil is stored on site or discharged on site).

6.3.2.1. Description

The dimension stone industry is a clean industry from a pollution point of view. Various environmental impact assessments conducted identified that petrochemical pollution emanating from this industry is the most serious threat in this regard, and in order to maintain the record as a clean industry, this threat is taken very seriously.

There are various waste disposal methods used worldwide during the exploration of dimension stone in particular marble. Management of used oil at a large scale is reported to be a challenge as more significant maintenance is required to minimize the losses of the oil into the environment (Richards, 2009). Once used oil is spilled, it causes detrimental effect to both living and none living things and more especially to groundwater because it's chemical constituents are poisonous. The oil coats and clings to every rock and grain of sand. Sometimes if the oil washes into wetlands, fibrous plants and grasses absorb the oil, which can damage the plants and make the whole area unsuitable for wildlife habitat.

6.3.2.2. Sensitivity of the affected environment

Table 13: Expected significance of the project on liquid waste

Criteria	Impact of oil spills on groundwater aquifer and surface water streams
Extent	local
Duration	permanent
Intensity	high
Probability Significance before mitigation	definite
Significance after mitigation	High
Degree of confidence in predictions	Medium
Extent	high

6.3.2.3. Mitigation and enhancement measures

- ❑ Train and supervise staff to ensure minimal spillage of oil.
- ❑ Routine inspections before the start of every work schedule involving potential spillage.
- ❑ Used oil is collected in drums and stored, and is sold to recycling companies.
- ❑ Equip the exploration site with emergency petrochemical spillage kits which are used such events as hydraulic pipes bursting in service and spilling oil.
- ❑ Bio-remediate contaminated soil using proprietary products kept on sites for the purpose. The process of bio-remediation involves loosening the contaminated soil to allow for oxygen penetration. Transported contaminated soil to a specific impervious site for treatment to avoid compaction during the process, and adding agricultural fertilizer and the proprietary products containing appropriate microbes to break down the hydrocarbons.

6.3.2.4. Monitoring

- ❑ Daily visual monitoring by site manager.
- ❑ Weekly spot checks by environmental manager

6.3.3 Dust generation on site

6.3.3.1. Description

During the exploration process dust will be generated onsite by earth moving equipments and also on the gravel road by trucks and vehicles. On site, marble blocks will be cut into smaller blocks in order to give them the desired smooth shape and to obtain the preferred sampling blocks. During the cutting process a significant amount of the original marble mass is lost in the form of dust. In addition, processing of marble results in the formation of marble dust, which is suspended in the air and which could be inhaled by the workers. Epidemiological studies indicates that workers exposed to marble dust stand an increased risk of suffering from asthma symptoms, chronic bronchitis, nasal inflammation and impairment of lung function (Angotzi et al., 2005). In their study they found out that, the affected workers were having body problems like headache, backache and stressed due tounder- payment. Individuals having papilloma, faced problem at work like noise, dust or fumes and poor maintenance of equipment. Moreover, their data also demonstrated that

long period of chronic exposure to dust induced progressive atrophic changes in the alveoli (Gammal et al, 2011).

Therefore, there are some potential risk of dimension stone industry on the environment, which requires attention, mitigations, and management to protect the existing human and animal health.

It is globally known that the generated dust during exploration operations of marble may affect human, plant and animal growth at the surrounding environment. Exposure between 10 and 15 years is associated with the long term complication, while the short term complication can cause difficulty in breathing". The reaction depends on the particle inhaled, as the lung is too exposed to expel particles beyond 10 micro meters. With the inherent natural mechanism of its defence, the lung is supposed to be able to expel such amount of particles but sizes below one to 10 millimeter (mm) can go down to the terminal end of the lung and the macrophages may not be able to expel that. To avoid respiratory or other problems caused by exposure to dust, engineering control methods such as those highlighted in the mitigation measures below and the use of tools that minimized the generation of dust should be introduced.

6.3.3.2. Sensitivity of the affected environment

Table 14: Expected significance of the project on dust generated on site

Criteria	Soil or land disturbance:
Extent	local
Duration	long to permanent
Intensity	medium
Probability	definite
Significance before mitigation	high
Significance after mitigation	medium
Degree of confidence in predictions	high

6.3.3.3. Mitigations and enhancement measures

- Measures such as the use of wet processes enclosure of dust-producing processes under negative air pressure (slight vacuum compared to the air pressure outside the enclosure),
- Exhausting air containing dust through a collection system before emission to the atmosphere, and exhaust ventilation should be used in the workplace.
- Use of personal protective equipment for proper dust control for respiratory protection and should be used only where dust control methods are not yet effective or are inadequate.
- Direct skin contact should be prevented by gloves, wearing respiratory protection during cleanup,
- Educational awareness programs for workers should be instituted about hazard of exposure to marble dust and on the use and maintenance of exhaust ventilation systems, and the use and maintenance of personal protective equipment to avoid risk of dust and noise.
- All gravel roads in quarry areas should have a speed limit of 60km/h for light vehicles and 30km/h for heavy vehicles in order to minimise the amount of dust generated by vehicles.
- In addition, where available water allows, roads should be sprayed with water on a regular basis in order to prevent dust creation.

6.3.3.4. Monitoring

- Daily inspection by the ENC of the gravel roads and exploration site on possible dust creation that requires attention.
- Daily inspection on site by the ENC to ensure that all workers are wearing their protective clothes at all time during the mining process and the dry skin contact with gloves is prevented.

6.4. Social Economic Environment

6.4.1. Job creation

6.4.1.1. Description

According to the Namibian statistics agency, (2011), the employment rate in Karibib has reduced from 71% in 2001 to 59% in 2011 while the unemployment increased from 29% in 2001 to 41% in 2011. Comparing to the Erongo region at large, the Karibib residence has the second highest unemployment rate in the region after the Daures constituency with an unemployment rate of 44%. Karibib district is also one of the constituencies with a high rate of no proper sanitation, ranking in second after the Daures constituency.

It is clear that unemployment is big challenge in the Town of Karibib; hence the necessity of this project which will employ about 5 to 10 people during the exploration phase. The employment will be conducted in the company's offices which will be opened in the Town of Karibib once exploration has begun, the local authority will be contacted if assistance is needed during the employment process in order to ensure that the local inhabitants can get the full benefit.

It should be noted that the use of manual labour instead of mechanized construction methods, does pose some advantages and disadvantages:

Advantages:

- ❑ If locals are used, housing will be available nearby,
- ❑ Contribution to local economy – reducing unemployment,
- ❑ Development of local skills,
- ❑ Smaller ecological footprint.

