QKR NAMIBIA
NAVACHAB GOLD MINE

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REPORT:

SCOPING REPORT FOR THE CONSTRUCTION AND OPERATION OF TSF 3 NAVACHAB GOLD MINE, ERONGO REGION, NAMIBIA.

PROJECT NUMBER: ECC-107-378-REP-07-D

REPORT VERSION: REV 01

DATE: 26 JULY 2023

ECC
ENVIRONMENTAL
COMPLIANCE CONSULTANCY

TITLE AND APPROVAL PAGE

Project Name:	Scoping report for the construction and operation of TSF 3 Navachab Gold Mine, Erongo Region, Namibia.
Client Company Name:	QKR Namibia Navachab Gold Mine (Pty) Ltd
Client Name:	Mr Anthony Moller
Ministry Reference:	APP-001547
Status of Report:	Final for government submission/Rev 01
Project Number:	ECC-107-378-REP-07-D
Date of issue:	26 July 2023
Review Period	N/A

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ABBREVIATIONS

Abbreviation	Description
ADMS	air dispersion modelling system
AMD	acid mine drainage
ANC	acid neutralising capacity
Au	gold
BFS	Bankable feasibility study
CAN	Central area of Namibia
CC	Close Corporation
CEO	Chief Executive Officer
CIA	cumulative impact assessment
CIL	carbon-in-leach
COD	Cone of Drawdown
CO_2	carbon dioxide
Competent Authority	Government Ministry that assists the MEFT in assessing a project and issuing a record of decision, in this case Ministry of Mines and Energy
Corp.	corporation
COVID	Coronavirus
COVID-19	Coronavirus 2019
dBA	decibels
DEA	Directorate of Environmental Assessment
DWA	Department of Water Affairs
EAP	environmental assessment practitioner
ECC	Environmental Compliance Consultancy
ECC	environmental clearance certificate
EHS	environmental health and safety
EIA	environmental impact assessment
EMA	Environmental Management Act
EMP	environmental management plan
EPLs	exclusive prospecting licences
ESIA	environmental and social impact assessment
ESMP	environmental and social management plan
g/t	grams per tonne
GDP	gross domestic product
GG	government gazette
GN	government notice
GROWAS	groundwater survey
ha	hectares
HIV/AIDS	human immunodeficiency virus / acquired immunodeficiency syndrome
I&APs	interested and affected parties
IFC (ps)	International Finance Corporation (performance standards)
ITS	ITS Global - traffic engineering consultants
KFZ	Karibib fault zone
kg H_2SO_4/t	kilograms of sulphuric acid per tonne
kg/ha	kilograms per hectare

Abbreviation	Description
km	kilometres
km/h	kilometres per hour
km^2	kilometres squared
KP	Knight Piesold (Pty) Ltd.
kV	kilovolts
kW	kilowatts
kWh/t	kilowatt hour/tonne
LAN	limestone ammonium nitrate
LOM	life of mine
Ltd	Limited
m	metre
m/s	metre per second
m^3	cubic metres
Mm^3	Million cubic metres
m^3/day	cubic metres per day
Ma	million years ago
masl	metres above sea level
MAWLR	Ministry of Agriculture, Water and Land Reform
mbgl	metres below ground level
MEFT	Ministry of Environment, Forestry and Tourism
mg/m^2/day	milligrams per metres squared per day
ML	mining licence
mm	millimetre
Mm^3	million cubic metres
MME	Ministry of Mines and Energy
MWT	Ministry of Works and Transport
MPA	maximum potential acidity
Mt	million tonnes
Mtpa	million tonnes per annum
MW	million watts
N$ or NAD	Namibian dollar
Na	sodium
NAF	net acid forming
NAPP	net acid producing potential
NDP	national development plan
NHC	National Heritage Council
NOx	nitrogen oxides
NPI	national pollutant inventory
NSR	noise sensitive receptor
NT	near threatened
PAF	low to moderate ANC, altered rock and elevated sulphur content
PEA	preliminary economic assessment
pH	acidity alkalinity unit
PM	particulate matter

Abbreviation	Description
PM10	particulate matter with an aerodynamic diameter of less than 2.5µm (thoracic particles)
PM2.5	particulate matter with an aerodynamic diameter of less than 10µm (respirable particles)
Project	Navachab Gold Mine TSF3 construction and operation
Proponent	QKR Namibia Navachab Gold Mine (Pty) Ltd
Pty	proprietary
Reg	registration
ROM	run of mine
SO2	sulphur dioxide
STRM	shuttle radar topography mission
t	tonnes
TB	tuberculosis
ToR	terms of reference
TSF	tailings storage facility
TSP	total suspended particulates
V	vulnerable
WRD	waste rock dump
Zn	zinc
µSv/cm	micro sieverts per cm

1 INTRODUCTION

1.1 COMPANY BACKGROUND

Environmental Compliance Consultancy (ECC) has been retained by QKR Namibia Navachab Gold Mine (Pty) Ltd, (hereinafter referred to as the Proponent), to undertake an environmental and social impact assessment (ESIA) and compile an integrated environmental management plan (ESMP) for the whole of Navachab Gold Mine operations in terms of the Environmental Management Act, No 7 of 2007 and its regulations of 2012. Accordingly, an environmental clearance application will be submitted to the relevant competent authorities and the Ministry of Environment, Forestry, and Tourism (MEFT) for a record of decision.

QKR Namibia Navachab Gold Mine (Pty) Ltd is a mining company with a portfolio of gold assets in Namibia. The Proponent is a Namibian registered company that proposes constructing and developing a 20 million cubic meters (Mm^3) tailing storage facility. Navachab Gold Mine is an open pit mine located approximately 9 km outside Karibib.

The location of the Navachab Gold Mine is shown in Figure 1. Management of the current operations and disturbed areas remain as per previous approvals and requirements of Environmental Clearance Certificates. The intended outcome of this ESIA is to consolidate approved clearance certificates, adapt the environmental and social management plan where needed and follow on with the submission of the application for an Integrated Management Plan that will act as an umbrella for the Navachab Gold Mine operation.

