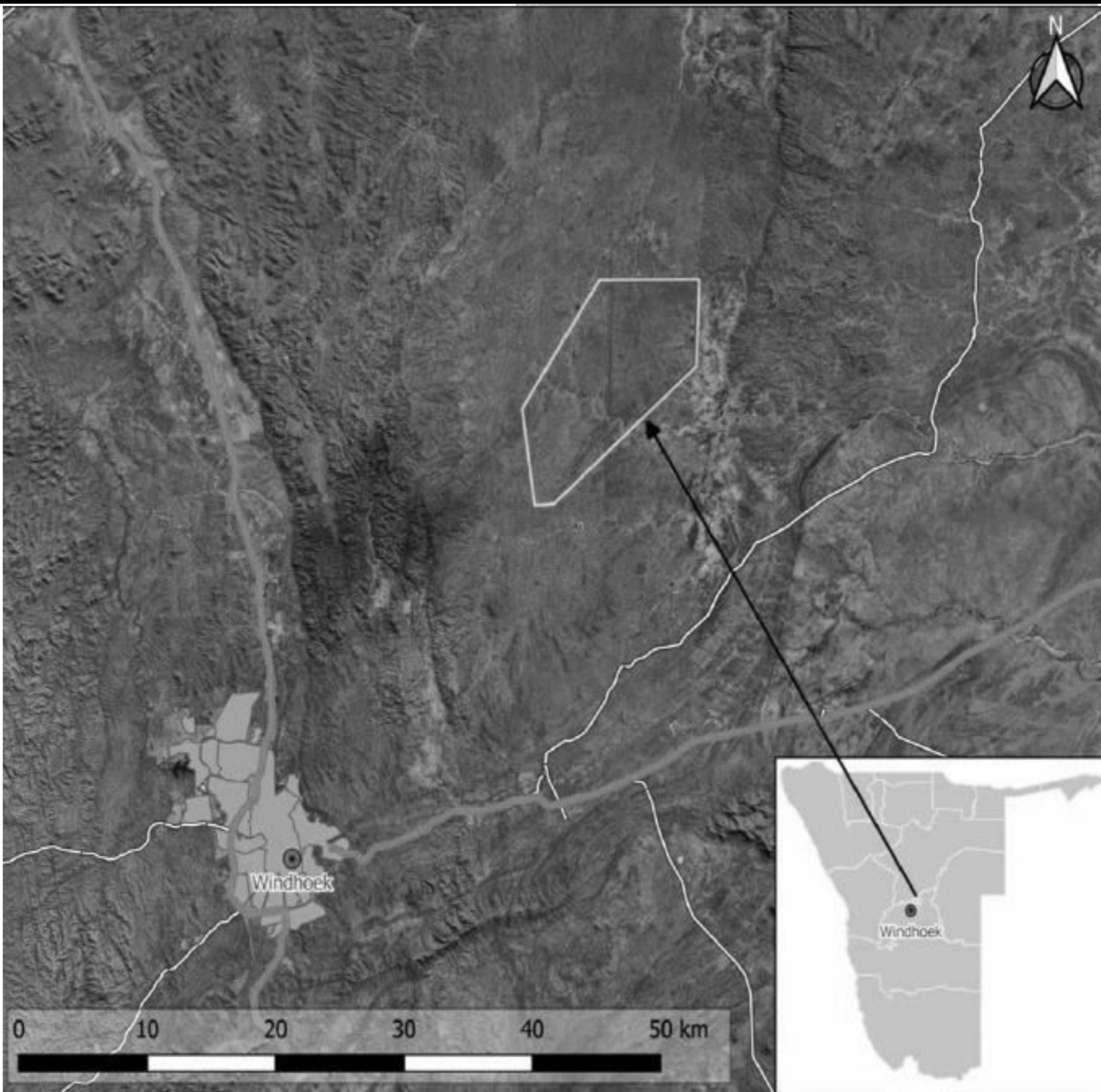
2024

ESIA REPORT Proposed Ongombo Mine Copper Project (ML240 on EPL 5772), Khomas Region



Ongombo Mine (Pty) Ltd

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ANNEXURES

Annexure A: Proof of site notices/ posters
Annexure B: Proof of advertisements
Annexure C: Photo Plates
Annexure D: Public Participation process
1) I&AP database & Registered List
2) Notification sent of BID
3) Comments received and responses (Phase 1)
4) Notification sent of DESR
5) Comments and responses DESR (Phase 2)
6) Issues and Response Trail

Annexure E: Curriculum Vitae of Environmental Assessment Practitioners
Annexure F: Environmental Management Plan
Annexure G: Fauna and Flora Biodiversity Specialist Study
Annexure H: Surface, Groundwater and Geochemical Specialist Study
Annexure I: Air Quality Specialist Study
Annexure J: Socio-Economic Specialist Study
Annexure K: Archeological Specialist Study
Annexure L: Traffic Specialist Study

LIST OF ACRONYMS

AFP	African Pioneer PLC
AIDS	Acquired immune deficiency syndrome
CRR	Comments and response report
dB	Decibels
DESR	Draft Environmental Scoping Report
EA	Environmental Assessment
EAP	Environmental Assessment Practitioner
EAR	Environmental Assessment Report
ECC	Environmental Clearance Certificate
ECO	Environmental Control Officer
ESIA	Environmental and Social Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
ESR	Environmental Scoping Report
FESR	Final Environmental Scoping Report
GTZ	Gesellschaft für Technische Zusammenarbeit
HIV	Human immunodeficiency virus
I&AP	Interested and Affected Party
IUCN	International Union for Conservation of Nature
MEFT	Ministry of Environment, Forestry and Tourism
MEFT: DEA	Ministry of Environment, Forestry and Tourism: Department of Environmental AffairsMURD Ministry of Urban and Rural Development
MWTC	Ministry of Works Transport and Communication
PPP	Public participation process
p/km^2	People per square kilometre
SADC	Southern African Development Community
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

1 INTRODUCTION AND BACKGROUND

A copper-gold mine and processing facility will be built on-site at the Ongombo prospect, about 15km northeast of Otjihase Mine and 45km from Windhoek. The main objective of the proposed facility is to produce a high-grade copper - gold pre-concentrate that is capable of bearing the cost of transportation to the Otjihase Mine flotation processing plant or an alternate location for final concentration and production of a copper – gold concentrate for export via Walvis Bay and subsequent sale.

Ore will be mined using open pit mining methods at a rate of 300ktpa initially with an increase to 700ktpa -1 Mtpa after year 3 of operations. The Ongombo deposit lies in quartz and quartz biotite schists and consists of “shoots” of massive and disseminated sulphides up to 350m wide plunging at about 2° in the shallow Central Shoot and at about 6° in the deeper East Shoot. The deposit dips at about 15°- 20° to the Northwest. The mineralization thickness varies between 1 and 5m with an average between 1 and 2m in the Central Shoot and up to 5m in the East Shoot. The known mineralization stretches from near surface to depths of 500m and may be divided into two or more compartments by faults.

Ongombo Mine (Pty) Ltd has devised an operating programme that will see the production of a high-grade pre-concentrate on-site at Ongombo using ore sorting technology that requires only negligible amounts of water, does not use chemicals, or generate wet tailings and which will produce a high-grade pre-concentrate that can bear the economic cost of transportation off-site for final processing.

This will have multiple benefits for the environment (limited water required, smaller footprint at Ongombo), for the community (new employment opportunities), in addition to the financial benefits accruing to the Government through a range of taxes and royalties.

The proponent appointed Environam Consultants Trading (ECT) to undertake an Environmental and Social Impact Assessment and to apply for an Environmental Clearance Certificate (ECC) form the Office of the Environmental Commissioner on its behalf.

The process will be undertaken in terms of the gazetted Namibian Government Notice No. 30 Environmental Impact Assessment Regulations (herein referred to as EIA Regulations) of the Environmental Management Act (No 7 of 2007) (herein referred to as the EMA). The ESIA process will investigate if there are any potential significant bio-physical and socio-economic impacts associated with the proposed development and related infrastructure and services.

The EIA process would also provide an opportunity for the public and key stakeholders to provide comments and participate in the process. It will also serve the purpose of informing the proponent’s decision-making, and that of MEFT.

2 LEGISLATIVE FRAMEWORK

The principal environmental regulatory agency in Namibia is the Office of the Environmental Commissioner within the Directorate of Environmental Affairs of the Ministry of Environment, Forestry and Tourism. Most of the policies and legislative instruments have their basis in two clauses of the Namibian Constitution, i.e., Article 91 (c) and Article 95 (l); however, good environmental management finds recourse in multiple legal instruments.

3 ENGINEERING SERVICES

Water will be sourced from the nearby White Nossob alluvial aquifer. A photovoltaic cell solar farm will be established to provide power to operate the ore sorting plant with a backup generator system. Sewage will be managed on a Decentralised Wastewater Treatment (DWWT) basis, such as a septic tank system. Other alternative systems may also be considered such as a trickling filter sewage treatment plant to treat sewage and moderately polluted effluents. Waste skips will be used for storing domestic waste, which will be collected regularly and disposed of at the Windhoek municipal waste disposal site by a local contractor. Industrial waste will also be stored in separate containers and removed in a similar manner. From Windhoek, the area is accessible by tar road (B6) and well-maintained gravel roads.

4 PUBLIC PARTICIPATION PROCESS

In terms of Section 21 of the EIA Regulations a call for public consultation with all Interested and Affected Parties (IAPS) during the EIA process is required. This entails consultation with members of the public and providing them with an opportunity to comment on the proposed project. The Public Consultation Process does not only incorporate the requirements of Namibia's legislation, but also takes account of national and International Best Practices.

The process included consultation meetings with the relevant authorities and affected communities. Thereafter a consultation report containing the issues identified during the consultation process was circulated to registered IAPS for input.

The second phase of the Public Consultation Process involved the lodging of the Draft Environmental Scoping Report (DESR) to all registered IAPS for comment. Registered and potential IAPS were informed of the availability of the DESR for public comment. IAPS were given time to submit comments or raise any issues or concerns they may have with regard to the proposed project.

5 POTENTIAL IMPACTS IDENTIFIED

The following impacts were identified and assessed:

- Biodiversity (Fauna and flora);
- Pressure on the existing infrastructure;
- Surface and groundwater;
- Health, safety and security;
- Air quality,
- Noise pollution,
- Traffic;
- Waste management;
- Hazardous substances;

- Socio-economic impact.
- Archaeology
- Visual

6 CONCLUSION

The impacts associated with the proposed mining development can be reduced to acceptable measures. It is, however, important to implement and monitor the measures contained in the EMP and associated management plans. We recommend that the project receives Environmental Clearance, provided the EMP is implemented.

1. INTRODUCTION

1.2 Project Background

Ongombo Mine (Pty) Ltd (the proponent) has appointed Environam Consultants Trading (ECT) to conduct an Environmental and Social Impact Assessment (ESIA) for mining of base metals, namely copper, within a proposed Mining Licence (ML 240) located on exclusive prospecting licence 5772 (EPL 5772), near the capital city Windhoek, Khomas Region, Namibia.

The Proponent has focused on the development of potential copper projects in Namibia through extensive exploration programmes. The proposed Ongombo Copper Project will be an underground mine with a copper extraction process similar to existing but dormant copper mines in Namibia, for example the Otjihase and Matchless mines. The proposed Project will be referred to herein as the "Ongombo Project" or the "Project". Additionally, a conventional open pit is planned to be mined from the Central shoot.

Environmental studies were done for exploration purposes in the area as required by the Ministry of Mines and Energy. An Environmental Clearance Certificate (ECC) was issued by the Ministry of Environment, Forestry and Tourism for this purpose. Furthermore, an Environmental Scoping Report was developed for the project in 2022. This was to be pro-active in the development approach to the project and to prepare for the Environmental and Social Impact Assessment (ESIA) studies to follow.

Subsequent to the above, it was decided that a full Environmental and Social Impact Assessment (ESIA) should be conducted. As a result, the proponent commissioned the ESIA and appointed Environam Consultants Trading (ECT) to undertake the necessary activities to enable an application for an Environmental Clearance Certificate with the Environmental Commissioner as prescribed by the Environmental Management Act (No. 7 of 2007) and Environmental Impact Assessment Regulations (Government Notice No. 30 of 2012).

The ESIA process will investigate if there are any potential significant bio-physical and socio-economic impacts associated with the proposed development and related infrastructure and services.

The ESIA process would also provide an opportunity for the public and key stakeholders to provide comments and participate in the process. It will additionally serve the purpose of informing the proponent’s decision-making, and that of MEFT.

1.3 Project Location

The Ongombo tenements are situated in the Windhoek District of the Khomas region of Namibia. The Ongombo Project is located 15km northeast of Otjihase Mine and 45km from Windhoek, the capital of Namibia. The property is easily accessed from the capital Windhoek, first by the Windhoek to Gobabis tar road (B6), and then by gravel road (M53). The terrain northeast of Windhoek in the area of the Ongombo property is gently undulating with elevations in the range of 1,600-2,000m above sea level. The landscape is dominated by rolling hills covered by grassland and bush. Economic activities in the immediate project area include cattle; small stock farming; and game and wildlife tourism.

The area under license measures 15.781km from north to south and 12.552km from east to west and covers an area of 12,092Ha. Refer to **Figure 1** below for the locality map of the Ongombo deposits, and EPL 5772.

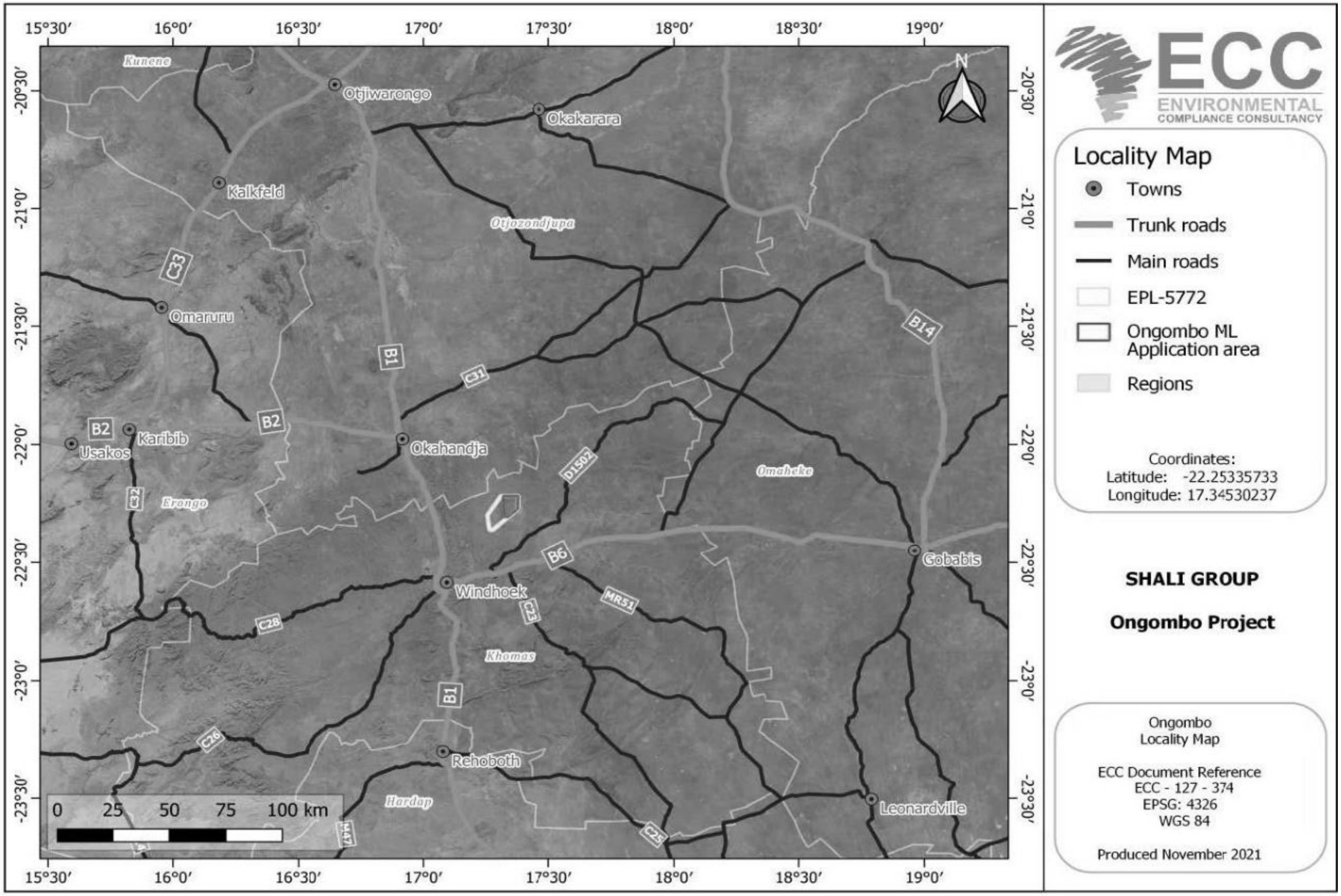


Figure 1. Locality map of EPL 5722 and Ongombo Oos (source: ECC, 2022)

1.4 Project Rational

Copper and its alloys are used in diverse applications that enable us to live a specific standard of living. A continuous flow of copper production and use is essential to the development of society. The discovery and mining of new copper deposits will cover the majority of future copper demand. As part of the circular economy, technological improvements and efficient designs aimed at limiting copper consumption will be equally important, similar to recycling (Pietrzyk & Tora, 2018).

It is rare to find pure copper, which constitutes only 1% of all copper compounds. About 90% of copper resources are found as sulphide ores and 9% as oxide ores. Over 160 compounds contain metallic minerals from which copper can be recovered. Copper minerals include chalcosine, bornite, chalcopyrite, digenite, covellite, cuprite, malachite, djurleite, anilite, and idaite. In copper mines, natural copper ores are extracted to produce pure copper metal. Copper ore can be exploited in three ways: open-pit, underground, and leaching. Globally, open-pit mining is the most dominant form of mining (Pietrzyk & Tora, 2018).

Many copper applications rely on its properties, including high electrical and thermal conductivity, workability and ductility, corrosion resistance, and antibacterial properties. The latter feature is becoming increasingly important (Pietrzyk & Tora, 2018). More than 90% of the world's copper output is used in electrical devices and communications systems. After silver, copper represents the highest electrical conductivity, making it the most widely used (40%) in electricity generation and distribution systems by both industrial and individual consumers. Electric and electronic equipment (electric circuits, cables, contacts, etc.) use 12.5% of copper (Pietrzyk & Tora, 2017, Wieniewski & Myczkowski, 2017).

A further 12.5% is used in transportation (for example, in the form of copper cable bundles with the highest purity, used in trains, airplanes, trucks, etc., which conduct currents from batteries to various control devices, lighting, onboard computers, or satellite navigation systems). An additional 20% of the copper output is used in the building industry (sewage systems inside buildings, roof decking, or facade panels). Due to its natural properties, beautiful appearance, and ability to be recycled, copper is ideal for building light and durable structures that do not require maintenance. Approximately 10% of copper's output is used to manufacture coins, sculptures, jewelry, musical instruments, kitchen utensils, and other consumer products (Wieniewski & Myczkowski, 2017). In addition, copper consumption is returning with anti-microbiological touch surfaces designed for hospitals or public spaces.

1.5 Environmental Assessment Practitioner

In accordance with the Environmental Management Act (2007) of Namibia (and its regulations (2012)), an Environmental Assessment is required for the following activities as they relate to this development:

- Activity 3.1 “The construction of facilities for any process or activities which requires a license, right or other form of authorisation, and the renewal of a license, right or other form of authorisation, in terms of the Minerals (Prospecting and Mining Act), 1992.”
- Activity 3.3 “Resource extraction, manipulation, conservation and related activities.”
- Activity 3.4 “Other forms of mining or extraction of any natural resources whether regulated by law or not.”
- Activity 8.1 “The abstraction of ground or surface water for industrial or commercial purposes”.
- Activity 8.9 “Construction and other activities within a catchment area”.

It is against this background that Ongombo Mine (Pty) Ltd appointed Environam Consultants Trading as independent environmental consultants to conduct the ESIA and the associated EMP on their behalf. The assignment was conducted by Mr Colin P Namene and Mize Shippiki, whose Curricula Vitae are attached as APPENDIX E.

1.6 Terms of Reference and Scope of Project

Ongombo Mine has provided the Terms of Reference for this assignment, which includes providing services of conducting an Environmental and Social Impact Assessment (ESIA) and Environmental Management Plan for the Ongombo Project to investigate if there are any potential significant bio-physical and socio-economic impacts associated with the proposed development and related infrastructure and services.
The process as prescribed by the Environmental Regulations (2012) covered the following steps, which are reported on in this document as follows:

- Provide a detailed description of the proposed activity;
- Identify all legislation and guidelines that have reference to the proposed project;
- Identify existing environmental (both bio-physical and socio-economic) conditions of the area in order to determine their environmental sensitivity;
- Inform Interested and Affected Parties (I&APs) and relevant authorities of the details of the proposed development and provide them with a reasonable opportunity to participate during the process;

- Consider the potential environmental and socio-economic impacts of the development, and assess the significance of the identified impacts.
- Outline management and mitigation measures in an Environmental Management Plan (EMP) to minimize and/or mitigate potentially negative impacts and formulate a closure plan for the mine.

1.7 Approach to the Assignment

Figure 2 illustrates the workflow for the ESIA, which was developed in accordance with the ESIA's Terms of Reference. Environmental studies were done for exploration purposes in the area as required by the Ministry of Mines and Energy; and the Ministry of Environment, Forestry and Tourism. In October 2021 Practara Pty Ltd developed a Technical Scoping Report for the Ongombo Copper Project which includes an economic analysis that is based, in part, on Inferred Mineral Resources. Furthermore, an Environmental Scoping Report was developed for the project in 2021. A significant amount of reference will therefore be made from the above literature.

Additionally, for this assignment specialist studies (Air quality, socio-economic, biodiversity, surface and groundwater, archaeological and traffic) have been conducted and are incorporated in the assessment.

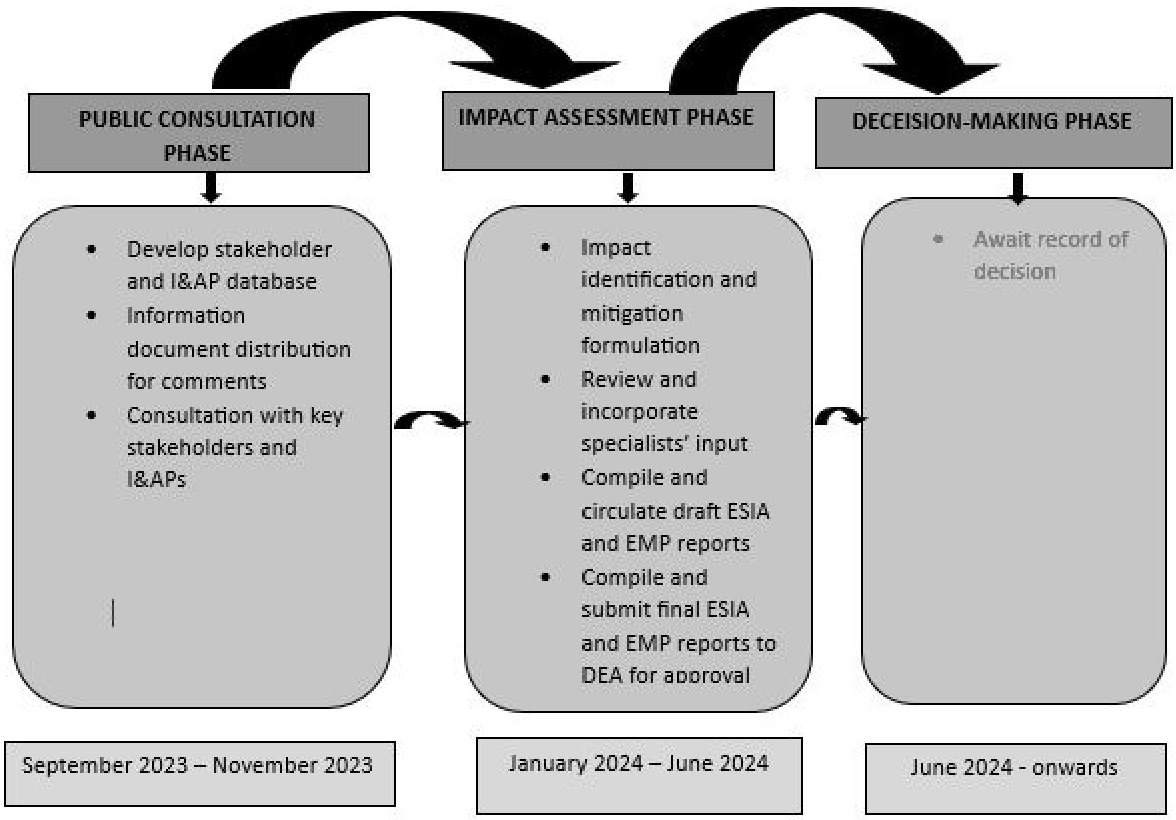


Figure 2. Proposed workflow for the ESIA.

2. PROJECT DESCRIPTION

2.1. Project Summary

The Mineral Resource considered in the Scoping Study is made up of two areas, the Central Shoot and East/Ost Shoot. Due to the difference in the seam heights, two mining methods are envisaged: conventional stoping using pneumatic rock drills and scrapers, and bord and pillar mining. In the first three blocks (Central, East, and East Central) the deposit under consideration is a narrow, intermediate dipping (15° to 20°) tabular body and as such is amenable to a conventional mining approach common to South African narrow gold and platinum mining. Options of both breast and dip mining were considered for extraction of the three areas with breast mining being the preferred mining method (Practara, 2021).

Based on geotechnical inputs, an extraction rate of 86% has been used for all conventional stopes and a 71% extraction for the bord and pillar section. The minimum mining cut selected for conventional mining is 105cm and in some cases, areas have been diluted to this cut. Due to the low-grade nature of the deposit, stoping width control will be a critical aspect of mining and it will be especially important that grade is not sacrificed for tonnage. No additional dilution from the hanging wall, but a 5% dilution factor has been applied for gully and winch cubby development. In the bord and pillar section, no dilution has been applied.

Based on the application of dilution and mining losses that would result from the mining methods selected in the Scoping Study, the Ongombo mineral inventory (modified Mineral Resources) is summarized in Table 1 (Practara, 2021).

Table 1. Mineral Inventory

Area	Tonnes (t)	Grade Cu (%)	Grade Ag (g/t)	Grade Au (g/t)
Central Block	1 845 000	1.69	8.76	0.32
East Block	1 035 000	1.12	6.46	0.32
East Central Block	642 000	1.16	5.78	0.32
East Deeps	2 228 000	1.36	6.93	0.32
Total	**5 750 000**	**1.40**	**7.31**	**0.32**

2.1.1. Property Development History

The property has been extensively explored by a number of companies going back to the 1970's. Companies like B&O Minerals (1971-1973), JCI Limited (1975), and Goldfields Namibia (1986-1994), just to mention a few.

Starlight Investments Pty Ltd (Starlight), a Namibian registered company, was formed to apply for the Exclusive Prospecting License over the Ongombo copper prospect. Starlight was granted EPL3238 on the 8th of November 2007 (Practara, 2021).

Starlight and Avanti Resources Pty Ltd (Avanti) signed an Option Agreement on the 19th of June 2007, whereby Avanti had the exclusive right to promote EPL 3238 over the Ongombo copper deposit to potential investing companies. Subsequent to the Option Agreement between Avanti and Starlight, Avanti prepared a Technical Review of the Ongombo Copper Deposit in Namibia (Marlow, 2007).

Avanti and STH Pty Ltd (STH) signed an Option Deed on the 13th September 2019, where STH would acquire the option held by Avanti over the Ongombo copper deposit with Starlight. After the Option Agreement, Starlight and Avanti and STH signed the Ongombo Farm and Exploration Joint Venture Agreement.

The Ministry of Mines and Energy approved the Gazania Investments Thirty Two (Pty)

Ltd Joint Venture Agreement between Starlight Investments Pty Ltd, and Avanti Recourses Pty Ltd, and STH Pty Ltd on the 27th November 2007. Subsequent to the Ministerial approval of the JV, the ASX listed company Namibian Copper NL (NCO) was formed to fund and manage the exploration on EPL 3238 (Practara, 2021).

2.1.2. Mineral Licences

Starlight Investments Pty Ltd (Starlight), a Namibian registered company, was formed to apply for the Exclusive Prospecting License over the Ongombo copper prospect. Starlight was granted EPL 3238 on the 8th of November 2007. In the same year, a Joint Venture was formed between the license holders Starlight Investments, NCO and Avanti Resources. NCO funded and managed the JV and over a period of 7 years, the JV defined JORC-compliant Mineral Resources of over 10Mt at Ongombo.

In 2014, new investors in NCO insisted on the resignation of the three founding Directors who had managed the company since 2007. The newly appointed NCO board and management lost tenure of the Ongombo license in 2015. The Shali Group applied for and was granted an EPL over Ongombo in 2015 (Practara, 2021). Shali Group and African Pioneer PLC (AFP) entered into a joint venture for the Ongombo mining project

2.2. Mining Operation

2.2.1. Mineral Resources Estimation

A geological model and Mineral Resource estimate for the drilling data was undertaken to determine the potential of the property and help plan future exploitation.

Modelled features are the Central Shoot and East/Ost Shoot. The Central Shoot is defined as the shoot with the southernmost outcrop east of the White Nossob River. The East and Ost shoots to the northwest have been combined as a single unit as indicated in Figure 3.

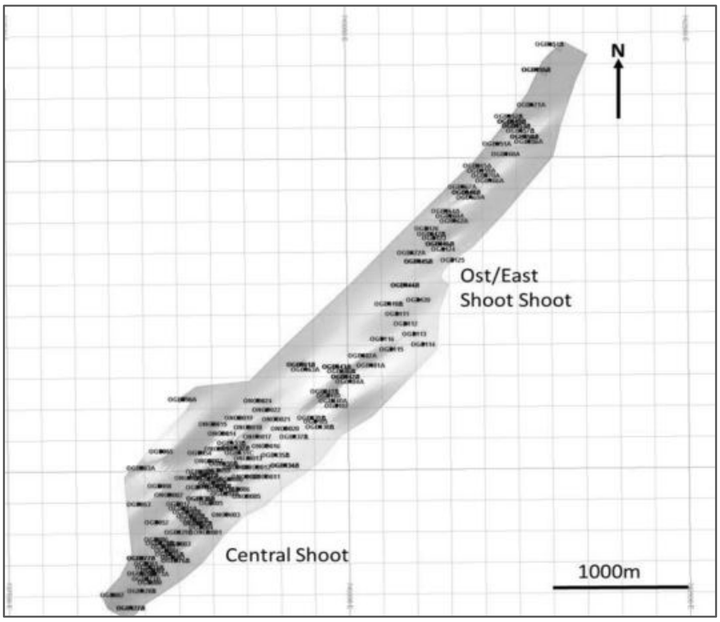


Figure 3. Drill holes and “Shoot” Positions

The shoots are all found in the same stratigraphic position. The mineralized layer was modelled as a single continuous seam using the Datamine vein modelling algorithm. There do not appear to be any abrupt discontinuities with large displacements.

The object of the estimation exercise is to evaluate the quality of the historical data, the potential of the project and a base for future exploration. To this extent the geology was modelled using the top and bottom contacts of the mineralized zone creating a simple seam model with a waste halo for use in mine design software. No attempt to calculate a “best cut” from the boreholes was made (Practara, 2021).

The estimate used 25cm composites, a two structure variogram and anisotropic search ellipse, and 3 pass search and Ordinary Kriging. The variogram and search ellipses were rotated along the axes of the Central Shoot and East.

Resources declared are for copper and silver only. All gold is considered Inferred due to insufficient assay data. Zn and Au grades are very low and there are many gaps in the data due to either lack of assay or non-reporting. Because Zn is at or near detection limit of the assays it is not reported in the Mineral Resource statement.

Mineral Resources are classified as Indicated and Inferred. There is a moderate to high confidence in the data. Historical assays have been confirmed as accurate. Collar surveys have been corrected. The lack of downhole surveys on the 2014 drilling and some historical holes creates uncertainty in the position of the mineralised layer especially the Central Shoot. Variogram results are consistent with the interpretation of the style of mineralization. Geophysical interpretations confirm the locations of the shoots. The mineralization behaves in a similar manner to known deposits at the neighbouring Otjihase and nearby Matchless mines (Practara, 2021). The Mineral Resource Estimation shown in Table 2 forms the basis from which the current study follows.

Table 2. Mineral Resource of the Ongombo Project (Practara, 2021)

Resource Category	In situ tonnes and grade at 1% Cu cut-off			
	Tonnes (Millions)	Cu (%)	Ag (g/t)	Au (g/t)
Measured*				
Central Shoot	-	-	-	-
Est/Ost Shoot	-	-	-	-
Indicated*	10.4			
Central Shoot	3.67	1.61	7.06	0.35
Est/Ost Shoot	6.8	1.27	6.9	0.35
Total Measured and Indicated	10.4	1.4	7	0.35
Inferred				
Central Shoot	0.39	1.38	7	0.35
Est/Ost Shoot	1.26	1.37	7.4	0.35
Total	1.65	1.37	7.3	0.35
Indicated Mineral Resource for Cu and Ag only. Au is Inferred. Cut-off grade is 1% Cu				

2.2.2. Mining Method

2.2.2.1. Central Shoot, East Shoot South and East Shoot Central

The conventional stoping method will be applied with panels being mined on a breast layout. Panels are 20m in length and strike pillars will follow along the gullies. Pillar dimensions vary with depth and mining width. Since the channel width is sometimes less than 90cm a minimum stope width of 1.05m will be maintained with the top limit being 2m allowing for the safe installation of stope stick support. Each raise will be serviced by an ore pass, tipping into a crosscut off of the footwall haulage. Each raise will be serviced by footwall drive access and a short crosscut/travel way to the stope at the bottom of the raise. Stope face advance is planned on 12m per month (Practara, 2021).

2.2.2.2. Mining Method: East Shoot North

Bord and Pillar mining method will be applied for this shoot. For the deep East Shoot North, a decline will be developed down the plunge of the mineralized zone at approximately 7.5°. Bords will be driven off this decline in an opposite direction and subsequent stopes can be mined out sideways down-dip following the slope of the floor. Mining then continues for 6m (maximum span) and, at this point, 7m pillars will be left in place for support.

Mining drives will be on an apparent dip of 10.7° with square pillars. The pillar sizes will depend on mining width. The geological information indicates that the mining width will not usually exceed 4m so 7 x 7m pillars with 6m bords will be the norm. Pillar dimensions have been designed to support 200m of overburden with a factor of safety of 1.5.

The bords run at 45° to the strike direction, with 6m bord and pillar size varying with mining width. Support of the bords will be with 2.4m split-sets spaced at 1.5m in a diamond pattern (Practara, 2021).

2.2.3. Equipment and Logistics

The planned operation at Ongombo can be considered to be a typical small-scale hybrid operation and will therefore use medium-sized equipment. For stoping areas, a 30t haul truck will be used for trucking ore from the stope ore passes to surface or the underground conveyor belt. Stope hauling is based on truck availability and utilisation of 85% with an average monthly haul rate of 12,000 tonnes per truck.

The ancillary plant such as LDVs, charge-up vehicles and utility vehicles are expected to be utilised to carry out the works in the project schedule.

The mine is at relatively shallow depth allowing easy access by persons on foot during early development. During development operations, personnel will walk to the face gaining access via the individual portals. As development proceeds further from the portal, LDVs or personnel carriers will transport personnel. When stoping begins personnel carriers will transport personnel to their working places. These personnel carriers will double as materials utility vehicles when not in use transporting the shift workers.

During development, the rock will be cleaned from the face by LHD and loaded into 30t trucks, which will transport the rock to surface or conveyor. During stoping operations, faces will be cleaned by scraper winch to gullies; the ore reporting to ore-passes. The bottom of each ore-pass will be fitted with a loading box and this will be used to load trucks directly.

Trucks will either travel up the decline to deposit the rock on the appropriate surface stockpile adjacent to the portal or will load directly onto a conveyor. In the case of bord and pillar mining, the LHD will load into a 30t truck which will transport the mineralized material to the conveyor (Practara, 2021). See Table 3 below for the proposed mining fleet.

Table 3. Proposed Mining Fleet

CLASSIFICATION	DESCRIPTION	MAKE AND MODEL	QUANTITY
Loading Unit	50t Excavator	Hitachi ZX 490/Volvo480D	2
Hauling Unit	30t ADT	Volvo A30/Bell B30	8
Ancillary	20t Dozer	Caterpillar D6	1
Ancillary/Road	17t Grader	Caterpillar 140k	1
Maintenance	40,000L Water Bowser	Volvo A40 WB	1
Ancillary	TLB	Caterpillar 428F	1
Ancillary	20t TH Drill Rig	Sandvik DP1100i	1
Drilling	Lighting Plants	N/A	4
Ancillary	Front End Loader	Cat 950	1
Ancillary	10,000L Diesel Bowser	Scania	1
Ancillary	Service Truck	Scania	1

In addition to the mining fleet the processing plant and mine services will also have the following:

- 8 X Toyota Hilux Double Cab LDV's
- 2 X 5-ton forklift
- 3 X Cat 920 front End loaders
- 2 X Hi-abb trucks
- 1 X 20-seater personnel carrier bus

2.2.4. Mining Access

It is proposed to access the Ongombo deposit via a twin decline system utilizing trackless mobile mining equipment, See Figures 4 and 5. Consideration has been given to conventional means but the risk at this stage is too high seeing advance rates will be compromised that would have a delay on production build-up.

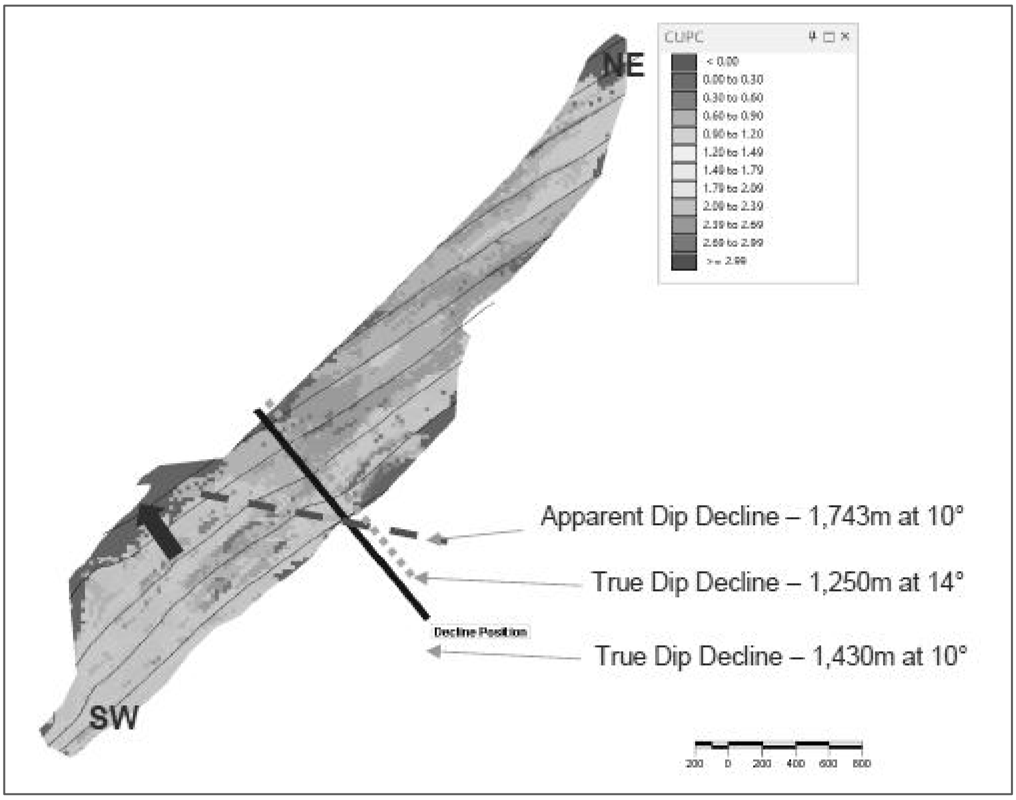


Figure 4. Plan View – Decline Access Options

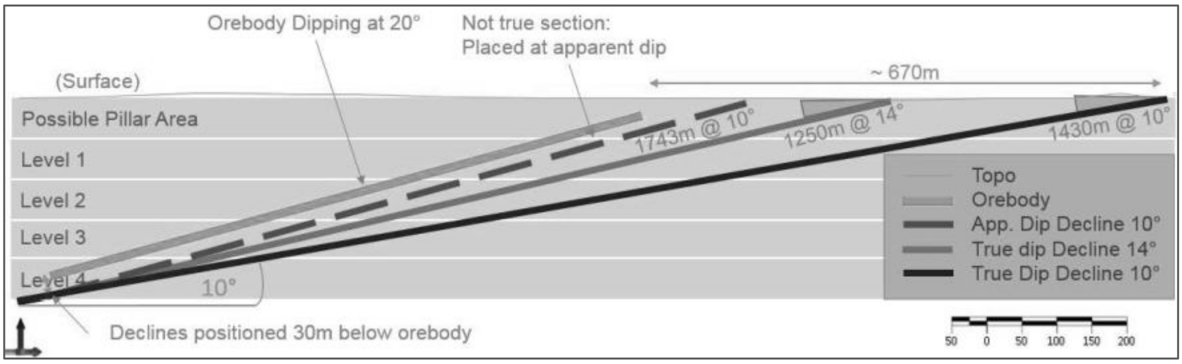


Figure 5. Section View – Decline Access Options

As the economic portion of the Ongombo deposit is from near-surface to 500m below surface, the use of vertical shafts is ruled out due to capital and operating cost, as well as the low tonnage profile and short life of mine. A vertical shaft may warrant consideration for sections of the deposit beyond 300m vertical depths, provided sufficient Mineral Resource is discovered in future to support the anticipated capital expenditure.

Appropriate surface sites for the access portal have been considered and high-level positioning completed. Geotechnical analysis work will follow in the next phase of the study to confirm final positioning. The final portal will be positioned where sound evaluation has been assessed including areas where the typography and geology are optimal for ease of access, excavation positioning below orebody, as well as to position the decline in the best suitable location for the deposit.

Using the proposed trucking fleet of 30t trucks as a basis, a minimum of 5m wide and 5m high or larger decline is required. The initial development down through the surface soil and weathered surface zone can be considered as the portal and represents the interface between surface and underground.

The anticipated 1,250m true dip decline at 14° with +2,200m haulage will be developed to the base of the Central and East areas using electric-hydraulic twin-boom jumbos, capable of achieving 3.5m advances per blast. Cleaning will be done with LHDs, loading into the 30t trucks, which will haul the development waste to surface or the conveyor belt depending upon the position of the development ends (Practara, 2021).

2.2.5. Mine Infrastructure

Infrastructure is one of the most important aspects of mining. It needs as much consideration as geology, mine planning, and processing. Infrastructure such as transport, power, and water transportation costs make up some of the biggest outlays for a mining company, and therefore choosing the right options can therefore make a big impact on a mine's operation. These structures include the following:

- Storm Water management Structures – These structures are needed if major landscape alterations take place and the natural flow of storm water is affected.
- Earth Movement structures - These are structures that will be created because of the mining activities in the area. As mining is taking place, the footprint of the following structures will also continue to change/grow.
- Erectable infrastructure – These structures include offices, workshops, plant, etc. that might be needed for the operation of the mine
- Staff Accommodation – It is assumed that all mining personnel will be recruited from the neighbouring areas and no significant housing infrastructure will be needed on-site.

Assuming a 2 weeks production buffer product stockpile on site before transportation to a beneficiation plant for final processing the proponent will require a 50m x 50m x 12m high ore stockpile area at the plant site itself.

Based on current mass balances the coarse rejects from the ore sorter would be low enough grade to combine with the mine waste stockpile. At a strip ratio of 5 parts waste to 1-part RoM, Ongombo Mine will utilise a 300m x 300m footprint per year for the waste stockpile.

This would typically be positioned directly adjacent to the open pit to be used later for backfilling or road building purposes. Depending on the production profile Ongombo Mine would only be able to start backfilling after about 12-18 months of production at best so the eventual size of the waste stockpile has been estimated on this basis. It is advisable to store the waste stockpile away from the ore body to prevent sterilisation.

See Figure 6 below for the mine infrastructure layout of Ongombo Mine.

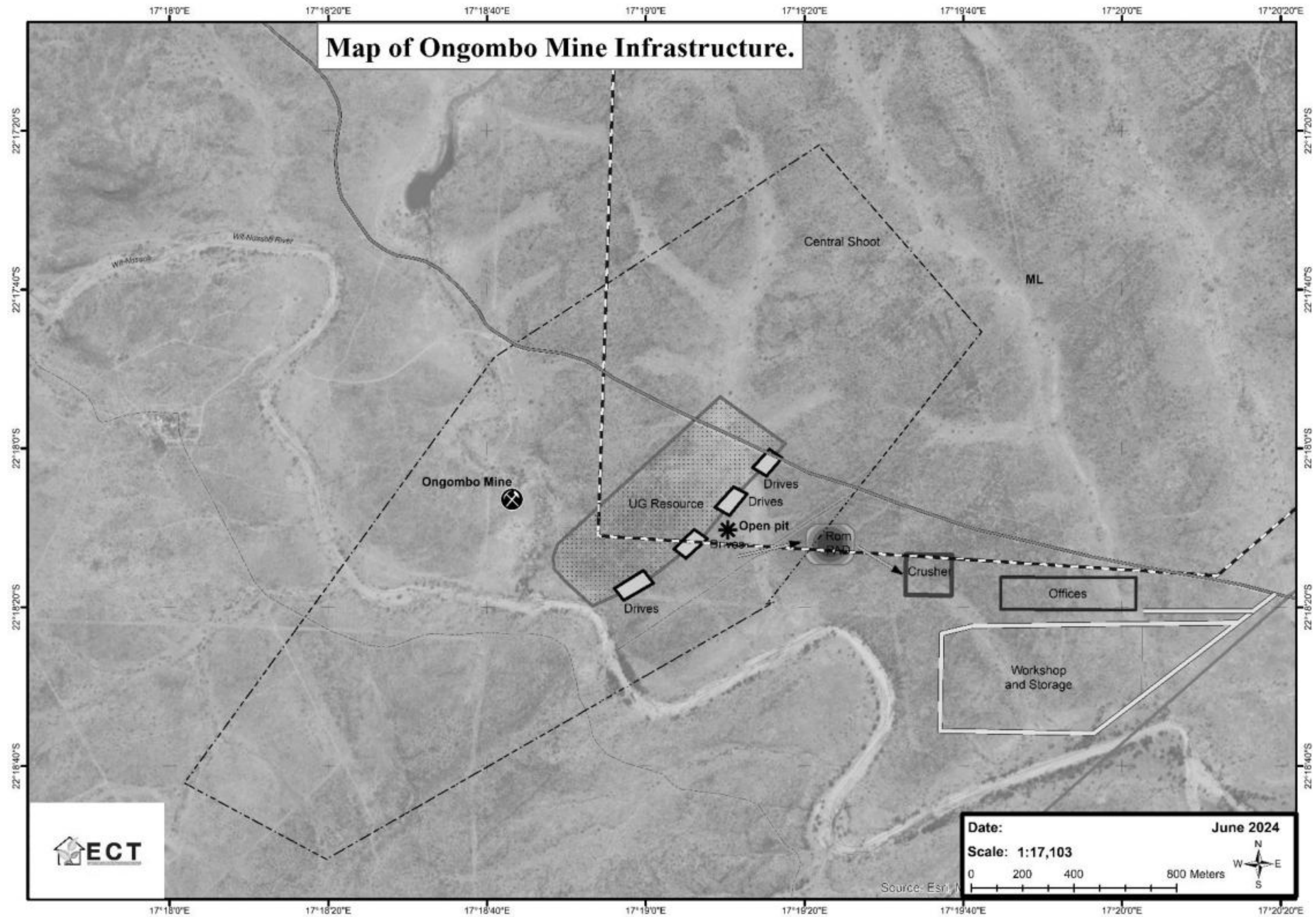


Figure 6. Ongombo Mine Infrastructure

2.3. On-Site Infrastructure and Accommodation

2.3.1. Accommodation

Mining requires support infrastructure to operate. These are structures such as water management infrastructure, earthmoving structures, and erectable units. Some structures like offices will be erected on the surface and others like workshops and battery bays will be constructed underground. No project infrastructure other than that associated with the mining, processing and tailings has been considered at this stage. No staff accommodation has been considered as it is assumed that the employees at the mine will be recruited from the surrounding areas.

2.3.2. Change House

Two change house modules each serving up to 20 persons will be provided for.

Table 4: Proposed Change House Facilities Specifications

Facilities Ablutions are of 30m2 (7.4 x 4m) Locker area of 16m2 (4 x 4m) 2 x 2m wide covered entrance 4m2 (2x2m)	Structure Prefabricated External walls insulated Internal walls insulated 3m clear height to truss 0.4mm thickness IBR silver coloured roof sheeting	Finishes External walls sealed and insulated Internal walls sealed and insulated Windows – timber framed louver type Doors a. Room Entrance door – steel framed solid core flush door b. Cubicle doors – hollow flush timber cw coat hook 'Alububble' roof insulation

2.3.3. Administrative Offices

The administrative offices shall be located as shown in the site plan. These shall comprise at least 100m2 floor area and 1 unit shall consist of the following facilities.

Table 5: Proposed Administration Block Facility Specifications

<u>Facilities</u> ▪ Entrance lobby reception and waiting ▪ Mine General Managers office ▪ Mine manager's office ▪ Main board room ▪ Open Plan offices for accounts section partitioned from the main offices ▪ Open plan offices for all other sections ▪ Male toilets ▪ Female changing and toilets ▪ Stationary supplies cupboard ▪ Tea kitchen ▪ Fireproof records room with fire rated secure door - 10m^2 (4 x 2.5m) ▪ Fireproof server room 9m^2 ▪ Prefabricated construction - Stationary supplies - Tea room/ kitchen - Fireproof records room with fire rated secure door - 10m^2 (4 x 2.5m) - Fireproof server room 9m^2 - Prefabricated construction

2.3.4. Fire and Rescue Station

A fire and rescue station structure suitable for the accommodation of rescue vehicles shall be located near the administrative offices.

Table 6: Proposed Firehouse and Rescue Station Specifications

<u>Facilities</u> 2 covered parking bays 4m x 8m with 4m height clearance Lean to, 12m^2 (3m x 4m), rescue equipment storage 8m x 4m graded, free-draining hard standing	<u>Structure</u> Concrete ground slab with polished concrete floor finish Steel portal frame structure with steel columns, rafters, and purlins 4m clear height 0.4mm thickness IBR silver coloured roof sheeting External walls hydroform11. Gables to full height, rear wall to 3m.

2.3.5. First Aid Post

A structure to accommodate what will serve as a clinic will be erected and will cater for both outpatient treatment and inpatient observation.

Table 7: Proposed First Aid Post Specifications

<u>Facilities</u> Entrance / reception area Waiting area Treatment room 20m^2 (5x4) 2 bed in patient ward 42m^2 (6x7) Staff room 9m^2 (3x3) Toilets 9m^2 (3x3) Bath and showers 9m^2 (3x3) Supplies store 6m^2 (2x3) Pharmacy with store 15m^2 (5x3) Records room 6m^2 (3x2)	<u>Structure</u> Prefabricated External walls insulated Internal walls insulated 3.0m floor to ceiling height 0.4mm thickness IBR silver coloured roof sheeting	<u>Finishes</u> Vinyl tiles with vinyl skirting throughout External walls insulated Internal walls Ablution walls tiled to 1.8m height Windows - timber framed louvre type

2.3.6. Main Stores

A three-part storage facility consisting of a 420m^2 main store building, a 320m^2 open, fenced large items storage area and a 160m^2 hazmat store including a 50m^2 covered concrete slab will be provided.

Table 8: Proposed Main Stores Facility Specifications

<u>Facilities</u> Main stores area 320 m^2 Ablutions 14 m^2 Valuable Items store 50 m^2 Offices 27.5 m^2 External covered slab 50 m^2	<u>Structure</u> Prefabricated except for hazmat store which will have a concrete ground slab with power float concrete floor finish. Steel portal frame structure with steel columns, rafters, and purlins. 5m height to eaves. 0.4mm thickness IBR silver coloured roof sheeting. External and internal walls insulated.

2.3.7. Workshop for Plant Maintenance

A four bay heavy equipment maintenance workshop capable of housing the largest item of mobile plant is provided for. The maintenance area will be 288m^2 with 60m^2 of offices and stores as an external lean-to construction.

Table 9: Proposed Plant Maintenance Workshop Specifications

<u>Facilities</u> 4 maintenance bays each 6m x 12m Offices 20m^2 Stores 20m^2 Ablutions 20m^2

2.3.8. Explosives Magazine

An explosives magazine meeting National regulations for the storage of approximately 25t of palletized, bagged explosives will be erected. A total of $120m^2$ will be reserved for the explosives store with a remotely located $9m^2$ building for detonator storage.

Table 10: Proposed Explosives Magazine Facility Specifications

<u>Facilities</u> Explosives reception area $20m^2$ (2 x 10) Explosives storage area $100m^2$ (10 x 10) Detonator store (remote) $9m^2$ (3 x 3) Gravel paved parking apron $200m^2$ (10x 20) <u>Structure</u> 1. Explosives store Strip foundation Concrete floor slab at 1500mm AGL for direct unloading power float finished. Concrete ground slab with float concrete floor finish External walls insulated. Internal walls insulated. 3.0m floor to ceiling height Steel lip channel purlins supported on the internal partition walls between room 6m. 0.4mm thickness IBR silver coloured roof sheeting 2. Detonator Store: Concrete floor slab power float finished. External walls insulated. 2.4m floor to ceiling height 75mm thick concrete roof slab Single pitch 0.4mm galvanized steel IBR roofing over concrete slab on steel frame	<u>Finishes</u> 1. Explosives store: External walls sealed. Internal walls insulated. Doors a. Entrance door – 2.5 x 2.8m hardwood timber sliding door on nylon rollers b. Internal doors – 2.0 x 2.8m hardwood timber sliding door on nylon rollers Mineral wool roof insulation Ceiling of 12.5mm gypsum board skimmed and painted white non washable PVA. 2. Detonator store External walls sealed insulated. Internal walls sealed insulated. Doors a. Entrance door – 0.85m hardwood solid flush door with external lockable steel grill door Roof soffit 3 coats white non washable PVA <u>Electrical and Data</u> 1 phase 220v power supply to building from renewable source. 1 electrical distribution board external wall mounted under covered area with: a. 40A single pole incomer b. 10A Lighting circuit c. Earth Fault Protection Recessed ceiling mounted fluorescent lamps to entrance and explosives store area. Roof mounted compact fluorescent lamp in protective holder to detonator store. Surface mount external duty fluorescent lamps one per external wall of both buildings for security lighting 4 x mercury vapour flood lamps mounted on 6m timber gum poles to floodlight the area	<u>External Works</u> Crushed rock paving to area within fence ($1000m^2$) 0.75m concrete apron slab 3 sides of buildings 3 brick dish drains to 3 sides of buildings Area fenced with 2m high fencing topped 3 strands barbed wire complete with lockable 6m double leaf gates

2.3.9. Roads

Table 11: Proposed Access roads Specifications

<u>Main Access Road</u> Gravel - 9m cross section gravel standard road suited to heavy vehicle traffic. • 6m carriageway with 2 x 1.5m shoulders • 300mm gravel wearing course on compacted in-situ ground.	<u>Internal Roads</u> • 6m cross section gravel standard road suited to heavy vehicle traffic. • 4.5m carriageway with 2 x 0.75m shoulders • 150mm gravel wearing course on compacted in-situ ground.