Disadvantages:

- ❑ It might increase the costs of the project impacting on the affordability of water;
- ❑ It will take longer to complete than if the processed in mechanized;
- ❑ The safety risk resulting from open trenches will become bigger;
- ❑ It will require a greater management of workforce, quality of work.

6.4.1.2. Sensitivity of the affected Environment

By implementing the exploration project the socioeconomic significance of Geo Experts Consulting Services cc can be summarized as follows:

Table 15: Expected significance of the project on social economic implications

Criteria	Social economics implications
Extent	local
Duration	long to permanent
Intensity	medium
Probability	definite
Significance before mitigation	high
Significance after mitigation	low
Degree of confidence in predictions	high

6.4.1.3. Mitigation and enhancement measures

- ❑ Where unskilled labour can be used, a 'locals first' policy should be considered.
- ❑ It is proposed that local people, meaning the community members from Karibib Town, should be employed as far as possible, especially where no specific skills are required.
- ❑ Both men and women should be granted the opportunity to be employed by this project.

6.4.1.4. Monitoring

It is recommended that Geo Experts Consulting Services cc 's Exploration Manager should employee workers to be obtained from the potentially affected communities in particular Karibib Town. Geo Experts Consulting Services ccin consultation with the Karibib Town Councillor will then be responsible to supervise the employment process when implementing this 'local's first' recommendation.

6.4.2. Potential spread of HIV/AIDS

6.4.2.1. Description

In the proposed project area, it is estimated that one out of every four people are HIV positive (Namibian statistics agency). Previous experience has shown that construction workers or exploration workers residing in a construction camp may engage in risky sexual behaviour with members of the community. This can contribute to the spread of HIV both in the project area and beyond to other region.

6.4.2.2. Sensitivity of the affected environment

Table 16: Expected significance of the project on the spread of HIV/AIDS

Criteria	Contribution to the spread of HIV/AIDS
Extent	national
Duration	permanent
Intensity	serious effect
Probability	definite
Significance before mitigation	high
Significance after mitigation	medium
Degree of confidence in predictions	high

6.4.2.3. Mitigation and enhancement measures

The ENC and Geo Experts Consulting Services cc should sensitize the risks of sexual behaviour, and also the effects of HIV/AIDS to its employees. Workers should be prohibited to engage in such activities with especially minors. Mitigation measures as outlined in the EMP should be adhered to.

6.4.2.4. Monitoring

The ENC should report back to Geo Experts Consulting Services cc as to when and how the workers received HIV training. Also, how workers were informed about the mitigation measures of the EMP.

6.4.3. Disturbance or destruction of archaeological sites

6.4.3.1. Descriptions

The exploration activities may partially or completely destroy some small archaeological sites found within and outside the boundary of the exploration area. These archaeological sites are rock arts and are associated with the sun people tribe. Their archaeological significance is low to medium. It is also likely that some damage will occur outside the immediate project area through the establishment of access roads and contractor's lay-down areas. Some cumulative impacts can be expected during operation.

6.4.3.2. Sensitivity of the affected environment

Table 17: Expected significance of the project on archaeological sites

Criteria	Archaeological implications
Extent	local
Duration	permanent
Intensity	serious effect
Probability	definite
Significance before mitigation	medium
Significance after mitigation	Low
Degree of confidence in predictions	high

6.4.3.3. Mitigation and enhancement measures

- ❑ The records obtained during this fieldwork are considered adequate and no further work is needed.

6.5. Solid waste: wires, drill bits, and human waste

6.5.1. Descriptions

Solid waste management is a problem in the mining/exploration industry or quarrying industry, and sometimes this problems extent beyond the mining/exploration industry. In the mining industry or exploration industry, different types of solid waste are generated and some of these wastes contain toxic substance that can affect living and non-living things. Therefore proper handling and management of these wastes is critical for the protection of the environment.

Solid waste that will be generated from this project if not managed will have an effect on the environment. The effect will mainly be at the project site. Human waste that will be generated during the exploration process, if not managed will have an effect on the environment although at a small scale.

6.5.2. Sensitivity of the affected environment

The significance of the identified problem to the study can summarise as follows:

Table 18: Expected significance of the project on solid waste

Criteria	Solid waste :
Extent	local
Duration	short
Intensity	low
Probability	definite
Significance before mitigation	medium
Significance after mitigation	low
Degree of confidence in predictions	high

6.5.3. Mitigation and enhancement measures

Waste disposal sites should established on site were paper, plastic and wire should be kept. The collected solid waste should be dispose at the Town of Karibib solid waste disposal site. For human waste, mobile toilet should be made available on site for workers and once these facilities are full, the collected human waste should be disposed at the Karibib Town human waste disposal site. Prior to the disposal of the above mentioned wastes, Geo Experts Consulting Services cc must enter into agreement with the Karibib Town for permission to use their facility.

Monitoring (Karibib town council waste disposal department contacted for ability to accept the disposal of human and solid wastes).

 Weekly inspection by the ENC, to collect and empty the plastic bag that are full and also the mobile toilet.

6.6. Land or soil disturbance: on site

6.6.1. Descriptions

During the exploration process, land or soil will be disturbed on site. Top soil will be removed from the surface rocks during the drilling to recover the slabs needed for sampling. The removed top soil during drilling if not properly management will affect the growth of vegetation and the development biodiversity hiding or resting spots.

6.6.2. Sensitivity of the affected environment

The significance of the identified problem to the study can summarize as follows:

Table 19: Expected significance of the project on soil or land disturbance Criteria Soil or land disturbance

Criteria	Soil or land disturbance:
Extent	local
Duration	permanent
Intensity	serious affected
Probability	definite
Significance before mitigation	high
Significance after mitigation	medium
Degree of confidence in predictions	high

6.6.3. Mitigation and enhancement measures

The top soil from 0 to 30cm should be removed and stockpile and used during the rehabilitation process. The stockpile will seeded with seeds of grasses and shrubs to keep organic activity alive, as well as ensure a fertile seed bank in the topsoil when it is finally used. It is recommended that top soil should be removed down to the subsoil, where it is significantly thicker than 0.5m, as topsoil is always a scarce resource, and even if this lower material does not contain seed and is poorer in soil organisms, it has been found to be useful in reclamation. Where top soil is less than 150mm thick the unconsolidated material beneath should also be removed and treated as topsoil.

6.6.4. Monitoring

- ❑ Daily inspection by ENC to ensure that top soil is removed and stock pile on site.

6. CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

The EPL 7280 is in the Karibib District in the Erongo Region. The implementation of the proposed exploration activities by Geo Experts Consulting Services cc will be undertaken with provisions of the Environmental Impact Assessment (EIA) regulations of 2012. Based on the assessment of both negative and positive impacts undertaken for the proposed exploration activities, a number of high positive and negative impacts have been identified. Overall positive impacts of the proposed exploration activities outweigh the negative ones at local, regional, national and global levels.

All development have potential negative environmental consequences, but identifying the most highly affecting impacts, coupled with environmentally acceptable mitigating factors, lessens the overall impact of such development. The eventual actual development area(s) and associated infrastructure (e.g. access route, etc.) would be relatively small and thus only have localised negative implications on the environmental and associated areas. Good planning prior to development (including associated infrastructure development) and access route(s) development as well as adhering to proposed mitigation measures would minimise the overall effect on the environment in the proposed exploration area.

It is therefore concluded that all significant impacts identified during this Environmental Impact Assessment can be mitigated through management actions implemented during the proposed exploration activities for marble. It is important that the Environmental Management Plan developed for the project be implemented during the exploration activities for marble otherwise the impacts identified will remain unacceptable.

6.2. Recommendations

Based on the findings of this Environmental Impact Assessment study, it is recommended that once the clearance certificate has been awarded by the Ministry of Environment and Tourism that they take all necessary steps to ensure that all recommendations of the EMP are adhered to. This will promote the successful implementation and completion of the proposed exploration activities for marble in EPL 7280

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8 APPENDICES

Appendix A

Tables:

1. **Trees and shrubs in the area**
2. **Grass Diversity**
3. **Reptile Diversity**
4. **Amphibian Diversity**
5. **Mammal Diversity**
6. **Avian Diversity**

Appendix B

Background Information Document

Appendix C

Newspaper Advert

Appendix D

Copy of Licence EPL 7280

Appendix E

Copy of Company Documents

Appendix F

CV of consultants

Appendix A

Tables:

7. **Trees and shrubs in the area**
8. **Grass Diversity**
9. **Reptile Diversity**
10. **Amphibian Diversity**
11. **Mammal Diversity**

Avian Diversity The following table indicates the trees & shrubs known and/or expected to occur in the general Karibib area and are derived from Curtis & Mannheimer (2005). Some species indicated to possibly occur in the area according to Coats Palgrave (1983) and Van Wyk & Van Wyk (1997) are excluded here.

Table 1: Trees and shrubs expected/in the study area

Species: Scientific name	Expected	Status
Acacia erioloba	√	Protected (F)
Acacia erubescens	√	
Acacia fleckii	√	
Acacia hebeclada	√	
Acacia hereroensis	√	
Acacia karroo	√	
Acacia luederitzii	√	
Acacia mellifera subsp. detinens	√	
Acacia reficiens	√	
Acacia senegal	√	
Acacia tortilis	√	
Adenium boehmianum	√	
Adenolobus garipensis	√	
Albizia anthelmintica		Protected (F)
Aloe dichotoma	√	NC, C2
Aloe litoralis	√	NC, C2

Azima tetracantha	∫	
Boscia albitrunca	∫	Protected (F)
Boscia foetida	∫	
Caesalpinia rubra	∫	
Catophractes alexandri	∫	
Combretum apiculatum	∫	
Combretum hereroense	∫	
Combretum imberbe	∫	Protected (F)
Commiphora africana	∫	
Commiphora angolensis	∫	
Commiphora dinteri	∫	Endemic
Commiphora glandulosa	∫	
Commiphora glaucescens	∫	
Commiphora pyracanthoides	∫	
Commiphora saxicola	∫	Endemic
Commiphora tenuipetiolata	∫	
Commiphora virgata	∫	Endemic
Cordia sp. [C. monoica]	∫	
Cordia sinensis	∫	
Croton gratissimus	∫	
Cyphostemma bainesii	∫	Endemic NC
Cyphostemma currorii	∫	NC
Dichrostachys cinerea	∫	
Diospyros lycioides	∫	
Dombeya rotundifolia	∫	

Ehretia alba	✓	
Erythrina decora	✓	Endemic
Elephantorrhiza suffruticosa	✓	
Euclea pseudebenus	✓	Protected (F)
Euclea undulata	✓	
Euphorbia avasmontana	✓	C2
Euphorbia damarana	✓	Endemic C2
Euphorbia guerichiana	✓	C2
Euphorbia virosa	✓	C2
Faidherbia albida	✓	Protected (F)
Flueggea virosa	✓	
Ficus cordata	✓	Protected (F)
Ficus ilicina	✓	
Ficus sycomorus	✓	Protected (F)
Grewia avellana	✓	
Grewia bicolor	✓	
Grewia flava	✓	
Grewia flavescens	✓	
Grewia retinervis	✓	
Grewia tenax	✓	
Grewia villosa	✓	
Gymnosporia buxifolia	✓	
Gymnosporia maranguensis	✓	
Gymnosporia senegalensis	✓	
Lycium bosciifolium	✓	

Lycium eenii	ſ	
Maerua juncea	ſ	
Maerua parvifolia	ſ	
Maerua schinzii	ſ	Protected (F)
Manuleopsis dinteri	ſ	
Montinia caryophyllacea	ſ	
Moringa ovalifolia	ſ	NC
Mundulea sericea	ſ	
Nymania capensis	ſ	
Obetia carruthersiana	ſ	
Osyris lanceolata	ſ	
Ozoroa crassinervia	ſ	Protected (F)
Parkinsonia africana	ſ	Protected (F)
Phaeoptilum spinosum	ſ	
Rotheca myricoides	ſ	
Rhus lancea	ſ	Protected (F)
Rhus marlothii	ſ	
Rhus tenuinervis	ſ	
Rhus undulata	ſ	
Rhigozum brevispinosum	ſ	
Rhigozum trichotomum	ſ	
Salvadora persica	ſ	
Steganotaenia araliacea	ſ	
Sterculia africana	ſ	Protected (F)
Sterculia quinqueloba	ſ	Protected (F)
Strophanthus amboensis	ſ	

Tamarix usneoides	√	Protected (F)
Tarchonanthus camphoratus	√	
Tinnea rhodesiana	√	
Terminalia pruniodes	√	
Vangueria cyanescens	√	
Vangueria infausta	√	
Ximenia americana	√	
Ximenia caffra	√	
Ziziphus mucronata	√	Protected (F)

Endemic (Craven 1999)

F – Forestry Ordinance No. 37 of 1952 and/or Forest Act No. 72 of 1968 (Curtis & Mannheimer 2005)

NC – Nature Conservation Ordinance No. 4 of 1975 (Curtis & Mannheimer 2005)

The following table indicates the grasses known and/or expected to occur in the general Karibib area and are derived from [1]Müller (2007) and [2]Van Oudtshoorn (1999).