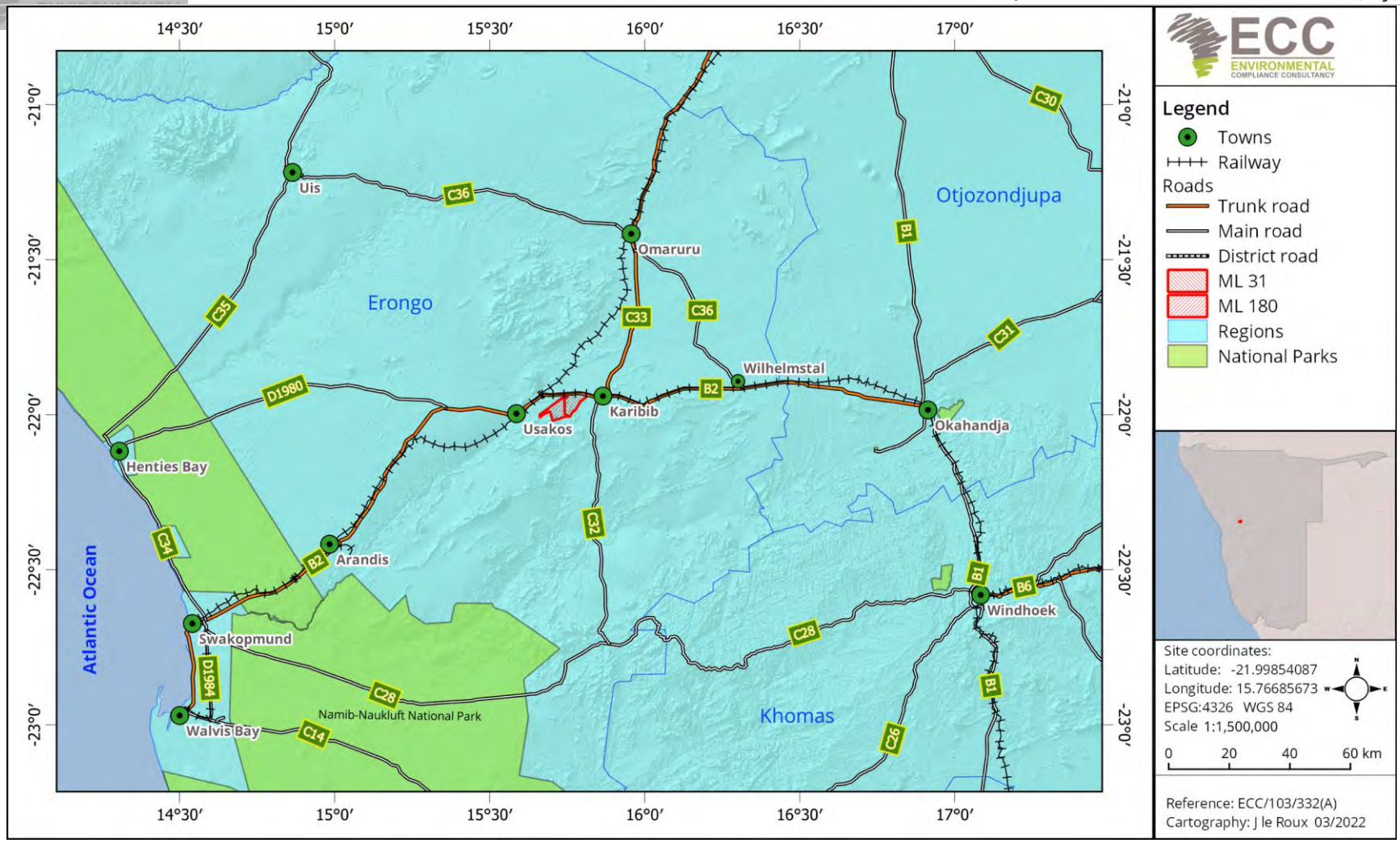

Figure 1 - Locality map of the Navachab Gold Mine.

1.2 PURPOSE OF THE SCOPING REPORT

An environmental and social impact assessment (ESIA) is underway as per the Environmental Management Act, 2007, and its regulations. The purpose of this report is to present the findings of the scoping study phase that forms part of the larger ESIA process.

The final scoping report summarises the prescribed ESIA process followed; provides information on the baseline biophysical and socioeconomic environments, Project description, and details; outlines the terms of reference for the assessment phase; and presents a preliminary operational environmental management plan (OESMP), which is provided as Appendix A.

The draft scoping report and appendices was submitted to the public for their review from the 8th of June 2023 to the 22nd of June 2023. This stage provided an opportunity for interested and affected parties (I&APs) to provide input, comments, and suggestions on the proposed Project, and in so doing, guide the impact assessment phase. The final scoping report, inclusive of the public comments, will be submitted to the Ministry of Mines and Energy (MME) as the competent authority for the Project. Thereafter, it will be submitted to the Ministry of Environment, Forestry, and Tourism (MEFT) - Directorate of Environmental Affairs (DEA) for a record of decision.

1.3 THE PROPONENT OF THE PROPOSED PROJECT

Table 1 - Proponent's details

Company Representative:	Contact Details:
Anthony Moller Technical contact person	[P.O. Box 150, Karibib, Namibia] Anthony.Moller@navachab.com.na +264 (64) 555 2090

1.4 ENVIRONMENTAL AND SOCIAL ASSESSMENT PRACTITIONER

The report has been prepared by Environmental Compliance Consultancy Pty Ltd (ECC) (Reg. No. 2022/0593) on behalf of the Proponent. Authored by ECC employees with no material interest in the report's outcome, ECC maintains independence from the Proponent and has no financial interest in the Project apart from fair remuneration for professional fees. Payment of fees is not contingent on the report's results or any government decision. ECC members or employees are not, and do not intend to be, employed by the Proponent, nor do they hold any shareholding in the Project. Personal views expressed by the writer may not reflect ECC or its client's views. The environmental report's information is based on the best available data and professional judgment at the time of writing. However, please note that environmental conditions can change rapidly, and the accuracy, completeness, or currency of the information cannot be guaranteed.