2.3.10. Fencing

Fencing will be installed around working areas where there is a risk of injury or accident or where there are facilities such as stores or explosives depots.

2.4. Processing Operation

2.4.1. Processing Plant

Studies completed by external consultants have been based on a copper (gold) processing plant capable of processing run-of-mine feed to produce a pre-concentrate product. An integrated copper plant comprising sensor-based sorting units has been designed to include ancillary equipment (comminution and delivery) together with the supply of a renewable power. The plant construction, operation, maintenance together with the ancillary equipment and plant and the renewable power supply are expected to be provided by the contractor at no cost to Ongombo Mine (Pty) Ltd. The proponent is, therefore, not required to meet any of the capital cost for the processing plant at Ongombo.

The Plant will be equipped with sensors used to detect the diagnostic characteristics of mineralisation and waste material. The mineralised material will be separated and ejected using compressed air. The technology does not use water or reagents to beneficiate Run of Mine ore as conventional plants would do. Also, processing and handling wet tailings require the design of waste licenses and tailings storage, none of which are needed by the chosen ore sorting process.

The Sorting Plant will consist of typical feed reception facilities, Run of Mine pads, crushing, sizing, and screening and conveying together with further screening, pre-concentrate and waste conveying and stockpile facilities at the back-end of the sorting plant. The plant will include other ancillary equipment including dust suppression equipment. A renewable energy power plant will also be used to operate the facility.

Ongombo Mine will enter into an agreement with a manufacturer and operator to deliver the power and sorting plants. The sorting plant manufacturer/operator will design, construct, commission, operate, maintain and monitor the plant to enable it to fulfil its processing obligations. The plant will be sited close to the initial ROM Pad. Ongombo Mine will be responsible for the delivery of the Run of Mine feed.

No water is required for the operation of the ore sorting plant. Some water may be required for dust suppression on roads used to deliver feed, but this will be minimized and may be limited by various agencies wishing to minimise impact on the environment.

Waste generated during processing is expected to host little or no sulphides as sulphide mineralisation is typically constrained to bands and well-defined horizons and is not typically disseminated throughout the host rock. Waste from open pit operations will be utilised to form bunds to "hide" operating equipment from general view and will be used for road maintenance and repair. Underground waste will be returned below surface as backfill. Some temporary storage of waste will be required on surface to allow stopes to be depleted before they can be backfilled. The sorting plant can be operational within 4 to 6 months of sign-off. Commissioning typically takes 3 to 4 weeks after which the plant can be expected to operate at nameplate capacity.

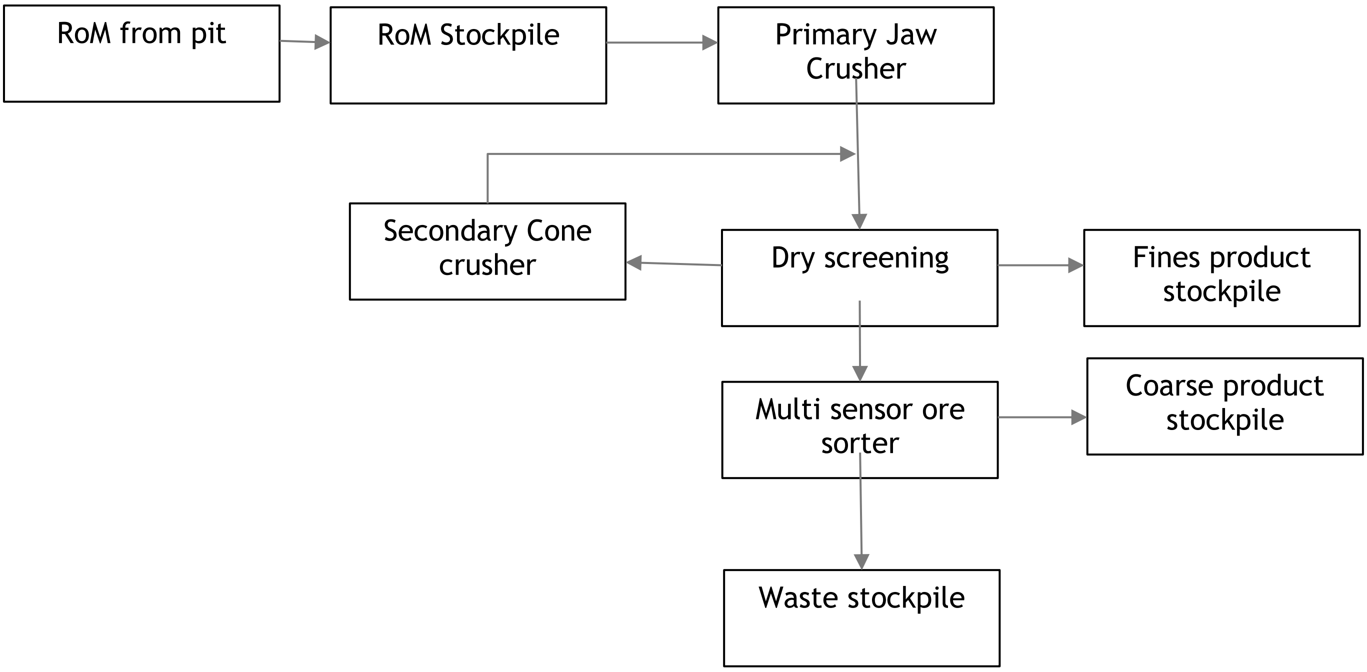
2.4.2. Process Flow

Ore will be mined using open pit mining methods at a rate of 300ktpa initially with an increase to 700ktpa -1 Mtpa after year 3 of operations. The ore processing circuit is shown below and will consist of:

- Open pit Run of Mine (RoM) ore mined will be stockpiled on a RoM pad to serve as crusher feed.
- Ore from the RoM stockpile will be fed by Front End loader at a controlled rate to a Vibrating Grizzly Screen from where the oversize (>80mm<450mm) will report to a Jaw crusher for size reduction.
- The product from the Jaw crusher product will be recombined with the grizzly undersize and report to a sizing screen where material will be sized into >40mm, 10-40mm and <10mm fractions.
- The >40mm fraction will report to a secondary cone crusher in close circuit with the screen.
- Material <10mm will be stockpiled as a fines RoM product.
- Material 10-40mm in size will report to and multisensory ore sorter where waste will be separated from mineral bearing ore. The product from the sorter (app 150ktpa) will

be stockpiled from where it will be trucked to a further beneficiation plant located elsewhere.

- Waste from the ore sorter will constitute a final waste product which will initially be stockpiled from where some will be used for backfilling or road building purposes.



2.4.3. Stages of processing

Mineralisation throughout the Matchless Belt is ubiquitous and recognised as an easy ore to concentrate and one that produces a clean marketable concentrate. Flotation is the common copper processing technology, which can be used for sulfide ore and oxide ore. The copper flotation plant usually includes the following steps: crushing and screening; stage grinding and flotation; thickening and dewatering; and copper concentrates recovery. During the flotation process a series of cells is used to obtain a purer and purer concentrate.

Conventional flotation requires a sizeable volume of water. However, flotation will be required as a second stage of processing to take place at the final offsite flotation plant, possibly at Otjihase, where the dry ore sorted pre-concentrate will be upgraded to generate the final concentrate product for sale.

It should be noted that the high-grade nature of the feed entering the float plant will need to be managed otherwise the float cells will be overwhelmed by copper production. This has been discussed with the plant operators at the float plant and can be managed. Even though the technology is not water intensive, the company will still employ water recycling methods.

2.4.4. Product storage and transport

Pre-concentrate will be transported from the Ongombo site to the processing plant for final concentration. The final product will be containerized and transported to the port at Walvis Bay, by means of rail and/or road for export and subsequent sale to the market. Each container will be loaded with approximately 28 tonnes of packaged product. Once operational, the processing plant will operate 52 weeks per year, five days per week, and 24 hours per day.

2.5. Tailings Storage Facility (TSF)

2.5.1. General

Typically, the bulk quantity of tailings consists of rock which is remaining after the processing and the extraction of the valuable mineralization. The material is crushed and ground to a fine size ranging from fine sand down to silt (Particles ≤ 0.1 mm in diameter) and is mixed with water (Crowflight Minerals Inc., 2007).

Ongombo Mine’s environmental objectives include the following:

- To restrict the deposition of waste materials on surface to material generated during open pit mining and the discard post ore sorting generating as benign coarse crushed product that can safely be stored on surface with the balance of any future underground waste from waste development and ore sorting discard, to be relocated underground where feasible in the form of backfill.
- To operate a processing plant without recourse to a traditional flotation tailings facility by virtue of the production of a coarse rock discard from ore sorting and an absence of fine-grained wet tailings containing residual reagents and chemicals required for flotation.
- Operate a dry sorting pre-concentration processing plant on-site specifically to reduce the volume of commercially viable ore that can be separated from waste rock so that a high-grade pre-concentrate can be transported from site for final processing, thereby further limiting on-site impact.

To this end, Ongombo Mine (Pty) Ltd has devised an operating programme that will see the production of a high-grade pre-concentrate on-site at Ongombo using ore sorting technology that requires only negligible amounts of water, does not use chemicals, or generate wet tailings and which will produce a high-grade pre-concentrate that can bear the cost of transportation off-site.

The Plant will be equipped with sensors used to detect the diagnostic characteristics of mineralisation and waste material. The mineralised material is separated and ejected using compressed air. The technology does not use water or reagents to beneficiate Run of Mine ore as conventional plants would do. Also, processing and handling wet tailings require the design of waste licenses and tailings storage, none of which are necessary with the chosen ore sorting process.

Even though the technology is not water intensive, the developer will still employ water recycling methods to reduce reliance on freshwater.

The dump and ore storage footprints depicted in the Ongombo Infrastructure layout (Figure 6 above) show the maximum anticipated areal extent of the storage areas. There will be minimal fine material (<2mm) as there is no fine grinding anticipated – but only crushing to generate feedstock for the dry processing unit. Hence, there will be no generation of a tailings slurry that would require storage in a conventional Tailings Management Facility (TMF).

2.6. Resource and Infrastructure Requirements

2.6.1. Water requirements

At this stage, the project water demand varies between 18,720 m^3/a and 41,400 m^3/a, or 52 m^3/d to 113 m^3/d, depending on the anticipated figures of employees. These figures could however change significantly as they are process dependent.

The water demand can be sourced locally from the local hard rock aquifer, which has a limited potential, from the alluvium of the White Nossob River, which is also limited, or from the dewatering of the future underground operations (Madec, 2024).

2.6.2. Power supply

Ongombo Mine is committed to operating a "green" mining operation, limiting environmental impacts and as such it will operate using a sustainable renewable power supply.

A photovoltaic cell solar farm will be established to provide power to operate the sorting plant with a back-up generator system. The systems will be interlocked to ensure that power during daylight hours will be provided by the photovoltaic system. Battery storage and a standby generator will be available for back-up.

From this main panel, power will be distributed to offices, first aid room, change house, stores, workshop, main ventilation fans, the crusher, sorting plant and other ancillary plant and equipment required for processing of ore. 800kVA 400V/3,3 kV crushing and grinding plant step-up transformer.

The open pit will have limited additional power requirements to what is planned for the surface infrastructure. Lights will be powered by small accompanying generator units where required (Ongombo Mine, 2024).

2.6.3. Sewerage system

Sewage will be managed on a Decentralised Wastewater Treatment (DWWT) basis, such as a septic tank system. Other alternative systems will also be considered such as a trickling filter sewage treatment plant to treat sewage and moderately polluted effluents. In addition to being environmentally friendly, this system is capable of treating effluent effectively for the approximately 80 workers estimated to work on this project. Water from the plant can be reused.

Screens will be used to remove non-degradable material from wastewater during the first stage of treatment. The aerobic and anaerobic digestion processes take place in a two-chamber septic tank (Figure 7). After that, the effluent is pumped onto the fixed film trickling filter with a submersible pump. Biological treatment takes place in the trickling filter in order to remove harmful organics. After solids are separated in a settler, the final effluent is disinfected with chlorine (Aqua Services and Engineering, 2001).

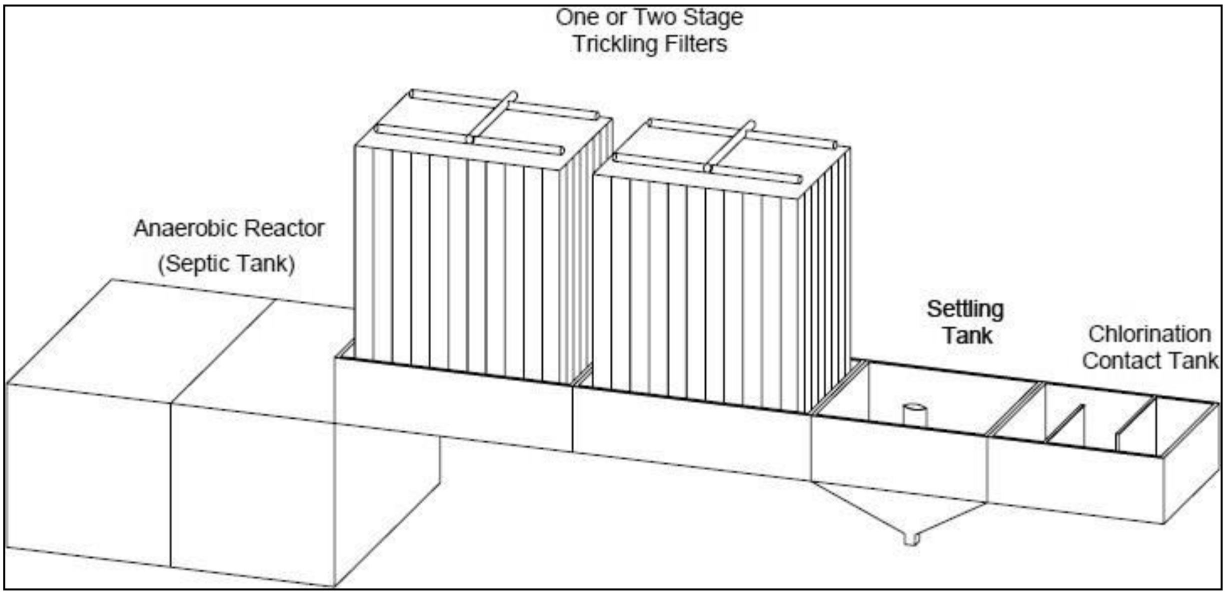
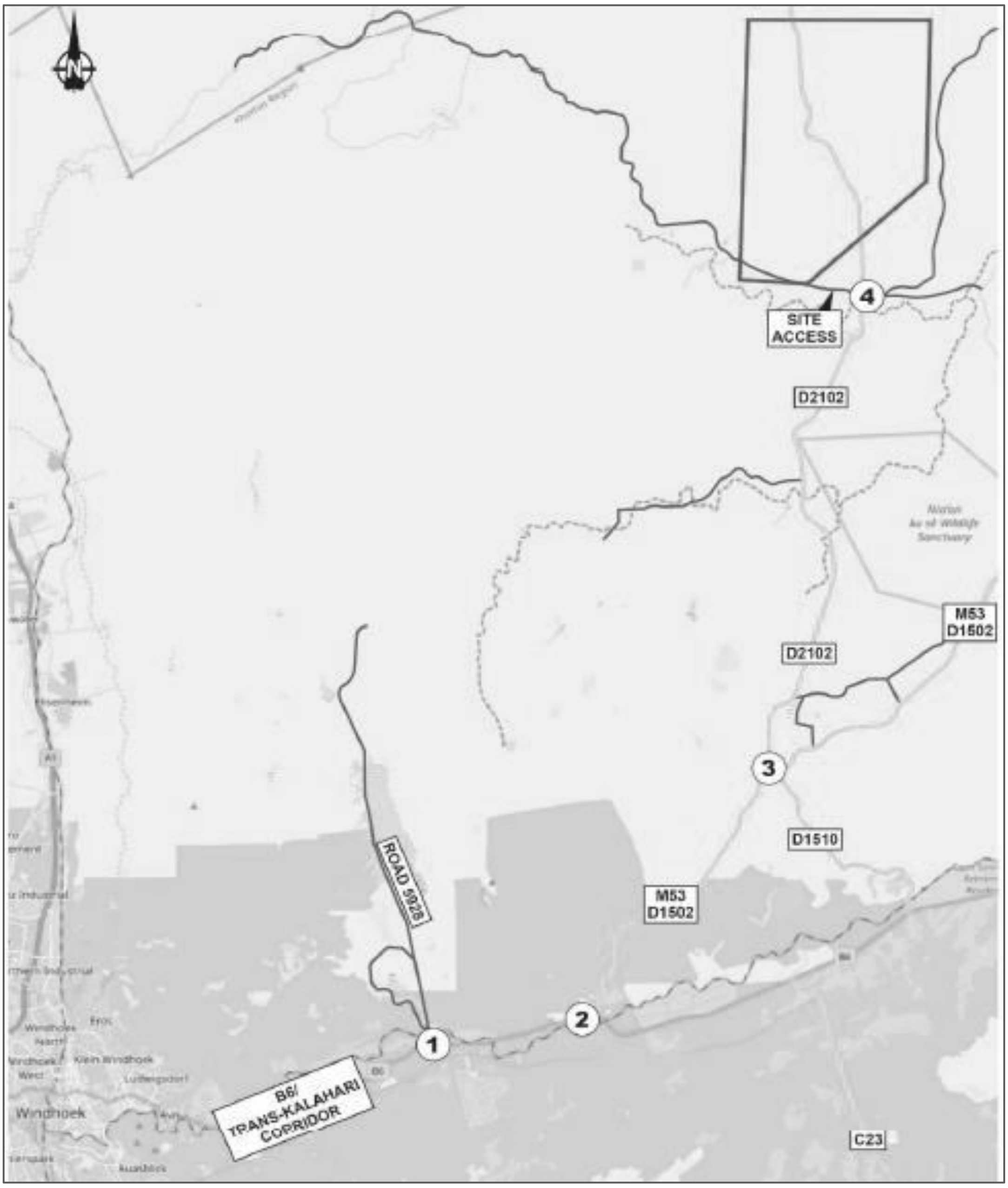


Figure 7. Trickling filter sewage treatment plant (Aqua Services and Engineering, 2001)

2.6.4. Traffic and Transport

As part of the ESIA, a traffic impact assessment (TIA) study was commissioned for the project and carried out by Lithon Projects Consultants (2023), to determine the expected transport related impacts of the proposed haulage of pre-concentrate ore to the preferred location of Otjihase Mine. The study also assessed potential alternative routes from the Ongombo mine to the Otjihase Mine for processing. It is anticipated that the haulage of this ore to Otjihase would result in additional traffic in the area, as well as the transport of the final products (copper concentrate), between the process plant and the final destination (Walvis Bay Harbour) for export of product.

The Traffic Impact Assessment was conducted based on the proposed mine plan, associated mining activities, facilities and the project layout. The assessment included assessing the traffic conditions at the site access at the Otjihase Junction (5928); Kapps Farm Junction (M53/D1502); Midgard Intersection (M53, D2102, D1510, M3); and at the (D2102). See map below for access road network.



- *Anticipated Road Hauling Traffic*

The anticipated monthly production from the mine is 40 000 tonnes, which translates to 1 333 tonnes per day (assuming 30 days per month) or 166 tonnes per hour (assuming hauling will only occur during the day, for a total of 8 hours). A 34-ton pay-load is used (similar to the truck shown in Photo 1 below) in the calculations, which equates to 4.9 trucks (5 trucks) or 10 trips/hour.

Shift change times at mines normally occur outside the normal weekday morning and afternoon peak hours. The exception is the administrative section, which operates between around 07:30 and 16:00, and typically coincides with the peak demand of the adjacent road network traffic flow. Considering that official trip generating rates for mines are still to be determined, the use of potential employment figures and acceptable shift change times can be used to determine a potential peak hour trip generation. The mine will have two shifts, and the shift change times will typically be as follows:

- Shift 1: 06:00 – 18:00
- Shift 2: 18:00 – 06:00
- Admin: 07:30- 16:00

The operational phase will comprise two mining crews, supported by staff and management and it is expected that the total staff complement will be between 50 and 80 people. As part of the study a staff component of 80 people was assumed as part of the calculations. The mining crew will comprise of 14 personnel and is summarised as follows:

- Miner
- Team leader
- Two blasting assistants
- A drill rig operator
- A drill rig assistant
- On roof bolter operator
- One roof bolter assistant
- One long haul drill operator
- Two truck drivers
- Three face preparation assistants

Provision is made for 5% of the staff complement to provide supporting services to the night shift. Thus, the night shift will have 18 staff members, while the remaining 62 staff members will operate during the day shift.

The admin component will have a potential peak hour demand during the morning and afternoon peak hours. It is assumed that the mining crews will arrive 30 minutes before start of shift to change from civilian to overalls and other PPE and at the end of the shift it will take approximately 30 minutes to return any equipment, to shower and change to civilian clothes, before leaving the site.

Some employees could be dropped off/collected by another person or spouse and some employees may even form a carpool club. However, for purposes of calculation, it was assumed that each of these employees will generate 1 trip during the weekday morning (arrive at the mine) and 1 trip during the weekday afternoon peak (going home). This simulates the worst-case scenario, and the travelling pattern adopted for the mine workers and supporting staff are summarised in Table 12.

Table 12. Travel pattern of mine staff members

Time	Activities	No. of Staff	No. Trips	
			IN	OUT
04:30	Bus departs from mine to collect day shift crew	1	-	1
05:00	Pick-up day shift crew	-	-	-
05:30	Bus arrives at mine with day shift crew	14	1	-
	Management staff for day shift crew using private vehicles arrive at mine	2	2	-
06:00	Nigh/day shift change over	-	-	-
06:30	Bus departs from mine to drop off night shift crew	16	-	1
	Night shift management staff using private vehicles departs from the mine	2	-	2
07:00 - 730	Bus arrives with supporting staff (using public transport).	29	1	-
	Staff using private vehicles arrive at mine	16	16	-
	TOTAL	80	20	4
16:00	Staff using private vehicles depart from the mine	16	-	16
	Bus departs from mine to drop off supporting staff using the bus and collect the night shift crew	30	-	1
17:00	Pick-up night shift screw	-	-	-
17:30	Bus arrives at mine with night shift crew	16	1	-
	Night shift management staff using private vehicles arrives from the mine	2	2	-
18:00	Day/Nigh shift change over	-	-	-
18:30	Bus departs from mine to drop off day shift crew	14	1	1
19:00	Bus arrives at mine for overnight stay	-	-	1
	TOTAL	80	20	4

Note: (1) Bus driver only calculated at start of bus trip.

Based on the results the following:

- The peak demand for the mine operations are 06:30 to 07:30 and 16:00 to 17:00.
- The expected peak hour trip generation demand is 20 trips (In = 17; Out = 3), during the weekday morning and 17 trips (In = 0; Out = 17), during the weekday afternoon.

During the construction phase, it is anticipated that between 20 and 80 people will be employed. For the duration of the construction phase, it is anticipated that the contractors will provide labor transportation to and from the site. The anticipated travels are deemed insignificant because the construction phase is really temporary in respect to the mining operations as a whole. According to the information above, the mining operations will produce about 4 trips per hour, with a 10%: 90% (In: Out) directional split.

Most of the imported equipment will be shipped directly from overseas through Walvis Bay (B2 and B6 roads), whilst minimal shipment will come from South Africa to Namibia, via the B1 and B6 roads. It is expected that approximately 80% of all traffic will come from Walvis Bay whereas 20% will come from South Africa. In all events, the D2102 road will be used as the main access road to the mine site.

- *Survey Details and Minimum Design Parameters*

Existing Traffic Conditions were ascertained by conducting traffic counts at the following intersection:

- ❖ Intersection 1: Otjihase Junction (5928);
- ❖ Intersection 2: Kapps Farm Junction (M53/D1502);
- ❖ Intersection 3: Midgard Intersection (M53, D2102, D1510, M3);
- ❖ Intersection 4: Site access intersection on district road (D2102);

All traffic movements (turning and straight through) on street approaches were considered. The traffic counts were conducted on 1 November 2023 and 7 November 2023. The counts were conducted from 06:00 to 18:30. The detailed traffic counts (Annexure L), and the peak hours extracted are appended in Figure 8.

The peak hour count was adequate in determining trip generation (in terms of access to the facility) and trip distribution and provide an estimation of the level of service at which the respective intersections will operate with the additional development traffic.

Full access from Road D2102, at Intersection 1 – The final access arrangements configuration to be prepared as per the findings of this report.

The methodology and minimum design parameters adopted are summarised as follows:

- ❖ Intersection 4: Road D2102 & Site Access/Farm Access
- ❖ Road D2102, as well as the access to the site are a gravel road. It is expected that the current surface structure will remain, and the civil engineer to confirm the minimum design specifications of the new access road. Further to this the civil engineer to confirm whether the current Road D2102 has sufficient structure strength to accommodate the additional development trips.
- ❖ Accepted a speed limit of 80km/h along Road D2102 and 60km/h on the access road.
- ❖ The site access road to be widen to a minimum of 7.5m, including any access gate to be implemented along the site access road.
- ❖ No turning lane to be provided on the road network.
- ❖ A throat length of 75.0m to be provided, between the property boundary on Road D2102 and any access control system to be implemented along the site access road.
    - ❖ Minimum access radii on local authority roads should be 15m.

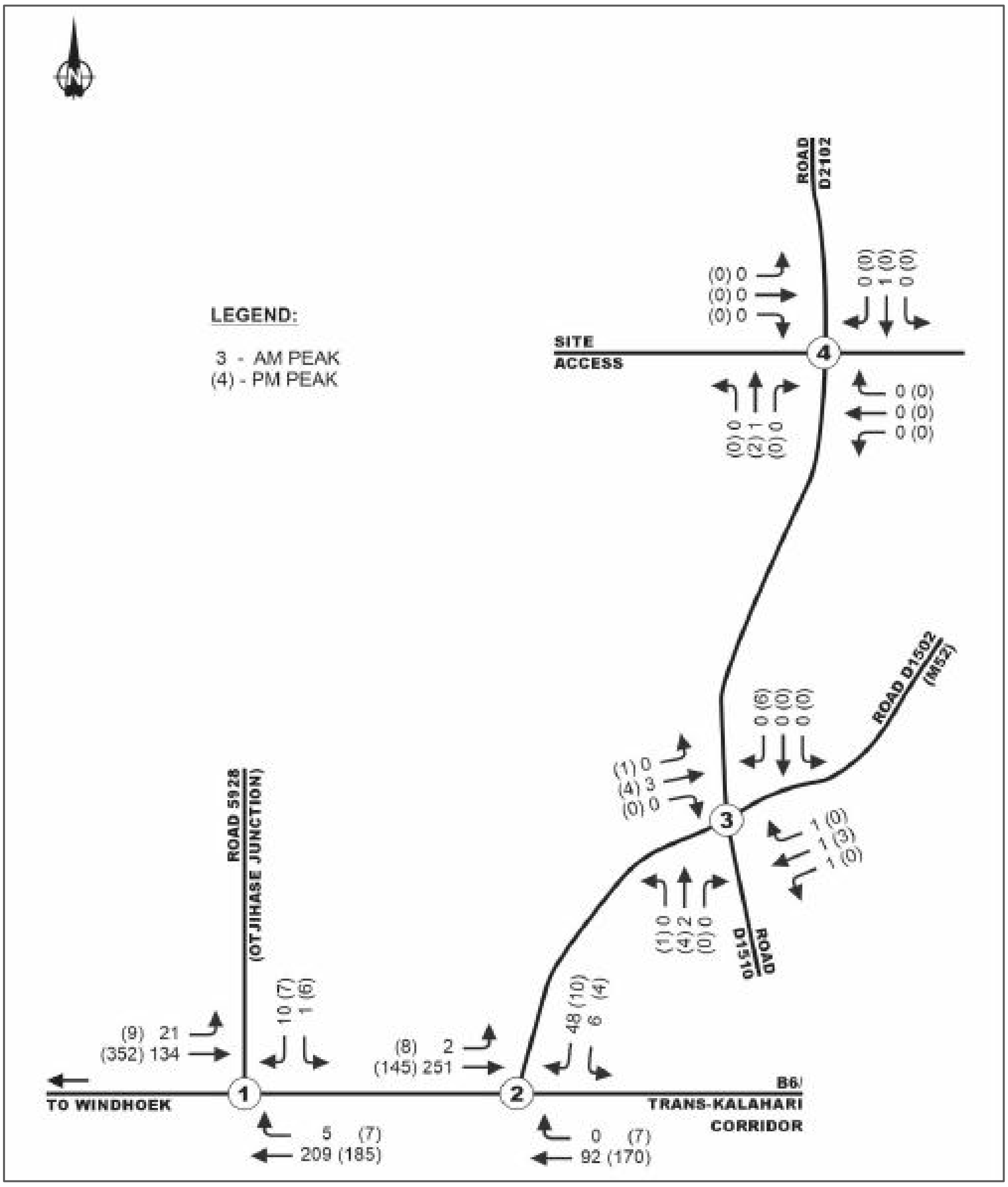


Figure 8. Peak hours extracted *(Source: Lithon, 2023)*

- *Strength and Safety of Access Roads*

From the traffic analysis done, it is clear that the number of traffic generated is approximately 107 trips/day (hauling 32; mine activities = 27 and mine staff 48) and is less than the norm for providing a gravel road. There is thus no need to upgrade to bitumen roads for the purpose of structural capacity.

Safety of gravel roads should be taken cognizance of. Typical defects which may affect unpaved roads are dustiness, potholes, stoniness, corrugations, ruts, cracks, ravelling (formation of loose material), erosion, slipperiness, impassability and loss of surfacing or wearing course. Many of these have a direct effect on the road roughness and safety.

Dust is generally considered by the travelling public to be unacceptable when it totally obscures vehicles behind a moving vehicle, either following vehicles or those passing from the opposite direction, especially near road junctions. The potential dustiness of a material is very difficult to predict. Although material composition is the major characteristic affecting dustiness, aspects such as the vehicle volume, mix and speeds of vehicles, moisture content of the road, looseness of the material, maintenance frequency, tyre tread and wind all affect the apparent dustiness.

In many cases it may be necessary to apply dust palliatives in order to bind the dust particles. A number of dust palliatives are commercially available but each one has to be tested individually in order to identify its suitability and cost-effectiveness for the material under consideration. General routine maintenance of the gravel access roads will provide the necessary mitigation to reduce safety risks.

- *Findings and Recommendations*

Based on the results the existing road network has sufficient capacity to accommodate the additional development traffic.

It is therefore recommended that with the proposed mining activities be considered favourably from a traffic impact perspective. The overall traffic volumes to be generated are very low and within the capacity of the immediate road infrastructure.

The following Recommendation has been made as described hereafter.

- Hauling and heavy vehicle movement to be limited to day time only.
- The current access to be improved, with a new access road to have a minimum width of 7.5m. Surface can remain gravel, but the risk of dust on the surrounding area to be monitored and where necessary dust control measures to be implemented.
- The site access is located on the inside of a horizontal curve and sufficient and safe sight distances to be provided on the site. A detailed topographical survey required to confirm final sight distances. In the event the proposed position does not meet the required standards, alternative access point to be considered along Road D2102.
- A registered civil engineer to confirm the pavement for Road D2102 can accommodate the additional truck traffic.
- Advance road traffic warning signs to be erected to increase awareness of the site access point and related mining activities.

2.6.5. Solid waste disposal

Waste skips will be used for storing domestic waste, which will be collected regularly and disposed of at the Windhoek municipal waste disposal site by a local contractor. Industrial waste will also be stored in separate containers and removed in a similar manner. However, used oils and other lubricants will be removed by oil recycling contractors (e.g. Rent-A-Drum, Wesco Waste Management etc.) for final disposal or re-use. The following methods in Table 13 below will be used to dispose of hazardous waste.

Table 13. Hazardous waste sources and disposal methods

HAZARDOUS WASTE	SOURCE	PROPOSED MANAGEMENT / DISPOSAL
Radioactive sources	Densitometers, level gauges and the XRF instrument	To be disposed offsite through a licensed hazardous waste disposal agent.
Hydrocarbon contaminated materials	Leaking vehicles, machinery and equipment. Used oil, grease, oil rags, paint tins, solvent cleaner rags	Hydrocarbon traps will be installed around machinery to contain spillages. Oil and grease will be recovered from equipment and machinery and stored in drums and stored in a bunded area before being sold offsite for recycling. Any fuel spills will be soaked up onto a suitable absorbent and disposed of together with oils and grease. Any fuel/oil contaminated soil will be disposed in a plastic drum/bag and taken to a bioremediation facility.
Halogenated solvents	Any organic chemical containing F, Cl, Br or I. E.g. Chloroform, carbon tetrachloride, methylene chloride, trichloroethylene	Collected in plastic drums and disposed of offsite through a licensed hazardous waste disposal agent.
Fluorescent tubes		Crushed and collected in drums until sufficient quantities have been collected, to be disposed offsite through a licensed hazardous waste disposal agent.

HAZARDOUS WASTE	SOURCE	PROPOSED MANAGEMENT / DISPOSAL
Acids	H_2SO_4	Storage and handling will be in accordance with manufacturer requirements specified in Material Safety Data Sheets. Site procedures will also be developed to ensure a clear understanding of all requirements, this will include the assessment of any product prior to bringing it on site. Acids to be neutralized with a base prior to disposal and/or recycled.
Bases	NaOH	To be neutralized prior to disposal and/or recycled.
Used pesticide containers	Spraying for mosquitoes, insects, etc.	Collected in plastic drums and disposed offsite through a licensed hazardous waste disposal agent.
Laboratory waste	Diluted acid and bases, samples prepared for XRF using the fusion method and powder pallet methods contains lithium borate and wax.	Acid and base mixtures will be collected in plastic drums, to be disposed of offsite through a licensed hazardous waste disposal agent.
Fuel spills		Any fuel spills will be soaked up onto a suitable absorbent and disposed of together with oils and grease. Any fuel/oil contaminated soil will be disposed in a plastic drum/bag and taken to a bioremediation facility.
Batteries		Used batteries will be stored in plastic drums, to be disposed offsite or recycled through a licensed hazardous waste disposal agent.
Medical waste from on-site clinic		To be incinerated at the Windhoek facilities.

HAZARDOUS WASTE	SOURCE	PROPOSED MANAGEMENT / DISPOSAL
Reagent containers/ drums/bags		If possible, these will be cleaned and/or re-used or sold. If not possible to clean 100%, it will be damaged to prevent re-use and disposed of by the waste disposal agent.

2.6.6. Employment

- Labor force

The Project will undertake mining using modern methods, operating to international standards, limiting impact on the environment whilst ensuring meaningful direct employment of Namibian citizens of up to 80 persons.

Mining and pre-concentration at Ongombo followed by transport of a high-grade pre-concentrate, preferably to Otjihase, for final concentration will create an estimated 80 job opportunities.

- During the construction Phase: 20-80 persons, mostly contractors, will be employed and increasing from ground-breaking to commissioning.
- For the operational/Production Phase: 80 persons will be employed of which the majority will be contractors.

The company is committed to providing a safe working environment for all its employees and to responsibly managing all the environmental interactions of its business. Their objective is to perform and achieve at a level notably in excess of the regulatory minima required in Namibia.

To meet these objectives, the company has defined and adopted a Health, Safety, Environment, and Community (HSEC) policy that it applies to all company activities in Namibia and elsewhere.

The proponent is further committed to the implementation of a high standard of HSEC management and delivery from exploration through production to eventual mine closure. The field staff are accountable for delivery of the HSEC policy, and the Directors, Officers and Employees are responsible for compliance with the expected high standards of HSEC performance.

The following specific commitments are made as regards HSEC matters:

Health & Safety

- ✓ To provide all employees with health and safety training as required and applicable.
- ✓ To take all necessary measures to minimise workplace injuries to employees.
- ✓ To establish management and advisory programmes for the prevention of communicable diseases of employees.

- <u>Working hours</u>

The operating hours at the mine and processing plant are envisaged to be as follows, resulting in the indicated shift schedules (Table 14).

Table 14. Working hours of the mine and processing plant

	WORKING HOURS	SHIFTS
CONSTRUCTION	8 hours/day 6 days/week	1 x 8 hour shift, 6 days per week
MINING	12 hours/day 6 days/week	2 x 6 hour shift, 6 days per week
PROCESSING		
➢ Crushing, Milling, flotation, Utilities	24 hours/day 7 days/week	3 x 8 hour shifts, 7 days per week
➢ Weighing, bagging, Product Dispatch	8 hours/day, 7 days/week	1 x 8 hour shift, 7 days per week

- <u>Accommodation</u>

No staff accommodation has been considered as it is assumed that the employees at the mine will be recruited mostly from the surrounding areas.

- <u>Transportation</u>

In the case of construction workers being accommodated in Windhoek, buses will be used instead of private vehicles to transport them to and from the mine site.

- <u>Security</u>

The project area will be surrounded by a standard welding mesh security fence.

3. PROJECT ALTERNATIVES

According to Namibia's Environmental Management Act (2007) and regulations (2012), alternatives are described as: *"different ways to meet the objective and requirements of an activity"*. In order to identify the alternative that will be the most practical and least damaging to the environment while undertaking the project, this chapter highlights the various ways in which the project can be carried out.

In order to assess the alternatives, three questions must be answered:

1. How feasible are the alternatives from a technical and economic perspective?
2. If feasible alternatives are chosen, what are their environmental effects?
3. Why was the preferred alternative selected?

This project's alternatives are discussed in the following sections.

3.1. The ‘no-go’ alternative

This alternative predicts what would happen in the future, as a result of the absence of any project. As described in the baseline description, it represents the status quo. A 'no-go' alternative will prevail if the proposed project does not receive Environmental Clearance from the DEA.

The project is situated in a commercial agricultural region and the land use is dominated by cattle; small stock farming; and game and wildlife tourism. The project area is not part of any communal conservancy, although the SEEIS private conservancy borders the project area and the Namatanga private conservancy are located south and south east of the site. The proposed project is in an area of relatively well-developed infrastructure on the farms Ongombo East and Ongombo West (ECC, 2022).

The ‘no-go’ alternative will result in the continuation of these land use activities. Farming and tourism provide direct benefits to those who engage in it (operators receive payments for their services) whereas the benefits of mining are broader relating to:

- ❖ Revenue generation through taxes and royalties,
- ❖ The creation of more jobs in the local area,
- ❖ The area will grow and develop socio-economically.

Without the Project, no additional economic activity, skills development, or jobs would be created. Additionally, Ongombo Mine reserves would remain untapped. A 'no-go' option is not considered a preferred alternative for this proposal.

3.2. Position Alternatives

3.2.1. Pit location

Due to the location of the pit being restricted to the deposit boundaries, no viable alternative to the location of the mine exists.

3.2.2. Stockpile and waste rock dump (WRD) location

The waste rock dump would typically be positioned directly adjacent to the open pit stock pile so that it can be used later for rehabilitation and backfilling of the pit. Depending on mine production profile, Ongombo Mine would only be able to start backfilling after about 12-18 months of production at best. It is therefore advisable to build the WRD to the north-northeast of the pit away from the ore body to prevent sterilisation.

The rejects from the fines fraction in the dry sorting process will still have a grade of 0.8-0.9% Cu and thus probably classified as a Low Grade Ore feed and not waste for potential future processing and will thus be stockpiled close to the plant.

3.2.3. Alternative ore processing methods

Copper processing is a complex process. For copper oxide ores, aqueous solutions (water-based) are used to extract and purify copper at ordinary temperatures, usually through heap leaching, solvent extraction, and electrowinning. The process for copper extraction and purification from sulfide ores involves a series of physical steps and high temperatures, in four basic steps: froth flotation, thickening, smelting, and electrolysis (SRC, 2022). As a result of these processes, large volumes of industrial waste are generated, and water, electricity, and chemical reagents are consumed in large quantities.

A sensor-based ore sorting method, on the other hand, can improve processing efficiency and reduce tailings by diverting sub-economic material (Peukert et al., 2022). Sensor-based ore sorting is applicable at various points of the process flow diagram and can be used to eliminate waste, divert material into different processing lines, produce pre- and final concentrates, reprocess coarse-grained waste dumps, and other applications (Robben and Wotruba, 2019).

By removing mined material that cannot be economically processed, unnecessary grinding and flotation can be avoided. A significant reduction in energy consumption, water consumption, and chemical reagent consumption can be achieved through this method, especially for low grade heterogeneous ores containing a lot of gangue. A reduction in fine tailings is also achieved by avoiding unnecessary grinding of gangue. The amount of mined material does not decrease, but the waste rock remains at a coarser size, reducing the environmental impact of fine tailings which are difficult to contain (Peukert et al., 2022).

To this end, the proponent has devised an operational program that will see the production of a high-grade pre-concentrate on-site at Ongombo using ore sorting technology that requires only minimal amounts of water, doesn't use chemicals, and doesn't generate wet tailings. This pre-concentrate will allow the company to transport the pre-concentrate off-site, preferably to Otjihase, where it will be processed into a metal-rich flotation concentrate that can be exported and sold via Walvis Bay.

3.3. Concluding Remarks on the Alternatives

As part of the planning phase, a variety of alternatives have been considered. Alternatives that are preferred include:

- **No-go vs. proceeding with project**: Continued development of the project could bring valuable economic development to the area, which will not only benefit the local population but also the country as a whole. Therefore, developing the project is the preferred option.
- **Stockpile and waste rock dump (WRD) location:** This would typically be positioned directly adjacent to the open pit to be used later for rehabilitation and backfilling of the pit. It is therefore advisable to build the WRD to the north-northeast of the pit away from the ore body to prevent sterilisation.

  The rejects from the fines fraction in the dry sorting process will still have a grade of 0.8-0.9% Cu and thus probably classified as a Low Grade Ore feed for potential future processing and will thus be stockpiled close to the plant and classified as Low Grade RoM and not as waste.
- **Processing Method**: The conventional copper processing and extraction methods produce large volumes of industrial waste and require large quantities of water, electricity, and chemical reagents. In contrast, the sensor-based ore sorting technology requires only minimal amounts of water, doesn't use chemicals, and doesn't generate wet tailings. Hence the latter is the preferred processing method for the mining project.

As a result of the project being implemented within a legal environment which includes both national and international requirements, the following section gives an overview of the legal framework.

4. LEGAL AND REGULATORY REQUIREMENTS

A summary of all pertinent international and national standards, guidelines, policies and laws of relevance to the Ongombo Project is presented below. The column entitled "Application to the Ongombo project" provides an indication of the relevance of each legal instrument to this project.

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
NATIONAL LEGISLATION AND POLICY			
Namibian constitution	Namibian Constitution First Amendment Act, 1998	• General human rights (Articles 5-25) – e.g. eliminates discrimination of any kind, and the principles that undergird them (Article 95). • Article 95(l) of the Constitution of the Republic of Namibia: "maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future".	These principles are applied throughout the EIA process including the specialist studies and the public consultation process.
Environmental and Social Assessment and Management Systems	Environmental Management Act (7 of 2007)	• Requires for adequate public participation during the environmental assessment process for interested and affected parties to voice their opinions about a project (Section 2(b-c)).	Follow the EIA process described in the act. Conduct public participation as part of the EIA process as described in the act.

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
		• Requires the protection of Namibia's cultural and natural heritage, including its biological diversity for the benefit of present and future generations (Section 2(d)).	An Environmental Clearance certificate is required before the project can start.
		• Requires that projects with significant environmental impact are subject to an environmental assessment process (Section 27).	
	EMA Regulations GN 28-30 (GG 4878) (February 2012)	Listed activities requiring an Environmental Clearance Certificate (GN No 29 Annexure): • Section 3.1: "The construction of facilities for any process or activities which requires a license, right or other form of authorization, and the renewal of a license, right or other form of authorization, in terms of the Minerals (Prospecting and Mining) Act, 1992."	Conduct an EIA that covers all the components of the project, listed in the regulations.
		• Section 3.3: "Resource extraction, manipulation, conservation and related activities."	
		• Section 8.1: "The abstraction of ground or surface water for industrial or commercial purposes."	

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
		• Section 8.6: "Construction of industrial and domestic wastewater treatment plants and related pipeline systems." • Section 9.1: "The manufacturing, storage, handling or processing of a hazardous substance defined in the Hazardous Substances Ordinance, 1974."	
Mining related legislation	Minerals (Prospecting and Mining) Act No 33 of 1992	• Section 68(f) stipulates the conditions for compliance and notification during the construction and operation phase. • Section 50(i) requires "an environmental impact assessment indicating the extent of any pollution of the environment before any prospecting operations or mining operations are being carried out and an estimate of any pollution, if any, likely to be caused by such prospecting operations or mining operations". Even though this refers to the mining activities of the operation, "accessory works" are mentioned under the definitions of the Act, and may be interpreted as the processing activities of the operation, even though not explicitly required as	Requires the specific consideration of pollution prior to and the anticipated pollution effects after the mining process has been completed in the EIA process. It also makes provision for a mine closure plan that prescribes steps necessary to remedy any damage caused by any prospecting and mining operations carried out. The following information or assessment

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
		such in the act. • Section 54(2): If a reconnaissance area, prospecting area, retention area or mining area is abandoned…. The holder of the mineral license to which such area relates shall – (a) demolish any accessory works erected or constructed by such person in such area, except in so far as the owner of the land retains such accessory, works on such conditions as may mutually be agreed upon between such owner and person, and remove from such land all debris and any other object brought onto such land; (b) take all such steps as may be necessary to remedy to the reasonable satisfaction of the Minister any damage caused by any prospecting operations and mining operations carried on by such holder to the surface of, and the environment on, the land in the area in question. • Section 68(f) – Environmental Conditions	is necessary [called the Environmental Conditions]: a. Particulars of the existing conditions of the environment b. An estimate of the effect which the proposed operations may have c. Steps to be taken to prevent or minimise such effect d. This information forms a part of the Pro-forma Environmental Contract between the Government and the applicant and is attached as 'Appendix A' to the contract once the Ministry of Environment, Forestry and Tourism (MEFT) and Ministry of Mines and Energy (MME) are satisfied with the submitted Environmental Conditions.
	The Mines, Works & Minerals Ordinance 1968 (Ordinance 20	• Regulates mining and exploration activities providing for environmental health and safety,	It encourages the conservation of natural resources at the Ongombo site,

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
	of 1968) of South West Africa	and environmental protection and conservation and occupational health and safety. • A safe site is the responsibility of the mine owner • The mine owner is responsible for restoration of the site • Land owners are to be compensated by the mine owners for operations usage: roads, wood, water, damage to property and land, diminution of the surface value of the land. • The minister can direct the mine owner to buy the land should operations prevent the proper usage of the land. • Conservation of natural resources on and around the land • Prevention, limitation, or treatment of pollution • Minimization of mining effects on adjoining or neighbouring areas and inhabitants • Protection of the environment • Conserving natural resources	describes how the landowners should be compensated for the use of their land and prescribes health and safety measures for the operation of the mine.
Biodiversity instruments	Forestry Act No 27 of 2004	• Provision for the protection of various plant species.	Some species that occur in the area are protected under the Forestry Act

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
		• Section 22(1): It is unlawful for any person to "cut, destroy or remove any living tree, bush or shrub growing within 100 meters from a river, stream or watercourse on land that is not part of a surveyed erf or a local authority area without a license.	and a permit is therefore required to remove the species.
	The Nature Conservation Ordinance (1975) as amended through the Nature Conservation Amendment Act of 1996.	• Protects inter alia nature reserves, conservancies, the hunting and protection of wild animals, and the protection of indigenous plants. • Prohibits disturbance or destruction of the eggs of huntable game birds or protected birds without a permit. • Requires a permit for picking (the definition of "picking" includes damage or destroy) protected plants without a permit. • Preservation of Trees and Forests Ordinance: • Protection to tree species.	Conservation of wildlife in the area. Identify the existence of any protected plants and habitats of conservation concern to be addressed in the ESIA. List applicable biodiversity compliance issues in the EMP.
Heritage	National Heritage Act No 27 of 2004	• To provide for the protection and conservation of places and objects of heritage significance and the registration of such places and objects	Identify areas with archaeological potential. Conduct further archaeological assessment if required.

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
		• Establishes a body to govern matters relating to places and objects of heritage significance – National Heritage Council • Establishes a National Heritage Register	
Water resource management	Water Resources Management Act 11 of 2013.	• A permit application in terms of Sections 72(1) of the Water Act is required for the disposal of industrial or domestic waste water and effluent. • Section 44 (1): a licence for abstraction and use of water, to be obtained from the Minister. • 64. (1) (a) Licence to abstract and dispose of groundwater - from a mine or other excavation to facilitate mining or other underground operations.	Obligation not to pollute surface water bodies. The following licences are required in terms of the Water Resources Management Act: • Licence to abstract and use water; • Groundwater disposal licence; • Borehole licence.
		• Section 68 (1): Prohibits pollution of water resources. • Section 68 (2): Prevents the pollution of Water resources.	
		Section 68 (3): Liability to remedy effects of pollution.	
		• 71 (1) (c) authorisation to - use alternative methods for the treatment or disposal of wastewater, effluent or waste in accordance with any	

		technology evaluated and approved.	
		• Section 76 (1) Protection of water resources.	

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
Soil	Soil Conservation Act 76 of 1969	Consolidates and amends laws relating to the combating and prevention of soil erosion, the conservation, improvement and manner of use of the soil and vegetation and the protection of the water sources of Namibia.	Soil and water resources need to be protected in accordance with this act.
Explosives & petroleum products	Explosives Act No 26 of 1956	Provides for the control of manufacturing, storage,	A licensed inspector is required to visit

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
		sell, transport, importation, exportation and use of explosives. 5(1) "No person shall keep, store or be in possession of any unauthorized explosive unless it has been manufactured as provided by sub-section (1) of section three and is kept, stored or possessed in such a manner and in such quantities as have been approved in writing by an inspector." (9)(1)" No person shall use any blasting material- (a) unless he is in possession of a permit issued by or under the authority of an inspector; or (b) unless he is, while using such blasting material, under the immediate and constant supervision of a person who is in possession of such a permit."	the site to assess its safety and to issue a permit.
	Petroleum Products and Energy Act, No 13 of 1990 Petroleum Products and Energy Amendment Act, No 29 of 1994	Storage of petroleum products	Proponent needs to apply at MME for a consumer installation certificate.
Pollution and Waste Management Bill	Atmospheric Pollution Prevention	• This legislation provides for the prevention of pollution of the atmosphere and for matters	Proponent will need to have measures in place to control dust and minimize

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
	Act 11 of 1976	incidental thereto. • Provides for the 'control of noxious or offensive gases' and every premise where a scheduled process if carried on, has to be registered. Two main aspects of the legislation are relevant in the context of mining: • Dust control and the promulgation fur such purpose; • The control of pollution of the atmosphere by gases emitted by vehicles and the promulgation of regulations for such purpose.	potential air pollution. These measures are prescribed in the EMP.
Roads	Roads Ordinance 1972 (Ordinance no 17 of 1972) and Regulations	• Provides the laws relating to roads and incidental matters. • Legislation appropriate to environmental protection and conservation is embodied in Section 37(1)(b) and (c) and addresses the pollution of public roads.	Requires Proponent to minimize their impact on private and public roads.
	Road Traffic Ordinance 1967 (Ordinance 30 of 1967) and Regulations	• Consolidates the laws relating to motor vehicles and other vehicles and the regulation of traffic on public roads and to provide for matters incidental thereto.	Requires Proponent to consider potential traffic issues associated with the transport of materials and products. This is included in the EMP.

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
		• Section 119(1) deals with environmental protection conservation, and pollution of public roads	
Air pollution	Atmospheric Pollution Prevention Act (Act No 45 of 1965) (APPA).	Based on the stipulations of this act, the following parts are applicable: • Part II: Controls of noxious or offensive gases; • Part III: Atmospheric pollution by smoke; • Part IV: Dust control; and • Part V: Air pollution by fumes emitted by vehicles.	Include a requirement in the EMP that these regulations are to be adhered to.
Labour, working conditions and employment	Labour Act (1992)	• Health and Safety Regulations (not in force yet) (s135). • Minimum wages and working conditions including health and safety measures (s39-47).	Include a requirement in the EMP that these regulations are to be adhered to. Ensure that minimum wage and working conditions are stipulated in the contract.
	Affirmative Action (Employment) Act 29 of 1998	Provides for a set of affirmative action measures designed to ensure that persons in designated groups enjoy equal employment opportunities at all levels of employment and are equitably represented in the workforce of a relevant employer.	Include a requirement in the EMP that this needs to be adhered to.

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
Public Health	Public Health Act 36 of 1919	Provides for the prevention of pollution of public water supplies.	Identify sites where potential pollution may occur, introduce mitigation measures where needed. The necessary compliance measures are to be included in the EMP.
NATIONAL, REGIONAL AND LOCAL PLANNING FRAMEWORK			
National Planning	Vision 2030	To be a prosperous industrialised country by 2030, developed by our people, and enjoying peace, harmony and political stability.	Ensure that the project outcome supports these objectives and that any negative influences on it are addressed in the EIA.
	National Development Plan 3 (NDP3) 2007/2008 – 2011/2012	Based on the Vision 2030, and provides the long-term development framework for the country to achieve it. The main vehicle to translate the Vision 2030 into action. Includes policy directions and is based on eight key result areas, each corresponding to the main eight objectives of Vision 2030, under the themes Competitive economy, Infrastructure, Productive utilisation of natural resources and environmental sustainability, productive and competitive human resources and institutions, knowledge based economy and technology, quality of life, equality and social welfare, peace security and political stability and regional and international stability and integration.	Ensure that the project outcome supports these objectives and that any negative influences on it are addressed in the EIA.

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
INTERNATIONAL OBLIGATIONS			
International protocols and conventions	International Convention on Biological Diversity Rio de Janeiro (1992)	• Details the preservation of rare and endemic species. • Namibia is a signatory to this convention. Ratified by Namibia in 1997. • Article 14 requires that EIAs are carried out for projects that are likely to adversely affect biological diversity, avoid or minimize such effects, and where appropriate, allow for public participation.	Sites which are likely to affect biological diversity to be identified and assessed and the impacts avoided or minimized.
	The Convention on International Trade in Endangered Species (CITES) of 1973	Ratified by Namibia in 1990 the CITES regulates trade in endangered species, through listing in appendices (Relevant appendices include 1-2)	Vulnerable and threatened species will be identified and assessed and the impacts avoided or minimised.
	United Nations Framework Convention on Climate Change (UNFCCC) (1994), ratified by Namibia in 1995	Sets an overall framework for intergovernmental efforts to address the challenge posed by climate change.	Consider how this project could potentially affect and be affected by Climate Change.