Table 2: Grass Diversity

Species: Scientific name	Expected	Ecological Status *	Grazing Value *
[1,2]*Andropogon chinensis*	√	Increaser 1	Average
[2]*Andropogon eucomus*	√	Increaser 2	Low
[1]*Anthephora argentea*	√	Decreaser	High
[1,2]*Anthephora pubescens*	√	Decreaser	High
[1]*Anthephora schinzii*	√	Increaser 2	Low
[1,2]*Aristida adscensionis*	√	Increaser 2	Low
[1,2]*Aristida congesta*	√	Increaser 2	Low

[1]*Aristida effusa*	√	Increaser 2	Low
[1,2]*Aristida meridionalis*	√	Increaser 2	Low
[1]*Aristida rhiniochloa*	√	Increaser 2	Low
[1,2]*Bachiaria deflexa*	√	Increaser 2	Average
[1]*Brachiaria malacodes*	√	?	Low
[1]*Brachiaria glomerata*	√	Decreaser	Average
[1,2]*Brachiaria nigropedata*	√	Decreaser	High
[1,2]*Cenchrus ciliaris*	√	Decreaser	High

[1,2]*Centropodia glauca*	✓	Decreaser	High
[1,2]*Chloris virgata*	✓	Increaser 2	Average
[2]*Cladoraphis spinosa*	✓	Increaser 1	Low
[1,2]*Cynodon dactylon*	✓	Increaser 2	High
[1,2]*Dactyloctenium aegyptium*	✓	Increaser 2	Low
[1]*Danthoniopsis ramosa*	✓	?	High
[1,2]*Dichanthium annulatum*	✓	Decreaser	High
[2]*Diplachne fusca*	✓	Decreaser	High
[1]*Echinochloa colona*	✓	?	Low
[2]*Elionurus muticus*	✓	Increaser 2	Low
[1,2]*Enneapogon cenchroides*	✓	Increaser 2	Low
[1,2]*Enneapogon desvauxii*	✓	Intermediate	Average
[1,2]*Enneapogon scaber*	✓	?	Low
[1,2]*Enneapogon scoparius*	✓	Increaser 2	Low
[1]*Entoplocamia aristulata*	✓	Intermediate	Low
[1,2]*Eragrostis annulata*	✓	Increaser 2	Low
[1]*Eragrostis cylindriflora*	✓	?	Low
[2]*Eragrostis biflora*	✓	Increaser 2	Low
[2]*Eragrostis cilianensis*	✓	Increaser 2	Low
[1,2]*Eragrostis echinochloidea*	✓	Increaser 2	Average
[1]*Eragrostis homomalla*	✓	?	Low
[2]*Eragrostis lehmanniana*	✓	Increaser 2	Average
[1,2]*Eragrostis nindensis*	✓	Increaser 2	Average
[1]*Eragrostis omahekensis* **[E]**	✓	?	Low
[1]*Eragrostis porosa*	✓	Intermediate	Low
[1]*Eragrostis rigidior*	✓	Increaser 2	Average

[1,2]*Eragrostis rotifer*	✓	Intermediate	Low
[1]*Eragrostis scopelophila*	✓	?	High
[1,2]*Eragrostis superba*	✓	Increaser 2	Average
[1,2]*Eragrostis trichophora*	✓	Increaser 2	Average
[1,2]*Eragrostis viscosa*	✓	Increaser 2	Low
[1,2]*Fingerhuthia africana*	✓	Decreaser	Average
[1,2]*Heteropogon contortus*	✓	Increaser 2	Average
[1,2]*Hyparrhenia hirta*	✓	Increaser 1	Average
[1]*Leptochloa fusca*	✓	?	Average
[1,2]*Microchloa caffra*	✓	Increaser 2	Low
[1]*Monelytrum luederitzianum*	✓	?	Average
[1,2]*Melinis repens*	✓	Increaser 2	Low
[1]*Odyssea paucinervis*	✓	?	Average
[1,2]*Oropetium capense*	✓	?	Low
[1,2]*Panicum coloratum*	✓	Decreaser	High
[1,2]*Panicum maximum*	✓	Decreaser	High
[2]*Panicum repens*	✓	Decreaser	High
[1]*Pogonarthria fleckii*	✓	Increaser 2	Low
[2]*Polypogon monspeliensis*	✓	?	Average
[1,2]*Schmidtia kalahariensis*	✓	Increaser 2	Low
[1,2]*Schmidtia pappophoroides*	✓	Decreaser	High
[1]*Setaria appendiculata*	✓	?	Average
[1,2]*Setaria verticillata*	✓	Increaser 2	Average
[1]*Sorghum bicolour*	✓	?	Average
[1,2]*Sporobolus festivus*	✓	Increaser 2	Low
[1,2]*Stipagrostis ciliata*	✓	Decreaser	High

[1]*Stipagrostis giessii*	√	?	Average
[1,2]*Stipagrostis hirtigluma*	√	Increaser 2	Low
[1]*Stipagrostis hochstetteriana*	√	Decreaser	Average
[1,2]*Stipagrostis namaquensis*	√	?	Average
[1,2]*Stipagrostis obtusa*	√	Decreaser	High
[1,2]*Stipagrostis uniplumis*	√	Increaser 2	Average
[1,2]*Tricholaena monachne*	√	Increaser 2	Average
[1]*Triraphis purpurea*	√	?	Low
[1]*Triraphis ramosissima*	√	?	Average
[1,2]*Tragus berteronianus*	√	Increaser 2	Low
[1]*Tragus racemosus*	√	Increaser 2	Low
[1]*Urochloa brachyura*	√	?	Average
[1]*Urochloa panicoides*	√	?	Low

Endemic (Craven 1999)

F – Forestry Ordinance No. 37 of 1952 and/or Forest Act No. 72 of 1968 (Curtis & Mannheimer 2005)

NC – Nature Conservation Ordinance No. 4 of 1975 (Curtis & Mannheimer 2005)

C2 – CITES Appendix 2 (Curtis & Mannheimer 2005)

The following table indicates the reptile diversity known and/or expected to occur in the general Karibib area:

Table 3: Reptile Diversity

Species: Scientific name	Species: Common name	Expected	Status
TORTOISES & TERRAPINS			
Geochelone pardalis	Leopard Tortoise	√	

