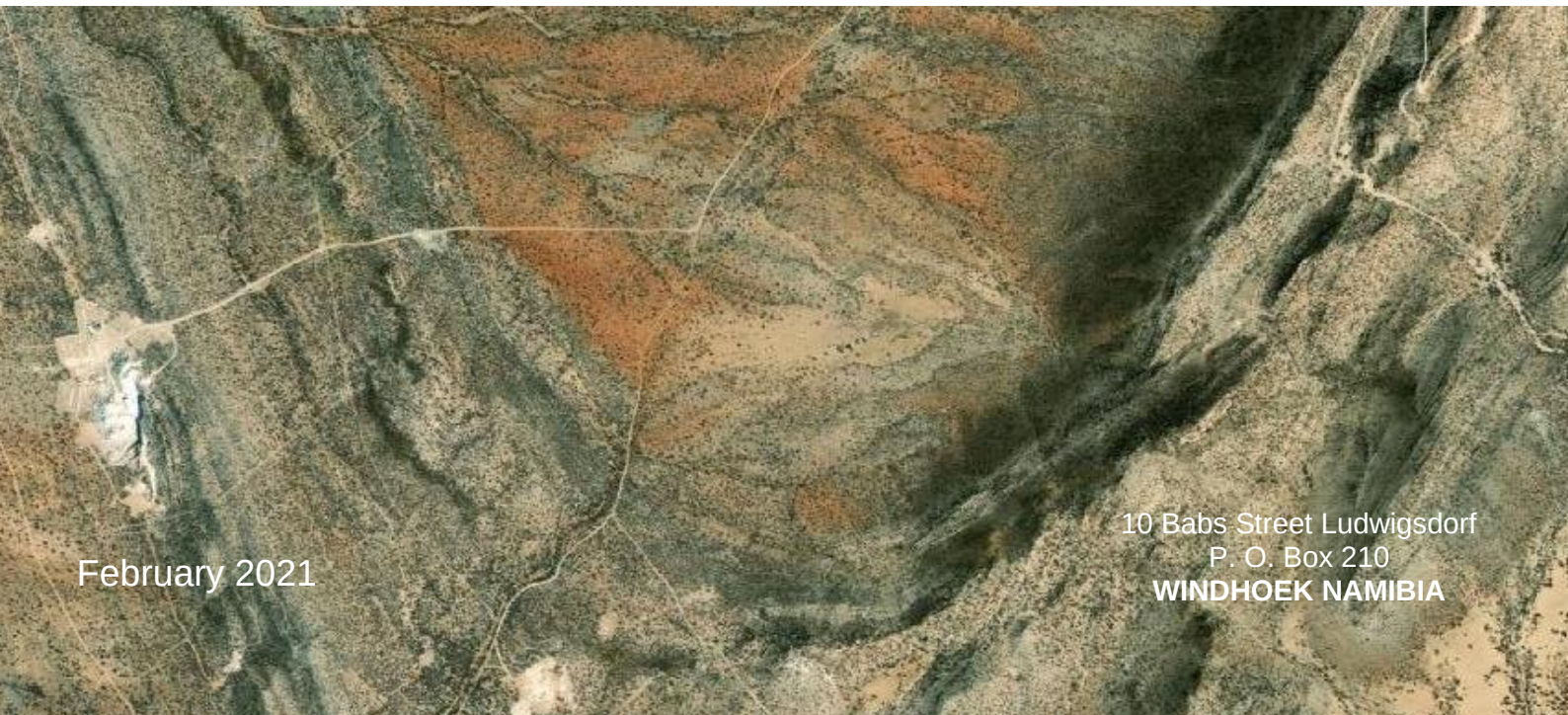
Ludi Namibia Mining and Investments (Pty) Ltd

Updated Environmental Impact Assessment (EIA) Report to Support the Application for the Renewal of the Environmental Clearance Certificate (ECC) for Mining License (ML) No. 205

KARIBIB DISTRICT, ERONGO REGION



February 2021

10 Babs Street Ludwigsdorf
P. O. Box 210
WINDHOEK NAMIBIA

PROPONENT, LISTED ACTIVITIES AND RELATED INFORMATION SUMMARY

TYPE OF AUTHORISATIONS REQUIRING ECC

Mining License (ML) No. 205

NAME OF THE PROPONENT

Ludi Namibia Mining and Investments (Pty) Ltd

COMPETENT AUTHORITY

Ministry of Mines and Energy (MME)

ADDRESS OF THE PROPONENT AND CONTACT PERSON

10 Babs Street Ludwigsdorf
P. O. Box 210
WINDHOEK NAMIBIA

CONTACT PERSON:
Ms. Mia Liu
Ludi Namibia Mining and Investments (Pty) Ltd.
Mobile: +264 81 358 6938
Email: mialiu1212@hotmail.com

PROPOSED PROJECT

Ongoing Dimension Stone (Marble) Mining Operation in
Mining License (ML) No. 205

PROJECT LOCATION

Karibib District Erongo Region
(Latitude: -22.080278, Longitude: 15.856944)

ENVIRONMENTAL CONSULTANTS

Risk-Based Solutions (RBS) CC
(Consulting Arm of Foresight Group Namibia (FGN) (Pty) Ltd)
41 Feld Street Ausspannplatz
Cnr of Lazarett and Feld Street
P. O. Box 1839, **WINDHOEK, NAMIBIA**
Tel: +264 - 61- 306058. Fax: +264 - 61- 306059
Cell: + 264-811413229. Email: smwiya@rbs.com.na
Global Office / URL: www.rbs.com.na

ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

Dr. Sindila Mwiya
PhD, PG Cert, MPhil, BEng (Hons), Pr Eng

Summary Profile and Qualifications of the Environmental Assessment Practitioner (EAP) / International Resources Consultant – Dr Sindila Mwiya

Dr Sindila Mwiya has more than eighteen (18) years of practical field-based technical industry experience in Environmental Assessment (SEA, EIA, EMP, EMS), Energy (Renewable and Non-renewable energy sources), onshore and offshore resources (minerals, oil, gas and water) exploration / prospecting, operation and utilisation, covering general and specialist technical exploration and recovery support, Health, Safety and Environment (HSE) permitting for Geophysical Surveys such as 2D, 3D and 4D Seismic, Gravity and Electromagnetic Surveys for mining, energy and petroleum (oil and gas) operations support, through to engineering planning, layout, designing, logistical support, recovery, production / operations, compliance monitoring, rehabilitation, closure and aftercare projects lifecycles. He continues to work internationally in the resources (mining and petroleum) and energy sectors, from permitting through to exploration and production. From the frontier regions (high risk hydrocarbons exploration zones) of South Africa and Namibia, to the prolific oil and gas fields of the Middle East, Angola and the West African Gulf of Guinea, Dr Mwiya has been directly involved in field-based aerial, ground and marine geophysical (gravity, magnetics and seismic) surveys, been onboard exploration drilling rigs, onboard production platforms, conducted public and stakeholder consultations and engagements, and worked with highly technical and well organised and committed clients and third-party teams from emerging and well established global resources and energy companies from many countries such as the UK, France, USA, Russia, Canada, Croatia, Norway, the Netherland, Spain, Brazil, China, South Africa, Equatorial Guinea, Angola and Nigeria. He is fully aware of all the competing interests and niche donation-based business environmental advocacy opportunism that exists in the resources sector from the local, regional, and international perspectives.

Through his companies, Risk-Based Solutions (RBS) CC and Foresight Group Namibia (FGN) (Pty) Ltd which he founded, he has undertaken more than 200 projects for Local (Namibia), Continental (Africa) and International (Global) based clients. He has worked and continue to work for Global, Continental and Namibian based reputable resources (petroleum and mining / minerals) and energy companies such as Dundee Precious Metals (Namibia / Canada), Headspring Investment (Namibia/ Russia), Green Energy (Namibia/UK/Russia), EMGS (UK/ Norway), Lepidico (Australia / UK), Best Sheer / Bohale (Namibia / China), CGG Services UK Limited (UK/ France/Namibia), BW Offshore (Norway/Singapore /Namibia), Shell Namibia B. V. Limited (Namibia/ the Netherlands), Tullow Oil (UK/Namibia), Debmarine (DBMN) (Namibia), Reconnaissance Energy Africa Ltd (ReconAfrica) (UK/Canada/Namibia), Osino Resource Corporation (Canada/USA/Namibia), Petrobras Oil and Gas (Brazil) / BP (UK)/ Namibia, REPSOL (Spain/ Namibia), ACREP (Namibia/Angola), Preview Energy Resources (UK), HRT Africa (Brazil / USA/ Namibia), Chariot Oil and Gas Exploration (UK/ Namibia), NABIRM (USA/ Namibia), Serica Energy (UK/ Namibia), Eco (Atlantic) Oil and Gas (Canada / USA/ Namibia), ION GeoVentures (USA), PGS UK Exploration (UK), TGS-Nopec (UK), Maurel & Prom (France/ Namibia), GeoPartners (UK), PetroSA Equatorial Guinea (South Africa / Equatorial Guinea/ Namibia), Preview Energy Resources (Namibia / UK), Sintezneftegaz Namibia Ltd (Russia/ Namibia), INA Namibia (INA INDUSTRIJA NAFTE d.d) (Croatia/ Namibia), Namibia Underwater Technologies (NUTAM) (South Africa/Namibia), InnoSun Holdings (Pty) Ltd and all its subsidiary renewable energy companies and projects in Namibia (Namibia / France), HopSol (Namibia/Switzerland), Momentous Solar One (Pty) Ltd (Namibia / Canada), OLC Northern Sun Energy (Pty) Ltd (Namibia) and more than 100 local companies. Dr Sindila Mwiya is highly qualified with extensive practical field-based experience in petroleum, mining, renewable energy (Solar, Wind, Biomass, Geothermal and Hydropower), Non-Renewable energy (Coal, Petroleum, and Natural Gas), applied environmental assessment, management, and monitoring (Scoping, EIA, EMP, EMP, EMS) and overall industry specific HSE, cleaner production programmes, Geoenvironmental, geological and geotechnical engineering specialist fields.

Dr Sindila Mwiya has undertaken and continue to undertake and manage high value projects on behalf of global and local resources and energy companies. Currently, (2020-2023) Dr Sindila Mwiya is responsible for permitting planning through to operational and completion compliance monitoring, HSE and engineering technical support for multiple major upstream onshore and offshore petroleum, minerals, and mining projects, Solar and Wind Energy Projects, manufacturing and environmentally sustainable, automated / smart and Climate Change resilient homes developments in different parts of the World including Namibia. He continue to worked as an International Resources Consultant, national Environmental Assessment Practitioner (EAP) / Environmentally Sustainable, automated / smart and Climate Change resilient homes developer, Engineering / Technical Consultant (RBS / FGN), Project Manager, Programme Advisor for the Department of Natural and Applied Sciences, Namibia University of Science and Technology (NUST) and has worked as a Lecturer, University of Namibia (UNAM), External Examiner/ Moderator, NUST, National (Namibia) Technical Advisor (Directorate of Environmental Affairs, Ministry of Environment, Forestry and Tourism / DANIDA – Cleaner Production Component) and Chief Geologist for Engineering and Environment Division, Geological Survey of Namibia, Ministry of Mines and Energy and a Field-Based Geotechnician (Specialised in Magnetics, Seismic, Gravity and Electromagnetics Exploration and Survey Methods) under the Federal Institute for Geoscience and Natural Resources (BGR) German Mineral Exploration Promotion Project to Namibia, Geophysics Division, Geological Survey of Namibia, Ministry of Mines and Energy.

He has supervised and continue to support a number of MScs and PhDs research programmes and has been a reviewer on international, national and regional researches, plans, programmes and projects with the objective to ensure substantial local skills development, pivotal to the national socioeconomic development through the promotion of sustainable natural resources coexistence, management, development, recovery, utilisation and for development policies, plans, programmes and projects financed by governments, private investors and Namibian development partners. Since 2006 until 2017, he has provided extensive technical support to the Department of Environmental Affairs (DEA), Ministry of Environment, Forestry and Tourism (MEFT) through GIZ in the preparation and amendments of the Namibian Environmental Management Act, 2007, (Act No. 7 of 2007), Strategic Environmental Assessment (SEA) Regulations, Environmental Impact Assessment (EIA) Regulations as well as the SEA and EIA Guidelines and Procedures all aimed at promoting effective environmental assessment and management practices in Namibia. Among his academic achievements, Dr Sindila Mwiya is a holder of a PhD within the broader fields of Engineering Geology/Geotechnical / Geoenvironmental / Environmental Engineering and Artificial Intelligence with a research thesis titled Development of a Knowledge-Based System Methodology (KBSM) for the Design of Solid Waste Disposal Sites in Arid and Semiarid Environments, MPhil/PG Cert and BEng (Hons) (Engineering Geology and Geotechnics) qualifications from the University of Portsmouth, School of Earth and Environmental Sciences, United Kingdom. During the 2004 Namibia National Science Awards, organised by the Namibian Ministry of Education, and held in Windhoek, Dr Sindila Mwiya was awarded the Geologist of the Year for 2004, in the professional category. Furthermore, as part of his professional career recognition, Dr Sindila Mwiya is a life member of the Geological Society of Namibia, Consulting member of the Hydrogeological Society of Namibia and a Professional Engineer registered with the Engineering Council of Namibia.

WINDHOEK FEBRUARY 2021

MAIN SPECIALIST CONSULTANTS / SPECIALIST MANAGERS

1. **Dr. Sindila Mwiya** – EIA Projects Director / EAP

2. **Dr. Vita Stankevica** – Socioeconomic Specialist and Quality Control.

3. **Mr. Peter Cunningham** - Flora and Fauna Specialist.

4. **HM Resources and Waste cc –** Specialist Report on Hydrogeological Baseline Assessment and Groundwater Exploration

5. **Dr. S. Onjefu** and **Ms N. Hamatui**- Air Quality and Noise Impact Assessment

6. **Ms. Meriam Kayama** and **Ms. Christine Links** (Administrative Consultants) Public consultation support and logistics

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NON-TECHNICAL SUMMARY

1. Overview

Ludi Namibia Mining and Investments (Pty) Ltd (**the Proponent**) holds minerals rights under the Mining License (ML) No. 205. The ML 205 is situated in the Karibib District, Erongo Region and was granted on the 19/03/2019 and will expire on the 18/03/2029. The ML 205 covers a total area of 502.796 Ha. The following is the summary of the key components of the ongoing mining operations in ML 205:

- **Commodity Group**: Dimension stone, marble.
- **Size of Deposit**: 32 million cubic meters and will continuous ongoing exploration activities, this amount will increase by fourfold.
- **Type/s of Marble**: Grey- white and Black marble.
- **Estimated mine life**: 25 years and beyond.
- **Socioeconomic benefits** / **Project Motivation**: Employment opportunities, value addition, in-situ potential underground minerals resources and high beneficiation opportunities in Karibib / Walvis Bay and additional socioeconomic benefits in terms of capital investments, license rental fees, royalties payable to Government, export earnings, foreign direct investments, and various taxes payable to the Government.
- **Mining Technique:** Quarry, with a diamond wire saws and stone cutting machines used for cutting out the 5 m^3 rectangular blocks.
- **Processing**: Further processing of the mined-out marble blocks will take place either in Karibib or Walvis Bay. At the processing plant, a giant saw is used to cut up the marble into more manageable pieces.
- **Sources of Water Supply:** Groundwater from a local borehole to be drilled.
- **Sources of Electricity Supply**: Diesel generator and solar.
- **Mining and operational equipment**: 2 Loaders, 2 Excavators, 4 Generators, 4 Air Compressors, 8 Wire Saws, 8 Stone Cutting Machine, 16 Water Tanks, 6 Wendy Houses and 10 Containers, and.
- **Waste Rock**: Waste rock will be used for mine rehabilitation. The effective capacity of the waste rock facility will vary but is likely to be in range of 100 × 90 m^3, calculated with 0.85 as capacity utilization coefficient of waste rock.

2. Summary of Alternatives Project Development

The following alternatives have been considered:

(i) Location of the marble deposits/ quarry.

(ii) Mining methods.

(iii) Transport.

(iv) Processing.

(v) Water resources.

(vi) Energy sources.

(vii) The no-action alternative.

(viii) Other alternative land uses.

(ix) Potential land use conflicts.

(x) Ecosystem function (what the ecosystem does).

(xi) Ecosystem services.

(xii) Use values, and.

(xiii) Non-use or passive use.

3. Methodology and Impact Assessment

The ongoing mining activities in the ML 205 cannot be undertaken without an Environmental Clearance Certificate (ECC) because they are listed in the Environmental Management Act, 2007, (Act No. 7 of 2007). In order to obtain the ECC the proponent is required to have undertaken an Environmental Assessment (EA) comprising Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP). The current ECC which was granted on the 9th April 2018 will expire in April 2021 and need to be renewed.

This updated Environmental Impact Assessment (EIA) Report covering the impact assessment for the ongoing mining and exploration operations and all the supporting infrastructures such as roads and water supply within the ML 205 has been prepared in order to support the application for the renewal of the current ECC.

This EIA excludes all the activities associated with the processing of the mined marble once it arrives at the processing plant in Karibib or Walvis Bay as well as the export of the finished product through the Port of Walvis Bay. All the mitigation measures for ongoing mining operations with significant impacts on the receiving environment are detailed in the Environmental Management Plan (EMP) Report

The assessment covered the marble quarry and supporting infrastructures (roads and water supply services) for the following developmental stages:

(i) Preconstruction.

(ii) Construction.

(iii) Operation, ongoing monitoring and rehabilitation.

(iv) Decommissioning, closure and aftercare.

The detailed outline of all the activities associated with each of the above project developmental stages as sources of potential environmental impacts are outlined in Table 1.

The impact assessment methodology has adopted a two dimensional matrix approach in predicting the potential impacts of the project on the receiving environment. The two dimensional matrix consisted of the following cross-referencing:

- The activities linked to the project that are supposed to have an impact on man and the environment.

- The existing environmental and socioeconomic conditions that could possibly be affected by the project.

The impact assessment considerations included the following components of the receiving environment grouped into physical and biological environments as shown in Tables 1 and 2:

- Land disturbance/land use impacts.
- Specially designated areas.
- Soil and surficial processes.
- Water and air resources.
- Flora, ecosystems and habitats.
- Fauna, ecosystems and habitats.
- Built environment and visual.
- Cultural, paleontological and archaeological resources, and.
- Socioeconomic.

The results of the overall impacts assessment results are presented in Table 1 with the significant impacts results shown in Table 2.

Table 1: Matrix impact assessment results of the ongoing mining activities.

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

SOURCES OF POTENTIAL IMPACT	PROJECT DEVELOPMENT PHASE	ACTIVITIES		RECEPTORS / TARGETS THAT MAY BE IMPACTED							
				PHYSICAL AND SOCIOECONOMIC ENVIRONMENT				BIOLOGICAL ENVIRONMENT			
				Natural Environment – Air, Noise, Water, Green Space	Built Environment – Houses, Transport Systems,	Socioeconomic- Job, Investment, Taxes and Social Issues e.g. HIV&Aids	Archaeological and Cultural Resources	Flora	Fauna	Habitat	Ecosystem - Services, function, use values and non-use
	PRE-CONSTRUCTION	1.	General site clearing, administration block, waste rock, supporting infrastructure	3 (-)	1 (-)	3 (+)	3 (-)	3 (-)	3 (-)	3 (-)	3 (-)
		2.	Access roads clearing / upgrading	3 (-)	1 (-)	3 (-)	3 (-)	3 (-)	3 (-)	3 (-)	3 (-)
		3.	Top soil removal and storage	3 (-)	1 (-)	3 (+)	1 (-)	3 (-)	3 (-)	3 (-)	3 (-)
		4.	Development of the temporary construction camp	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
		5.	Installation of campsites, offices, workshops, storage facilities.	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
	CONSTRUCTION	MINE SUPPORTING INFRASTRUCTURE	1. Transportation facilities, including access roads to the site and on-site roads	3 (-)	1 (-)	3 (+)	1 (-)	3 (-)	3 (-)	3 (-)	3 (-)
			2. Supporting site infrastructure	3 (-)	1 (-)	3 (+)	1 (-)	3 (-)	3 (-)	3 (-)	3 (-)
			3. Waste rock stockpiles	3 (-)	1 (-)	3 (+)	1 (-)	3 (-)	3 (-)	3 (-)	3 (-)
			4. Groundwater water supply systems	3 (-)	1 (-)	3 (+)	1 (-)	3 (-)	3 (-)	3 (-)	3 (-)
			5. Local generator areas for power infrastructure	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
			6. Administration blocks	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
			7. Fuel supply and storage / yard	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
			8. Workshop and equipment maintenance facilities	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
			9. Wastewater treatment systems	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
			10. Solid waste transfer facility	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
			11. Storm water management around the pit, waste rock and supporting infrastructure	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
		MINE WORKINGS	1. Excavation as maybe required to create direct access to the marble	3 (-)	1 (-)	3 (+)	1 (-)	3 (-)	3 (-)	3 (-)	3 (-)
			2. Actual pit excavation and stripping of the overburden to create direct access to fresh marble	3 (-)	1 (-)	3 (+)	1 (-)	3 (-)	3 (-)	3 (-)	3 (-)
			3. Marble production for test mining operations	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
			4. Test mining and commissioning	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)

Table 5.52: *Cont.*

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

SOURCES OF POTENTIAL IMPACT	PROJECT DEVELOPMENT PHASE	ACTIVITIES	RECEPTORS / TARGETS THAT MAY BE IMPACTED: PHYSICAL AND SOCIOECONOMIC ENVIRONMENT: Natural Environment – Air, Noise, Water, Green Space	Built Environment – Houses, Transport Systems,	Socioeconomic-Job, Investment, Taxes and Social Issues e.g. HIV&Aids	Archaeological and Cultural Resources	BIOLOGICAL ENVIRONMENT: Flora	Fauna	Habitat	Ecosystem - Services, function, use values and non-use
	OPERATION, ONGOING MONITORING AND REHABILITATION	1. Mining operations (actual mining operations including excavation as maybe required)	3(-)	0(-)	3(+)	1 (-)	1(-)	2(-)	1(-)	1(-)
		2. Transportation of the mined materials from pit to the yard for sorting	3(-)	1(-)	3(+)	1 (-)	1(-)	2(-)	1(-)	1(-)
		3. Transportation of the 5m^3 mined marble blocks to the sorting yard / storage facility and later to be further transported for processing in either Karibib or Walvis Bay	3(-)	1(-)	3(+)	1 (-)	1(-)	2(-)	1(-)	1(-)
		4. Operations of the waste rock	3(-)	0(-)	3(+)	1 (-)	1(-)	2(-)	1(-)	1(-)
		5. Ongoing exploration support	3(-)	0(-)	3(+)	1 (-)	1(-)	2(-)	1(-)	1(-)
		6. Ongoing rehabilitation and maintenance	2(-)	0(-)	3(+)	1 (-)	1(-)	2(-)	1(-)	1(-)
		7. Waste water and sludge management	2(-)	0(-)	3(+)	1 (-)	1(-)	2(-)	1(-)	1(-)
		8. Environmental Monitoring on the overall receiving environment	1(-)	0(-)	3(+)	1 (-)	1(-)	2(-)	1(-)	1(-)
	DECOMMISSIONING CLOSURE AND AFTERCARE	1. Implementation of sustainable socioeconomic plan	0(-)	0(-)	3(+)	1 (-)	2(-)	2(-)	2(-)	2(-)
		2. Closure of open pits through backfill and fencing	3(-)	0(-)	3(+)	1 (-)	2(-)	2(-)	2(-)	2(-)
		3. Closure of waste rock stockpile and used for backfilling	3(-)	0(-)	3(+)	1 (-)	2(-)	2(-)	2(-)	2(-)
		4. Closure of storage, yard and municipal solid waste transfer sites	3(-)	0(-)	3(+)	1 (-)	2(-)	2(-)	2(-)	2(-)
		5. Decommissioning of water and electricity infrastructure	2(-)	0(-)	3(+)	1 (-)	2(-)	2(-)	2(-)	2(-)
		6. Overall land reclamation	2(-)	0(-)	3(+)	1 (-)	2(-)	2(-)	2(-)	2(-)
		7. Restoration of internal roads	2(+)	0(-)	3(+)	1 (-)	2(-)	2(-)	2(-)	2(-)
		8. Revegetation and aftercare as may be required	2(-)	0(-)	3(+)	1 (-)	2(-)	2(-)	2(-)	2(-)

Table 2: Significant matrix impact assessment results of the ongoing mining activities.