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
		It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. Under the Convention, governments: • gather and share information on greenhouse gas emissions, national policies and best practices • launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries cooperate in preparing for adaptation to the impacts of climate change. "Namibia, like all other SADC members, has signed and ratified both the UNFCCC and the Kyoto Protocol. As a non-Annex I Party to the Protocol, Namibia is not bound by specific targets for GHG emissions, however a number of global initiatives are being implemented, through donor and other support, to assist in the operationalization of the UNFCCC."	

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
International performance standards and principles	International Finance Corporation (IFC)	The International Finance Corporation (IFC) developed Policy and Performance Standards (PS) on Environmental and Social Sustainability. It describes IFC's commitment, roles and responsibilities related to environmental and social sustainability. Eight PS were developed and are designed to help avoid, manage and mitigate risks and impacts and promotes doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities. PS broaden the suite of studies that are now done for ESIA's.	If international funding is sought, then the Proponent will have to demonstrate its adherence to these requirements. This EIA and associated appendices are drafted so as to comply with the principles and standards.
	Equator Principles	The Equator Principles (10 in total) were developed in order to ensure that the projects that are financed by the Equator Principles Financial Institutions are developed in a manner that is socially responsible and reflect sound environmental management practices: • Principle 1: requires a project that is proposed for	If international funding is sought, then the Proponent will have to demonstrate its adherence to these requirements.

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
		financing be categorised according to the magnitude of its potential impacts; • Principle 2: requires that a social and environmental assessment be conducted; • Principle 3: requires adherence to applicable International Finance Corporation (IFC) performance standards and Environmental Health and Safety guidelines; • Principle 4: requires the development of an Action Plan and Environmental Management System informed by the assessments conducted; • Principle 5: requires public participation and transparency; • Principle 6: requires the setting up of a compensation mechanism where grievances are unavoidable; • Principle 7: requires the independent review of the assessments conducted; • Principle 8: requires the borrower of category A and B projects to commit in writing that (among other agreements) they will comply to all relevant laws, both social and environmental, laid out by the host country;	

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
		• Principle 9: requires that category A and B projects be subject to ongoing environmental monitoring and reporting; and • Principle 10: requires annual public reports regarding the implementation of these principles.	
International standards and guidelines	Noise standards: South African National Standards (SANS) World Bank Guidelines on Pollution Prevention International Finance Corporation – 2007 General EHS Guidelines: Environmental Noise.	SANS (South African National Standards) 10103:2008 Version 6 -The measurement and rating of environmental noise with respect to annoyance and to speech communication.	The necessary management actions need to be included in the EMP.
	Air quality guidelines: World Health Organization ambient air quality guidelines	The aim of these guidelines is to provide a basis for protecting public health from adverse effects of air pollutants, to eliminate or reduce exposure to hazardous air pollutants and to guide national and local authorities in their risk management decisions.	In the absence of Namibian standards for air quality, the WHO guidelines will be used by the specialist. The necessary management actions need to be included in the EMP.

THEME	LEGISLATION/GUIDELINE/POLICY/ AGREEMENT	RELEVANT PROVISIONS	APPLICATION TO ONGOMBO PROJECT
	Water quality guidelines:	The Department of Water Affairs uses a set of water quality standards for effluent to be discharged or disposed of in areas with potential for drinking water source contamination; international rivers and dams and in water management and other areas. These are used as their standard under the Water Resources Management Act. South Africa is the only African country with an official set of water quality guidelines for discharges from land-based sources.	A set of water quality objectives need to be compiled for this project which would best protect the receiving environment. The necessary management actions need to be included in the EMP.

5. THE RECEIVING ENVIRONMENT

According to the legislation highlighted in the previous section, there may be characteristics of the biophysical and social environment that require special protection during project implementation. With information collected on the receiving environments and issues identified during the consultation process, it will be possible to make informed decisions regarding planning, construction, and operation of the proposed project based on the study area.

The following are descriptions of the baseline based on information found in the literature mentioned earlier as well as site observations, and have been updated in some cases based on specialist studies performed for this ESIA. Where applicable, vulnerability ratings have been provided to the environmental features. Vulnerability, as it is used in this section, refers to "the susceptibility of an environmental feature to suffer harm or its inability to withstand the effects of a hostile environment before potential impacts are taken into account". "Ratings" are provided according to the following criteria (Table 15).

Table 15. Descriptions of the vulnerability ratings

VULNERABILITY RATING	CRITERIA
LOW	The environmental feature will be negligibly affected by the potential impact and has the ability to withstand negative effects without being adversely affected.
MEDIUM	The environmental feature will be moderately susceptible to suffer harm and will therefore be negatively affected by the activity albeit not adversely.
HIGH	The environmental feature will be severely affected by the potential impact as it is highly susceptible to suffer harm and lacks the ability to withstand the negative effects of the activity.

5.1. Climatic Settings of Ongombo

Namibia's climate is generally characterized as arid, with approximately 90% of the overall landmass being hyper-arid, semi-arid or arid. The coastal regions are characterized by the Namib Desert whilst the eastern parts of the country are dominated by the Kalahari Desert. The only permanent flowing rivers in the country lie near or form part of the country's international borders to the north and the south. Low and highly variable rainfall leads to corresponding variability in run-off, stream flow and groundwater aquifer recharge.

Water demand has continued to grow with the county's development and this has become an evolving challenge for urban areas located far from perennial water sources. The country's main water consumers are the agriculture and mining sectors. The county is investigating expanding new water sources as part of a long-term plan for water security and supply, this may include desalination. Currently, groundwater extraction remains the cheapest available source of water in Namibia.

The central Namibia area where the Project is located receives between 350 – 400mm of rain per annum. The average annual temperature is approximately 20°C. The approximate elevation for the site is 1,800 metres above sea level.

It is likely that the soil types vary from Eutric Regosols and Leptosols to Ferraic Arenosols, which do have the potential to support moderate levels of agricultural activity. Vegetation types around the site area are limited to scattered shrubs with frequent patches of bare soil typical of the Acacia tree and shrub Savannah. There are no perennial rivers in the immediate vicinity of the project area, however there is the presence of occasional non-perennial drainage lines (ECC, 2022).

5.2. Air Quality

The climate of an area plays an important role in determining its dispersion potential. As well as determining plume buoyancy (the higher the temperature difference between the plume and the ambient air, the higher the plume will rise), the air temperature plays an important role in determining mixing and inversion layers. Another important component is precipitation, since it removes atmospheric pollutants and mitigates sources of entrained and windblown dust. The degree of dispersion or dilution of pollutants in the air is determined by the speed of the wind and the amount of insolation (solar radiation). Dilution of pollutants is limited by low wind speeds, little or no insolation (night), or weak insolation due to overcast conditions. On the other hand, unstable conditions are conducive to good dispersion and occur when there is moderate wind and strong solar radiation. Pollutants are dispersed horizontally by the wind, and pollutants are diluted in the atmosphere by unstable conditions.

This section contains a summary from Airshed Planning Professionals (2024) report about the air quality assessment of the project area (Annexure I).

Various activities or sources relating to the proposed project can pollute the air and cause potential impacts (i.e. nuisance impacts and / or health) on human, animal and plant health in the area during all project phases. Pollution sources relating to dust generation will include land clearing activities, materials handling and stockpiling, wind erosion of stockpiles, waste rock dumps (WRDs), tailings storage facility (TSF) and disturbed areas and vehicle movement (i.e. haulage) along unpaved roads.

As an integral part of the ESIA for the proposed mining project, an air quality impact assessment was conducted by Airshed. The main objective of the investigation was to quantify the potential impacts resulting from the proposed activities on the surrounding environment and human health. As part of the air quality assessment, a good understanding of the regional climate and local dispersion potential of the site is necessary and subsequently an understanding of existing sources of air pollution in the region.

Airborne emissions occur during each stage of the mine cycle, but especially during exploration, development, construction, and operational activities. Mining operations mobilize large amounts of material, and waste piles containing small size particles are easily dispersed by the wind.

5.2.1. Site Description and Sensitivity Receptors

Air Quality Sensitive (AQSRs) primarily relate to where people reside. Based on arial satellite imagery, there are multiple dwellings to the west, east and southeast of the Project area as shown in Figure 8. There are no human settlements in the immediate vicinity of the Project apart from the Ongombo and Ongombo West farms. Within a 20km radius of the Project site, twenty-eight (28) AQSRs were identified relative to the project area (Figure 9). These AQSRs were included as discrete receptor locations in the model setup.

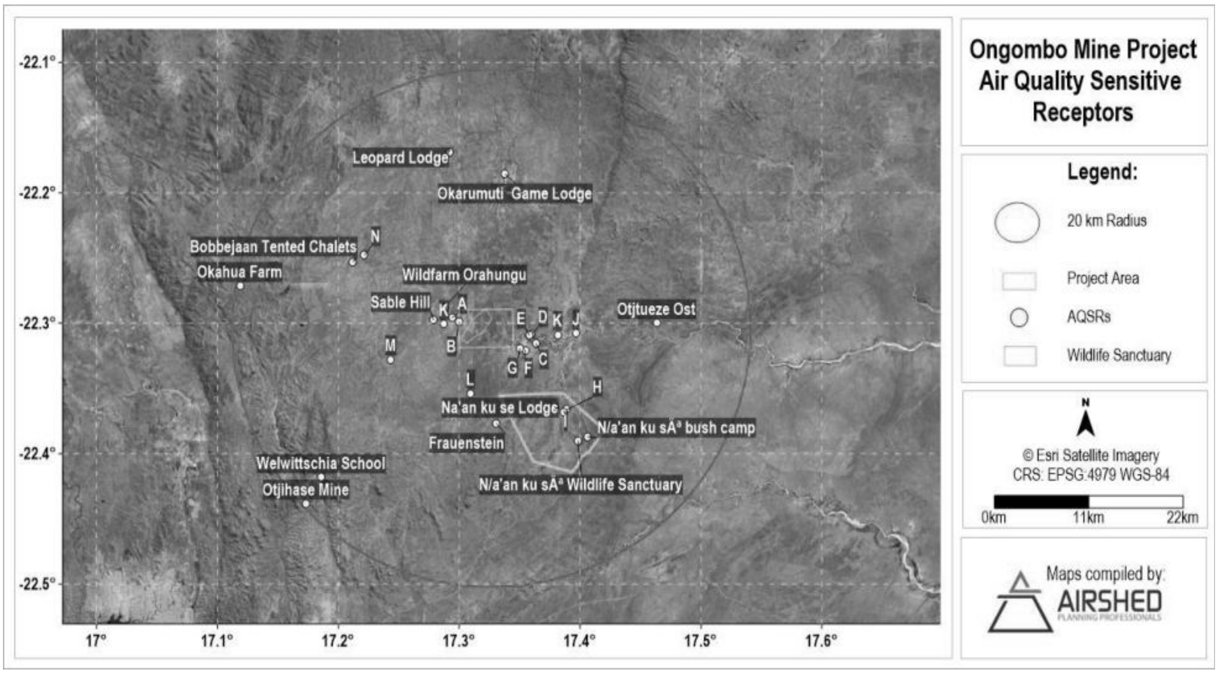


Figure 9. Project layout and identified air quality sensitive receptors

The main road near the Project area is the D2102 gravel road to the east of the site. The Project locality has a hot and dry climate with maximum mean temperatures of 31°C and 15°C for summer and winter respectively. Summer rainfall varies between 350-450 mm per annum. Prospecting can normally be conducted throughout the year although potential extreme wet seasons between December and February can limit access. The terrain in the Project area is gently undulating with elevations in the range of 1,600 m –2,000 m above mean sea level (amsl). The landscape is dominated by rolling hills and covered by scrub and grassland.

The Swakop River divides the exclusive prospecting licence into two parts, but the Project locality drains into the White Nossob River catchment. The topography of the Project site is shown in Figure 10. The main economic activity in the area is stock farming, game hunting and eco-tourism.

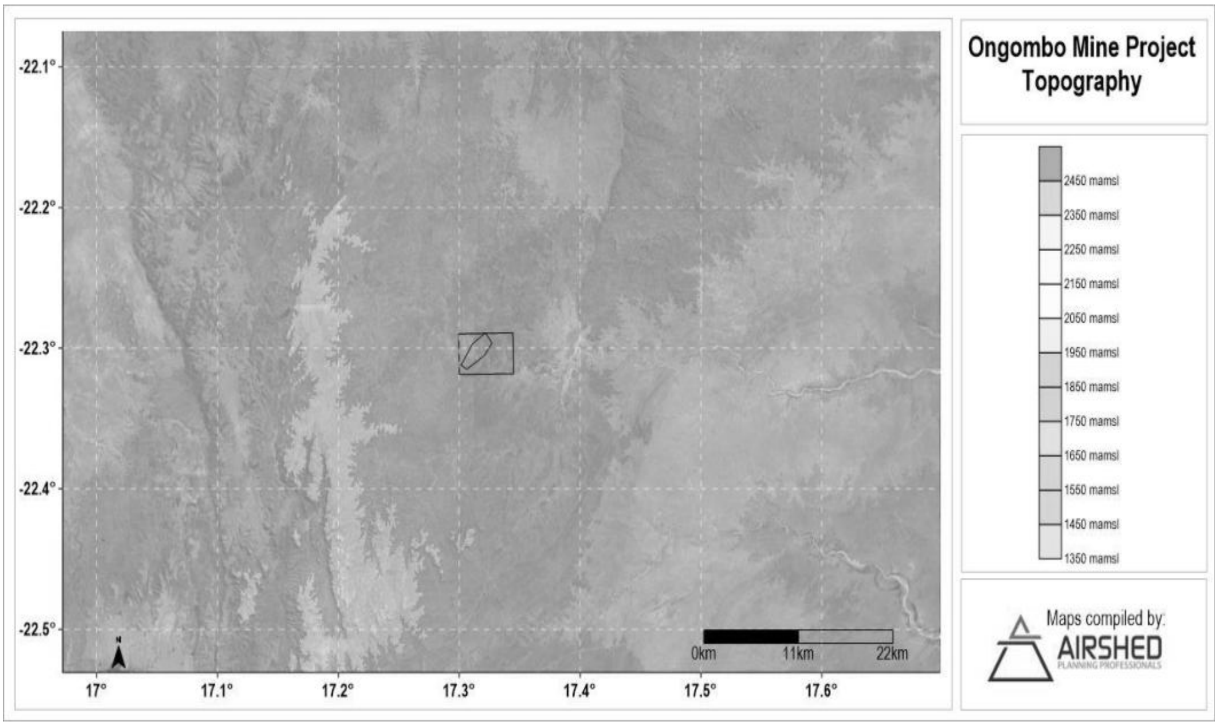


Figure 10. Topography of the Project Area

5.2.2. Atmospheric Dispersion Potential

Meteorological mechanisms govern the dispersion, transformation and eventual removal of pollutants from the atmosphere. The extent to which pollution will accumulate or disperse in the atmosphere is dependent on the degree of thermal and mechanical turbulence within the earth's boundary layer. Dispersion comprises vertical and horizontal components of motion. The stability of the atmosphere and the depth of the surface-mixing layer define the vertical component. The horizontal dispersion of pollution in the boundary layer is primarily a function of the wind field. The wind speed determines both the distance of downwind transport and the rate of dilution as a result of plume 'stretching'. The generation of mechanical turbulence is similarly a function of the wind speed, in combination with the surface roughness. Pollution concentration levels therefore fluctuate in response to changes in atmospheric stability, to concurrent variations in the mixing depth, and to shifts in the wind field.

A description of the wind field, temperature, precipitation, and atmospheric stability is provided in the following section. Modelled meteorological data for the Project area obtained from Metoeblue.com for the period 1 January 2021 to 31 December 2023 was utilised which include wind speed (m/s), wind direction (degrees), temperature (°C), humidity (%) and rainfall (mm). The data availability for the 3-year period was 100%.

5.2.2.1. Surface wind field

The wind direction, and the variability in wind direction, determines the general path that air pollutants will follow, and the extent of crosswind spreading. Wind roses comprise 16 spokes, which represent the directions from which winds blew during the period. The colours used in the wind roses below, reflect the different categories of wind speeds; the red area, for example, representing winds between 6 m/s and 8 m/s. The dotted circles provide information regarding the frequency of occurrence of wind speed and direction categories. The frequency with which calms occurred refers to periods during which the wind speed was below 1 m/s.

Period, daytime and night-time wind roses for the study area, based on the measured meteorological data for the three year period: 1 January 2021 to 31 December 2023, are depicted in Figure 11, with seasonal wind roses for the same period shown in Figure 12.

The wind field is dominated by southeasterly and east-southeasterly winds, with less frequent flow from the other sectors. During the day there is an increase in winds from the western sector. Night-time shows more frequent winds from the southeast and less frequent of winds from the northwest. The average wind speed measured during the period was 10.7 m/s and the highest wind speed over the period was 16.7 m/s.

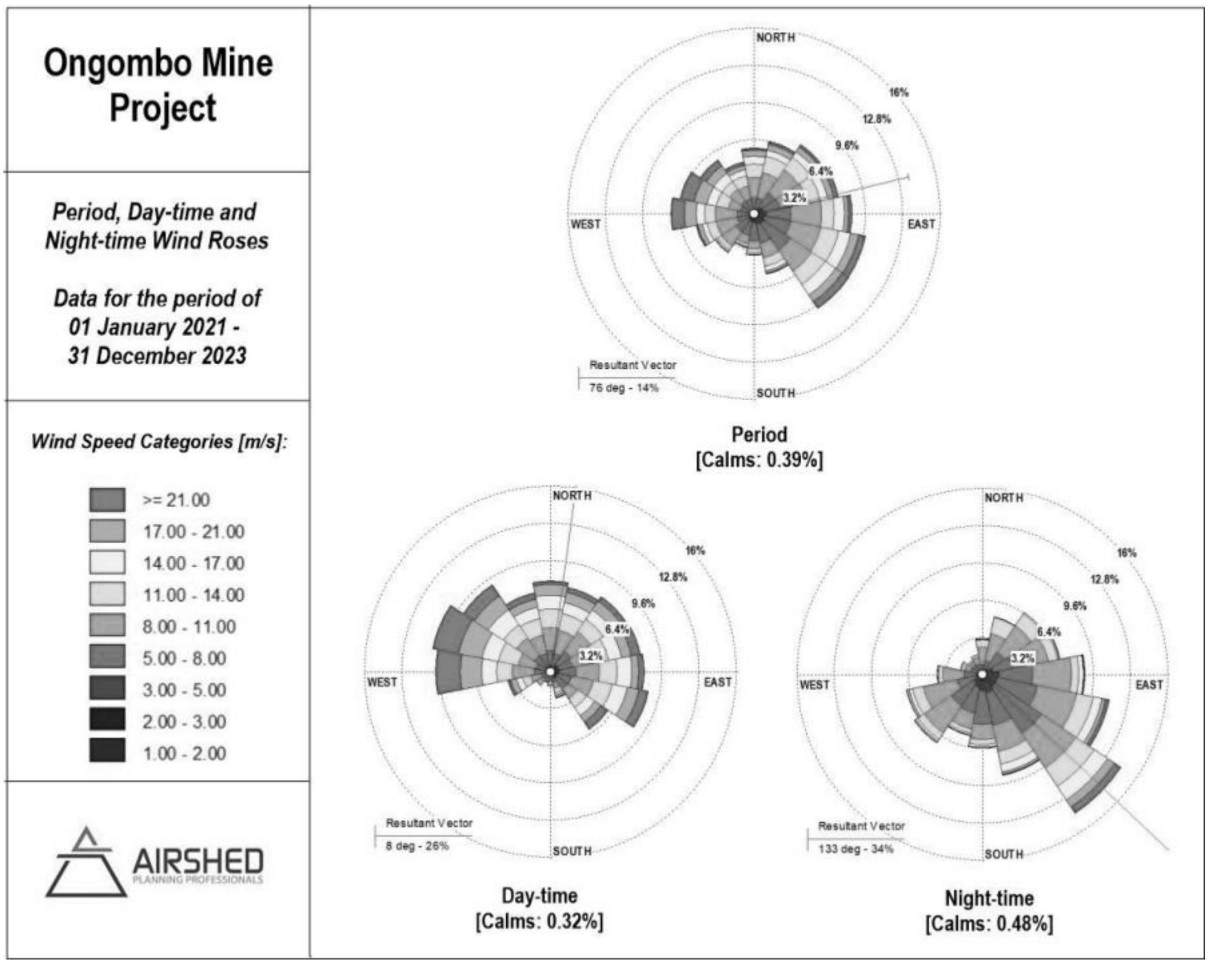


Figure 11. Period, day- and night-time wind roses based on modelled data (1 January 2021 to 31 December 2023)

Seasonal variation in the wind field is illustrated in Figure 11. During summer and spring, the wind field is dominated by winds from the southeast, east-southeast and west while northeasterly winds dominate during autumn and winter.

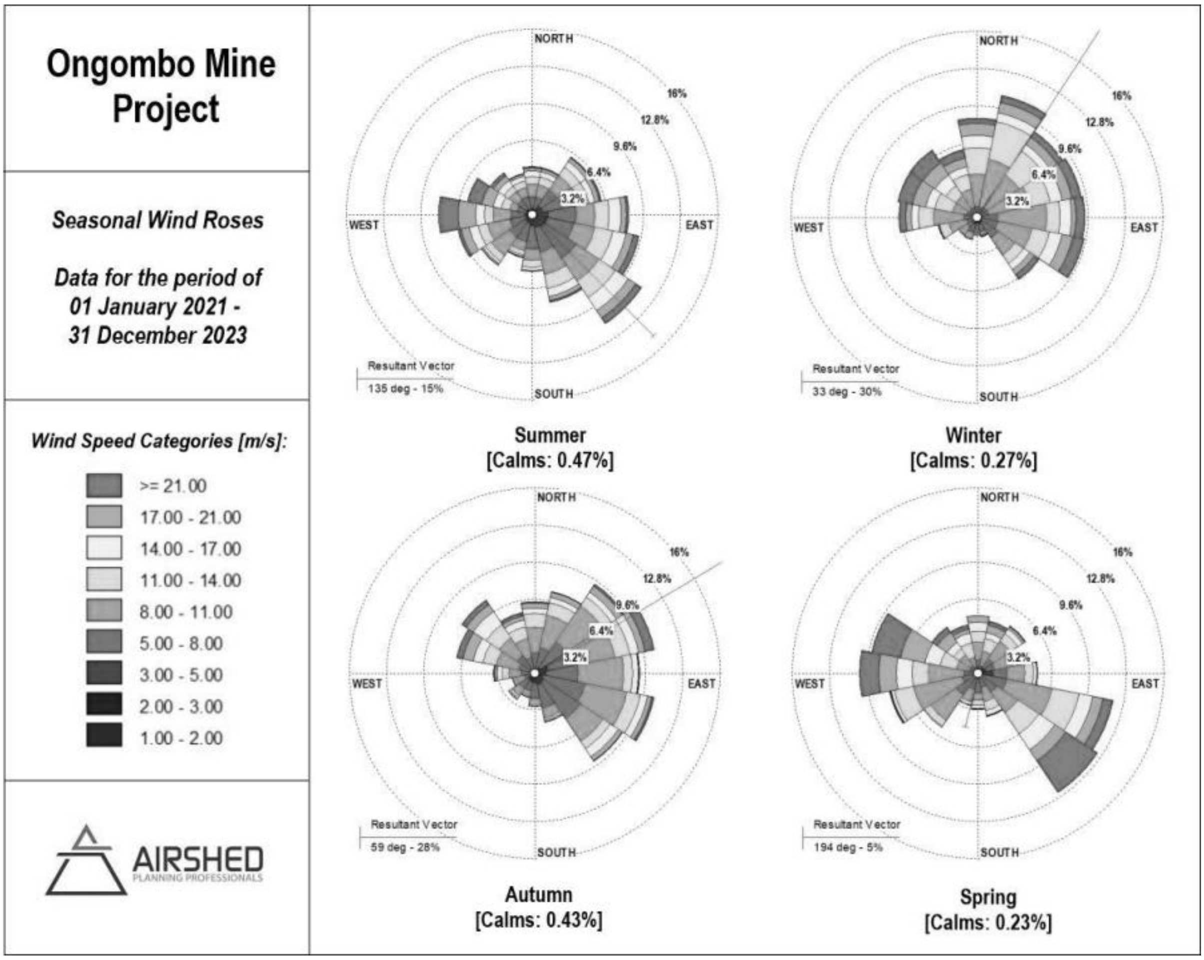


Figure 12. Seasonal wind roses based on modelled data (1 January 2021 to 31 December 2023)

According to the Beaufort wind force scale, wind speeds between 6-8 m/s equate to a moderate breeze, with wind speeds between 9-11 m/s referred to as a fresh breeze.

Wind speeds between 11-14 m/s are described as a strong breeze with winds between 14-17 m/s near gale force winds and 17-21 m/s as gale force winds. The predominant winds during the period can be categorized as a fresh breeze occurring 28% of the time and a moderate breeze occurring 23% of the time, based on the simulated data. Strong breeze winds and gale force winds are occasionally seen at the Project area, as shown in (Figure 13), despite their rarity. When the wind speed surpasses 10 m/s, the probability of wind erosion from exposed and open surfaces with loose fine material was estimated (Liebenberg-Enslin, et al., 2019), keeping in mind that the natural surfaces are crusted. Wind speeds exceeding 10 m/s occurred for 47% over the 3 - year period.

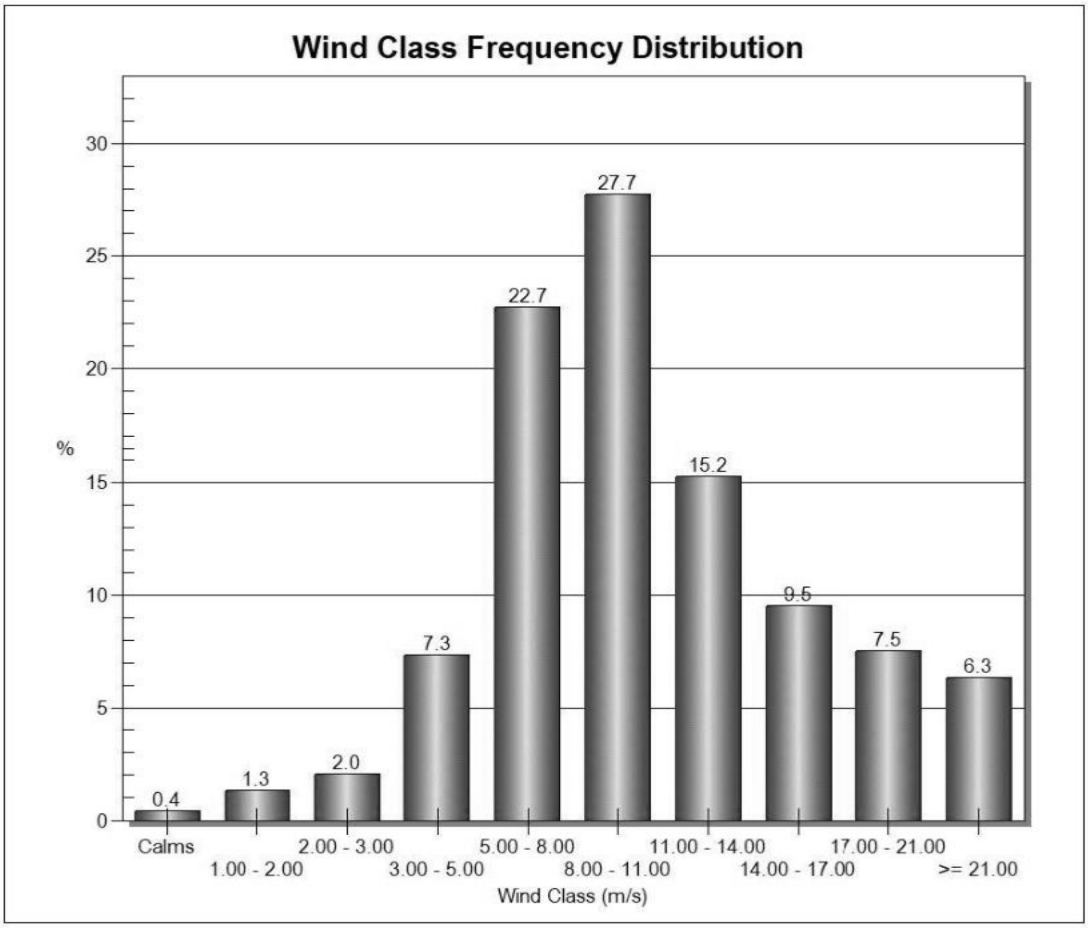


Figure 13. Wind speed categories based on modelled data (11 January 2021 to 31 December 2023)

5.2.2.2. Temperature

Air temperature is important, both for determining the effect of plume buoyancy (the larger the temperature difference between the plume and the ambient air, the higher the plume can rise), and determining the development of the mixing and inversion layers.

Minimum, average, and maximum temperatures for the study area based on modelled Oruhungu weather data for the period 1 January 2021 to 31 December 2023 are given in Figure 14. Here is a breakdown of some key trends:

- Seasonal Variation: The temperatures vary significantly across the months, indicating distinct seasons. January and February have relatively higher average temperatures compared to April and May, suggesting a transition from cooler to warmer months.
- Summer Peak: The months of October, November, and December exhibit the highest average temperatures, with November and December being the warmest. This indicates the peak of summer in the region.

- Winter Trough: Conversely, the months of June, July, and August show the lowest average temperatures, indicating the peak of winter. June and July particularly have the lowest average temperatures, suggesting the coldest month.
- Temperature Extremes: The maximum and minimum values provide insights into the temperature variability. For instance, while December has the highest average temperature, January has the highest maximum temperature, indicating that extreme heat events may occur in January despite the average being slightly lower.
- Transition Months: March and September appear to be transition months, with temperatures gradually warming up in March and cooling down in September as the seasons change.

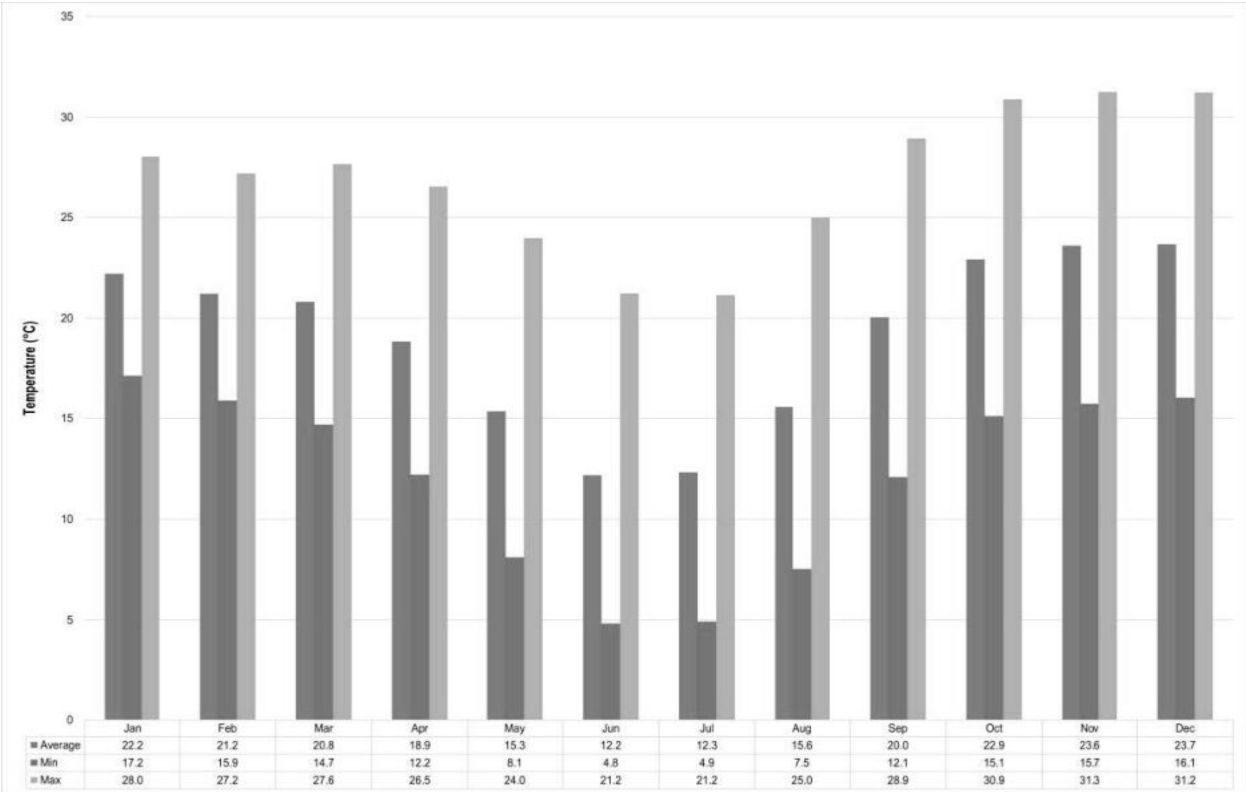


Figure 14. Minimum, average, and maximum temperatures based on modelled data for Oruhungu (1 January 2021 to 31 December 2023)

Diurnal temperature variability is presented in Figure 15. The chart effectively illustrates the significant changes in temperature between different times of day and seasons over the period. The diurnal temperature chart depicts the following trends:

- Seasonal Variation: The highest temperatures occur during the summer months (October, November and December), with midday and afternoon hours showing red areas on the plot, indicating the hottest temperatures (31˚C - 32˚C).
- Daily Variation: There is a clear pattern of temperatures rising from early morning, peaking around midday, and then falling towards the evening.

- Winter Temperatures: The lowest temperatures are seen in the winter months (June, July and August), especially during the early morning hours, as indicated by the blue areas on the plot, with temperatures ranging between 4°C to 7°C.
- Transitional Seasons: Spring and Autumn show transitional temperatures with green and yellow colours, representing moderate temperature ranges.

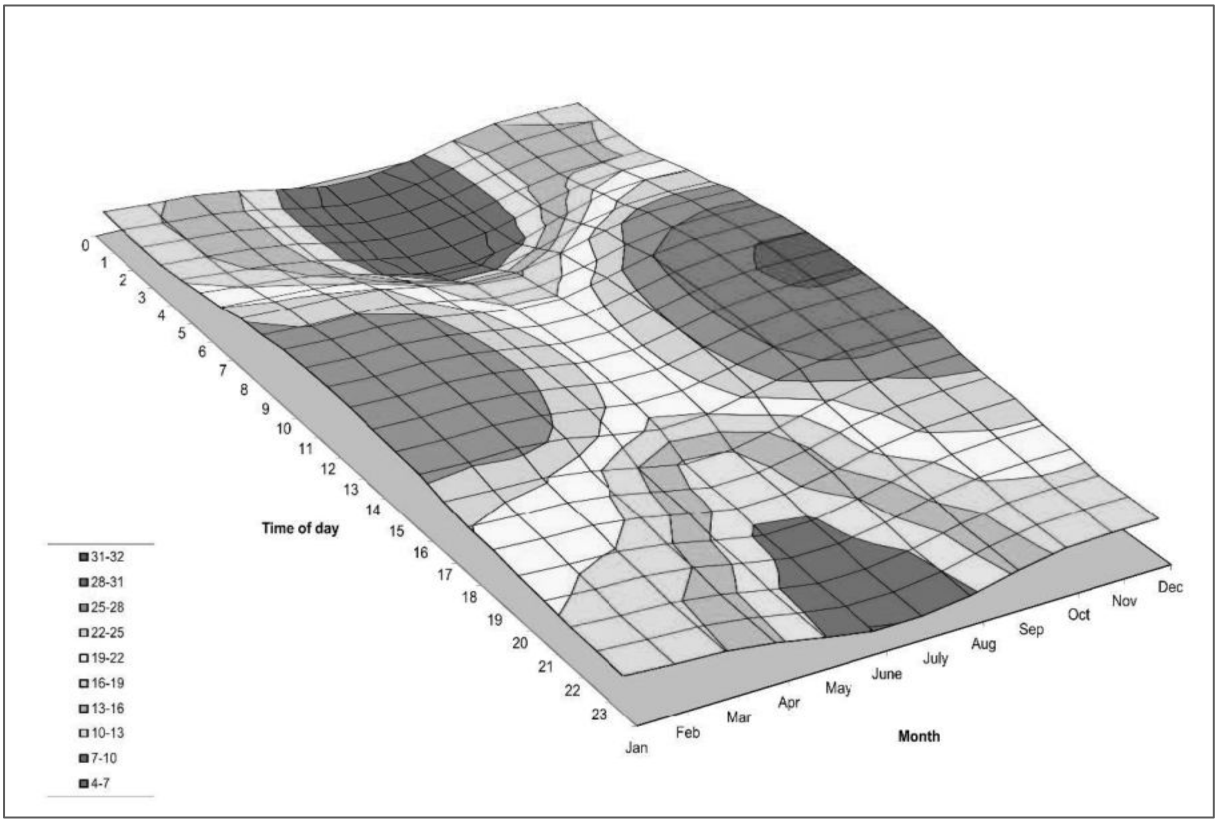
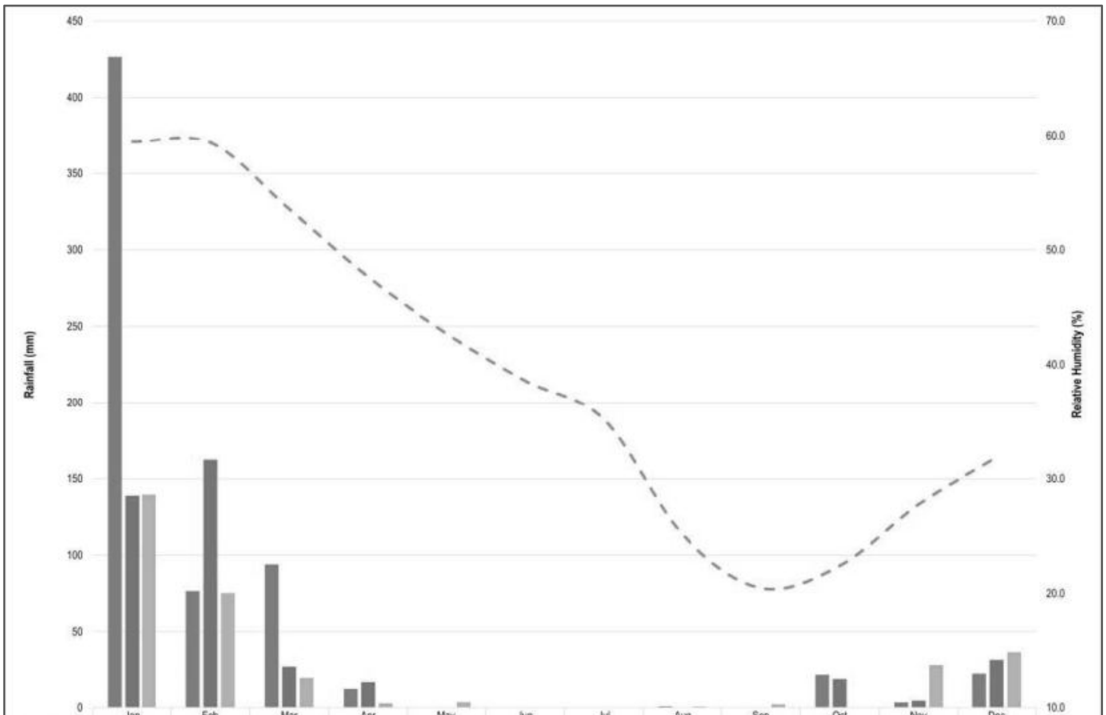


Figure 15. Diurnal temperature profile based on modelled data for Oruhungu (1 January 2021 to 31 December 2023)

5.2.2.3. Precipitation

Precipitation is important to air pollution studies since it represents an effective removal mechanism for atmospheric pollutants and inhibits dust generation potentials. Monthly average rainfall figures obtained from the measured data are illustrated in Figure 16. This chart illustrates the seasonal variations in rainfall and humidity, with periods of high precipitation and moisture as well as notable dry spells throughout the year.

Measured total rainfall for the 3-year period was 1365 mm, with the highest monthly rainfall measured (427 mm) in January 2021. The rainfall and humidity decrease rapidly in spring (February to April) heading towards the lowest in winter indicating a drier period. From October, the rainfall and humidity show a steady but slight increase heading towards the peak in January.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021	426.5	76.7	94.1	12.1	0	0	0	0.7	0	21.3	3.4	22
2022	138.9	162.3	27.2	16.5	0	0	0	0	0	18.6	4.5	31.7
2023	139.5	75.3	19.4	2.8	3.6	0	0	0.6	2	0.2	28.4	36.8
RH	59.4	59.4	53.5	47.6	42.7	38.6	35.2	25.1	20.5	22.4	27.8	31.9

Figure 16. Average rainfall based on modelled data for Oruhungu (1 January 2021 to 31 December 2023)

5.2.2.4. Atmospheric Stability

The new generation air dispersion models differ from the models traditionally used in a number of aspects, the most important of which are the description of atmospheric stability as a continuum rather than discrete classes. The atmospheric boundary layer properties are therefore described by two parameters; the boundary layer depth and the Obukhov length (often referred to as the Monin-Obukhov length). Explaining atmospheric stability using the inverse Monin-Obukhov length and mixing height involves understanding how these factors influence vertical air movement and the dispersion of pollutants.

In summary, the inverse Monin-Obukhov length and mixing height provide complementary information about atmospheric stability and its impact on air quality. Positive values of the IMOL indicate stable conditions with limited vertical mixing, while negative values indicate unstable conditions with enhanced vertical mixing and dispersion. The mixing height further influences the vertical extent of pollutant dispersion, with shallow heights in stable conditions and deeper heights in unstable conditions.

The highest ground level concentrations for ground level releases, like fugitive dust, which are typical of the Project, will happen during stable night-time conditions.

5.2.3. Current Ambient Air Quality

5.2.3.1. Existing Sources of Atmospheric Emissions in the Area

The main air pollution sources within the region include current mining and quarry operations, exploration activities, public roads (paved and unpaved), natural exposed areas prone to wind erosion.

The main pollutant of concern would be particulate matter (TSP; PM_{10} and $PM_{2.5}$) resulting from vehicle entrainment on the roads (paved, unpaved, and treated surfaces), windblown dust, and mining and exploration activities. Gaseous pollutants such as SO_2, NO_x, CO and CO_2 would result from vehicles and combustion sources, but these are expected to be at low concentrations due to the few combustion sources in the region.

- The main contribution from these sources can be summarized as:

Vehicle entrainment from roads: Particulate emissions from roads occur when the force of the wheels on the road surface grinds the surface material into finer particles which are then lifted by the rolling wheels and kept in suspension due to the turbulent wake behind the vehicle (U.S. EPA, 2011). Dust emissions from paved and unpaved roads varies linearly with the volume of traffic. In addition, a number of parameters influence the surface condition of a particular road, such as average vehicle speed, mean vehicle weight, silt content of road material, and road surface moisture, and these will thus impact on dust emissions (U.S. EPA, 2006).

Located approximately 40 km northeast of Windhoek, the area is accessible by a paved road (B6) which clinks to a smaller paved road (M3) before connecting to a well-maintained gravel road (D2102) which is the main access to the Project area.

Windblown dust: Windblown particulates from natural exposed surfaces can result in significant dust emissions with high particulate concentrations near the source locations, potentially affecting both the environment and human health.

Wind erosion is a complex process, including three different phases of particle entrainment, transport, and deposition. For wind erosion to occur, the wind speed needs to exceed a certain threshold, called the friction velocity. This relates to gravity and the inter-particle cohesion that resists removal. Surface properties such as soil texture, soil moisture and vegetation cover influence the removal potential. For a natural environment such as gravel plains, the threshold friction velocity was estimated to be 10 m/s and above due to the crusting effect of the soil surface. This may be similar for the arid environment where the Project is located.

Wind speeds from the modelled weather data exceeded 10 m/s for 0.6% of the time over the three years of data analysed. Windblown dust from natural exposed surfaces at and around the Project is regarded to be an insignificant source of particulate matter.

Mines and Exploration operations: Pollutants typically emitted from mining and quarrying activities are particulates, with smaller quantities associated with vehicle exhaust emissions. Mining and quarrying activities, especially open-cast mining methods, as well as exploration activities, emit pollutants near ground-level over (potentially) large areas. Source activities resulting in significant dust emissions include: drilling and blasting; materials handling (loading, unloading, and tipping); crushing and screening; windblown dust (from the sources as described above); and access roads.

Industrial emissions: The project is located 40 km northeast of the capital Windhoek, which is home to various industries and motor vehicles, which contribute to air emissions. The primary air pollutants in Windhoek are PM, SO_2, NO_x, and greenhouse gases (GHGs). Industrial activities, particularly in urban areas, have led to increased PM levels. In 2004, the mean for PM10 in urban areas was reported at 50 µg/m^3, but it is estimated to have doubled since then due to increased industrial activities and vehicle emissions (Hamatui & Beynon, 2017).

The energy sector is another significant contributor to air emissions in Namibia. The country's electrical energy mix is dominated by liquid fuel, accounting for about 63% of total energy consumption. The increasing energy demand, projected to grow by 43% over the next 20 years, will require the construction of new power generating facilities, which could potentially lead to increased GHG and air pollutant emissions if sustainable energy choices are not made (Kgabi, 2016).

Regional transportation of pollutants: Another source of air pollution is aerosols as a result of regional-scale transport of mineral dust and ozone (due to vegetation burning) from the north of Namibia (http://www.fao.org/docrep/005/x9751e/x9751e06.htm). burning is an incomplete combustion process (Cachier, 1992), with carbon monoxide, methane and nitrogen dioxide gasses being emitted. Approximately 40% of the nitrogen in biomass is emitted as nitrogen, 10% is left in the ashes, and it may be assumed that 20% of the nitrogen is emitted as higher molecular weight nitrogen compounds (Held, et al., 1996). The visibility of the smoke plumes is attributed to the aerosol (particulate matter) content. Formenti et al., (2018) attributed the recording of black carbon at Henties Bay to contributions from biomass burning and even from the SA highveld’s coal fired power stations.

Evaporation of sea spray are also sources of airborne particles, whereas pollen grains, fungal spores and plant and insect parts all contribute to the atmospheric particulate load. Marine aerosols may include sea salt as well as organic matter (O'Dowd and De Leew, 2007). Sea salt is a major atmospheric aerosol component on a global scale, with a significant impact on PM concentrations (O'Dowd and De Leew, 2007; Athanasopoulou et al., 2008; Kelly et al., 2010; Karaguliun et al., 2015). Aside from the primary contribution from sea salt, recent interest is on its role in chemical reactions (with gaseous emission) and on climate change (O'Dowd and De Leew, 2007; Kelly et al., 2010). One of the findings from the SEMP AQMP was the contribution from the ocean (westerly sector) to PM_{10} concentrations at Swakopmund and Walvis Bay. The contribution from sea salts in the PM_{10} filters was confirmed through chemical analyses (Liebenberg-Enslin, et al., 2019). How far these sea salts can be transported inland is not known.

5.2.4. Dust Fallout Dispersion Modelling Results

The simulated maximum daily dustfall rates for unmitigated activities are provided in Figure 17. Maximum daily dustfall rates do not exceed the AQO (BOS 498:2012 residential limit of 600 mg/m²/day) at the closest AQSR or beyond the Project boundary.

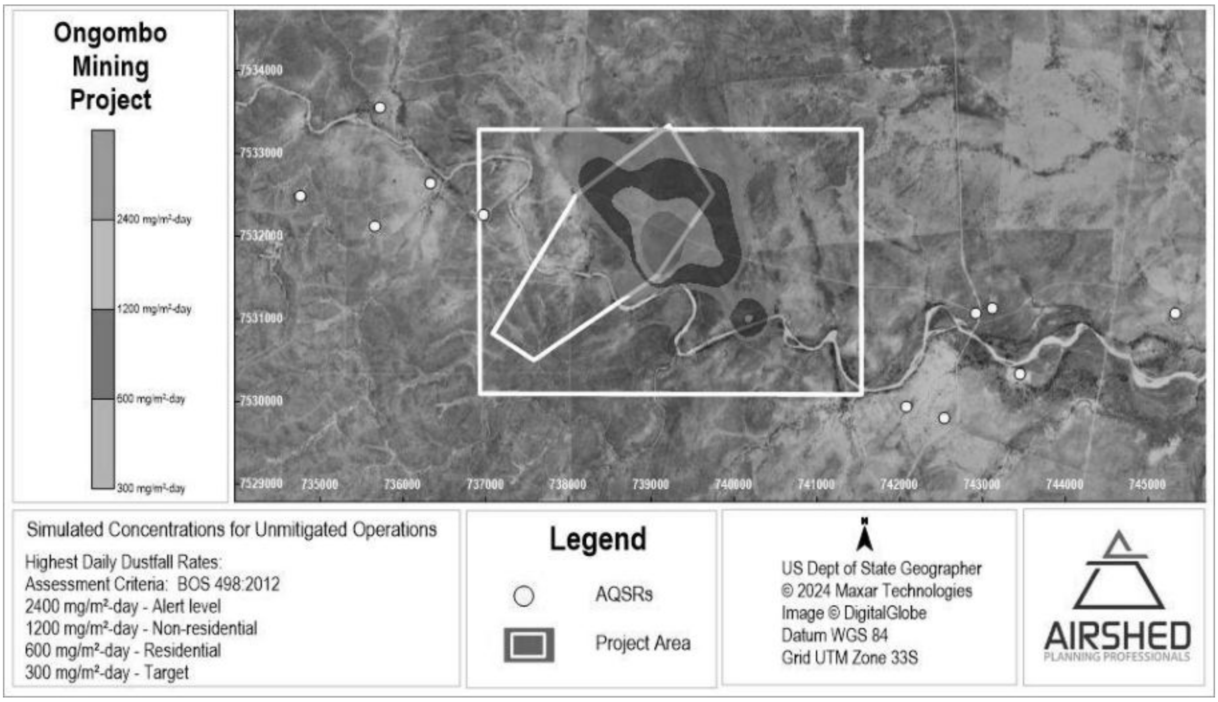


Figure 17. Simulated daily dustfall rates due to unmitigated operations

The simulated maximum daily dustfall rates for mitigated activities are provided in Figure 18. Maximum daily dustfall rates are within the AQO (SA NDCR residential limit of 600 mg/m²/day) at the nearest AQSR or beyond the Project boundary.

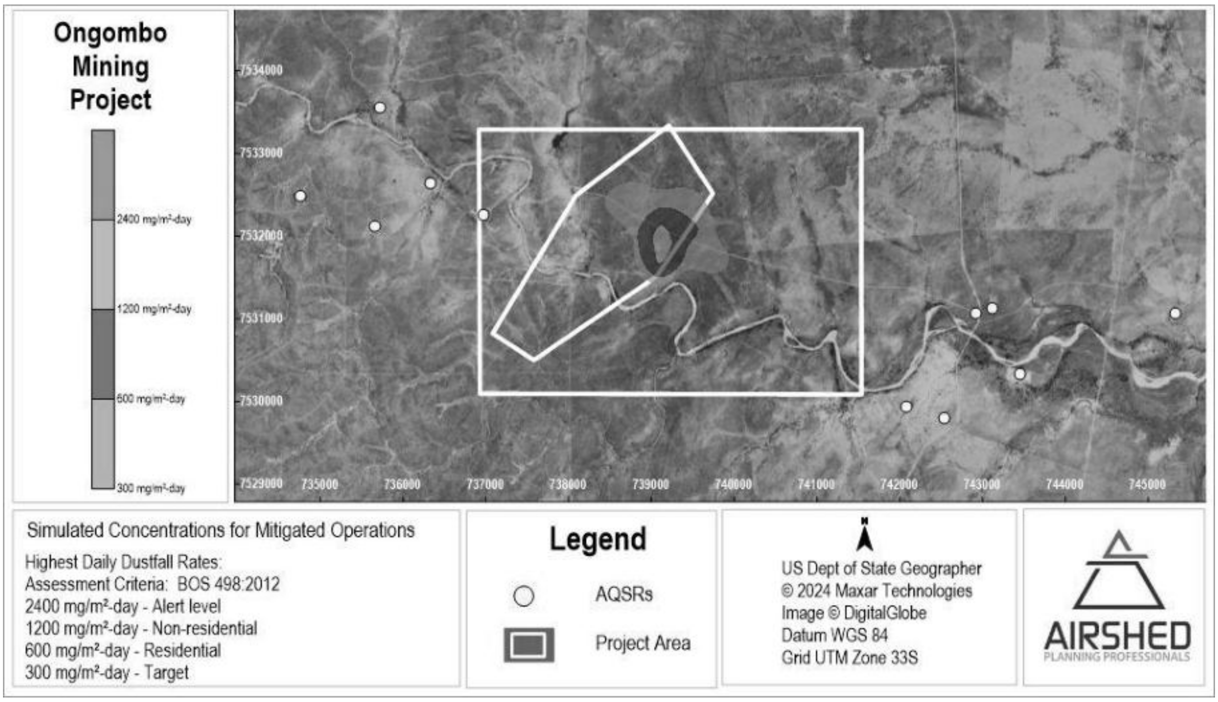


Figure 18. Simulated daily dustfall rates due to unmitigated operations

5.2.5. Air Quality Impact Assessment

Mining activities during construction, operational, and closure phases result in airborne emissions of pollutants. Mining operations muster large amounts of material, and waste piles comprise small size particles that are easily diffused by the wind.

5.2.5.1. Construction Phase

The construction phase will include the establishment of required mining infrastructure and associated facilities such as offices, workshops, stores, change houses, lamp-room, transformer bays, MCC rooms, and security blocks, which will be constructed from purpose-built containerised offices and shipping containers for stores and workshops. Activities that would result in air pollution during the construction phase are listed Table 16.