Psammobates oculiferus	Kalahari Tent Tortoise	✓	
Pelomedusa subrufa	Marsh/Helmeted Terrapin	✓	
SNAKES			
Blind Snakes			
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	✓	Endemic
Thread Snakes			
Leptotyphlops occidentalis	Western Thread Snake	✓	Endemic
Leptotyphlops labialis	Damara Thread Snake	✓	
Pythons			
Python natalensis	Southern African Python	✓	
Python anchietae	Anchieta's Dwarf Python	✓	Endemic
Burrowing Snakes			
Atractaspis bibronii	Southern/Bibron's Burrowing Asp	✓	
Xenocalamus bicolour bicolor	Bicoloured Quill-snouted Snake	✓	
Typical Snakes			
Lamprophis fuliginosus	Brown House Snake	✓	
Lycophidion capense	Cape Wolf Snake	✓	
Lycophidion namibianum	Namibian Wolf Snake	✓	Endemic
Mehelya capensis	Cape File Snake	✓	
Mehelya vernayi	Angola File Snake	✓	
Pseudaspis cana	Mole Snake	✓	
Pythonodipsas carinata	Western Keeled Snake	✓	
Prosymna frontalis	South-western Shovel-snout	✓	
Hemirhagerrhis viperinus	Viperine Bark Snake	✓	

Dipsina multimaculata	Dwarf Beaked Snake	✓	Endemic
Psammophis trigrammus	Western Sand Snake	✓	
Psammophis notostictus	Karoo Sand Snake	✓	
Psammophis leightoni namibensis	Namib Sand Snake	✓	
Psammophis brevirostris leopardinus	Leopard Grass Snake	✓	
Philothamnus semivariegatus	Spotted Bush Snake	✓	
Dasypeltis scabra	Common/Rhombic Egg Eater	✓	
Telescopus semiannulatus polystrictus	Eastern Tiger Snake	✓	
Aspidelaps lubricus infuscatus	Coral Snake	✓	
Aspidelaps scutatus scutatus	Shield-nose Snake	✓	Endemic
Naja nivea	Cape Cobra	✓	Endemic
Naya nigricollis nigricincta	Black-necked Spitting Cobra	✓	Endemic
Bitis arietans	Puff Adder	✓	
Bitis caudalis	Horned Adder	✓	
WORM LIZARDS			
Zygaspis quadrifrons	Kalahari Round-headed Worm Lizard	✓	
LIZARDS			
Skinks			
Typhlosaurus braini	Brain's Blind Legless Skink	✓	Endemic
Typhlacontias brevipes	FitzSimon's Burrowing Skink	✓	Endemic
Mabuya acutilabris	Wedge-snouted Skink	✓	

Mabuya capensis	Cape Skink	✓	
Mabuya hoeschi	Hoesch's Skink	✓	
Mabuya occidentalis	Western Three-striped Skink	✓	
Mabuya spilogaster	Kalahari Tree Skink	✓	
Mabuya striata wahlbergi	Striped Skink	✓	
Mabuya sulcata	Western Rock Skink	✓	
Mabuya variegata variegata	Variegated Skink	✓	
Old World Lizards			
Heliobolus lugubris	Bushveld Lizard	✓	
Meroles anchietae	Shovel-snouted Lizard	✓	
Meroles cuneirostris	Wedge-snouted Lizard	✓	Endemic
Meroles micropholidotus	Small-scaled Desert Lizard	✓	Endemic
Meroles reticulatus	Reticulated Desert Lizard	✓	
Meroles suborbitalis	Spotted Desert Lizard	✓	Endemic
Pedioplanis breviceps	Short-headed Sand Lizard	✓	Endemic
Pedioplanis namaquensis	Namaqua Sand Lizard	✓	
Pedioplanis undata	Western Sand Lizard	✓	
Pedioplanis inornata	Plain Sand Lizard	✓	Endemic
Pedioplanis husabensis	Husab Sand Lizard	✓	Endemic
Plated Lizards			
Cordylosaurus subtessellatus	Dwarf Plated Lizard	✓	
Gerrhosaurus validus	Giant Plated Lizard	✓	
Girdled Lizards			
Cordylus jordani	Jordan's Girdled Lizard	✓	Endemic

Monitors			
Varanus albigularis	Rock Monitor	✓	
Agamas			
Agama anchietae	Anchieta's Agama	✓	
Agama planiceps	Namibian Rock Agama	✓	Endemic
Chameleons			
Chamaeleo namaquensis	Namaqua Chameleon	✓	
Geckos			
Afroedura africana	African Flat Gecko	✓	Endemic
Chondrodactylus angulifer angulifer + C. a. namibensis	Giant Ground Gecko	✓	Endemic
Lygodactylus bradfieldi	Bradfield's Dwarf Gecko	✓	Endemic
Narudasia festiva	Festive Gecko	✓	Endemic
Pachydactylus bicolour	Velvety Thick-toed Gecko	✓	Endemic
Pachydactylus capensis	Cape Thick-toed Gecko	✓	Endemic
Pachydactylus kochii	Koch's Thick-toed Gecko	✓	Endemic
Pachydactylus turneri	Turner's Thick-toed Gecko	✓	Endemic
Pachydactylus punctatus	Speckled Thick-toed Gecko	✓	
Pachydactylus rugosus	Rough Thick-toed Gecko	✓	Endemic
Pachydactylus scherzi	Namib Variable Gecko	✓	Endemic
Pachydactylus weberi	Weber's Thick-toed Gecko	✓	Endemic
Palmatogecko rangei	Web-footed Gecko	✓	
Ptenopus carpi	Carp's Barking Gecko	✓	Endemic
Ptenopus garrulus garrulous + P. g. maculatus	Common Barking Gecko	✓	Endemic

Ptenopus kochi	Kock's Barking Gecko	✓	Endemic
Rhoptropus afer	Common Namib Day Gecko	✓	
Rhoptropus boultoni	Boulton's Namib Day Gecko	✓	
Rhoptropus bradfieldi	Bradfield's Namib Day Gecko	✓	Endemic

Source for literature review: Branch (1998), Branch (2008), Bonin *et al.* (2006), Boycott & Bourquin 2000, Broadley (1983), Buys & Buys (1983), Cunningham (2006a), Griffin (2003), Griffin (2005a), Hebbard (n.d.), Marais (1992)

The following table indicates the amphibian diversity known and/or expected to occur in the general Karibib area:

Table 4: Amphibian Diversity

Species: Scientific name	Species: Common name	Expected	Status
Platannas			
Xenopus laevis	Common Platanna	✓	
Toads			
Bufo dombensis	Dombe Toad	✓	Endemic
Bufo hoeschi	Hoesch's Toad	✓	Endemic
Bufo poweri	Power's Toad or Western Olive Toad	✓	
Kassinas			
Kassina senegalensis	Bubbling Kasina	✓	
Rain Frogs			
Breviceps adspersus	Common/Bushveld Rain Frog	✓	
Rubber Frog			
Phrynomantis annectens	Marbled Rubber Frog	✓	Endemic

Bull & Sand Frogs			
Pyxicephalus adspersus	Giant Bullfrog or African Bullfrog	✓	
Tomopterna cryptotus	Tremolo Sand Frog	✓	

Source for literature review: Carruthers (2001), Channing (2001), Channing & Griffin (1993), Griffin (1998b), Passmore & Carruthers (1995)

The following table indicates the mammal diversity known and/or expected to occur in the general Karibib area:

Table 5: Mammal Diversity

Species: Scientific name	Species: Common name	Expected	Status
Shrews			
Crosidura cyanea	Reddish-grey Musk Shrew	✓	
Hedgehog			
Atelerix frontalis	South African Hedgehog	✓	[1]Near Threatened
Elephant Shrews			
Macroscelides proboscideus	Round-eared Elephant-shrew	✓	Endemic [2]Vulnerable
Elephantulus rupestris	Smith's Rock Elephant-shrew	✓	[2]Vulnerable
Elephantulus intufi	Bushveld Elephant-shrew	✓	
Bats			
Sauromys petrophilus	Flat-headed Free-tailed Bat	✓	

Tadarida aegyptiaca	Egyptian Free-tailed Bat	✓	
Myotis seabrai	Angola Hairy Bat	✓	
Cistugo seabrai	Namibian Wing-gland Bat	✓	Endemic [1]Vulnerable
Laephotis namibensis	Namib Long-eared Bat	✓	Endemic [2]Endangered
Eptesicus hottentotus	Long-tailed Serotine Bat	✓	
Pipistrellus capensis	Cape Serotine Bat	✓	
Nycteris thebaica	Common Slit-faced Bat	✓	
Rhinolophus fumigatus	Rüppell's Horseshoe Bat	✓	[1]Near Threatened
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	✓	[1]Near Threatened
Rhinolophus darlingi	Darling's Horseshoe Bat	✓	[1]Near Threatened
Rhinolophus denti	Dent's Horseshoe Bat	✓	[1]Near Threatened
Hipposideros caffer	Sundevall's Leaf-nosed Bat	✓	
Monkeys & Baboons			
Papio ursinus	Chacma Baboon	✓	
Pangolin			
Manis temminckii	Pangolin	✓	[1]Vulnerable CITES Appendix II
Hares & Rabbits			
Lepus capensis	Cape Hare	✓	
Lepus saxatilis	Scrub Hare	✓	

Pronolagus randensis	Jameson's Red Rock Rabbit	✓	
Rodents			
Molerat			
Cryptomys damarensis	Damara Molerat	✓	
Squirrels			
Xerus inauris	Cape Ground Squirrel	✓	
Xerus princeps	Mountain Ground Squirrel	✓	Endemic [1]Near Threatened
Porcupine, Springhare & Dassie Rat			
Hystrix africaeaustralis	Cape Porcupine	✓	
Pedetes capensis	Springhare	✓	
Petromus typicus	Dassie Rat	✓	Endemic [1]Near Threatened
Rats & Mice			
Graphiurus rupicola	Western Rock Dormouse	✓	Endemic
Parotomys littledalei	Littledale's Whistling Rat	✓	Endemic [1]Near Threatened
Rhabdomys pumilio	Striped Mouse	✓	
Mus musculus	House Mouse	✓	Invasive alien
Mus indutus	Desert Pygmy Mouse	✓	
Thallomys nigricauda	Black-tailed Tree Rat	✓	
Aethomys namaquensis	Namaqua Rock Mouse	✓	
Aethomys chrysophilus	Red Veld Rat	✓	
Rattus rattus	House Rat	✓	Invasive alien

Desmodillus auricularis	Short-tailed Gerbil	✓	
Gerbillurus paeba infernus	Hairy-footed Gerbil	✓	Endemic
Gerbillurus setzeri	Setzer's Hairy-footed Gerbil	✓	Endemic
Tatera leucogaster	Bushveld Gerbil	✓	
Saccostomus campestris	Pouched Mouse	✓	
Malacothrix typical	Large-eared Mouse	✓	
Petromyscus collinus	Pygmy Rock Mouse	✓	Endemic
Carnivores			
Proteles cristatus	Aardwolf	✓	
Hyaena brunnea	Brown Hyena	✓	[1]Near Threatened [2]Endangered
Crocuta crocuta	Spotted Hyena	✓	
Acinonyx jubatus	Cheetah	✓	[2]Vulnerable; CITES Appendix 1
Panthera pardus	Leopard	✓	[2]Near threatened
Felis caracal	Caracal	✓	
Felis lybica	African Wild Cat	✓	
Otocyon megalotis	Bat-eared Fox	✓	
Vulpes chama	Cape Fox	✓	
Canis mesomelas	Black-backed Jackal	✓	
Mellivora capensis	Ratel or Honey Badger	✓	[1]Near Threatened
Ictonyx striatus	Striped Polecat	✓	
Genetta genetta	Small-spotted Genet	✓	

Suricata suricatta	Suricate	✓	
Cynictis penicillata	Yellow Mongoose	✓	
Galerella sanguinea	Slender Mongoose	✓	
Galerella nigrata	Black Mongoose	✓	Endemic
Aardvark			
Orycteropus afer	Aardvark	✓	
Dassie			
Procavia capensis	Rock Dassie	✓	
Zebra			
Equus zebra hartmannae	Hartmann's Mountain Zebra	✓	Endemic
Pig			
Phacochoerus aethiopicus	Warthog	✓	
Antelopes			
Sylvicapra grimmia	Common Duiker	✓	
Antidorcas marsupialis	Springbok	✓	
Oreotragus oreotragus	Klipspringer	✓	
Madoqua kirkii	Damara Dik-Dik	✓	
Raphicerus campestris	Steenbok	✓	
Oryx gazella	Gemsbok	✓	
Tragelaphus strepsiceros	Kudu	✓	

[1]SARDB (2004)

[2]IUCN (2008)

Source for literature review: De Graaff (1981), Griffin (2005), Estes (1995), Joubert & Mostert (1975), Skinner & Smithers (1990) & Taylor (2000)

The following table indicates the avian diversity known and/or expected to occur in the general Karibib area. This table excludes aquatic and migratory birds and/or birds only attracted to the area after localized rain showers, but rather focus on birds that are breeding residents or can be found in the area during any time of the year. This would imply that many more birds could occur in the area depending on “favourable” environmental conditions.