IMPACT SEVERITY	IMPACT LIKELIHOOD: Extremely Unlikely [0]	Unlikely [1]	Low Likelihood [2]	Medium Likelihood [3]	High Likelihood [4]
Slight [A]	[A0]	[A1]	[A2]	[A3]	[A4]
Low [B]	[B0]	[B1]	[B2]	[B3]	[B4]
Medium [C]	[C0]	[C1]	[C2]	[C3]	[C4]
High [D]	[D0]	[D1]	[D2]	[D3]	[D4]

SOURCES OF POTENTIAL IMPACT	PROJECT DEVELOPMENT PHASE	ACTIVITIES		RECEPTORS / TARGETS THAT MAY BE IMPACTED: PHYSICAL AND SOCIOECONOMIC ENVIRONMENT: Natural Environment – Air, Noise, Water, Green Space	Built Environment – Houses, Transport Systems,	Socioeconomic- Job, Investment, Taxes and Social Issues e.g. HIV&Aids	Archaeological and Cultural Resources	BIOLOGICAL ENVIRONMENT: Flora	Fauna	Habitat	Ecosystem - Services, function, use values and non-use
	PRE-CONSTRUCTION	1. General site clearing, administration block, waste rock, supporting infrastructure		B4 (-)	A1(-)	D3 (+)	A1(-)	B4 (-)	B4 (-)	B4 (-)	B4 (-)
		2. Access roads clearing / upgrading		B4 (-)	A1(-)	D3 (+)	A1(-)	B4 (-)	B4 (-)	B4 (-)	B4 (-)
		3. Top soil removal and storage		B4 (-)	A1(-)	D3 (+)	A1(-)	B4 (-)	B4 (-)	B4 (-)	B4 (-)
		4. Development of the temporary construction camp		B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
		5. Installation of campsites, offices, workshops, storage facilities.		B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
	CONSTRUCTION	MINE SUPPORTING INFRASTRUCTURE	1. Transportation facilities, including access roads to the site and on-site roads	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			2. Supporting site infrastructure	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			3. Waste rock stockpiles	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			4. Groundwater water supply systems	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			5. Local generator areas for power infrastructure	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			6. Administration blocks	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			7. Fuel supply and storage / yard	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			8. Workshop and equipment maintenance facilities	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			9. Wastewater treatment systems	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			10. Solid waste transfer facility	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			11. Storm water management around the pit, waste rock and supporting infrastructure	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
		MINE WORKINGS	1. Excavation as maybe required to create direct access to the marble	B4 (-)	A1(-)	D3 (+)	A1(-)	B4 (-)	B4 (-)	B4 (-)	B4 (-)
			2. Actual pit excavation and stripping of the overburden to create direct access to fresh marble	B4 (-)	A1(-)	D3 (+)	A1(-)	B4 (-)	B4 (-)	B4 (-)	B4 (-)
			3. Marble production for test mining operations	B4 (-)	A1(-)	D3 (+)	A1(-)	B4 (-)	B4 (-)	B4 (-)	B4 (-)
			4. Test mining and commissioning	B4 (-)	A1(-)	D3 (+)	A1(-)	B4 (-)	B4 (-)	B4 (-)	B4 (-)

Table 5.52: *Cont.*

IMPACT SEVERITY	IMPACT LIKELIHOOD: Extremely Unlikely [0]	Unlikely [1]	Low Likelihood [2]	Medium Likelihood [3]	High Likelihood [4]
Slight [A]	[A0]	[A1]	[A2]	[A3]	[A4]
Low [B]	[B0]	[B1]	[B2]	[B3]	[B4]
Medium [C]	[C0]	[C1]	[C2]	[C3]	[C4]
High [D]	[D0]	[D1]	[D2]	[D3]	[D4]

SOURCES OF POTENTIAL IMPACT	PROJECT DEVELOPMENT PHASE	ACTIVITIES	RECEPTORS / TARGETS THAT MAY BE IMPACTED: PHYSICAL AND SOCIOECONOMIC ENVIRONMENT: Natural Environment – Air, Noise, Water, Green Space	Built Environment – Houses, Transport Systems,	Socioeconomic- Job, Investment, Taxes and Social Issues e.g. HIV&Aids	Archaeological and Cultural Resources	BIOLOGICAL ENVIRONMENT: Flora	Fauna	Habitat	Ecosystem - Services, function, use values and non-use
	OPERATION, ONGOING MONITORING AND REHABILITATION	1. Mining operations (actual mining operations including excavation as maybe required)	C3(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		2. Transportation of the mined materials from pit to the yard for sorting	C3(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		3. Transportation of the 5m^3 mined marble blocks to the sorting yard / storage facility and later to be further transported for processing in either Karibib or Walvis Bay	C3(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		4. Operations of the waste rock	C3(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		5. Ongoing exploration support	C3(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		6. Ongoing rehabilitation and maintenance	B2 (-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		7. Waste water and sludge management	B2 (-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		8. Environmental Monitoring on the overall receiving environment	A1(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
	DECOMMISSIONING CLOSURE AND AFTERCARE	1. Implementation of sustainable socioeconomic plan	C3(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		2. Closure of open pits through backfill and fencing	C3(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		3. Closure of waste rock stockpile and used for backfilling	B4 (-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		4. Closure of storage, yard and municipal solid waste transfer sites	B4 (-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		5. Decommissioning of water and electricity infrastructure	B4 (-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		6. Overall land reclamation	B4 (-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		7. Restoration of internal roads	A1(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		8. Revegetation and aftercare as may be required	C3(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)

4. Summary of EIA Conclusions and Recommendations

The EIA study presented in this report covers the environmental assessment for the preconstruction, construction, operation, ongoing monitoring and rehabilitation and decommissioning, closure and aftercare of the marble mine / quarry and supporting infrastructure and excludes the processing plant in Karibib or Walvis Bay.

The assessment has been undertaken in accordance with the requirements of the national applicable regulations. All key specialist studies with respect to the ongoing, mining and exploration operations in ML 205 have been undertaken with the findings and recommendations incorporated and presented in this report.

Marble mine / quarry and supporting infrastructure in the ML 205 poses localised negative impacts to the receiving environment with great offset /trade-offs/ benefits in form of socioeconomic benefits. The extent of the ongoing mining operations is limited in area extent with respect to the marble ore body, the pit and supporting infrastructures areas. Focusing on developing and utilising the already disturbed areas from previous exploration and mining operations will greatly be beneficial to the future rehabilitation of the current operation. Due to the localised extent of the likely negative impacts, compared to the likely positive impacts, it is hereby recommended that a detailed EMP Report be prepared to address all the identified impacts.

It is hereby recommended that the ongoing marble mining and exploration operations as well as the supporting infrastructure in the ML 205 shall go ahead and shall be issued with a renewed Environmental Clearance Certificate (ECC) with an amended correct title reflecting the ML 205. The following is the summary of the key conditions that shall be implemented by the proponent for the project activities:

(i) The proponent shall prepare a detailed updated EMP Report in order to address all the identified medium and high rated impacts.

(ii) The proponent shall negotiate a Lease Agreement with the owner/s covering the ML 205 area.

(iii) In consultation with the land owners and where possible and if key and core conservation, tourism or archaeological resources areas are identified within the ML 205 area, such areas shall be excluded from future mining activities.

(iv) The proponent shall negotiate further Lease Agreements with the owners of any other farm falling within the ML 205 that may be used for mining related operations in the future as may be required.

(v) The proponent must implement and adhere to all the provisions of the EMP report, and.

(vi) Environmental monitoring shall be implemented as provided for the in EMP and Environmental Clearance Certificate (ECC).

1. PROJECT BACKGROUND

1.1 Introduction

Ludi Namibia Mining and Investments (Pty) Ltd (the Proponent) holds minerals rights under the Mining License (ML) No. 205. The ML 205 was granted on the 19/03/2019 and will expire on the 18/03/2029. The ML 205 covers a total area of 502.796 Ha. The total delineated marble resources currently stand at 32 million cubic meters and with the planned ongoing exploration activities to support the mining phase, this amount will increase by fourfold.

1.2 Regulatory Requirements

The ongoing mining and exploration / prospecting activities in the ML 205 falls under the activities that are listed in the Environmental Management Act, 2007, (Act No. 7 of 2007) and cannot be undertaken without an Environmental Clearance Certificate (ECC). To obtain the ECC for the ongoing mining and exploration activities, the proponent is required to have undertaken Environmental Assessment comprising Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) reports.

In fulfilment of the environmental requirements, the Proponent appointed Risk-Based Solutions (RBS) CC as the Environmental Consultant, led by Dr Sindila Mwiya as the Environmental Assessment Practitioner (EAP) to undertake the EIA and EMP to support the application for Environmental Clearance Certificate (ECC). The ECC application together with the supporting EIA and EMP Reports were submitted to the Environmental Commissioner in Ministry of Environment, Forestry and Tourism (MET) on the 6th December 2017. The current ECC as shown in Fig. 1.1 granted on the 9th April 2018 will expire in April 2021 and need to be renewed. This updated Environmental Impact Assessment (EIA) Report covering the impact assessment for the ongoing mining and exploration operations and all the supporting infrastructures such as roads and water supply within the ML 205 has been prepared to support the application for the renewal of the current ECC.

1.3 Project Motivation

The ML area in the ML 205 is situated in a highly prospective area for dimensions stones (marble and granite) associated with local Damara metamorphic rocks. The ML area and exploration activities will have good socioeconomic benefits including value addition to the potential marble resources in the area which otherwise would not have been known if the exploration in the ML 205 did not take place.

The potential discovery of additional economic minerals resources and the expansion of value addition chain for the local marble resources will have much greater and positive socioeconomic benefits to the local community and the Town of Karibib which current depend on the operations of the QKR Namibia Navachab Gold Mine. Additional socioeconomic benefits will also be realised at regional and national levels in terms of capital investments, value addition opportunities, license rental fees, royalty taxes payable to Government, direct and indirect contracts and employment opportunities, export earnings, foreign direct investments, and various taxes payable to the Government.

1.4 Location, Site Description, Land Use and Infrastructure

1.4.1 Location

The ML 205 is located in central Namibia, approximately 180 km east of the Atlantic Ocean (Figs. 1.2 – 1.5). More specifically the ML area is located within the Karibib Constituency (or Karibib Magisterial District) in the Erongo Region of Namibia. The Town of Karibib is Constituency's district capital, and nearest town situated approximately 15 km to the northwest of the ML area. Swakopmund, the regional centre of the Erongo Region and Walvis Bay the main Port, are situated to the west of the ML area, about 170 km and 200 km respectively. Namibia's capital city, Windhoek, is located approximately 124 km southeast of the ML Area (Fig. 1.2).

REPUBLIC OF NAMIBIA

MINISTRY OF ENVIRONMENT AND TOURISM

Tel: (00 26461) 284 2111
Fax: (00 26461) 229 936

E-mail: simon.hangula@met.gov.na

Enquiries: Mr. Simon Hangula

Cnr Robert Mugabe &
Dr Kenneth Kaunda Street
Private Bag 13306
Windhoek
Namibia

4 April 2018

OFFICE OF THE ENVIRONMENTAL COMMISSIONER

The Manager
Ludi Namibia Mining and Investments (Pty) Ltd
10 Babs Street
P O Box 210
Windhoek

Dear Sir/Madam

SUBJECT: ENVIRONMENTAL CLEARANCE CERTIFICATE FOR THE PROPOSED DIMENSION STONE (MARBLE) MINING LICENSE (ML) APPLICATION AND ONGOING EXPLORATION WITHIN THE EXCLUSIVE PROSPECTING LICENSE (EPL) NO. 5536 KARIBIB DISTRICT, ERONGO REGION

The Environmental impact assessment and Environmental Management Plan submitted are sufficient as these have made an adequate provision of the environmental management for the proposed activities. From this perspective, regular environmental monitoring and evaluations on environmental performance should be conducted. Targets for improvements should be established and monitored throughout this process.

This Ministry reserves the right to attach further legislative and regulatory conditions during the operational phase of the project.

On the basis of the above, this letter serves as an environmental clearance certificate for the project to commence. However, this clearance letter does not in any way hold the Ministry of Environment and Tourism accountable for misleading information, nor any adverse effects that may arise from this project's activities. Instead, full accountability rests with Ludi Namibia Mining and Investments (Pty) Ltd and their consultants.

This environmental clearance is valid for a period of (three) 3 years, from the date of issue unless withdrawn by this office.

MINISTRY OF ENVIRONMENT AND TOURISM
P/Bag 13306
Windhoek, Namibia
2018 -04- 09
Office of the
Environmental Commissioner

Yours sincerely,

Teofilus Nghitila
ENVIRONMENTAL COMMISSIONER

"Stop the poaching of our rhinos"

All official correspondence must be addressed to the Permanent Secretary

Figure 1.1: Copy of the ECC granted on the 9th April 2018 to Ludi Namibia Mining and Investments (Pty) Ltd expiring in April 2021 and need to be renewed.

Figure 1.2: Regional location of the EPL (Source: Updated from Risk-Based Solutions, 2015).

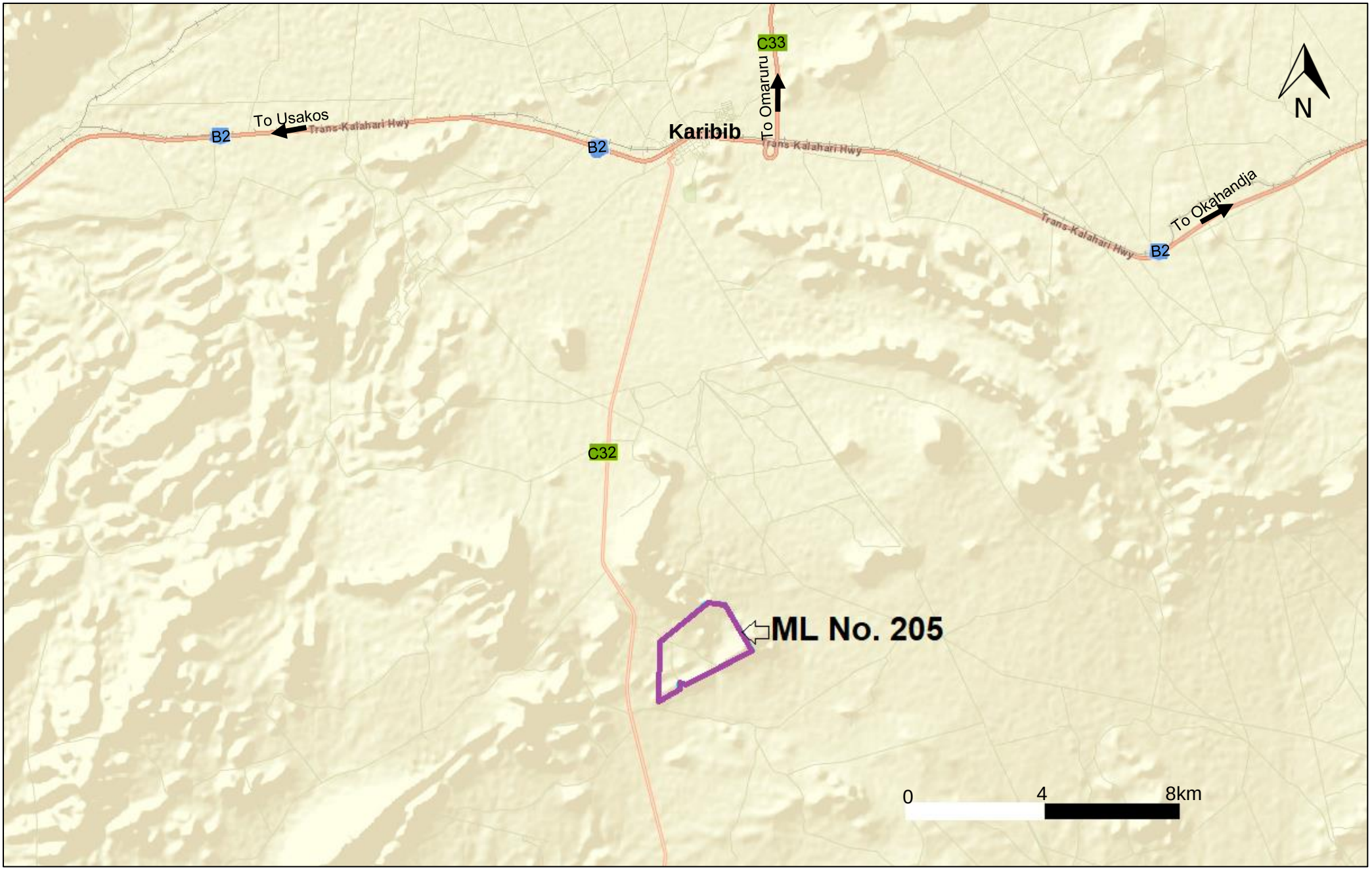


Figure 1.3: Detailed location of the ML 205 (Data Source: http://portals.flexicadastre.com/Namibia).

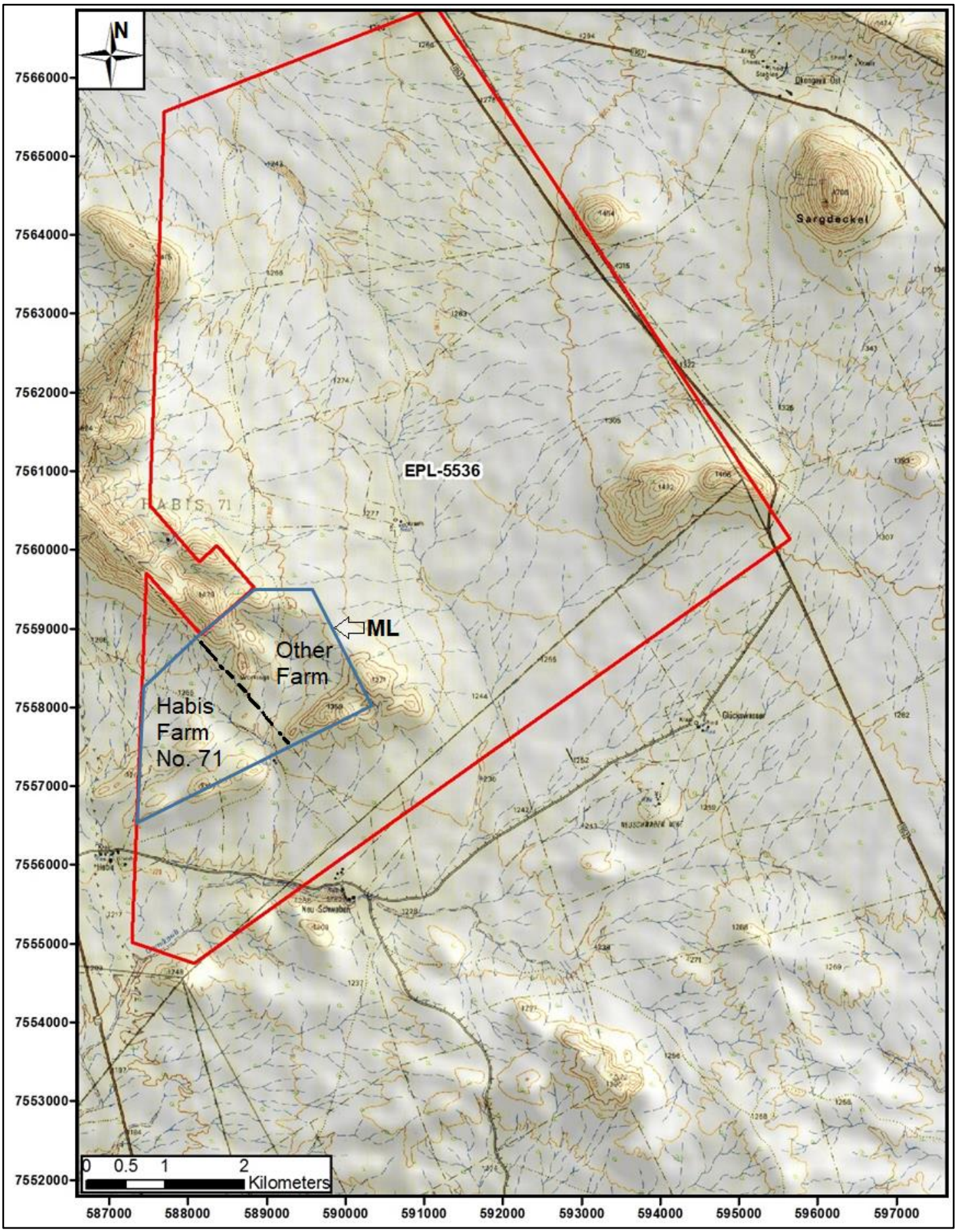


Figure 1.4: Detailed location of the ML 205 falling within the EPL 5536 and showing the two (2) privately owned farms covered by the ML 205 Area (Data Source: Geological Survey of Namibia).

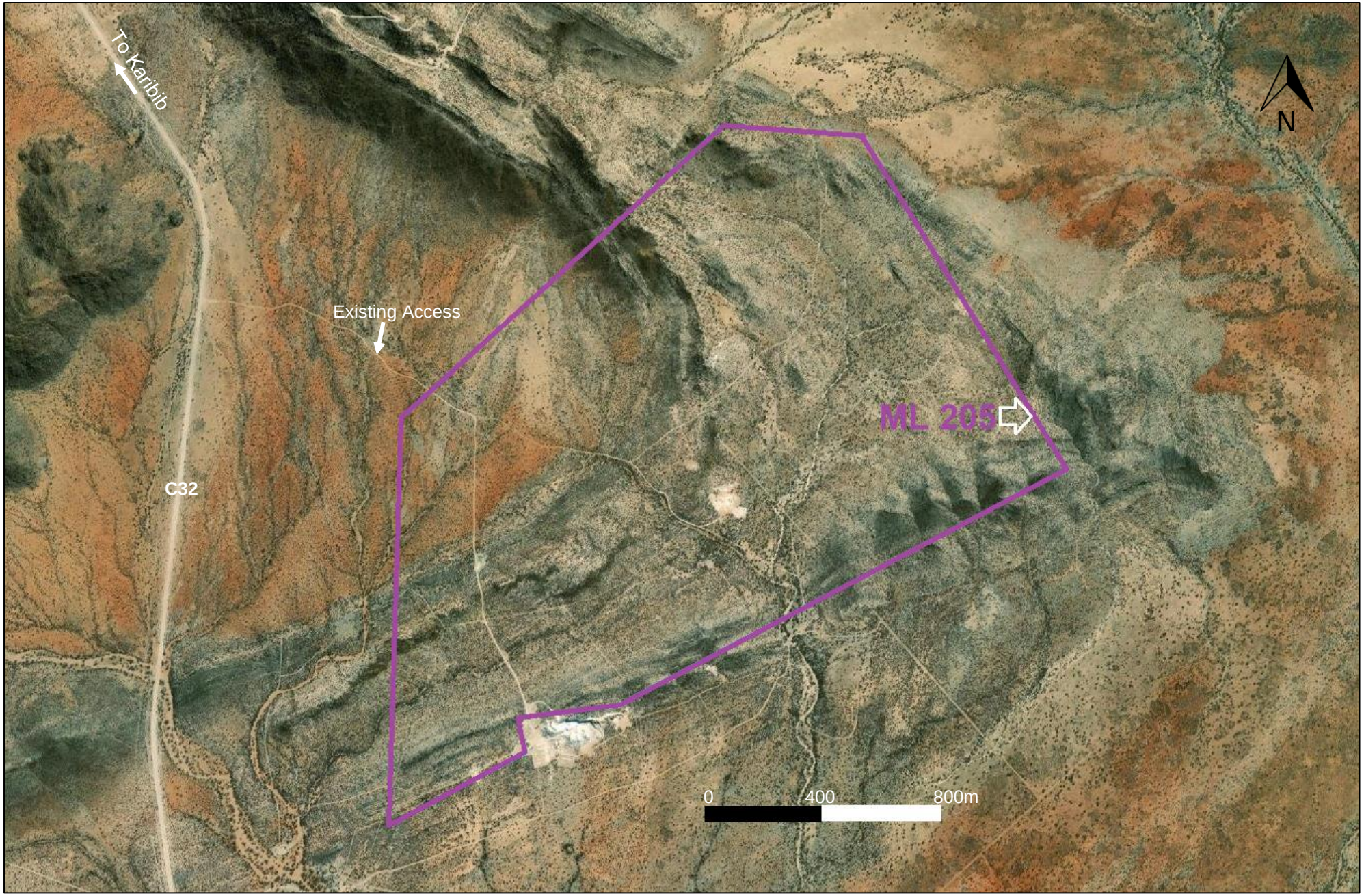


Figure 1.5: Detailed location of the 502 Ha ML 205 area with respect to the existing access roads and quarries / excavations in the area (Source: Google Earth, 2021).

1.4.2 Current Land Uses

The general land use of the ML area is mainly dominated by agriculture (cattle and small stock framing) and dimension stone (marble and granite) exploration and mining. Although not necessary within the ML area, privately owned Safari Game Farms / Game Hunting Farms are found in the general surrounding areas. Some farms such as the Etusis Lodge have lodging facilities and services that support tourism in the Erongo Region. The game farms are also important conservation areas for endemic and protected flora and are sanctuaries for endangered faunal species. The game farms offer visitors the opportunity to be close to nature with a variety of tailor-made tourism products such game viewing, trails and hunting activities. The summary of other land uses activities found in the general areas includes: Karibib Townlands, tourism, conservation, prospecting and small-scale and large-scale mining and quarry operations.

1.4.3 Supporting Infrastructure and Services

The ML area is accessible via the B2 road linking the towns of Okahandja and Karibib, the C32 road link the towns of Karibib to the ML 205 area (Figs. 1.2-1.5). The Town of Karibib is the nearest town to the ML area (Figs 1.2-1.5). The ongoing mining and exploration operations will not require major water and energy resources. Water requirements for will be provided from the available local water resources supplied by private boreholes to be drilled with permission from the Department of Water Affairs (DWA) in the Ministry of Agriculture, Water and Land Reform (MAWLR). Electricity needs will be supplied by generators and solar installations while diesel and petrol will be the main sources of fuels and readily available in the Town of Karibib.

1.5 Summary of the Terms of Reference for the EIA and EMP

1.5.1 Overview

The impact assessment process has been undertaken in accordance with the Terms of Reference (ToR) (Annex 2) and the requirements of the Environmental Impact Assessment Regulations, 2012 and the Environmental Management Act, 2007, (Act No. 7 of 2007). All the project activities have all been assessed against the receiving environment covering the physical, biological, socioeconomic and ecosystem services (function, use values and non-use) (Table 1.1).