All compliance and regulatory requirements regarding this report should be forwarded by email or posted to the following address:

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PO Box 91193, Klein Windhoek, Namibia
Tel: +264 81 669 7608
Email: info@eccenvironmental.com

1.5 ENVIRONMENTAL REQUIREMENTS

The Environmental Management Act, 2007, and its regulations stipulate that an environmental clearance certificate is required before undertaking any of the listed activities that are identified in the Act and its regulations. Potential listed activities triggered by the Project are provided in Table 2.

Table 2 - Listed activities potentially triggered by the Project.

Listed activity	As defined by the Act	Relevance to the project
Waste management, treatment, handling, and disposal activities	(2.1) The construction of facilities for waste sites, and the treatment and disposal of waste. (2.3) The importing, processing, use, and recycling, temporary storage, transit, or exporting, of waste.	– Construction of a tailings storage facility. – Portable chemical toilets will be used during the construction phase and a septic tank sewer system will be installed on-site (operational phase).
Forestry activities	(4.) The clearance of forest areas, deforestation, afforestation, timber harvesting, or any other related activity that requires authorisation in terms of the Forest Act, 2001 (No. 12 of 2001) or any other law.	– Vegetation clearing will be required for site construction and infrastructure establishment.
Water resource developments	(8.5) Construction of dams, reservoirs, levees, and weirs. (8.6) Construction of industrial and domestic wastewater treatment plants and related pipeline systems.	– Construction of 20 million m^3 tailings storage facility and the dam will be built with the coarse fraction of the sandy tailings from cyclones as well as run of mine, non-mineralised mine waste rock.
Hazardous substance treatment, handling, and storage	(9.1) The manufacturing, storage, handling, or processing of hazardous substances defined in the Hazardous Substances Ordinance, 1974. (9.2) Any process or activity that requires a permit, licence, or other form of authorisation, or the modification of, or changes to, existing facilities for any process or activity that requires amendment of an existing permit, licence or authorisation, or which requires a new permit, licence or authorisation in terms of governing the generation or release of emissions, pollution, effluent, or waste.	– Storage of tailings: similar to existing operations over the past few decades, once TSF3 is constructed, the gold processing fine waste, or tailings, will be piped to the storage facility in existing pipelines and along existing routes. Tailings slurry will be discharged and stored within the facility. As part of the gold recovery process, the slurry will have elevated concentrations of cyanide (CN). CN destruction will take place within the pipeline and within the facility, typically by oxidation. Exposure in the tailings facility pond typically destroys CN quickly. The water fraction of the slurry will

Listed activity	As defined by the Act	Relevance to the project
	(9.4) The storage and handling of dangerous goods, including petrol, diesel, liquid petroleum, gas, or paraffin, in containers with a combined capacity of more than 30 cubic meters at one location.	naturally decant and separate from the tailings sands. It will pond against the western rock ridge from which the water will be pumped back to the processing facility for reuse. TSF3 will be constructed and operated like the currently operating TSF2. – Portable chemical toilets will be used during the construction phase of the Project. – A septic tank system will be installed for the permanent ablutions that will be constructed.

2 APPROACH TO THE ASSESSMENT

2.1 PURPOSE AND SCOPE OF THE ASSESSMENT

The aim of this assessment is to determine which impacts are likely to be significant; to scope the available data and identify any gaps that need to be filled; to determine the spatial and temporal scope, and to identify the assessment methodology.

2.2 THE ASSESSMENT PROCESS

The ESIA methodology applied to this assessment has been developed using the International Finance Corporation (IFC) standards and models, in particular, Performance Standard 1: 'Assessment and management of environmental and social risks and impacts (International Finance Corporation, 2012 and 2017); Namibian Draft Procedures and Guidance for EIA and ESMP (the Republic of Namibia, 2008); international and national best practice guidelines; and ECC's combined relevant ESIA experience.

Furthermore, this assessment was undertaken for the Proponent in accordance with Namibian legal requirements.

This assessment is a formal process. The potential effects that the Project will have on the biophysical, social, and economic environments are identified, assessed, and reported so that the significance of potential impacts can be taken into account when considering a record of decision for the proposed Project.

Final mitigation measures and recommendations are based on the cumulative experience of the consulting team and the client, taking into consideration the potential environmental and social impacts. The process followed, through the assessment, is illustrated in Figure 2 and is detailed further in the following sections.

At this juncture, it is important to note that the assessment will be carried out in accordance with the indicative plans received from the Proponent. After completing the assessment, some aspects of the Proponent's plans may need to change in order to comply with the stated recommended mitigations.

1. Project screening

Complete

The first stages in the ESIA process are to undertake a screening exercise to determine whether the Project triggers listed activities under the Environmental Management Act, 2007, and its regulations. The screening phase of the Project is a preliminary analysis, in order to determine ways in which the Project might interact with the biophysical, social, and economic environments.

Stakeholder engagement:
- Registration of the project
- Preparation of the BID
- Stakeholder engagement

2. Establishing the assessment scope

Complete

Where an ESIA is required, the second stage is to scope the assessment. The main aim of this stage is to determine which impacts are likely to be significant; to scope the available data and any gaps that need to be filled; to determine the spatial and temporal scope; and to identify the assessment methodology.

The scope of this assessment was determined through undertaking a preliminary assessment of the proposed Project against the receiving environment. Feedback from consultation with the public and the Proponent informs this process. The following environmental and social topics were scoped into the assessment, as there was the potential for significant impacts to occur. Impacts that are identified as potentially significant during the screening and scoping phase are taken forward for further assessment in the ESIA process. These are:

SOCIOECONOMIC ENVIRONMENT
- Air quality
- Noise
- Blast and vibration effects
- Cultural heritage and archaeology

BIOPHYSICAL ENVIRONMENT
- Biodiversity (endemism, conservation and protection status)
  - Fauna
  - Flora
- Ground and surface water quality

3. Baseline studies

Complete

A robust baseline is required, in order to provide a reference point against which any future changes associated with a Project can be assessed and to allow suitable mitigation and monitoring to be identified.

The project area has been studied utilising various specialist works and owner-generated information throughout the life of operation of the Navachab Gold Mine. This literature was available to be referenced by the consultant. The Project site-specific area has been studied as part of the ESIA process for the TSF3 area and the following has been conducted as part of this assessment:
- Field surveys
- Desktop studies
- Consultation with stakeholders
- Specialist field visits, monitoring, and ongoing studies

The environmental and social baselines are provided in chapter 5 of this scoping study.