Table 16. Construction activities resulting in air pollution

Activities	Associated pollutants
Handling and storage area for construction materials (paints, solvents, oils, grease) and waste	Particulate matter (PM)(a) and fumes (Volatile Organic Compounds [VOCs])

Activities	Associated pollutants
Power and water supply infrastructure	Sulfur dioxide (SO_2); oxides of nitrogen (NOx); carbon monoxide (CO); carbon dioxide (CO_2)(b); particulate matter (PM)
Clearing and other earth moving activities	Mostly PM, gaseous emissions from earth moving equipment (SO_2; NOx; CO; CO_2)
Stockpiling topsoil and sub-soil	Mostly PM, gaseous emissions from front-end-loaders (FEL) (SO_2; NOx; CO; CO_2)
Foundation excavations	Mostly PM, gaseous emissions from excavators (SO_2; NOx; CO; CO_2)
Opening and backfill of material (specific grade) from borrow pits	Mostly PM, gaseous emissions from trucks and equipment (SO_2; NOx; CO; CO_2)
Establishing access roads (scraping and grading)	Mostly PM, gaseous emissions from trucks and equipment (SO_2; NOx; CO; CO_2)
Digging of foundations and trenches	Mostly PM, gaseous emissions from diggers (SO_2; NOx; CO; CO_2)
Delivery of materials – storage and handling of material such as sand, rock, cement, chemical additives, etc.	Mostly PM, gaseous emissions from trucks (SO_2; NOx; CO; CO_2)
General building/construction activities including, amongst others: mixing of concrete; operation of construction vehicles and machinery; refuelling of machinery; civil, mechanical and electrical works; painting; grinding; welding; etc.	Mostly PM, gaseous emissions from construction vehicles and machinery (SO_2; NOx; CO; CO_2)

Construction normally comprises a series of different operations including land clearing, topsoil removal, material loading and hauling, stockpiling, grading, bulldozing, compaction, etc. Most of the infrastructure such as surface haul roads and stockpiles required for the Life of Mine (LOM) will be constructed during the first year of mining. The WRD will progress over time with haul trucks tipping the waste on the top elevation of the dump with the dozers pushing the waste material down. These actions will cause the WRD to progress horizontally over time. ROM pad stockpiles will be constructed in close vicinity to the primary crusher tipping point in order to minimise the reclamation costs.

The main pollutant of concern from construction operations is particulate matter, including PM_{10}, $PM_{2.5}$ and TSP. PM_{10} and $PM_{2.5}$ concentrations are associated with potential health impacts due to the size of the particulates being small enough to be inhaled. Nuisance effects are caused by the TSP fraction (20 µm to 75 µm in diameter) resulting in soiling of materials and visibility reductions. This could in effect also have financial implications due to the requirement for more cleaning materials.

All operations associated with the construction phase are listed in Table 17 below. Each of the operations have their own duration and potential for dust generation. It is therefore often necessary to estimate area wide construction emissions, without regard to the actual plans of any individual construction process. Quantified construction emissions are usually lower than operational phase emissions and due to their temporary nature and duration, and the likelihood that these activities will not occur concurrently at all portions of the site; dispersion simulation was not undertaken for construction emissions.

Areas assumed to be cleared of vegetation for infrastructure development and mining preparation are listed in Table 17.

Table 17. Construction areas and estimated emissions

Mining Area	Area (m^2)	Area (ha)	TSP (tpa)	PM_{10} (tpa)	$PM_{2.5}$ (tpa)
Pit clearance	174625	17.46	285.76	37.18	19.12
New Roads	2748	0.28	4.50	0.59	0.30
Crushing Infrastructure	411	0.04	0.92	0.09	0.05
Workshop & Offices	54687	5.47	122.76	11.64	5.99
Freshwater storage pond	100	0.01	0.22	0.02	0.01
Total	23 2571	23.26	414.16	49.52	5.47

5.2.5.2. Operational Phase

The phase one of the operating cycle includes opening up the mine using methods like drilling, blasting, and removal of ore. The ore is then hauled from the material extraction site to the ROM pad, while the waste rock is hauled to the WRD. In the pre-processing stage, Ore stockpiled from open-pit mine is fed into the primary crusher at the mine. The product from the Jaw crusher product will be recombined with the grizzly undersize and report to a sizing screen where material will be sized into >40mm, 10-40mm and <10mm fractions. Waste from the ore sorter will constitute a final waste product which will initially be stockpiled from where it can be sued for backfilling or road building purposes. Activities that would result in air pollution during the operational phase are listed Table 18.

Table 18. Operational activities resulting in air pollution

Activities		Associated pollutants
Open pit mining	Blasting – intermittent source of emissions	PM; SO_2; NOx; CO; CO_2
	Drilling	PM; SO_2; NOx; CO; CO_2
	Excavation of ore and waste rock	Mostly PM, gaseous emissions from mining equipment (PM; SO_2; NOx; CO; CO_2)
	Loading of ore and waste rock onto trucks	Mostly PM, gaseous emissions from haul truck exhaust (PM, SO_2; NOx; CO; CO_2)
Haulage of ore and waste rock	Ore from pit to ROM stockpile	PM from road surfaces and windblown dust from trucks, gaseous emissions from truck exhaust (PM, SO_2; NOx; CO; CO_2)
Off-loading of ore and waste rock	Ore at ore stockpile and at crusher plant	Mostly PM, gaseous emissions from haul truck exhaust (PM, SO_2; NOx; CO; CO_2)
	Waste rock at WRD	
Processing of ore	Primary crushing	Mostly PM, gaseous emissions from machinery (PM, SO_2; NOx; CO; CO_2)
Wind erosion	From WRD and ore stockpile	Mostly PM (TSP, PM_{10} and $PM_{2.5}$)

Activities		Associated pollutants
Haulage of pre-concentrate ore	Pre-concentrated ore from Ongombo Mine, provisionally to Otjihase	PM from road surfaces and windblown dust from trucks, gaseous emissions from truck exhaust (PM, SO_2; NOx; CO; CO_2)

Quantification of emissions from the proposed Project are restricted to fugitive releases (non-point releases). Particulates are the main pollutant of concern from mining operations. Gaseous emissions (i.e. SO_2, NOx, CO and VOCs) will primarily result from diesel combustion, both from mobile and stationary sources.

Ore production is estimated at 700Kt per annum (ktpa) to 1M tons per annum (Mtpa) after the third year of operation, which was used as the indicative year for emissions estimation. The strip ratio was indicated as 2.06. Operational hours were given as 6 days a week, 12 hours a day for open pit mining. For processing, operations will start at 6 days a week, 12 hours a day and ramped up to 24 hours a day, 7 days a week after production expansion.

The estimated control efficiencies as obtained from literature (NPI, 2012) for the various mining activities are given in Table 19.

Table 19. Estimated control efficiencies for mitigation measures applied to various mining operations (NPI, 2012)

Operation/Activity	Control method and emission reduction
Unpaved surface haul roads	50% CE for water sprays (Level 1 watering < 2 L/m²/hr)
Drilling	70% for water sprays
Blasting	No control
Materials handling (loading and unloading)	50% CE for water sprays
FEL	50% CE for water sprays
Dozing	50% CE for water sprays
Grading	50% CE for water sprays
Crushing and screening	50% CE for water sprays keeping ore wet
Windblown dust	30% CE for primary earthworks (reshaping/profiling, drainage structures installed)
Gaseous emissions (Vent and vehicle tailpipe)	No control

Note: CE is Control Efficiency

Both unmitigated and mitigated activities were assessed. A summary of estimated particulate emissions from the proposed Project operations is provided in Table 20.

Table 20. Calculated emission rates from unmitigated and mitigated mining operations

Activity/ Area of operation	Emission Rate (tpa)													
	Unmitigated							Mitigated						
	TSP	PM_{10}	$PM_{2.5}$	NO_x as NO_2	SO_2	CO	VOC	TSP	PM_{10}	$PM_{2.5}$	NO_x as NO_2	SO_2	CO	VOC
Drilling	0.43	0.43	0.24					0.22	0.22	0.12				
Blasting	50.48	49.87	2.88											
Materials Handling	65.37	30.92	4.68					30.92	14.62	2.21				
Crushing & Screening	33.60	13.44	2.04					16.80	6.72	1.02				
Unpaved Roads	124.76	124.76	124.76					57.10	57.10	57.10				
FELs, Dozers, Grader	134.87	33.72	0.34					67.43	16.86	0.17				
WE (WRD & SPs)	592.69	296.34	29.63					414.88	207.44	20.74				
Vent Emissions	1.50	0.75	0.75	0.75	0.75			1.50	0.75	0.75	0.75	0.75		
Vehicle Tailpipe Emissions	11.79	11.79	9.77	148.37	0.10	68.36	10.81	11.79	11.79	9.77	148.37	0.10	68.36	10.81
Total	1 015.50	562.04	175.09	149.13	0.85	68.36	10.81	600.65	315.51	91.89	149.13	0.85	68.36	10.81

5.2.5.3. Closure and Decommissioning Phase

It is assumed that all the operations will have ceased by the closure phase of the project. The potential for impacts during this phase will depend on the extent of rehabilitation efforts during closure. Aspects and activities associated with the closure phase of the proposed operations are listed in Table 21. Simulations of the closure and decommissioning phases were not included in the current study due to its temporary impacting nature.

Table 21. Activities and aspects identified for the closure and decommissioning phase

Impact	Source	Activity
PM emissions	WRDs, stockpiles and mine pit	Dust generated during rehabilitation activities
PM emissions	Plant and infrastructure	Demolition of the process plant and infrastructure
Gas emissions	Vehicles	Tailpipe emissions from vehicles utilised during the closure phase

5.3. Rainfall and evaporation

The average annual rainfall for the region is 366mm, 86% of which falls during the summer months. March is the wettest month of the year with an average rainfall of 79mm. The evaporation rate is in the region of 3 200 mm a year.

Rainfall is highly erratic and unpredictable over the entire Khomas Hochland region, with the highest rainfall months being January to March. According to the Department of Water Affairs as much as 83% of the rainfall evaporates before it reaches the ground, 2% enters drainage systems and only 1% recharges the ground water sources (ECC, 2022).

5.4. Regional geology and mineralization description

The Ongombo Copper Project lies on the Matchless belt, which is located within the intracratonic branch of the late Neoproterozoic Damaran orogenic belt in central Namibia (Figure 19). The Matchless belt is hosted by the Kuiseb Formation of the Damara Sequence, which consists of a monotonous sequence of quartz-biotite schist. Minor calc-silicate rock and carbonaceous schist within the Kuiseb Formation indicate the sequence has a metapelitic origin. There is no significant compositional difference in the schists across the quartz-biotite schist sequence, although the relative abundance of individual schist units varies considerably (Madec, 2024).

Most of the mineral deposits rich zone, between the Swakop River to the north, the Kuiseb River to the south, the Khomas Hochland to the north and the Atlantic Ocean to the south are hosted within the Swakop Group, which is subdivided into (From the oldest to the youngest) the Rössing, Chuos, Karibib and Kuiseb formations that are dominated by carbonates (calcite and dolomite marbles, calc-silicate layers) alternating with meta-greywacke and meta-diamictite. Most notably, the Kuiseb Formation comprises of metasedimentary rocks, together with meta-volcanic and meta-gabbroic rocks of the Matchless Amphibolite Belt (MAB), which stretches inland with north-easterly direction, and encompasses the like of Otjihase and Matchless Mines further inland, respectively East and West of Windhoek, but along strike. The deposits are hosted within the magnetite-quartzite, and mineralization consist of massive pyrrhotite-chalcopyrite-pyrite lenses and chalcopyrite. Toward the Steinhausen the Matchless Belt fades beneath the thick sands of the Kalahari Desert.

According to Madec (2024), Avanti Resources notably states the proportion of extrusive to intrusive material varies along the length of the Matchless belt. In the Gorob area in the southwest, a discrete zone about 1.5 km thick contains only two major amphibolites, which are predominantly extrusive in origin. By contrast, towards the northeast, the ultramafic schists become more conspicuous, and around Ongombo in the northeast, metamorphosed intrusive rocks are reported to predominate. A total of 18 individual ore bodies have been recognized within the Matchless belt and the most important are the Hope, Gorob, Matchless, Otjihase, and Ongombo deposits (Figure 20). The Matchless cluster consists of the Matchless Mine deposit which has been previously worked as well as three additional sulphide bodies. The Otjihase cluster in the northeast consists of the Otjihase deposit, which is the largest known occurrence on the Matchless belt, as well as the Ongeama deposit which is adjacent to the Ongombo deposit.

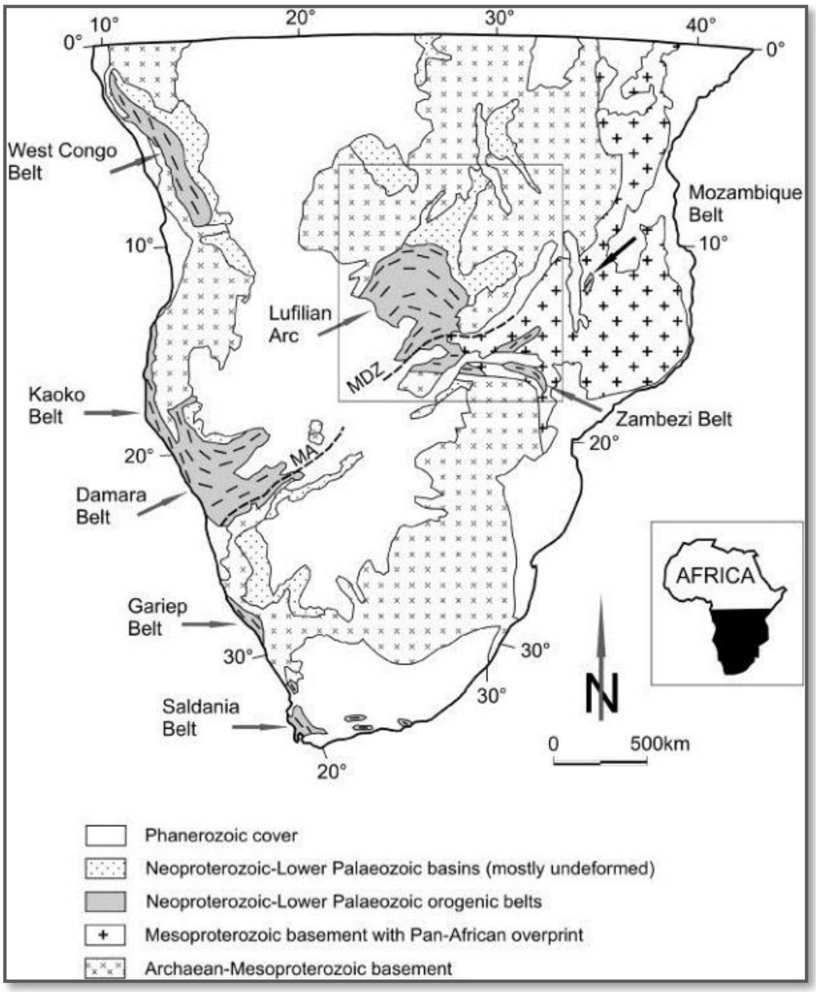


Figure 19. Location of the neoproterozoic orogenic belts and basins in the precambrian tectonic framework of Southern Africa

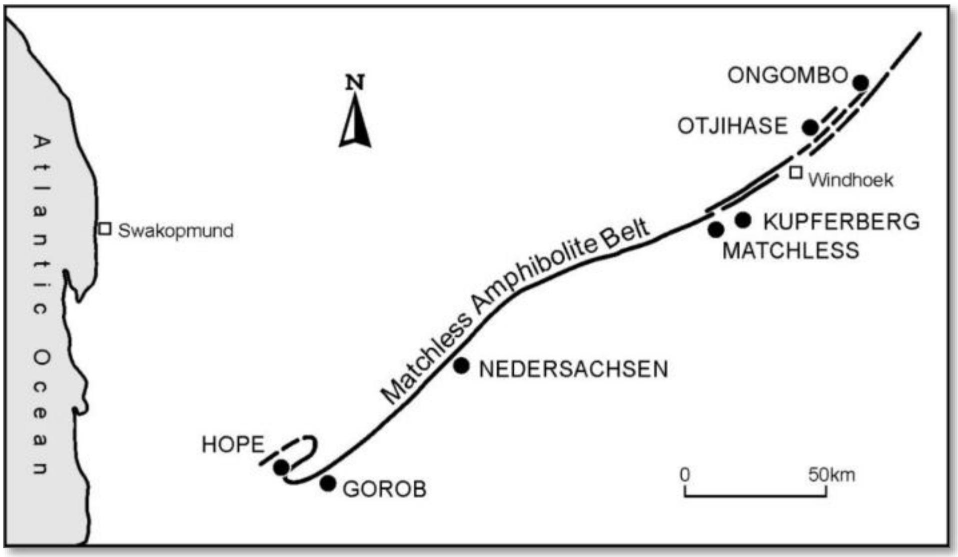


Figure 20. Matchless belt with major sulphide deposits (Practara, 2021)

5.5. Local geology

The Ongombo Project lies within the Matchless Member of the Kuiseb Formation and Khomas Group, a conspicuous assemblage of lenses of foliated amphibolite, chlorite-amphibolite schist, talc schist and metagabbro. The Matchless Belt (Figure 21) is up to 5km wide in the Otjihase area, stretches 350km east-north-eastwards in the Southern Zone of the Damara Orogen from the Gorob - Hope (Figure 19) area towards Steinhausen, north of Omitara (ECC, 2022).

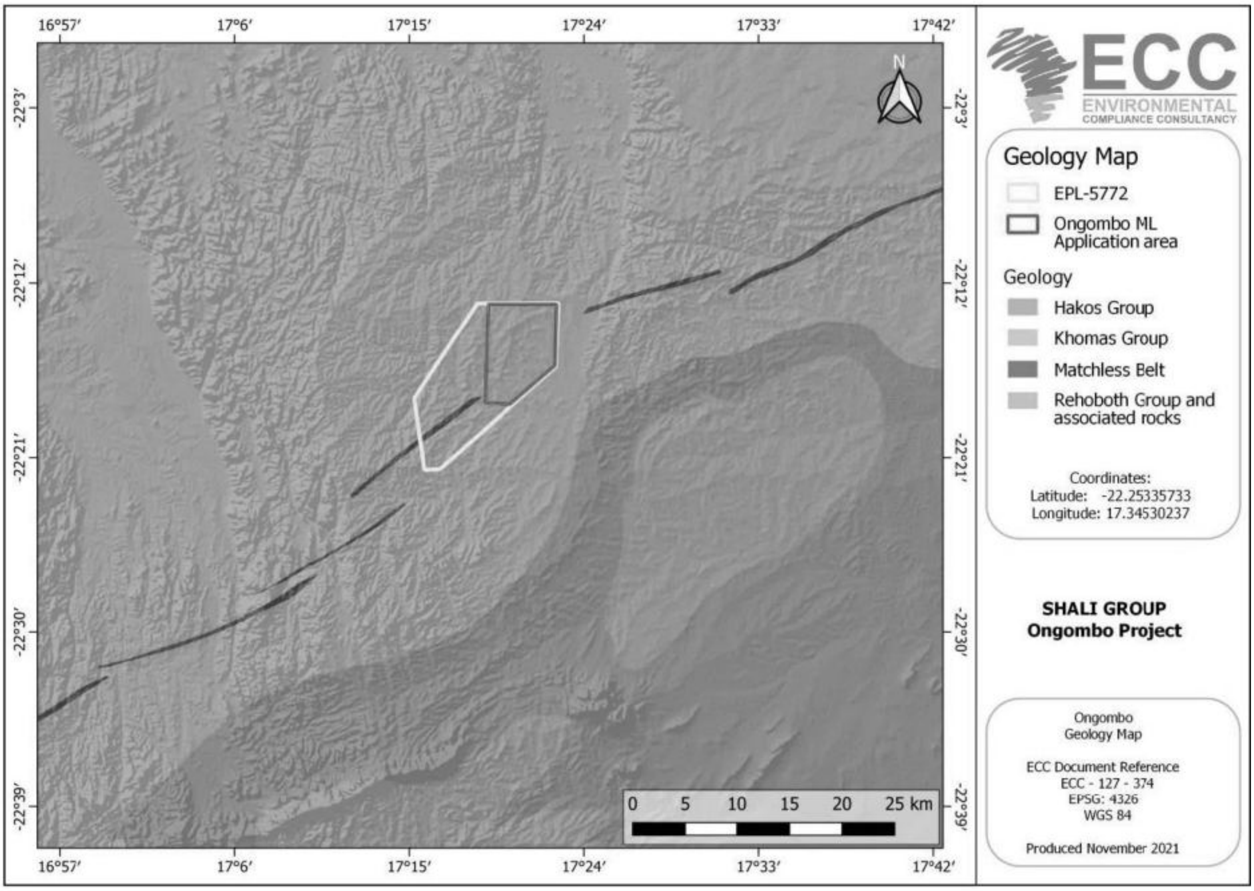


Figure 21. Local geology of the proposed site (source: ECC, 2022)

The Matchless Belt hosts several volcanogenic-exhalative, stratiform and strata-bound cupriferous pyrite deposits containing subordinate and variable amounts of zinc, lead, silver and gold. The deposits range in size from 0.3 to 16 million tonnes averaging 2% Cu, and are generally attributed to a Besshi-type genetic model. The deposits occur in close association with the amphibolites, and lie near the southern edge of the Matchless belt throughout its exposed strike length. However, the detailed position of the deposits relative to the amphibolite varies considerably (ECC, 2022).

A total of 18 individual ore bodies have been recognized within the Matchless Belt and the most important are the Hope, Gorob, Matchless, Otjihase, and Ongombo deposits (Figure 18) There are close similarities between the mineralization at the individual deposits.

Four main clusters have been recognized which may correlate spatially with palaeovolcanic centres. The Gorob cluster in the southwest consists of eight sulphide lenses distributed about a large synformal fold. The Niedersachsen cluster consists of three separate gossanous magnetite-quartzite occurrences associated with quartz-sericite schist. The largest occurrence at Niedersachsen, comprises three lenses with a total strike length of about 1.8 km, and the other two occurrences each have a strike length of about 1 km. The Matchless cluster consists of the Matchless Mine deposit which has been previously worked as well as three additional sulphide bodies. The Otjihase cluster in the northeast consists of the Otjihase deposit, which is the largest known occurrence on the Matchless belt, as well as the Ongeama and Ongombo deposits.

The most striking characteristic of these sulphide deposits is their intimate and invariable association with one or more magnetite-quartzite horizons, which can be barren or mineralised. Although the magnetite-quartzites are characteristically discontinuous, they are generally laterally more extensive than the associated sulphide mineralisation. The magnetite-quartzites are massive or banded, and generally contain 5 to 40 percent magnetite by volume. With increasing mica content, the magnetite quartzites grade through sericite-quartzite into quartz-sericite schists containing little to no magnetite. The schists adjacent to the magnetite-quartzite, quartz-sericite schist, and sulphide mineralisation are commonly aluminous and may contain significant amounts of sericite, cordierite, sillimanite, staurolite, kyanite, garnet, clay and prehnite. Chlorite is a common constituent of the aluminous schists, the magnetite-quartzites, and quartz-sericite schists (ECC, 2022).

Amphibolites and amphibole-schists may also be directly associated with the sulphide mineralization. At the Matchless mine most of the copper mineralisation is hosted by the hanging wall amphibolite or underlying amphibolite schist. The shape of the Matchless deposits varies from tabular to ribbon-like but all are stratiform. Non-metamorphosed stratiform massive sulphide orebodies are generally circular in plan, and the present shapes of the Matchless deposits are considered to be influenced largely by Damaran orogenic crustal shortening. The stratabound ores are considered to be of Besshi type, forming initially on the sea floor and afterwards emplaced into continental margin sediments. The deposition is however considered to be syngenetic, and to have developed within the four volcanic centres spread out along the Matchless Belt.

The surface expression of the sulphide deposits varies from true gossans with box work structures after sulphides to limonite-stained quartzite's and mica schists. Secondary copper minerals, although present are generally inconspicuous. Chrysocolla and atacamite have been reported in outcrop at Gorob, and cuprite, chrysocolla, native copper, bornite, covellite, chalcocite, and tenorite have been reported from the upper levels of the Matchless Mine. Native copper has also been reported from the interface between the oxide and sulphide zones in the Otjihase Mine. The oxidation depth for the deposits of the Otjihase cluster is generally 20 to 25m vertically below surface. The deposits comprising the Gorob cluster are generally oxidized to a depth of 35 to 40m vertically below surface, the top 5m being leached of copper minerals. This variable depth of oxidation can be related to the different geomorphological domains occurring over the considerable length of the Matchless Member. Goldfields defined a linear Pb-Co soil anomaly at Ongombo which extends along strike to the northeast beyond the gossan outcrops (ECC, 2022).

5.6. Topography and soil

The terrain in the project area is gently undulating with elevations in the range of 1,700m - 2,000m above mean sea level (amsl) (Figure 23). The landscape is flat with some sharp topographical contrasts. Generally, there is a rise in elevation from west to east and from north to south, with the highest readings to the northwest of the proposed project area.

Ongombo is located by the Khomas Hochland Plateau, which is the large ridge of higher ground in the centre of the country. Although the Hochland is generally characterised by rolling hills, the proposed itself falls within an area of rugged and heavily dissected terrain with some rocky outcrops (ECC, 2022).

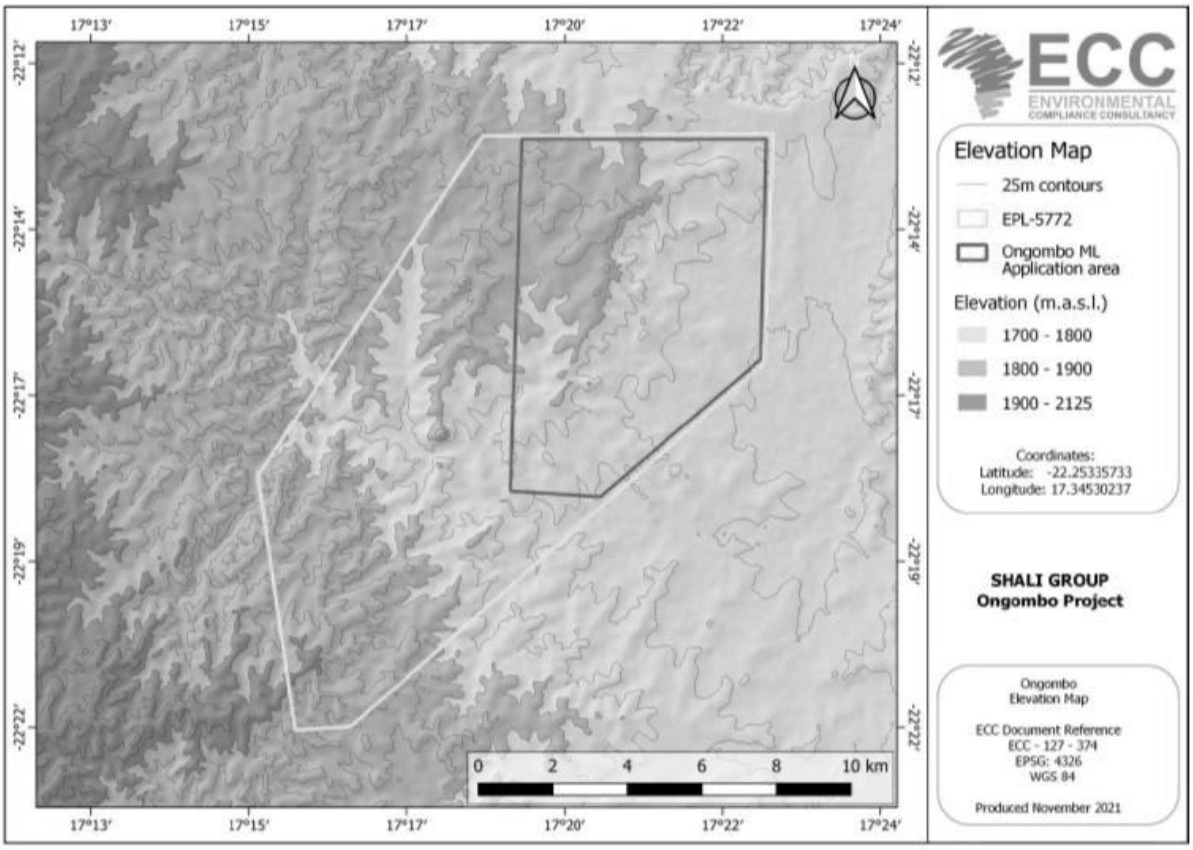


Figure 22. Elevation profile along the proposed project site (source: ECC, 2022)

The landscape is dominated by rolling hills and covered by scrub and grassland. The Swakop River runs through the proposed project area. The main economic activity in the area is stock farming, game hunting and eco-tourism. The soil fertility is relatively low to medium, dominated by chromic cambisol soil type, and red soils, characterised by good holding capacity and internal drainage. These soils are not particularly fertile and have limited agricultural potential. The primary land use in the area surrounding the proposed project area is livestock and game farming.

Ongombo is largely covered by the Regosol soil group. Regosols typically form in actively eroding landscapes, especially in the hilly or undulating areas that cover much of the southern and north-western Namibia. These coarse-texured soils are characterised by the presence of a continuous hard-rock. Regosols are therefore shallow and often contain much gravel. As a result, the water holding capacity is low and the vegetation occurrence is often subject to drought. Vegetation cover on these thin soils is generally sparse because they cannot provide most plants with sufficient water or nutrients, however it can support low-density stock farming or wildlife (ECC, 2022).

5.7. Surface and Groundwater

Namibia's varied geology encompasses rocks of Archaean to Cenozoic age, thus covering more than 2600 million years (Ma) of Earth history. Nearly half of the country's surface area is bedrock exposure, while the remainder is covered by young surficial deposits of the Kalahari and Namib Deserts. Metamorphic inliers consisting of highly deformed gneisses, amphibolites, meta-sediments and associated intrusive rocks occur in the central and northern parts of the country, and represent some of the oldest rocks of Palaeoproterozoic age (ca.2200 to 1800 Ma) in Namibia (ECC, 2022).

Based on their hydrogeological characteristics, the extremely varied lithology's occurring in Namibia were grouped into 12 main units for the Hydrogeological Map. While stratigraphic positions and spatial distribution were taken into consideration, the main focus was placed on the groundwater potential of the rocks. The resulting sub-division is therefore quite different from the lithological units shown on the Geological Map of Namibia.

The Ongombo Project area falls within sub-division 10 (Metamorphic rocks, including quartzite and marble bands) and many different, highly folded rock types of Mokolian and Namibian ages are included in this unit. These extend from the Gobabis area to the Gamsberg region and then southwards to Helmeringhausen. The 1800-million-year-old Rehoboth Sequence is thought to have formed in the back-arc basin of a magmatic arc and comprises schist, phyllite, amphibolite and quartzite. Rocks of the Sinclair Sequence accumulated within an intra-continental drift. Deposition of quartzites took place in narrow fault-bounded troughs in today's Helme- Ringhausen-Solitaire area after a cycle of magmatic activity. Damaran rocks present in this unit include schists of the basal Nosib Group, marbles of the Ugab and Kudis Subgroups, schist, phyllite and amphibolite of the Chuos Formation and marble, schists and amphibolites of the Karibib and Kuiseb Formations, including the Matchless Amphibolite Belt (ECC, 2022).

5.7.1. Surface water

The project area falls within the north western part (sub-catchment N1) of quaternary catchment D43A (also Z10A), falling within the Lower Orange River water management area. The quaternary catchment is 98 908km2 in size. Flash floods in the area are relatively short and highly variable in magnitude, duration, and frequency.

The exploration license is dissected by the upper reach of the White Nossob river, while the application for the mining license (dark pink polygon) is restricted to the area north of the White Nossob River (Figure 24). Therefore, no mining activities are expected to take place in the course of the White Nossob River.

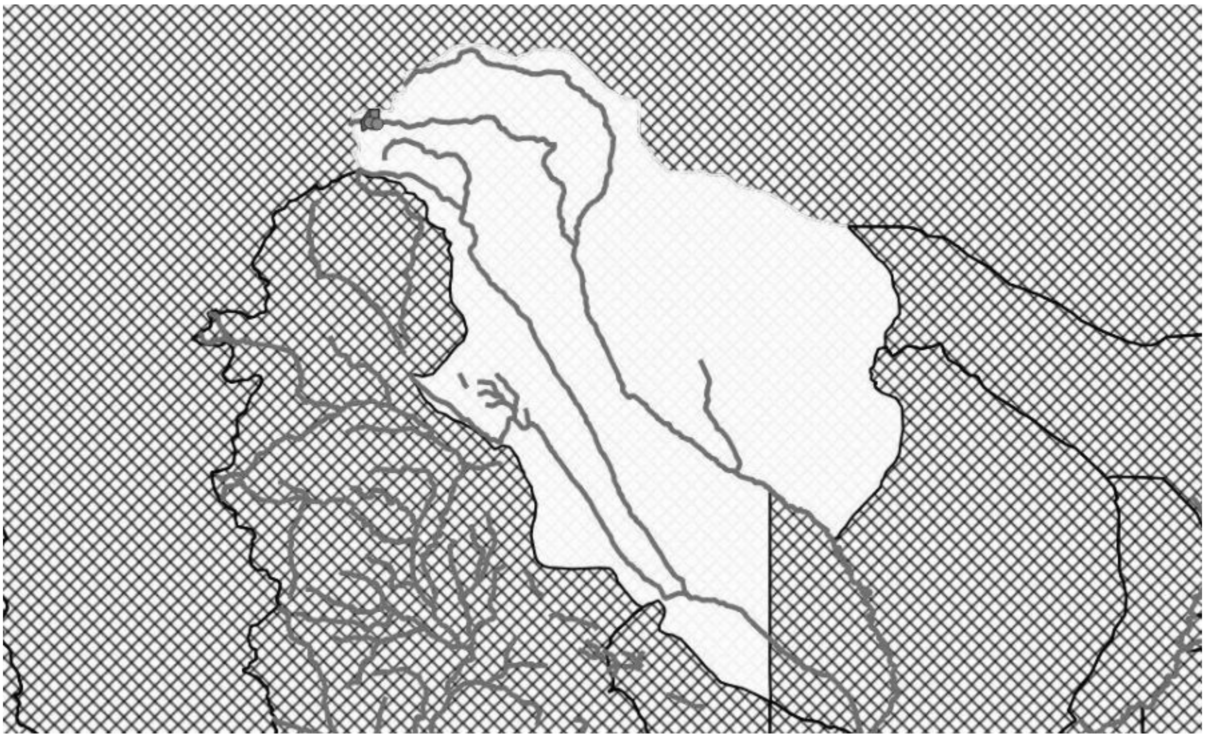


Figure 23. The exploration permit dissected by upper reach of White Nossob, while mining license restricted to north of river.

Initial modeling of the greater Nossob catchment has been previously performed. This provides a natural Mean Annual Runoff of $2.3Mm^3/a$ for the N1 sub-catchment (Wilke, 2024).

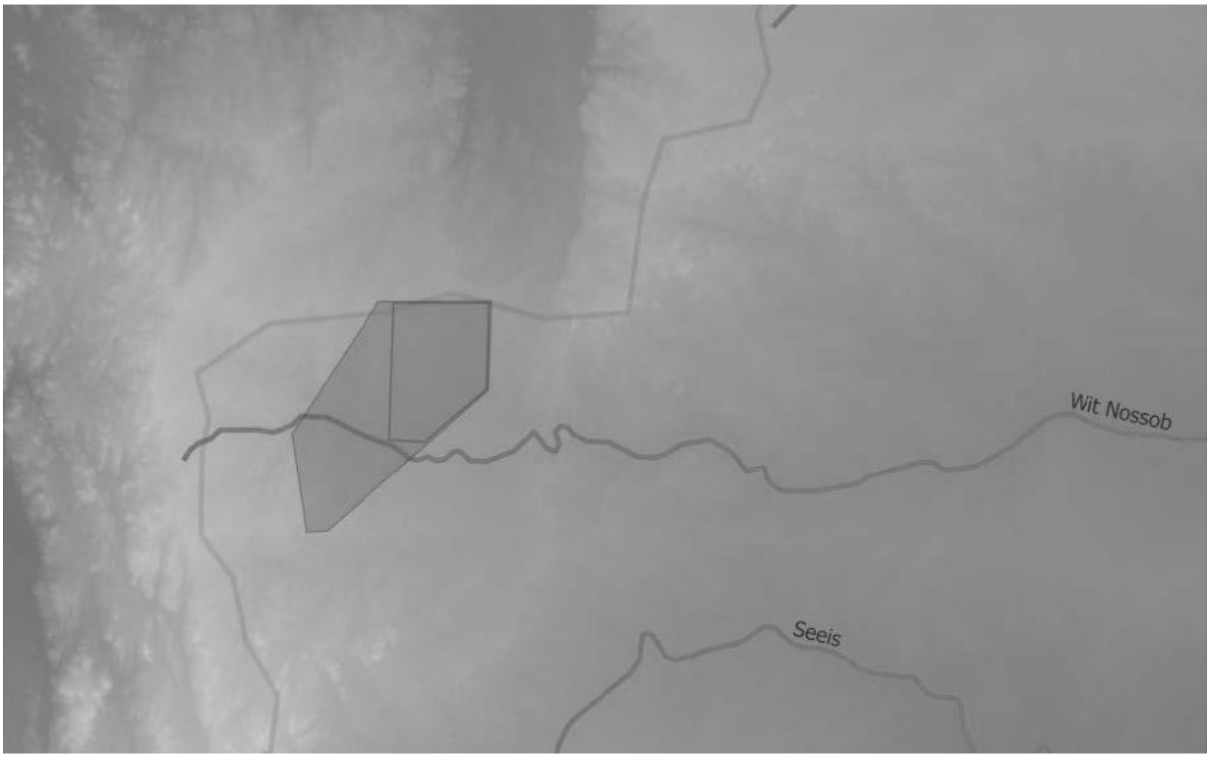


Figure 24. Modeling of the greater Nossob catchment (Wilke, 2024)

The Otjivero dam is located within the N1 sub-catchment and supplies water via a pipeline to the Thilda Viljoen dam. The Otjivero dam has a Full Supply Capacity of 9.8 Mm^3 with the upstream silt dam having a capacity of 7.8 Mm^3. The rainfall station network has several stations within the catchment area, the following distribution in Figure 26 is from ORASECOM (Wilke, 2024).

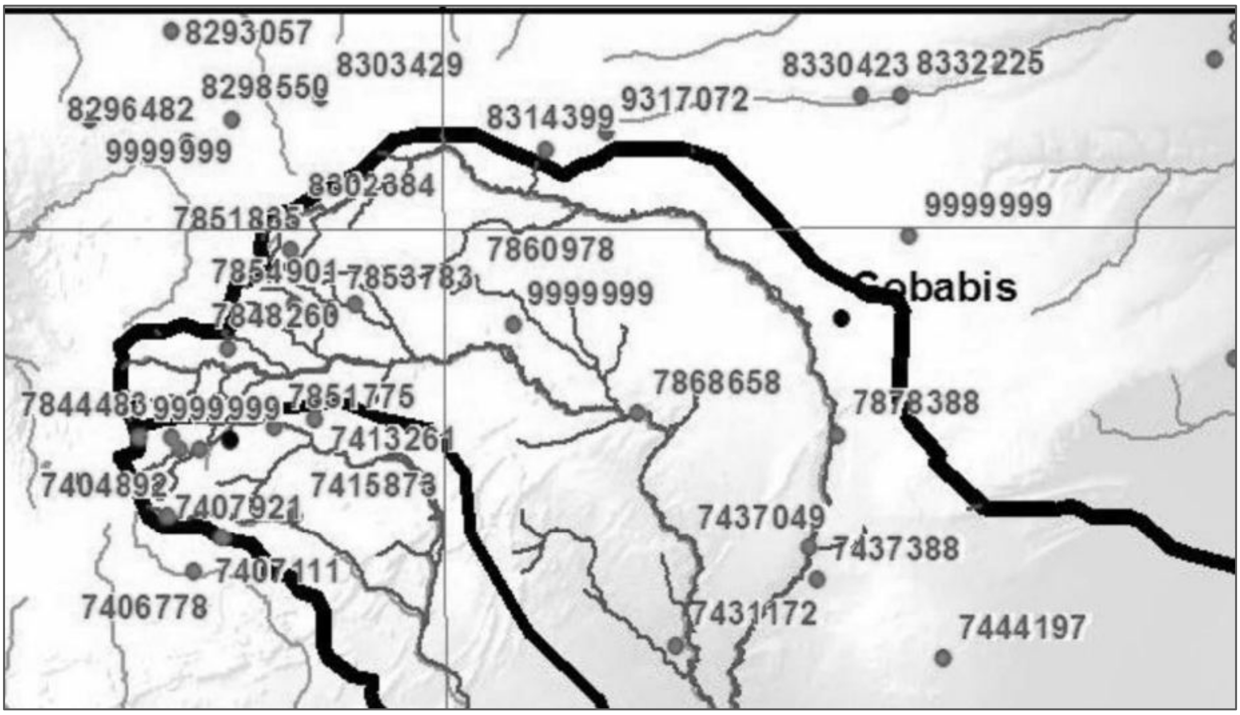


Figure 25. Rainfall station network within the catchment area

5.7.1.1. Risk Identification

Surface water sensitivities and potential impacts are listed below (Table 22).

Table 22. **Sensitive hydrological component**

COMPONENT	SENSITIVITY	VULNERABILITY	POTENTIAL IMPACT
SURFACE WATER RUNOFF	Surface water drainage	High	Runoff entering mine structures and stockpiles can contaminate surface water. Runoff collects and carries various pollutants, including heavy metals, sediments, and chemicals, from the mine site into nearby water bodies. Surface water runoff from mines

			often contains contaminants that can harm aquatic life and impair water usability.

Surface water risks are generally categorised into the following primary risk categories:

- Surface Water Quality; and
- Surface Water Quantity.

Secondary risks that exist are:

- Surface Water Users (on site or downstream);
- Receiving environment (water courses, fauna and flora (terrestrial and aquatic)); and
- Aquifers.

5.7.1.2. Impact Assessment and Quantification

i. Catchment Delineation

The catchment delineation will be conducted on a project scale with the following being taken into account:

- Infrastructure with a potential contamination risk, therefore dirty areas to be contained;
- Areas upstream from dirty areas that require diversion to downstream clean areas;
- The opencast pit footprints, and post mining pit catchment area.

For the assessment, the following is provisionally noted:

- Overburden stockpiles will be generated for the deposit;
- Concentrator waste will be generated (dry sorting, therefore not traditional slimes or tailings but milled or crushed waste material);
- The Ongombo deposit will have an opencast pit, with associated catchment.

ii. Stormwater Flow Assessment

The flood risk will be assessed based on the mine plan. The following is noted:

- The catchment delineation will be completed for the various mine areas;
- The runoff factors and catchment characteristics from literature will be used;

- The assessment of the flow towards the pit will be undertaken.

The volume of flow from contaminated catchments that could reach the tributaries of the White Nossob will be assessed in order to understand the relative volume contribution to the Nossob River flow.

5.7.2. Groundwater

The mining licence (ML 240) does not fall under a Water Control Area (Government notice 189, 1970). However, for bulk groundwater development and abstraction such as for mining purposes, a plan has to be submitted to the Geohydrology Division, Department of Water Affairs for evaluation and approval. The main concerns usually are the sustainability of the proposed abstraction scheme and effect on exiting groundwater supply sources. As such, drilling permit and subsequent abstraction permits are to be obtained from the competent authority, as per the Water Act 54 of 1956, Chapter 3, Section 28.

Water quality guidelines of 1988 and proclaimed Subterranean Water Control Areas will be superseded by Water Resources Management Act, 2013. The latter has been brought into force on 29 August 2023 by GN 268 2023 (GG 8187) Regulations relating to appeals to Water Tribunal in GN 270 (GG 8188). An overlapping period of 18 months is established to enable the phasing in of the new Act whilst the former is phased out.

5.7.2.1. Water use in the Project Area and Surroundings

The landscape is defined by rolling hills on a highland with a vegetation of Savannah ideal for cattle farming. With the proximity of the Hosea Kutako International airport, several lodges and hunting farms have established businesses which rely mainly on groundwater for water supply. The Otjivera Mountains are the natural water divide between waters flowing westwards, such as the Swakop River and eastward, such as the White Nossob River. The latter is an ephemeral river, joining the Black Nossob in Leonardville and contributing to feeding the Stampriet artesian aquifer. Average rainfall recorded at Windhoek weather bureau is 380 mm/a whereby the great majority pours in summer.

Although outdated, according to Department of Water Affairs Database (GROWAS), the majority of the boreholes were drilled to depths of less than 100m below ground level (mbgl), whilst some boreholes on the upper reaches were drilled much deeper. A number of shallow boreholes (< 20mbgl) are present along rivers (streams) in the area, tapping the shallow alluvium aquifers. The water points generally produce less than $5m^3/h$, with higher yields observed along the alluvium aquifers.

Figure 26 below provides an indication of borehole depths and yields in the study area.

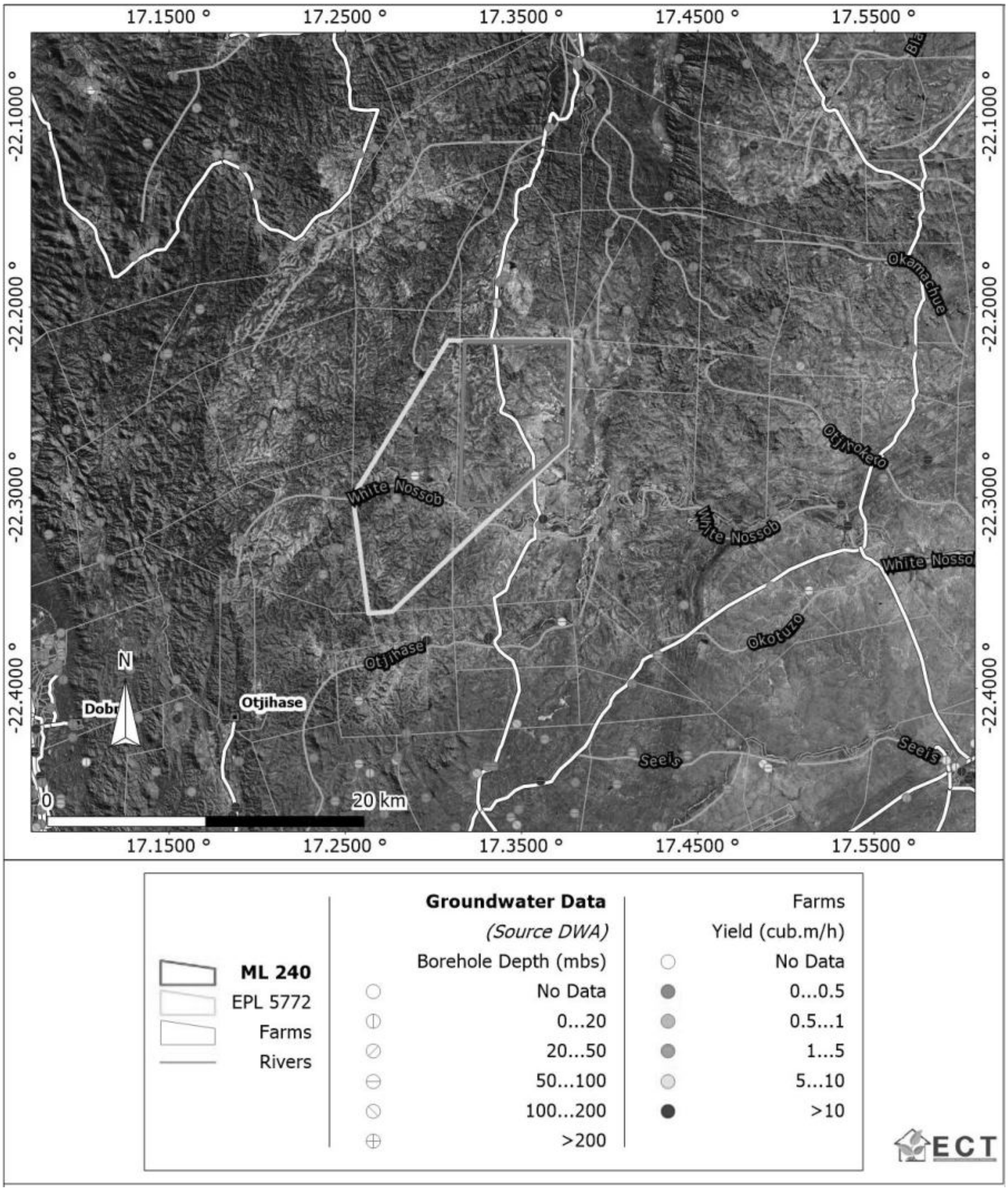


Figure 26. General borehole depth and yields in the project area

A hydrocensus, specific to the location and the magnitude of the project is the basis of any hydrogeological appraisal, and for the case under study is limited to the farms directly adjacent to the project with a particular focus on the White Nossob River. Its alluvium which is estimated to be only 10 – 15 m thick is nevertheless fairly productive. The outcome of the hydrocensus, summarised in Table 23 and map (Figure 27) highlights the abundance of boreholes (Past or existing) along the White Nossob River.

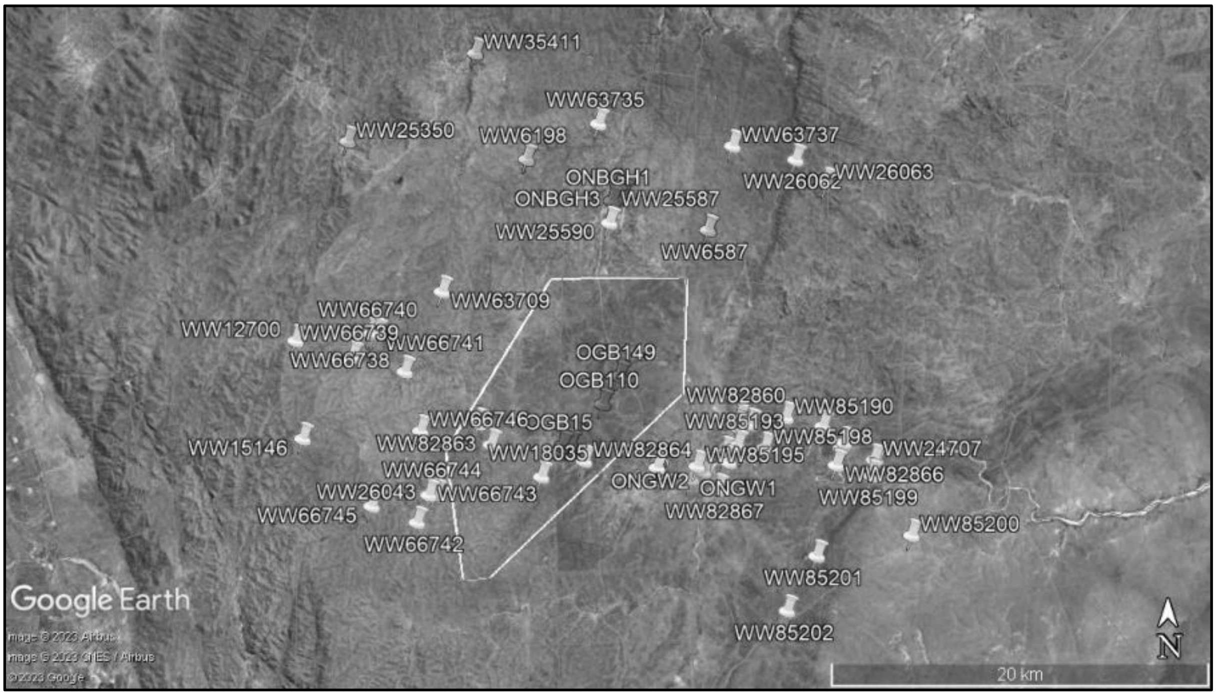


Figure 27. Ongombo mining project hydrocensus

Coffey Mining conducted a hydrocensus in 2013 whereby 9 boreholes were surveyed (in light blue) and 3 were sampled, namely ONGBH1, ONGBH6 and OGB149. While interrogating GROWAS, only 4 boreholes (in blue) were identified by Coffey Mining whereas numerous are used by the latter to generate an interpolated piezometric map.

Two (2) boreholes, namely ONGW1 and ONGW2 are existing boreholes drilled in 2014 on a portion of the neighboring farm Ongombo West. They were test pumped and their sustainable yield is respectively 6 m^3/h (ONGW1) and 7 m^3/h (ONGW2). Their aim was to sustain a flower farm and a nursery. It is envisaged (Communication from Mr Julius, Ongombo West Manager) that an agreement could be obtained between the owner of these boreholes and the Ongombo Copper Project to potentially supply (a portion or in full) the water requirements during the construction and operational phases. Another possibility would be that Ongombo West authorizes, upon agreement, the Ongombo Copper Project to drill borehole(s) on their land to optimize their water needs during the mining period.

A total of forty-nine (49) boreholes were recorded when interrogating GROWAS from which twenty (20) are drilled in or near the White Nossob River thus tapping its productive alluvium. Their known depth is generally less than 100m with yield reaching up to 18 m^3/h. Other boreholes are drilled in the less productive Kuiseb Schists with depth generally beyond 100 m and typically yielding less than 5 m^3/h.