1.5.2 Impact Assessment Process

The overall impact assessment approach adopted the Leopold matrix framework which is one of the internationally best-known matrix assessment methodology available for predicting the impact of a project on the receiving environment. The assessment process took into considerations the ongoing activities, trade-offs, alternatives, and issues. Further inputs were provided by the specialist consultants. The following specialist studies were undertaken as part of the environmental assessment process: Flora, fauna, socioeconomic, archaeology, noise, dust, and hydrogeology.

1.5.3 Evaluation of Impacts

The ongoing mine operations and exploration activities have been considered as the key sources of impacts in assessing the likely impacts that the ongoing project activities will have on the receiving environment. In evaluating the degree of potential impacts, the following factors were taken into consideration:

(i) Impact Severity: The severity of an impact is a function of a range of considerations.

(ii) Likelihood of Occurrence (Probability): How likely is the impact to occur?

In evaluating the severity of potential environmental impacts, the following factors were taken into consideration:

- ❖ Receptor/ Resource Characteristics: The nature, importance and sensitivity to change of the receptors / target or resources that could be affected.

- ❖ Impact Magnitude: The magnitude of the change that is induced.

- ❖ Impact Duration: The time period over which the impact is expected to last.

- ❖ Impact Extent: The geographical extent of the induced change, and.

- ❖ Regulations, standards and guidelines: The status of the impact in relation to regulations (eg. discharge limits), standards (eg. environmental quality criteria) and guidelines / regulatory provisions.

1.5.4 Mitigation Measures for Significance Impacts

Based on the finding of this updated EIA Report, an updated EMP report has been prepared detailing the mitigation measures that the proponent shall implement in minimising and maximising the likely effects of negative and positive impacts respectively. The following is the summary of the mitigation measures adopted in order of preference:

(i) Enhancement, e.g. provision of new habitats.

(ii) Avoidance, e.g. sensitive design to avoid effects on ecological receptors.

(iii) Reduction, e.g. limitation of effects on receptors through design changes. and

(iv) Compensation, e.g. community benefits.

1.6 Environmental Assessment Process

The processes and steps that has been followed in the preparation of this updated EIA Report took into considerations the provisions of the Environmental Impact Assessment Regulations, 2012 and the Environmental Management Act, 2007, (Act No. 7 of 2007).

1.7 Structure of the Report

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

- ❖ **Section 1: Project Background** covering Introductions, regulatory requirements, project motivation, site description, Terms of Reference summary, Environmental Assessment Process and Steps and Structure of report.

- ❖ **Section 2: Description of the Ongoing Project** covering site description, ongoing project design and activities to be undertaken.

- ❖ **Section 3: Regulatory Framework providing** a summary of the applicable legislations and permitting requirements.

- ❖ **Section 4: Receiving Environment** covering physical environment (climate, water, air quality, and geology), Biological environment (flora, fauna and ecosystem services and functions) and socioeconomic environment.

- ❖ **Section 5: Assessment of Likely Impact** covering assessment procedure, summary of likely Impacts covered in the EIA and the method of assessment.

- ❖ **Section 6: EIA Conclusions and Recommendations** covering the key issues identified and summarised recommendations.

2. DESCRIPTION OF THE ONGOING PROJECT

2.1 Overview

The following is the summary of the key components of the ongoing marble mining and exploration operations:

- **Commodity Group**: Dimension stone, marble.
- **Size of Deposit**: 32 million cubic meters and will continuous ongoing exploration activities, this amount will increase by fourfold.
- **Type/s of Marble**: Grey- white and Black marble.
- **Estimated mine life**: 25 years and beyond.
- **Socioeconomic benefits** / **Project Motivation**: Employment opportunities, value addition, in-situ potential underground minerals resources and high beneficiation opportunities in Karibib / Walvis Bay and additional socioeconomic benefits in terms of capital investments, license rental fees, royalties payable to Government, export earnings, foreign direct investments and various taxes payable to the Government.
- **Processing**: Further processing of the mined out marble blocks will take place either in Karibib or Walvis Bay. At the processing plant, a giant saw is used to cut up the marble into more manageable pieces.
- **Sources of Water Supply:** Groundwater from a local borehole to be drilled.
- **Sources of Electricity Supply**: Diesel generator and solar.
- **Mining and operational equipment**: 2 Loaders, 2 Excavators, 4 Generators, 4 Air Compressors, 8 Wire Saws, 8 Stone Cutting Machine, 16 Water Tanks, 6 Wendy Houses and 10 Containers, and.
- **Waste Rock**: Waste rock will be used for mine rehabilitation. The effective capacity of the waste rock facility will vary but is likely to be in range of 100 × 90 m^3, calculated with 0.85 as capacity utilization coefficient of waste rock.

2.2 Exploration and Pre-Mining Activities

2.2.1 Overview

The following is the summary of the exploration and pre-mining activities that have been undertaken to support the ongoing mining operations (Fig. 2.1):

(i) Initial desktop exploration activities (no field-work undertaken).

(ii) Regional reconnaissance field-based mapping and sampling activities.

(iii) Initial local field-based mapping and sampling activities.

(iv) Detailed local field-based activities such as local geological mapping, geochemical mapping, and sampling, trenching and drilling of closely spaced boreholes and bulk sampling.

(v) Detailed geological mapping and sampling including approximately 6,500 m of drilling completed (Figs. 2.1 and 2.2).

(vi) Hydrogeological survey.

(vii) Mineralogy test work completed.

(viii) Environmental Assessment (EA) covering Scoping and Environmental Management Plan (EMP) to support the application for Environmental Clearance Certificate (ECC) for the current ongoing exploration activities leading the preparation of the feasibility report and application for a Mining License (ML) completed ECC for exploration issued by the Office of the Environmental Commissioner in the Ministry of Environment, Forestry and Tourism (MEFT).

(ix) Environmental Assessment (EA) covering Scoping, Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) to support the application for Environmental Clearance Certificate (ECC) for the Mining License application (this EIA), and.

(x) Preparation of the feasibility report supported by technical reports inclusive of the ore reserve and resources, geotechnical engineering, documents detailing technical viability, mine planning, forecasts of estimated expenditure and financial feasibility studies, with applicable plans (completed).

2.3 Project Planning, Design and Preconstruction

2.3.1 Overview

The project planning, design and preconstruction stage of the marble mine / quarry and supporting infrastructure covered the following components:

- Preparation of plans, field-based surveying, and layouts.
- General site clearing of the pit area, administration block, waste rock, supporting infrastructure such as sorting / storage yard, workshop, water, electricity and other related infrastructures.
- Access roads clearing and upgrading as maybe required.
- Top soil removal, levelling, and storage / stockpiling of potential key resources materials.
- Development of the temporary construction camp, and.
- Installation of campsites, offices, workshops, storage facilities.

2.3.2 List of Equipment

The following is the summary of the key equipment that being used in the development and operation of the marble mining and processing operations:

- 2 Loaders.
- 2 Excavators.
- 4 Generators.
- 4 Air Compressors.

- 8 Wire Saws.
- 8 Stone Cutting Machine.
- 16 Water Tanks.
- 6 Wendy Houses, and.
- 10 Containers.

2.3.3 Mine Layout and Supporting Infrastructure

2.3.3.1 Planning and Extracting the Marble

The marble mine layout covering the quarry, workshop, yard / storage/ sorting area, administration area and waste rock dumps will be confined to the existing disturbed area as far as practically possible. Fig. 2.1 illustrates the mine and supporting infrastructure to layout. The selection of the mine support infrastructure areas (yard, workshop and administrative) has been carefully considered with respect to the already existing access and topographic low laying requirements for easy trucks access to the mining area. The mining technique to be used will involve the use of diamond wire saws and stone cutting machines to extract / mine $5m^3$ rectangular blocks as illustrated in Fig. 2.3. The rectangular shape will make it easier to shape the marble into useful objects during further processing.

2.3.3.2 Access Roads, Water and Energy Services

All the mining and processing infrastructures will be situated within the ML area as shown in Fig. 2.1. The supporting infrastructure such as roads will utilise the already existing roads and tracks (Fig. 2.1). Accommodation for worker will be provided in the Town of Karibib and no new accommodation buildings will be built within the ML area. Limited containerised administration blocks including office and workshop will be situated in the ML area. The rest of the main office blocks and accommodation of the senior mine officials, visitors and VIPs will be situated within the Town of Karibib.

Negotiations to acquire properties in Karibib from the Town Council as well as private land and property owners will need to be started immediately on issue of the ML by the Competent Authority (Ministry of Mines and Energy) and concluded during the preconstruction planning stage. The project requires reliable but limited water and energy supply both for mining and processing operations. The source of water supply being supplied from a local borehole drilled by the proponent within the mining license area for water supply. Due to the arid nature of ML area and the surrounding local area, water recycling and reuse for marble mining is highly encouraged. The sources of power supply are from diesel back-up generators, and solar for minor office and administrative power requirements.

2.3.3.3 New Waste Disposal Location and Design

Waste from the mining and marble processing as well as all the supporting activities will be disposed on a waste disposal to be situated within the ML area. The new site must first be excavated up to hardrock in order to create a landfill compared to the landform type of waste disposal. Waste rock and other type of waste must NOT be mixed. Different types of waste must be filled in separate cells within the excavated area with final landform having the same height profile as the surrounding terrain.

The excavated materials must be stored and used for final site restoration. The final cover must have a graded layers coarsing upwards. This means that coarse material must be placed on top in order to protect the fines below from wind and erosion. Furthermore, the coarse grained material below will also help in retaining moisture for good vegetation growth over the rock waste. All domestic waste such as plastic and all related packaging shall be collected and disposed off at the Karibib Municipal Waste Disposal Site.

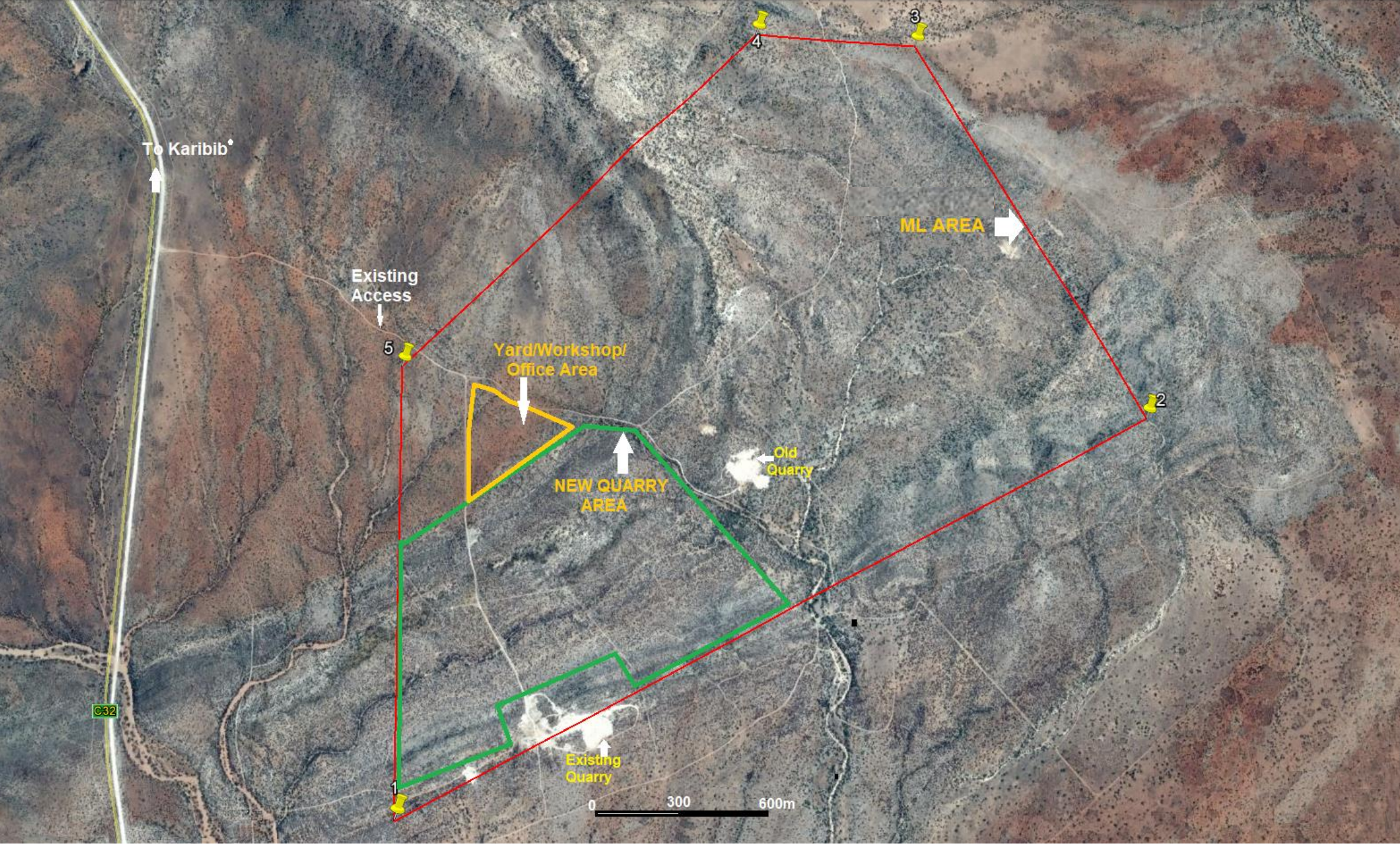


Figure 2.1: Marble mine / quarry layout (Source: Google Earth, 2017).

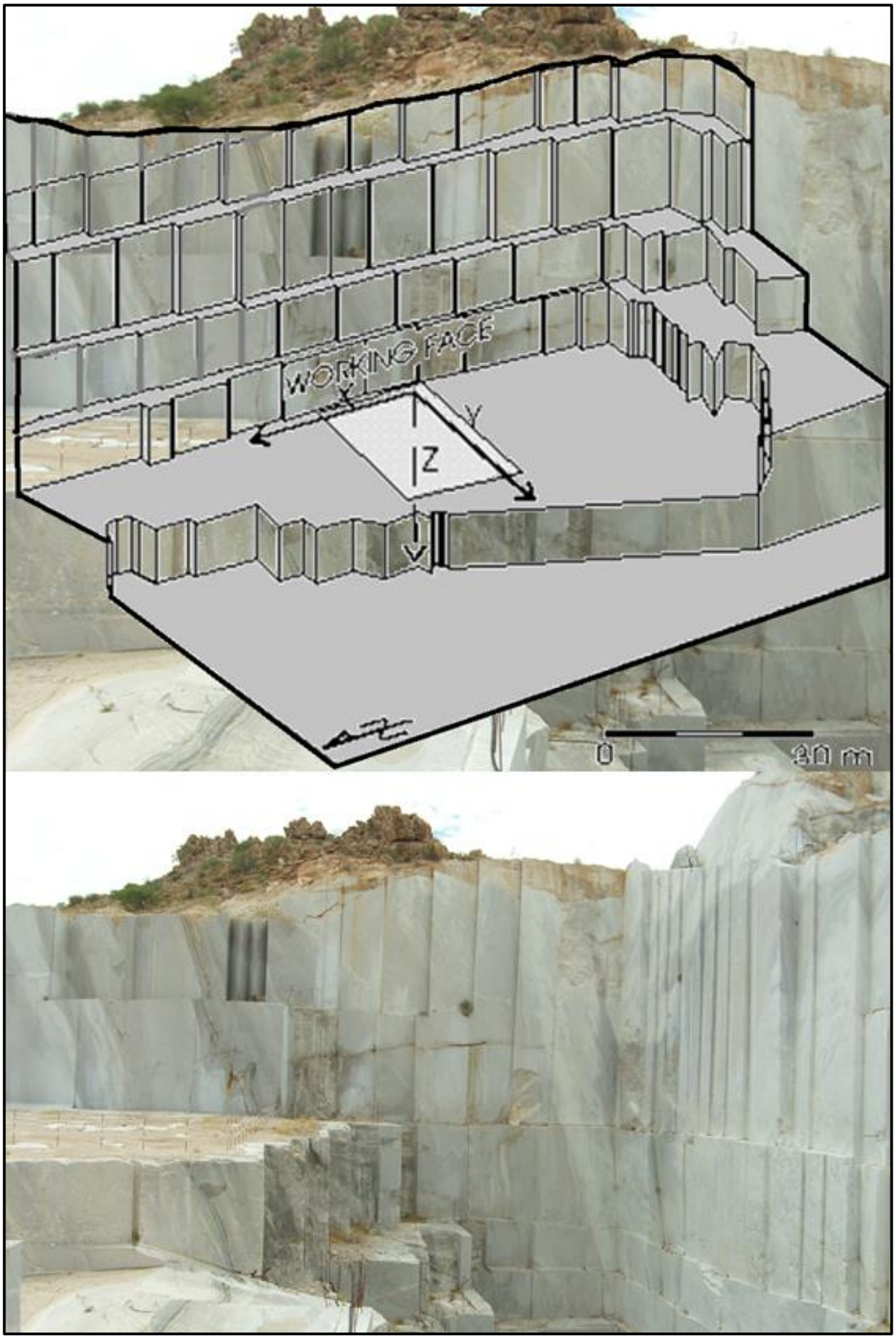


Figure 2.2: Detailed quarry design and mining techniques, (RBS, 2017).

2.4 Project Economic Assessment

2.4.1 Summary the project Economics

The total project investment is N$39.9 million with an ongoing cost for each month estimated to be around N$5 million. The following is the summary of the economic assessments of the ongoing mining project and exploration operations to be undertaken in the ML 205:

(i) **Construction Investment Estimation:** The estimated total investment for the ongoing quarry / mine development is around **N$23 million**, including:

- ❖ Test mining N$1.6 million.
- ❖ Mine building N$.4 million, and.
- ❖ Mining equipment N$20 million

(ii) **Working Capital Estimation covering the following:**

- ❖ Production of Working Capital N$ 6.8 million.
- ❖ Sales of working capital N$12.8 million, and.
- ❖ **Total working capital** N$19.9 million.

2.4.2 Rehabilitation, Closure and Aftercare Stages

2.4.2.1 Ongoing and Final Rehabilitation

Ongoing rehabilitation shall be undertaken as mining operations progresses. Areas where mining has been undertaken shall be rehabilitated and once the whole mining operations ceases, then the final rehabilitation shall be undertaken leading to the mine closure and aftercare stages. The following is the summary of the key actions that must be undertaken as part of the ongoing and final rehabilitation for the ongoing mining operations:

(i) Before commencing with the construction or mining activities, the topsoil shall be removed from all affected areas and stockpiled and used for ongoing and final rehabilitation as maybe applicable.

(ii) All structures shall be removed including concrete platforms and foundations unless they can be used for some other activities beyond the mine closure.

(iii) All infrastructure shall be removed – pipelines, power lines, buildings, scrap metals etc..

(iv) Shallow excavations shall be filled with waste rocks while deep excavation shall be secured including fencing the peripheral.

(v) All compacted soils, such as roadways, sites beneath slabs, and stockpile areas shall be ripped to loosen soil if not required for other activities beyond the mine closure.

(vi) Stormwater retention dams should be retained to trap runoff for use during the mine aftercare stage as well as for any other activities to be undertaken beyond mine closure, and.

(vii) Rock waste shall be refilled in the excavated pit or trimmed off to resemble natural landforms and cladded with waste rock or coarse rocks from the local ephemeral river channels or offcuts from the nearby quarries.

3. REGULATORY FRAMEWORK

3.1 Minerals Exploration Legislation and Regulations

The Ministry of Mines and Energy (MME) is the competent authority with respect to minerals prospecting and mining activities in Namibia. The Minerals (Prospecting and Mining) Act (No 33 of 1992) is the most important legal instrument governing minerals prospecting / exploration and mining activities. 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 minimising or preventing pollution.

3.2 Environmental Regulations

3.2.1 Environmental Assessment Requirements and Procedures

Environmental Assessment (EA) process in Namibia is governed by the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 gazetted under the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007). The ML area and ongoing field –based exploration activities falls within the categories of listed activities that cannot be undertaken without an Environmental Clearance.

3.2.2 Competent Authorities

The environmental regulatory authorities responsible for environmental protection and management in relation to the ML area and ongoing project including their role in regulating environmental protection are listed in Table 3.1.

Table 3.1: Government agencies regulating environmental protection in Namibia.

AGENCY	RESPONSIBILITY
Ministry of Environment, Forestry and Tourism (MEFT)	Issue of Environmental Clearance Certificate (ECC) based on the review and approval of the Environmental Assessments (EA) reports comprising Environmental Scoping, Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) prepared in accordance with the Environmental Management Act (2007) and the Environmental Impact Assessment Regulations, 2012. The National Botanical Research Institute's (NBRI) mandate is to study the flora and vegetation of Namibia, to promote the understanding, conservation, and sustainable use of Namibia's plants for the benefit of all. The Directorate of Forestry (DOF) is responsible for issuing of forestry permits with respect to harvest, transport, and export or market forest resources.
Ministry of Mines and Energy (MME)	The competent authority for minerals prospecting and mining activities in Namibia. Issues Exclusive prospecting License (EPL), Mining Licenses (ML) and Mining Claims (license) as well as all other minerals related permits for processing, trading and export of minerals resources
Ministry of Agriculture, Water and Land Reform (MAWLR)	The Mission of the Ministry of Agriculture, Water and Land Reform (MAWLR) is to realize the potential of the Agricultural, Water and Forestry sectors towards the promotion of an efficient and sustainable socio-economic development for a prosperous Namibia. It has a mandate to promote, develop, manage, and utilise Agriculture, Water and Land resources The Directorate of Resource Management within the Department of Water Affairs (DWA) at the MAWLR is currently the lead agency responsible for management of surface and groundwater utilisation through the issuing of abstraction permits and waste water disposal permits. DWA is also the Government agency responsible for water quality monitoring and reporting.

3.3 Standards and Guidelines

The only key missing components to the regulatory frameworks in Namibia are the standards, and guidelines with respect to gaseous, liquid, and solid emissions. However, in the absence of national gaseous, liquid, and solid emission limits for Namibia, the ongoing project shall target the Multilateral Investment Guarantee Agency (MIGA) gaseous effluent emission level and liquid effluent emission

levels (Table 3.2). Noise abatement measures must target to achieve either the levels shown in Table 3.3 or a maximum increase in background levels of 3 dB (A) at the nearest receptor location off-site (MIGA guidelines). Industrial effluent likely to be generated by the ongoing activities must comply with provisions of the Government Gazette No 217 dated 5 April 1962 (Table 3.4) while the drinking water quality comparative guideline values are shown in Table 3.5.

Table 3.2: Liquid effluent emission levels (MIGA /IFC).

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

Table 3.3: Noise emission levels (MIGA /IFC).