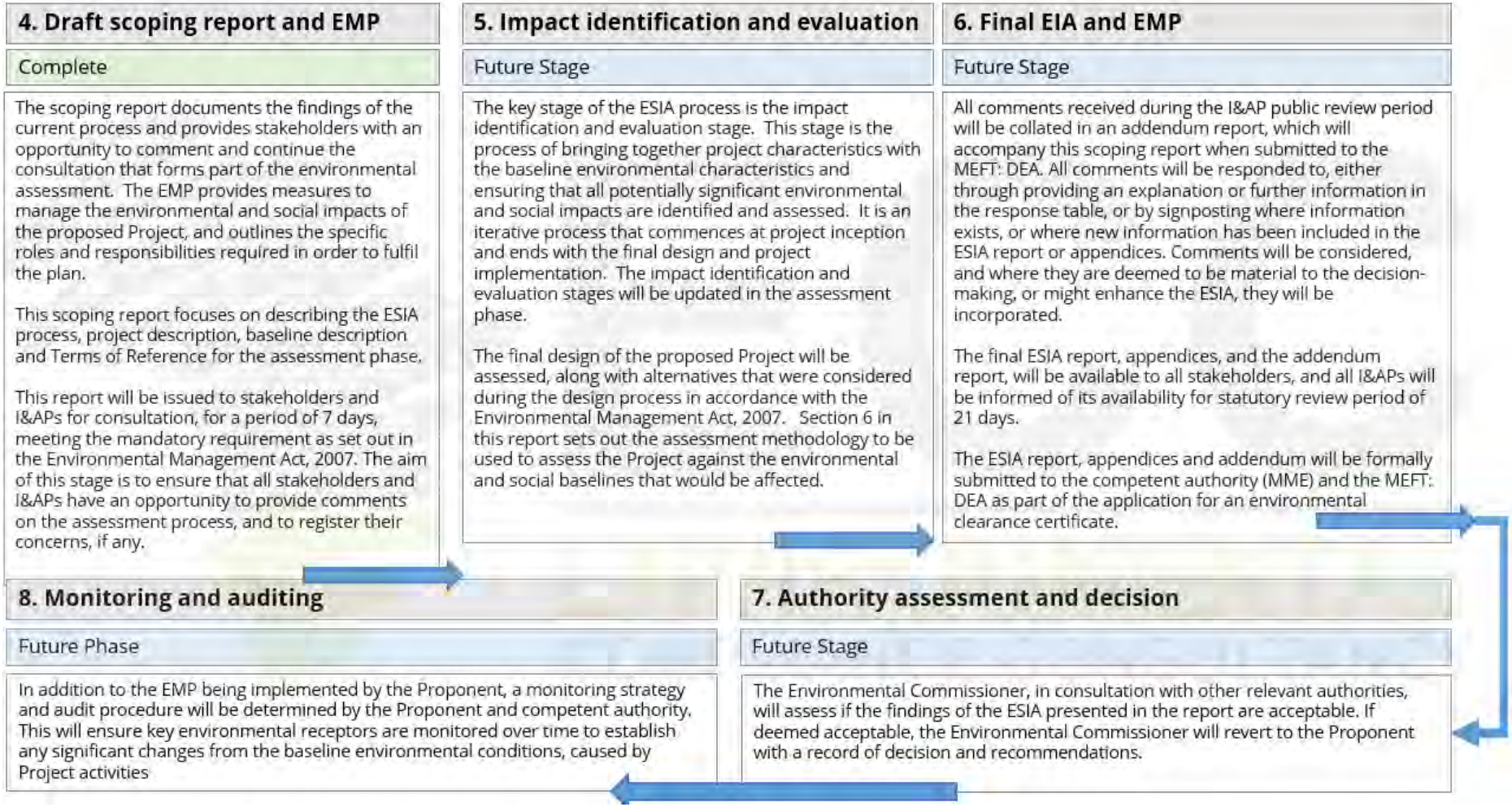

Figure 2 - ESIA process

2.3 STUDY AREA

This ESIA study area has been defined according to the geographic scope of the receiving environment and potential impacts that could arise because of the proposed Project within that area. The receiving environment is a summary term for the biophysical and socioeconomic environment that is described in the baseline chapter. The study area is presented in Figure 3 and Figure 4.