Table 23. Hydrocensus summary

Bh_ID	Coordinates		RWL	Bh Depth	Yield	Farm Name	Comments
	Lat [S]	Long [E]	[mbgl]	[mbgl]	[m3/h]		
WW63733	22.18360	17.34030		70	0.1	Okarumuti	Source: GROWAS
WW25588	22.18600	17.33850				Okarumuti	Source: GROWAS
WW25587	22.18700	17.33750				Okarumuti	Source: GROWAS
WW25590	22.19790	17.33600			0.7	Okarumuti	Source: GROWAS
WW63735	22.15030	17.33030				Okarumuti	Source: GROWAS
WW63737	22.16090	17.39960		70	0.1	Okarumuti Ost	Source: GROWAS
WW26062	22.16760	17.43210				Okaparkaha	Source: GROWAS
WW26063	22.17900	17.44770				Okaparkaha	Source: GROWAS
WW6587	22.20140	17.38660		61	1.1	Okaparkaha	Source: GROWAS
WW85195	22.31390	17.38090				Otjituezu	Source: GROWAS
WW82860	22.29160	17.40260				Otjituezu	Source: GROWAS
WW85191	22.29390	17.40850				Otjituezu	Source: GROWAS
WW85198	22.30530	17.41570				Otjituezu	Source: GROWAS
WW85190	22.29080	17.42660				Otjituezu	Source: GROWAS
WW85192	22.29490	17.44580				Otjituezu	Source: GROWAS
WW84474	22.30270	17.45680				Otjituezu Oos	Source: GROWAS
WW24707	22.31090	17.47220	1.23	60	18	Deutsch-Krone	Source: GROWAS
WW24708	22.31110	17.47320	1.2	67	18	Deutsch-Krone	Source: GROWAS
WW85196	22.31200	17.39730				Voigtskrich	Source: GROWAS
WW82867	22.32500	17.39170				Voigtskrich	Source: GROWAS
WW85194	22.30730	17.39550				Voigtskrich	Source: GROWAS
WW85193	22.30400	17.40180				Voigtskrich	Source: GROWAS
WW84475	22.29560	17.40250				Voigtskrich	Source: GROWAS
WW85197	22.30520	17.45530				Voigtskrich	Source: GROWAS
WW82866	22.31340	17.45260				Voigtskrich	Source: GROWAS
WW85199	22.31840	17.47080		91.4	4	Voigtskrich	Source: GROWAS
WW85202	22.38240	17.42710		88.4	3	Voigtskrich	Source: GROWAS
WW85201	22.35640	17.44240		120.4	2.9	Voigtskrich	Source: GROWAS
WW85200	22.34670	17.49130		109.7	2.5	Voigtskrich	Source: GROWAS
WW82864	22.31140	17.32300				Ongombo West	Source: GROWAS
WW82862	22.31460	17.36040				Ongombo West	Source: GROWAS
WW82863	22.30360	17.27520				Ongombo West	Source: GROWAS
WW15146	22.30060	17.27880	24	61.3	1.6	Ongombo West	Source: GROWAS
WW18035	22.31890	17.30100		109.7		Ongombo West	Source: GROWAS
ONGW1	22.31886	17.37801		52	6	Ongombo West	Source: MCS
ONGW2	22.32067	17.38087		57	7	Ongombo West	Source: MCS
WW66746	22.29700	17.23900	46	122	4	Ongeama Tambuka	Source: GROWAS
WW66745	22.33260	17.21420	20	117	1.6	Ongeama Tambuka	Source: GROWAS
WW66742	22.34030	17.23740	6	77	2	Ongeama Tambuka	Source: GROWAS
WW66743	22.32740	17.24330		110		Ongeama Tambuka	Source: GROWAS
WW26043	22.32640	17.24450				Ongeama Tambuka	Source: GROWAS
WW66744	22.32700	17.24680		94	2	Ongeama Tambuka	Source: GROWAS
Omujeve	22.29375	17.26879				Okatjeru	Source: G. Madec
WW12700	22.25410	17.17490	15.4	139.3	1.8	Okatjeru	Source: GROWAS
WW66739	22.26180	17.20400	7	139	1.6	Okatjeru	Source: GROWAS
WW66738	22.26890	17.23090	15	44	4.3	Okatjeru	Source: GROWAS
WW66740	22.25090	17.21360	5	146	0.8	Okatjeru	Source: GROWAS
WW66741	22.25080	17.21660	3	139	2.7	Okatjeru	Source: GROWAS
WW63709	22.23080	17.25000	15	98	11.3	Okatjeru	Source: GROWAS
WW82865	22.31110	17.36220		5	35	Ongombo Oos	Source: GROWAS
ONBGH1	22.18761	17.33708	5.92	25			Source: Coffey Mining 2013
ONBGH2	22.18687	17.33834	5.24	15			Source: Coffey Mining 2013
ONBGH3	22.18693	17.33891					Source: Coffey Mining 2013
ONBGH4	22.1846	17.34249					Source: Coffey Mining 2013
ONBGH5	22.31172	17.3608					Source: Coffey Mining 2013
ONBGH6	22.30368	17.31541	11.4			Ongombo Oos	Source: Coffey Mining 2013
OGB15	22.30439	17.31144				Oruhungu	Source: Coffey Mining 2013
OGB110	22.28442	17.33226				Ongombo Oos	Source: Coffey Mining 2013
OGB149	22.27116	17.34093				Ongombo Oos	Source: Coffey Mining 2013

Note: Drilled in or near the White Nossob River

It is suggested that water levels from a selection of boreholes listed in the summary table be collated before mining commences. This will feed the database and enable generation of the baseline for monitoring. Water quality is an equally important component for baseline groundwater monitoring, and as such it is also suggested to collect groundwater samples from the boreholes which were dipped for groundwater levels in the summary table. These samples should be dispatched to a laboratory for analysis.

5.7.2.2. Hydrogeology of the Area

The project area has two aquifers – the shallow alluvial aquifer associated with the White Nossob River and the fractured hardrock aquifer of the project zone. The potential of the alluvial aquifer is limited to the data gathered from the hydrocensus. All Namibian rivers flowing eastward see recharge happening in the highlands during the rainy season. The Ongombo Copper Project is located near to where the White Nossob originates, thus the river witnesses some significant run-off, therefore the alluvium thickness consists of 10 m maximum, only locally, since several outcrops cross-cut the river bed upstream and near the project area. Subsequently its recharge is not optimum. The geometry and the hydraulic properties of the alluvial aquifer are locally unknown. In order to improve the water supply of Gobabis, a dam was built on the White Nossob at about seventy (70) km eastward and downstream.

The Black Nossob merges the White Nossob in the north of Leonardsville to form the Nossob River which eventually contributes to feed the Stampriet Artesian Basin, which is known as the Stampriet Subterranean Water Control Area, as defined by law in the Artesian Water Control Ordinance of 1955 (Groundwater Namibia, 2001). Ensuring the quality of the water entering the White Nossob, and the subsequent aquifers, whether fractured or alluvial, is tantamount to safeguarding the integrity of the Stampriet Artesian Basin. Figure 28 below depicts the existing continuity between the Hochfeld-Dordabis-Gobabis basin, where the Ongombo Copper Project is located and the Stampriet basin which relies mostly on the latter for its recharge.

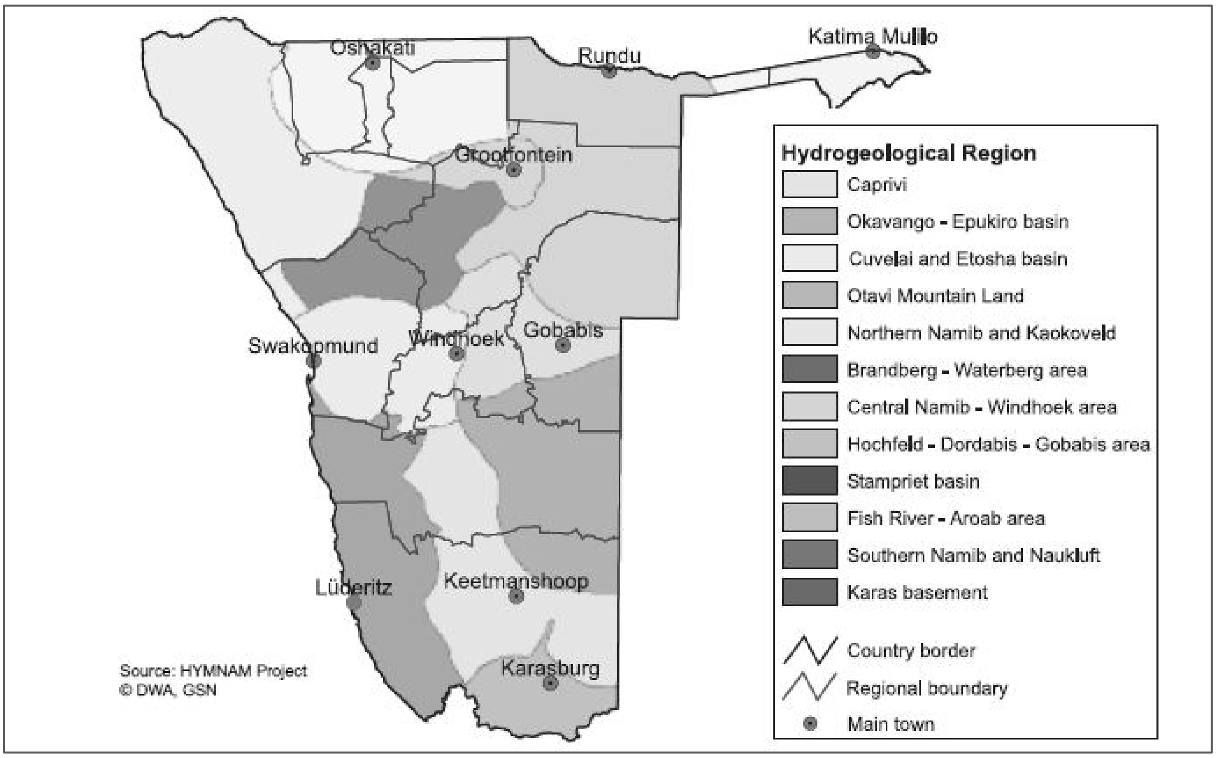


Figure 28. Groundwater basins and hydrogeological regions in Namibia

Moreover, it is suspected that a hydraulic connection between the alluvium of the White Nossob River and the adjacent fractures which can be found along the river course exists. Indeed, a large scale study conducted by Matrix Consulting Services (MCS - 2014) which aimed at supplying water to the neighboring farm Ongombo West, located immediately to the south of farm Ongombo Oos and across the White Nossob River, showed the unexpected potential of the locally fractured quartzitic schists. Apart from a hydrocensus, two boreholes (ONGW1 and ONGW2) were sited by means of ground geophysics (Apex MaxMin – HLEM), successfully drilled to 57 m and 52 m respectively, with fairly shallow water strikes, between 20 m and 40 m deep. Due to the proximity of the White Nossob River, it is safe to assume that there is lateral recharge occurring from this particular source. Drilling was essentially stopped because sufficient volume was attained for the purpose of the project. Both boreholes were pump tested at respectively 7 m^3/h and 6 m^3/h, the maximum attained yield was due to pumping material constraints. It is therefore safe to say that their sustainable yield was not quantified and it is strongly suggested that they be pump tested again to ascertain their sustainable yield so as to refine the hydrogeological parameters such as the Darcy coefficient (K) and the Transmissivity (T).

The shallow water levels measured at ONBGH1, ONBGH2 (Situated both on Farm Okarumuti, north of Ongombo Oos) and ONBGH6 (Farm Ongombo Oos and 250 m north of the White Nossob River, respectively 5.92 mbgl, 5.24 mbgl and 11.94 mbgl, precludes mining without dewatering. An adverse effect would most certainly be on the flora (trees) and consequently the fauna, but the abstracted volumes may in return be used for not only the ore processing but also, and not restricted to, dust suppression, ablution etc.

5.7.2.3. Groundwater Management Plan

The objectives of a management plan are to monitor groundwater levels and groundwater quality. In particular, to establish a baseline for groundwater levels that will enable recognition of any over-abstraction of groundwater, and changes in groundwater quality related to mining activities, in this particular case creating an operational caution.

The following sensitivity and potential impact have been identified on the ground water component (Table 24).

Table 24. Sensitive groundwater component

COMPONENT	SENSITIVITY	VULNERABILITY	POTENTIAL IMPACT
GROUNDWATER	Contaminants infiltrating groundwater as a result of mining activity	High	Groundwater may be contaminated with AMD from mining activity.
	There is low groundwater potential in the fractured rock aquifer	High	Water resources sustainability

The monitoring plan, only generic at this stage, will be updated once the newly drilled monitoring boreholes, strategically collared, will be included into a selection of existing boreholes. A network of monitoring boreholes aims at collecting groundwater data in order to establish a baseline during the first hydrologic year, and thereafter to assess the potential changes in groundwater. Typically, groundwater level in a borehole is measured and a sample is collected and taken to a dedicated laboratory for its quality to be analysed. By doing so, enabling to highlight any significant changes within the groundwater quality which in return could identify a potential pollution from the mining operations in this specific case. Variations of groundwater levels may indicate an over abstraction, should the water level decreases, which negatively impacts the aquifer by stressing it. Alternatively, a recovery in the water level may indicate a recharge, thus a relapse on the strain put on the groundwater resource.

All potential sources of pollution inherent to any mining activities are typically originating from facilities such as: the TSF, the WRD, a Water Return Dam, around a process plant etc. The project is situated upstream a transboundary aquifer, of strategic national interest, the

Stampriet Artesian Basin, thus reinforcing the need of monitoring the groundwater quality. It is equally crucial to monitor the groundwater after mine closure for a period to be yet determined, but a minimum of five (5) years would be recommended; in particular if ARD has been detected.

Groundwater monitoring should be scheduled on a quarterly basis for the predefined monitoring network to obtain a pre-mining baseline, which frequency is likely to be increased to a monthly basis during operations. A selection of boreholes, outside the mining license, must be determined for regional monitoring purpose, which ought to take place bi-annually.

5.7.2.4. Project Water Demand

At this stage, the project water demand varies between 18,720 m^3/a and 41,400 m^3/a, or 52 m^3/d to 113 m^3/d, depending on the anticipated figures of employees. These figures could however change significantly as they are process dependent.

The water demand can be sourced locally from the local hard rock aquifer, which has a limited potential, from the alluvium of the White Nossob River, which is also limited, or from the dewatering of the possible underground operations. The characteristics of each scenario vs the likelihood of meeting the project water needs is discussed in the sections below.

5.7.2.5. Local hard rock aquifer

By “Local hard rock aquifer” it is assumed that it is a fractured aquifer with poor permeability inherent to the rock material which underwent constraints of compressive nature, and limited to the project area surroundings, i.e.: within the mining license and/or along the White Nossob River whereby recharge is enhanced in the event of flash floods. Alternatively, it is suggested to seek agreement with neighbours to secure a water supply source. The groundwater potential is limited in terms of sustainable yield and quality to reach volumes required for the construction of a mine. With boreholes general yielding less than 5 m^3/h, and groundwater which might have to undergo treatment, a supplementary solution must be secured.

Should new boreholes be drilled, targets will typically be fractures and contact zones within schists and essentially near the river banks.

5.7.2.6. White Nossob River Alluvial

Open consultations with the neighboring farming community is vital in ensuring sustainable water use and protection, and avoid conflicts within the communities. It is in that light that direct usage of the groundwater stored in the alluvium should be reduced to a minimum. This will also reduce the pressure on the downstream users.

5.7.2.7. Dewatering Process

Whether the development of the underground is done by stoping or the ore is brought to surface by the conventional bord and pillar methods, groundwater ingress is envisaged. Dewatering underground workings will be required to ensure safe mining operations. Therefore, pre-empting dewatering should be seen as a win-win opportunity. Excavating the ore will not be hampered by groundwater and the said groundwater can, in return, be used for the process needs.

Figure 29 below summarised the three (3) identified water sources. All drilling and abstraction are however subject to permitting.

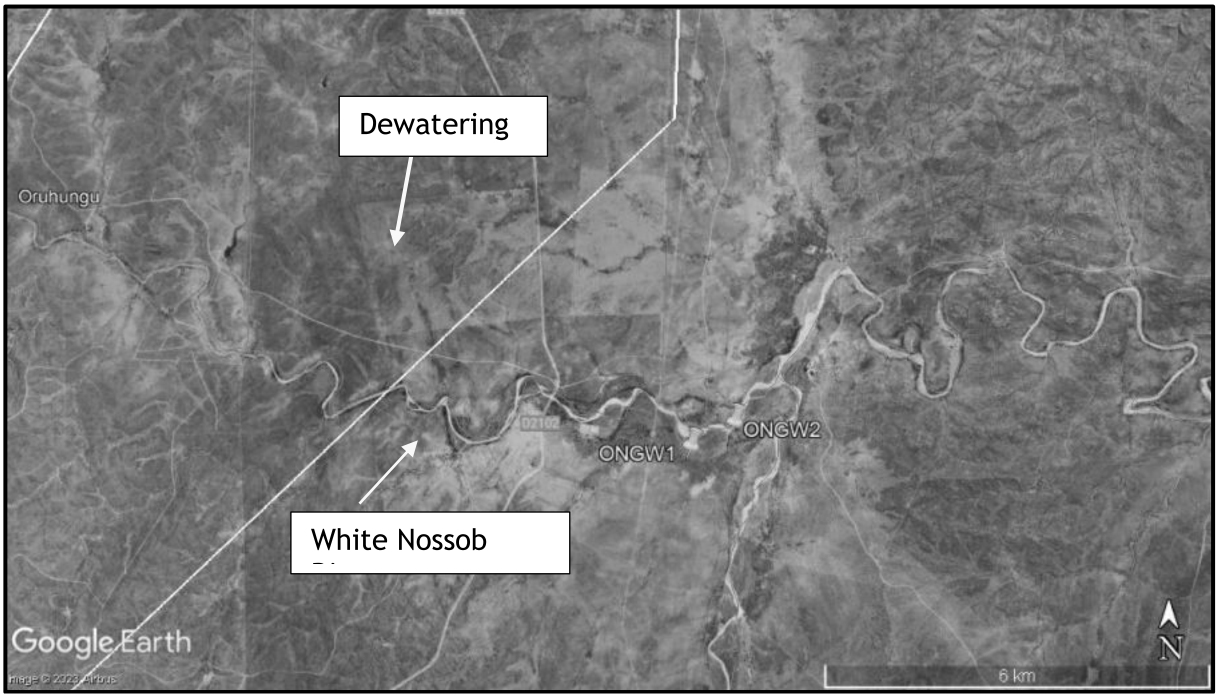


Figure 29. Potential water sources

5.7.2.8. Findings and Recommendations

From the assessment performed, it is concluded that the envisaged mining process would restrict its water usage to a minimum. Groundwater, as the only possible source of water, shall be sourced by either the mine's own drilled boreholes or included into a mix which would include mine boreholes and outsourced water from a neighboring farm (Ongombo

West) for example, and upon agreement. The maximum envisaged daily need is at stage 113 m^3/d. However, given the dynamic of the project this figure may change in both ways, downward or upward. The main usage of water will be the staff on site during operations and possibly dust suppression. Mine dewatering is an essential part of resources extraction, as it lowers the water table around the mine. Given the sensitiveness of the environment, a tight network of monitoring boreholes, on both the fractured aquifer around the mining activities and in the alluvium aquifer of the White Nossob River will be developed and continuously monitored. The integrity of both aquifers may be at risk of over abstraction on one hand, and possible pollution on the other hand. Therefore, the following recommendations arise:

- To secure monitoring boreholes, in both the fractured and the alluvial aquifers, upstream and downstream the proposed mining zone in order to establish a baseline in terms of groundwater quality and groundwater levels;
- The groundwater monitoring patterns is proposed to be on a quarterly basis prior to mining activities start, thereafter on a monthly basis during the life of mine, and again on a quarterly basis after decommissioning for a number of years which should be stipulated in the mine closure plan;
- It is of utmost importance to contain spillage from surface storage facilities such as tailings, waste rock dumps and hydrocarbons. Avoid AMD (due to pyrite) in particular;
- The new Water Act dated 2013 has just been gazetted (September 2023) and compliance with new rules and regulations should be enforced;
- Whether employees are accommodated on site or not, it is suggested to set up a double piping system to collect waste water. One connected to bathroom basins and showers, which water can be used for dust suppression with a minimum treatment, and a second system, connected to the toilets and the kitchen basins which volumes shall be treated by a state-of-the art sewage system, and output to be reused as grey water.

5.7.3. Geochemical Characterisation of the Project Area

In order to assess the mineralogical composition, acid mine drainage potential, and metal concentration of the leachate of host rock, a geochemical assessment of the host rock was conducted by Wilke (2024).

Several reports have been completed for the project including a scoping study in 2013 (Coffey) an updated scoping study in 2021 (Practara) and a geological report (Marlow, 2021). An extensive drill record exists for Ongombo, with 295 collar records. The historical analyses for total S% is as follows:

- Tsumeb Corporation, 1988 drilling programme

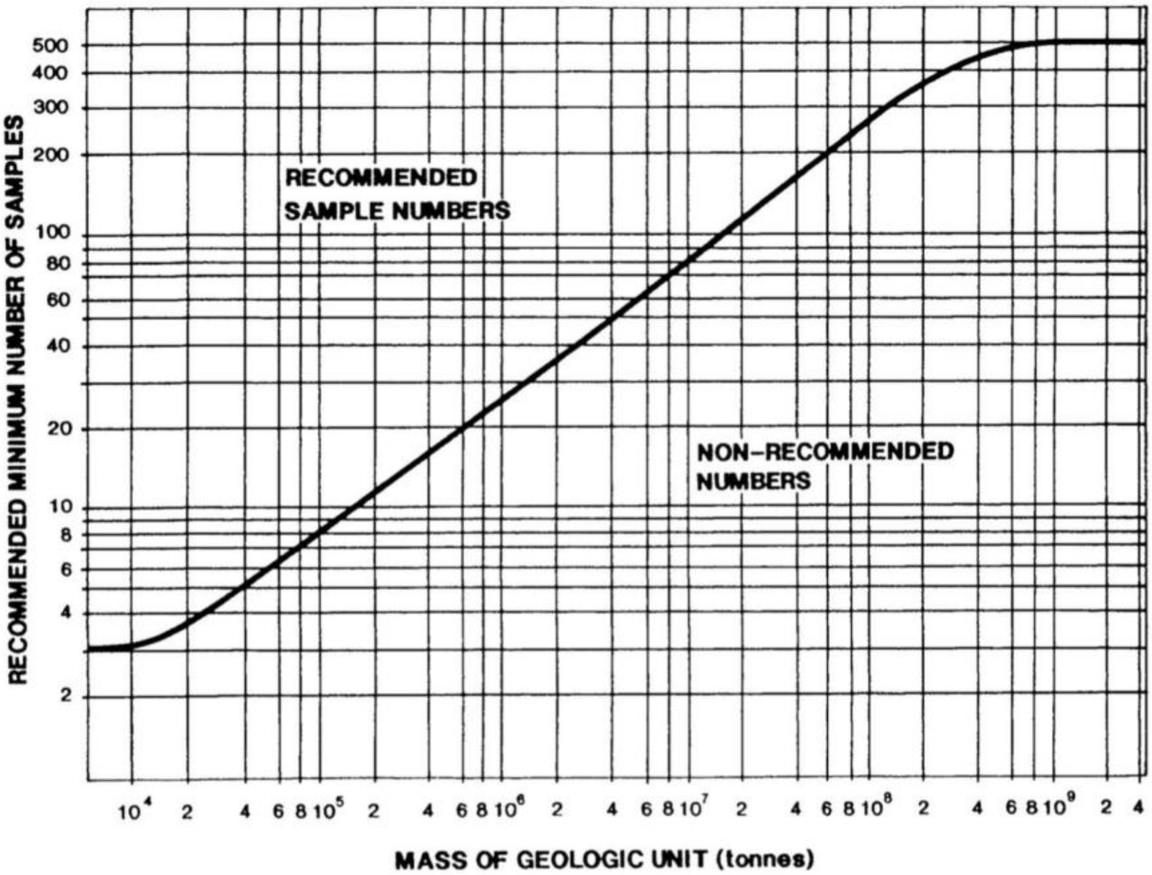
- Namibia Copper Organisation (NCO), 2014 drilling programme
- Shali Group, 2017 drilling programme

The following is noted:

- 1493 analyses for total S% exist in the historic data set (excludes samples labeled as 0 - a total of 313 samples);
- The maximum measured total S% is 44.29%;
- The minimum measured total S% is 0.005%;
- The average measured total S% is 5.50%;
- The median measured total S% is 1.76%;
- 634 samples had a S% of more than 3% (42.5% of the samples).

The geology report gives tonnages for the proposed opencast pit and underground ore body. Comparing the volumes to SRK 1989 gives an estimate of the number of samples recommended and is provided in the table as set out in the table below (Wilke, 2024).

Deposit	Tonnage	Recommended # Samples
Opencast Overburden (15:1 strip ratio)	13.95 Mt	90
Opencast Orebody	0.93 Mt	23
Underground Ore Body	4.7 Mt	52



Metallurgical test work is being carried out on 12 samples, the test programme is not known at present, nor the laboratory.

The latest update (Ongombo Mining, 2023) includes the update on drilling results and is accompanied by the pit layout overlaying the drilling campaigns as shown below in Figure 30.

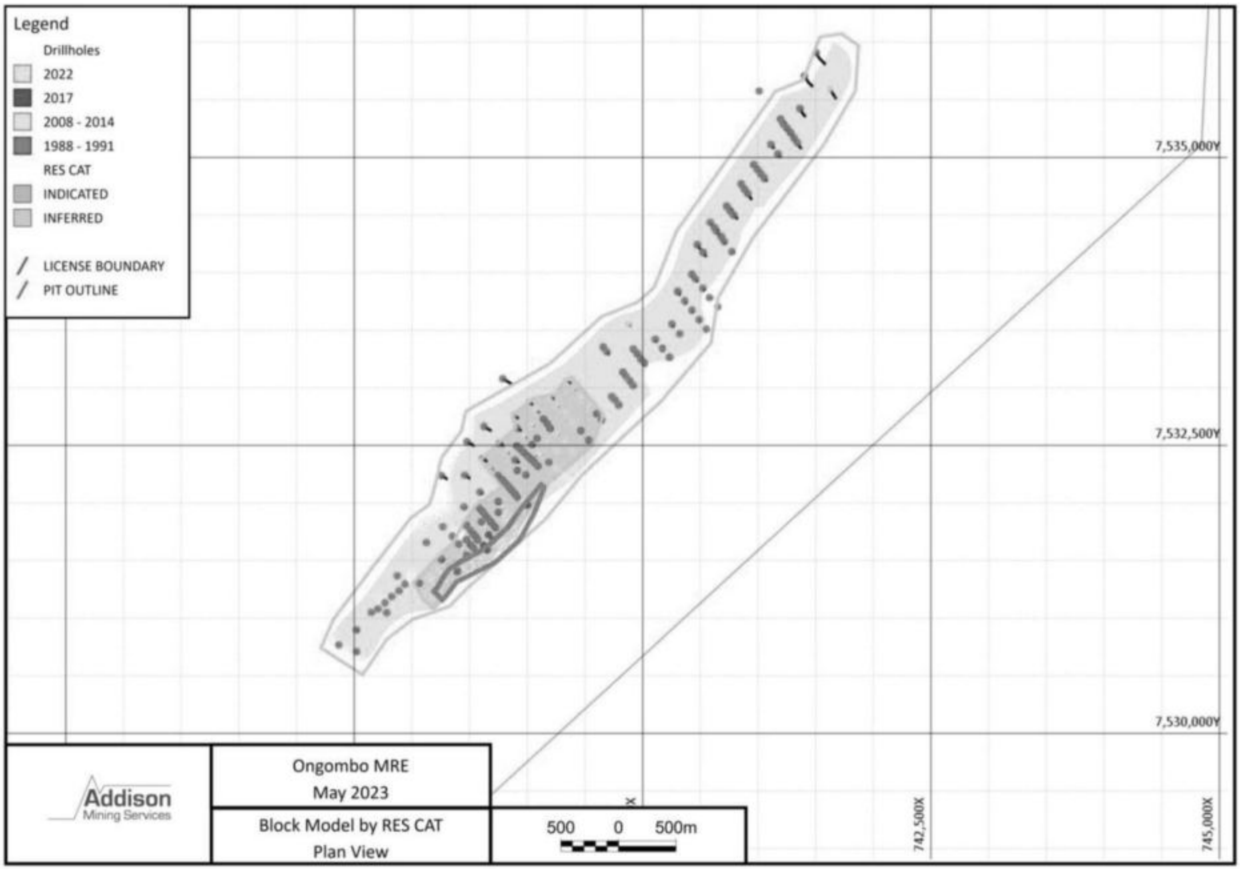


Figure 30. Overlaying of the drilling campaigns

It can be seen that:

- The 2022 drilling campaign (light blue drill locations) covers the opencast pit area, and down dip underground area.
- The majority of boreholes drilled over the larger underground area are from drilling campaigns pre 2014.

The following conclusions can be reached at present:

- A substantial number of total S% analyses have been undertaken, and this will enable the characterisation of the AP of the underground ore body;
- The only samples analysed for the opencast orebody are BO1 through BO5 from the 2022 drilling campaign that included total S% for the orezone (total of 13 samples, minimum of 0.28%, maximum of 11.4% and average of 6.0%, which is within 10% of the total data set).

Following on from the above, further work is proposed for the mining project comprising:

- Selection of 10 samples to represent opencast overburden for AP, NP and NNP analyses from the 2022 drilling campaign. Half the sample should be preserved for possible mineralogical analyses depending on the outcome of the initial analyses;

- Request be made for preservation of the 12 metallurgy samples after testwork in order to determine the likely AP, NP and NNP characteristics of the future waste material; selection of 8 samples to represent the underground ore body (AP and NP to be assessed, but the primary focus is to obtain an initial assessment of the NP).

The above number of samples, based on the SRK (1989) figures would not alone be adequate for a full understanding of the geochemistry. The previous test work and S% available are informative but not definitive. The variability of the NP in the samples would indicate if further analyses are required in order to have confidence in the results of testing (the AP is generally more variable than the NP).

5.8. Fauna and Flora

A biodiversity specialist (Cunningham, 2024) was commissioned for this ESIA. A field survey was conducted between 13 and 14 January 2024 to determine the vertebrate fauna (e.g., reptiles, amphibians, mammals and birds) and flora (trees >1m in height; grasses and other important flora) within the proposed Ongombo Mine project area (ML 240). This survey was preceded by a literature review of the vertebrate fauna and flora known/expected to occur in the general area. See Annexure G for the full assessment report. Below is a summary of the study, providing a description of the fauna and flora at the proposed mine site.

5.8.1. Fauna

Fieldwork to determine the actual vertebrate fauna diversity included the following:

- Small mammal trapping to determine small mammal diversity;
- Larger mammal observations – direct sightings, faeces, tracks, etc.;
- Reptile and amphibian transects (diurnal) to determine reptile and amphibian diversity; and
- Bird transects to determine avian diversity in the area (Cunningham, 2024).

5.8.1.1. Reptile Diversity

Reptile diversity known and/or expected to occur in the general Ongombo area (ML240) is presented in Table 25 below (Cunningham, 2024).

Table 25. Reptile diversity expected to occur in the general Ongombo project area

Species: Scientific name	Species: Common name	Species confirmed	Namibian conservation and legal status	International Status		
				SARDB (2004)	IUCN (2023)	CITES
TURTLES AND TERRAPINS						
Stigmochelys pardalis	Leopard Tortoise	√	Vulnerable; Peripheral; Protected game		LC	C2
Psammobates oculiferus	Kalahari Tent Tortoise	√Δ	Vulnerable; Protected game			C2
Pelomedusa subrufa	Marsh/Helmeted Terrapin	√*	Secure		LC	
SNAKES						
Blind Snakes						
Rhinotyphlops boylei	Boyle's Beaked Blind Snake		Endemic; Secure		LC	
Rhinotyphlops schinzi	Schinz's Beaked Blind Snake		Endemic; Secure	P	LC	
Rhinotyphlops schlegelii	Schlegel's Beaked Blind Snake		Secure			
Thread Snakes						
Leptotyphlops scutifrons	Peters' Thread Snake		Secure		LC	
Namibiana (Leptotyphlops) occidentalis	Western Thread Snake		Endemic; Secure	P	LC	
Pythons						
Python anchietae	Dwarf Python	√Δ	Endemic; Insufficiently known; Protected game		LC	C2
Python natalensis	Southern African Python	√*	Vulnerable; Peripheral; Protected game	V	LC	C2
Burrowing Asps						
Atractraspis bibronii	Bibron's Burrowing Asp	√Δ	Secure			
Quill Snouted Snakes						
Xenocalamus bicolour bicolor	Bicoloured Quill-snouted Snake		Secure			
Xenocalamus mechowii	Elongate Quill-snouted Snake		Secure		LC	
Typical Snakes						
Boaedon (Lamprophis) fuliginosus	Brown House Snake	√Δ	Secure		LC	
Lycophidion capense	Cape Wolf Snake		Secure		LC	
Pseudaspis cana	Mole Snake	√Δ	Secure		LC	
Prosymna bivittate	Two-striped Shovel-snout		Secure		LC	
Prosymna frontalis	South-western Shovel-snout		Endemic; Secure	P	LC	
Dipsina multimaculata	Dwarf Beaked Snake		Endemic; Secure		LC	
Psammophylax tritaeniatus	Striped Skaapsteker	√Δ	Secure		LC	

Species: Scientific name	Species: Common name	Species confirmed	Namibian conservation and legal status	International Status		
				SARDB (2004)	IUCN (2023)	CITES
Psammophis trigrammus	Western Sand Snake		Endemic; Secure		LC	
Psammophis notostictus	Karoo Sand Snake	√Δ	Secure			
Psammophis leightoni trinasalis	Namib Sand Snake		Secure		LC	
Psammophis (brevirostris) leopardinus	Leopard and Short-snouted Grass Snakes	√Δ	Secure		LC	
Philothamnus semivariegatus	Spotted Bush Snake	√Δ	Secure		LC	
Dasypeltis scabra	Common/Rhombic Egg Eater	√Δ	Secure		LC	
Telescopus semiannulatus	Eastern Tiger Snake		Secure			
Telescopus beetzii	Beetz's/Namib Tiger Snake		Secure		LC	
Dispholidus typus	Boomslang	√*	Secure		LC	
Aspidelaps lubricus infuscatus	Coral Snake	√Δ	Secure		LC	
Aspidelaps scutatus	Shield-nose Snake	√Δ	Secure		LC	
Elapsoidea sunderwallii	Sundevall's Garter Snake		Endemic; Secure		LC	
Naja anchietae	Snouted Cobra	√*	Secure		LC	
Naja nivea	Cape Cobra	√Δ	Endemic; Secure		LC	
Naya nigricincta	Black-necked Spitting Cobra	√*	Endemic; Secure	R	LC	
Dendroaspis polylepis	Mamba	√*	Secure		LC	
Bitis arietans	Puff Adder	√*	Secure		LC	
Bitis caudalis	Horned Adder	√Δ	Secure		LC	
Worm Lizard						
Zygaspis quadrifrons	Kalahari Round-headed Worm Lizard	√Δ	Secure			
Monopeltis infuscata	Dusky Spade-snouted Worm Lizard		Secure		LC	
LIZARDS					LC	
Skinks						
Acontias (percivali) occidentalis	Percival's Legless Skink		Secure			
Acontias jappi (Typhlosaurus lineatus lineatus)	Striped Blind Legless Skink		Secure		LC	
Mochlus (Lygosoma) sundevallii	Sundevall's Writhing Skink		Secure		LC	
Trachylepis acutilabris	Wedge-snouted Skink		Secure		LC	
Trachylepis capensis	Cape Skink		Secure		LC	
Trachylepis hoeschi	Hoesch's Skink		Endemic; Secure		LC	

Species: Scientific name	Species: Common name	Species confirme d	Namibian conservation and legal status	International Status		
				SARDB (2004)	IUCN (2023)	CITES
Trachylepis occidentalis	Western Three-striped Skink	√Δ	Secure		LC	
Trachylepis spilogaster	Kalahari Tree Skink	√	Endemic; Secure		LC	
Trachylepis striata wahlbergi	Striped Skink	√Δ	Secure		LC	
Trachylepis sulcata	Western Rock Skink	√	Secure		LC	
Trachylepis variegata punctulata	Variegated Skink	√Δ	Secure		LC	
Old World Lizards						
Heliobolus lugubris	Bushveld Lizard	√Δ	Secure			
Ichnotropis squamulosa	Common Rough-scaled Lizard		Secure		LC	
Meroles suborbitalis	Spotted Desert Lizard	√Δ	Endemic; Secure		LC	
Nucras intertexta	Spotted Sandveld Lizard	√Δ	Endemic; Secure		LC	
Pedioplanis lineoocellata lineoocellata	Spotted Sand Lizard		Endemic; Secure		LC	
Pedioplanis namaquensis	Namaqua Sand Lizard	√	Secure		LC	
Pedioplanis undata	Western Sand Lizard	√	Endemic; Secure		LC	
Plated Lizards						
Cordylosaurus subtessellatus	Dwarf Plated Lizard	√Δ	Endemic; Secure		LC	
Matobosaurus (Gerrhosaurus validus) maltzahni	Giant Plated Lizard	√Δ	Secure		LC	
Girdled Lizards						
Karusasaurus (Cordylus) jordani	Jordan's Girdled Lizard	√Δ	Endemic; Secure		LC	C2
Namazonurus (Cordylus) pustulatus	Auas or Herero Girdled Lizard	√Δ	Endemic; Insufficiently known		LC	C2
Monitors						
Varanus albigularis	Rock or White-throated Monitor	√*	Vulnerable; Peripheral; Protected game	S to V	LC	C2
Agama						
Agama aculeata	Ground Agama	√Δ	Secure		LC	
Agama anchietae	Anchietae's Agama		Secure		LC	
Agama planiceps	Namib/Namibian Rock Agama	√Δ	Endemic; Secure		LC	
Chameleons						
Chamaeleo dilepis	Flap-neck Chameleon	√*	Secure		LC	C2
Chamaeleo namaquensis	Namaqua Chameleon		Secure		LC	C2
Geckos						

Species: Scientific name	Species: Common name	Species confirmed	Namibian conservation and legal status	International Status		
				SARDB (2004)	IUCN (2023)	CITES
Chondrodactylus angulifer angulifer	Common/Giant Ground Gecko	√Δ	Endemic; Secure		LC	
Lygodactylus bradfieldi	Bradfield's Dwarf Gecko	√Δ	Endemic; Secure		LC	
Narudasia festiva	Festive Gecko		Endemic; Secure		LC	
Pachydactylus bicolor	Two-coloured/Velvety Thick-toed Gecko		Endemic; Secure		LC	
Pachydactylus capensis	Cape Thick-toed Gecko		Endemic; Secure		LC	
Pachydactylus turneri	Turner's Thick-toed Gecko	√Δ	Secure		LC	
Pachydactylus punctatus	Speckled Thick-toed Gecko	√Δ	Secure		LC	
Pachydactylus rugosus rugosus	Rough Thick-toed Gecko		Endemic; Secure		LC	
Pachydactylus serval serval	Western Spotted Thick-toed Gecko		Endemic; Secure		LC	
Ptenopus garrulus maculatus	Common Barking Gecko	√Δ	Endemic; Secure		LC	

Since reptiles are an understudied group of animals, especially in Namibia, it is expected that more species may be in the general area than presented above. Various anthropomorphic influences, especially close to Windhoek urban developments, and throughout the area have probably resulted in most of the larger reptiles – e.g., tortoises and pythons – having become extirpated over time (Cunningham, 2024).

5.8.1.2. Amphibian Diversity

Amphibian diversity known and/or expected to occur in the general Ongombo ML240 area, is presented in **Table 26** (Cunningham, 2024).

Table 26. Amphibian diversity expected to occur in the general Ongombo ML240 area.

Species: Scientific name	Species: Common name	Species confirmed	Namibian conservation and legal status	International Status: IUCN (2023)
Rain Frog				
Breviceps adspersus	Bushveld Rain Frog	$\surd^{\Delta}$		LC
Toads				
Amietophrynus poweri	Western Olive Toad	$\surd^{\Delta}$		LC
Poyntonophrynus hoeschi	Hoesch’s Pygmy Toad		Endemic	LC
Kassinas				
Kassina senegalensis	Bubbling Kassina	$\surd^{\Delta}$		LC
Rubber Frog				
Phrynomantis annectens	Marbled Rubber Frog	$\surd^{\Delta}$	Endemic	LC
Puddle Frog				
Phrynobatrachus mababiensis	Dwarf Puddle Frog			
Cacos				LC
Cacosternum boettgeri	Boettger’s Caco			
Bullfrogs				LC
Pyxicephalus adspersus	Giant Bullfrog	√*		LC; Near Threatened*
Sand Frogs				
Tomopterna tandyi	Tandy’s Sand Frog			LC
Platannas				
Xenopus laevis	Common Platanna	$\surd^{\Delta}$		LC

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

According to Mendelsohn et al. (2002), the overall frog diversity in the general area is estimated at between 8-11 species while Jarvis et al. (2022) indicates 9-12 species of which 3 species are viewed as endemic. Griffin (1998b) puts the species richness in the general area at between 11-14 species. According to Griffin (1998b) at least 13 species of amphibians are expected in the Daan Viljoen protected area.

The most important species are the endemic *Poyntonophrynus hoeschi* and *Phrynomantis annectens* although they are widespread in Namibia and not exclusively associated with the general Windhoek area. Temporary pools in the various ephemeral drainage lines and pans are viewed as suitable amphibian habitat throughout the area. Other potential habitats include farm reservoirs and earth dams although the latter are also dependent on localised showers and temporary in nature (Cunningham, 2024).

5.8.1.3. Mammal Diversity

Mammal diversity known and/or expected to occur in the Ongombo EPL ML240 area, is presented in Table 27.

Table 27. Mammal diversity expected to occur in the general Ongombo EPL ML240 area

Species: Scientific name	Species: Common name	Species confirmed	Namibian conservation and legal status	Red List - Namibia (carnivores)	International Status		
					SARDB (2004)	IUCN (2023)	CITES
Elephant Shrews							
Macroscelides proboscideus	Round-eared Elephant-shrew		Secure			LC	
Elephantulus rupestris	Western Rock Elephant-shrew		Secure			LC	
Elephantulus intufi	Bushveld Elephant-shrew	√Δ	Secure		DD	LC	
Aardvark							
Orycteropus afer	Aardvark	√	Secure; Protected Game			LC	
Shrews							
Crocidura fuscomurina	Tiny Musk Shrew		Secure		DD	LC	
Crocidura cyanea	Reddish-grey Musk Shrew	√Δ	Secure		DD	LC	
Hyrax							
Procavia capensis	Rock Hyrax	√	Secure; Problem animal			LC	
Bats							
Eidolon helvum	African straw-coloured Fruit Bat		Secure; Migrant			NT	
Tadarida aegyptiaca	Egyptian Free-tailed Bat		Secure			LC	
Neoromicia capensis	Cape Serotine Bat		Secure			LC	
Neoromicia zuluensis	Zulu Serotine Bat		Secure			LC	
Cistugo seabrae	Namibian Wing-gland Bat		Endemic; Rare		V	LC	
Eptesicus hottentotus	Long-tailed Serotine Bat		Secure			LC	
Nycteris thebaica	Egyptian Slit-faced Bat		Secure			LC	
Rhinolophus fumigatus	Rüppell's Horseshoe Bat		Secure		NT	LC	
Rhinolophus clivosus	Geoffroy's Horseshoe Bat		Secure		NT	LC	
Rhinolophus darlingi	Darling's Horseshoe Bat		Secure; Peripheral		NT	LC	
Rhinolophus denti	Dent's Horseshoe Bat		Secure		NT	LC	
Rhinolophus fumigatus	Rüppell's Horseshoe Bat		Secure		NT	LC	
Hipposideros commersoni	Commerson's Roundleaf Bat		Secure			NT	
Hipposideros caffer	Sundevall's Roundleaf Bat		Secure		DD	LC	
Hipposideros gigas	Giant Leaf-nosed Bat		Not listed			LC	
Hipposideros vittatus	Striped Leaf-nosed Bat		Not Listed			NT	

Species: Scientific name	Species: Common name	Species confirmed	Namibian conservation and legal status	Red List - Namibia (carnivores)	International Status		
					SARDB (2004)	IUCN (2023)	CITES
Sauromys petrophilus	Roberts's Flat-headed Bat		Secure			LC	
Miniopterus natalensis	Natal Long-fingered Bat		Secure		NT	LC	
Scotophilus dinganii	Yellow-bellied House Bat	√Δ	Secure			LC	
Hares and Rabbits							
Lepus capensis	Cape Hare	√	Secure			LC	
Lepus saxatilis	Scrub Hare		Secure			LC	
Pronolagus randensis	Jameson's Red Rock Rabbit		Secure			LC	
Rodents							
Molerat							
Fukomys (Cryptomys) damarensis	Damaraland Mole-Rat	√Δ	Secure			LC	
Porcupine							
Hystrix africaeaustralis	Cape Porcupine	√	Secure			LC	
Rats and Mice							
Petromys typicus	Dassie Rat	√	Endemic; Secure		NT		
Pedetes capensis	Springhare	√Δ	Secure			LC	
Xerus inaurus	South African Ground Squirrel	√	Secure			LC	
Xerus princeps	Damara Ground Squirrel		Endemic		NT		
Graphiurus murinus	Woodland Dormouse		Secure			LC	
Rhabdomys pumilio	Four-striped Grass Mouse	√Δ	Secure			LC	
Mus indutus	Desert Pygmy Mouse		Secure			LC	
Mastomys coucha	Southern Multimammate Mouse		Secure			LC	
Thallomys paedulcus	Acacia Rat	√Δ	Secure			LC	
Thallomys nigricauda	Black-tailed Tree Rat	√Δ	Secure			LC	
Aethomys chrysophilus	Red Veld Rat		Secure			LC	
Micaelamys (Aethomys) namaquensis	Namaqua Rock Mouse	√Δ	Secure			LC	
Desmodillus auricularis	Cape Short-tailed Gerbil		Secure			LC	
Gerbillurus paeba	Hairy-footed Gerbil		Insufficiently Known			LC	
Gerbilliscus (Tatera) leucogaster	Bushveld Gerbil	√Δ	Secure		DD	LC	

Species: Scientific name	Species: Common name	Species confirmed	Namibian conservation and legal status	Red List - Namibia (carnivores)	International Status		
					SARDB (2004)	IUCN (2023)	CITES
Gerbilliscus (Tatera) brantsii	Highveld Gerbil		Secure			LC	
Saccostomus campestris	Pouched Mouse		Secure			LC	
Malacothrix typica	Gerbil Mouse		Secure			LC	
Petromyscus collinus	Pygmy Rock Mouse	√Δ	Endemic; Secure			LC	
Mus musculus	House Mouse	√Δ	Invasive alien			LC	
Primates							
Galago moholi	South African Galago		Vulnerable; Protected Game			LC	C2
Papio ursinus	Chacma Baboon	√	Secure; Problem animal			LC	C2
Hedgehog							
Atelerix frontalis angolae	Southern African Hedgehog	√Δ	Insufficiently Known; Rare; Protected Game		NT	LC	
Pangolin							
Smutsia (Manis) temminckii	Ground Pangolin	√*	Vulnerable; Peripheral; Protected Game		V	V	C2
Carnivores							
Proteles cristatus	Aardwolf	√*	Insufficiently known; (Vulnerable?); Peripheral			LC	
Parahyaena (Hyaena) brunnea	Brown Hyena	√	Insufficiently known; (Vulnerable?); Peripheral	NT	NT	NT	
Crocuta crocuta	Spotted Hyena		Secure?; Peripheral	V	NT	LC	
Acinonyx jubatus	Cheetah	√*	Vulnerable; Protected Game	E	V	V	C1
Panthera pardus	Leopard	√*	Secure?; Peripheral; Protected Game	V		V	C1
Caracal caracal	Caracal	√*	Secure; Problem Animal			LC	C2
Felis silvestris	African Wild Cat	√*	Vulnerable			LC	C2
Felis nigripes	Black-footed Cat		Indeterminate; Rare	V		V	C1
Genetta genetta	Small Spotted Genet	√Δ	Secure			LC	
Suricata suricatta marjoriae	Suricate	√Δ	Endemic; Secure			LC	
Cynictis penicillata	Yellow Mongoose	√	Secure			LC	
Galerella sanguinea	Slender Mongoose	√	Secure				
Otocyon megalotis	Bat-eared Fox	√*	Vulnerable?; Peripheral			LC	
Vulpes chama	Cape Fox	√Δ	Vulnerable?			LC	

Species: Scientific name	Species: Common name	Species confirmed	Namibian conservation and legal status	Red List - Namibia (carnivores)	International Status		
					SARDB (2004)	IUCN (2023)	CITES
Canis mesomelas	Black-backed Jackal	√*	Secure; Problem animal			LC	
Mellivora capensis	Honey Badger/Ratel	√$^{\Delta}$	Secure; Protected Game		NT	LC	
Ictonyx striatus	Striped Polecat	√*	Secure			LC	
Zebra							
Equus zebra hartmannae	Hartmann's Mountain Zebra	√$^{\Delta}$	Endemic; Secure; Specially Protected Game		E	V	C1
Pigs							
Phacochoerus africanus	Common Warthog	√	Secure; Huntable Game			LC	
Antelopes							
Tragelaphus strepsiceros	Greater Kudu	√	Secure; Huntable Game			LC	
Alcelaphus buselaphus	Red Hartebeest	√	Secure; Protected Game			LC	
Oryx gazella	Gemsbok	√	Secure; Huntable game			LC	
Sylvicapra grimmia	Common Duiker	√	Secure			LC	
Antidorcas marsupialis	Springbok	√	Secure; Huntable game			LC	
Madoqua (damarensis) kirkii	Damara Dik-Dik	√$^{\Delta}$	Insufficiently known; Protected Game			LC	
Raphicerus campestris	Steenbok	√	Secure; Protected Game			LC	
Oreotragus oreotragus	Klipspringer	√*	Secure; Specially Protected Game			LC	

Namibia is well endowed with mammal diversity with at least 250 species occurring in the country. According to the literature at least 83 species of mammals are known and/or expected to occur in the general area of which 6 species (7.2%) are classified as endemic. The Namibian legislation classifies 8 species as vulnerable, 3 species as rare, 2 species as specially protected game, and 10 species as protected game, 5 species as insufficiently known and 7 species as peripheral, 1 species as indeterminate, and 4 species as huntable game, 2 species as not listed, 1 species as invasive and 3 species as problem animals. At least 33.8% (25 species) of the mammalian fauna that occur or are expected to occur in general area are represented by rodents of which 3 species (12%) are endemic. This is followed by bats with 22.9% (19 species) of which 1 species is classified as endemic and rare (i.e., *Cistugo seabrai*) (5.3%) and carnivores with 20.5% (17 species) of which 1 species (5.9%) is endemic.

The most important species from the general area are all those classified by the IUCN (2023) as vulnerable (*Smutsia* (*Manis*) *temminckii, Acinonyx jubatus, Panthera pardus, Felis nigripes*, *Equus zebra hartmannae*) and near threatened (*Eidolon helvum, Hipposideros commersoni, Hipposideros vittatus, Parahyaena* (*Hyaena*) *brunnea*) and rare under Namibian legislation (Namibian wing-gland bat, hedgehog and black-footed cat). Carnivores are often also indiscriminately killed with the black-footed cat probably one of the most threatened species expected to occur in the general area. Pangolin and hedgehog are other species of concern throughout their range in Namibia. None of the mammals, especially the important species, is exclusively associated with the Ongombo ML240 area.

5.8.1.4. Avian Diversity

Bird diversity known and/or expected to occur in the general Ongombo area (ML240) is presented in Table 28. This table excludes coastal marine birds although some may occasionally occur in the area (e.g., gulls and terns), migratory birds (e.g. Petrel, Albatross, Skua, etc.) and species breeding extralimital (e.g. stints, sandpipers, etc.) and rather focuses on birds that are breeding residents or can be found in the area during any time of the year. This would imply that many more birds (e.g., Palaearctic migrants) could occur in the area depending on “favourable” environmental conditions (Cunningham, 2024).

Bird diversity is viewed as “high” in the general area with 201-230 species estimated and 4-5 species being endemic (Mendelsohn et al. 2000, Jarvis et al. 2022). Simmons (1998a) suggests 4-6 endemic species and a “high” ranking for southern African endemics and “average” ranking for red data birds expected from the general area. The Ongombo project area is not classified as an Important Birding Area (IBA) in Namibia (Simmons 1998a) and closest such site is located at the Waterberg approximately 350km to the north-east. Dams in the general area – e.g., Avis, Daan Viljoen, Otjivero, Von Bach and Swakoppoort Dams –

are viewed as important breeding, feeding and roosting sites for a variety of aquatic birds.

Most aquatic species (e.g., ducks, etc.) are highly mobile and not expected to be permanently associated with the area although permanent water bodies such as the larger dams are viewed as suitable aquatic habitat.

The most important species are viewed as the Namibian endemics – especially rockrunner – and those classified by Simmons et al. (2015) as endangered (i.e., violet wood-hoopoe, Ludwig's bustard, white-backed vulture, black harrier, black stork, saddle-billed stork, tawny, booted and martial eagles) and the IUCN (2023) as critically endangered (white-backed vulture), endangered (Ludwig's bustard, lappet-faced vulture, black harrier, martial eagle, secretary bird), vulnerable (tawny eagle) and near threatened (kori bustard, pallid harrier). Other important species such as the greater and lesser flamingoes are excluded in Table 28 as they are not known and/or expected to breed or be permanently associated with the area (Cunningham, 2024).

Of the 49 species observed and/or confirmed from the area during the fieldwork, the white-backed vulture, and the lappet-faced vulture, classified as critically endangered and endangered by the IUCN (2023), respectively, are viewed as the most important. *Aegypius tracheliotos* (lappet-faced vulture) – endangered – were observed in the Ongombo area. Although nests are known on the neighbouring farm (Okarumuti) no nests are known and/or observed on the Ongombo project area (P. Bianchi *Pers. com.*).