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

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

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

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

Parameter and Expression of the results			**WHO** Guidelines for Drinking-Water Quality 2nd edition 1993		**Proposed Council Directive** of 28 April 1995 (95/C/13-1/03) EEC	**Council Directive of 15 July 1980** relating to the quality intended for human consumption 80/778/EEC		**U.S. EPA** Drinking water Standards and Health Advisories Table December 1995		**Namibia, Department of Water Affairs** Guidelines for the evaluation of drinking-water for human consumption with reference to chemical, physical and bacteriological quality July 1991			
			Guideline Value (GV)		**Proposed Parameter Value**	**Guide Level (GL)**	**Maximum Admissible Concentration (MAC)**	**Maximum Contaminant Level (MCL)**		**Group A Excellent Quality**	**Group B Good Quality**	**Group C Low Health Risk**	**Group D Unsuitable**
Temperature	t	°C		-	-	12	25		-	-	-	-	-
Hydrogen ion concentration	pH, 25° C	-	R	<8.0	6.5 to 9.5	6.5 to 8.5	10		-	6.0 to 9.0	5.5 to 9.5	4.0 to 11.0	<4.0 to >11.0
Electronic conductivity	EC, 25° C	mS/m		-	280	45	-		-	150	300	400	>400
Total dissolved solids	TDS	mg/l	R	1000	-	-	1500		-	-	-	-	-
Total Hardness	$CaCO_3$	mg/l		-	-	-	-		-	300	650	1300	>1300
Aluminium	Al	µ g/l	R	200	200	50	200	S	50-200	150	500	1000	>1000
Ammonia	NH_4^+	mg/l	R	1.5	0.5	0.05	0.5		-	1.5	2.5	5.0	>5.0
	N	mg/l		1.0		0.04	0.4		-	1.0	2.0	4.0	>4.0
Antimony	Sb	µ g/l	P	5	3	-	10	C	6	50	100	200	>200
Arsenic	As	µ g/l		10	10	-	50	C	50	100	300	600	>600
Barium	Ba	µ g/l	P	700	-	100	-	C	2000	500	1000	2000	>2000
Berylium	Be	µ g/l		-	-	-	-	C	4	2	5	10	>10
Bismuth	Bi	µ g/l		-	-	-	-		-	250	500	1000	>1000
Boron	B	µ g/l		300	300	1000	-		-	500	2000	4000	>4000
Bromate	BrO_3^-	µ g/l		-	10	-	-	P	10	-	-	-	-
Bromine	Br	µ g/l		-	-	-	-		-	1000	3000	6000	>6000
Cadmium	Cd	µ g/l		3	5	-	5	C	5	10	20	40	>40
Calcium	Ca	mg/l		-	-	100	-		-	150	200	400	>400
	$CaCO_3$	mg/l		-	-	250	-		-	375	500	1000	>1000
Cerium	Ce	µ g/l		-	-	-	-		-	1000	2000	4000	>4000
Chloride	Cl^-	mg/l	R	250	-	25	-	S	250	250	600	1200	>1200
Chromium	Cr	µ g/l	P	50	50	-	50	C	100	100	200	400	>400
Cobalt		µ g/l		-	-	-	-		-	250	500	1000	>1000
Copper after 12 hours in pipe	Cu	µ g/l	P	2000	2	100	-	C	TT##	500	1000	2000	>2000
		µ g/l		-	-	3000[1]	-	S	1000	-	-	-	-
Cyanide	CN^-	µ g/l		70	50	-	50	C	200	200	300	600	>600
Fluoride	F^-	mg/l		1.5	1.5	-	at 8 to 12 °C: 1.5	C	4	1.5	2.0	3.0	>3.0
		mg/l		-	-	-	at 25 to 30 °C: 0.7	P,S	2	-	-	-	-
Gold	Au	µ g/l		-	-	-	-		-	2	5	10	>10
Hydrogen sulphide	H_2S	µ g/l	R	50	-	-	undetectable		-	100	300	600	>600
Iodine	I	µ g/l		-	-	-	-		-	500	1000	2000	>2000
Iron	Fe	µ g/l	R	300	200	50	200	S	300	100	1000	2000	>2000
Lead	Pb	µ g/l		10	10	-	50	C	TT#	50	100	200	>200
Lithium	Li	µ g/l		-	-	-	-		-	2500	5000	10000	>10000
Magnesium	Mg	mg/l		-	-	30	50		-	70	100	200	>200
	$CaCO_3$	mg/l		-	-	7	12		-	290	420	840	>840
Manganese	Mn	µ g/l	P	500	50	20	50	S	50	50	1000	2000	>2000
Mercury	Hg	µ g/l		1	1	-	1	C	2	5	10	20	>20
Molybdenum	Mo	µ g/l		70	-	-	-		-	50	100	200	>200
Nickel	Ni	µ g/l		20	20	-	50		-	250	500	1000	>1000
Nitrate*	NO_3^-	mg/l	P	50	50	25	50		45	45	90	180	>180
	N	mg/l		-	-	5	11	C	10	10	20	40	>40
Nitrite*	NO_2^-	mg/l		3	0.1	-	0.1		3	-	-	-	-
	N	mg/l		-	-	-		C	1	-	-	-	-
Oxygen, dissolved	O_2	% sat.		-	50	-	-		-	-	-	-	-
Phosphorus	P_2O_5	µ g/l		-	-	400	5000		-	-	-	-	-
	PO_4^{3-}	µ g/l		-	-	300	3350		-	-	-	-	-
Potassium	K	mg/l		-	-	10	12		-	200	400	800	>800
Selenium	Se	µ g/l		10	10	-	10	C	50	20	50	100	>100
Silver	Ag	µ g/l		-	-	-	10	S	100	20	50	100	>100
Sodium	Na	mg/l	R	200	-	20	175		-	100	400	800	>800
Sulphate	SO_4^{2-}	mg/l	R	250	250	25	250	S	250	200	600	1200	>1200
Tellurium	Te	µ g/l		-	-	-	-		-	2	5	10	>10
Thallium	Tl	µ g/l		-	-	-	-	C	2	5	10	20	>20
Tin	Sn	µ g/l		-	-	-	-		-	100	200	400	>400
Titanum	Ti	µ g/l		-	-	-	-		-	100	500	1000	>1000
Tungsten	W	µ g/l		-	-	-	-		-	100	500	1000	>1000
Uranium	U	µ g/l		-	-	-	-	P	20	1000	4000	8000	>8000
Vanadium	V	µ g/l		-	-	-	-		-	250	500	1000	>1000
Zinc after 12 hours in pipe	Zn	µ g/l	R	3000	-	100	-	S	5000	1000	5000	10000	>10000
		µ g/l		-	-	5000	-		-	-	-	-	-
			P: Provisional R: May give reason to complaints from consumers					C: Current. P: Proposed. S: Secondary. T#: Treatment technique in lieu of numeric MCL. TT##: treatment technique triggered at action level of 1300 µ g/l					

3.4 Summary of the National Regulatory Framework

The proponent shall meet all the applicable national legislative, regulatory and policies frameworks, standards and protocol with respect to the activities of the current and future exploration, mine testing and mine preconstruction, construction, operation, closure, rehabilitation and aftercare stages. It is hereby recommended that throughout the ongoing project lifecycle, the developer shall follow the provisions of all the applicable national regulatory frameworks. the following is the summary of the relevant and applicable national policies, legislations and regulation as well as regional (Southern Africa Development Community –SADC) treaties and protocols:

1. The Constitution of Namibia.
2. Environmental Management Act, No. 7 of 2007.
3. Nature Conservation Ordinance, No. 4 of 1975 (as emended).
4. Forest Act, No. 12 of 2001.
5. Atmospheric Pollution Prevention Ordinance, No. 11 of 1976.
6. Electricity Act, No. 4 of 2007.
7. Foreign Investment Act, No. 27 of 1990 (as emended by Foreign Investment.
8. Amendment Act 24 of 1993).
9. Soil Conservation Act, no. 76 or 1969 as amended in South Africa to March 1978.
10. Hazardous Substances Ordinance, No. 14 of 1974.
11. Road Traffic and Transport Act, No. 22 of 1999.
12. Labour Act, No. 11 of 2007 (including Health and Safety Regulations).
13. Minerals (Prospecting and Mining) Act, No. 33 of 1992.
14. Petroleum Products and Energy Act, No. 13 of 1990.
15. Public Health Act, No. 36 of 1919.
16. Regional Councils Act, No. 22 of 1992.
17. Mines, Works and Minerals Ordinance, No. 20 of 1968: Regulations (GN143, GG2927 of 01 October 1968).
18. Water Act, No. 54 of 1956.
19. Namibia Water Corporation Act, No. 12 of 1997.
20. National Heritage Act, No. 27 of 2004.
21. National Environmental Health Policy, 2002.
22. Minerals Policy of Namibia, 2003.
23. Policy for the Conservation of Biotic Diversity and Habitat Protection, 1994.
24. Waste Management Policy.

25. Policy for Prospecting and Mining in Protected Areas and National Monuments.

26. Convention on the Protection of Biological Diversity.

27. Vienna Convention for the Protection of the Ozone Layer, 1985.

28. United Nations Framework Convention on Climate Change, 1992.

29. Kyoto Protocol on the Framework Convention on Climate Change, 1998.

30. Basel Convention on the Control of Transboundary Movement of Hazardous.

31. Wastes and their Disposal, 1989.

32. Southern African Development Community: Protocol on Mining, and.

33. Southern African Development Community: Protocol on Energy.

3.5 International and Regional Treaties and Protocols

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

- The Paris Agreement, 2016.
- Convention on Biological Diversity, 1992.
- Vienna Convention for the Protection of the Ozone Layer, 1985.
- Montreal Protocol on Substances that Deplete the Ozone Layer, 1987.
- United Nations Framework Convention on Climate Change, 1992.
- Kyoto Protocol on the Framework Convention on Climate Change, 1998.
- Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and Their Disposal, 1989.
- World Heritage Convention, 1972.
- Convention to Combat Desertification, 1994. and
- Stockholm Convention of Persistent Organic Pollutants, 2001.
- Southern Africa Development Community (SADC) Protocol on Mining, and.
- Southern Africa Development Community (SADC) Protocol on Energy.

3.6 Recommendations on Regulatory Framework

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

(i) Mining Licenses (ML) from Department of Mines in the Ministry of Mines and Energy.

(ii) Environmental Clearance Certificate (ECC) from the Department of Environmental Affairs in the Ministry of Environment. Forestry and Tourism (MEFT).

(iii) Fresh Water Abstraction permits and Waste Water Disposal permits from the Department of Water Affairs in the Ministry of Agriculture, Water and Land Reform, and.

(iv) All other permits as may be become applicable during the ongoing mining and exploration operations.

4. RECEIVING ENVIRONMENT

4.1 Regional Physical Geography

The ML 205 area falls within the Erongo Region is in the central western part of Namibia within the Damara Orogen that dominates the structural basement of most central part of Namibia. On the Western part of the region is the Atlantic Ocean with Ugab River in the North and Kuiseb River as the southern boundary (Ministry of Mines and Energy (MME), 2010). The Namib Desert borders the Namibian coastline with Atlantic Ocean and stretching inwards to about 120-150 km. The Topography of land rises steadily from sea level to about 1000m across the Namib Desert. Most of the land within Namib Desert is flat to undulating gravel plains, with occasional ridges and isolated inselberg hills and mountains. In the far north of the Erongo Region lies the Brandberg at a highest peak of 2579 m, making it the country's highest mountain.

Ephemeral rivers in Erongo region run through from their inland catchment to seawards direction. These rivers include the Swakop River with its main tributary the Khan River, the Omaruru River, Kuiseb and Ugab River (Fig. 1.1). The surface flows of the ephemeral rivers in the region are short-lived and only their alluvial aquifers provide a source of groundwater. Palaeochannels in the Omaruru River form the underground Omaruru delta also providing a significant source of surface water for the central Namib. There are two water supply schemes in the Kuiseb (Gobabeb) namely, Swartbank and Rooibank.

The project area falls within the Great Escarpment. The area is characterized by relatively flat topography, with the exception of local ridges and hills where more competent rocks occur, forming conspicuous topographic elevated surface expressions. Small, ephemeral rivers that flow only when it rains and dry most of the year dominate the general drainage. The elevation above mean sea level (amsl) ranges from 1,250 m, at the lowest point in the project area, to 1,709 m at the top of Jiperekkeneberg ridge in the northeast of the EPL, with an average elevation of 1,300 m.

4.2 Climatic Settings

4.2.1 Overview

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

- A dry and relatively cool season from April to August with average daytime highs of 23°C and virtually no rainfall during this period.

- A hot and dry season from September to December with minimal and variable rainfall falling (<20mm per month) and average daytime highs of 30°C, which regularly exceed 40°C, and.

- A hot and rainy season from January through to March with >50mm per month falling during this period (although this is extremely variable) and average high temperatures of 29°C.

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

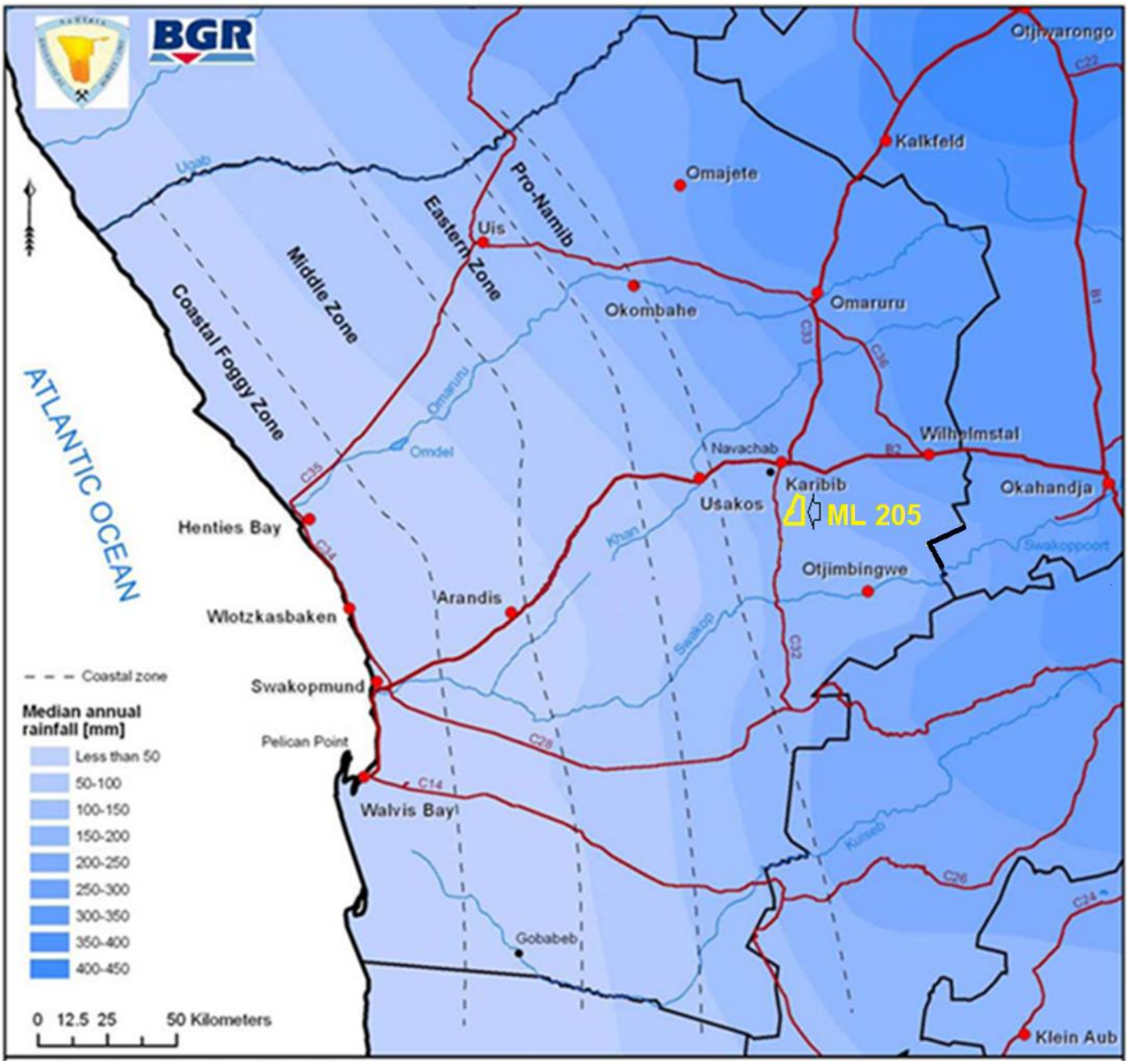


Figure 4.1: Median annual rainfall of central Namib Desert showing the location of the project area, ML 205 (Source: Ministry of Mines and Energy (MME), 2010).

4.2.2 Wind Patterns

The Namib Desert is heavily influenced by high pressure systems, the sub continental high and the South Atlantic high. The coastal winds are driven by the South Atlantic high pressure systems, resulting in strong winds prevailing from the south or south-west (Fig. 4.2). The cold Benguela Current on the Namibian coastline influences the South-westerly winds. The Stronger winds experienced in the coastal towns and surroundings are mainly north-easterly or east winds. These winds are usually dry and hot with a wind speed of about 27km/hour. This influence is experience to up to 50 days annually between the months of April to September. Within the project area, stronger winds are dominated by the south-westerly or a north-easterly component. The wind is stronger in winter due to high pressure system of inland regions.

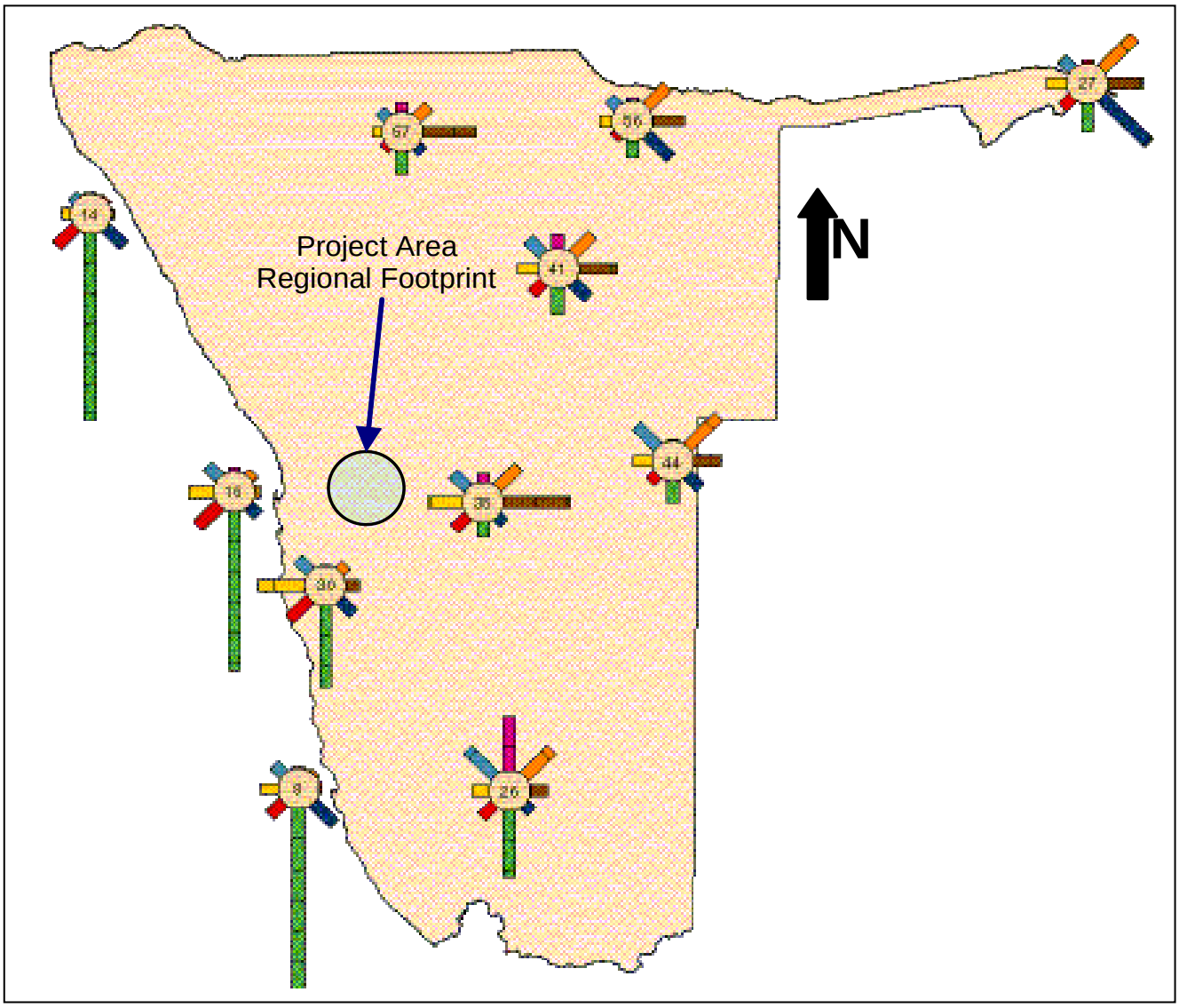


Figure 4.2: Regional wind patterns.

4.2.3 Regional and Local Air Quality Assessment

The need for air quality monitoring is important and must be focused on evaluating the likely influence of any pollutant that may be associated with the ongoing activities. Ambient air quality monitoring for suspended particulate matter, sulphur dioxide, and nitrogen oxides should be carried out over a longer periods during the operation of the mine. The aim should be to study diurnal and seasonal variation and spatial distribution of said pollutants. Dust fall rate measurements should also be carried out for a period of one month out of each season and for all the four seasons of the year. Mining and associated activities may raise the background levels of particulate pollution in the local area. Material handling and processing plant, poorly maintained roads, resulting in transport of fine mined and processed materials dust by means of wind, are potential sources of particulate pollution in mining operations. Burning of fuel and transportation activities could be among the major sources of SO_2 and NO_x in mining operations.

Erongo Strategic Environmental Assessment (SEA) project has developed 20 Dust fallout monitoring network with inclusion of existing mining projects across the Erongo region. In addition to the regional dust monitoring station, a total ten (10) dust monitoring station have been established within the ML 205 area. The dust monitoring programme has been established in order to provide a trend analysis of dust deposition over a period of time. The recorded dust fallout results have been compared to the dust fallout limits as provided by Germany and South Africa as SANS (South African National Standard, 2005) (Annex 4). The main findings and the ongoing dust monitoring associated with the Erongo

Strategic Environmental Assessment (SEA), (MME, 2010) as well as those implemented for the ongoing project dust fallout activities in the Erongo Region can be summarised as in the slight impact range (< 150 mg/m²/day). Overall, the dust fallout were below the SANS residential limit of 600 mg/m²/day and most are below the German standard of 350 mg/m²/day for the general area (Annex 4).

4.2.4 Noise and Air Emissions

4.2.4.1 Assessment Overview and Approach

A specialist assessment of baseline and future noise and air emission trends were undertaken as part of the environmental assessment undertaken in 2017. To achieve the project objectives, noise monitoring of current levels on noise at the two (2) respective mining sites was conducted using an Integrating Sound Level Meter Class 2, using a C band filter for environmental monitoring. A windshield was used to control the impact of wind speed and measurements were conducted at 1.8 meter height and an interval of 15 minutes and results were extrapolated to an hour rating to the continuous rating. The air quality was assessed using American Society for Testing and Materials standard method for collection and analysis of dust fallout (ASTM D1739). A portable Microdust Pro Real-time Dust Monitor serial number 1749391(Casella) was also used to account for hours and possible monthly dust concentration at the sites.

4.2.4.2 Results and Findings of the Specialist Study

The main aim of the air quality assessment and modelling of the likely impact of the mining operations in the ML 205 determined the likely contaminant sources, possible pathways, and targets with respect to the likely final process designs efficiency. The completed study found that the general air quality ranged from 16.61 to 101.88 (mg/m^{2}day) while the noise levels ranged from 59.8 - 76.2 (dBA). The study has found that the existing air quality and noise pollution are below acceptable limit hence following or adopting the proposed recommendations will help to improve compliance throughout the lifecycle of the ongoing mining and exploration operations in ML 205.

Plate 4.1: Dust monitoring stations to be established within the ML 205 as part of the monitoring programme (RBS Geotagged Image Series, 2017).

4.2.5 Recommendations on the Climatic Components

Based on the regional climatic data sets and the results of the specialist study, it is likely that a proportion of windblown dust will be generated during the ongoing project lifecycle covering exploration, preconstruction, construction, operation, rehabilitation, closure and aftercare stages. Due to the proximity of other mines and quarries in the area, there will be potential for cumulative impacts on the air quality occurring. This is likely to occur when the threshold wind speed of 4.5 m/s is exceeded. The threshold wind speed is dependent on the erosion potential of the exposed surface, which is expressed in terms of availability of erodible material per unit area. Any factor that binds the erodible material will significantly reduce the availability of erodible material on the surface, thus reducing the erosion potential of the surface. Namibia does not have air quality standards. Nonetheless, the proponent, must aim at reducing hazardous air pollutant (HAPs) emissions to levels that comply with long-term regional (SADC) and international standards air quality guidelines as outlined in Annex 4.

4.3 Ground Component

4.3.1 Topography

The ML 205 falls within the foothills of the escarpment, more specifically within the Otjipatera Mountain Range which has a highest point of 1,989 mamsl. The terrain in the Project area is gently undulating with elevations in the range of 1, 240 – 1, 340 mamsl. The terrain is rocky and rugged in nature with steep slopes characterising the mountainous sections whilst the foothills of the mountains are flat and gently undulating. The drainage of the area is dendritic in nature with ephemeral streams, often steeply incised, forming small early-stage tributaries into the Swakop River which one of the major ephemeral rivers of western Namibia.

4.3.2 Hydrology

The study area lies in the Swakop River catchment, a large west flowing ephemeral river of the country. Southwards flowing ephemeral tributaries of the Swakop River, namely the Audawib and the Omusema, drain the study area. Elevated areas to the north with exposed basement rocks form a surface water divide. Arid Region Rivers typically show extreme variability with extended dry periods followed by runoff that is rapidly initiated in response to summer rain. Groundwater recharge occurs during these flow events. The safeguarding of the ephemeral drainage system is therefore important for groundwater recharge. There are no natural permanent surface water bodies in the project area. The only large water body on the vicinity is the Swakoppoort Dam built on the Swakop River and is situated 80 km southeast of the EPL area.

4.3.3 Regional Geology

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

According to Miller, (1992), widespread carbonate deposition followed and overlapped far beyond early rift shoulders (Kudis, Ugab and basal Khomas Subgroups). interbedded mica and graphitic schist, quartzite (some ferruginous), massflow deposits, iron-formation and local within-plate basic lava point to fairly variable depositional conditions south of a stable platform where only carbonates with very minor clastics occur (Otavi Group). Near the southern margin of the orogen, deep-water fans, facies equivalents of the carbonates were deposited on either side of a Southern Zone ocean separating Kalahari and Congo Cratons (Auas and Tinkas Formations). Thick schistose metagreywacke and metapelite (Kuiseb Formation) overlie the above rocks. The lithostratigraphy of the Damara Sequence

in the Central Zone (CZ) in which the ML 205 falls has been reviewed and significantly revised by Badenhorst (1987), who has also correlated the stratigraphy across the Omaruru Lineament. The stratigraphy of the CZ taken from Steven (1993) as slightly modified after Badenhorst, (1987) and (1988) is given in Table 4.1.

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

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

4.3.4 Local Geology

The Local Geology of the project area forms a regional anticlinal structure with the Karibib Marble Formation being the main unit that is folded, which plunges to the E-W direction, with dips 45-60° (Fig. 4.3). There are other several rock types that occurs in targeted ML area. These includes: Karibib marble formation, granite, porphyritic andesite. The Karibib Marble Formation occurs in central targeted ML area. Generally, it is made up of white-grey marble, grey metamorphic quartz sandstone and grey quartz schist. The strike is NE-NNW direction, trend SE-NE direction with dips 42-75°in mapped area. The white marble outcrops generally well throughout the targeted ML area. The thickness of the horizon varies between 23 and 50 m thinning gradually north-westwards and south-westwards away from the fold hinge (Fig. 4.3). The granite within the mapped area is the pink in colour with light brown strongly weathered bands. Occurrence of granite is small stock, this granite is the medium grained, consisting of feldspar, quartz and biotite with weak gneissic structure. A porphyritic andesite reef is found in the central part of the ML area within the white marble orebody (Fig. 4.3). This reef is grey-brown in colour and has feldspar as major mineral constituents.