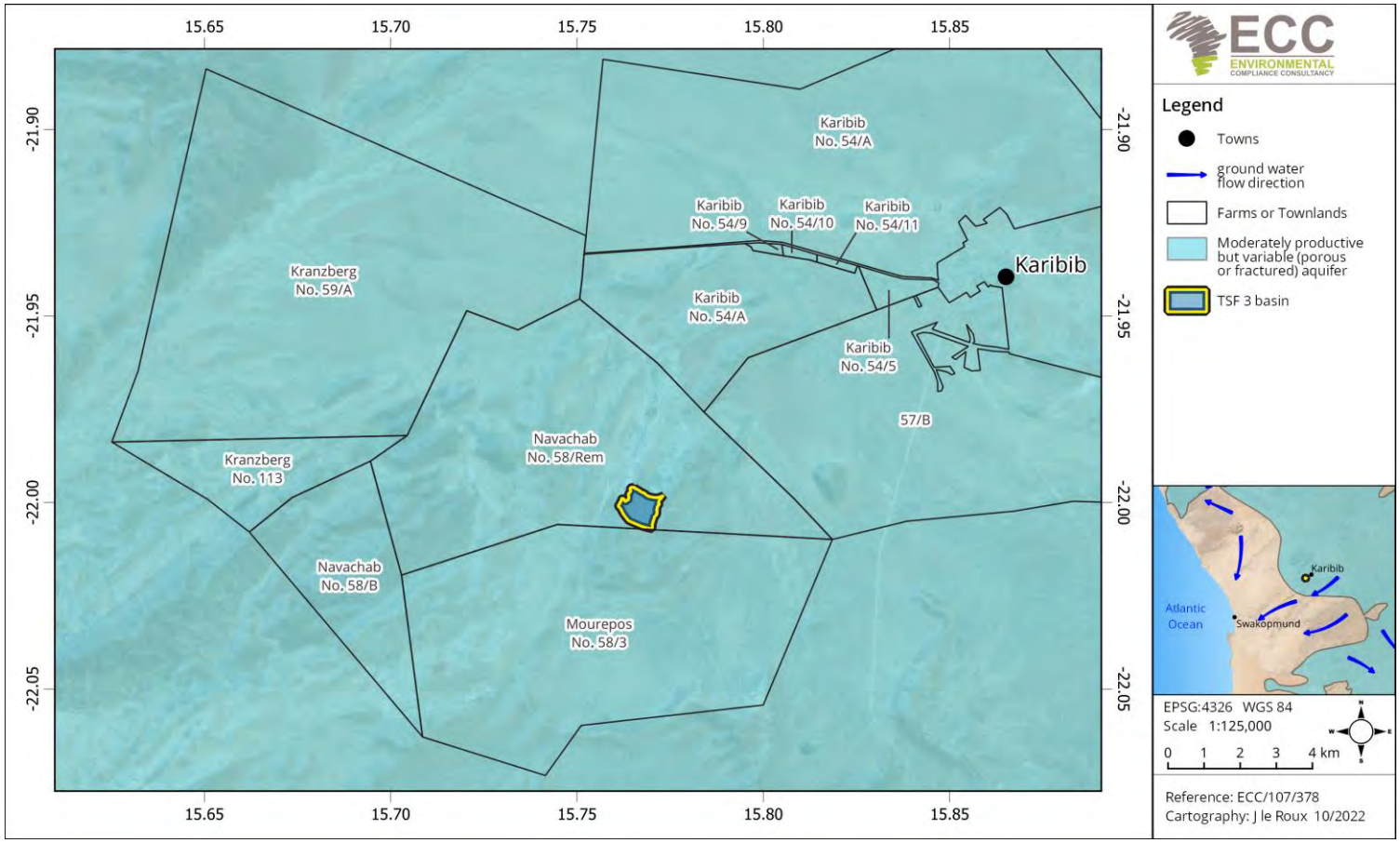

Figure 3 - ESIA study area noting TSF3 surrounding farms and regional groundwater flow direction.

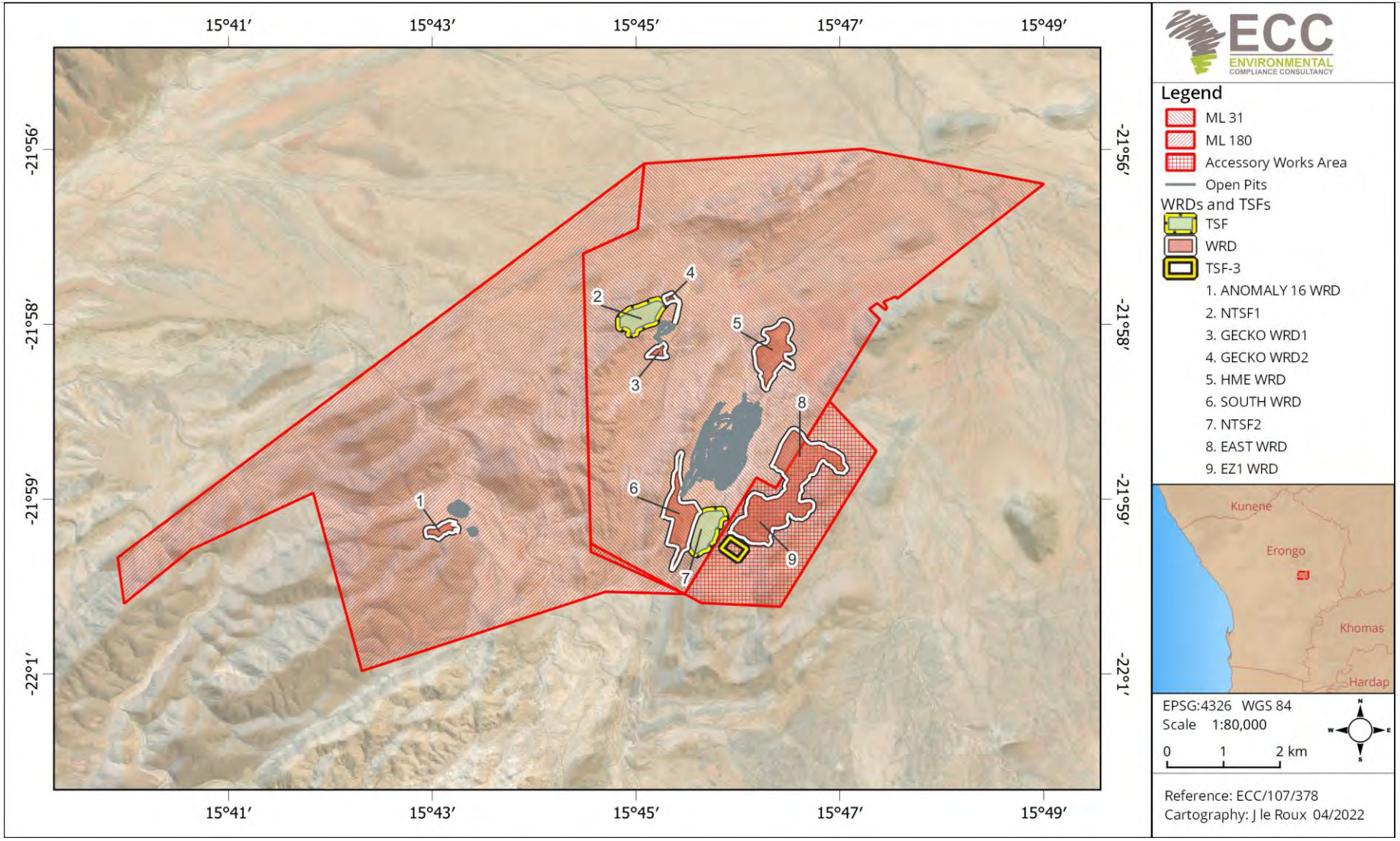

Figure 4 - ESIA study area noting MLs, Accessory works area, mine domain areas and TSF3.