None of the birds, especially the important species, are exclusively associated with the Ongombo ML240 area

Table 28. Avian diversity expected to occur in the general Ongombo ML240 area

pecies: Scientific name	Species: Common name	Species confirmed	Namibian conservation and legal status	International Status	
				Southern Africa	IUCN (2022)
Struthio camelus	Common Ostrich				
Scleroptila levaillantoides	Orange River Francolin	√		N-end	
Pternistis hartlaubi	Hartlaub's Spurfowl		End	N-end	
Pternistis adspersus	Red-billed Spurfowl	√		N-end	
Pternistis swainsonii	Swainson's Spurfowl				
Coturnix coturnix	Common Quail	√$^{\Delta}$			
Coturnix delegorguei	Harlequin Quail				
Numida meleagris	Helmeted Guineafowl	√			
Dendrocygna viduata	White-faced Duck	√$^{\Delta}$			
Oxyura maccoa	Maccoa Duck	√$^{\Delta}$	NT		
Alopochen aegyptiaca	Egyptian Goose	√			
Tadorna cana	South African Shelduck	√$^{\Delta}$		End	
Sarkidiornis melanotos	Comb Duck				
Anas capensis	Cape Teal	√$^{\Delta}$			
Anas smithii	Cape Shoveler	√$^{\Delta}$		End	
Anas erythrorhyncha	Red-billed Teal	√			
Anas hottentota	Hottentot Teal				
Netta erythrophthalma	Southern Pochard	√$^{\Delta}$			
Turnix sylvaticus	Kurrichane Buttonquail				
Indicator minor	Lesser Honeyguide				
Campethera bennettii	Bennett's Woodpecker				
Campethera abingoni	Golden-tailed Woodpecker	√$^{\Delta}$			
Dendropicos fuscescens	Cardinal Woodpecker	√$^{\Delta}$			
Dendropicos namaquus	Bearded Woodpecker				
Tricholaema leucomelas	Acacia Pied Barbet	√$^{\Delta}$		N-end	
Tockus monteiri	Monteiro's Hornbill	√$^{\Delta}$	End		
Tockus damarensis	Damara Hornbill	√$^{\Delta}$	End	N-end	
Tockus leucomelas	Southern Yellow-billed Hornbill	√		N-end	
Tockus nasutus	African Grey Hornbill	√$^{\Delta}$			

pecies: Scientific name	Species: Common name	Species confirmed	Namibian conservation and legal status	International Status	
				Southern Africa	IUCN (2022)
Upupa Africana	African Hoopoe	√Δ			
Phoeniculus purpureus	Green Wood-Hoopoe				
Phoeniculus damarensis	Violet Wood-Hoopoe		E; N-End		
Rhinopomastus cyanomelas	Common Scimitarbill	√			
Coracius garrulus	European Roller		NT		
Coracias caudatus	Lilac-breasted Roller	√Δ			
Coracias naevius	Purple Roller				
Merops hirundineus	Swallow-tailed Bee-eater	√			
Merops persicus	Blue-cheeked Bee-eater				
Colius colius	White-backed Mousebird	√Δ		End	
Urocolius indicus	Red-faced Mousebird	√Δ			
Poicephalus rueppellii	Rüppell’s Parrot		NT; N-End	N-end	
Agapornis roseicollis	Rosy-faced Lovebird	√Δ	End	N-end	
Cypsiurus parvus	African Palm Swift	√Δ			
Tachymarptis melba	Alpine Swift				
Apus bradfieldi	Bradfield’s Swift			N-end	
Apus affinis	Little Swift	√			
Apus horus	Horus Swift				
Apus caffer	White-rumped Swift				
Corythaixoides concolor	Grey Go-away Bird	√			
Tyto alba	Barn Owl	√Δ			
Otus senegalensis	African Scops-Owl				
Ptilopsis granti	Southern White-faced Scops-Owl				
Bubo africanus	Spotted Eagle Owl	√Δ			
Bubo lacteus	Verreaux’s Eagle-Owl				
Glaucidium perlatum	Pearl-spotted Owlet	√Δ			
Glaucidium capense	African Barred Owlet				
Caprimulgus pectoralis	Fiery-necked Nightjar				
Caprimulgus tristigma	Freckled Nightjar	√Δ			
Caprimulgus rufigena	Rufous-cheeked Nightjar				
Columba livia	Rock Dove	√Δ			

pecies: Scientific name	Species: Common name	Species confirmed	Namibian conservation and legal status	International Status	
				Southern Africa	IUCN (2022)
Columba guinea	Speckled Pigeon	√Δ			
Streptopelia capicola	Cape Turtle Dove	√			
Streptopelia senegalensis	Laughing Dove	√Δ			
Oena capensis	Namaqua Dove	√Δ			
Neotis ludwigii	Ludwig's Bustard		E	N-end	E
Ardeotis kori	Kori Bustard	√Δ	NT		NT
Lophotis ruficrista	Red-crested Korhaan	√		N-end	
Afrotis afraoides	Northern Black Korhaan	√		End	
Amaurornis flavirostris	Black Crake				
Gallinula chloropus	Common Moorhen				
Fulica cristata	Red-knobbed Coot				
Pterocles namaqua	Namaqua Sandgrouse			N-end	
Pterocles bicinctus	Double-banded Sandgrouse	√Δ		N-end	
Pterocles burchelli	Burchell's Sandgrouse			N-end	
Actophilornis africanus	African Jacana				
Burhinus capensis	Spotted Thick-knee	√Δ			
Vanellus armatus	Blacksmith Lapwing	√			
Vanellus coronatus	Crowned Lapwing	√			
Rhinoptilus africanus	Double-banded Courser				
Rhinoptilus chalcopterus	Bronze-winged Courser				
Cursorius rufus	Burchell's Courser			N-end	
Cursorius temminckii	Temminck's Courser	√Δ			
Elanus caeruleus	Black-shouldered Kite	√Δ			
Gyps africanus	White-backed Vulture	√	E		CE
Aegypius tracheliotos	Lappet-faced Vulture	√	V		E
Circaetus pectoralis	Black-chested Snake-Eagle	√Δ			
Circaetus cinereus	Brown Snake-Eagle	√Δ			
Circus maurus	Black Harrier		E	End	E
Circus macrourus	Pallid Harrier		NT		NT
Polyboroides typus	African Harrier-Hawk	√Δ			

pecies: Scientific name	Species: Common name	Species confirmed	Namibian conservation and legal status	International Status	
				Southern Africa	IUCN (2022)
Melierax canorus	Southern Pale Chanting Goshawk	√		N-end	
Melierax gabar	Gabar Goshawk	√			
Accipiter badius	Shikra				
Accipiter minullus	Little Sparrowhawk				
Buteo vulpinus	Steppe Buzzard				
Buteo augur	Augur Buzzard	√Δ			
Buteo rufofuscus	Jackal Buzzard			End	
Pandion haliaetus	Osprey	√Δ			
Haliaeetus vocifer	African Fish Eagle	√Δ	V		
Aquila rapax	Tawny Eagle	√Δ	E		V
Aquila verreauxii	Verreaux's Eagle	√Δ	NT		
Aquila spilogaster	African Hawk-Eagle	√			
Aquila pennatus	Booted Eagle		E		
Aquila wahlbergi	Wahlberg's Eagle				
Polemaetus bellicosus	Martial Eagle	√Δ	E		E
Sagittarius serpentarius	Secretarybird		V		E
Polihierax semitorquatus	Pygmy Falcon	√Δ			
Falco rupicolus	Rock Kestrel	√Δ			
Falco rupicoloides	Greater Kestrel				
Falco vespertinus	Red-footed Falcon	√Δ	NT		
Falco chicquera	Red-necked Falcon				
Falco biarmicus	Lanner Falcon	√Δ			
Falco peregrinus	Peregrine Falcon	√Δ	NT		
Tachybaptus ruficollis	Little Grebe	√			
Podiceps nigricollis	Black-necked Grebe		NT		
Anhinga rufa	African Darter	√Δ			
Phalacrocorax africanus	Reed Cormorant	√Δ			
Phalacrocorax lucidus	White-breasted Cormorant	√Δ			
Egretta garzetta	Little Egret	√Δ			
Egretta intermedia	Yellow-billed Egret	√Δ			

pecies: Scientific name	Species: Common name	Species confirmed	Namibian conservation and legal status	International Status	
				Southern Africa	IUCN (2022)
Egretta alba	Great Egret	√$^{\Delta}$			
Ardea cinerea	Grey Heron	√$^{\Delta}$			
Ardea melanocephala	Black-headed Heron				
Ardea goliath	Goliath Heron				
Ardea purpurea	Purple Heron				
Bubulcus ibis	Cattle Egret	√$^{\Delta}$			
Ardeola ralloides	Squacco Heron	√$^{\Delta}$			
Butorides striata	Green-backed Heron				
Nycticorax nycticorax	Black-crowned Night-Heron				
Ixobrychus minutus	Little Bittern				
Scopus umbrette	Hamerkop				
Platalea alba	African Spoonbill	√$^{\Delta}$			
Pelecanus onocrotalus	Great White Pelican	√$^{\Delta}$	V		
Ciconia nigra	Black Stork		E		
Ephippiorhynchus senegalensis	Saddle-billed Stork		E		
Leptoptilos crumenifer (crumeniferus)	Marabou Stork	√$^{\Delta}$	NT		
Dicrurus adsimilis	Fork-tailed Drongo	√			
Terpsiphone viridis	African Paradise-Flycatcher	√$^{\Delta}$			
Nilaus afer	Brubru	√$^{\Delta}$			
Tchagra australis	Brown-crowned Tchagra	√$^{\Delta}$			
Laniarius atrococcineus	Crimson-breasted Shrike	√		N-end	
Telophorus zeylonus	Bokmakierie	√$^{\Delta}$		N-end	
Lanioturdus torquatus	White-tailed Shrike	√$^{\Delta}$	End	N-end	
Batis pririt	Pririt Batis	√$^{\Delta}$		N-end	
Corvus capensis	Cape Crow	√$^{\Delta}$			
Corvus albus	Pied Crow	√$^{\Delta}$			
Lanius collaris	Common Fiscal	√			
Eurocephalus anguitimens	Southern White-crowned Shrike			N-end	
Anthoscopus minutes	Cape Penduline Tit	√$^{\Delta}$		N-end	
Parus carpi	Carp's Tit		End	N-end	

pecies: Scientific name	Species: Common name	Species confirmed	Namibian conservation and legal status	International Status	
				Southern Africa	IUCN (2022)
Parus cinerascens	Ashy Tit			End	
Riparia paludicola	Brown-throated Martin				
Hirundu albigularis	White-throated Swallow	√			
Hirundo dimidiata	Pearl-breasted Swallow				
Hirundo cucullata	Greater Striped Swallow	√$^{\Delta}$			
Hirundo semirufa	Red-breasted Swallow				
Hirundo fuligula	Rock Martin	√			
Delichon urbicum	Common House Martin				
Pycnonotus nigricans	African Red-eyed Bulbul	√$^{\Delta}$		N-end	
Achaetps pycnopygius	Rockrunner	√$^{\Delta}$	End	N-end	
Sylvietta rufescens	Long-billed Crombec	√$^{\Delta}$			
Eremomela icteropygialis	Yellow-bellied Eremomela	√$^{\Delta}$			
Eremomela gregalis	Karoo Eremomela			End	
Eremomela usticollis	Burnt-necked Eremomela				
Turdoides bicolor	Southern Pied Babbler	√		End	
Parisoma layardi	Layard’s Tit-Babbler			End	
Parisoma subcaeruleum	Chestnut-vented Tit-Babbler	√		N-end	
Zosterops pallidus	Orange River White-eye	√$^{\Delta}$		End	
Cisticola chiniana	Rattling Cisticola				
Cisticola rufilatus	Tinkling Cisticola				
Cisticola subruficapilla	Grey-backed Cisticola			N-end	
Cisticola juncidis	Zitting Cisticola				
Cisticola jaridulus	Desert Cisticola				
Prinia flavicans	Black-chested Prinia	√			
Malcorus pectoralis	Rufous-eared Warbler			End	
Camaroptera brevicaudata	Grey-backed Camaroptera	√$^{\Delta}$			
Calamonastes fasciolatus	Barren Wren-Warbler			N-end	
Mirafra passerina	Monotonous Lark				
Mirafra africana	Rufous-naped Lark				
Mirafra fasciolata	Eastern Clapper Lark			N-end	
Mirafra sabota	Sabota Lark	√			

pecies: Scientific name	Species: Common name	Species confirmed	Namibian conservation and legal status	International Status	
				Southern Africa	IUCN (2022)
Calendulauda africanoides	Fawn-coloured Lark			N-end	
Pinarocorys nigricans	Dusky Lark				
Chersomanes albofasciata	Spike-heeled Lark	√		N-end	
Certhilauda subcoronata	Karoo Long-billed Lark			End	
Eremopterix leucotis	Chestnut-backed Sparrowlark				
Eremopterix verticalis	Grey-backed Sparrowlark			N-end	
Calandrella cinerea	Red-capped Lark				
Alauda starki	Stark's Lark			N-end	
Monticola brevipes	Short-toed Rock Thrush	√$^{\Delta}$			
Psophocichla litsitsirupa	Groundscraper Thrush	√$^{\Delta}$			
Bradornis infuscatus	Chat Flycatcher			N-end	
Melaenornis mariquensis	Marico Flycatcher	√		N-end	
Muscicapa striata	Spotted Flycatcher				
Cercotrichas leucophrys	White-browed Scrub-Robin				
Cercotrichas paena	Kalahari Scrub-Robin	√			
Oenanthe monticola	Mountain Wheatear	√$^{\Delta}$		N-end	
Oenanthe pileata	Capped Wheatear	√$^{\Delta}$			
Cercomela schlegelii	Karoo Chat			N-end	
Cercomela familiaris	Familiar Chat	√$^{\Delta}$			
Myrmecocichla formicivora	Ant-eating Chat	√		End	
Onychognathus nabouroup	Pale-winged Starling	√$^{\Delta}$		N-end	
Lamprotornis nitens	Cape Glossy Starling	√			
Lamprotornis australis	Burchell's Starling				
Cinnyricinclus leucogaster	Violet-backed Starling				
Creatophora cinerea	Wattled Starling	√			
Chalcomitra senegalensis	Scarlet-chested Sunbird	√$^{\Delta}$			
Nectarinia fusca	Dusky Sunbird	√$^{\Delta}$		N-end	
Cinnyris mariquensis	Marico Sunbird				
Bualornis niger	Red-billed Buffalo-Weaver	√			
Sporopipes squamifrons	Scaly-feathered Finch	√		N-end	
Plocepasser mahali	White-browed Sparrow-Weaver	√			

pecies: Scientific name	Species: Common name	Species confirmed	Namibian conservation and legal status	International Status	
				Southern Africa	IUCN (2022)
Philetairus socius	Sociable Weaver			End	
Ploceus intermedius	Lesser Masked-Weaver	√$^{\Delta}$			
Ploceus velatus	Southern Masked-Weaver	√			
Ploceus rubiginosus	Chestnut Weaver	√$^{\Delta}$			
Quelea quelea	Red-billed Quelea	√$^{\Delta}$			
Euplectes orix	Southern Red Bishop	√$^{\Delta}$			
Ortygospiza atricollis	African Quailfinch				
Amadina erythrocephala	Red-headed Finch	√$^{\Delta}$		N-end	
Estrilda erythronotos	Black-faced Waxbill	√$^{\Delta}$			
Estrilda astrild	Common Waxbill	√$^{\Delta}$			
Granatina granatina	Violet-eared Waxbill	√			
Uraeginthus angolensis	Blue Waxbill	√$^{\Delta}$			
Pytilia melba	Green-winged Pytilia	√			
Vidua macroura	Pin-tailed Whydah	√$^{\Delta}$			
Vidua paradisaea	Long-tailed Paradise-Whydah				
Vidua regia	Shaft-tailed Whydah	√			
Passer domesticus	House Sparrow	√			
Passer motitensis	Great Sparrow	√$^{\Delta}$		N-end	
Passer melanurus	Cape Sparrow	√$^{\Delta}$		N-end	
Passer griseus	Southern Grey-headed Sparrow				
Motacilla aguimp	African Pied Wagtail	√$^{\Delta}$			
Motacilla capensis	Cape Wagtail	√$^{\Delta}$			
Anthus cinnamomeus	African Pipit				
Anthus vaalensis	Buffy Pipit				
Anthus similes	Long-billed Pipit				
Serinus alario	Black-headed Canary			End	
Crithagra atrogulariis	Black-throated Canary	√$^{\Delta}$			
Serinus flaviventris	Yellow Canary	√		N-end	
Serinus albogularis	White-throated Canary	√		N-end	
Emberiza impetuani	Lark-like Bunting	√$^{\Delta}$		N-end	

pecies: Scientific name	Species: Common name	Species confirmed	Namibian conservation and legal status	International Status	
				Southern Africa	IUCN (2022)
Emberiza tahapisi	Cinnamon-breasted Bunting	√[Δ]			
Emberiza capensis	Cape Bunting			N-end	
Emberiza flaviventris	Golden-breasted Bunting				

5.8.2. Flora

5.8.2.1. Tree and Shrub Diversity

It is estimated that 79-115 species of larger trees and shrubs (>1m in height) occur in the general area (Table 29).

Twenty-seven (23.5%) species of larger trees and shrubs (>1m in height) have some kind of protected status (includes endemic; near-endemic species, etc.) in the general area. Five species (4.4%) are endemic, three species (2.6%) near-endemic, 18 species (15.7%) protected by the Forest Act No. 12 of 2001, four species (3.5%) protected by Nature Conservation Ordinance No. 4 of 1975 with four species (3.5%) listed as CITES Appendix 2 species. The IUCN (2023) lists 1 species as near threatened (*Gossypium anomalum*), 1 species as data deficient (*Gossypium herbaceum*) and 74 species as of least concern.

According to their protective status *Cyphostemma bainesii* (F; End, NC), *Cyphostemma currorii* (F; NC), *Erythrina decora* (Forestry; End), *Heteromorpha papillosa* (End) and *Manuleopsis dinteri* (End) are probably the most important trees/shrubs that are expected to occur in the general area. Dense patches of *Acacia erioloba* (F), *Albizia anthelmintica* (F) and *Aloe litoralis* (NC, C2) are known to occur in the general Windhoek area and probably the most important tree species to be affected most by developments. The two *Gossypium* species listed as near threatened and data deficient by the IUCN (2023) are also important. *Acacia erioloba* (camel thorn) – protected F – are not numerous in the general area and occur as scattered individuals throughout (Cunningham, 2024).

Table 29. Tree and shrub diversity expected to occur in the general Ongombo ML240 area

Species: Scientific name	Species confirmed	Namibian conservation and legal status	International status (IUCN 2023)
Acacia erioloba	√	Protected (F)	LC
Acacia erubescens			LC
Acacia fleckii			LC
Acacia haematoxylon			LC
Acacia hebeclada	√		LC
Acacia hereroensis	√		LC
Acacia karroo	√		LC
Acacia luederitzii			LC
Acacia mellifera	√[Δ]		LC
Acacia nebrownii			LC
Acacia reficiens			LC
Acacia Senegal			
Acacia tortilis			LC
Adenium boehmianum		Protected (F)	
Adenolobus garipensis			LC
Albizia anthelmintica		Protected (F)	
Aloe litoralis	√	NC; C2	LC
Anisostigma schenckii		End	
Azima tetracantha			LC
Boscia albitrunca	√	Protected (F)	LC
Boscia foetida			LC
Cadaba aphylla			LC
Caesalpinia rubra			
Catophractes alexandri	√		LC
Combretum apiculatum	√		LC
Combretum imberbe		Protected (F)	LC
Commiphora africana			LC
Commiphora angolensis			LC
Commiphora glandulosa	√		LC

Species: Scientific name	Species confirmed	Namibian conservation and legal status	International status (IUCN 2023)
Commiphora glaucescens		N-end	LC
Commiphora pyracanthoides			LC
Commiphora tenuipetiolata			LC
Cordia sinensis			LC
Croton gratissimus			LC
Cyphostemma bainesii		Protected (F); End; NC	LC
Cyphostemma currorii		Protected (F); NC	
Dichrostachys cinerea	√		
Diospyros lycioides			LC
Dombeya rotundifolia			LC
Ehretia alba	√		
Ehretia namibiensis			
Elephantorrhiza elephantina	√		
Elephantorrhiza suffruticosa			
Erythrina decora	√	Protected (F); End	
Euclea pseudebenus		Protected (F)	LC
Euclea undulata	√		LC
Euphorbia avasmontana		C2	
Euphorbia guerichiana		C2	LC
Euphorbia virosa		C2	
Faidherbia albida		Protected (F)	LC
Ficus cordata		Protected (F)	LC
Ficus ilicina			LC
Ficus sycomorus		Protected (F)	LC
Grewia avellana			
Grewia bicolor			
Grewia flava	√		LC
Grewia flavescens	√		LC
Grewia olukondae			
Grewia retinervis			LC
Grewia tenax			LC

Species: Scientific name	Species confirmed	Namibian conservation and legal status	International status (IUCN 2023)
Grewia villosa			LC
Gossypium anomalum			NT
Gossypium herbaceum			DD
Gossypium triphyllum			
Gymnosporia buxifolia			LC
Gymnosporia linearis			LC
Gymnosporia senegalensis			LC
Heteromorpha papillosa		End	
Ipomoea adenioides			
Laggera decurrens	√		
Lycium bosciifolium	√		LC
Lycium cinereum			
Lycium eenii	√		
Lycium hirsutum			
Lycium pumilum			
Lycium villosum			
Maerua juncea			LC
Maerua parvifolia			LC
Maerua schinzii		Protected (F)	LC
Manuleopsis dinteri		End	
Melianthus comosus			LC
Montinia caryophyllacea			LC
Moringa ovalifolia		Protected (F); NC; N-end	
Mundulea sericea			LC
Nymania capensis			LC
Obetia carruthersiana		N-end	
Olea europaea			
Osyris lanceolata			LC
Ozoroa crassinervia			LC
Ozoroa paniculosa			LC
Parkinsonia africana			LC

Species: Scientific name	Species confirmed	Namibian conservation and legal status	International status (IUCN 2023)
Pechuel-Loeschea leubnitziae			
Phaeoptilum spinosum	√		
Rhigozum brevispinosum			LC
Rhigozum trichotomum			
Rotheca myricoides			
Salvadora persica			LC
Searsia ciliata	√		
Searsia lancea	√	Protected (F)	LC
Searsia marlothii	√		LC
Searsia pyroides			LC
Searsia tenuinervis			LC
Searsia undulata			LC
Steganotaenia araliacea			LC
Sterculia africana		Protected (F)	LC
Tamarix usneoides		Protected (F)	
Tarchonanthus camphoratus	√[Δ]		
Tetradenia riparia			LC
Tinnea rhodesiana			
Vangueria cyanescens			LC
Vangueria infausta			LC
Vernonia cinerascens			
Ximenia americana			LC
Ximenia caffra var. *caffra*			LC
Ziziphus mucronata	√	Protected (F)	LC

5.8.2.2. Grass Diversity

It is estimated that up to 111 grasses – 73 to 88 species – occur in the general Windhoek area. Table 30 indicates the grasses known and/or expected to occur in the area.

Table 30. Grass diversity expected in the general Ongombo ML240

Species: Scientific name	Species confirmed	Status	Ecological Status	Grazing Value
[2,3]*Andropogon chinensis*			Decreaser	High
[1]*Andropogon schinzii*			Decreaser	High
[1,2,3]*Anthephora pubescens*			Decreaser	High
[1,3]*Anthephora schinzii*			?	Low
[1,2,3]*Aristida adscensionis*			Increaser 2	Low
[1,2,3]*Aristida congesta*	√		Increaser 2	Low
[2,3]*Aristida stipitata*			Increaser 2	Low
[1,3]*Aristida effusa*			?	Low
[1,2,3]*Aristida meridionalis*	√		Increaser 3	Low
[1,2,3]*Aristida rhiniochloa*			Increaser 2	Low
[1,3]*Aristida stipitata*			Increaser 2	Low
[3]*Aristida stipoides*			?	Low
[1,2,3]*Brachiaria deflexa*			Increaser 2	Average
[2]*Brachiaria eruciformis*			Increaser 2	Average
[1,2]*Bothriochloa radicans*			Increaser 2	Low
[3]*Brachiaria malacodes*			Increaser 2	Low
[1,2]*Brachiaria marlothii*			Increaser 2	Low
[1,2,3]*Brachiaria nigropedata*			Decreaser	High
[1]*Brachiaria poaeoides*			?	Average
[1,2,3]*Cenchrus ciliaris*	√		Decreaser	High
[2]*Centropodia glauca*			Decreaser	High
[1,2,3]*Chloris virgata*			Increaser 2	Average
[1,2,3]*Cymbopogon caesius*	√		Increaser 1	Low
[2]*Cymbopogon plurinodis*			Increaser 1	Low
[1,3]*Cymbopogon pospischilii*	√		Increaser 1	Low
[1,2,3]*Cynodon dactylon*			Increaser 2	High
[1,2,3]*Dactyloctenium aegyptium*			Increaser 2	Average
[1,3]*Danthoniopsis ramosa*			?	Average
[2,3]*Dichanthium annulatum*	√		Decreaser	High
[1]*Dichanthium papillosum*			Decreaser	High
[1,2,3]*Digitaria eriantha*			Decreaser	High
[2,3]*Digitaria velutina*			Increaser 2	Low
[2]*Diplachne fusca*			Decreaser	High
[1,2,3]*Echinochloa holubii*			Increaser 2	Average
[2]*Eleusine coracana*			Increaser 2	Low
[1,2,3]*Elionurus muticus*			Increaser 3	Low
[1,2,3]*Enneapogon cenchroides*			Increaser 2	Average
[1,2,3]*Enneapogon desvauxii*			Intermediate	Average
[3]*Enneapogon scaber*			?	Low
[1,2,3]*Enneapogon scoparius*			Increaser 3	Low
[1,3]*Entoplocamia aristulata*			?	Average
[1,3]*Eragrostis annulata*			?	Low
[2,3]*Eragrostis bicolor*			?	Low
[1,2,3]*Eragrostis biflora*			Increaser 2	Low
[2]*Eragrostis cilianensis*			Increaser 2	Low

Species: Scientific name	Species confirmed	Status	Ecological Status	Grazing Value
[2]*Eragrostis curvula*			Increaser 2	High
[1,3]*Eragrostis cylindriflora*			Increaser 2	Low
[3]*Eragrostis dinteri*			Increaser 2	Average
[1,2,3]*Eragrostis echinochloidea*	√		Increaser 2	Average
[2]*Eragrostis gummiflua*			Increaser 2	Low
[1,2,3]*Eragrostis lehmanniana*			Increaser 2	Average
[1,2,3]*Eragrostis nindensis*	√		Increaser 2	Average
[1,3]*Eragrostis omahekensis*		End	Increaser 2	Low
[1,3]*Eragrostis porosa*			Increaser 2	Low
[1,2,3]*Eragrostis rigidior*			Increaser 2	Average
[1,2,3]*Eragrostis rotifer*	√		?	Average
[1,3]*Eragrostis scopelophila*		End	Decreaser	Average
[1,2,3]*Eragrostis superba*	√		Increaser 2	Average
[1,2,3]*Eragrostis trichophora*	√		Increaser 2	Average
[1]*Eragrostis truncata*			?	Average
[2,3]*Eragrostis viscosa*			Increaser 2	Low
[1,2,3]*Fingerhuthia africana*			Decreaser	Average
[1,2,3]*Heteropogon contortus*	√		Increaser 2	Average
[1,2,3]*Hyparrhenia hirta*	√		Increaser 1	Average
[2]*Imperata cylindrica*			Increaser 1	Low
[3]*Leptochloa fusca*			?	Average
[1,2,3]*Melinis repens*	√		Increaser 2	Low
[1,2,3]*Microchloa caffra*			Increaser 2	Low
[1,3]*Monelytrum leuderitzianum*			?	Low
[3]*Odyssea paucinervis*			?	Low
[2,3]*Oropetium capense*			Increaser 2	Low
[1,2,3]*Panicum coloratum*			Decreaser	High
[1,3]*Panicum lanipes*			?	High
[1,2,3]*Panicum maximum*	√		Decreaser	High
[3]*Panicum novemnerve*			?	Low
[3]*Panicum repens*			Decreaser	High
[1,3]*Panicum stapfianum*			Decreaser	High
[1,3]*Pennisetum foermeranum*		End	?	Low
[1,3]*Pogonarthria fleckii*	√		Increaser 2	Low
[1,2,3]*Pogonarthria squarrosa*			Increaser 2	Low
[2,3]*Schizachyrium sanguineum*			Increaser 1	Low
[1,2,3]*Schmidtia kalahariensis*			Increaser 2	Low
[1,2,3]*Schmidtia pappophoroides*	√		Decreaser	High
[1,3]*Setaria finita*		End	?	Low
[2]*Setaria incrassata*			Decreaser	High
[2]*Setaria pallide-fusca*			Increaser 2	Average
[1,2,3]*Setaria verticillata*			Increaser 2	Average
[3]*Sorghum bicolor*			?	High
[2,3]*Sporobolus festivus*			Increaser 2	Low
[1,2,3]*Sporobolus fimbriatus*	√		Decreaser	High
[1,2,3]*Sporobolus ioclados*	√		Increaser 2	Average
[2]*Sporobolus pyramidalis*			Increaser 2	Low
[1,2]*Stipagrostis ciliata*			Decreaser	High
[1,2,3]*Stipagrostis hirtigluma*			Increaser 2	Low
[1,3]*Stipagrostis hochstetteriana*			Decreaser	High
[1,2,3]*Stipagrostis namaquensis*			?	Average
[1,2,3]*Stipagrostis obtusa*			Decreaser	High

Species: Scientific name	Species confirmed	Status	Ecological Status	Grazing Value
[1,2,3]*Stipagrostis uniplumis*	√		Increaser 2	Average
[1,2]*Themeda triandra*			Decreaser	High
[2,3]*Tragus berteronianus*			Increaser 2	Low
[3]*Tragus racemosus*			Increaser 2	Low
[1,2,3]*Tricholaena monachne*			Increaser 2	Average
[2]*Trichoneura grandiglumis*			Increaser 2	Low
[1]*Triraphis purpurea*			Increaser 1	Low
[1,3]*Triraphis ramosissima*			?	High
[1]*Urochloa bolbodes*			Decreaser	High
[3]*Urochloa brachyura*			?	Average
[2,3]*Urochloa oligotricha*			Decreaser	High
[2,3]*Urochloa panicoides*			Increaser 2	High
[3]*Urochloa trichopus*			?	Low
[3]*Willkommia sarmentosa*			?	High

A total of 20 species of grass were confirmed at Ongombo with the dominant species being *Aristida meridionalis*, *Eragrostis trichophora* and *Schmidtia pappophoroides* (Table 30).

During the fieldwork 8 species of grasses were encountered along various transects conducted at Ongombo totalling 400m. *Eragrostis trichophora* (26.5%), *Schmidtia pappophoroides* (21%) and *Aristida meridionalis* (20.25%) were the most dominant grass species observed during the fieldwork on both sides of the D2102 gravel road. None of the endemic species were observed. However, except for *Cymbopogon dieterlenii* which is restricted to the Auas Mountains and not expected to occur in the Ongombo area, none of the grasses, especially the important species, are exclusively associated with the Ongombo ML240 area

Other species

Other species observed throughout the proposed development area included the following herbs, etc. (Table 31). This list is not comprehensive – i.e., many more species are known and/or expected to occur locally, but not necessarily within the Ongombo ML240 area.

Forty-two "other" species were identified in the Ongombo area during the fieldwork with the 2 near endemic species (*Hibiscus fleckii* and *Oxalis purpurascens*) viewed as the most important species although they are not exclusively associated with the project area.

Table 31. Other species – bulbs, herbs, etc.

Species	Conservation status
Abutilon fruticosum	
Aerva leucura	
Albuca stapffii	
Alternanthera pungens	Alien
Asparagus spp.	
Babiana spp.	
Boophone disticha	
Commelina Africana	
Cucumis meeusei	
Cyperus fulgens	
Cyphostemma congestum	
Cyphostemma hereroensis	
Dicoma macrocephala	
Dicoma tomentosa	
Dipcardi crispum	
Eriocephalus luedderitzianus	
Forsskaolea viridis	
Galenia africana	
Geigeria spp.	
Gomphocarpus fruticosus	
Gomphocarpus tomentosus	
Hermbstaedtia odorata	
Hibiscus fleckii	N-end
Hermania affinis	
Ipomoea bolusiana	
Ipomoea obscura	
Kalanchoe rotundifolia	
Kyllinga alba	
Leucosphaera bainesii	
Nerine laticoma	
Ocimum americanum	
Oxalis purpurascens	N-end
Peliostomum leucorrhizum	
Pergularia daemia	
Persicaria lapathifolia	
Pseudogaltonia clavata	
Solanum lichtensteinii	
Tagetes minuta	Alien
Talinum caffrum	
Tapinanthus oleifolius	
Tribulus terrestris	
Viscum rotundifolium	

5.9. Archaeology

5.9.1. Archaeological Setting and Observations

Archaeological remains in Namibia are protected under the National Heritage Act (27 of 2004) and National Heritage Regulations (Government Notice 106 of 2005), and disturbance requires the issuance of a letter of consent from the National Heritage Council of Namibia.

A heritage and archaeological assessment was conducted within the mineral lease areas EPL 5772 and ML 240 by Mr. J. Kinahan, archaeologist. The primary task of the archaeological assessment was to identify sensitive archaeological sites that could be affected by the proposed mineral exploration and mining activities. The archaeological assessment forms the basis of recommended management actions to avoid or reduce negative impacts, as part of the Environmental Assessment. The assessment was carried out from 4th to 5th December 2023.

This section contains a summary of Kinahan (2023) observations and assessment made in the course of the field visit to the project site (Appendix K).

To understand the value of any archaeological site, no matter how small and seemingly unimportant, it is necessary to view it in the context of present knowledge and of questions about the human past that can only be answered on the basis of the archaeological evidence.

Central Namibia, including the Khomas Region, comprises an important archaeological landscape, having abundant evidence of human settlement spanning the last one hundred thousand years. Of particular interest and significance are archaeological sites dating to within the last 1000 years, a period of marked climatic instability that brought many changes in human settlement and subsistence behaviour. This period culminated in the advent of the colonial era in Namibia during which fundamental changes in human settlement and land tenure were initiated.

The Holocene period, roughly the last 10 000 years, commenced with the onset of warm, moist conditions following the Last Glacial Maximum, and saw a rapid expansion of human occupation over the Namibian interior. Higher than normal rainfall appears to have resulted in widespread sheet erosion, removing much of the archaeological record from this region, except where traces of human occupation were preserved in caves and rock shelters. As a result, the archaeological record of the Namibian central highlands is somewhat truncated.

Archaeological and other heritage evidence from the area surrounding the Ongombo property and the mineral leases of EPL 5772 and ML 240 are dominated firstly by the remains of semi-nomadic pastoral encampments and other associated sites. Among the latter is important evidence of indigenous copper production which commenced in approximately 1200 AD. Copper production sites are associated with the Matchless amphibolite belt which extends over a distance of approximately 300km along a SW-NE strike with localized areas of copper mineralization. Exploration and mining interest in EPL 5772 and ML 240 is associated with this Matchless amphibolite as shown in Figure 31.

The second body of evidence that is important in this area consists of early colonial farming and associated settlement remains. Immediately following the Herero Revolt of 1904 desirable farming land in central Namibia was apportioned to German settlers. Many farm buildings and related infrastructure such as wells and cemeteries date from this period and therefore resort under the protection afforded by the National Heritage Act. Colonial settlement is superimposed on a quite different precolonial pattern of settlement and land-use which, less obvious to casual inspection, is nonetheless important to an understanding of the Namibian past.

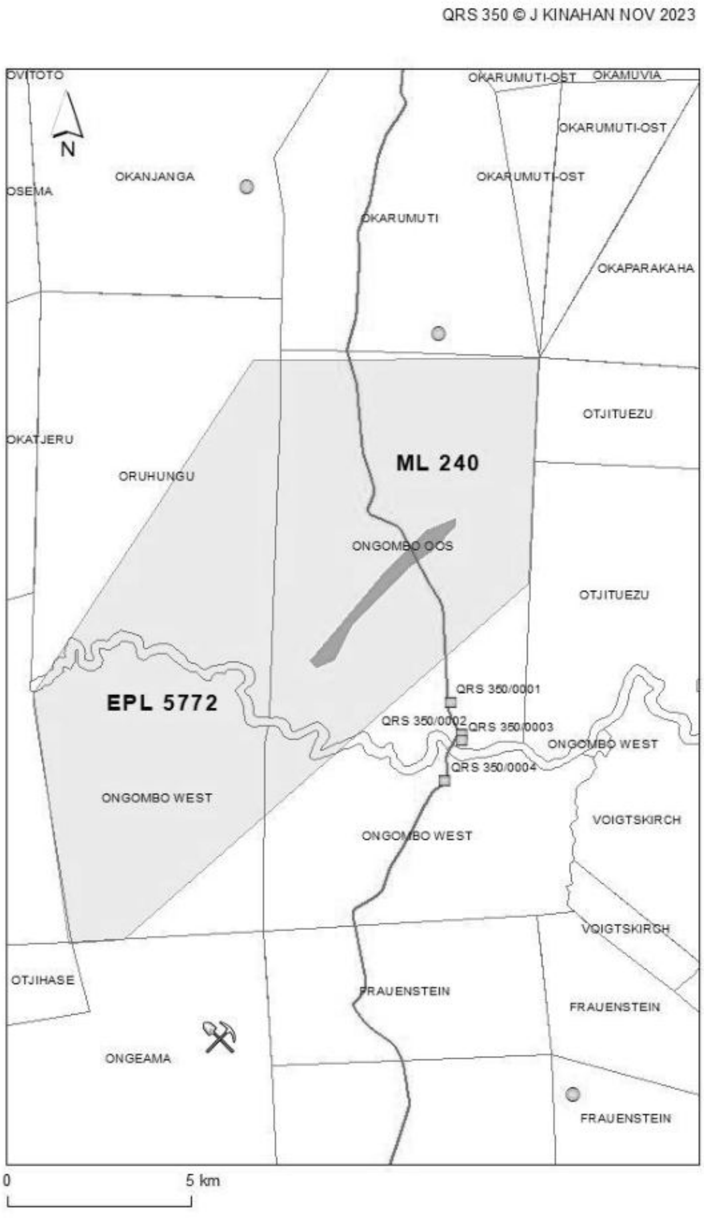


Figure 31. EPL 5772 and ML 240 on Ongombo West and East, showing the Matchless amphibolite belt

(green) and the location of archaeological/heritage sites mentioned in the text.

5.9.2. Observations on EPL 5772 and ML 240

The field survey carried ON EPL 5772 and ML 240 recorded no heritage sites within the boundaries of the mineral leases. However, the following four sites below, which are also indicated in Figure 1 were located on the approaches and margins of the mineral leases.

QRS 350/1
Position (WGS 84): -22.3015560 17.3569650
Precision: 1
Setting: Hill slope adjacent to D2102
Description: c65 graves in a fenced area 100x100m.
Records: site notes, locality data, photographs
Significance rating: 5
Vulnerability rating: 2
Sensitivity rating: 10

QRS 350/2
Position (WGS 84): -22.3092750 17.3598200
Precision: 1
Setting: Access track to abandoned farmhouse.
Description: Stone pillars adjacent to entrance marked 1907.
Records: site notes, locality data, photographs
Significance rating: 3
Vulnerability rating: 2
Sensitivity rating: 6

QRS 350/3
Position (WGS 84): -22.3108830 17.3598090
Precision: 1
Setting: Riverbank
Description: Complex of stables, storerooms &c built with massive vein quartz blocks. The floor is paved with Auas quartzite slabs. An adjacent outbuilding is of sundried brick. The building is unroofed and in disrepair.
Records: site notes, locality data, photographs
Significance rating: 5
Vulnerability rating: 4

Sensitivity rating: 20

QRS 350/4

Position (WGS 84): -22.3207140 17.3555890

Precision: 1

Setting: Hill slope below Ongombo farmhouse

Description: Small cemetery of Pfeiffer family, fenced but disused

Records: site notes, locality data, photographs

Significance rating: 5

Vulnerability rating: 2

Sensitivity rating: 10.

Photo 1. Part of cemetery QRS 350/1

Photo 2. Date inscription on farmhouse entrance QRS 350/2

Photo 3. Partially collapsed walling QRS 350/3

Photo 4. Wooden door lintel QRS 350/3

5.10. Socio-economic Environment

This section contains a summary of the SandSea (2023) specialist study about the socio-economic implications of the project (Appendix J).

5.10.1. Khomas Region

Khomas Region has the highest population density with over 342,141 heads counted during the 2011 census period, despite covering only 4.5% of Namibia's land area. The Region accommodates the largest percentage (18%) of the national population, and the regional growth rate indicates that Khomas Region's population has rapidly increased. In the last decade, the Khomas region had a population of 250,262 in 2001 escalating to 342,141 by 2011 (NSA, 2011).

Namibia is one of the least densely populated countries globally, with vast unpopulated areas. The population density in the Khomas Region is 4.2 times higher (12 persons per km^2) than the national average. In 2023, regional population distribution mirrors that of 2011, with Khomas remaining the most populous region at 494,605 (16.4%) in Namibia.

In the Khomas Region, 95% of the population lives in urban areas, with Oshiwambo being the most spoken language (41% of households). Urban living implies better conditions, with high access to safe water (99%), limited households without toilet facilities (25%), and electricity for lighting (64%). A small portion of the population (7%) depends on open fires for food preparation.

The urban population pyramid for Namibia shows a dominance of the age group 20 – 35 and infants (0 – 4 years of age). As most people in the Khomas Region live in urban areas, the prominence of Windhoek is further evident. The population in the Khomas Region is predominantly young, with many within the child-bearing age range.

This analysis offers a population comparison across census years, revealing a notable trend. The total population of Khomas saw significant growth, rising from 167,071 in 1991 to 250,262 in 2001, and 342,141 in 2011, and further 494,605 in 2023. Notably, this trend mirrors the urban population's consistent increase throughout the census years, while the rural population has experienced a decline over the same period (NSA, 2011).

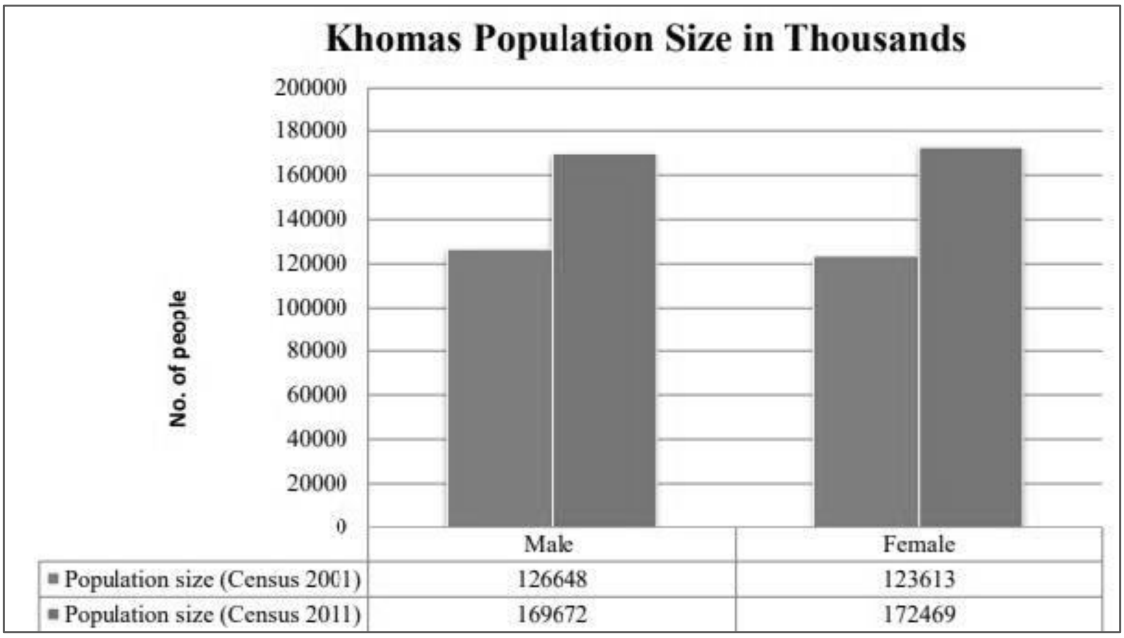


Figure 32. Khomas Region Population size in 2001 and 2011 (Khomas Regional Development Profile).

The Figure above indicates the labour force participation rate for the Khomas region was 73.6 percent. This means that approximately 73.6 percent of the working-age population in the Khomas region, typically those between 15 and 64 years old, were either employed or actively seeking employment. The rate was higher for males (77.1%) than for females (70.1%). This shows that a higher percentage of working-age males in the Khomas region were either employed or actively seeking employment compared to females.

Urban vs. Rural Areas: The rate of labour force participation was higher in rural areas (75.5%) compared to urban areas (73.5%). This indicates that a greater percentage of the working-age population in rural areas in the Khomas region were participating in the labour force compared to urban areas.

The above demographic breakdowns provide insights into the labour force participation patterns within the Khomas region, highlighting differences based on gender and urban-rural distinctions. These statistics are valuable for labour market analysis, policy planning, and addressing potential disparities in labour force engagement.

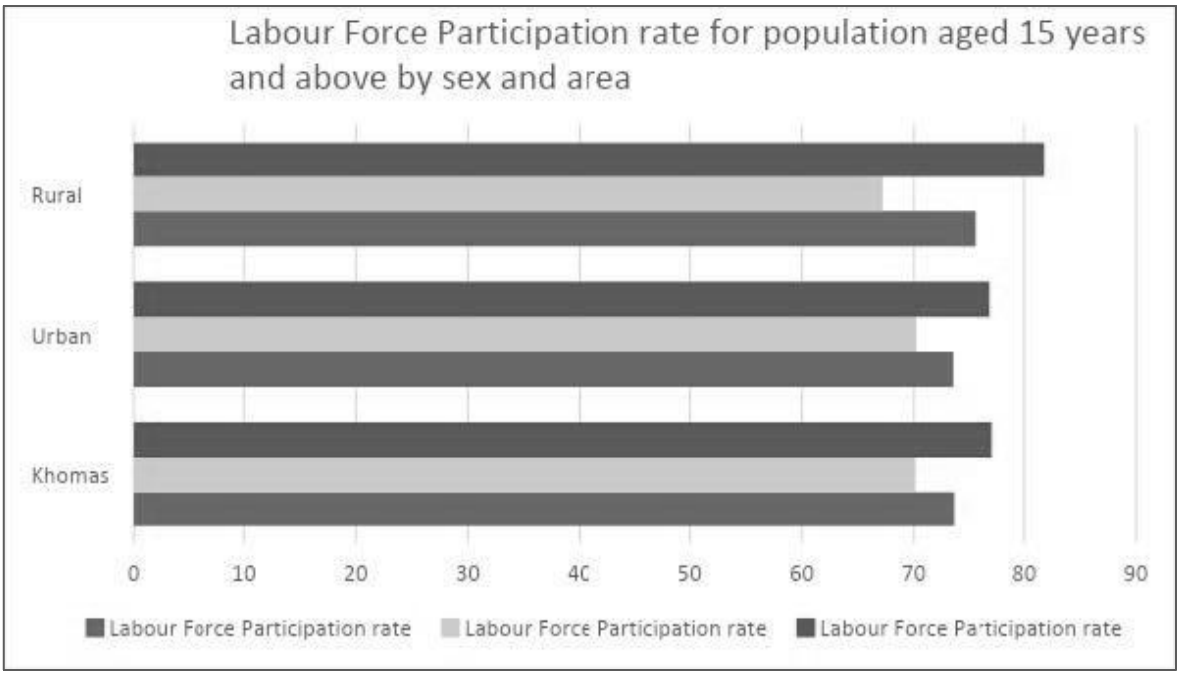


Figure 33. Labour Force Participation rate for population age 15 years and above by sex and area.

5.10.2. Employment by Industry

In 2011, the National Statistics Agency (NSA) offered insights into the employment distribution by gender and industry sectors within the Khomas region, with particular attention to Mining, Construction, and Transportation. During that year, a total of 126,966 individuals aged 15 and above were employed in the Khomas region. Among them, 71,385 were males, and 55,581 were females, engaged across various sectors.

Specifically, within the Mining and Quarrying sector, 2.1% of individuals were employed. The Construction sector had an employment rate of 11.1%, while the Transportation and Storage sector employed 7.2% of the workforce. The remaining 101,032 individuals found employment in various other industries. Breaking down the data by gender and industry, the Mining and Quarrying sector employed 1,959 males and 714 females. The Construction sector had 13,052 males and 1,056 females in its workforce. In the Transportation and Storage sector, 7,951 males and 1,202 females were actively engaged.

Main industry	Employed population		
	Total	Female	Male
Total	126 966	55 581	71 385
Agriculture Forestry and Fishing	4 236	988	3 248
Mining And Quarrying	2 673	714	1 959
Manufacturing	9 358	2 845	6 513
Electricity Gas Steam and Air conditioning supply	411	109	302
Water Supply Sewerage Waste Management and Remediation activities	454	135	319
Construction	14 108	1 056	13 052
Wholesale and Retail trade; Repair of motor vehicles and motorcycles	13 226	5 578	7 648
Transportation and Storage	9 153	1 202	7 951
Accommodation and Food Service activities	6 145	3 934	2 211
Information and Communication	3 355	1 425	1 930
Financial Insurance Activities	6 224	3 827	2 397
Real estate Activities	457	256	201
Professional Scientific and Technical activities	5 435	2 791	2 644
Administrative and Support service activities	16 269	8 234	8 035
Public Administration and Defence; compulsory social security	8 656	3 304	5 352
Education	6 193	4 261	1 932
Human Health and Social work activities	5 542	4 068	1 474
Arts Entertainment and Recreation	1 154	474	680
Other Services activities	4 421	2 820	1 601

Figure 34. Khomas Region Employment Distribution (NSA Census Report, 2011)

5.10.3. Unemployment in the Region

The unemployment rate is a measure that reflects the proportion of people without employment within a particular demographic group. This rate is calculated by taking the number of individuals who are jobless in the labour force and dividing it by the total labour force population within the same demographic group. To better understand the concept of the unemployment rate, it's essential to consider it in relation to the economically active population.

The economically active population, as defined, includes individuals between 15 and 65 years of age who have opted to participate in the labour market. They show their willingness to work in exchange for income. Therefore, being categorized as economically active does not depend on whether an individual is currently employed. If there's a desire, willingness, and readiness to work, even if it doesn't result in immediate employment, they are classified as part of the labour force.

Based on this understanding, information from the 2011 Population and Housing Census Regional Profile indicates that the Khomas Region had an economically active labour force of 181,334 individuals, accounting for approximately 73.6% of the total population in the region. Within this economically active group, around 30% or 54,368 individuals were unemployed, while approximately 70% or 126,966 individuals were employed in various sectors. A visual representation of the employment status of both men and women can be found in the chart below.

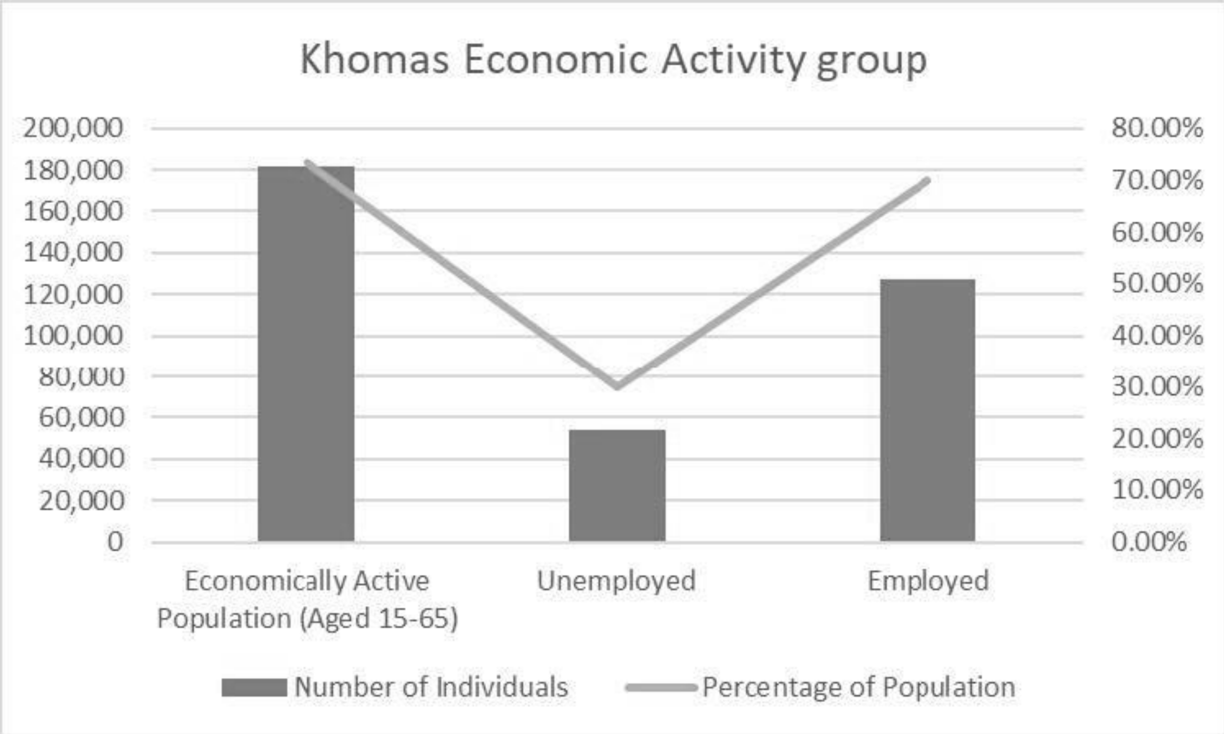


Figure 35. Khomas economic activity group

The proposed mining development is likely to increase the job opportunities in the area and region at large. The Construction phase of the project will provide job opportunities, of which at least 80% are expected to be unskilled and semi-skilled people and can be sourced from the unemployed labour force of the nearby communities and the surrounding areas.

The principle of maximising local employment creation will be applied by identifying suitable construction contractors in the region. It is highly likely that suitable contractors would be identified in Windhoek for the construction of the mine infrastructure. The region is well-supplied with competent small and medium enterprise (SME) construction companies to conduct the mining development. The project will also give rise to indirect economic benefits through the procurement of materials, goods and local services.

The local economies of the nearby communities are expected to benefit from the project. A percentage of money derived from salaries and wages earned by construction workers is likely to be spent locally. The money spent in these communities around the project location would create substantial flows of revenue within these communities, thus acting as a catalyst for growth in the local economy.

In addition, procurement of construction materials, goods and services would have beneficial downstream economic impacts by stimulating demand up the supply chain. The more goods and services procured from local SMEs or enterprises in the area, the greater the project's contribution to the growth of the local economy.

It is therefore recommended that, where feasible, contractors employ local labour by recruiting from local communities; and that procurement of materials, goods and services from local suppliers be encouraged.

5.10.4. City of Windhoek

Windhoek, the capital and largest city of Namibia, is located in the central region of the country. It plays a pivotal role in the nation's political, economic, and cultural landscape. The estimated population of Windhoek has seen steady growth in recent years, driven by urbanization and economic opportunities. As of 2023, the population of Windhoek is estimated to be approximately 494,605 reflecting its diverse and multicultural composition, with residents from various ethnic backgrounds, including Ovambo, Herero, Damara, Nama, and others.

Windhoek is not only the political capital but also the economic heart of Namibia. The city hosts a wide array of economic activities, including banking, commerce, manufacturing, and mining. It serves as the headquarters for numerous national and international businesses, contributing significantly to the country's economic growth.

The city's housing landscape is diverse and reflects economic disparities. It encompasses various housing types, ranging from informal settlements and low-income areas to middle-income and high-income neighbourhoods.

On the other hand, low-income housing areas like Hakahana, Babylon, Okuryangava, and Havana are home to a significant portion of the city's population, residing in shacks. Monthly household incomes in Windhoek vary significantly, with incomes in high-income areas such as Ludwigsdorf, Cimbebasia, Suiderhof and Kleine Kuppe typically exceeding N$ 20,000, while low-income residents may earn as little as N$ 2,000, highlighting income inequalities within the city.

Windhoek boasts a variety of educational institutions, including primary and secondary schools. Various public and private secondary schools serve the city, with additional primary schools catering to students across different neighbourhoods. However, as per the standards set by the Ministry of Education, there is an under-provision of schools, indicating a need for future planning to accommodate the city's growing population.

Tertiary institutions in Windhoek include the University of Namibia (UNAM), Namibia University of Science and Technology (NUST), and Vocational Training Centre of Namibia (VTC) offering a range of academic and vocational programs. These institutions cater to local students and attract learners from other regions.

Windhoek's strategic location, economic significance, and educational institutions make it a thriving urban center and a magnet for those seeking better opportunities and a higher quality of life. While the city faces challenges related to housing, education, and inequality, it remains a key driver of Namibia's economic progress and a hub of cultural diversity and innovation.

5.10.5. Ongombo West Resettlement Farm

Farm Ongombo West is a resettlement farm situated in the central highlands of Namibia and is subject to the governance of the Agricultural (Commercial) Land Reform Act of 1995. Spanning an expansive 4,000 hectares, the farm is subdivided into 4 sections/plots, denoted as Plot A, B, C & D. The area of interest for the development of the Copper mine is mainly found on Plot A, which is located on the west of the D2102 access road that passes through the farm.

Figure 36. Access Road to the Farm

Ongombo West Plot A resettlement farm is peculiar in that it is a resettlement of 7 former farm workers of Ongombo West farm and their families. Their livelihoods depend mainly on small-scale livestock farming and gardening, particularly because of their experience on the farm before resettlement.


Figure 37. Gardening work present at the farm

Initially the 7 resettled farmworkers and their families occupied Ongombo West resettlement farm Plot A however the community has grown to 21 households residing on Plot A. The remainder of the Ongombo West farm plots/sections have been relocated with individual ownership, consisting of previously disadvantaged farmers from diverse Namibian backgrounds.

The residents of Plot A live in improvised housing structures made from several kinds of scrap metal and corrugated iron roof sheets. They do not have electricity supply and they use firewood as a fuel source for their cooking needs as well as battery powered devices for lighting.