Table 6: Avian Diversity

Species: Scientific name	Species: Common name	Expected	Status
Struthio camelus	Common Ostrich	✓	
Leptoptilos crumeniferus	Marabou Stork	✓	
Sagittarius serpentarius	Secretarybird	✓	
Gyps coprotheres	Cape Vulture	✓	Endemic (southern Africa)
Gyps africanus	White-backed Vulture	✓	
Torgos tracheliotus	Lappet-faced Vulture	✓	
Elanus caeruleus	Black-shouldered Kite	✓	
Aquila verreauxii	Verreaux’s Eagle	✓	
Aquila rapax	Tawny Eagle	✓	
Hieraaetus fasciatus	African Hawk-Eagle	✓	
Polemaetus bellicosus	Martial Eagle	✓	
Circaetus cinereus	Brown Snake Eagle	✓	
Circaetus gallicus	Black-chested Snake Eagle	✓	
Buteo augur	Augur Buzzard	✓	
Buteo rufofuscus	Jackal Buzzard	✓	Endemic (southern Africa)
Accipter badius	Shikra	✓	

Micronisus gabar	Gabar Goshawk	✓	
Melierax canorus	Southern Pale Chanting Goshawk	✓	Near endemic
Accipiter minullus	Little Sparrowhawk	✓	
Accipiter ovampensis	Ovambo Sparrowhawk	✓	
Circus maurus	Black Harrier	✓	
Falco peregrinus	Peregrine Falcon	✓	
Falco biarmicus	Lanner Falcon	✓	
Falco chicquera	Red-necked Falcon	✓	
Falco tinnunculus	Rock Kestrel	✓	
Falco rupicoloides	Greater Kestrel	✓	
Polihierax semitorquatus	Pygmy Falcon	✓	
Scleroptila levailantoides	Orange River Francolin	✓	Near endemic
Francolinus adspersus	Red-billed Spurfowl	✓	Near endemic
Francolinus hartlaubi	Hartlaub's Spurfowl	✓	Endemic
Coturnix coturnix	Common Quail	✓	
Coturnix delegorguei	Harlequin Quail	✓	
Numida meleagris	Helmeted Guineafowl	✓	
Trunix sylvatica	Kurrichane Buttonquail	✓	
Ardeotis kori	Kori Bustard	✓	
Neotis ludwigii	Ludwig's Bustard	✓	Near endemic
Eupodotis rueppellii	Rüppell's Korhaan	✓	Endemic
Eupodotis rufisrista	Red-crested Korhaan	✓	Near endemic
Eupodotis afra	Northern Black Korhaan	✓	Endemic (southern Africa)
Vanellus coronatus	Crowned Lapwing	✓	

Vanellus armatus	Blacksmith Lapwing	✓	
Burhinus capensis	Spotted Thick-knee	✓	
Cursorius rufus	Burchell's Courser	✓	Near endemic
Cursorius temminckii	Temminck's Courser	✓	
Rhinoptilus africanus	Double-banded Courser	✓	
Rhinoptilus chalcopterus	Bronze-winged Courser	✓	
Pterocles namaqua	Namaqua Sandgrouse	✓	Near endemic
Pterocles bicinctus	Double-banded Sandgrouse	✓	Near endemic
Columba livea	Rock Dove	✓	
Columba guinea	Speckled Pigeon	✓	
Streptopelia capicola	Cape Turtle Dove	✓	
Streptopelia senegalensis	Laughing Dove	✓	
Oena capensis	Namaqua Dove	✓	
Poicephalus rueppellii	Rüppell's Parrot	✓	Endemic
Agapornis roseicollis	Rosy-faced Lovebird	✓	Endemic
Corythaixoides concolor	Grey Go-away-bird	✓	
Tyto alba	Barn Owl	✓	
Otus senegalensis	African Scops-Owl	✓	
Otus leucotis	Southern White-faced Scops-Owl	✓	
Glaucidium perlatum	Pearl-spotted Owlet	✓	
Bubo africanus	Spotted Eagle-Owl	✓	
Bubo lacteus	Verreaux's Eagle-Owl	✓	
Caprimulgus pectoralis	Fiery-necked Nightjar	✓	
Caprimulgus tristigma	Freckled Nightjar	✓	
Caprimulgus rufigenta	Rufous-cheeked Nightjar	✓	

Cypsiurus parvus	African Palm-Swift	✓	
Apus bradfieldi	Bradfield's Swift	✓	Near endemic
Apus affinis	Little Swift	✓	
Colius colius	White-backed Mousebird	✓	Endemic (southern Africa)
Colius indicus	Red-faced Mousebird	✓	
Merops hirundineus	Swallow-tailed Bee-eater	✓	
Coracias caudate	Lilac-breasted Roller	✓	
Coracias naevia	Purple Roller	✓	
Upupa africana	African Hoopoe	✓	
Phoeniculus purpureus	Green Wood-Hoopoe	✓	
Phoeniculus damarensis	Violet Wood-Hoopoe	✓	Endemic
Phoeniculus cyanomelas	Common Scimitarbill	✓	
Tockus nasutus	African Grey Hornbill	✓	
Tockus damarensis	Damara Hornbill	✓	Near endemic
Tockus flavirostris	Southern Yellow-billed Hornbill	✓	Near endemic
Tockus monteiri	Monteiro's Hornbill	✓	Endemic
Lybius leucomelas	Acacia Pied Barbet	✓	Near endemic
Indicator minor	Lesser Honeyguide	✓	
Campethera abingoni	Golden-tailed Woodpecker	✓	
Dendropicos fuscescens	Cardinal Woodpecker	✓	
Thrioias namaquus	Bearded Woodpecker	✓	
Mirafra passerine	Monotonous Lark	✓	Near endemic
Mirafra africana	Rufous-naped Lark	✓	
Mirafra apiata	Eastern Clapper Lark	✓	Near endemic