4.3.5 Geotechnical Engineering Considerations

Rocks of varying geotechnical characteristics are expected within the ML area. Table 4.2 outlines an indicative classification of the various discontinuities that are likely to be found in the area including the targeted marble outcrop. Both low and high order discontinuities are likely to be found around the targeted ML area. Based on results of the fieldwork and laboratory assessment undertaken by Ludi Investments, the marble found within the ML area is good for dimension stone mining and depending on the dip and intersections of the various discontinuities, can withstand near vertical steep slopes required for mining operations.

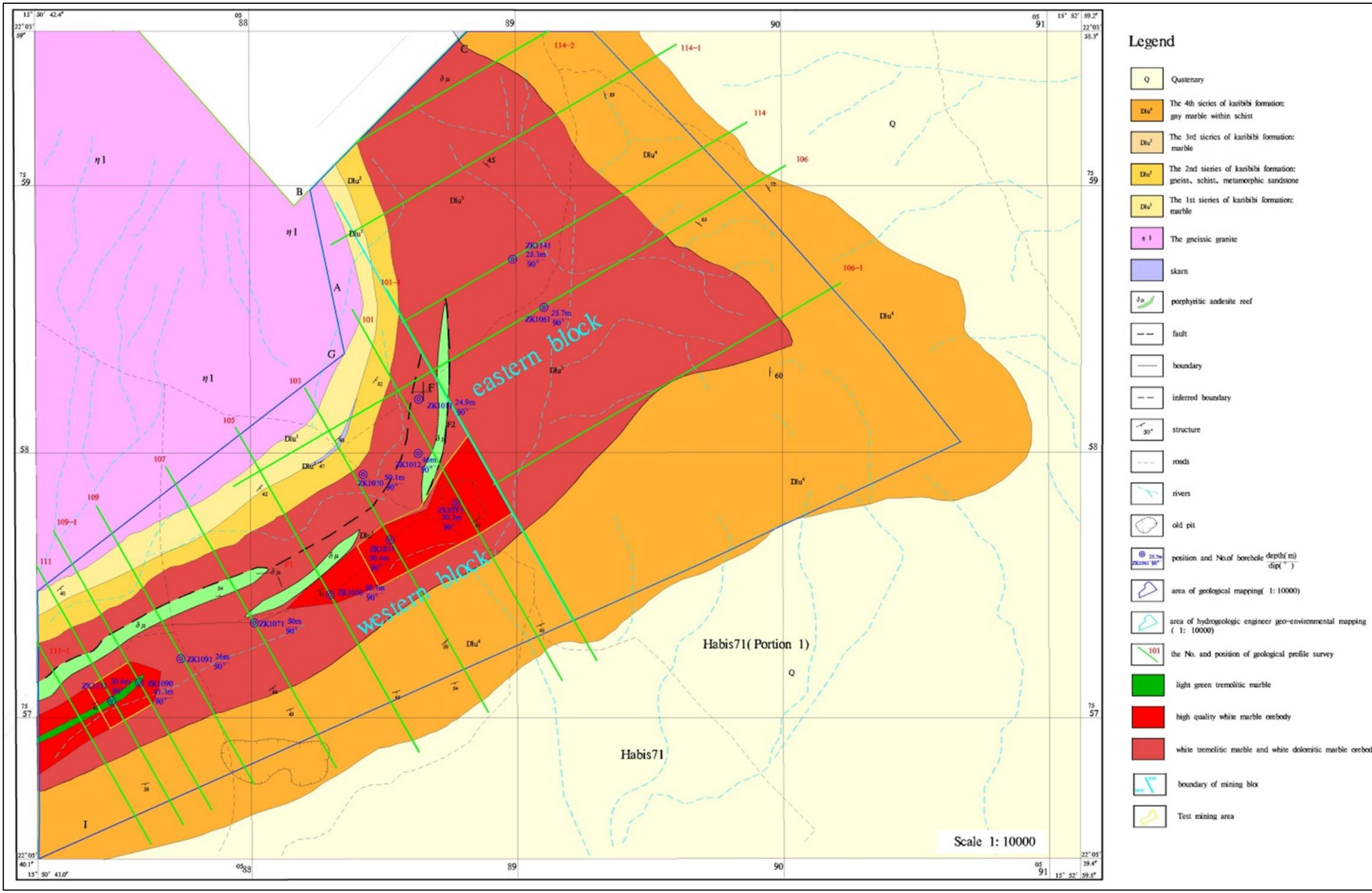


Figure 4.3: Local geological map of the project area (Source: Ludi Investments, 2017).

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

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

4.3.6 Sources of Water Supply

Groundwater as well as surface water (only during the rainy season) from ephemeral river channels is the sources of water supply in the area as well as much of the Erongo Region. According to the Department of Water Affairs, (2001), the Erongo Region, the Karibib and the ML area generally has a low groundwater potential. The area with aquifer potential, reflects the rainfall distribution, decreasing westwards. Knowledge of the aquifers in this area is sparse, due to the low number of boreholes and few on groundwater.

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

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

According to the hydrogeological study under undertaken, the possible water sources for the ongoing mining operations will be from groundwater sources. The hard-rock aquifer can supply sustainably at yields of up to 5 m^3/h per borehole as seen from past drilling records.

4.3.7 Evaluation of Water Vulnerability

4.3.7.1 Overview

Vulnerability assessment of surface water covered possible runoff, the presence of source factors and major flow routes such as ephemeral river channels, valleys and gullies as pathways and the presence of surface water body as a target. The groundwater assessments covered hydraulic properties and thickness of the unsaturated and saturated zones derived from geological and hydrogeological data. The assessment of the unsaturated characteristics was based on the ability for source factors to influence the system through known pathway factors such as discontinuities. However, groundwater or surface water will only be vulnerable to contamination if there are contaminant sources, if there are pathways for contaminant migration and there are targets (surface water or groundwater) present within the project area.

Overall, the limited local groundwater resources found in the area form part of the unconfined aquifer system that is highly vulnerable to any sources of pollution that maybe associated with the ongoing mining operations. During the rainy season, surface water bodies can be found along the major ephemeral river systems in the area with an active local spring. This surface water often recharges the local groundwater resources along the faults, solutions holes, and other discontinuities along the ephemeral rivers in the area. Therefore, surface water in the area could be vulnerable to pollution sources from the ongoing mining activities. It is important that all polluting activities such as waste rock stockpile, dirty water pond and ore stockpile must not be placed or undertaken in areas with high discontinuities, valleys or gullies connected to major ephemeral rivers systems in the area (Annex 5). Management of wastewater from the onsite administration blocks and related infrastructures will utilise French Drains. Effective monitoring will need to be put in place to avoid under designing of the facilities that may results in overflow of waste water into the surrounding receiving environment.

4.4 Fauna

4.4.1 Reptiles

The high percentage of endemic reptile species (45.3%) associated with the rocky escarpment region of central western Namibia underscores the importance of this area without formal state protection. The most important species expected to occur in the general area are viewed as the tortoises *Stigmochelys pardalis* and *Psammobates oculiferus*. pythons – *P. anchietae* and *P. natalensis*. Namibian wolf snake (*Lycophidion namibianum*) – *Varanus albigularis* and some of the endemic and little-known gecko species – e.g. *Pachydactylus* species. Tortoises, snakes and monitor lizards are routinely killed for food or as perceived threats. Other important species are those viewed as “rare” – i.e. *Rhinotyphlops lalandei*, *Mehelya vernayi* & *Afroedura africana* – although very little is known about these species.

4.4.2 Amphibians

Of the seven species of amphibians that potentially could occur in the general area of which 2 species are endemic (*Poyntonophrynus hoeschi* and *Phrynomantis annectens*) (Griffin 1998b) and 1 species is classified as “near threatened” (*Pyxicephalus adspersus*) (Du Preez and Carruthers 2009) – i.e. high level (42.9%) of amphibians of conservation value from the general area. Except for these important species and due to the fact that there is no open permanent surface water in the area, amphibians are not viewed as very important in the general area.

4.4.3 Mammals

Of the 87 species of mammals known and/or expected to occur in the general Karibib area, 9 species (10.3%) are classified as endemic. Rodents (of which 6 species – 23.1% – are endemic) and bats (of which 1 species is classified as “rare”) are the groups least studied. Species of greatest concern in the general area are those viewed as “rare” in Namibia – i.e. Namibian wing-gland bat and Southern African hedgehog – and species classified as “near threatened” – i.e. Commerson’s roundleaf bat, striped leaf-

nosed bat and brown hyena, leopard – and "vulnerable" by the IUCN (2016) – i.e. cheetah & Hartmann's mountain zebra.

4.4.4 Birds

At least 217 bird species [mainly terrestrial "breeding residents"] occur and/or could occur in the general Karibib area at any time and include 12 of the 14 Namibian endemics (85.7% of all Namibian endemic species or 5.6% of all the species expected to occur in the area). The most important bird species from the general area are those classified as endemic to Namibia of which the Damara hornbill and Herero chat are viewed as the most important due to the overall lack of knowledge of these species. Although also viewed as important, Rüppels korhaan is migratory throughout its range while the rockrunner inhabits inaccessible terrain and is widespread throughout mountainous areas in Namibia. Other species of concern are those classified as endangered (violet wood-hoopoe, Ludwig's bustard, white-backed vulture, black harrier, tawny eagle, booted eagle, martial eagle, black stork), vulnerable (lappet-faced vulture, secretarybird) and near threatened (Rűppel's parrot, kori bustard, Verreaux's eagle, peregrine falcon, marabou stork) (Simmons *et al.* 2015).

4.5 Flora

4.5.1 Trees/Shrubs and Grasses

At least 91 to 101 larger species of trees and shrubs are known and/or expected to occur in the general area of which 8 species (7.9%) expected to occur in the general Karibib area are classified as endemics, 4 species as near endemics, 23 species (22.8%) are protected by the Forest Act No 12. of 2001 and another 2 species by various other Forestry laws (Curtis and Mannheimer 2005 and Mannheimer and Curtis 2009), 5 species (4.9%) are protected under the Nature Conservation Ordinance No. 4 of 1975 while 6 species (5.9%) are classified as CITES Appendix 2 species (Annex 6). The endemic grass – *Eragrostis omahekensis* – is viewed as the most important species potentially occurring in the general area (Annex 6).

4.5.2 Aloes

Aloes are protected throughout Namibia and potentially occur in the general area, and those viewed as important are: *Aloe asperifolia*, *A. hereroensis* and *A. zebrina* (Rothmann 2004).

4.5.3 Commiphora

Many endemic Commiphora species are found throughout Namibia with Steyn (2003) indicating that *Commiphora crenato-serrata* potentially also occurring in the general area.

4.5.4 Lithops

Lithops species – all protected (See Nature Conservation Ordinance No. 4 of 1975) – are also known to occur in the general area and often difficult to observe, especially during the dry season when their aboveground structures wither. The closest species are currently only known to occur west of Usakos and include *Lithops gracilidelineata* var. *gracilidelineata* and *L. werneri* (Cole and Cole 2005).

4.5.5 Ferns

At least 64 species of ferns, of which 13 species being endemic, occur throughout Namibia. Ferns in the general Karibib area include at least 15 indigenous species (*Actiniopteris radiata*, *Asplenium cordatum*, *Cheilanthes dinteri*, *C. eckloniana*, *C. marlothii*, *C. parviloba*, *Marselia aegyptiaca*, *M. ephippiocarpa*, *M. farinosa*, *M. macrocarpa*, *M. nubica*, *M. unicornis*, *M. vera*, *Ophioglossum polyphyllum* & *Pellaea calomelanos*) (Crouch *et al.* 2011). The general area is under collected with more species probably occurring in the general area than presented above.

4.5.6 Lichens

The overall diversity of lichens is poorly known from Namibia, especially the coastal areas and statistics on endemicity is even sparser (Craven 1998). More than 100 species are expected to occur in the Namib Desert with the majority being uniquely related to the coastal fog belt (Wirth 2010). Lichen diversity is related to air humidity and generally decreases inland form the Namibian coast (Schults and Rambold 2007). Off road driving is the biggest threat to these lichens which are often rare and unique to Namibia. To indicate how poorly known lichens are from Namibia, the recent publication by Schultz *et al.* (2009) indicating that 37 of the 39 lichen species collected during BIOTA surveys in the early/mid 2000's was new to science (i.e. new species), is a case in point. Lichens are known to occur on rocky terrain in the mountainous terrain in the general area.

4.5.7 Other species

Other species with commercial potential that could occur in the general Karibib area include *Harpagophytum procumbens* (Devil's claw) – harvested for medicinal purposes and often over-exploited and *Citrullus lanatus* (Tsamma melon) which potentially has a huge economic benefit (Mendelsohn *et al.* 2002).

4.5.8 Important Habitat Areas

The most important areas are:

(i) **Mountainous**: Rocky areas generally have high biodiversity and consequently viewed as important habitat for all vertebrate fauna and flora such as *Aloe litoralis* (protected) as well as *Ficus cordata* (protected), *Sterculia africana* (protected) and *Commiphora glaucescens* (near endemic) individuals.

(ii) **Ephemeral drainage lines**: The various ephemeral drainage lines are important habitat to larger trees, especially *Acacia erioloba* (protected), *Euclea pseudebenus* (protected), *Faidherbia albida* (protected) and *Ziziphus mucronata* (protected).

4.6 Socioeconomic Environment of ML Area

4.6.1 Overview

The ML 205 area falls within the Karibib Constituency, Erongo Region in Namibia. The total area of Karibib Constituency covers 14 535.8 km² amounting to 22.8 percent of the total area of Erongo Region (Republic of Namibia, 2014b). Karibib Constituency is bordered by the Omaruru Constituency in the north, Daures Constituency in the northwest, Arandis Constituency in the southwest and Otjozondjupa and Khomas Regions to the east. The ML area falls within the Government owned resettlement farmland. The neighbouring farms are privately owned commercial farmland. Cattle and small stock farming is the dominant farming activity in the general ML area. The risk of farming is viewed as relatively high with the carrying capacity viewed as 20-30 kg/Ha (Mendelsohn *et al.* 2002) or 18-24ha/LAU (van der Merwe 1983). The tourism potential of this area is viewed as moderate to low (Mendelsohn *et al.* 2002, van der Merwe 1983).

The nearest Town to the ML 205 is the mining Town of Karibib. The development of this project will have some socioeconomic contributions to the Town of Karibib which currently is dependent on the Navachab Gold Mine. There will be temporary employment opportunities and workers from the project area will be staying in the Town of Karibib. Potential for the development of a viable mining project will bring added local benefits and will contribute to the national economy through taxes, royalty, and direct investment.

4.6.2 Socioeconomic Baseline Summary

Based on the desktop and field-based socioeconomic assessment undertaken for this project, the following is the summary of the key socioeconomic information associated with the ML 205 area:

- The population of Karibib Constituency is 13 320 which is 8.8 percent of the total Erongo Region population.
- The ongoing project is located in the sparsely populated freehold farming area. Karibib Constituency is among the least densely populated area in Erongo Region with a population density of approximately 0.9 persons per km^2.
- About 60% of the Constituency population are people in working-age (between 15-59 years of age) and 46% are junior population (14 and less years old).
- Female population in Karibib Constituency is slightly less (48.1%) compared to 51.9 percent for males.
- 87.4% of the population in Erongo Region lives in urban areas, making Erongo Region as the second most urbanized region in Namibia.
- Net migration in Erongo Region is 1.5%, meaning Erongo region gained more people from other regions over between 2010 and 2011. Most of influx to Erongo Region originates from northern regions of Namibia.
- Labour force participation rate in Karibib Constituency is 76.3 %. male labour force participation rates being higher than for females (80.2 and 71.8% respectively).
- The household size in Karibib Constituency is 3.7 people which is lower than national average.
- 62.8 % of households in Karibib Constituency are headed by males and 37.2% are headed by females.
- The main source of income of households in Karibib Constituency are wages and salaries, amounting to 58.2%.
- Average household income in Erongo Region is around N$84 989 per annum and exceeds the national average of N$68 878, ranking the region amongst the most affluent.
- Detached houses are most common dwellings in Karibib Constituency, making 45.5% of all households. 29.3% of housing are improvised dwellings (shacks).
- Quality of infrastructure and service provision in Erongo Region are generally good.
- Health-care availability in the Erongo Region is well regarded.
- Main health challenges in Erongo Region are HIV/AIDS, TB, substance abuse, other respiratory system diseases and children in need of care.
- The access to educational and health-care infrastructure in Erongo Region is above the national average. 66.9% of households have less than a kilometre to the nearest primary school, 44.2% of households have less than 1 kilometres to the nearest high school and 60.3 % of households in Erongo Region have less that a kilometre to travel to nearest hospital.
- In comparison to the Erongo Region where 96.3 % of households had access to safe water, Karibib Constituency had only 88.9 % households that have access to safe water.

- ❖ Erongo Region is a relatively prosperous region in Namibia, with the second highest per capita income (after Khomas) derived mostly from mining, fishing and tourism, and.

- ❖ The greatest limiting factors for economic activities is the arid climate and an overall shortage of water, poor soils and rangeland productivity. poor skills base.

4.7 Archaeology

4.7.1 Regional Archaeological Setting

Modern humans and their ancestors have lived in Namibia for more than one million years, and there are fossil remains of lineal hominin ancestors as early as the Miocene Epoch. Namibia has a relatively complete sequence covering the mid-Pleistocene to Recent Holocene period, represented by thousands of archaeological sites mainly concentrated in the central highlands, escarpment, and Namib Desert. The Recent Holocene archaeological sequence in Namibia, i.e. the last 5 000 years, is of particular importance because it provides the background evidence for the development and recent history of the indigenous peoples of Namibia before the advent of written historical records during the colonial era. Many archaeological sites from this period are of great significance to the understanding of Namibian history, and some are of global importance.

4.7.2 Local Archaeological Setting

In summary, the three area surveys previously undertaken in the vicinity of EPL-5536 provide new evidence relating to the last one thousand years, with little indication of earlier occupation. The pre-colonial evidence points to impermanent settlement by groups of probably Khoe pastoralists. These people formed part of a regional-scale network with links to the Atlantic coast and inland sites where copper was produced. However, there are a large assemblage of ceramic vessels associated with the general area of Farm Habis and represent an important addition to the regional archaeological picture. Evidence from the early colonial period relates to mining in the Karibib area and a combination of trade, missionary activity and wagon repair in the Otjimbingwe area. Both Karibib and Otjimbingwe are centres of historical importance and have a number of National Monument sites recognized under the National Heritage Act.

4.7.3 Archaeological Desk Assessment

On the basis of the three previous field surveys it is safe to assume that EPL-5536 will have some sites of archaeological significance and that these will probably date to the late pre-colonial and early colonial periods. Early colonial remains are expected to be relatively abundant on EPL-5536, although it is likely that if these are related to historical mining activity they will form part of the general area of mining interest in the vicinity. It is expected that the area of mining interest will be extensively disturbed and that little might remain of either pre-colonial or early colonial sites in the near vicinity. It is possible that rocky outcrop areas in the EPL-5536 will have rock shelters containing stratified archaeological deposits and that there may be some highly significant sites that would require detailed documentation and possibly mitigation measures to be adopted in the event of encroachment by mining activity.

4.7.4 Archaeological Conclusions and Recommendations

The area of interest for mining operations probably has archaeological potential, although no archaeological sites have been recorded so far from within the area itself. The expectation is therefore:

(i) A high likelihood of Holocene age archaeological sites, including rock art, associated with outcropping granite.

(ii) A high likelihood of late precolonial settlement sites throughout the entire tenement, especially in the vicinity of springs and seepages, and.

(iii) A high likelihood of early colonial settlement remains relating to the historical occupation of Karibib and Otjimbingwe.

The following are the key recommended actions related to archelogy in the EPL area:

(i) Contractors working on the site should be made aware that under the National Heritage Act any items protected under the definition of heritage found in the course of development should be reported to the National Heritage Council.

(ii) The Chance Finds procedure as outlined in the EMP must be implemented at all times.

(iii) Detailed field survey should be carried out if suspected archaeological resources have been unearthed during the mining operations.

4.8 Stakeholder Consultations and Engagement

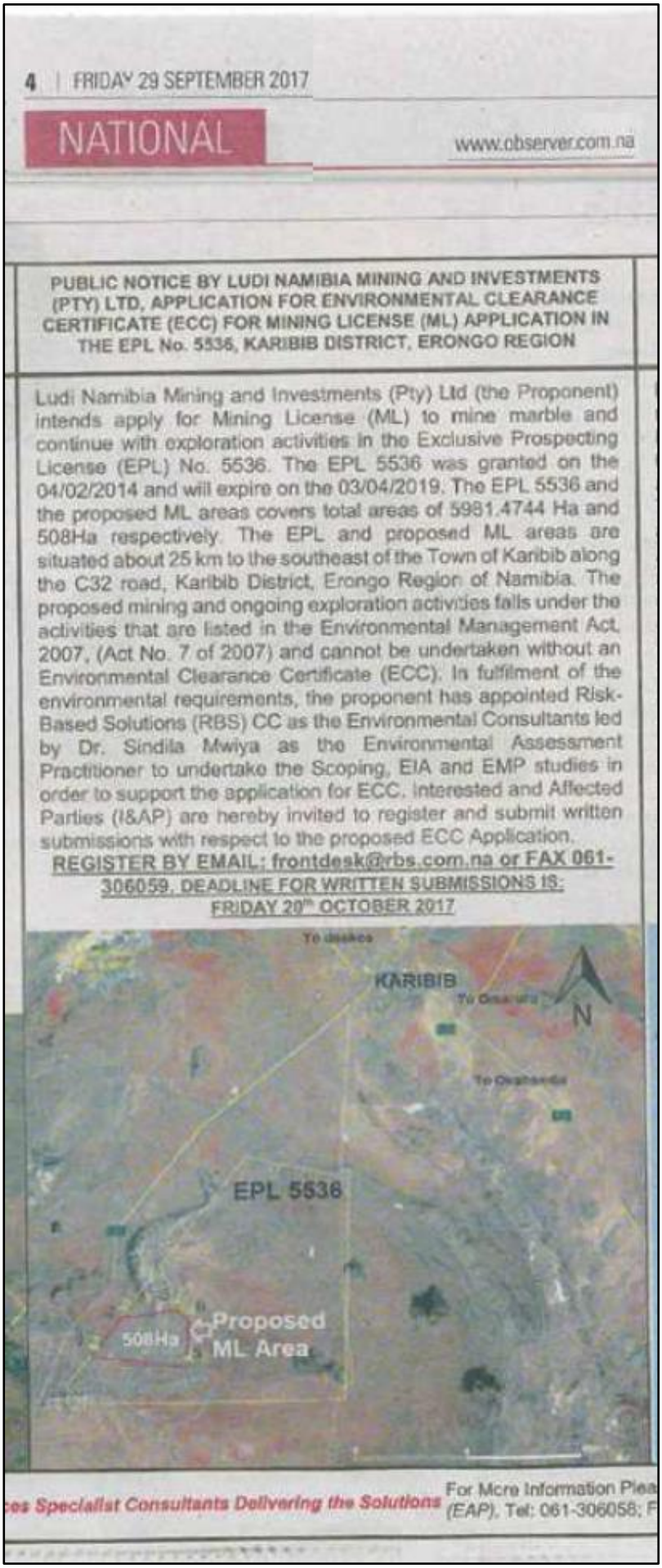
4.8.1 Overview

Public consultation and engagement process has been part of the environmental assessment process for this project. Land owners were directly contacted and invited to participate in the environmental assessment process via emails and telephone calls. The general public were invited to submit written comments / inputs / objections with respect to the ongoing mining operations and ongoing minerals exploration activities in the ML 205 via public notices published in the local newspapers.

4.8.2 Public Consultation Process

Public notices were published in the local newspapers during the months of September and October 2017 (Figs. 4.4 - 4.6). A stakeholder register was opened and despite telephonic inquiries with respect to contracts and employment opportunities, no written comments / inputs / objections were received during period dedicated for public consultations in line with the provisions of the Environmental Assessment (EA) process in Namibia is governed by the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 gazetted under the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007).

Public consultation process was undertaken through emails contact and the newspaper advertisements as shown in Figs. 4.4- 4.6.



4 | FRIDAY 29 SEPTEMBER 2017

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PUBLIC NOTICE BY LUDI NAMIBIA MINING AND INVESTMENTS (PTY) LTD, APPLICATION FOR ENVIRONMENTAL CLEARANCE CERTIFICATE (ECC) FOR MINING LICENSE (ML) APPLICATION IN THE EPL No. 5536, KARIBIB DISTRICT, ERONGO REGION

Ludi Namibia Mining and Investments (Pty) Ltd (the Proponent) intends apply for Mining License (ML) to mine marble and continue with exploration activities in the Exclusive Prospecting License (EPL) No. 5536. The EPL 5536 was granted on the 04/02/2014 and will expire on the 03/04/2019. The EPL 5536 and the proposed ML areas covers total areas of 5981.4744 Ha and 508Ha respectively. The EPL and proposed ML areas are situated about 25 km to the southeast of the Town of Karibib along the C32 road, Karibib District, Erongo Region of Namibia. The proposed mining and ongoing exploration activities falls under the activities that are listed in the Environmental Management Act, 2007, (Act No. 7 of 2007) and cannot be undertaken without an Environmental Clearance Certificate (ECC). In fulfilment of the environmental requirements, the proponent has appointed Risk-Based Solutions (RBS) CC as the Environmental Consultants led by Dr. Sindila Mwiya as the Environmental Assessment Practitioner to undertake the Scoping, EIA and EMP studies in order to support the application for ECC. Interested and Affected Parties (I&AP) are hereby invited to register and submit written submissions with respect to the proposed ECC Application.