Figure 38. Building structures utilised by the farm workers

The water source for Ongombo West resettlement farm Plot A residents is a borehole drilled as a rural water supply under the Ministry of Agriculture, Water and Land Reform (MAWLR). The borehole supplies water tanks from which the budding settlement's community members collect water.

Figure 39. Water tank where water is stored for usage for the community

There is a mobile clinic from the Ministry of Health and Social Services which visits the farm's community once a month. However, there is no local health care facility at the farm. Transport to and from the farm is dependent on traffic along the D2102 which is sporadic and perchance. When residents of the Plot A settlement have to travel to Windhoek for urgent needs, they often walk to the Roadblock at Kaaps farm and there often catch a hike with vehicles going into Windhoek. Therefore, falling severely ill on Ongombo West resettlement farm, getting critically injured or being bitten by a poisonous snake can prove fatal as access to healthcare is barely existent. A number of unemployed youth are found on the farm, some of whom assisted with the geoprospecting activities for the Ongombo Copper Mining project. However, most households consist of children with their grandparents, as their parents are in the city of Windhoek seeking employment. There is neither kindergarten nor primary school at the budding settlement and some of the children whose grandparents could not secure hostel accommodation for them at primary schools in Windhoek are forced to stay at home on the farm without an education.

Figure 40. An un-operational kindergarten at the resettlement

Residents of Ongombo West Plot A resettlement farm, especially the unemployed youth, would wish to secure employment at the envisaged mine and have proven capable as productive candidates during the exploration phase of the project. There are concerns regarding water availability due to the prevailing drought, the water level at the drilled well has significantly dropped and residents are concerned that new wells drilled by the mine during the construction and operation phase may further reduce the level of the water table, thus making water availability for the residents and their livestock more scarce.

Stock theft is another concern within the community where livestock from Ongombo West and surrounding farms has already fallen victim to stock thieves. The closest police presence is found at the roadblock along the B6 road at Kappsfarm.

The residents of Ongombo West Plot A resettlement farm are however positive towards the envisaged development of a copper mine and foresee positive change for their community if the youth at the farm secure employment with the mine.

Figure 41. Signboard of a neighbouring farm

5.10.6. Economic Overview

Although the economy grew between 2010 and 2015 by an average of 5.3% per annum, it has not been out of recession since 2016. COVID-19 has negatively impacted commodity export markets, tourism and local consumption patterns and service industries and these resulted in a further 8% contraction of the economy in 2020 (IPPR, 2021).

Tertiary industries have always been the most significant contributor to Namibia's GDP such as public sector, retail and wholesale, transport and services sectors while secondary industries including manufacturing such as meat and other food processing, beverages, mineral processing, electricity generation and construction contributed 18% to GDP. Unfortunately, with the economic shock caused by COVID-19 pandemic it is likely to leave permanent scars on the Namibian economy, particularly in the tourism, hospitality and transport industries; and it is not known to what degree these sectors will recover.

5.10.6.1. The Gross Domestic Product

Namibia, being an arid country, faces significant constraints despite having abundant mineral resources, fish stocks, widespread livestock production, and an increasingly urban population. Since Independence in 1990, Namibia has successfully halved the proportion of people living below the poverty line to 17.4% in 2015/16 (NSA, 2017).

Despite its relatively low population, the country grapples with high inequality, prevalent rural and urban poverty, low educational achievement, a shortage of technical skills, a substantial housing backlog, and elevated youth unemployment. The Fifth National Development Plan 2017/18 – 2021/22 (NDP5) strives for rapid industrialization while adhering to the four integrated pillars of sustainable development: Economic Progression; Social Transformation; Environmental Sustainability; and Good Governance.

Namibia witnessed a period of economic slowdown, marked by its slowest growth in recent years, recording an estimated 1.1 percent growth in 2016. This deceleration was attributed to weakened performances in the primary, secondary, and tertiary industries. Specifically, the primary and secondary sectors contracted by 2.0 percent and 7.8 percent, respectively, while the tertiary sector exhibited slow growth of 3.9 percent (NPC, 2018).

However, Namibia's domestic economy faced a period of contraction during the review period from 2017 to 2021, with recorded contractions of 1.0%, 0.8%, and a significant 8.0% in 2017, 2019, and 2020, respectively. In 2021, the economy rebounded, achieving a growth rate of 2.7%, recovering from the severe 8.0% decline, which marked its most substantial contraction in 2020. The notable contraction in 2020 was primarily attributed to the global, regional, and domestic economic disruptions induced by the COVID-19 pandemic (NSA Annual National Accounts, 2021).

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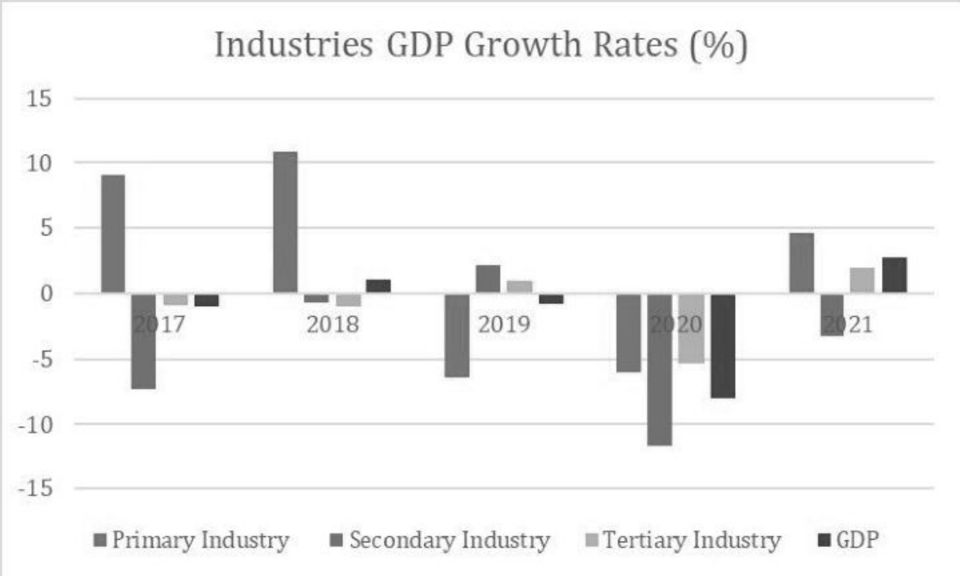

Figure 42. Industries GDP Growth Rate (NSA Annual National Accounts, 2021)

In the first quarter of 2022, Namibia's domestic economy exhibited robust quarter-on-quarter growth of 5.3%, signalling a significant recovery from the 4.9% decline in the corresponding quarter of 2021. This information is sourced from the United Nations Development Programme (UNDP) report in 2022. However, the positive economic trajectory faces a threat from the ongoing Russia-Ukraine conflict, which is anticipated to hinder the slow recovery from the Covid-19 pandemic for many African nations, including Namibia. The conflict introduces an additional layer of disruption as countries strive to overcome the lingering effects of the global pandemic, resulting in economic setbacks.

The economic repercussions of the Russia-Ukraine conflict extend to Africa, causing trade disruptions and challenges in global food and oil supply. This, in turn, contributes to an escalation in food and fuel prices. Namibia, heavily reliant on imports for food consumption, especially cereals like wheat and maize, faces a threat to its food security. Conflict-induced supply disruptions have led to a rapid increase in food prices, affecting predominantly low-income households. These households, lacking the financial means to shift to alternative food sources, bear the brunt of inflationary pressures. This information is corroborated by the NSA Annual National Accounts 2021, providing a comprehensive understanding of the economic challenges posed by the conflict and its impact on Namibia's food security and inflation rates.

Namibia's Gross Domestic Product (GDP) serves as a key indicator of the country's economic performance and overall economic health. GDP measures the total value of all goods and services produced within the borders of Namibia over a specific period. It provides crucial insights into the size and growth rate of the economy, serving as a vital tool for policymakers, investors, and analysts. The performance growth rates of economic sectors in the first quarter of 2023 indicate how much each sector has expanded or contracted compared to the corresponding period in the previous year.

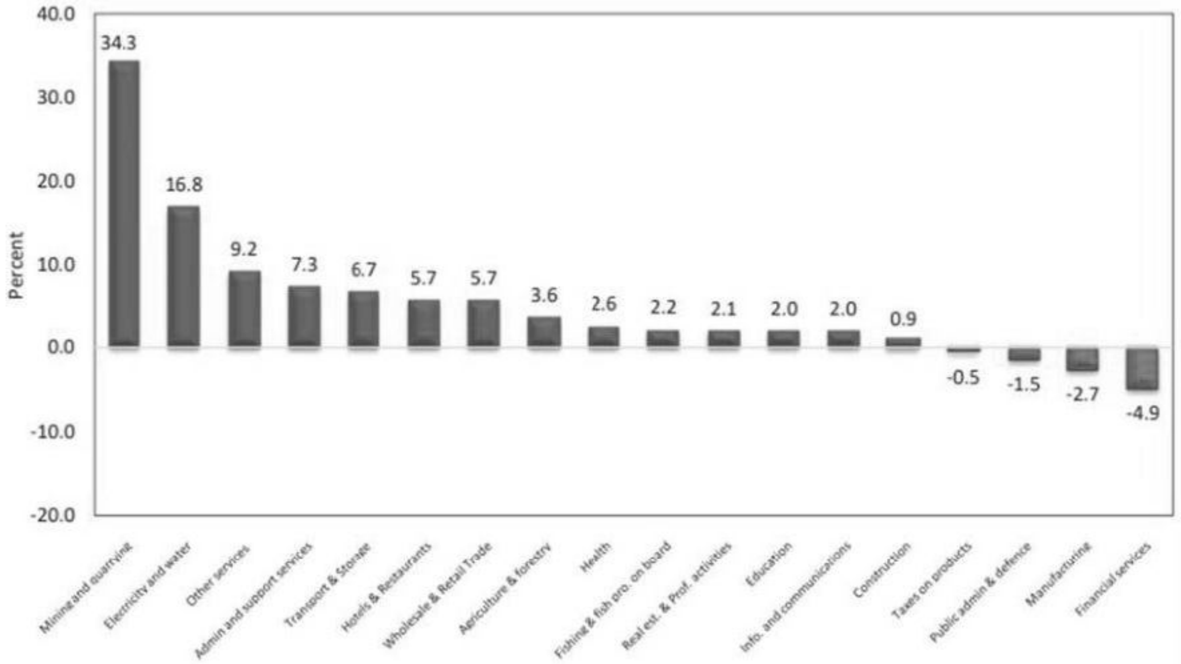

Figure 43. For Q1 of 2023, the growth rates of economic sectors real value-added performance (NSA, 2023)

The contribution of sectors to GDP growth rate is calculated by analysing the individual sectoral growth rates and their respective shares in the overall economy. These contributions are calculated based on the sector's growth rate and its relative weight or share in the overall GDP.

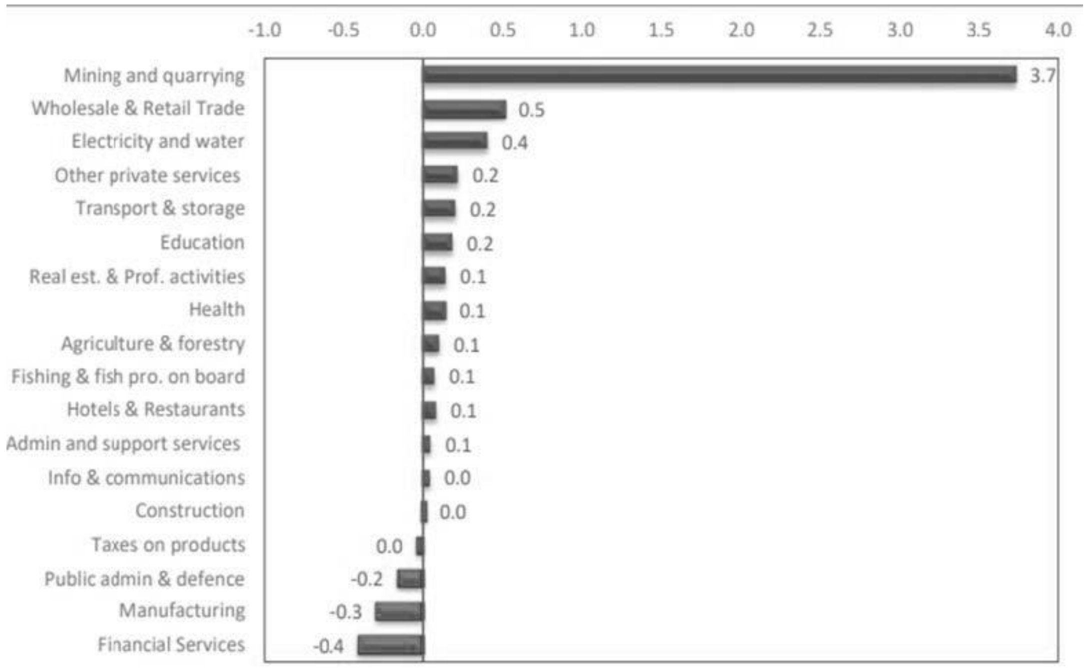

Figure 44. Q1 of 2023 GDP growth rate sector (percentage points)

5.10.6.2. Agriculture Sector

The agricultural sector in Namibia holds significant importance in the nation's economy, contributing significantly to food security, employment, and rural development. It encompasses various activities such as crop production, livestock rearing, fisheries, and forestry. Namibia's agricultural sector faces both challenges and opportunities that are distinct to the region. The country's semi-arid climate and limited water resources pose obstacles to agricultural production, particularly in certain regions. Nonetheless, innovative farming techniques like conservation agriculture and water-efficient irrigation methods have been adopted to address these challenges and promote sustainable agricultural practices.

During the first quarter of 2023, the agriculture and forestry sector experienced a moderate growth rate of 3.6 percent in real value added. However, this growth rate indicates a decrease compared to the corresponding quarter of the previous year, which recorded an increase of 8.1 percent (NSA, 2023).

The sluggish performance in the agriculture and forestry sector can mainly be attributed to the Crop farming subsector, which contracted by 3.6 percent during the first quarter of 2023. This decline stands in contrast to the growth of 3.2 percent observed in the corresponding quarter of 2022. The unfavourable performance of the sub sector can be directly linked to the adverse impact of inadequate, delayed, and unpredictable rainfall (NSA, 2023).

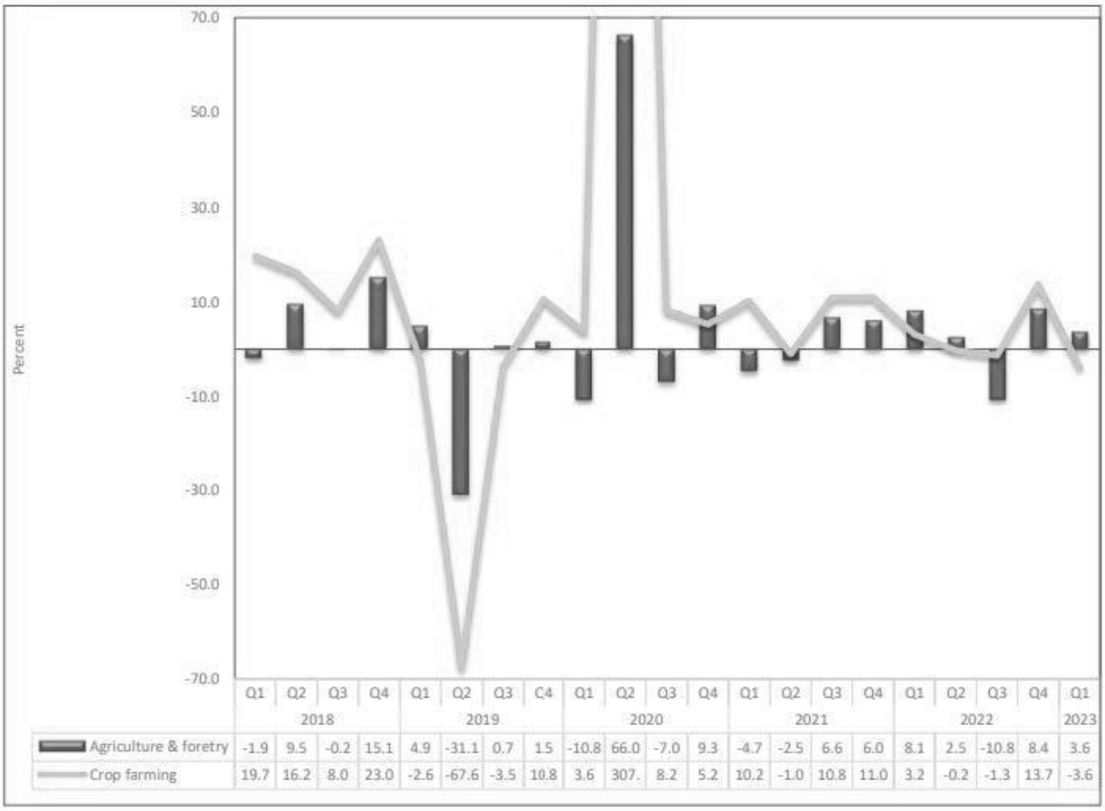

Figure 45. Agriculture and Forestry sector real value-added growth rate (NSA, 2023)

5.10.6.3. The Mining and Quarry Sector

The mining sector holds a prominent position in Namibia's overall economic development, playing a crucial role in generating revenue, fostering job creation, and attracting foreign direct investment. Namibia is rich in mineral resources, and mining serves as a vital industry for the country.

In 2022, the mining sector demonstrated substantial growth in its contributions to the government's revenue. A notable increase was observed in corporate taxes paid by the mining industry, rising from N$ 1.553 billion in 2021 to N$ 1.9 billion in 2022, indicating a significant growth rate of approximately 22%.

Additionally, the mining sector made substantial royalty payments amounting to N$ 2.154 billion to the Namibian Government (CoM, 2022). Additionally, the employment sector within the mining industry experienced significant expansion in 2022, with a 6.9% increase in total direct employment. During this period, the sector provided job opportunities to 16,147 individuals, contributing substantially to government revenue through approximately N$ 2.6 billion in Pay-As-You-Earn (PAYE) taxes (CoM, 2022).

In the consecutive years of 2019 and 2020, the primary industry faced contraction, experiencing declines of 6.4% and 6.0%, respectively. This downturn was primarily attributed to the mining and quarrying sector, which recorded negative growth rates of 8.7% and 15.0% in these respective years. However, in 2021, the primary industries rebounded, showcasing a robust growth of 6.2%, marking the strongest performance since 2018. The noteworthy recovery in 2021 was largely driven by the mining and quarrying sector, which exhibited a remarkable growth of 10.1%. This positive trajectory was influenced by the uranium subsector, which experienced growth rates of 15.3%, and other mining and quarrying sub-sectors, which posted an impressive growth of 47.4%. The strong performance of the uranium subsector can be attributed to increased production driven by high global demand for uranium ores, as highlighted in the NSA Annual National Accounts 2021.

Table 32. Mining and Quarry Industry of Development (NSA Annual National Accounts, 2021)

	2017	2018	2019	2020	2021	Average
Mining and quarrying	14.2	16.1	-8.7	-15.0	10.1	3.3
Diamond mining	14.5	15.1	-16.4	-14.8	0.0	-0.3
Uranium	23.4	33.4	-4.4	-8.7	15.3	11.8
Metal Ores	-26.3	1.3	14.0	-20.7	-0.6	-6.5
Other mining and Quarrying	63.7	13.6	5.1	-18.4	47.4	22.4
Primary Industries	9.0	10.8	-6.4	-6.0	6.2	2.7

Table 32 above, shows the Mining and Quarrying sector's performance was influenced by fluctuations in specific subsectors, such as a notable recovery in Uranium and Other Mining and Quarrying in 2021 after challenging years. The Primary Industries, encompassing these subsectors, rebounded in 2021, contributing to the positive overall growth in that year.

In a secondary source, it was reported that Namibia experienced notable developments in its mining sector in 2021. A historic milestone was achieved as the country exported 52,000 tonnes of raw iron ore for the first time. The growth in the Other Mining and Quarrying subsector during 2021 was driven by increased production of salt and marble, along with heightened exploration of fossil fuels. The diamond subsector, the largest within the mining sector, maintained stability with no growth (0.0%) in 2021, a significant improvement from the 14.8% decline in 2020. Debmarine Namibia, a key player in the diamond subsector, saw a positive shift, producing 1.136 million carats in 2021, reflecting a 1% increase from the previous year, influenced by improved conditions in the diamond market.

During 2021, the mining sector made substantial contributions to the national economy, accounting for about 9.1% of the GDP. Employment in the sector also witnessed growth, reaching approximately 15,246 people, reflecting a 4.5% increase compared to the previous year. Post-2021, the mining sector continued its robust performance, recording a growth of 23.5% in the first quarter of 2022, surpassing the 19.1% growth observed in the corresponding quarter of 2021. This exceptional growth was primarily attributed to the upswing in diamond mining activities, signifying the sector's resilience and ongoing positive trajectory (Chamber of Mines, 2021).

Table 33 below illustrates the mining contributions made to the Namibian Economy in the year 2022.

Table 33. Mining contributions made to the Namibian Economy in the year 2022

Total Mining Industry contributions in 2022 (N$ 37.961 Billion)	
Wages and Salaries	6.225 Billion
Local Procurement	16.823 Billion
Corporate tax	1.90 Billion
Royalties	2.154 Billion
Export levies	249.4 Million
taxes	4.401 Billion
Skills expenditure	196 Million
CSR	184 Million
Gross fixed capital formation	5 Billion
Operations	964.9 Million

Particularly, during the first quarter of 2023, the subsector of 'Other mining and quarrying' experienced a substantial acceleration, with a growth rate of 68.8 percent in real value added. This significant increase in the subsector's performance within the mining and quarrying sector can be attributed to the contrasting growth rate of 19.3 percent recorded in the corresponding quarter of 2022 (NSA, 2023).

However, during the first quarter of 2023, the mining and quarrying sector in Namibia exhibited a robust growth of 34.3 percent in real value added. This substantial increase represents a significant improvement compared to the corresponding quarter of 2022, which recorded a growth rate of 28.5 percent (NSA, 2023).

The growth of the mining and quarrying sector has several positive implications for Namibia's economy. It stimulates economic activity by expanding mining operations, which leads to increased employment opportunities, infrastructure development, and the establishment of support industries. Additionally, the sector's growth contributes to foreign exchange earnings through mineral exports, strengthening the country's balance of payments and overall economic stability.

The Otjihase mine is situated approximately 15 km northeast of Ongombo mine and it is 17 km northeast of Windhoek. Otjihase consists of two underground mines (Otjihase and Matchless) and an 800ktpa copper concentrator. The mine was placed on care and maintenance in September 2015. The mines and concentrator are being maintained ready for restart, with underground workings dewatered and faces accessible.

5.10.7. Impacts of COVID-19 on Namibia’s Socio-economy

The COVID-19 pandemic has had significant impacts on Namibia's socio-economy, affecting various sectors and aspects of daily life. Here are some key impacts of COVID-19 on Namibia's socio-economy.

Namibia experienced a sharp economic downturn due to the pandemic. Lockdown measures, travel restrictions, and disruptions to global supply chains resulted in reduced economic activity, decreased trade, and decreased revenue generation. Sectors such as tourism, hospitality, retail, and manufacturing were particularly hard hit, leading to job losses, business closures, and reduced income levels.

The pandemic led to widespread job losses and income reductions, impacting individuals and households across the country. Many businesses, especially those in the most affected sectors, were forced to downsize or close temporarily or permanently. This resulted in increased unemployment rates and financial hardships for individuals and families. COVID-19 exacerbated existing socioeconomic inequalities and increased the risk of poverty for vulnerable populations. Those in low-income jobs, informal workers, and marginalized communities faced greater challenges in accessing necessities and social support. The pandemic deepened disparities in education, healthcare, and access to essential services, highlighting the need for targeted interventions to address these inequalities.

Namibia's healthcare system faced significant strain due to the surge in COVID-19 cases. Increased demand for healthcare services, shortages of medical supplies, and the need to allocate resources for COVID-19 response impacted the overall healthcare delivery. The strain on the health system also had indirect consequences on non-COVID-19 healthcare services, leading to delays in diagnosis, treatment, and access to essential healthcare for other medical conditions.

School closures and disruptions to education systems had a profound impact on students' learning and development. The shift to remote learning posed challenges, particularly for disadvantaged students without access to technology or stable internet connections. The digital divide widened, potentially leading to learning gaps and long-term impacts on educational outcomes. The pandemic brought about social isolation, increased stress, and mental health challenges for individuals and communities. The restrictions on social gatherings, closure of public spaces, and limited social interactions impacted people's overall well-being. The psychosocial effects of the pandemic, including anxiety, depression, and loneliness, necessitated the need for mental health support and services.

The Namibian government implemented various measures to mitigate the socio-economic impacts of COVID-19. These included fiscal stimulus packages, social protection programs, and targeted support for affected sectors and vulnerable populations. Efforts were also made to enhance healthcare capacity, ramp up testing and vaccination campaigns, and develop strategies for economic recovery and resilience.

5.10.8. Main Findings and Recommendations

The socio-economic study conducted on the proposed project has provided valuable insights into the potential impacts and implications on the local communities and the broader region. The study assessed various factors including employment, in-migration, housing, economic contributions, environmental risks, and social issues. In the unmitigated scenario, the overall significance of the impact is considered high. However, through the implementation of mitigation measures, the significance of the impact can be reduced. Based on the analysis, several key findings have emerged, along with corresponding management and mitigation measures.

In terms of employment, the project is expected to create both skilled and unskilled job opportunities during the construction and operational phases. Priority must be given to hiring local communities, while ensuring compliance with Affirmative Action Acts. Measures such as training, skills upgrading, and promoting home ownership will enhance the socio-economic benefits for the workforce.

The study highlights the potential challenges of in-migration and housing. Project-induced migration, particularly during the construction phase, may exert pressure on local infrastructure and housing stock. However, by engaging with key stakeholders, planning recruitment strategies, and investing in affordable housing, the impacts of in-migration can be managed and reduced.

The economic impacts of the project are expected to be positive, with direct and indirect contributions to national income and employment. Through mining royalties, taxes, and increased economic activity, the project will generate revenue for the government and stimulate economic growth in the region. Corporate social investment, particularly in affordable housing, education, and essential services, will further support local development.

It is essential to recognize and address potential negative impacts, such as poaching, littering, and social issues related to alcohol and drug abuse. By implementing measures such as wildlife conservation programs, waste management strategies, and comprehensive awareness and education initiatives, these impacts can be mitigated.

In conclusion, the socio-economic assessment indicates that the proposed project has significant potential to contribute to the local and national economy, create employment opportunities, and support community development. However, it also highlights the importance of proactive management and mitigation measures to minimize negative impacts and ensure sustainable socio-economic outcomes. By engaging with stakeholders, adopting responsible practices, and investing in the well-being of the workforce and local communities, the project can maximize its positive contributions and foster long-term socio-economic benefits for all stakeholders involved. The key sensitivities are summarised in Table 34 below.

Table 34. Summary of Key Socio-Economic Sensitivities

COMPONENT	SENSITIVITY	VULNERABILITY	POTENTIAL IMPACT
NATIONAL ECONOMY	Taxes and royalties contribute to the GDP.	Low	Namibia's economy will benefit from taxes and royalties paid on the project.
REGIONAL AND LOCAL ECONOMY	Regional and local businesses that deliver goods and services can benefit from increased spending.	Medium to High	Through job creation and spending on goods and services, the proposed project contributes to the local and regional economies.
ACCOMODATION	Currently, there is a shortage of erven and available housing.	High	The need for housing and/or accomodation for mine employees in Windhoek during both construction and operational phases can further increase the pressure on shortage of housing in the city. This pressure will also be exacerbated by an influx of job seekers.

COMPONENT	SENSITIVITY	VULNERABILITY	POTENTIAL IMPACT
TRAFFIC AND ROAD INFRASTRUCTURE	Several access roads to the mine site are designated district roads maintained by the Roads Authority Namibia	Medium	This project will increase traffic, which will increase road infrastructure pressure.
EMPLOYMENT	There is a 30% unemployment rate in the Khomas Region, and a 14.4% rate in Windhoek Rural. This problem can be alleviated by creating new job opportunities.	Low	A number of people can benefit from job creation in both the construction and operational phases of this project.
INFLUX OF JOB SEEKERS	Population growth and increased developments in the region has attracted a large number of job seekers to the region.	High	The development of this new mine will contribute to the existing trend of influx of job seekers to Windhoek, and in particular to nearby settlements. This might be an issue especially during the implementation phase as the local infrastructure will not be able to handle the increased pressures. The informal settlement area is likely to expand.
LAND USES IN THE AREA	Land use change.	Low to Medium	Surrounding property/land values may change, as a result of changes in land use of project location.

COMPONENT	SENSITIVITY	VULNERABILITY	POTENTIAL IMPACT
LIVESTOCK AND WILDLIFE	Animals and wildlife play an important role in supporting the economic activities of nearby farms and communities.	Low to Medium	Illegal poaching activities of livestock and wildlife can be perpetrated by construction and operational workers. Game and wildlife tourism activities can also be affected by nuisances such as noise and dust.
HEALTH	Considering that Windhoek is the main hub for the mine and has a HIV/AIDS prevalence rate of 4.1%, it is susceptible to disease outbreaks.	Medium	The influx of job seekers and temporary workers during the construction phase can lead to a faster spread of disease.

6. PUBLIC PARTICIPATION

6.1. Introduction

Participation by the public is an essential part of an Environmental and Social Impact Assessment (ESIA), as it offers potential Interested and Affected Parties (I&APs) the opportunity to raise any concerns or issues they may have with the proposed project. Considering all potential impacts helps the consultant determine whether additional investigations are necessary, and to what extent.

Furthermore, the public participation process also provides an opportunity for I&APs to review and comment on all documents produced during the ESIA process. This is done in accordance with both the Namibian Environmental Management Act of 2007 and international environmental best practices.

The process included consultation meetings with the relevant authorities and affected communities. Thereafter a consultation report containing the issues identified during the consultation process was circulated to registered I&APs for input. More details on the public participation process and its findings can be viewed in the consultation document (Annexure D). A list of all comments received on the consultation document is provided in the Issues and Responses Trail (Annexure D-4).

An additional period was extended to Interested and Affected Parties to make supplementary inputs and comments with regard to the ESIA.

6.2. Availability of draft ESIA Report

I&APs were notified of the availability of the draft ESIA and EMP reports, and given a two-week period to comment and provide input. The final report takes into account all comments received on the project. Incorporated comments are included in the final version of the application for an Environmental Clearance Certificate, which is submitted to the Directorate of Environmental Affairs.

7. IMPACT ASSESSMENT

7.1. Identification of Key Issues

Taking the impacts identified during the ESIA study and the issues raised during public consultation into consideration, the following key impacts are identified:

- ❖ Impact on air quality
- ❖ Impact on groundwater and surface water hydrology,
- ❖ Impact on biodiversity,
- ❖ Impact on the socio-economic environment,
- ❖ Impact on archaeology,
- ❖ Cumulative impact associated with the implementation of the project.

Consequently, specialist studies were commissioned to determine the magnitude of these impacts and identify mitigation measures that were feasible. The rest of this chapter presents the results of these investigations.

7.2. Methodology Employed for the Impact Assessment

Criteria for describing the significance of an impact on a particular environmental component are outlined below in Table 35 below:

Table 35: Definitions of the criteria used to determine the significance of impacts

DESCRIPTION	
NATURE	Reviews the type of effect that the proposed activity will have on the relevant component of the environment and includes "what will be affected and how?"
EXTENT	Indicates the geographic extent of impact. Whether the impact will be within a limited area (on site where construction is to take place); local (limited to within 25km of the area); regional (limited to ~200km radius); national (limited to the borders of Namibia); or international (extending beyond Namibia's borders).
DURATION	Whether the impact will be temporary (during construction only), short term (1-5 years), medium term (5-10 years), long term (longer than 10 years, but will cease after operation) or permanent.

DESCRIPTION	
INTENSITY	Establishes whether the magnitude of the impact is destructive or innocuous and whether or not it exceeds set standards, and is described as none (no impact); low (where natural/ social environmental functions and processes are negligibly affected); medium (where the environment continues to function but in a noticeably modified manner); or high (where environmental functions and processes are altered such that they temporarily or permanently cease and/or exceed legal standards/requirements).
PROBABILITY	Considers the likelihood of the impact occurring and is described as uncertain, improbable (low likelihood), probable (distinct possibility), highly probable (most likely) or definite (impact will occur regardless of prevention measures).
SIGNIFICANCE	Significance is given before and after mitigation. Low if the impact will not have an influence on the decision or require to be significantly accommodated in the project design, Medium if the impact could have an influence on the environment which will require modification of the project design or alternative mitigation (the route can be used, but with deviations or mitigation) High where it could have a “no-go” implication regardless of any possible mitigation (an alternative route should be used).
STATUS OF THE IMPACT	A statement of whether the impact is positive (a benefit), negative (a cost), or neutral. Indicate in each case who is likely to benefit and who is likely to bear the costs of each impact.
DEGREE OF CONFIDENCE IN PREDICTIONS	Is based on the availability of specialist knowledge and other information.

7.3. Assessment of Impacts

7.3.1. Impact on air quality

The main findings from the baseline air quality assessment can be summarised as follows:

- The site is located in the Khomas Region of Namibia, approximately 15km northeast of the Otjihase mine
- The terrain in the Project area is gently undulating with elevations in the range of 1,600 m –2,000 m above mean sea level (amsl) representing complex topography within the greater region that will likely influence the local wind field.
- There are no human settlements in the immediate vicinity of the Project apart from the Ongombo and Ongombo West farms. Within a 20km radius of the Project site, twenty-eight (28) AQSRs were identified relative to the project area.
- Modelled meteorological data for the Project area (Oruhungu) was utilised for the period January 2021 to December 2023 in this assessment. The wind field is dominated by southeasterly and northeasterly winds, with more frequent flow from the western sector during day-time.
- Temperature data is characterised by seasonal variation, summer peaks, winter troughs, temperature extremes and transition months.
- Measured total rainfall for the 3-year period was 1365 mm, with the highest monthly rainfall measured (427 mm) in January 2021. The rainfall and humidity decrease rapidly in spring (February to April) heading towards the lowest in winter indicating a drier period. From October, the rainfall and humidity show a steady but slight increase heading towards the peak in January.
- The main pollutant of concern in the region is particulate matter (TSP; PM_{10} and $PM_{2.5}$) resulting from vehicle entrainment on the roads (paved, unpaved and treated surfaces), windblown dust, and mining and exploration activities. Gaseous pollutants such as SO_2, NOx, CO and CO_2 would result from vehicles and combustion sources, but these are expected to be at low concentrations due to the few sources in the region.
- Sources of atmospheric emissions in the vicinity of the proposed Project include:
  - ✓ Windblown dust: Windblown particulates from natural exposed surfaces can result in significant dust emissions with high particulate concentrations near the source locations, potentially affecting both the environment and human health.
  - ✓ Mines and Exploration operations: Other mines in proximity to the proposed Project are the dormant Otjihase mine, Thorn Tree mine and Otjisongati mine.
  - ✓ Vehicle entrainment on paved and unpaved roads.
  - ✓ Industrial emissions

- ✓ Regional transport of pollutants: regional-scale transport of mineral dust and ozone (due to vegetation burning) from the north of Namibia is a significant contributing source to background PM concentrations.

i. Impact Assessment

The findings from the impact assessment can be summarised as follows:

Construction Phase normally comprises a series of different operations including land clearing, topsoil removal, road grading, material loading and hauling, stockpiling, grading, bulldozing, compaction, etc., with particulate matter the main pollutants of concern from these activities. The extent of dust emissions would vary substantially from day to day depending on the level of activity, the specific operations, and the prevailing meteorological conditions, and how close these activities are to AQSRs. Due to the intermittent nature of construction operations, the emissions are expected to have a varying impact depending on the level of activity. With mitigation measures in place these impacts are expected to be low.

Operational Phase:

- Emissions quantified for the proposed Project were restricted to fugitive releases (non-point releases) with particulates the main pollutant of concern. Gaseous emissions (i.e. SO_2, NOx, CO and VOCs) will primarily result from diesel combustion, both from mobile and stationary sources.
- Topography was included in the dispersion model to account for any site-specific topography that will influence the dispersion results.
- Both unmitigated and mitigated scenarios were modelled for the worst-case scenario were mining throughput is expected to be at its peak. Mitigation was applied was based on mining best practices as prescribed by the Australian national pollutant inventory (NPI) Emission Estimation Technique Manual for Mining (NPI, 2012), which included the following:
  - ✓ Surface haul roads: level 1 watering (2 litres/m^2/h) resulting in 50% CE.
  - ✓ Materials handling (loading and unloading ROM and waste rock and frontend loaders at the plant): water sprays at tip points resulting in 50% CE.
  - ✓ Crushing and screening of ROM (primary and secondary): resulting in 50% CE from water sprays to keep ore wet.
  - ✓ Scrapping using front end loaders (FELs), dozers and graders: water sprays during periods of visible dust plumes resulting in 50% CE.
  - ✓ Wind erosion from stockpiles: 30% CE for primary earthworks (reshaping/profiling, drainage structures installed).

- Dispersion modelling results indicate no exceedances of the AQOs for $PM_{2.5}$, PM_{10} and dustfall at the nearest identified AQSRs or beyond the site Project boundary. The air quality impacts on-site can be reduced by applying mitigation measures.

- From the simulated results, the GLCs for VOCs, CO, SO_2 and NO_2 were below 5% of their respective AQOs for the entire study area for peak operations.
- Cumulative air quality impacts could not be assessed since no background PM_{10} and $PM_{2.5}$ data are available. The localised PM_{10} and $PM_{2.5}$ impacts from the proposed Project modelling results indicate the potential for low regional cumulative impacts, and only high cumulative impacts in the immediate vicinity of the mine. Off-site impacts are likely to be managed with proper mitigation measures in place.

Closure Phase:

Closure operations are likely to include demolishing existing structures, scraping and moving surface material to cover the remaining exposed surfaces (WRD) and contouring of the surface areas. The impacts are expected to be similar to that of construction operations – potentially small but harmful impacts in close proximity to the site, depending on the level of activity but low impacts with mitigation measures in place. Post-closure operations, likely to include vegetation cover maintenance, would result in very low air quality related impacts.

The proposed project is likely to result in increased $PM_{2.5}$ and PM_{10} ground level concentrations in the immediate vicinity of the mine and impacts can be reduced by applying appropriate mitigation measures. The dispersion modelling results indicate that the AQOs were not exceeded at the nearest sensitive receptor or beyond the site boundary. Dustfall rates are likely to be low throughout the life of mine, with gaseous concentrations (SO_2, NO2 and CO) also expected to result in low air quality impacts.

7.3.1.1. Sources of Emissions

Findings from the emissions quantification and dispersion modelling indicated the following pollutants and their sources of emission (Table 36).

Table 36. Sources of pollutants expected from the project (Airshed, 2024)

ACTIVITY	ASSOCIATED POLLUTANTS
CONSTRUCTION ACTIVITIES	
Handling and storage area for construction materials (paints, solvents, oils, grease) and waste	Particulate matter (PM)(a) and fumes (Volatile Organic Compounds [VOCs])
Power and water supply infrastructure	Sulfur dioxide (SO_2); oxides of nitrogen (NOx); carbon monoxide (CO); carbon dioxide (CO_2)(b); particulate matter (PM)
Delivery of materials – storage and handling of material such as sand, rock, cement, chemical additives, etc.	Mostly PM, gaseous emissions from trucks (SO_2; NOx; CO; CO_2)
General building/construction activities including, amongst others: mixing of concrete; operation of construction vehicles and machinery; refuelling of machinery; civil, mechanical and electrical works; painting; grinding; welding; etc	Mostly PM, gaseous emissions from construction vehicles and machinery (SO_2; NOx; CO; CO_2)
OPERATIONAL ACTIVITIES	
Drilling and blasting	Mostly PM, but also gaseous emissions (SO_2; NOx; CO; CO_2)
Haulage of materials (ore and waste rock)	PM from road surfaces and windblown dust from trucks, gaseous emissions from truck exhaust (PM, SO_2; NOx; CO; CO_2)
Waste rock dump (WRD), Waste stockpile, Ore stockpiles	PM from tipping and windblown dust, gaseous emissions from truck exhaust (PM, SO2; NOx; CO; CO2)
Processing Plant (Crushing and Screening, Loading from Stockpiles)	Mostly PM, gaseous emissions from machinery (PM, SO2; NOx; CO; CO2)

7.3.1.2. Impacts of particulates and gas emissions on the environment and human health

Dispersion modelling results indicate no exceedances of the AQOs for $PM_{2.5}$, PM_{10} and dustfall at any identified AQSR or beyond the site boundary (EPL-5772). Dustfall rates are likely to be low throughout the life of mine, with gaseous concentrations (SO_2, NO_2 and CO) also expected to result in low air quality impacts. The air quality impacts on-site can be reduced by applying mitigation measures. Table 37 below outlines the potential health effects resulting from emissions/particulates expected from the project:

Table 37. Potential health effects associated with the main emissions/particulates

	HUMAN HEALTH	ANIMAL	VEGETATION
SO2	• Increases the prevalence of chronic respiratory disease and the risk of acute respiratory illness. Due to it being highly soluble, sulphur dioxide is more likely to be adsorbed in the upper airways rather than penetrate to the pulmonary region. • People with asthma are the most sensitive group.	• Acute inhalation of SO_2 produces bronchia constriction, increases respiratory flow resistance, increases mucus production and has been shown to reduce abilities to resist bacterial infection. • Short exposures to low concentrations of SO_2 (~2.6 mg/m^3) have been shown to have immediate physiological response without resulting in significant or permanent damage.	• May affect the selenium (an essential nutrient for livestock) content of forage plants.
		• Sulphur dioxide can produce mild bronchial constriction, changes in metabolism and irritation of the respiratory tract and eyes in cattle.	
		• Chronic exposure can affect mucus secretions and result in respiratory damage similar to chronic bronchitis.	
NO2	• NO2 is an irritating gas that is absorbed into the mucous membrane of the respiratory tract. Exposure to NO_2 is linked with increased susceptibility to respiratory infection, increased airway resistance in asthmatics and decreased pulmonary function.	• NO_2 concentrations upward of 40 ppm (72 mg/m^3) resulted in signs of toxicity (eye irritation, lacrimation and laboured breathing) in various animals (mice, rats, guinea pigs, rabbits and dogs). Below concentrations of 20 ppm (36	

	HUMAN HEALTH	ANIMAL	VEGETATION
	• Exposure to high concentrations of NO_2 can lead to pulmonary oedema and pneumonitis.	mg/m³) signs of irritation were minimal and no effects on behaviour were noted.	
PM10	• Scientific studies have linked breathing particulate matter to a series of significant health problems, including: • aggravated asthma • increases in respiratory symptoms like coughing and difficult or painful breathing • chronic bronchitis • decreased lung function • premature death	• Acute exposures (4-6 hour single exposures) of laboratory animals to a variety of types of particles, almost always at concentrations well above those occurring in the environment have been shown to cause decreases in lung function, changes in airway defense mechanisms and increased mortality rates. • At ambient concentrations PM_{10} exposures will not lead to high mortality.	• PM_{10} is not likely to impact on vegetation with dust fallout the main particulate fraction of concern.

- Proposed Mitigation
  - ❖ Air quality impacts during construction would be minimised through basic control measures such as limiting the speed of haul trucks; limit unnecessary travelling of vehicles on untreated roads; reducing the area of construction where it is close to receptors; and to apply water sprays on regularly travelled, unpaved sections.
  - ❖ During closure and post-closure, the open exposed areas prone to wind erosion should be either covered with surface material or rehabilitated (vegetated or compacted) to ensure the surfaces form a hard crust and/or gladded with waste rock.
  - ❖ In minimising dust from crushing and screening operations, water sprays to keep the ore wet should ensure a 50% CE, whereas windbreaks around the crushers could achieve 30%. According to literature hooding with cyclones would achieve 65% CE, whereas scrubbers will achieve 75% and fabric filters would result in 83% CE. Enclosure or underground crushing would result in up to 100% CE.
  - ❖ In minimising windblown dust from stockpile areas, water sprays should be used to keep surface material moist. A mitigation efficiency of 50% is anticipated.

- Chemical surfactants should be used to all haul roads and access roads in order to reduce dust emissions. A 75% efficiency (CE) in the control of vehicle-entrained dust is recommended.
- An extraction system for the crusher should be installed in accordance with the design parameters. Achieving a control efficiency of up to 50% at the ROM stockpile requires the application of water sprays to keep the ore wet.
- Water sprays at the tip points should be used to mitigate material transfer sites. A control efficiency of 50% is recommended. It is advised to clear-up loading sites on a regular basis.
- All material handling operations should use water sprays if visible dust plumes are produced.
- Windblown dust from all material handling operations and from materials at the ROM stockpile should be minimised with the use of water sprays to keep surface material moist.
- Keep active areas small and use water sprays to minimize wind erosion; reshape all disturbed areas to their natural contours; cover disturbed areas with previously collected topsoil and replant native species; and replace larger waste rock pieces with rock cladding to minimize windblown dust from the dormant WRD/
- Ideally, the vehicle fleet should be powered by engines that are compliant with Tier-2 or Tier-3 standards to ensure low combustion emissions. It is important to maintain and service vehicles regularly and to limit vehicle idling time to minimize NO2 emissions and impacts.
- For the fleet and equipment of mine vehicles, low-sulfur fuels should be utilized.

- <u>Proposed Monitoring</u>
  - SO_2 concentrations should be sampled to:
    - Determine the impact of vehicle exhaust emissions and sulphide oxidation on the surrounding environment.
    - Determine the impact of sulphide oxidation on employee health.
    - Determine the rate of sulphide oxidation.
  - It is advised that a network of at least four dust buckets distributed cardinally should be incorporated in the dustfall monitoring and management plan, as illustrated in map Figure 46. The dustfall units and particulate monitor must be maintained and the monthly dustfall results used as indicators to tract the

effectiveness of the applied mitigation measures. Dustfall collection should follow the ASTM method.

- A passive SO2 and NO2 sampling campaign should be conducted bi-annually (summer and winter) at the same locations used for dust fallout monitoring.
- Occupational PM_{10}, SO_2 and NO_2 exposure should be measured regularly. Personal samplers can be issued to selected employees covering various mining activities and areas. This is useful to obtain a data record of exposure levels at the mine.

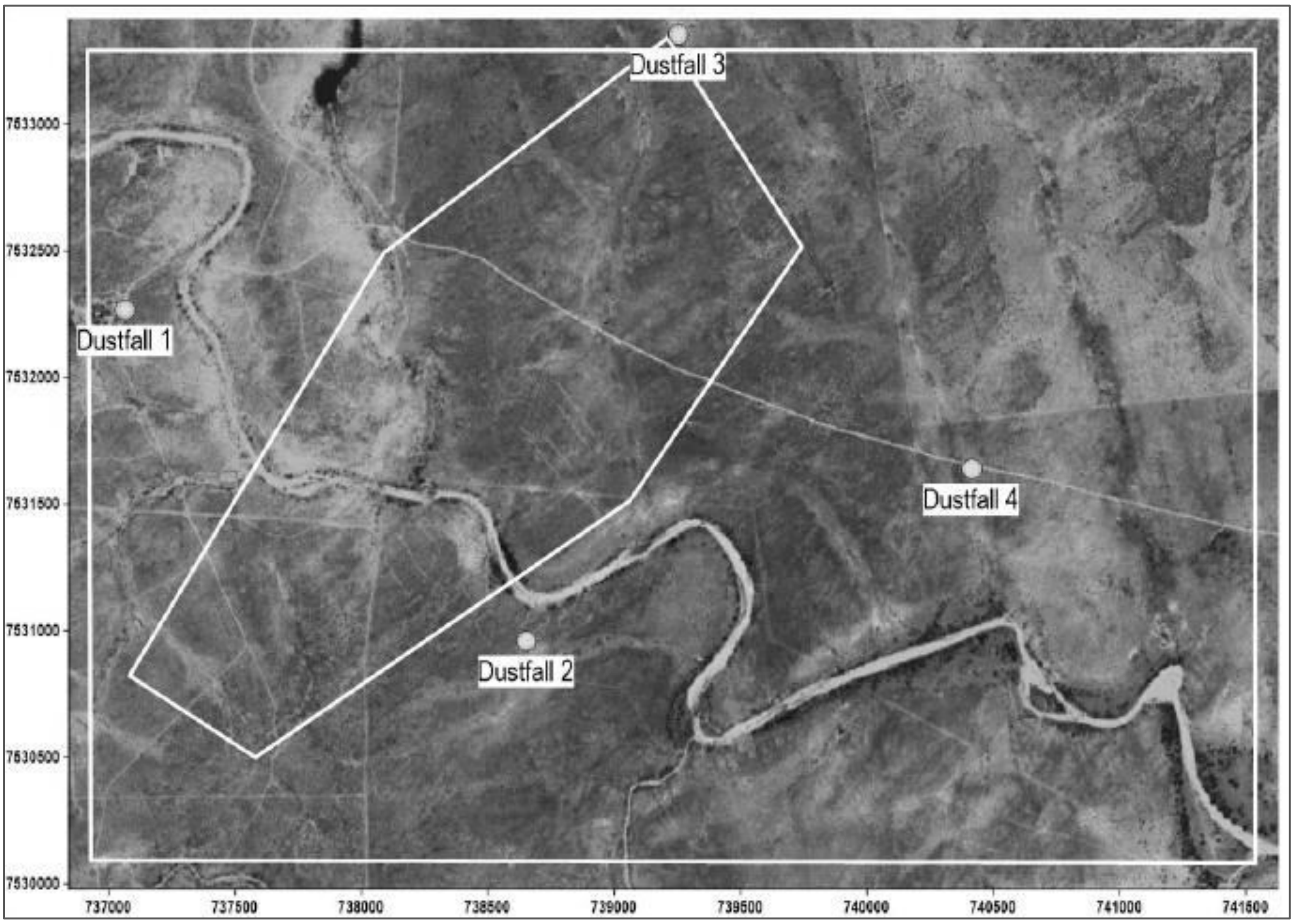

Figure 46. Proposed dustfall monitoring layout (Source: Airshed, 2023)

- Summary

Table 38 below provides a summary of the potential impacts related to air quality:

Table 38. Assessment of impacts from Air Quality

POTENTAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT	POST-MITIGATION
CONSTRUCTION PHASE									
PM2.5 HUMAN HEALTH AND ANIMAL IMPACTS	Respiratory and cardiovascular effects	On-site	Temporary	Low	Low	Medium	Low	Water sprays on roads, material handling points and cleared areas	Very Low
PM10 HUMAN HEALTH AND ANIMAL IMPACTS	Respiratory and cardiovascular effects	Local (<5 km)	Temporary	Medium	Medium	Medium	Medium	Water sprays on roads, material handling points and cleared areas	Low
SO2 HUMAN HEALTH AND ANIMAL IMPACTS	Chronic respiratory disease and acute respiratory illness	On-site	Temporary	Low	Low	Medium	Low	Use low sulfur fuels, regular maintenance and repair	Very Low
NO2 HUMAN HEALTH AND ANIMAL IMPACTS	Chronic respiratory disease and acute respiratory illness	On-site	Temporary	Low	Low	Medium	Low	Use tier-2 or tier-3 compliant engines, minimize vehicle idling times, regular maintenance and repair	Very Low

POTENTAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT	POST-MITIGATION
CO HUMAN HEALTH AND ANIMAL IMPACTS	Reducing oxygen delivery to the body's organs	On-site	Temporary	None	Low	Medium	Low	Use tier-2 or tier-3 compliant engines, minimize vehicle idling times	Very Low
VOC HUMAN HEALTH AND ANIMAL IMPACTS	Adverse health effects	On-site	Temporary	None	Low	Medium	Low	Use tier-2 or tier-3 compliant engines,	Very Low
DUSTFALL NUISANCE IMPACTS	Nuisance impact - visual dust	On-site	Temporary	Medium	Medium	Medium	Medium	Water sprays on roads, material handling points and cleared areas	Low
DUSTFALL IMPACTS ON ANIMALS	Dust deposition on vegetation that the animals feed on	On-site	Temporary	Medium	Medium	Medium	Medium	Water sprays on roads, material handling points and cleared areas	Low
OPERATIONAL PHASE									
PM2.5 HUMAN HEALTH AND ANIMAL IMPACTS	Respiratory and cardiovascular effects	On-site (only at plant and mine)	Long Term	Medium	Medium	High	Medium	Water sprays and chemical suppressants on roads, water sprays at crusher and materials handling	Low

POTENTAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT	POST-MITIGATION
								points and vegetation cover on WRD	
PM10 HUMAN HEALTH AND ANIMAL IMPACTS	Respiratory and cardiovascular effects	On-site at (only plant and mine)	Long Term	High	Medium	High	Medium	Water sprays and chemical suppressants on roads, water sprays at crusher and materials handling points and vegetation cover on WRD	Low
DUSTFALL NUISANCE IMPACTS	Nuisance impact - visual dust	On-site at (only plant and mine)	Long Term	Medium	Medium	High	Medium	Water sprays and chemical suppressants on roads, water sprays at crusher and materials handling points and vegetation cover on WRD	Low

POTENTAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT	POST-MITIGATION
DUSTFALL IMPACTS ON ANIMALS	Dust deposition on vegetation that the animals feed on	On-site at (only plant and mine)	Long Term	Medium	Medium	High	Medium	Water sprays and chemical suppressants on roads, water sprays at crusher and materials handling points and vegetation cover on WRD	Low
DECOMMISSIONING PHASE									
PM2.5 HUMAN HEALTH AND ANIMAL IMPACTS	Respiratory and cardiovascular effects	On-site	Short-term (1-5 years)	Low	Medium	Medium	Low	Water sprays on roads, material handling points and cleared areas, full vegetation cover on WRD	Very Low
PM10 HUMAN HEALTH AND ANIMAL IMPACTS	Respiratory and cardiovascular effects	On-site	Short-term (1-5 years)	Low	Medium	Medium	Low	Water sprays on roads, material handling points and cleared areas, full vegetation cover on WRD	Very Low

POTENTAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT	POST-MITIGATION
DUSTFALL NUISANCE IMPACTS	Nuisance impact – visual dust	On-site	Short-term (1-5 years)	Low	Medium	Medium	Low	Water sprays on roads, material handling points and cleared areas, full vegetation cover on WRD	Very Low
DUSTFALL IMPACTS ON ANIMALS	Dust deposition on Vegetation that the animals feed on	On-site	Short-term (1-5 years)	Low	Medium	Medium	Low	Water sprays on roads, material handling points and cleared areas, full vegetation cover on WRD	Very Low

7.3.2. Impact on groundwater and surface hydrology

The mining project is situated within the White Nossob River catchment, an ephemeral river flowing in the in a southeasterly direction. The exploration license is dissected by the upper reach of the White Nossob River, while the application for the mining license is restricted to the area north of the river.