2.4 PUBLIC CONSULTATION

Public participation and consultation are a requirement stipulated in Section 21 of the Environmental Management Act, 2007, and its regulations, for a project that requires an environmental clearance certificate. Consultation is a compulsory and critical component of the ESIA process for achieving transparent decision-making and can provide many benefits. Consultation is ongoing during the ESIA process.

The objectives of the public participation and consultation process are to:

- Provide information on the Project and introduce the overall Project concept and plan in the form of a background information document (BID) (Appendix B).
- Determine the relevant government, regional, and local regulating authorities.
- Listen to and understand community, NGO, and tourism-related issues, record concerns, and questions.
- Explain the process of the ESIA and the timeframes involved; and
- Establish a platform for ongoing consultation.

2.4.1 IDENTIFICATION OF KEY STAKEHOLDERS AND INTERESTED AND AFFETCED PARTIES

A stakeholder mapping exercise was undertaken to identify individuals or groups of stakeholders and the method in which they will be engaged during the ESIA process. Stakeholders were approached through the national press, site notices, or directly by email. The list of stakeholders is included in Appendix B. Figure 5 shows the direct stakeholders of interest in the Project.

A summarised list of stakeholders that were engaged during the public consultation process is given below:

- The general public with an interest in the Project.
- Regional and local authorities.
- Relevant line Ministries (MEFT, MAWLR and MME); and
- The neighbouring farming community.

Appendix B provides a list of interested and affected parties, evidence of consultation, including minutes of public meetings, advertisements in national newspapers, and a summary of the comments or questions raised by the public throughout the process. A summary of the key concerns raised during the consultation process is provided in section 2.4.2.

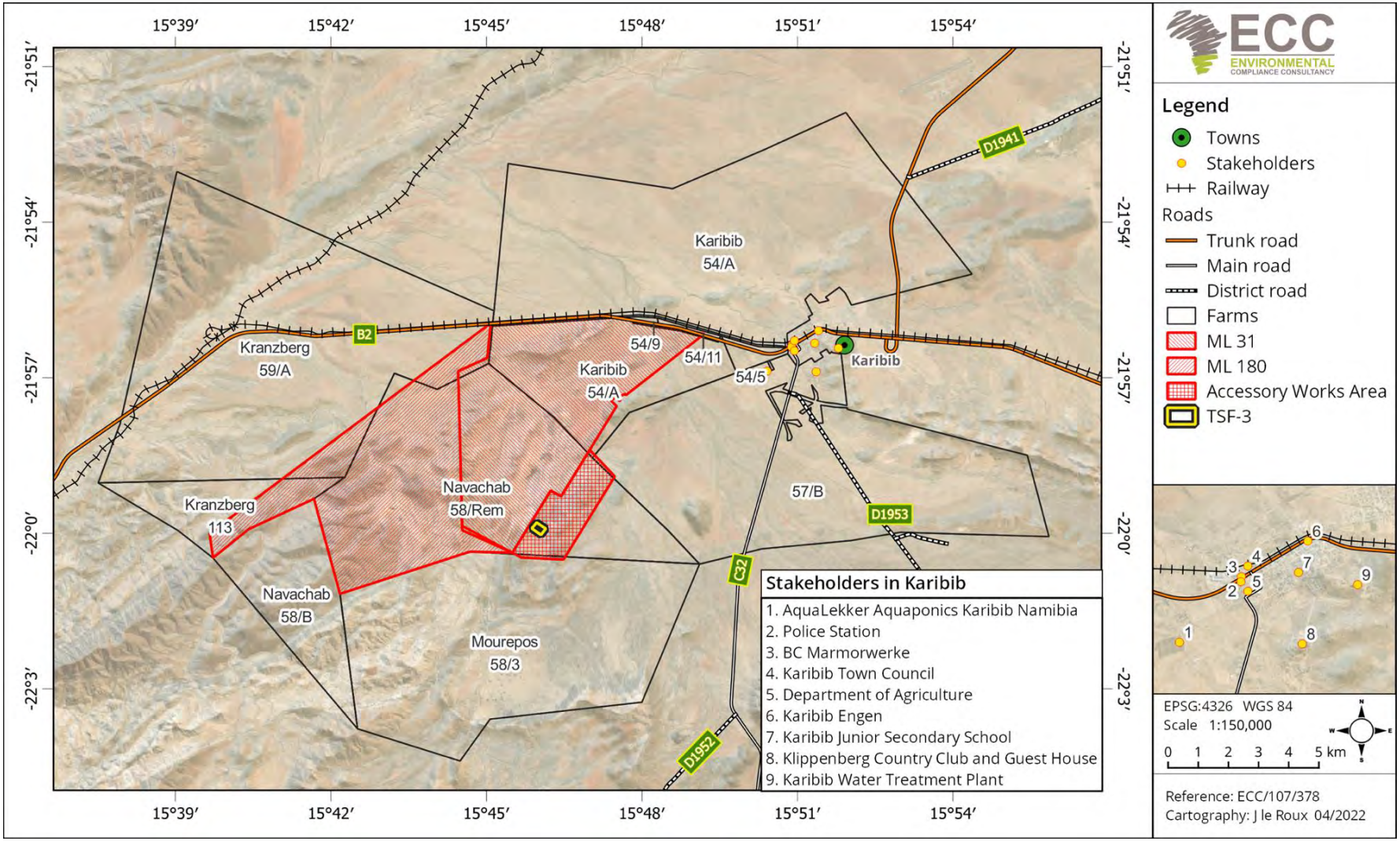

Figure 5 - Neighbouring farms to the mining licence areas

2.4.2 SUMMARY OF ISSUES RAISED

During the compilation of the screening and scoping for the assessment, stakeholders and interested and affected parties were engaged for input and feedback into potential issues or concerns regarding the proposed Project. Overall, the proposed Project received significant positive feedback and was well received by the public. The matters raised to date could be considered typical concerns for this type and scale of Project, and are summarised as follows:

- Continuous groundwater availability and quality
- The potential lowering of the water table and contamination on the neighbouring farm Mon Repos (Drenam (Pty/Ltd)
- Socio-economic benefits (i.e., employment and community development programs)
- Interest in how to tender for mine supplies and services
- Road degradation concerns due to increased traffic on the public road network
- Potential visual impact of the TSF wall on the viewshed from Mon Repos
- Concern about potential for dam wall failure during heavy rainstorm, and
- Interest in provision and approaches for rehabilitation in the life of mine plan

The impacts listed above are described and assessed in the ESIA report.