REGISTER BY EMAIL: frontdesk@rbs.com.na or FAX 061-306059. DEADLINE FOR WRITTEN SUBMISSIONS IS: FRIDAY 20th OCTOBER 2017

...es Specialist Consultants Delivering the Solutions For More Information Plea... *(EAP)*, Tel: 061-306058; F...

Figure 4.4: Copy of the public notice that was published in the Windhoek Observer newspaper dated 29th September 2017.

12 - 18 October 2017 CONFIDÉNTE

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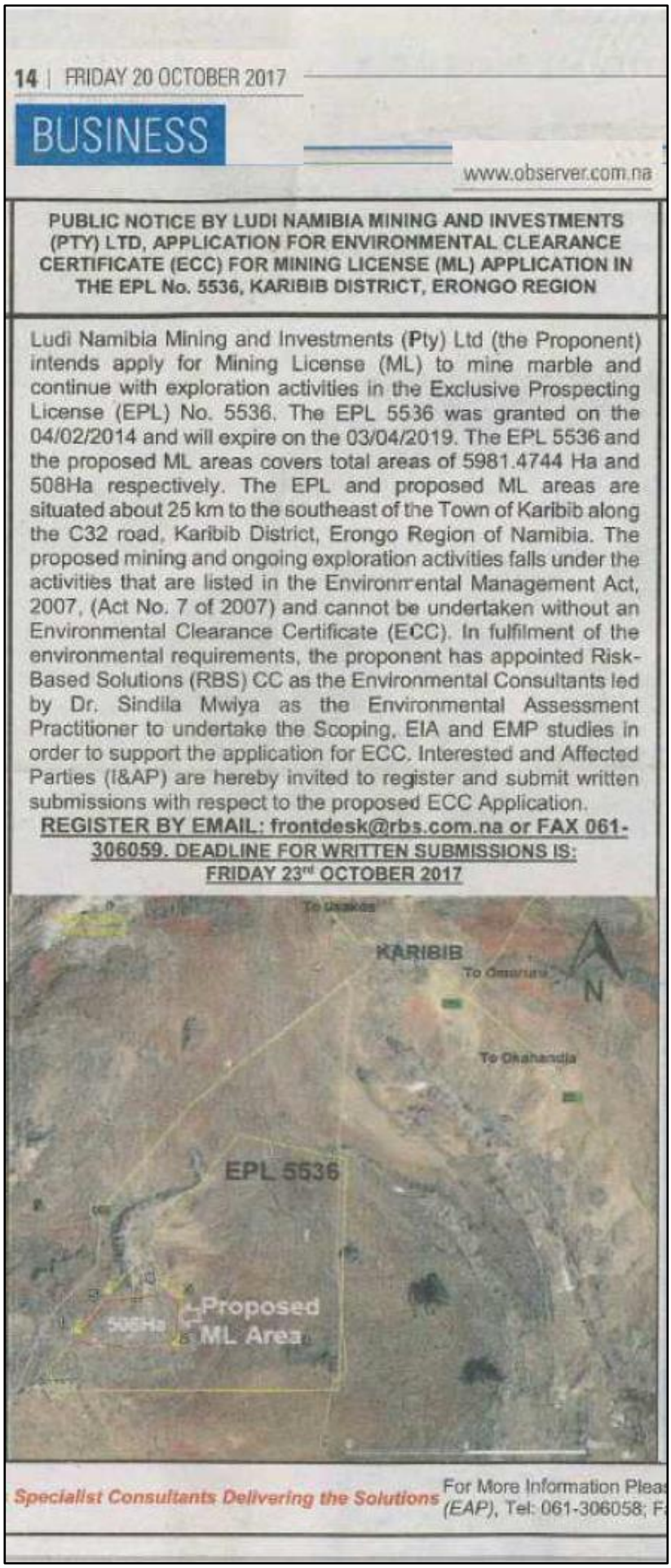
Specialist Consultants Delivering the Solutions For More Information Please (EAP), Tel: 061-306058, Fa

Figure 4.5: Copy of the public notice that was published in the Confidente newspaper dated 12th – 18th October 2017.



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BUSINESS

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PUBLIC NOTICE BY LUDI NAMIBIA MINING AND INVESTMENTS (PTY) LTD, APPLICATION FOR ENVIRONMENTAL CLEARANCE CERTIFICATE (ECC) FOR MINING LICENSE (ML) APPLICATION IN THE EPL No. 5536, KARIBIB DISTRICT, ERONGO REGION

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REGISTER BY EMAIL: frontdesk@rbs.com.na or FAX 061-306059. DEADLINE FOR WRITTEN SUBMISSIONS IS: FRIDAY 23rd OCTOBER 2017

Specialist Consultants Delivering the Solutions For More Information Plea... *(EAP)*, Tel: 061-306058; F...

Figure 4.6: Copy of the public notice that was published in the Windhoek Observer newspaper dated 20th October 2017.

5. ASSESSMENT OF LIKELY IMPACTS

5.1 Overview

The **'environment'** is the surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation.

An **'environmental aspect**' is defined as an element/part of an organisation's activities, products or services that can interact with the environment – i.e. the source of the impact.

An **'environmental impact'** is any change to the environment whether adverse or beneficial wholly or partially resulting from an organisation's environmental aspect.

An **'environmental objective'** is an overall environmental goal, consistent with the environmental policy that an organisation sets to achieve.

'Environmental performance' is the measurable results of an organisation's management of its environmental aspects. Results can be measured against the organisation's environmental policy, environmental objectives, environmental targets, and other environmental performance requirements.

5.2 Evaluation of Impacts

5.2.1 Impact Assessment Objectives

The overall objective of the impact assessment undertaken for this project focused attention specifically on mining, exploration and supporting infrastructure related impacts of potentially significant risk covering the whole project lifecycle.

The overall impact assessment approach has adopted the Leopold matrix framework which is one of the internationally best-known matrix assessment methodology available for predicting the impact of a project on the receiving environment.

5.2.2 Environmental Impact Assessment Rankings

To ensure consistency in the evaluation of environmental impacts associated with ongoing mining and exploration activities, the rating criteria for the impact assessment have been standardised to include set definitions applied in the risk assessment (Table 5.1). To the extent possible, allocation to rank categories is based on quantifiable criteria which can be measured as detailed in Table 5.1.

Furthermore, when evaluating impacts, the allocated ranks refer to the resultant *impact* (e.g. area affected, or time that the result of the impact will last), and not of the *cause* thereof (e.g. area actually mined, or time of active impact).

Each activity has been assessed with respect to the type of effect that the aspect will have on the relevant component of the environment and includes "what will be affected and how?" The criteria used to determine the significance rating of the impact(s) is detailed in Table 5.2.

Table 5.1: The criteria used in the evaluation of environmental impacts.

Rating	Definition of Rating
Status of the Impact – in terms of meeting the objective of maintaining a healthy environment.	
Positive	The impact benefits the environment
Negative	The impact results in a cost to the environment
Neutral	The impact has no effect
Probability – the likelihood of the impact occurring	
Negligible	Possibility negligible
Improbable	Possibility very low
Probable	Distinct possibility
Highly Probable	Most likely
Definite	Impact will occur regardless of preventive measures
Degree of confidence in predictions – in terms of basing the assessment on available information	
Low	Assessment based on extrapolated data
Medium	Information base available but lacking
High	Information base comparatively reliable
Extent – the area over which the impact will be experienced	
Site specific	Confined to within < 1 km of the project
Local	Confined to the study area or within 5 km of the project
Regional	Confined to the region, i.e. > 5 km but < National
National	Nationally
International	Beyond the borders of Namibia
Duration – the time frame for which the impact will be experienced	
Very short	Less than 2 years
Short-term	2 to 5 years
Medium-term	6 to 15 years
Long-term	More than 15 years
Permanent	Generations
Intensity – the magnitude of the impact in relation to the sensitivity of the receiving environment	
Negligible	Natural functions and processes are negligibly altered due to adaptation by the receptor(s) to high natural environmental variability
Mild	Natural functions and processes continue albeit in a modified way that **does not** appear to have a significant disruptive effect (i.e. changes are temporary)
Moderate	Natural functions and processes continue albeit in a modified way that **does** appear to have a noticeable disruptive effect (i.e. changes are permanent)
Severe	Natural functions or processes are altered to the extent that they temporarily cease resulting in severe deterioration of the impacted environment
Very Severe	Natural functions or processes permanently cease or are completely disrupted

Table 5.2: The criteria used to determine the significance rating of the impact(s).

Low:	Where the impact will have a negligible influence on the environment and no modifications or mitigations are necessary for the given project 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 project design and/or alternative mitigation. This would be allocated to impacts of moderate severity, 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(ies) causing it should not be permitted without substantial mitigation and management, and pro-active rehabilitation commitments (i.e. there could be a 'no-go' implication for the project). This would be allocated to impacts of severe magnitude, locally over the medium-term, and/or of severe magnitude regionally and beyond.

5.2.3 Assessment of Alternatives

The various project alternative has been assessed for the ongoing marble quarry in the ML 205 and will need to be continuously reviewed at various stages of the project development process. The following alternatives have been considered and evaluated with respect to the ongoing project operations:

(i) **Location of the Marble Deposits/ Quarry:** A number of the different marble deposits are known to exist in different parts of Namibia and some have been explored and mined by different companies over the years. The deposits found around the ML area have been

explored and still being mined by different companies in the area. Based on the historical records available as well as the results of the comprehensive work covering desktop studies, field-base data collection process, including a field surface, drilling and sampling programmes undertaken, there is potential to develop a mining project in this area compared to other known deposits within the EPL area. More so, however, is that the deposit is located in an area with very good infrastructure required for development a dimension stone mining project including telecommunication with a mobile network as well as good road network connecting the ML 205 area to the town of Karibib.

(ii) **Exploration Methods:** In general, an exploration programme covers four stages namely: desk study, scoping, pre-feasibility and feasibility. The type of exploration methods applied at each stage may be different and will depend on the various issues such as the type of the hosting rocks, depth, as well as the level of detail required. All different variables and alternatives have been considered in the evaluation of the influences likely to be posed by the ongoing exploration activities. Due to the availability of sufficient historical data sets, much of the exploration activities undertaken at each of the four stages (scoping, pre-feasibility and feasibility) comprised desk studies, surface field mapping, sampling, trenching in selected areas, sampling in selected areas, test mining and ore reserve assessments and evaluations. Other exploration techniques such as geophysical surveys have also been used.

(iii) **Mining Methods**: The mining techniques will use open cast mining in the extraction of the marble blocks. The blocks will be cut using a diamond wire and removed by a frontend loader for stockpiling.

(iv) **Transport:** Assessment of the transport alternatives are more of a major issue to the mining phase compared the exploration. During the exploration much of the transport mechanisms will utilise light 4x4 vehicles. The transport systems to be employed for the mining phase can be divided into the following:

- ❖ Transport of marble blocks from the mining face to the stockpile will be done by the front-end loader, and.
- ❖ Transport of the stockpile blocks to Karibib / Walvis Bay will be done by trucks.

(v) **Processing:** A dimension stone ore body comprise block of rock from which certain shape and size block can be taken out by sawing with a diamond cutter. These blocks will cut, trimmed and processed into a variety of products. All the marble blocks produced will be inspected and classified in terms of size, dimension colour, texture, fractures, veins, spots.

(vi) **Water Resources:** Groundwater is available in the area. Permission for the extraction of water (drilling of borehole) and the disposal of waste water will need to be obtained from the Ministry of Agriculture, Water and Forestry. The main source of water in the area is the groundwater associated with the good secondary hydraulic properties of the limited surficial covers and extensive carbonate deposits in the area. The strategies for the recycling and reuse of water will need to be implemented.

(vii) **Energy Sources:** The available sources of energy include solar, diesel, Liquid Petroleum Gas (LPG) and petrol.

(viii) **The No-Action Alternative** - A comparative assessment of the environmental impacts of the 'no-action' alternative (a future in which the ML area and exploration activities do not take place) has been undertake. An assessment of the environmental impacts of a future, in which the ML area and exploration does not take place, may be good for the receiving environment because there be no negative environmental impacts due to the ongoing mining and exploration operation that may take place in the EPL area. The environmental benefits will include no negative environmental impact on the receiving environment. However, it is important to understand that even if the ML area and exploration activities do

not take place, to which the likely negative environmental impacts are likely to be low and localised, the current and other future land uses such as agriculture will still have some negative impacts on the receiving environment. The likely negative environmental impacts of other current and future land use that may still happen in the absence of the ML area and ongoing minerals exploration activities includes: Land degradation due to drought, poor land management practices, erosion and overgrazing. Furthermore, it is also important to understand what benefits might be lost if the ML area and exploration activities do not take place. Key loses that may never be realised if the ML area and ongoing project activities do not go-ahead include: Loss of potential added value to the unknown marble resources that maybe found within the EPL area, socioeconomic benefits derived from current and future mining and exploration activities, direct and indirect contracts and employment opportunities, export earnings, foreign direct investments, license rental fees, royalties, and various other taxes payable to the Government.

(ix) **Other Alternative Land Uses:** The ML area fall within commercial agricultural land uses area dominated by game, cattle, and small stock farming as well as quarrying. The growing game farming is also making tourism a vital socioeconomic opportunity in the general area but not necessary within the ML 205. Minerals exploration and mining activities are well known land uses options in Namibia and the surrounding EPL area. Due to the limited scope of the ML area and exploration and the implementation of the EMP, it is likely that the ongoing mining and exploration activities will continue to coexist with the current and future land uses.

(x) **Potential Land Use Conflicts:** Considering the current land use practices (agriculture and mining) it is likely that the development of a mine in the general area can still co-exist with the existing and potential future land use options of the general area. However, much more detail assessment of any likely visual and other socioeconomic impacts will need to be undertaken as part of the EIA. The use of thematic mapping thereby delineating zones for specific uses such as conservation, mining, or tourism etc, within the EPL area will greatly improve the multiple land use practices and promote coexistence.

(xi) **Ecosystem Function** (**What the Ecosystem Does**)**:** There are wildlife habitats, carbon cycling or the trapping of nutrients and characterised by the physical, chemical, and biological processes or attributes that contribute to the self-maintenance of an ecosystem in this area. The ML area and exploration activities will not affect the ecosystem function due to the limited scope and the ecosystem of this EPL area is part of the larger local and regional ecosystems which are all interlinked.

(xii) **Ecosystem Services:** Food chain, harvesting of animals or plants, and the provision of clean water or scenic views are some of the local ecosystem services associated with the EPL area. However, the ML area and exploration activities will not affect the ecosystem services due to the limited scope, area of coverage and the ecosystem of this EPL area is part of the larger local and regional ecosystems which are all interlinked.

(xiii) **Use Values**: The EPL area has direct use for other land uses such as agriculture, conservation and tourism as well as indirect include watching a television show about the general area and its wildlife, food chain linkages that sustains the complex life within this area and bequest value for future generations to enjoy. The ML area and exploration activities will not destroy the current use values due to the limited scope of the ML area and ongoing activities as well as the adherence to the provisions of the EMP, and.

(xiv) **Non-Use or Passive Use**: The ML area within the EPL area has an existence value that is not linked to the direct use / benefits to current or future generations. The ML area and exploration activities will not affect ecosystem current or future none or passive uses due to the limited scope that will leave much of the EPL area untouched and the ecosystem of this EPL area is part of the larger local and regional ecosystems which are all interlinked.

5.2.4 Likely Sources Positive Impacts

Not all activities of ongoing mining and exploration operations have negative impacts on the receiving environment. The following is summary of the positive socioeconomic impacts likely to be associated with the ongoing mining and exploration operations:

- The contribution of taxes, royalties, and dividends- These will contribute to the national economy. Namibian Government will benefit in the form of taxes, royalties, and dividends. This also includes property and company income taxes to the Namibian Government.

- Employment – provision of work provides an income, with boosting the quality of life for employees and their families. which will also reduce unemployment and sustain the Namibian economy.

- Transfer of knowledge, skills and technology associated with different aspects of the Development – the use of new technologies will call for a new skills base which has to be transferred to employees.

- Investments in community development –The Company is committed in community development of the local infrastructure such roads and water supply. Furthermore, once in full operation, the company is also committed to support education (particularly around science and technology), health, welfare, and sustainable income-generating community projects in Namibia.

- Secondary economic boost – the development will aid in sustaining secondary industries in Karibib, Erongo Region and elsewhere in Namibia.

5.2.5 Likely Sources of Negative Impacts

Table 5.3 summarise the key sources of likely negative impacts associated with the ongoing mining and exploration operations in the ML 205 and it is inclusive of the supporting infrastructure such as roads and water supply services.

The impact assessment covering this EIA and the preparation of the EMP reports has been undertaken in line with the following mine and supporting infrastructures (roads and water supply) developmental stages:

(i) Preconstruction.

(ii) Construction.

(iii) Operation, ongoing monitoring and rehabilitation, and.

(iv) Decommissioning, closure and aftercare.

Table 5.3: Summary sources of negative impacts associated with the ongoing mining and exploration activities in the ML 205.

PROJECT PHASE	DEVELOPMENT ACTIVITIES FOR EACH PHASE	
PRECONSTRUCTION	1. General site clearing, administration block, waste rock, supporting infrastructure (Office blocks, water and electricity) other site infrastructure	
	2. Access roads clearing / upgrading	
	3. Top soil removal and storage	
	4. Development of the temporary construction camp	
	5. Installation of campsites, offices, workshops, storage facilities.	
CONSTRUCTION	MINE SUPPORTING INFRASTRUCTURE	1. Transportation facilities, including access roads to the site and on-site roads
		2. Supporting site infrastructure including foundations and fencing
		3. Waste rock stockpiles
		4. Groundwater water supply systems
		5. Local generator areas for power infrastructure
		6. Administration blocks
		7. Fuel supply and storage / yard
		8. Workshop and equipment maintenance facilities
		9. Wastewater treatment systems
		10. Solid waste transfer facility (No Municipal Waste disposal shall be developed on Site)
		11. Storm water management around the pit, waste rock and supporting infrastructure
	MINE WORKINGS	1. Excavation as maybe required to create direct access to the marble
		2. Actual pit excavation and stripping of the overburden to create direct access to fresh marble
		3. Marble production for test mining operations
		4. Test mining and commissioning
OPERATION, ONGOING MONITORING AND REHABILITATION	1. Mining operations (actual mining operations including excavation as maybe required)	
	2. Transportation of the mined materials from pit to the yard for sorting	
	3. Transportation of the 5m^3 mined marble blocks to the sorting yard / storage facility and later to be further transported for processing in either Karibib or Walvis Bay	
	4. Operations of the waste rock	
	5. Ongoing exploration support	
	6. Ongoing rehabilitation and maintenance	
	7. Waste water and sludge management	
	8. Environmental Monitoring on the overall receiving environment	
DECOMMISSIONING CLOSURE AND AFTERCARE	1. Implementation of sustainable socioeconomic plan	
	2. Closure of open pits through backfill and fencing	
	3. Closure of waste rock stockpile and used for backfilling	
	4. Closure of storage, yard and municipal solid waste transfer sites	
	5. Decommissioning of water and electricity infrastructure	
	6. Overall land reclamation	
	7. Restoration of internal roads	
	8. Revegetation and aftercare as may be required	

5.3 Impact Assessment Results

5.3.1 Positive Impact Assessment Results

Tables 5.4 - 5.10 summarises the impact assessment results associated with positive impacts which are mainly linked socioeconomic issues covering payment of taxes / royalties, employment, improved local infrastructure, training and skills transfer, boost to local economies, development of technology and technological advancement.

Table 5.4: Payment of Taxes / royalties.

Contribution to national economy through payment of taxes and royalties	*Status*	Positive
	Probability	Definite
	Confidence	High
	Extent	National: The proponent may use international contractors are maybe required but the bulk of the support services will be reserved for Namibian companies / services providers
	Duration	Medium-term
	Intensity	Moderate
	Significance	High. The proponent will make a marked contribution to the Namibian economy through payment of taxes and royalties throughout the life of the mine

Table 5.5: Employment.

Provision of employment opportunities boosting the local economy	*Status*	Positive
	Probability	Definite
	Confidence	High
	Extent	National: Employees are mostly from Namibia
	Duration	Medium-term
	Intensity	High
	Significance	High. a significant number of especially Namibian families will be supported financially over the life of the ongoing mining operations

Table 5.6: Improved local infrastructure.

Upgrade of the local infrastructure such as access road linking the mine to Karibib	*Status*	Positive
	Probability	Definite
	Confidence	High
	Extent	Local
	Duration	Medium-term
	Intensity	Moderate
	Significance	Medium

Table 5.7: Training and skills transfer

Provision of employee training and development of skills including high value beneficiation support in Karibib bad Walvis Bay	*Status*	Positive
	Probability	Definite
	Confidence	High
	Extent	International
	Duration	Long-term
	Intensity	High (=Severe)
	Significance	High

Table 5.8: Boost to local and reginal economies.

Use of Karibib to house the mine workers and Walvis Bay as the logistics base and facilities, purchasing of local goods and services, use of local vendors, local employment and local economic boost.	*Status*	Positive
	Probability	Definite
	Confidence	High
	Extent	Local to Regional
	Duration	Long-term
	Intensity	High (=Severe)
	Significance	High

Table 5.9: Development of technology and technological advancement.

Research and design associated with minerals exploration, mining and processing techniques including high value beneficiation	*Status*	Positive
	Probability	Definite
	Confidence	High
	Extent	International
	Duration	Permanent
	Intensity	Moderate
	Significance	High

Table 5.10: Sponsorships of research, education and community projects.

Creation of opportunities for research and education Improved environmental knowledge/awareness with links to institutions of higher learning	*Status*	Positive
	Probability	Definite
	Confidence	High
	Extent	Regional
	Duration	Medium-term
	Intensity	Moderate
	Significance	Medium

5.3.2 Negative Impact Assessment Results

5.3.2.1 Preconstruction

The preconstruction is very important from an environmental perspective. The preconstruction phase will cover site preparation (clearing, stripping and grading) and construction of the supporting infrastructure.

The following is the summary of the key activities that have been assessed in the EIA with respect to the site preparation and construction of mine infrastructure phase:

(i) General site clearing, administration block, waste rock, supporting infrastructure (Office blocks, water and electricity) other site infrastructure.

(ii) Access roads clearing / upgrading.

(iii) Top soil removal and storage.

(iv) Development of the temporary construction camp, and.

(v) Installation of campsites, offices, workshops, storage facilities.

All the above activities are likely to have potentially important environmental implications. Potential concerns are related to highly localised negative impacts on natural environment (air quality, noise, water, soil), built environment (roads, transport systems, buildings, infrastructure), socioeconomic, archaeological and cultural resources, flora, fauna, habitat and ecosystem (services, function, use values and non-use) (Tables 5.11 - 5.13).

Detailed mitigation measures are provided in the EMP Report. The preconstruction related activities are also associated with the air quality, risk of spills and accidents, which could result in the release of contaminants such as chemicals, reagents and other substances into the receiving environment and results in harm including Occupational Health and Safety (OHS).

Table 5.11: General site clearing of the pit area, administration block, waste rock and supporting infrastructure.

Preconstruction activities associated exploration, mining and supporting infrastructure	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Medium

Table 5.12: Access roads clearing and upgrading the existing and creation of new road networks.

Preconstruction activities associated with the access road linking the ML area to Karibib as well as roads within the ML	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Medium

Table 5.13: Development of the temporary construction camp by upgrading the existing and creation of new structures.

Preconstruction activities associated with the development of the temporary construction camp by upgrading the existing and creation of new structures	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Medium

Table 5.14: Installation of campsites, offices, workshops, storage facilities by upgrading the existing and creation of new structures.

Preconstruction activities associated with the installation of campsites, offices, workshops, storage facilities by upgrading the existing and creation of new structures	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Medium

Table 5.15: Air quality and noise related potential environmental concerns during site preparation and the construction of mine infrastructure.

Potential Sources of Concern	Nature of Potential Concern	Assessment of Impacts
1. Operation and maintenance of vehicles and any on-site power generation facilities	❖ Potential releases of particulate matter, carbon monoxide, oxides of nitrogen, sulphur dioxide, and volatile organic compounds	(i) **Extent:** Localised (ii) **Duration:** Short term (iii) **Intensity:** Medium and can be reduced to negligible with mitigation measures (iv) **Probability**: Highly probably and can be reduced low with mitigation (v) **Confidence**: High (vi) **Significance:** Medium to low with mitigation
2. Fuel and chemical transportation, handling and storage	❖ Potential releases of volatile organic compounds and other harmful substances	
3. Site preparation and construction activities	❖ Potential releases of particulate matter	
4. Noise from preconstruction activities, including vehicle operations and drilling	❖ Noise may affect local wildlife populations, and well as workers	

Table 5.16: Water quality and aquatic ecosystems related potential environmental concerns during site preparation.