Mirafra africanoides	Fawn-coloured Lark	ſ	Near endemic
Mirafra sabota	Sabota Lark	ſ	
Pinarocorys nigricans	Dusky Lark	ſ	
Ammomanopsis grayi	Gray's Lark	ſ	Endemic
Certhilauda subcoronata	Karoo Long-billed Lark	ſ	
Chersomanes albofasciata	Spike-heeled Lark	ſ	
Calandrella cinerea	Red-capped Lark	ſ	
Alauda starki	Stark's Lark	√	Near endemic
Eremopterix leucotis	Chestnut-backed Sparrowlark	ſ	
Eremopterix verticalis	Grey-backed Sparrowlark	ſ	Near endemic
Hirundo fuligula	Rock Martin	ſ	
Riparia paludicola	Brown-throated Martin	ſ	
Dicrurus adsimilis	Fork-tailed Drongo	ſ	
Terpsiphone viridis	African Paradise-Flycatcher	ſ	
Corvus capensis	Cape Crow	ſ	
Corvus albus	Pied Crow	ſ	
Parus cinerascens	Ashy Tit	ſ	Near endemic
Parus carpi	Carp's Tit	ſ	Endemic
Anthoscopus minutes	Cape Penduline-Tit	ſ	Near endemic
Turdoides bicolour	Southern Pied Babbler	ſ	
Pycnonotus nigricans	African Red-eyed Bulbul	ſ	Near endemic
Turdus litsitsirupa	Groundscraper Thrush	ſ	
Monticola brevipes	Short-toed Rock-Thrush	ſ	Near endemic
Oenanthe monticola	Mountain Wheatear	ſ	Near endemic
Oenanthe pileata	Capped Wheatear	ſ	

Cercomela familiaris	Familiar Chat	✓	
Cercomela tractrac	Tractrac Chat	✓	Near endemic
Cercomela schlegelii	Karoo Chat	✓	Near endemic
Myrmecocichla formicivora	Ant-eating Chat	✓	Endemic (southern Africa)
Cercotrichas leucophrys	White-browed Scrub- Robin	✓	
Erythropygia paena	Kalahari Scrub-Robin	✓	
Namibornis herero	Herero Chat	✓	Endemic
Parisoma subcaeruleum	Chestnut-vented Tit-Babbler	✓	Near endemic
Parisoma layardi	Layard's Tit-Babbler	✓	Endemic (southern Africa)
Sylvietta rufescens	Long-billed Crombec	✓	
Eremomela icteropygialis	Yellow-bellied Eremomela	✓	
Eremomela gregalis	Karoo Eremomela	✓	Endemic (southern Africa)
Eremomela usticollis	Burnt-necked Eremomela	✓	
Camaroptera fasciolata	Barren Wren-Warbler	✓	Near endemic
Achaetops pycnopygius	Rockruner	✓	Endemic
Cisticola aridula	Desert Cisticola	✓	
Cisticola subruficapilla	Grey-backed Cisticola	✓	Near endemic
Cisticola juncidis	Zitting Cisticola	✓	
Prinia flavicans	Black-chested Prinia	✓	
Malcorus pectoralis	Rufous-eared Warbler	✓	
Camaroptera brevicaudata	Grey-backed Camaroptera	✓	
Melaenornis mariquensis	Marico Flycatcher	✓	Near endemic
Melaenornis infuscatus	Chat Flycatcher	✓	Near endemic

Muscicapa striata	Spotted Flycatcher	✓	
Batis pririt	Pririt Batis	✓	Near endemic
Motacila capensis	Cape Wagtail	✓	
Anthus cinnamomeus	African Pipit	✓	Endemic (southern Africa)
Anthus similes	Long-billed Pipit	✓	
Lanius collaris	Common Fiscal	✓	
Eurocephalus anguitimens	Southern White-crowned Shrike	✓	Near endemic
Laniarius atrococcineus	Crimson-breasted Shrike	✓	Near endemic
Nilaus afer	Brubru	✓	
Tchagra australis	Brown-crowned Tchagra	✓	
Telophorus zeylonus	Bokmakierie	✓	Near endemic
Lanioturdus torquatus	White-tailed Shrike	✓	Endemic
Creatophora cinerea	Wattled Starling	✓	
Lamprotornis australis	Burchell's Starling	✓	Near endemic
Lamprotornis nitens	Cape Glossy Starling	✓	
Onychognathus nabouroup	Pale-winged Starling	✓	Near endemic
Cinnyricinclus leucogaster	Violet-backed Starling	✓	
Nectarinia mariquensis	Marico Sunbird	✓	
Nectarinia fusca	Dusky Sunbird	✓	
Nectarinia senegalensis	Scarlet-chested Sunbird	✓	
Zosterops pallidus	Orange River White-eye	✓	Endemic (southern Africa)
Bubalornis niger	Red-billed Buffalo- Weaver	✓	
Plocepasser mahali	White-browed Sparrow-weaver	✓	

Philetairus socius	Sociable Weaver	✓	Endemic (southern Africa)
Passer domesticus	House Sparrow	✓	
Passer motitensis	Great Sparrow	✓	Near endemic
Passer melanurus	Cape Sparrow	✓	Near endemic
Passer griseus	Southern Grey-headed Sparrow	✓	
Sporopipes squamifrons	Scaly-feathered Finch	✓	
Ploceus velatus	Southern Masked Weaver	✓	
Ploceus rubiginosus	Chestnut Weaver	✓	
Quelea quelea	Red-billed Quelea	✓	
Pytilia melba	Green-winged Pytilia	✓	
Uraeginthus granatinus	Violet-eared Waxbill	✓	
Estrilda astrild	Common Waxbill	✓	
Estrilda erythronotos	Black-faced Waxbill	✓	
Amadina erythrocephala	Red-headed Finch	✓	Near endemic
Vidua regia	Shaft-tailed Whydah	✓	Near endemic
Serinus atrogularis	Black-throated Canary	✓	
Serinus alario	Black-headed Canary	✓	Endemic (southern Africa)
Serinus flaviventris	Yellow Canary	✓	Near endemic
Serinus albogularis	White-throated Canary	✓	Near endemic
Emberiza capensis	Cape Bunting	✓	Near endemic
Emberiza tahapisi	Cinnamon-breasted Bunting	✓	
Emberiza flaviventris	Golden-breasted Bunting	✓	
Emberiza impetuani	Lark-like Bunting	✓	Near endemic

Source for literature review: Brown *et al.* (1998), Hockey *et al.* (2006), Komen (n.d.), Maclean (1985) & Tarboton (2001)

* Names of birds follow the new *Roberts* (2006) classification system.

* Near endemic (largely restricted to southern Africa) & endemic to Southern Africa (confined to southern Africa) as classified by Hockey *et al.* (2006).