The draft scoping report was submitted to the competent authority, and all interested and affected parties for their review on the 8th of June 2023. The public review period was open for a period of 14 days from 8th of June 2023 to 22nd of June 2023. No comments were received.

The final scoping report will be submitted to the competent authority and MEFT for their review and record of decision.

3 REVIEW OF THE LEGAL ENVIRONMENT

This chapter outlines the regulatory framework applicable to the proposed Project. As stated in Section 1, an environmental clearance is required for any activity listed in the Government Notice No. 29 of 2012 of the EMA. The Proponent holds several current and valid environmental clearance certificates for the exploration phase of the Project.

The Project area is located outside of any national parks, heritage listed areas, or areas of significance. However, the Project area is located within a groundwater-controlled area, as regulated under the Water Management Act of 1956.

A thorough review of relevant legislation has been conducted for the proposed Project. Table 3 below identifies relevant legal requirements specific to the Project.

Table 4 provides the national policies and plan, Table 5 provides a list of Namibian national polices and plans applicable to the TSF 3 Project and

Table 6 lists specific permits for the Project.

3.1 NATIONAL REGULATORY FRAMEWORK

Table 3 - Details of the regulatory framework as it applied to the TSF 3 Project

National regulatory regime	Summary	Applicability to the project
Constitution of the Republic of Namibia (1990)	– The constitution defines the country's position in relation to sustainable development and environmental management. – The constitution refers that the State shall actively promote and maintain the welfare of the people by adopting policies aimed at the following: o *"Maintenance of ecosystems, essential ecological processes and biological diversity of Namibia, and the utilisation of living, natural resources on a sustainable basis for the benefit of all Namibians, both present, and future."*	The Proponent is committed to the sustainable use of the environment, and has aligned its corporate mission, vision, and objectives within the ambit of the Constitution of the Republic of Namibia (1990) and good international industry practices.
Environmental Management Act, 2007 (act no. 7 of 2007) and its regulations, including the Environmental Impact Assessment Regulation, 2007 (no. 30 of 2011)	– The Act aims to promote sustainable management of the environment and the use of natural resources. The Act requires certain activities to obtain an environmental clearance certificate prior to Project development. – The Act states that an EIA should be undertaken and submitted as part of the environmental clearance certificate application process. – The MEFT is responsible for the protection and management of Namibia's natural environment. The Department of Environmental Affairs, under	This environmental scoping report documents the findings of the scoping phase of the environmental assessment undertaken for the proposed Project. The process will be undertaken in line with the requirements under the Act and its regulations.

National regulatory regime	Summary	Applicability to the project
	the MEFT, is responsible for the administration of the EIA process.	
Water Act, 1956	– The Act provides for the control, conservation and use of water for domestic, agricultural, urban and industrial purposes; to make provision for the control, in certain respects, of the use of seawater for certain purposes; and for the control of certain activities on or in water in certain areas. – The Ministry of Agriculture, Water and Land Reform (MAWLR) Department of Water Affairs is responsible for the administration of the Water Act.	– The Act stipulates obligations to prevent the pollution of water. – The ESMP sets out measures to avoid polluting the environment.
Water Resources Management Act, 2013 (No.11 of 2013)	This Act provides a framework for managing water resources based on the principles of integrated water resource management. It provides for the management, development, protection, conservation, and use of water resources. This Act has not been approved by parliament; however, it is best practice to comply with this Act.	– The Act sets out obligations in order to avoid water pollution. – These have been incorporated into the ESMP to minimise pollution.
National Heritage Act, No. 27 of 2004	– The Act provides provisions for the protection and conservation of places and objects with heritage significance. Section 55 compels mining companies to report any archaeological findings to the National Heritage Council (NHC).	– There is the potential for heritage-related objects to be found in the mining licence area. Therefore, the relevant stipulations in the Act will be taken into consideration and incorporated into the ESMP.

National regulatory regime	Summary	Applicability to the project
	– Subsection 9 allows the NHC to issue a consent, subject to any conditions that the Council deems necessary.	– In cases where heritage sites are discovered, the 'chance find procedure' will be used.
Hazardous Substances Ordinance, No. 14 of 1974	– This Ordinance provides for the control of toxic substances and can be applied in conjunction with the Atmospheric Pollution Prevention Ordinance, No. 11 of 1976. – This applies to the manufacture, sale, use, disposal, and dumping of hazardous substances, as well as their import and export.	– The planned Project will involve the handling and storage of hazardous substances such as fuels, reagents, and industrial chemicals. The Proponent shall ensure safe handling, transfer, storage, and disposal protocols are continually implemented, and audited throughout its operations. – The Proponent is obliged to ensure that all permits under this Ordinance are obtained prior to Project commencement.
Labour Act, No. 11 of 2007	The Labour Act, No. 11 of 2007 (Regulations relating to the Occupational Health & Safety provisions of Employees at Work, promulgated in terms of Section 101 of the Labour Act, No. 6 of 1992 - GN156, GG 1617 of 1 August 1997)	– The Project shall adhere to all labour provisions and guidelines, as enshrined in the Labour Act. – The Project shall also develop and implement a comprehensive occupational health and safety plan to ensure adequate protection for its personnel throughout the Project lifecycle.