Potential Sources of Concern	Nature of Potential Concern	Assessment of Impacts
1. Operation and maintenance of vehicles and any on-site power generation facilities	❖ Potential releases of substances such as suspended solids, trace metals, oil, degreasers, and detergents and other harmful substances that could affect water quality and aquatic ecosystems	(i) **Extent:** Localised (ii) **Duration:** Short term (iii) **Intensity:** Medium and can be reduced to negligible with mitigation measures (iv) **Probability**: Highly probably and can be reduced low with mitigation (v) **Confidence**: High (vi) **Significance:** Medium to low with mitigation
2. Fuel and chemical transportation, handling and storage	❖ In the event of spills, potential releases of petroleum products or chemicals that could affect surface waters or groundwater as well as aquatic ecosystems	
3. Site preparation and construction activities	❖ Potential release of sediments, increasing concentrations of total suspended solids in receiving waters	
4. Sewage and wastewater disposal	❖ Potential releases of nutrients and other contaminants	
5. Construction of site access roads and power lines	❖ Potential release of sediments along the routes, increasing total suspended solids in receiving waters ❖ Potential for acidic drainage if sulphide-bearing minerals are exposed during construction ❖ Stream crossings for access roads may affect aquatic ecosystems ❖ Increased road access in remote areas may lead to increased land degradation	

Table 5.17: Soil quality and terrestrial ecosystems related potential environmental concerns during site preparation.

Potential Sources of Concern	Nature of Potential Concern	Assessment of Impacts
1. Fuel and chemical transportation, handling and storage	❖ In the event of spills, potential releases of petroleum products or chemicals that could affect soils, vegetation and wildlife	(i) **Extent:** Localised (ii) **Duration:** Short term (iii) **Intensity:** Medium and can be reduced to negligible with mitigation measures (iv) **Probability**: Highly probably and can be reduced low with mitigation (v) **Confidence**: High (vi) **Significance:** Medium to low with mitigation
2. Operation of vehicles	❖ Vehicle operations may result in collisions with wildlife	
3. Site preparation and construction activities	❖ Clearing of vegetation on site may have impacts on biodiversity, particularly if any rare, threatened or keystone species are present ❖ Activities on site may disrupt and dislocate local wildlife and any migratory wildlife in the area ❖ Some animals may be drawn to the site as a result of improper waste disposal or kitchen odours, which could lead to potential hazards for both workers and the animals	
4. Construction of site access roads and power lines	❖ Construction activities may disrupt and dislocate wildlife and any migratory wildlife in the area ❖ Increased road access in remote areas may lead to increased hunting, stressing wildlife populations ❖ Vehicle operations may result in collisions with wildlife	

5.3.2.2 Construction Stage

The construction stage of the ongoing mining development and exploration activities in the EPL No. 5536 will cover the mine supporting infrastructure and the actual mine workings. These activities will last for periods ranging from six (6) months and one (1) year. The following are the key activities that have been assessed:

1. **Mine Supporting Infrastructure:**

   (i) Transportation facilities, including access roads to the site and on-site roads.

   (ii) Supporting site infrastructure including foundations and fencing.

   (iii) Waste rock stockpiles.

   (iv) Groundwater water supply systems.

   (v) Local generator areas for power infrastructure.

   (vi) Administration blocks.

(vii) Fuel supply and storage / yard.

(viii) Workshop and equipment maintenance facilities.

(ix) Wastewater treatment system.

(x) Solid waste transfer facility (No Municipal Waste disposal shall be developed on Site), and.

(xi) Storm water management around the pit, waste rock and supporting infrastructure.

2. Mine workings:

(i) Excavation as maybe required to create direct access to the marble.

(ii) Actual pit excavation and stripping of the overburden to create direct access to fresh marble.

(iii) Marble production for test mining operations, and.

(iv) Test mining and commissioning.

Tables 5.18 – 5.28 summarises impacts of the mine supporting infrastructure and workings with respect to the natural environment (air quality, noise, water, soil), built environment (houses, roads, transport systems, buildings, infrastructure), socioeconomic, archaeological, and cultural resources, flora, fauna, habitat, and ecosystem (services, function, use values and non-use). The construction related activities are also associated with the air quality, risk of spills and accidents, which could result in the release of contaminants such as chemicals, reagents and other substances into the receiving environment and results in harm including Occupational Health and Safety (OHS).

Table 5.18: Transportation facilities, including access road linking the mine site to Karibib and on-site roads linking various operational areas.

Construction of the transportation facilities, including access roads to the site and on-site roads	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Low (Will involve upgrading of existing roads)

Table 5.19: Supporting site infrastructure including foundations and fencing.

Construction of supporting site infrastructure including foundations and fencing	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Low (Use already disturbed areas)

Table 5.20: Waste rock stockpiles.

Construction of waste rock stockpiles	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Medium (Use already disturbed areas)

Table 5.21: Water supply systems.

Construction of water supply systems	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Low (Use already disturbed areas)

Table 5.22: Local generator areas for power infrastructure.

Construction / preparation of areas for generator / power infrastructure	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Moderate to High

Table 5.23: Administration blocks and warehouses.

Construction of new administration blocks and warehouses	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Moderate (Use already disturbed areas)

Table 5.24: Fuel supply and storage / yard.

Construction of fuel supply and storage	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Moderate

Table 5.25: Workshop and equipment maintenance facilities.

Construction of workshop and equipment maintenance facilities	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Moderate (Use already disturbed areas)

Table 5.26: Solid waste transfer facility.

Construction of new solid waste disposal storage / transfer facility. No burial of municipal / hazardous waste is allowed to be buried within he ML / EPL area	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Low (Use already disturbed areas / old mine compound)

Table 5.27: Wastewater treatment systems.

Construction of wastewater treatment system (French Drains Systems to be used)	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Moderate (Use already disturbed areas)

Table 5.28: Storm water management around the pit, waste rock and supporting infrastructure.

Construction of peripheral storm water management around the quarry, waste rock and supporting infrastructure such yard and workshop to prevent leachate from entering the local ephemeral rivers	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Moderate

5.3.2.3 Mine Operations and exploration

5.3.2.3.1 Overview

The following is the summary of the key component of the ongoing mining operations stage that has been assessed with respect to the natural environment (air quality, noise, water, soil), built environment (houses and roads,), socioeconomic, archaeological and cultural resources, flora, fauna, habitat and ecosystem services, function, use values and non-use:

(i) Mining operations (actual mining operations including excavation as maybe required).

(ii) Transportation of the mined materials from pit to the yard for sorting.

(iii) Transportation of the $5m^3$ mined marble blocks to the sorting yard / storage facility and later to be further transported for processing in either Karibib or Walvis Bay.

(iv) Operations of the waste rock.

(v) Ongoing exploration support.

(vi) Ongoing rehabilitation and maintenance.

(vii) Waste water and sludge management, and.

(viii) Environmental Monitoring on the overall receiving environment.

Mining operations and explorations activities are also associated with the air quality, risk of spills and accidents, which could result in the release of contaminants such as chemicals, reagents and other substances into the receiving environment and results in harm including Occupational Health and Safety (OHS).

5.3.2.3.2 Actual Mining Operations

The primary environmental concerns associated with marble extraction activities are the disposal of waste rock and the release of mine water. Waste rock disposal and water management and treatment are further discussed below. Ore extraction activities can also affect the environment because of dust, noise and vibration. The impact assessment of the ongoing mining operation with respect to the receiving environment is shown in Table 5.29.

Table 5.29: Actual mining operations.

Mining operations (actual mining operations including excavation as maybe required	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Moderate - High

5.3.2.3.3 Transportation of the Mined / Recovered Marble 5m³ Blocks

The primary environmental concerns associated with the transportation of the mined / recovered marble 5m^3 blocks to the sorting yard / storage facility and later to be further transported for processing in either Karibib or Walvis Bay relates to the air quality, disposal of waste rock / offcuts and the management and treatment of wastewater as well as all other associated components of the receiving environment. The impact assessments for all forms of ore transportation activities and storage with respect to the receiving environment are shown in Tables 5.30 and 5.31.

Table 5.30: Transportation of the mined marble blocks to the sorting yard / storage facility and later to be further transported for processing in either Karibib or Walvis Bay.

Transportation of the 5m^3 mined marble blocks to the sorting yard / storage facility and later to be further transported for processing in either Karibib or Walvis Bay	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Low

Table 5.31: Storage and transportation of recovered minerals for further high value addition beneficiation and export through the Port of Walvis Bay.

Storage and transportation of recovered minerals for further high value addition beneficiation and export through the Port of Walvis Bay	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Low

5.3.2.3.4 Operations of a New Waste Rock

The production of marble blocks will always results in unwanted poor quality materials as well as offcuts from the operations. The poor quality and offcuts will be deposited on the waste rock dump. The key concern in the management of mine waste is the prevention or control of the release of contaminants that could have significant environmental impacts. Groundwater seepage is also a concern for waste rock facilities, in that seepage into the groundwater could result in the release of contaminants through a permeable foundation layer or other instability. The impact assessment results for operating a new waste rock dump as part of the mining operations with respect to the receiving environment are shown in Table 5.32.

Table 5.32: Operations of the waste rock.

Operation of new waste rock	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Moderate - High

5.3.2.3.5 Ongoing Exploration Ongoing Rehabilitation and Maintenance

In order to extend the life of the ongoing mining operations, there will be a need to continue undertaking exploration activities. At the same time, there will be a need to continuously undertake ongoing rehabilitation and maintenance of the mined out areas in order to make sure that the overall environmental liabilities for final rehabilitation are minimised during the mine closure. The environmental impacts assessment for the ongoing exploration, rehabilitation and maintenance activities in support mining operations are shown in Tables 5.33 and 5.34.

Table 5.33: Ongoing exploration.

Ongoing exploration to support the mining operations	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Moderate - High

Table 5.34: Ongoing rehabilitation and maintenance.

Ongoing rehabilitation and maintenance to support for the mining operations	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Moderate - High

5.3.2.3.6 Waste Water and Sludge Management

The management of waste water from the ongoing mining operations is key potential source of pollution. According to the preliminary design of the ongoing mining operations precautionary measures have been incorporated in the management of waste water and sludge from the ongoing operations. The composition of waste water and sludge varies, and sludge may contain a wide range of metals. The volumes of waste water and sludge likely to be produced from the ongoing mining operations will be limited and will not exceed the designs over the life of the mine. Any produced waste water and sludge will be disposed on site. Although there may be some uncertainties about the long-term chemical stability of waste water and sludge there are however, minor risks that they are likely to become sources metals beyond the final mine closure stage of the ongoing mining operations. Waste water and sludge disposal for both the mining operations impact assessment results with respect to the receiving environment covering the complete lifecycle of the project are shown in Table 5.35.

Table 5.35: Waste water and sludge disposal.

Waste water and sludge and sludge management	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Low (Less volumes and dry conditions)

5.3.2.3.7 Exploration, Mining, Supporting infrastructure and Impacts on Water

Freshwater management constitute the primary environmental concern for the ongoing mining operations. An effective water management program must incorporate the following cleaner production measures to:

- ❖ Segregate clean and contaminated water flows to help reduce the requirement for the treatment of effluent.
- ❖ Control and address seepage losses, and.
- ❖ Reduce water usage by recycling water for further process use.

Measures that can be used in water management include drainage ditches to divert off-site water and drainage ditches and diversions to control the flow of on-site water and prevent contamination in order to prevent contaminated waters from leaving the site before treatment. The impact assessment results of exploration and mining inclusive of all the supporting infrastructure activities on the receiving environment, covering the complete lifecycle of the project are shown in Table 5.36.

Table 5.36: Exploration, mining, supporting infrastructure and Impacts on water.

Overall likely impacts of mining and exploration operations including supporting infrastructure activities on water	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Moderate - High

5.3.2.3.8 Exploration, Mining, Supporting infrastructure and Impacts on Air Quality

Air quality impacts from exploration, mining, supporting infrastructure are mainly associated with the releases of airborne particulate matter. Operation of vehicles and generators can also lead to releases of greenhouse gases and various air contaminants, including sulphur oxides, nitrogen oxides, carbon monoxide and particulate matter. Releases of airborne particulate matter can result from various activities.

Climatic components have a direct linkage to the air quality. Overall, the project activities will have low significant impacts on the air quality. The impact assessment results of the exploration, mining, supporting infrastructure on the receiving environment, covering the complete lifecycle of the project are shown in Table 5.37.

Table 5.37: Mining, processing and minerals recovery impacts on air quality.

Overall likely impacts on air quality during mining and exploration operations including excavation, drilling, blasting as maybe required for all activities	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Low

5.3.2.3.9 Exploration, Mining, Supporting infrastructure and Impacts on Flora

The stripping of outcrops during mine construction and operation thereof, can have significant local effects on resident plant communities. These communities also represent wildlife habitat, and destroying habitat can lead to the loss of local breeding grounds and wildlife movement corridors or other locally important features. Mining activity may also contaminate terrestrial plants. Metals may be transported into terrestrial ecosystems adjacent to mine sites as a result of releases of airborne particulate matter and seepage of groundwater or surface water. In some cases, the uptake of contaminants from the soil in mining areas can lead to stressed vegetation. In such cases, the vegetation could be stunted or dwarfed. Overall, the ongoing mining project will have flora disturbance that will be localised. Table 5.38 indicates the potential/envisaged impacts expected regarding floral disturbance (which is obviously closely linked to habitat destruction. Detailed information about the type

of flora found in and around the ongoing mining area and the protection status are available in the Specialist Study Report.

Table 5.38: Summary of the potential/envisaged impacts expected regarding floral disturbance because of the ongoing activities linked to habitat destruction.

Description	Floral disturbance will vary depending on the scale/intensity of the development operation and associated and inevitable infrastructure.
Extent	**1.** Access routes - Localised disruption/destruction of the habitat and thus consequently flora associated directly with the actual routes. This however, would be a relatively small area(s) with localised implications. **2.** Mining / Prospecting sites - Localised disruption/destruction of the habitat and thus consequently flora associated directly with the actual sites. This however, would be relatively small area(s) – depending on scale of operations – with localised implications. **3.** Infrastructure - Localised disruption/destruction of the habitat and thus consequently flora associated directly with the actual sites. This however, would be relatively small area(s) – especially if the existing infrastructure areas are used rather than affecting new sites – with localised implications.
Duration	**1.** Access route(s) - The duration of the impact is expected to be permanent along the route(s). This however, would be relatively small area(s) with localised implications. **2.** Mining / Prospecting sites - The duration of the impact is expected to be permanent at the site(s). This however, would be relatively small area(s) with localised implications. **3.** Infrastructure - The duration of the impact is expected to be permanent at the site(s). This however, would be relatively small area(s) with localised implications.
Intensity	**1.** Access route(s) - The actual sites where construction of the route(s) would be located would be permanently altered. This however, would be relatively small area(s) with localised implications. **2.** Mining / Prospecting sites - The actual mining/prospecting site(s) would be permanently altered. This however, would be relatively small area(s) with localised implications. **3.** Infrastructure - The actual construction sites associated with the various mining infrastructures would be permanently altered. This however, would be relatively small area(s) with localised implications. The areas adjacent the mining/prospecting site(s) and other associated infrastructure should not be significantly affected. This however, would depend on control over the contractors during the road building, construction phase(s) & mining/prospecting phase(s), but should be limited to localised implications. Areas not directly affected by the mining/prospecting and associated infrastructure although within the immediate area would be affected minimally. This would include dust & other associated disturbances in the area, but is limited to the mining/prospecting & construction periods.
Frequency of occurrence	Expected to be a "once off" issue affecting the selected site(s). Further prospecting & associated road construction (should this become necessary/evident during the mining operations) throughout the area would however increase the frequency of occurrence.
Probability	Definite (100%) negative impact on flora is expected in the actual mining/prospecting area(s) as well as the access route(s) and infrastructure development sites. This however, would be much localised and cover only a small area and should avoid sensitive areas. Precautionary principle (e.g. avoid unique habitat features as well as adhering to the mitigating measures would minimise this) would decrease the significance of these potential impacts. Highly Probable (75%) negative impact on flora is expected in the general areas especially with large scale extraction of groundwater for prospecting/mining activities. Probable (50%) negative impact on flora is expected from the infrastructure (roads/tracks/buildings, etc.). Precautionary principle (e.g. avoid unique habitat features as well as adhering to the mitigating measures would minimise this) would decrease the significance of these potential impacts.
Significance	Before mitigation: **High** and After mitigation: **Medium** to **Low**
Status of the impact	Negative: Localised unique habitats. mountainous areas & drainage lines) with associated flora would bear the brunt of this development, but be limited in extent and only permanent at the actual mining site and access routes and infrastructure sites.
Legal requirements	Flora related: Forest Act No. 12 of 2001, Nature Conservation Ordinance No. 4 of 1975, CITES, IUCN
Degree of confidence in predictions	As an ecologist I am sure of the above mentioned predictions made and would suggest that the mitigation measures be implemented to minimise potentially negative aspects regarding the local flora in the area.

5.3.2.3.11 Exploration, Mining, Supporting infrastructure and Impacts on Fauna

Mining and exploration activities can affect fauna as a result of habitat loss and habitat degradation. For example, mining activity may affect migration routes, breeding grounds, or nesting areas.

Conversely, some wildlife species may be attracted to mine sites, particularly if food wastes and other wastes that may attract wildlife are not properly managed. Food sources for animals may become contaminated and some contaminants, particularly metals, can magnify up the food chain. This may lead to increased interactions between humans and wildlife and it could result in animals that pose a risk to persons on site having to be relocated or destroyed. Table 5.39 indicates the potential / envisaged impacts expected regarding fauna disturbance which is obviously closely linked to habitat destruction. Detailed information about the type of fauna found around the ongoing mining area and the protection status are available in the Specialist Study Report.

Table 5.39: Summary of the potential/envisaged impacts expected regarding fauna disturbance as a results of the ongoing mining project to habitat destruction.

Description	Faunal disturbance will vary depending on the scale/intensity of the development operation and associated and inevitable infrastructure.
Extent	**1.** Access routes - Localised disruption/destruction of the habitat and thus consequently fauna associated directly with the actual routes. This however, would be a relatively small area with localised implications. **2.** Mining/Prospecting sites - Localised disruption/destruction of the habitat and thus consequently fauna associated directly with the actual sites. This however, would be a relatively small area – depending on scale of operations – with localised implications. **3.** Infrastructure - Localised disruption/destruction of the habitat and thus consequently fauna associated directly with the actual sites. This however, would be a relatively small area – especially if the existing infrastructure areas are used rather than affecting new sites – with localised implications.
Duration	**1.** Access route(s) - The duration of the impact is expected to be permanent along the route(s). This however, would be a relatively small area(s) with localised implications. **2.** Mining/Prospecting sites - The duration of the impact is expected to be permanent at the site. This however, would be relatively small area(s) with localised implications. **3.** Infrastructure - The duration of the impact is expected to be permanent at the site(s). This however, would be relatively small area(s) with localised implications.
Intensity	**1.** Access route(s) - The actual sites where construction of the route(s) would be located would be permanently altered. This however, would be relatively small area(s) with localised implications. **2.** Mining/Prospecting - The actual prospecting/mining site(s) would be permanently altered. This however, would be relatively small area(s) with localised implications. **3.** Infrastructure - The actual construction sites associated with the various mining infrastructures would be permanently altered. This however, would be relatively small area(s) with localised implications. The areas adjacent the mining site(s) and other associated infrastructure should not be significantly affected. This however, would depend on control over the contractors during the road building, construction phase(s) & prospecting/mining phase(s), but should be limited to localised implications. Areas not directly affected by the prospecting/mining and associated infrastructure although within the immediate area would be affected minimally. This would include dust, noise, light & other associated disturbances in the area, but be limited to the prospecting/mining & construction periods.
Frequency of occurrence	Expected to be a “once off” issue affecting the selected site(s). Further prospecting & associated road construction (should this become necessary/evident during the mining operations) throughout the area would however increase the frequency of occurrence.
Probability	Definite (100%) negative impact on fauna is expected in the actual mining areas as well as the access route(s) and infrastructure development sites. This however, would be much localised and cover only a small area(s) and should avoid sensitive areas. Highly Probable (75%) negative impact on fauna is expected in the general areas especially during the construction and mining phase(s) as a result of noise, increased activities, etc. Probable (50%) negative impact on fauna is expected from the infrastructure (roads/tracks/buildings, etc.). Precautionary principle (e.g. avoid unique habitat features as well as adhering to the mitigating measures would minimise this) would decrease the significance of these potential impacts.
Significance	Before mitigation: **High** and After mitigation: **Medium** to **Low**
Status of the impact	Negative: Localised unique habitats (e.g. hills, mountainous areas & drainage lines) with associated fauna would bear the brunt of this development, but be limited in extent and only permanent at the actual mining site(s) and access routes and infrastructure sites.
Legal requirements	Fauna related: Nature Conservation Ordinance No. 4 of 1975, CITES, IUCN and SARDB Habitat – Flora related: Forest Act No. 12 of 2001, Nature Conservation Ordinance No. 4 of 1975, CITES
Degree of confidence in predictions	As an ecologist I am sure of the above mentioned predictions made and would suggest that the mitigation measures be implemented to minimise potentially negative aspects regarding the local fauna in the area.

5.3.2.3.12 Exploration, Mining, Supporting infrastructure and Archaeology

The likely type of archaeological resources will comprise pre-colonial sites that are likely to be small and widely scattered, probably comprising the remains of hutted encampments, and including some burial sites. The impact assessment results of the mining and exploration operations inclusive of all the supporting infrastructure activities on the receiving archaeological resource, covering the complete lifecycle of the project are shown in Table 5.40.

Table 5.40: Exploration, mining, supporting infrastructure and Impacts likely impacts on archaeology.

Likely impacts on archaeological resource during the mining and exploration operations including excavation as maybe required for all activities	*Status*	Negative
	Probability	Probable (already disturbed areas)
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Low

5.3.2.3.13 Exploration, Mining, Supporting Infrastructure on Socioeconomic

Mining, minerals processing and recovery activities are likely to be associated with negative socioeconomic impacts including the increase in prevalence of HIV / AIDs, as detailed in Annex 7. The impact assessment results of the ongoing mining and exploration operations inclusive of all the supporting infrastructure activities on the overall socioeconomic environment including any likely increase on the HIV / AIDs prevalence, covering the complete lifecycle of the project are shown in Table 5.41.

Table 5.41: Mining and exploration likely impacts on socioeconomic environment.

Likely impacts on socioeconomic environment including HIV/AIDs during the mining and exploration operations including excavation, drilling, blasting as maybe required for all activities	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Low

5.3.2.4 Progressive and Final Mine Closure

5.3.2.4.1 Progressive Mine Closure Activities During Mine Operations

In additional to the currently already disturbed land targeted for mining and exploration operations, additional disturbed areas of land may be disturbed during the ongoing mining and exploration activities. Disturbed areas that are not stabilised can be susceptible to erosion caused by both wind and water. Erosion can lead to problems with dust as well as water quality problems related to sedimentation. During the mine operations phase, it is important for the operator to start with ongoing landscape rehabilitation which may include the reshaping and restructuring of the landscape and erosion control measures. In addition to reshaping or recontouring, landscape restructuring activities can include the use of stockpiled soils to reconstruct soil structure in preparation for revegetation during the final restoration and closure stages. These activities are also associated with the air quality, risk of spills and accidents, which could result in the release of contaminants such as chemicals, reagents and other substances into the receiving environment and results in harm including Occupational Health and Safety (OHS). Assessment of the overall likely negative impacts associated with the progressive mine closure activities during mine operations are shown in Table 5.42.

Table 5.42: Progressive mine closure activities during mine operations.

Assessment of likely negative impacts associated with the progressive mine closure activities during mine operations	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Localised
	Duration	Very short
	Intensity	Low
	Significance	Moderate - High

5.3.2.4.2 Final Mine Closure Activities

The objectives of final mine closure are to:

- ❖ Ensure public and wildlife safety and preventing inadvertent access to mine openings and other infrastructure.
- ❖ Provide for the stable, long-term storage of waste rock.
- ❖ Ensure that the site is self-sustaining and to prevent or minimise environmental impacts, and.
- ❖ Rehabilitate disturbed areas for a specified land use (e.g., return of disturbed areas to a natural state or other acceptable land use).

The final closure of all the activities of the mine operations will results in both negative socioeconomic impacts such as loss of jobs and positive impacts. Tables 5.43 – 5.45 summarises the impact assessment results associated with the final closure of the ongoing mining operations. Table 5.46 provided a summary of components to be addressed in the final mine closure phase linked to the ongoing mine closure activities undertaken during mine operational stage.

Table 5.43: Implementation of sustainable socioeconomic closure plan.

Use of non-renewable resources, closure company operations and the termination of all contributions to the economy including taxes, employment, support to secondary industries	*Status*	Positive
	Probability	Definite
	Confidence	High
	Extent	Regional
	Duration	Long-term
	Intensity	Moderate
	Significance	Medium to High

Table 5.44: Closure of mining and exploration operations and removal of all infrastructure.

Closure of mining and exploration operations and removal of all supporting infrastructure covering: 1. Closure of open pits 2. Closure of solid waste piles at transfer facility 3. Backfill waste dump sites 4. Closure of storage sites	*Status*	Positive
	Probability	Definite
	Confidence	High
	Extent	Regional
	Duration	Long-term
	Intensity	Moderate
	Significance	Medium

Table 5.45: Overall land reclamation and revegetation and aftercare as may be required.

Land reclamation and revegetation of mined out and disturbed areas as part of the implementation of the final mine closure and aftercare stage	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	International
	Duration	Permanent
	Intensity	Low
	Significance	Low

Table 5.46: Mine components to be addressed in the ongoing and final mine closure plan.