The Black Nossob merges the White Nossob in the north of Leonardsville to form the Nossob River which eventually contributes to feed the Stampriet Artesian Basin, which is known as The Stampriet Subterranean Water Control Area, as defined by law in the Artesian Water Control Ordinance of 1955 (Groundwater Namibia, 2001). Ensuring the quality of the water entering the White Nossob, and the subsequent aquifers, whether fractured or alluvial, is tantamount to safeguarding the integrity of the Stampriet Artesian Basin.

Groundwater in the area is replenished primarily through direct infiltration of rainwater. Madec (2023) describes the project area as having two aquifers, namely, the shallow alluvial aquifer associated with the White Nossob River and its tributaries, and the fractured hardrock aquifer of the project zone. Based on the findings of historic groundwater exploration and resource assessment, the potential of the underlying hardrock aquifer is variable and low. On the other hand, the shallow alluvial aquifer associated of the White Nossob River has much better groundwater potential, hence it is the preferred water source to supply the development. It is concluded that the envisaged mining process would be essentially dry with a minimalist usage of water, hence the main usage of water during operations will be the mine staff and other supporting infrastructure on site.

Mine dewatering is an essential part of resources extraction, hence dewatering and groundwater control is an important part of many open pit and underground mines. Dewatering should therefore form an integral part of water management at a mine. In addition to groundwater management, it is also necessary to control the surface water. This is usually done by diverting as much surface water runoff away from the pit as possible and by pumping away the water that accumulates in the pit.

The integrity of the aquifers is important, as they may face the risk of over abstraction on one hand and pollution on the other. Effective water management is critical to both open pit and sub-surface mining operations.

According to Wilke (2024), the ore body at Ongombo contains variable amounts of sulphide minerals which could lead to possible contamination through Acid Mine Drainage.

Table 39 below summarizes the potential impacts associated with the various components of the mine.

Table 39. Potential impacts from various components of the mine

MINE COMPONENT	POTENTIAL IMPACTS
MINE PIT	• The groundwater seeping into the pit could be acidic as a result of the oxidation of sulphide minerals and exposure to oxygen in the atmosphere. • Oxidised sulphide phases may mobilize heavy metals, and this process is likely to increase over time. • The mine's groundwater could be used as process water during operation. If there is no other use for the water, then it may need to be neutralised.
RUN OF MINE	• Sulphide minerals will be present in variable quantities in the ore. • Acidic effluent may be released as a result of rainwater infiltration or stormwater runoff.
WASTE ROCK DUMP	• Rainwater infiltration or storm water runoff could result in the release of acidic effluent. • In this area, storm water runoff and direct rainfall volumes are expected to be small. • It is located on Kuiseb Formation rocks, which may produce acid.

Considering the long-term impacts of the mine pit (with maximum depth of 500m), the following impacts should be considered:

- After mining operations ceases, if the mine pit is left empty (open), groundwater seepage is likely to fill it to an equilibrium balance with the surrounding groundwater table. When the pit is first excavated, substantial inflow rates are anticipated, but subsequent flows are probably going to be moderate.

- This can cause the pit to fill with water that has a low pH, high sulfate content, and total dissolved solids (TDS), possibly containing dissolved metals that are concentrated due to evaporative water loss. This will be especially relevant for seepage from the pit walls above the water's surface as well as during seasonal variations in the flow and water level.

- Potential return and penetration of mine pit water into groundwater.

The groundwater security may be maintained by deep water levels and poor hydraulic conductivity. The mine pit's predicted inflow rates are low, and if it is discovered to be acidic, it may be neutralized. It is possible to prevent groundwater contamination through direct infiltration if surface water is redirected away from the mining structures.

The overall impact of the mine is envisaged to be minimal, and can be further minimized by implementing sound mitigation and management measures for the identified potential impacts; and by regularly assessing the effectiveness of the mitigation measures throughout the mine's operation and closure phases.

- Proposed Mitigation

  - No runoff should reach the embankment of the WRD and ROM stockpile area.
  - Berms on the upslope side would stop runoff entering the stockpiles or mine pit given the relatively small volumes of runoff expected.
  - Natural surface drainage at the mine will be towards the nearby White Nossob River. Avoid contamination of this river at all cost.
  - No mining activities are expected to take place in the course of the White Nossob River.
  - Develop and implement suitable mine dewatering solutions and techniques to ensure the integrity of the receiving environment.
  - It is advised to closely monitor and divert storm water drainage using berms and peripheral trenches to collect seepage water.
  - At mine closure, stock piles need to be graded to encourage drainage and lessen infiltration. The surface has to be covered with soil and vegetated.
  - Protective berms that deflect surface flow should be maintained to avoid any erosion of the soil cover after mine closure.
  - Prevent surface runoff water from entering the pit and allow it to exit it.
  - Limestone or marble, which are acid neutralizing materials, could be sourced and added to the mine pit.
  - In order to determine the present baseline hydrogeologic and hydrochemistry, install monitoring boreholes in areas such as the mine's proposed waste rock dump site.
  - In order to prevent animals and humans from accessing and using the mining pit, it should be closed off.

- Proposed Monitoring

A summary of the key monitoring actions is provided in Table 40.

Table 40. Summary of ground and surface water monitoring

RISK ITEM	MONITORING
SEEPAGE FROM WRD	• Monitoring boreholes around the proposed waste rock dump. • Monthly field water quality parameter measurements • Quarterly water quality analyses
CONTAMINATION AND RISK AFTER CLOSURE FROM MINE PIT	• Monitoring of borehole water levels • Monitoring of surface and groundwater quality
WASTE WATER DISPOSAL	• Monitor volume and quality

- Summary

Table 41 below provides a summary of the potential impacts related to ground and surface water:

Table 41. Assessment of impacts related to surface and groundwater

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT	POST-MITIGATION
OPERATIONAL PHASE									
PERIMETER TRENCH	Contaminate surface runoff with effluent in trench	Local	Short term	Medium	Probable	High	High	Protect trench from surface water runoff by diversion with berms.	Low
ROM STOCKPILE	Formation of AMD and contaminate surface / ground water	Local	Long term	Medium	Probable	High	Medium	Divert surface runoff infiltration with berms, peripheral trench to capture effluent.	Low

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT	POST-MITIGATION
WASTE ROCK DUMP	Formation of AMD and contaminate surface / ground water	Local	Long term	Medium	Probable	High	High	Divert surface runoff infiltration with berms, peripheral trench to capture effluent.	Low
WASTE WATER	Waste water disposal to natural environment	Local	Long term	Low	Probable	Moderate	Medium	Waste water disposed through evaporation.	Low

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT	POST-MITIGATION
LOCAL WATER SUPPLY	Possible loss of water supply	Local	Long duration	Low	Low	High	Low	Implement a tight network of monitoring boreholes (both for fractured and alluvium aquifers) around the mine. Develop a monitoring programme and continuously monitor.	Low
	Possible lowering of local water table	Local	Long duration	Low	Low	High	Low	Water for mine sourced from outside the area.	Low
DECOMMISSIONING PHASE									

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT	POST-MITIGATION
CONTAMINATION AND RISK AFTER CLOSURE FROM MINE PIT	Acid mine drainage and formation of acidic pool	Local	Permanent	Medium	High	High	Medium	Addition of neutralizing material to pit. Cordoning of mine pit.	Low
WASTE ROCK DUMP	Infiltration of rainwater and formation of AMD	Local	Permanent	Medium	Moderate	High	Medium	Grading of stockpile surface to prevent ponding of water. Introduce vegetation cover.	Low

7.3.3. Impact on fauna and flora

This Section has been extracted from the Biodiversity Specialist Study compiled by Peter Cunningham (Cunningham, 2024).

7.3.3.1. Fauna

It is estimated that at least 78 reptile, 10 amphibian, 73 mammal, 244 bird species (breeding residents) are known to or expected to occur in the general Windhoek area. Endemics include at least 36% of the reptiles, 30% of the amphibians, 7% of the mammals and 2.5% (6 of the 14 Namibian endemics) of all the breeding and/or resident birds known and/or expected to occur in the general area.

As all developments have potential negative environmental consequences, identifying the most important faunal species including high risk habitats beforehand, coupled with environmentally acceptable mitigating factors, lessens the overall impact of such development.

Reptiles

Endemic reptile species known and/or expected to occur in the general Windhoek area make up 36% of the reptiles from the area and although not as high as endemism elsewhere – for example the western escarpment areas of Namibia – still accounts for a large portion of the reptiles.

Tortoises are viewed as the group of reptiles most under threat in Namibia making *Stigmochelys pardalis* and *Psammobates oculiferus* probably the most important reptiles expected in the area followed by the pythons – *P. anchietae* and *P. natalensis* – and *Namazonurus (Cordylus) pustulatus* and *Varanus albigularis*. All the above-mentioned species (except probably *N. pustulatus*) are either consumed as food or indiscriminately killed when encountered – e.g., *Python natalensis*. However, although very little is known of *N. pustulatus*, they usually occur at higher elevations of the Auas Mountains south of Windhoek.

Amphibians

The most important species are the endemic *Poyntonophrynus hoeschi* and *Phrynomantis annectens* although they are widespread in Namibia and not exclusively associated with the Ongombo area. The most important species confirmed from the Ongombo area is *Pyxicephalus adspersus* (giant bullfrog) – Least Concern & Near Threatened. Dams such as the Otjivero, to the east in the Nossob River, are viewed as suitable amphibian habitat including temporary pools in the various ephemeral drainage lines throughout the area. Other potential habitats include farm reservoirs, earth dams and pans although the latter are also dependent on localised showers and temporary of nature.

Mammals

The most important species from the general area are all those classified by the IUCN (2023) as vulnerable *(Smutsia (Manis) temminckii, Acinonyx jubatus, Panthera pardus, Felis nigripes, Equus zebra hartmannae)* and near threatened *(Eidolon helvum, Hipposideros commersoni, Hipposideros vittatus, Parahyaena (Hyaena) brunnea)* and rare (Namibian wing-gland bat, hedgehog, and black-footed cat) under Namibian legislation. Carnivores classified by the Red List (Namibia) as endangered (*Acinonyx jubatus*), vulnerable (*Crocuta crocuta, Panthera pardus, Felis nigripes*) and near threatened (*Parahyaena (Hyaena) brunnea*) are important.

Birds

The most important species are viewed as the Namibian endemics – especially rockrunner – and those classified by Simmons et al. (2015) as endangered (i.e., violet wood-hoopoe, Ludwig's bustard, white-backed vulture, black harrier, black stork, saddle-billed stork, tawny, booted and martial eagles) and the IUCN (2023) as critically endangered (white-backed vulture), endangered (Ludwig's bustard, lappet-faced vulture, black harrier, martial eagle, secretary bird), vulnerable (tawny eagle) and near threatened (kori bustard, pallid harrier).

7.3.3.2. Flora

Trees/Shrubs

At least 115 species of trees and shrubs are known and/or expected to occur in the general area, respectively.

Twenty-seven (23.5%) species of larger trees and shrubs (>1m in height) have some kind of protected status (includes endemic; near-endemic species, etc.) in the general area. Five species (4.4%) are endemic, three species (2.6%) near-endemic, 18 species (15.7%) protected by the Forest Act No. 12 of 2001, four species (3.5%) protected by Nature Conservation Ordinance No. 4 of 1975 with four species (3.5%) listed as CITES Appendix 2 species.

According to their protective status *Cyphostemma bainesii* (F; End, NC), *Cyphostemma currorii* (F; NC), *Erythrina decora* (Forestry; End), *Heteromorpha papillosa* (End) and *Manuleopsis dinteri* (End) are probably the most important trees/shrubs that are expected to occur in the general area. Dense patches of *Acacia erioloba* (F), *Albizia* *anthelmintica* (F) and *Aloe litoralis* (NC, C2) are known to occur in the general Windhoek area and probably the most important larger tree species to be affected most by developments. The two Gossypium species listed as near threatened and data deficient by the IUCN (2023) are also important.

The most important species identified during the fieldwork at Ongombo is the endemic and protected Namibian coral tree (*Erythrina decora*) which is associated with rocky ridges and outcrops in the area.

The most important Red Data species are viewed as those listed as critically endangered (*Gazania thermalis*), rare (*Hoodia triebneri*), vulnerable (*Lithops pseudotruncatella* subsp. *groendrayensis, Lithops pseudotruncatella* subsp. *volkii*), and near threatened (*Ceropegia mafekingensis, Euphorbia pseudoduseimata, Haemanthus avasmontanus, Lithops pseudotruncatella* subsp. *dendritica*).

At least four species of plants are restricted to the Auas Mountains and include *Ebracteola montis-moltkei, Haemanthus avas-montanus, Hibiscus discophorus* and *Lapeirousia avasmontana* (Burke 2007) although not expected to occur in the Ongombo ML240 area.

Grass

Up to 111 grasses are expected in the general area of which 4 species are viewed as endemic (*Eragrostis omahekensis, Eragrostis scopelophila, Pennisetum foermeranum* and *Setaria finita*). *Pennisetum foermeranum* is associated with rocky mountainous terrain and consequently only expected is such suitable habitat. *Eragrostis omahekensis* is virtually only found on disturbed soils – e.g., close to watering points – while *Eragrostis scopelophila* is associated with mountainous areas under trees and shrubs. The endemic *Setaria finite* is associated with drainage lines in the general area; never very common and probably the grass species most likely to be affected most by development in the area. Another endemic and important grass (although not included in the available grass books), restricted to the Auas Mountains, is *Cymbopogon dieterlenii.*

7.3.3.3. Important areas

The most important habitats in the Ongombo ML240 area, ranked from most important to least important, are viewed as the Nossob River (white arrow); larger ground dams & pans (blue icons); larger ephemeral drainage lines (blue dotted arrows) and larger rocky ridges & outcrops (black barred circles), see Figure 47 for a map of these habitats.

a) Nossob River

Ephemeral drainage lines that drain the general area to the east, through the thick sands of the Kalahari, include the Seeis and White Nossob Rivers. The ephemeral Nossob River forms the southern boundary of the ML240 area. Such larger ephemeral drainage lines are viewed as important habitat as larger trees, often protected species such as *Acacia erioloba, Searsia lancea* and *Ziziphus mucronata,* are associated with such areas. Such drainage lines are unique and serve as habitat to various vertebrate and invertebrate species favouring larger/older trees for a variety of reasons (e.g., breeding, roosting, foraging, cavities, etc.). They are also used as thoroughfares (corridors); foraging sites; resting up places (shade); drinking sites, etc. for wildlife. Temporary pools also serve as habitat for amphibians and aquatic birds.

b) Ground dams and pans

The various ephemeral ground dams (albeit artificial), and ephemeral pans (natural) are important habitat, mainly for amphibians and aquatic birds, although the larger trees associated with such features serve as habitat to a variety of vertebrate fauna.

c) Ephemeral drainage lines

All ephemeral drainage lines are viewed as important habitats as larger trees, often protected species such as *Acacia erioloba, Searsia lancea* and *Ziziphus mucronata,* are associated with such areas. Such drainage lines are unique and serve as habitat to various vertebrate and invertebrate species favouring larger/older trees for a variety of reasons (e.g., breeding, roosting, foraging, cavities, etc.). They are also used as thoroughfares (corridors); foraging sites; resting up places (shade); drinking sites, etc. for wildlife. Temporary pools also serve as habitat for amphibians and aquatic birds.

d) Rocky areas

Rocky ridges and outcrops often serve as alternative habitat, especially to unique flora (e.g., *Erythrina decora,* Namibian coral tree [Endemic & Protected F]) in otherwise monotonous flat/undulating landscape with unique species associated with these areas in typical island scenario, and viewed as important habitats.

Within these above-mentioned broad habitats there are other less obvious (i.e., small scale) habitats such as caves, ephemeral fountains, termitaria, etc. which are also viewed as important for the biodiversity they support.

It is imperative to maintain connectivity between important habitats (i.e., rocky ridges and outcrops and ephemeral drainage lines) – i.e., corridors – to maintain genetic flow for a various species.

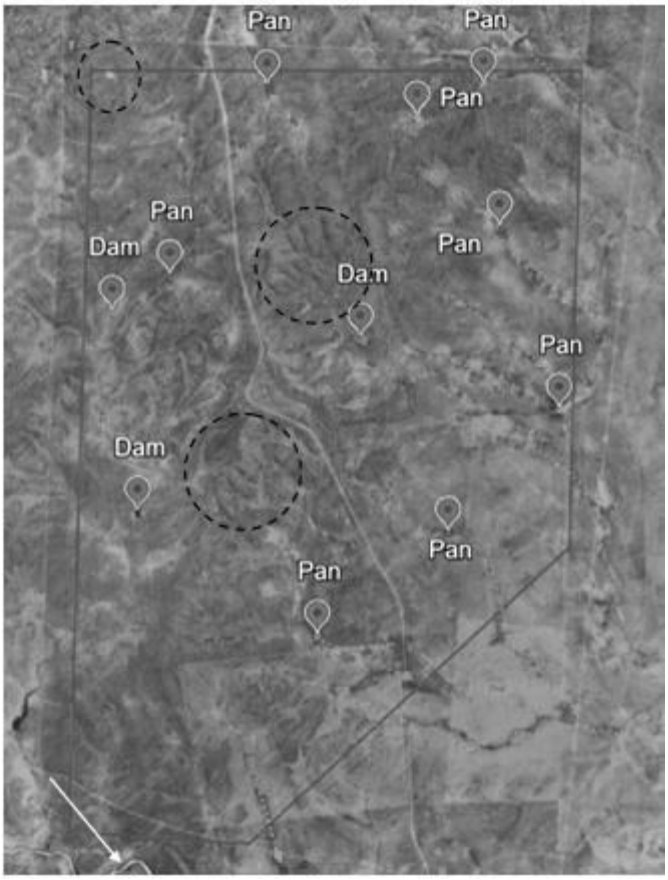

Figure 47. Most important habitats in the Ongombo ML240 area

7.3.3.4. Envisaged impacts

All developments change or are destructive to the local fauna to some or other degree. Assessing potential impacts is occasionally obvious, but more often difficult to predict accurately. Such predictions may change depending on the scope of the development – i.e., development, once initiated, and may have a different effect on the fauna as originally predicted. Thus, continuing monitoring of such impacts during the development phase(s) is imperative.

7.3.3.4.1. Faunal impact

Faunal impact with the proposed mining development would be localised. The following table indicates the potential/envisaged impacts expected regarding faunal loss (which is obviously closely linked to habitat destruction):

(Note: All references to tables and figures in this section are in relation to Annexure G)

Description	Faunal disturbance will vary depending on the scale/intensity of the development operation and associated and inevitable infrastructure.

Extent	**1.** Access route(s) - 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 site(s) - Localised disruption/destruction of the habitat and thus consequently fauna associated directly with the actual sites. This could cover an extensive area – depending on scale of operations – with large scale 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 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 site(s) - The duration of the impact is expected to be permanent at the site(s). **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 site(s) - The actual mining site(s) would be permanently altered. **3.** Infrastructure - The actual construction site associated with the various mining infrastructures would be permanently altered. This however, would be relatively small area 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 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 mining & construction periods.
Mitigation	**General** **1.** Limit the development to actual sites to be mined and avoid affecting adjacent areas, especially the Nossob River, ground dams & pans, well vegetated larger ephemeral drainage lines and rocky ridges/outcrops, throughout the entire area. **2.** Avoid development & associated infrastructure in sensitive areas – e.g., Nossob River, ground dams & pans, well vegetated larger ephemeral drainage lines and rocky ridges/outcrops – in the proposed development area (See Sections 4 & 5; Figures 26-30). This would minimise the negative effect on the local environment especially unique features serving as habitat to various vertebrate fauna species. **3.** Remove (e.g., capture) unique and sensitive fauna, especially sedentary and slow-moving reptiles (e.g., leopard & Kalahari tent tortoises, etc.) before commencing with the development activities and/or species serendipitously located during this period and relocate to a less sensitive/disturbed sites in the immediate area. **4.** Prevent and discourage the setting of snares (poaching), illegal collecting of veld foods, indiscriminate killing of perceived dangerous species (e.g., snakes, etc.) and collecting of wood as this would diminish and negatively affect the local fauna – especially during the development phase(s).

	5. Attempt to avoid the destruction of bigger trees during the development phase(s) – especially with the development of access routes & various infrastructures – as these serve as habitat for a myriad of fauna. **6.** Rehabilitation of the disturbed areas – i.e., initial development access route "scars" and associated tracks as well as associated mining infrastructures. Preferably workers should be transported in/out to the construction sites daily to avoid excess damage to the local environment (e.g., pollution, wood collection, poaching, etc.). Such rehabilitation would not only confirm the company's environmental integrity, but also show true local commitment to the environment. **7.** Prevent domestic pets – e.g., cats & dogs – accompanying the workers during the construction phase as cats decimate the local fauna and interbreed & transmit diseases to the indigenous African wild cat found in the area. Dogs often cause problems when bonding on hunting expeditions thus negatively affecting the local fauna and domestic stock. The indiscriminate and wanton killing of the local fauna by such pets should be avoided at all costs. **8.** Initiate a suitable waste removal system (i.e., remove to Windhoek and not store on site) as this often attracts wildlife – e.g., baboons, black-backed jackal, crows, etc. – which may result in human-wildlife conflict issues. **9.** Educate/inform contractors and staff on protected species (See Tables 1-8) to avoid and the consequences of illegal collection of such species. **10.** Investigate the idea of employing an Environmental Officer during the construction phase(s) to ensure compliance and minimise the overall impact on the fauna and the environment. **Tracks** **New proposed main access route(s)** **11.** These track(s) should avoid the important habitats (See Sections 4 & 5; Figures 26-30), especially avoid various & random crossing over the Nossob River, but use one recognised/official crossing point. This would minimise the effect on localised potentially sensitive habitats in the area as well as minimise erosion and downstream siltation issues. **All tracks** **12.** Avoid driving randomly through the area (i.e., enforce "track discipline"), but rather stick to permanently placed roads/tracks – especially during the construction phase. This would minimise the effect on localised potentially sensitive habitats in the area. **13.** Stick to speed limits of maximum 30km/h as this would result in fewer faunal road mortalities. Speed humps could also be used to ensure the speed limit. Lower speeds would also minimise dust pollution. **14.** Implement erosion control. – i.e., avoid constructing tracks up steep gradients; incorporate erosion furrows (runoff sites) and humps along tracks to channel water off the tracks to minimise erosion problems; cross drainage lines at right angles, etc. The area(s) towards & adjacent the drainage line(s) are easily eroded, and further development may exacerbate this problem. Avoid construction within 100m of the Nossob River to minimise erosion problems as well as preserving the riparian associated flora and fauna. **Plant – proposed site** **15.** Avoid constructing the plant in/close to sensitive areas (See Section 5 & Figures 26-30).

	Nossob River **16.** Avoid construction within 100m of the Nossob River to minimise erosion and downstream siltation problems as well as preserving the riparian associated flora and fauna **Ground dams & pans** **17.** Avoid damage to the larger ground dams and pans (See Figure 30). **Ephemeral drainage lines** **18.** Avoid damage to the larger well vegetated ephemeral drainage lines (See Figure 30). **Rocky outcrops** **19.** All rocky outcrops are viewed as important habitat to unique vertebrate fauna (See Figure 30).
Frequency of occurrence	Expected to be a "once off" issue affecting the selected site(s). Further prospecting/mining & associated road/infrastructure developments (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) because 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 proposed mitigating measures would minimise this) would decrease the significance of these potential impacts.
Significance	Before mitigation: **High** After mitigation: **Medium** to **Low**
Status of the impact	Negative Localised unique habitats (e.g., Nossob River, ground dams & pans, well vegetated ephemeral drainage lines and rocky ridges/outcrops) with associated vertebrate fauna would bear the brunt of this proposed 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	The biodiversity specialist is 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.

7.3.3.4.2. Floral impact

Floral impact with the proposed mining development would be localised. The following table indicates the potential/envisaged impacts expected regarding floral loss (which is obviously closely linked to habitat destruction):

Description	**1.** Access route(s) - Localised disruption/destruction of the habitat and thus consequently flora associated directly with the actual routes. This however, would be a relatively small area with localised implications. **2.** Mining site(s) - Localised disruption/destruction of the habitat and thus consequently flora associated directly with the actual sites. This could cover an extensive area – depending on scale of operations – with large scale implications. **3.** Infrastructure - Localised disruption/destruction of the habitat and thus consequently flora associated directly with the actual sites. This however, would be a relatively small area with localised implications.
Extent	**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 site(s) - The duration of the impact is expected to be permanent at the site(s). **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.
Duration	**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 site(s) - The actual mining site(s) would be permanently altered. **3.** Infrastructure - The actual construction site associated with the various mining infrastructures would be permanently altered. This however, would be relatively small area 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 mining and associated infrastructure although within the immediate area would be affected minimally. This would include dust & other associated disturbances in the area but be limited to the mining & construction periods.
Intensity	**1.** Access route(s) - Localised disruption/destruction of the habitat and thus consequently flora associated directly with the actual routes. This however, would be a relatively small area with localised implications. **2.** Mining site(s) - Localised disruption/destruction of the habitat and thus consequently flora associated directly with the actual sites. This could cover an extensive area – depending on scale of operations – with large scale implications. **3.** Infrastructure - Localised disruption/destruction of the habitat and thus consequently flora associated directly with the actual sites. This however, would be a relatively small area with localised implications.
Mitigation	**General:** **1.** Avoid development & associated infrastructure in sensitive areas – e.g., Nossob River, ground dams & pans, well vegetated larger ephemeral drainage lines and rocky ridges/outcrops – in the proposed development area (See Sections 4 & 5; Figures 26-30). This would minimise the negative effect on

	the local environment especially unique features serving as habitat to various flora species. **2.** Identify protected and unique species (i.e., *Erythrina decora* (Namibian coral tree). Other important species are the larger *Acacia erioloba* (camel thorn), Boscia albitrunca (shepherd's tree), *Searsia lancea* (karee) and *Ziziphus mucronata* (buffalo thorn) specimens before the commencement of development activities in areas where these occur and avoid. **3.** Prevent and discourage the collecting of firewood as dead wood has an important ecological role. Such collecting of firewood, especially for economic reasons, often leads to abuses – e.g., chopping down of live and/or protected tree species such as *Acacia erioloba* which is a good quality wood. **4.** Avoid the removal and damage of bigger trees (especially protected species – i.e., *Acacia erioloba* (camel thorn), etc. [See Table 5; Forest Act No. 12 of 2001]) – during developments – including the development of access routes – as these serve as habitat for a myriad of fauna. **5.** Implement a policy of "no tolerance" towards the existing invasive alien plant species (e.g., *Datura* spp., *Opuntia* spp., etc.) located throughout the area. This should include the removal and destruction of these species throughout the proposed development areas. Such activity would be beneficial to the overall ecology of the area, especially the Nossob River, which would transport seeds downstream. **6.** Rehabilitation of the disturbed areas – i.e., initial development access route "scars" and associated tracks, as well as temporary accommodation sites. Preferably workers should be transported in/out to the construction sites daily to avoid excess damage to the local environment (e.g., wood collection, poaching, etc.). Such rehabilitation would not only confirm the various development companies' environmental integrity, but also show true local commitment to the environment. **7.** Limit development – i.e., keep to the bare minimum – in the drainage lines or within 100m of these drainage lines to preserve the associated riparian fauna. **8.** Educate/inform contractors on protected species to avoid and the consequences of damaging such species. Liaise with NBRI and/or MEFT to provide this service. **9.** Investigate the idea of employing a qualified environmental officer (EO) during the construction phase to ensure appropriate conduct by contractor(s). **10.** Avoid the use of herbicides for plant/weed control throughout the areas. **11.** Employ an ecologist for advice on the best route(s)/sites, etc. prior to construction – i.e., assist with the final alignment. **Plant – proposed site** **12.** Avoid constructing the plant in/close to sensitive areas (See Section 5). **Nossob River** **13.** Avoid construction within 100m of the Nossob River to minimise erosion and downstream siltation problems as well as preserving the riparian associated flora and fauna **Ground dams & pans**

	14. Avoid damage to the larger ground dams and pans (See Figure 30). **Ephemeral drainage lines** **15.** Avoid damage to the larger well vegetated ephemeral drainage lines (See Figure 30). **Rocky outcrops** **16.** All rocky outcrops are viewed as important habitat to unique flora – e.g., *Aloe littoralis* (Windhoek aloe) and *Erythrina decora* (Namibian coral tree), etc. (See Figure 30).
Frequency of occurrence	Expected to be a "once off" issue affecting the selected site(s).
Probability	Definite (100%) negative impact on flora is expected in the actual development areas as well as the access route construction sites. This however, would be much localised and cover limited areas. Highly Probable (75%) negative impact on flora is expected from the infrastructure (roads/tracks, etc.). Precautionary principle (e.g., avoid unique habitat features as well as adhering to the proposed mitigating measures would minimise this) would decrease the significance of these potential impacts.
Significance	Before mitigation: **High** After mitigation: **Medium** to **Low**
Status of the impact	Negative Localised unique habitats (e.g., Nossob River, ground dams & pans, well vegetated ephemeral drainage lines and rocky ridges/outcrops) with associated flora would bear the brunt of this proposed development but be limited in extent and only permanent at the actual development sites and access routes.
Legal requirements	Flora related: Forest Act No. 12 of 2001, Nature Conservation Ordinance No. 4 of 1975, CITES, IUCN Habitat – Flora related: Forest Act No. 12 of 2001, Nature Conservation Ordinance No. 4 of 1975, CITES
Degree of confidence in predictions	The biodiversity specialist is 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.

7.3.4. Impact on archaeology

Archaeological and other heritage evidence from the area surrounding the Ongombo property and the mineral leases of EPL 5772 and ML 240 are dominated firstly by the remains of semi-nomadic pastoral encampments and other associated sites. Among the latter is important evidence of indigenous copper production which commenced in approximately 1200 AD. Copper production sites are associated with the Matchless amphibolite belt which extends over a distance of approximately 300km along a SW-NE strike with localized areas of copper mineralization. Exploration and mining interest in

EPL 5772 and ML 240 is apparently associated with the Matchless amphibolite.

The second body of evidence that is important in this area consists of early colonial farming and associated settlement remains. Immediately following the Herero Revolt of 1904 desirable farming land in central Namibia was apportioned to German settlers. Many farm buildings and related infrastructure such as wells and cemeteries date from this period and therefore resort under the protection afforded by the National Heritage Act. Colonial settlement is superimposed on a quite different precolonial pattern of settlement and land-use which, less obvious to casual inspection, is nonetheless important to an understanding of the Namibian past.

The field survey carried out on EPL 5772 and ML 240 recorded no heritage sites within the boundaries of the mineral leases. However, four sites were located on the approaches and margins of the mineral leases (i.e. QRS 350/1, QRS 350/2, QRS 350/3 and QRS 350/4). See Annexure K for location of the sites.

In view of the fact that the assessment is based on surface finds, it is recommended that developer adopt the Archaeological Chance Finds Procedure, as set out in the Archeological assessment report (Annexure K).

- <u>Summary</u>

Table 42 below provides a summary of the potential impacts related to archaeology:

Table 42: Summary of impact assessment of the project on archaeology

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION/ ENHANCEMENT	MITIGATION/ ENHANCEMENT	POST-MITIGATION/ ENHANCEMENT
CONSTRUCTION PHASE									
IMPACT ON LOCAL ARCHAEOLOGY	Negative	On site	Permanent	Low	Probable	High	Medium	Developer adopt the Archaeological Chance Finds Procedure.	Medium – Low

7.3.5. Impact on the socio-economic environment

The socio-economic study conducted on the proposed project has provided valuable insights into the potential impacts and implications on the local communities and the broader region. The study assessed various factors including employment, in-migration, housing, economic contributions, environmental risks, and social issues.

In terms of employment:

- The project is expected to create both skilled and unskilled job opportunities during the construction and operational phases.
- Priority must be given to hiring local residents and communities, while ensuring compliance with Affirmative Action Act.
- Measures such as training, skills upgrading, and promoting home ownership will enhance the socio-economic benefits for the workforce.

In addition to the direct and indirect jobs that the proposed project will create and the taxes and royalties it will generate for the national economy, a number of spin-off impacts are expected to stimulate the local and regional economies.

- Through mining royalties, taxes, and increased economic activity, the project will generate revenue for the government and stimulate economic growth in the region.
- Corporate social investment, particularly in affordable housing, education, and essential services, will further support local development.
- Meeting the demands of the project in terms of products and services needed.
- All mine workers and local communities will have more economic prosperity, resilience, and sustainable spending if they have a steady income. Their expenditures will therefore raise other people's incomes and possibly lead to the development of jobs.
- The operational employees are likely to spend a large portion of their salaries on accommodation, goods and services in Windhoek.
- The local housing industry is likely to benefit from an increased demand for housing or land.

The project will however also bring about some socio-economic pressures to the region:

- Influx of job seekers has the potential to worsen already-existing societal issues and raise the unemployment rate. Crime and alcohol misuse are the current issues facing the local communities.

- The lack of residential erven is already a problem for the City of Windhoek. The Ongombo Mine, together with the other mines and developments in the area, will collectively put a lot of strain on the town's housing shortage (in the event that construction workers be accommodated in the City).

  Already operating at full capacity, new people to the area, whether employed or job seekers, will add to these pressures since all of them will require housing and associated services.

- Educational facilities are already under pressure as the demand for schooling is higher than the availability thereof.
- Poaching, littering, and social issues related to alcohol and drug abuse.

The socio-economic assessment indicates that the proposed project has significant potential to contribute to the local and national economy, create employment opportunities, and support community development. However, it also highlights the importance of proactive management and mitigation measures to minimize negative impacts and ensure sustainable socio-economic outcomes. By engaging with stakeholders, adopting responsible practices, and investing in the well-being of the workforce and local communities, the project can maximize its positive contributions and foster long-term socio-economic benefits for all stakeholders involved.

- Proposed Mitigation

  - Local recruitment and contracting: The project will actively seek to recruit and contract individuals who are residents of the Khomas region. Preference must be given to Ongombo West community members.
  - The recruitment process should be gender inclusive, i.e., qualified women should be given an equal opportunity where possible.
  - Local Procurement: Implement a strong local procurement policy to prioritize sourcing goods and services from local suppliers and businesses. This will boost the local economy and create opportunities for local businesses to benefit from the project.
  - Skills development and training: The project must invest in skills development and training programs aimed at enhancing the capabilities of Ongombo community members. This will provide them with the necessary skills and qualifications to be eligible for employment or contracting opportunities within the project.

- Community Investment: Allocate a portion of the project's budget for community investment initiatives. Focus on supporting projects and programs that promote economic development, such as having a mobile clinic, building a school, entrepreneurship, small business development, and vocational training.
- Infrastructure Development: Collaborate with local authorities and stakeholders to identify and address infrastructure gaps in the region. This includes improving roads, utilities, a mobile clinic, building a school, and other necessary infrastructure to support the project and the Ongombo local community.
- Supply Chain Management: Implement transparent and fair supply chain practices that promote local supplier participation. Encourage local suppliers to meet quality and safety standards, providing them with opportunities to become part of the project's supply chain.
- Monitoring and Evaluation: Establish a robust monitoring and evaluation system to track the economic impacts of the project. Regularly assess the progress and effectiveness of the management and enhancement measures implemented and make necessary adjustments as required.
- Ensure there is a detailed mine closure plan in place when operations begin. This is essential, given the volatility of the global market and economy.
- Proactive stakeholder engagement: Engage with stakeholders, including suppliers, government authorities, local communities, and employees, in a timely manner. Communicate the potential risks of mine closure or transition to care and maintenance, allowing stakeholders to make necessary adjustments and plan accordingly.
- Community development initiatives: Invest in community development projects that can help mitigate the economic impacts of mine closure. This may involve supporting infrastructure development, educational programs, healthcare services, and other initiatives that contribute to the long-term well-being of the affected communities.
- Reclamation and land restoration: Allocate resources for land reclamation and restoration activities to minimize the long-term economic and environmental impacts of mine closure. This can include rehabilitating the site to support alternative land uses, such as agriculture, renewable energy projects, or nature conservation.
- Collaboration with small-scale miners: Explore opportunities to support small-scale miners by providing access to machinery, technical assistance, or training. This can help create sustainable livelihoods and economic opportunities for

individuals who may be affected by mine closure.

- Poaching: Measures must be implemented to prevent unauthorized access, protect the surrounding areas, and collaborate with local authorities to raise awareness about wildlife protection, discouraging poaching activities. Report poachers and workers who contravene the rules.
- Littering: Effective waste management systems will be established within the mine, including designated collection points, recycling facilities, and regular cleaning schedules. Workers will receive training on proper waste disposal to maintain cleanliness and prevent littering.
- Train and hold on-going awareness campaigns to educate contractors about the rules and the importance of biodiversity and the harm caused by litter.
- Implement comprehensive awareness and education programs: Provide training and educational initiatives on HIV prevention, responsible alcohol consumption, and drug abuse prevention. Promote safe sexual practices and provide access to contraceptives and healthcare services.
- Enforce strict alcohol and drug policies: Implement and enforce policies that prohibit the use of drugs and excessive alcohol consumption within the construction camp. Conduct regular inspections and testing to ensure compliance.
- Ongombo mine should consider assisting the local communities initiatives in terms of health, education etc. as part of the mine's Corporate Social Responsibility plans.
- All the neighbouring land users and communities should be informed regarding the dates and times for blasting.
- Foster collaboration and partnerships: Seek opportunities for collaboration and partnerships with key stakeholders to address common interests and concerns. This may involve joint initiatives, sharing of resources or expertise, or involving stakeholders in decision-making processes.
- A go-to-person should be identified by the Ongombo mine, and his/her details provided to the surrounding land users and communities. A platform has to be created for them to submit any complaints and also receive feedback on how issues were addressed. This can be done by electing a community representative committee who can communicate issues to the go-to-person.
- In the event of abnormal loads being transported from either South Africa or Walvis Bay to the site, the national, regional and local traffic departments should

be informed and involved.

- Proposed Monitoring
    - Keeping records of the number, amount, and country of origin of contractors is an important part of the project management process. Contractors should provide information on the number of Namibians they employ.
    - In addition to keeping records of the number of employees, it is also necessary to keep track of their salaries. Salary expenditures are a good indicator of how much money employees will spend locally, regionally, and nationally.
    - There should also be reports on how and where operational costs were spent, as well as what goods and services were used locally, regionally, and nationally.
    - A logbook should be kept at the gate of the access road indicating the time of entrance or exit, the type of vehicle, and its destination.
    - Records of communication with the surrounding land users and communities regarding blasting activities should be communicated by the Public Relations department to the Executive Management.
    - Records of complaints received from the surrounding land users and communities, as well as feedback on how it was addressed should be kept.
    - Records of compensation paid in the event of poaching should be provided to the Executive Management, as well as disciplinary actions taken by the Human Resources Department or contractor.
    - The Health and Wellness Coordinators should compile health overview reports of the workforce.

- Summary

Table 43 below provides a summary of the potential impacts related to the social environment:

Table 43. Summary of impact assessment of the project on the socio-economic environment

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE- MITIGATION/ ENHANCEMENT	MITIGATION/ ENHANCEMENT	POST-MITIGATION/ ENHANCEMENT
CONSTRUCTION PHASE									
CONTRIBUTION TO THE NAMIBIAN ECONOMY THROUGH CAPITAL EXPENDITURE	Positive	National	Temporary	Medium	Highly Probable	High	Low	Employ local labour.	Medium
SECONDARY ECONOMIC BOOST	Positive	Regional and Local	Temporary	Medium	Highly Probable	High	Low	Locals First Policy, employ local contractors and not foreigners. Encourage local spending.	Low to Medium
JOB CREATION (IF FOREIGN)	Negative, if foreigners	Local to National	Temporary	High	Highly Probable	High	Medium	Locals First Policy	Low
	are used								

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE- MITIGATION/ ENHANCEMENT	MITIGATION/ ENHANCEMENT	POST-MITIGATION/ ENHANCEMENT
JOB CREATION	Positive, if locals and Namibian are used.	Local to National	Temporary	High	Improbable	High	Low	Locals First Policy	Medium
PRESSURES ON AVAILABLE SERVICES AND HOUSING FOR ON-SITE HOUSING	Negative	Local	Temporary	High	Highly Probable	High	High	Provide infrastructure and services. Maintain sound environmental control.	Medium to Low
PRESSURES ON AVAILABLE SERVICES AND HOUSING FOR OFF-SITE HOUSING (Windhoek)	Negative	Local	Temporary	Medium	Definite	High	Medium	Negotiate with the local authority for access to affordable housing.	Medium to Low

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE- MITIGATION/ ENHANCEMENT	MITIGATION/ ENHANCEMENT	POST-MITIGATION/ ENHANCEMENT
INCREASED TRAFFIC ALONG ROUTES BETWEEN SOUTH AFRICA AND NAMIBIA; AND WALVIS BAY AND THE SITE	Negative	International	Temporary	Low	Definite	High	Low	Good traffic control Measures, communication with the local and national traffic departments when abnormal loads come in.	Very Low
INFLUX AND MOBILE WORKFORCE CONTRIBUTING TO SPREADING OF HIV/AIDS	Negative	Local to National	Permanent	High	Highly Probable	High	Medium	Awareness Raising Campaigns. Corporate Social Responsibility.	Medium-Low

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE- MITIGATION/ ENHANCEMENT	MITIGATION/ ENHANCEMENT	POST-MITIGATION/ ENHANCEMENT
IMPACT ON NEIGHBOURING PROPERTY VALUE	Negative	Local	Temporary	Low	Distinct possibility	Medium	Medium	Keep to national and international standards. Establish funds for cleanup and remediation upon mine Closure.	Low
OPERATIONAL PHASE									
SECONDARY ECONOMIC BOOST	Positive	Regional and Local	Long Term	Medium	Highly Probable	High	Low	Locals First Policy. Encourage local spending.	Low to Medium

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE- MITIGATION/ ENHANCEMENT	MITIGATION/ ENHANCEMENT	POST-MITIGATION/ ENHANCEMENT
CONTRIBUTION TO THE NAMIBIAN ECONOMY THROUGH TAXES AND ROYALTIES	Positive	National	Long Term	Medium	Highly Probable	High	Low	None	N/A
JOB CREATION	Positive	Local to National	Long Term	Medium	Highly Probable	High	Low	Locals First Policy	Low to Medium
INCREASED PRESSURE ON HOUSING	Negative	Local	Long Term	High	Definite	High	Medium	Locals First Policy, communication with local authorities, Corporate Social Responsibility.	Medium to Low

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE- MITIGATION/ ENHANCEMENT	MITIGATION/ ENHANCEMENT	POST-MITIGATION/ ENHANCEMENT
IMPACT ON NEIGHBOURING PROPERTY VALUE	Negative	Local	Temporary	Low	Distinct possibility	Medium	Medium	Keep to national and international standards. Establish funds for cleanup and remediation upon mine closure	Low
INFLUX AND MOBILE WORKFORCE CONTRIBUTING TO SPREADING OF HIV/AIDS	Negative	Local	Permanent	High	Medium Probable	High	Medium	Awareness Raising Campaigns, Corporate Social Responsibility	Medium-Low
DECOMMISSIONING PHASE									
LOSS OF TAXES AND ROYALTIES	Negative	National	Permanent	Medium	Definite	High	Low	None	N/A

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE- MITIGATION/ ENHANCEMENT	MITIGATION/ ENHANCEMENT	POST-MITIGATION/ ENHANCEMENT
RETRENCHMENT OF OPERATIONAL EMPLOYEES.	Negative	Local to National	Permanent	Medium	Definite	High	Medium to Low	Secure accreditation for in-house skills Transfer which recognizes and certifies any training courses	Low
CONTINUATION OF EMPLOYMENT	Positive	Local to National	Permanent	Medium	Definite	High	Low	Locals First Policy	Low to Medium
CHANGE TO LAND USE ACTIVITIES BY SURROUDNING FARMERS AND TOURISM	Positive, if landscape rehabilitation on takes place	Local	Permanent	High	Definite	High	Low	Implement rehabilitation plan	Medium

7.4. Cumulative Impacts

According to the Environmental Protection Agency (EPA), cumulative impacts are defined as follows:

"Cumulative impacts result when the effects of an action are added to or interact with other effects in a particular place and within a particular time. It is the combination of these effects, and any resulting environmental degradation, that should be the focus of cumulative impact analysis. While impacts can be differentiated by direct, indirect, and cumulative, the concept of cumulative impacts takes into account all disturbances since cumulative impacts result in the compounding of the effects of all actions over time. Thus, the cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action and all other activities affecting that resource no matter what entity (federal, non-federal, or private) is taking the actions."

The potentially cumulative impacts identified with this project, are highlighted in Table 44. Many of these impacts have a low overall (cumulative) significance and none of the identified cumulative impacts, justify the no-go alternative. However, some impacts are considered of low significance in the context of the proposed project, but when viewed in combination with the other projects (in particular mining) currently operating in the area, the significance increases.

Table 44. Cumulative impacts expected on the proposed project

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION/ ENHANCEMENT	MITIGATION/ ENHANCEMENT	POST-MITIGATION/ ENHANCEMENT
BIODIVERSITY									
OVERALL IMPACT OF THE PROJECT ON THE SURROUNDING BIODIVERSITY	Negative	Local	Long term - permanent	Minor effects	Highly probable	High	Low	Avoid the unnecessary removal of large tree species.	Low
CARBON FOOTPRINT									
GREENHOUSE GAS (GHG) EMISSIONS ASSOCIATED WITH THE PROJECT	Negative	International	Permanent	No local effects from greenhouse gas emissions	Definite	High confidence	None associated with GHG emissions	Impacts expected to be well below (<1%) of the international standards and guidelines.	None associated with GHG emissions

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION/ ENHANCEMENT	MITIGATION/ ENHANCEMENT	POST-MITIGATION/ ENHANCEMENT
CONTRIBUTION OF THE PROJECT (COLLECTIVELY WITH GLOBAL EMISSIONS) TO CLIMATE CHANGE	Negative	International	Permanent	Minor effects	Definite	High confidence	Low	Impacts expected to be negligible and well below (<1%) of the international standards and guidelines.	Low
POLLUTION									
IMPACT OF THE PROJECT ON LOCAL AIR QUALITY	Negative	Local	Long Term	Minor	Probable	Medium	Medium	Particulate emissions from the ROM stockpile and tailings storage facility should be controlled using best available practice.	Low

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION/ ENHANCEMENT	MITIGATION/ ENHANCEMENT	POST-MITIGATION/ ENHANCEMENT
IMPACT OF THE PROJECT ON GROUND AND SURFACE WATER RESOURCE	Negative	Local	Permanent	Moderate effect	Improbable	High	Medium	Mine supply will not affect local groundwater sources. Divert surface Water runoff with berms. Store locally sourced clean water for treatment before community and operations supply.	Low

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION/ ENHANCEMENT	MITIGATION/ ENHANCEMENT	POST-MITIGATION/ ENHANCEMENT
NOISE IMPACT OF THE PROJECT	Negative	Local	Short Term	No Lasting Effect	Highly probable	High	Low	All the neighbouring farms and communities should be informed regarding the dates and times for blasting.	Low
VISUAL									
SOCIO-ECONOMIC									
CONTRIBUTING TO THE EXISTING TREND OF INFLUX OF JOB SEEKERS	Negative	Local	Permanent	Minor Effects	Highly probable	High	Low	Locals First Policy	Low

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION/ ENHANCEMENT	MITIGATION/ ENHANCEMENT	POST-MITIGATION/ ENHANCEMENT
CONTRIBUTION TO THE NAMIBIAN ECONOMY THROUGH CAPITAL EXPENDITURE	Positive	National	Long term	Minor effect	Highly Probable	High	Low-medium	N/A	Low-medium
CONTRIBUTION THROUGH TAXES AND ROYALTIES	Positive	National	Long Term	Moderate Effect	Highly Probable	High	Low-Medium	N/A	Low-Medium
EMPLOYMENT CREATION DURING CONSTRUCTION AND OPERATIONAL PHASES	Positive, if locals and Namibian are used.	Local to National	Long term	Minor effects	Highly probable	High	Low-Medium	Locals First Policy	Medium

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION/ ENHANCEMENT	MITIGATION/ ENHANCEMENT	POST-MITIGATION/ ENHANCEMENT
STIMULATING SECONDARY BUSINESS ACTIVITIES/ SPIN-OFF EFFECTS	Positive	Local to national	Long Term	Minor effects	Probable	High	Low	Locals First Policy, employ local contractors and not foreigners. Encourage local spending. Encourage agribusiness development to diversify food supply options for local communities.	Low to Medium

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION/ ENHANCEMENT	MITIGATION/ ENHANCEMENT	POST-MITIGATION/ ENHANCEMENT
ADDITIONAL STRAIN ON HOUSING INFRASTRUCTURE	Negative	Local	Long term	High	Definite	High	Medium	Mine to consider and participate in meeting housing demand.	Low
INFLUX AND MOBILE WORKFORCE CONTRIBUTING TO SPREADING OF HIV/AIDS	Negative	Local to National	Permanent	Low	Highly Probable	High	Medium	Awareness Raising Campaigns	Medium-Low
ROAD AND TRAFFIC									

POTENTIAL IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION/ ENHANCEMENT	MITIGATION/ ENHANCEMENT	POST-MITIGATION/ ENHANCEMENT
ADDITIONAL STRAIN ON ROAD INFRASTRUCTURE	Negative	Local	Long term to permanent	High	Definite	High	High	Good traffic control measures, communication with the local and national traffic departments when abnormal loads come in.	Medium

8. CONCLUSION AND RECOMMENDATIONS

This report will be submitted to the Directorate of Environmental Affairs (DEA) to assist it in defining the conditions for the proposed development, if it should proceed. This report will enable the DEA to determine whether or not to grant authorization for the proposed development. It aims to ensure that informed decisions are made for the benefit of the environment and society.

8.1. Consideration of Alternatives

The main reason for considering alternatives is to adhere to the mitigation hierarchy of firstly striving to avoid the impacts before considering reduction through mitigation. As part of the planning phase, a variety of alternatives have been considered. Alternatives that are preferred include:

No-go vs. proceeding with project: Continued development of the project could bring valuable economic development to the area, which will not only benefit the local population but also the country as a whole. Therefore, developing the project is the preferred option.

Stockpile and waste rock dump (WRD) location: This would typically be positioned directly adjacent to the open pit to be used later for rehabilitation and backfilling of the pit. It is therefore advisable to build the WRD to the north-northeast of the pit away from the ore body to prevent sterilisation.

The rejects from the fines fraction in the dry sorting process will still have a Cu grade and thus probably classified as a Low Grade Ore feed for potential future processing and will thus best be stockpiled close to the plant and classified as Low Grade RoM and not as waste.

Mining Methods: Due to the difference in the seam heights, two mining methods are envisaged: conventional stoping using pneumatic rock drills and scrapers, and bord and pillar mining. In the first three blocks (Central, East, and East Central) the deposit under consideration is a narrow, intermediate dipping (15° to 20°) tabular body and as such is amenable to a conventional mining approach common to South African narrow gold and platinum mining. Options of both breast and dip mining were considered for extraction of the three areas with breast mining being the preferred mining method.

Processing Method: The conventional copper processing and extraction methods produce large volumes of industrial waste and require large quantities of water, electricity, and chemical reagents. Whereas the sensor-based ore sorting technology requires only minimal amounts of water, doesn't use chemicals, and doesn't generate wet tailings. Hence the latter is the preferred processing method for the mining project.

8.2. Summary of key Impacts

Air Quality Impacts: Impacts during the construction phase would be triggered by operations, such as land clearing, topsoil removal, road grading, material loading and hauling, stockpiling, grading, bulldozing, compaction, etc., with particulate matter the main pollutants of concern from these activities. The extent of dust emissions would vary substantially from day to day depending on the level of activity, the specific operations, and the prevailing meteorological conditions, and how close these activities are to AQSRs. Due to the intermittent nature of construction operations, the emissions are expected to have a varying impact depending on the level of activity. With mitigation measures in place these impacts are expected to be low.

For the operational phase, emissions quantified for the proposed project were restricted to fugitive releases (non-point releases) with particulates the main pollutant of concern. Gaseous emissions (i.e. SO_2, NOx, CO and VOCs) will primarily result from diesel combustion, both from mobile and stationary sources. Both unmitigated and mitigated scenarios were modelled. Mitigation applied was based on the design measures provided. Dispersion modelling results indicate no exceedances of the AQOs for $PM_{2.5}$, PM_{10} and dustfall at the one identified AQSR or beyond the site boundary (EPL-5772). The air quality impacts on-site can be reduced by applying mitigation measures.

Socio-economic Impacts: The assessment indicates that the proposed project has significant potential to contribute to the local and national economy, create employment opportunities, and support community development. However, it also highlights the importance of proactive management and mitigation measures to minimize negative impacts and ensure sustainable socio-economic outcomes. By engaging with stakeholders, adopting responsible practices, and investing in the well-being of the workforce and local communities, the project can maximize its positive contributions and foster long-term socio-economic benefits for all stakeholders involved.

In terms of employment, the project is expected to create both skilled and unskilled job opportunities during the construction and operational phases. Priority must be given to hiring local residents, in particular the Ongombo West communities, while ensuring compliance with Affirmative Action Acts. Measures such as training, skills upgrading, and promoting the concept of home ownership will enhance the socio-economic benefits for the workforce.

Surface and groundwater Impacts: Envisaged mining process would be essentially dry with a minimalist usage of water. Groundwater from an existing wellfield in the White Nossob River, downstream of the Ongombo mining project, is the preferred water source to supply the project by means of bowser to a constructed water storage facility (reservoir) on-site. The main usage of water will be for the staff during operations. The following recommendations arise from the assessment:

- To drill in both aquifers, fractured and alluvial, monitoring boreholes, upstream and downstream mining commences to establish a baseline in terms of groundwater quality and groundwater levels;
- The groundwater monitoring patterns is proposed to be on a quarterly basis prior to mining activities start, thereafter on a monthly basis during the life of mine, and again on a quarterly basis after decommissioning for a number of years;
- It is of utmost importance to contain spillage from surface storage facilities such as waste rock dumps and hydrocarbons.
- The new water act dated 2013 has just been gazetted (September 2023) and the project should comply with new rules and regulations.

Biodiversity Impacts: Planning of mining activities should take cognisance of the above sensitive habitats/areas/features and attempt not to disrupt wildlife corridors (e.g., foraging areas, especially vegetated drainage lines) and the overall interconnectivity of various habitats. The most sensitive areas to avoid as far as possible would be:

a) White Nossob River
b) Ground dams and pans
c) Ephemeral drainage lines
d) Rocky areas

Archaeological Impacts: The specialist assessment carried out on EPL 5772 and ML 240 recorded no heritage sites within the boundaries of the mineral leases. However, four sites were located on the approaches and margins of the mineral leases (i.e. QRS 350/1, QRS 350/2, QRS 350/3 and QRS 350/4) as described in Section 5.9.2 of this report. In view of the fact that the assessment is based on surface finds, it is recommended that developer adopt the Archaeological Chance Finds Procedure, as set out in the Archeological assessment report.

8.3. Conclusion

The impacts associated with the proposed mining development can be reduced to acceptable measures. It is, however, important to implement and monitor the measures contained in the

EMP and associated management plans. We recommend that the project receives Environmental Clearance, provided the EMP is implemented.

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