Components	Aspects to be Addressed
Open Pit Mines	○ Slope and bench stability ○ Groundwater and rainwater management ○ Security and unauthorized access ○ Wildlife entrapment ○ Effects of drainage into and from the pit
Yard, Storage / workshop / Sorting Facilities	○ Removal of buildings and foundations ○ Clean-up of workshops, fuel and reagent ○ Disposal of scrap and waste materials ○ Re-profiling and revegetation of site
Waste Rock Piles	○ Slope stability ○ Effects of leaching and seepage on surface and groundwater ○ Dust generation ○ Visual impact ○ Special considerations for some types of mines such as uranium mines
Water Management Facilities	○ Restoration or removal of dams, reservoirs, settling ponds, culverts, pipelines, spillways or culverts which are no longer needed ○ Surface drainage of the site and discharge of drainage waters ○ Maintenance of water management facilities
Solid Waste Transfer Station / and Waste Water Management Facilities	○ Disposal or removal from site of hazardous wastes ○ Disposal and stability of treatment sludge ○ Removal of sewage treatment plant ○ Prevention of groundwater contamination ○ Prevention of illegal dumping ○ Security and unauthorized access
Infrastructure	○ Removal of power and water supply ○ Removal of haul and access roads ○ Reuse of transportation and supply depots

5.3.2.5 Accidents and Emergencies

All the developmental activities of the mine operations in the ML 205 covering the preconstruction, construction, operation, ongoing monitoring and rehabilitation and decommissioning, closure and aftercare stages are associated with the air quality, risk of spills and accidents, which could result in the release of contaminants such as chemicals, reagents and other substances into the receiving environment and results in harm including Occupational Health and Safety (OHS). Tables 5.47 – 5.51 summarizes the impact assessment results associated with fire, hydraulic fluid spills, re-fuelling, accidents and related operational emergencies.

Table 5.47: Fire.

Fire emergency associated with the mining, processing, minerals recovery, exploration or use of any supporting infrastructure such in any area	*Status*	Negative
	Probability	Improbable. based on standards and procedures implemented and long track record
	Confidence	Medium
	Extent	Site specific (<1 km)
	Duration	Very Short. fires likely to be rapidly extinguished
	Intensity	Mild
	Significance	Low

Table 5.48: Hydraulic fluid spills.

Leakage of hydraulic fluid spill due to rupture of pipes /failure of hydraulic sampling / mining equipment which cannot be contained easily	*Status*	Negative
	Probability	Improbable. based on standards and procedures implemented and long track record
	Confidence	High
	Extent	Site specific (<1 km)
	Duration	Very Short. dispersal of low volume spills will be rapid
	Intensity	Mild
	Significance	Low

Table 5.49: Re-fuelling accidents.

Accidental spillage of fuel during refuelling operations due to rupture of pipes or valve failure	*Status*	Negative
	Probability	Improbable. based on standards and procedures implemented and long track record.
	Confidence	Medium
	Extent	Local
	Duration	Very Short to Short-term
	Intensity	Mild
	Significance	Low

Table 5.50: Mining and exploration or use of any supporting infrastructure emergency including car crush.

Emergency caused by mining and exploration or use of any supporting infrastructure including car crush	*Status*	Negative
	Probability	Improbable, always based on strict operational standard and speed limits
	Confidence	High
	Extent	Local
	Duration	Very Short
	Intensity	Moderate
	Significance	Low

Table 5.51: Exposure to potential radioactive sources.

Detrimental effects on the health of personnel as a result of exposure to high natural radiation from the country rocks or radiation related to the operational equipment	*Status*	Negative
	Probability	Improbable (Country rocks will be analysed as part of the exploration programme and no mining and processing equipment will use radiation sources).
	Confidence	High
	Extent	Site specific.
	Duration	Very Short
	Intensity	Very low
	Significance	Very Low

5.4 Overall Impact Assessment Results

5.4.1 Overview

The overall impact assessment methodology adapted for this EIA Report and the development of the EMP Report is in line with the ToR as well as the matrix criteria widely used internationally. The overall matrix framework used for this project is the Leopold matrix which is one of the internationally best-known matrix methodologies available for predicting the impact of a project on the receiving environment. The Leopold matrix is a two-dimensional matrix cross-referencing the following:

- The activities linked to the project that are supposed to have an impact on man and the environment.
- The existing environmental and socioeconomic conditions that could possibly be affected by the project.

The activities linked to the mine development are listed on one axis, while the environmental and socioeconomic conditions are listed on the other axis, and divided in following three (3) major groups:

- Physical conditions: receiving environment, air, etc.
- Biological conditions: fauna, flora, ecosystems etc., and.

- Social and cultural conditions: Socioeconomic setting, historical and cultural issues, populations, economy…

The activities of the mine development have the potential to affect the environment in many ways. The first step in the impact identification has been to identify the various types of activities associated with the mine development, together with their associated emissions and land discharges where appropriate. At a high level, the main sources of impact of the mine operations are:

- Physical disturbance to the local environment.
- Emissions, discharges and wastes.
- Accidental events.

Accidental events are clearly not a part of the intended activity and their potential occurrence has a low probability of occurrence associated with it. Such impacts have therefor been treated differently.

5.4.2 Assessment of the Ongoing Activities and the Key Issues

The results of the overall impacts and key issues associated with the ongoing activities / sources (mining, exploration and supporting infrastructure activities) of potential impacts with respect to the receiving environment that could potentially be affected, resulting in key issues are presented in Table 5.52.

Table 5.52: Matrix impact assessment results of the ongoing mining, exploration and supporting infrastructure activities.

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

SOURCES OF POTENTIAL IMPACT	PROJECT DEVELOPMENT PHASE		ACTIVITIES	RECEPTORS / TARGETS THAT MAY BE IMPACTED: PHYSICAL AND SOCIOECONOMIC ENVIRONMENT – Natural Environment – Air, Noise, Water, Green Space	Built Environment – Houses, Transport Systems,	Socioeconomic- Job, Investment, Taxes and Social Issues e.g. HIV&Aids	Archaeological and Cultural Resources	BIOLOGICAL ENVIRONMENT – Flora	Fauna	Habitat	Ecosystem - Services, function, use values and non-use
	PRE-CONSTRUCTION		6. General site clearing, administration block, waste rock, supporting infrastructure	3 (-)	1 (-)	3 (+)	3 (-)	3 (-)	3 (-)	3 (-)	3 (-)
			7. Access roads clearing / upgrading	3 (-)	1 (-)	3 (-)	3 (-)	3 (-)	3 (-)	3 (-)	3 (-)
			8. Top soil removal and storage	3 (-)	1 (-)	3 (+)	1 (-)	3 (-)	3 (-)	3 (-)	3 (-)
			9. Development of the temporary construction camp	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
			10. Installation of campsites, offices, workshops, storage facilities.	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
	CONSTRUCTION	MINE SUPPORTING INFRASTRUCTURE	12. Transportation facilities, including access roads to the site and on-site roads	3 (-)	1 (-)	3 (+)	1 (-)	3 (-)	3 (-)	3 (-)	3 (-)
			13. Supporting site infrastructure	3 (-)	1 (-)	3 (+)	1 (-)	3 (-)	3 (-)	3 (-)	3 (-)
			14. Waste rock stockpiles	3 (-)	1 (-)	3 (+)	1 (-)	3 (-)	3 (-)	3 (-)	3 (-)
			15. Groundwater water supply systems	3 (-)	1 (-)	3 (+)	1 (-)	3 (-)	3 (-)	3 (-)	3 (-)
			16. Local generator areas for power infrastructure	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
			17. Administration blocks	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
			18. Fuel supply and storage / yard	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
			19. Workshop and equipment maintenance facilities	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
			20. Wastewater treatment systems	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
			21. Solid waste transfer facility	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
			22. Storm water management around the pit, waste rock and supporting infrastructure	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
		MINE WORKINGS	5. Excavation as maybe required to create direct access to the marble	3 (-)	1 (-)	3 (+)	1 (-)	3 (-)	3 (-)	3 (-)	3 (-)
			6. Actual pit excavation and stripping of the overburden to create direct access to fresh marble	3 (-)	1 (-)	3 (+)	1 (-)	3 (-)	3 (-)	3 (-)	3 (-)
			7. Marble production for test mining operations	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)
			8. Test mining and commissioning	3 (-)	1 (-)	3 (+)	1 (-)	2(-)	2(-)	2(-)	2(-)

Table 5.52: *Cont.*

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

SOURCES OF POTENTIAL IMPACT	PROJECT DEVELOPMENT PHASE	ACTIVITIES	RECEPTORS / TARGETS THAT MAY BE IMPACTED: PHYSICAL AND SOCIOECONOMIC ENVIRONMENT: Natural Environment – Air, Noise, Water, Green Space	Built Environment – Houses, Transport Systems,	Socioeconomic-Job, Investment, Taxes and Social Issues e.g. HIV&Aids	Archaeological and Cultural Resources	BIOLOGICAL ENVIRONMENT: Flora	Fauna	Habitat	Ecosystem - Services, function, use values and non-use
	OPERATION, ONGOING MONITORING AND REHABILITATION	9. Mining operations (actual mining operations including excavation as maybe required)	3(-)	0(-)	3(+)	1 (-)	1(-)	2(-)	1(-)	1(-)
		10. Transportation of the mined materials from pit to the yard for sorting	3(-)	1(-)	3(+)	1 (-)	1(-)	2(-)	1(-)	1(-)
		11. Transportation of the 5m^3 mined marble blocks to the sorting yard / storage facility and later to be further transported for processing in either Karibib or Walvis Bay	3(-)	1(-)	3(+)	1 (-)	1(-)	2(-)	1(-)	1(-)
		12. Operations of the waste rock	3(-)	0(-)	3(+)	1 (-)	1(-)	2(-)	1(-)	1(-)
		13. Ongoing exploration support	3(-)	0(-)	3(+)	1 (-)	1(-)	2(-)	1(-)	1(-)
		14. Ongoing rehabilitation and maintenance	2(-)	0(-)	3(+)	1 (-)	1(-)	2(-)	1(-)	1(-)
		15. Waste water and sludge management	2(-)	0(-)	3(+)	1 (-)	1(-)	2(-)	1(-)	1(-)
		16. Environmental Monitoring on the overall receiving environment	1(-)	0(-)	3(+)	1 (-)	1(-)	2(-)	1(-)	1(-)
	DECOMMISSIONING CLOSURE AND AFTERCARE	9. Implementation of sustainable socioeconomic plan	0(-)	0(-)	3(+)	1 (-)	2(-)	2(-)	2(-)	2(-)
		10. Closure of open pits through backfill and fencing	3(-)	0(-)	3(+)	1 (-)	2(-)	2(-)	2(-)	2(-)
		11. Closure of waste rock stockpile and used for backfilling	3(-)	0(-)	3(+)	1 (-)	2(-)	2(-)	2(-)	2(-)
		12. Closure of storage, yard and municipal solid waste transfer sites	3(-)	0(-)	3(+)	1 (-)	2(-)	2(-)	2(-)	2(-)
		13. Decommissioning of water and electricity infrastructure	2(-)	0(-)	3(+)	1 (-)	2(-)	2(-)	2(-)	2(-)
		14. Overall land reclamation	2(-)	0(-)	3(+)	1 (-)	2(-)	2(-)	2(-)	2(-)
		15. Restoration of internal roads	2(+)	0(-)	3(+)	1 (-)	2(-)	2(-)	2(-)	2(-)
		16. Revegetation and aftercare as may be required	2(-)	0(-)	3(+)	1 (-)	2(-)	2(-)	2(-)	2(-)

5.4.3 Assessment of the Overall Significant Impacts

5.4.3.1 Overview

The determination of the significance of the negative impacts of the sources was undertaken based on the environmental baseline results and the intensity of the likely negative impact. The assessment was depending upon the degree to which the ongoing activities are likely to results in unwanted consequences on the receptor covering the natural environment such as the physical and biological environments. Overall, the assessment of significant impacts was focused on the ecosystem-based approach that considers potential impacts to the ecosystem as part of the receiving environment.

5.4.3.2 Summary of the Sources of Impacts

The main key sources of impacts that have been used to determine significant impact posed by the ongoing mine comprised all the activities associated with the operation and decommissioning stages. Each of the main sources of impacts have been evaluated against the receiving environment (receptor / pathways).

5.4.3.3 Determination of the Overall Likely Significant Impacts

To determine the overall significant impact of individual sources associated with the mine development, an impact identification and assessment process was undertaken as part of the EIA. The results of the overall likely significant impacts and key issues associated with the ongoing activities / sources (mining, exploration and supporting infrastructure related activities) of potential impacts with respect to the receiving environment that could potentially be affected, resulting in key issues.

The EIA impact identification and assessment processes has focused on the receiving environment (Physical, Biological and Socioeconomic) interaction approach with respect to the project activities, the pathways and the likely targets or receptor. In this process, components of the project activities that are likely to impact the receiving environment were broken down into individual development stages and activities (Table 5.53).

Table 5.52: Significant matrix impact assessment results for mining, exploration and supporting infrastructure activities.

IMPACT SEVERITY	IMPACT LIKELIHOOD: Extremely Unlikely [0]	Unlikely [1]	Low Likelihood [2]	Medium Likelihood [3]	High Likelihood [4]
Slight [A]	[A0]	[A1]	[A2]	[A3]	[A4]
Low [B]	[B0]	[B1]	[B2]	[B3]	[B4]
Medium [C]	[C0]	[C1]	[C2]	[C3]	[C4]
High [D]	[D0]	[D1]	[D2]	[D3]	[D4]

SOURCES OF POTENTIAL IMPACT	PROJECT DEVELOPMENT PHASE		ACTIVITIES	RECEPTORS / TARGETS THAT MAY BE IMPACTED: PHYSICAL AND SOCIOECONOMIC ENVIRONMENT: Natural Environment – Air, Noise, Water, Green Space	Built Environment – Houses, Transport Systems,	Socioeconomic- Job, Investment, Taxes and Social Issues e.g. HIV&Aids	Archaeological and Cultural Resources	BIOLOGICAL ENVIRONMENT: Flora	Fauna	Habitat	Ecosystem - Services, function, use values and non-use
	PRE-CONSTRUCTION		6. General site clearing, administration block, waste rock, supporting infrastructure	B4 (-)	A1(-)	D3 (+)	A1(-)	B4 (-)	B4 (-)	B4 (-)	B4 (-)
			7. Access roads clearing / upgrading	B4 (-)	A1(-)	D3 (+)	A1(-)	B4 (-)	B4 (-)	B4 (-)	B4 (-)
			8. Top soil removal and storage	B4 (-)	A1(-)	D3 (+)	A1(-)	B4 (-)	B4 (-)	B4 (-)	B4 (-)
			9. Development of the temporary construction camp	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			10. Installation of campsites, offices, workshops, storage facilities.	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
	CONSTRUCTION	MINE SUPPORTING INFRASTRUCTURE	12. Transportation facilities, including access roads to the site and on-site roads	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			13. Supporting site infrastructure	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			14. Waste rock stockpiles	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			15. Groundwater water supply systems	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			16. Local generator areas for power infrastructure	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			17. Administration blocks	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			18. Fuel supply and storage / yard	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			19. Workshop and equipment maintenance facilities	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			20. Wastewater treatment systems	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			21. Solid waste transfer facility	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
			22. Storm water management around the pit, waste rock and supporting infrastructure	B4 (-)	A1(-)	D3 (+)	A1(-)	B3(-)	B3(-)	B3(-)	B3(-)
		MINE WORKINGS	5. Excavation as maybe required to create direct access to the marble	B4 (-)	A1(-)	D3 (+)	A1(-)	B4 (-)	B4 (-)	B4 (-)	B4 (-)
			6. Actual pit excavation and stripping of the overburden to create direct access to fresh marble	B4 (-)	A1(-)	D3 (+)	A1(-)	B4 (-)	B4 (-)	B4 (-)	B4 (-)
			7. Marble production for test mining operations	B4 (-)	A1(-)	D3 (+)	A1(-)	B4 (-)	B4 (-)	B4 (-)	B4 (-)
			8. Test mining and commissioning	B4 (-)	A1(-)	D3 (+)	A1(-)	B4 (-)	B4 (-)	B4 (-)	B4 (-)

Table 5.52: *Cont.*

IMPACT SEVERITY	IMPACT LIKELIHOOD: Extremely Unlikely [0]	Unlikely [1]	Low Likelihood [2]	Medium Likelihood [3]	High Likelihood [4]
Slight [A]	[A0]	[A1]	[A2]	[A3]	[A4]
Low [B]	[B0]	[B1]	[B2]	[B3]	[B4]
Medium [C]	[C0]	[C1]	[C2]	[C3]	[C4]
High [D]	[D0]	[D1]	[D2]	[D3]	[D4]

SOURCES OF POTENTIAL IMPACT	PROJECT DEVELOPMENT PHASE	ACTIVITIES	RECEPTORS / TARGETS THAT MAY BE IMPACTED: PHYSICAL AND SOCIOECONOMIC ENVIRONMENT: Natural Environment – Air, Noise, Water, Green Space	Built Environment – Houses, Transport Systems,	Socioeconomic- Job, Investment, Taxes and Social Issues e.g. HIV&Aids	Archaeological and Cultural Resources	BIOLOGICAL ENVIRONMENT: Flora	Fauna	Habitat	Ecosystem - Services, function, use values and non-use
	OPERATION, ONGOING MONITORING AND REHABILITATION	9. Mining operations (actual mining operations including excavation as maybe required)	C3(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		10. Transportation of the mined materials from pit to the yard for sorting	C3(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		11. Transportation of the 5m^3 mined marble blocks to the sorting yard / storage facility and later to be further transported for processing in either Karibib or Walvis Bay	C3(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		12. Operations of the waste rock	C3(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		13. Ongoing exploration support	C3(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		14. Ongoing rehabilitation and maintenance	B2 (-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		15. Waste water and sludge management	B2 (-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		16. Environmental Monitoring on the overall receiving environment	A1(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
	DECOMMISSIONING CLOSURE AND AFTERCARE	9. Implementation of sustainable socioeconomic plan	C3(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		10. Closure of open pits through backfill and fencing	C3(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		11. Closure of waste rock stockpile and used for backfilling	B4 (-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		12. Closure of storage, yard and municipal solid waste transfer sites	B4 (-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		13. Decommissioning of water and electricity infrastructure	B4 (-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		14. Overall land reclamation	B4 (-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		15. Restoration of internal roads	A1(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)
		16. Revegetation and aftercare as may be required	C3(-)	A1(-)	D3 (+)	A1(-)	A1(-)	A1(-)	A1(-)	A1(-)

6. EIA CONCLUSIONS AND RECOMMENDATIONS

6.1 Development Opportunities

This EIA Report forms a part of the comprehensive feasibility work programme that has been implemented in accordance with the environmental requirements with respect to the ongoing marble mine and exploration programme. With high regard to good environmental performances, the overall objective is continue operating a medium to large size marble quarry / mine within the ML 205.

Based on all the data collected and analysed at different stages of this Environmental Assessment process, including all the findings and recommendations of the specialist studies, there are opportunities to continue with the ongoing mining operations in the ML 205 with higher considerations to good environmental performances. The ongoing marble mine and exploration operations within the ML 205 will coexist with the other current and future land uses within the local and surrounding areas.

6.2 Summary of EIA Conclusions

Table 6.1 summarises the results of the evaluation impacts undertaken as part of the environmental assessment process for the ongoing marble mine and exploration operations in the ML 205. It is important to note that the development of ongoing mining and exploration operations in the ML 205 will address the current environmental damages created by the previous exploration and mining operations as well as subsequent new mining exploration activities that will be undertaken.

This updated EIA report has been undertaken in accordance with the Terms of Reference (ToR), provisions of the Environmental Impact Assessment Regulations, 2012 and the Environmental Management Act, 2007, (Act No. 7 of 2007). All key specialist studies with respect to the ongoing mining operations in ML 205 have been undertaken with the findings and recommendations incorporated and presented in this updated EIA Report.

Table 6.1: Summary of the selected key potential environmental impacts likely to be associated with ongoing mining and exploration operations in the ML 205.

ENVIRONMENTAL IMPACT OR ISSUE	SIGNIFICANCE RATING BEFORE & AFTER MITIGATION
1. Impacts on air quality: dust (PM_{10} & dust outfall including metals)	Medium (-) Low with mitigation
2. Impacts on soil / habitats/ ecosystem	Medium (-) Low with mitigation
3. Impacts on flora / habitats/ ecosystem	Low (-) Can be avoided
4. Impacts on invertebrates/ habitats/ ecosystem	Medium (-) Probably reducible
5. Impacts on reptiles/ habitats/ ecosystem	Medium (-) Probably reducible
6. Impacts on birds/ habitats/ ecosystem	Medium (-) Low with mitigation
7. Impacts on mammals/ habitats/ ecosystem	Medium (-) Low with mitigation
8. Impact on groundwater levels / resource	Low (-)
9. Impacts on groundwater quality (offices, ablutions, waste, refuelling)	Medium (-) Low if mitigated
10. Impacts on groundwater quality	Medium (-) Low if mitigated
11. Impacts on groundwater quality (from rock waste drainage)	Medium (-) Low if mitigated
12. Impacts on volumes of surface runoff	Low (-)
13. Impacts on surface water quality	Medium (-) Low if mitigated
14. Impacts of solid and liquid waste	Medium (-) Low if fully compliant
15. Electricity demand	Low (-) but may be further reduced
16. Visual impacts and lighting	Medium (-) Low with mitigation
17. Impacts of water demand	Medium (-)
18. Impacts of water supply pipeline	Low (-) but may be further reduced
19. Road traffic and NamPort Walvis Bay Port	Low (-)
20. Mine rehabilitation, closure and aftercare	Medium (+) Must be a condition of approval
21. Local positive socioeconomic including benefits of direct employment	High (+) Medium term
22. Regional (Erongo region) and National (Namibia) overall positive socioeconomic benefits	High (+) Medium term
23. Impacts related to other land users / conflict / coexistence	Medium (-) Reducible to Low
24. Negative Socioeconomic and HIV/AIDS	Low (-)
25. Occupational Health and Safety	Low (-)
26. Emergency Response Plan	Low (-)

6.3 Key Issues with Likely Significance Impacts

The impact assessment covering this EIA and the preparation of the EMP reports has been undertaken in line with the following mine operations and supporting infrastructures (roads and water supply) developmental stages (ongoing project lifecycle):

(i) Preconstruction.

(ii) Construction.

(iii) Operation, ongoing monitoring and rehabilitation, and.

(iv) Decommissioning, closure and aftercare.

The following approach is taken regarding the concept of whether assessed key issues need to be actively addressed in the EMP:

- If environmental aspects are evaluated to be of low significance, they do not require specific management plans, and need not be actively addressed in the EMP (although they may still be listed and reported on).
- A decision on the need to actively address any issue with a "Medium" significance ranking will require consideration of other relevant factors, such as the nature of the impact, risks associated with possible cumulative aspects, and the degree of concern of stakeholders, and.
- If environmental aspects receive a "High" significance ranking, they must be addressed by means of active management, mitigation or rehabilitation measures.

For each negative impact of high or medium significance, mitigation objectives are set (i.e. ways of reducing negative impacts), and attainable management actions are subsequently addressed in the EMP for mining and prospecting. Without management, these impacts would either breach statutory limits or be unacceptable to statutory authorities or to stakeholders, as they would result in a significant deterioration of one or more environmental resources.

Based on the results of the impact assessment undertaken in this updated EIA Report, the following is summary of the key issues that have been assessed to have likely significance impacts on the receiving environment throughout the project lifecycle:

1. Pollution from routine operations and accidental incidences.
2. Waste management.
3. Stripping and stockpiling soils.
4. Tracks and roads management.
5. Water abstraction and supply.
6. Flora, habitat and ecosystem.
7. Fauna habitat and ecosystem
8. Noise.
9. Dust.
10. Visual.
11. Neighbouring communities and or the general public.

12. Archaeological, historical, and cultural heritage resources.

13. Office, workshop and all related sanitation.

14. Final mine, exploration and supporting infrastructure rehabilitation, closure and aftercare, and.

15. Mine components to be addressed in the ongoing and final mine closure plan.

Mitigation measures for each of the above (1) to 15) key issues have been prepared and presented in the updated EMP Report (Tables 3.1-3.15) for implementation by the proponent.

6.4 Summary of EIA Recommendations

The continual development of the marble quarry / mining and exploration operations in the ML 205 must always focus on utilising disturbed areas first as maybe required for all the supporting infrastructures, pit area, storage / stockpile areas to protect pristine / undisturbed area. Focusing on developing and utilising the already disturbed and contaminated areas from previous exploration or / and mining operations will greatly be beneficial to the future rehabilitation process for the ongoing mining, minerals, and exploration operations in the ML 205.

It is recommended that the ongoing marble mining and exploration project in the ML 205 with all the supporting infrastructure be issued with an Environmental Clearance Certificate (ECC) with the following key conditions:

(i) The proponent shall prepare a detailed EMP Report to address all the identified medium and high rated impacts.

(ii) The proponent shall negotiate a Lease Agreement with the owner/s covering the ML 205 area.

(iii) The proponent shall negotiate further Lease Agreements with the owners of any other farm falling within the ML 205 that may be used for mining related operations in the future as maybe required.

(iv) In consultation with the land owners and where possible and if key and core conservation, tourism or archaeological resources areas are identified within the ML 205 area, such areas shall be excluded from future mining activities.

(v) The proponent must implement and adhere to all the provisions of the EMP report, and.

(vi) Environmental monitoring shall be implemented as provided for the in EMP and Environmental Clearance Certificate (ECC).

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