Table 4 - Details of the internationally recognised guiding framework with reference to the TSF 3 Project

International regulatory regime	Summary	Applicability to the project
Global Industry Standard on Tailings Management (ICMM) And the MAC TSM Tailings Management and Operations Guidance	The International Council on Mining and Metals Mining Principals define good practice environmental, social and governance requirements for mining and metals industry. This Standard strives to achieve the goal of zero harm to people and the environment. Underpinned by an integrated approach to tailings management, the Standard aims to prevent catastrophic failure and enhance the safety of mine tailing facilities across the globe. The MAC TSM guidance is aligned with the ICMM global standard.	– The Proponent is committed to adhering to good environmental, social, and governance practice requirements. – The Project will adhere to the principles of the international council of mining and metals and will aim to ensure the safety of the tailings facility with measures that will be incorporated into the EMP.
International Commission on Large Dams (ICOLD)	ICOLD leads the profession in setting standards and guidelines to ensure that dams are built and operated safely, efficiently, economically, and are environmentally sustainable and socially equitable	– The Project will incorporate all relevant guidelines recommended under this standard. – The relevant guidelines will be included in the ESMP.
Intergovernmental Forum on Mining Minerals Metals and Sustainable Development (IGF)	The mining policy framework sets out the best practices required for good environmental, social, and economic governance of the mining sector and the generation and equitable sharing of benefits in a manner that will contribute to sustainable development.	The Project will follow the best practices set out in this framework to ensure good environmental, social, and economic governance to contribute to sustainable development.

3.2 NATIONAL POLICIES AND PLANS

Table 5 – Namibian national polices and plans applicable to the TSF 3 Project

Policy or plan	Description	Relevance to the project
Vision 2030	– Vision 2030 sets out the nation's development targets and strategies to achieve its national objectives. – Vision 2030 states that the overall goal is to improve the quality of life of the Namibian people aligned with the developed world.	The proposed Project shall aim to meet the objectives of Vision 2030 and shall contribute to the overall development of the country through continued employment opportunities and ongoing contributions to the gross domestic product (GDP).
Fifth National Development Plan (NDP5)	– The NDP5 is the fifth in a series of seven five-year national development plans that outline the objectives and aspirations of Namibia's long-term vision. – The NDP5 pillars are economic progression, social transformation, environmental sustainability, and good governance.	The planned Project supports meeting the objectives of the NDP5 through creating opportunities for continued employment.
The Harambee Prosperity Plan II (2021 – 2025)	Second Pillar: Economic advancement – ensuring increasing productivity of priority key sectors (including mining) and the development of additional engines of growth, such as new employment opportunities.	The Project will contribute to the continued advancement of the mining industry and create an additional employment generation engine within the regional and national landscape.

Table 6 – Specific permits and licence requirements for the TSF 3 Project

Permit or licence	Act/regulation	Related activities requiring a permit	Relevant authority
Environmental Clearance Certificate	Environmental Management Act, No 7 of 2007	Required for all listed activities shown in Table 2	Ministry of Environment, Forestry and Tourism (MEFT)
Accessory work permit	Section 90(3) of the Minerals Act, No.33 of 1992	Written permission from the mining commissioner before accessory works can be erected on a mining licence area.	Ministry of Mines and Energy (MME)
Permit for boreholes (water boreholes)	A permit is issued under the Water Act, No. 54 Of 1956 (enforced)	Required before the drilling of boreholes and the abstraction of water.	Ministry of Agriculture, Water and Land Reform (MAWLR)
Tailings waste disposal permit	A permit is issued under the Water Act, No. 54 of 1956 (enforced)	Required for the disposal of tailings.	Ministry of Agriculture, Water and Land Reform (MAWLR)
Wastewater discharge permit	A permit is issued under the Water Act, No. 54 Of 1956 (enforced) but form types that fall under the Water Act, No. 24 of 2004 are used.	Required for discharge of sewage and/or excess industrial or mine wastewater.	Ministry of Agriculture, Water and Land Reform (MAWLR)
Permit for the clearing land	The Forest Act, 2001 (Act No. 12 of 2001)	This Act governs the removal of vegetation within 100 m of a water course, or removal of more than 15 ha of woody vegetation, or the removal of any protected plant species.	Ministry of Agriculture, Water and Land Reform (MAWLR)

4 PROJECT DESCRIPTION

4.1 NEED FOR THE PROJECT

The current tailings storage facility or TSF2 will reach capacity in the next one to two years. For Navachab Gold Mine to continue producing at current rates, a new tailings storage facility is required. TSF3 will fulfill that need and will be constructed and operated similarly to and based on the experience with TSF2 and aligned with international standards including those of ICMM, ICOLD, MAC and IGF. Design is currently underway and will consider both TSF2 experience and these international standards.

If TSF3 is not approved or constructed, then Navachab Gold Mine will experience early closure. Since the conceptual planning of TSF3 more than 10 years ago, the proposed location was identified and accepted as the preferred location. Although design engineers will assess location and construction alternatives, the proposed location on the east side of TSF2, east of the ridge and south of the waste rock dump, is still the preferred location.

4.2 BACKGROUND OF THE PROJECT, PROJECT HISTORY AND EXPLORATION HISTORY

The Navachab Gold Mine originally started out as a geochemical anomaly for copper, but in 1981 gold was discovered on the neighbouring farm Krantzberg. Gold was discovered on the Navachab farm in 1984 and the first holes were drilled on the prospect in June 1985. The feasibility study for the proposed gold mine was completed in July 1987 and production started in October 1989 with full production being achieved in March 1990. The mine was completed at a capital cost of NAD 85 million.

Navachab Gold Mine is mined as a conventional open pit mine with the current Carbon-In-Pulp (CIP) plant having a production capacity of 230tph. The production capacity from this plant will be increased to 330tph at steady state with the addition of the ARGO plant.

Underground test mining and feasibility has begun, designed to access high-grade ore at depth not accessible by open pit mining methods. The geology and mineralisation of the underground ore is similar to the existing open pit mine which will be processed after blending with run-of-pit ore. Test results to date are encouraging.

The mine is in the process of expanding its processing capacity by installing an additional mill (ARGO mill) which will increase the throughput to 330 tph from the current 2220tph.

The ARGO mill is a new-generation high-pressure grinding roll (HPGR) mill. The ARGO plant commissioning started in December 2022 and steady state is expected to be reached in Q2 2023. A pre-concentration plant (PCP) with a current capacity of 400 tph consisting of a 200 tph dense medium separation (DMS) plant and a 200 tph X-Ray Transmitter (XRT) sorter plant produces a concentrate that is sent to the CIP feed.

The operations comprise exploitation of gold bearing ore from one main open pit with investigations in progress in respect to opening further satellite pits. The 35-metre-thick ore body is hosted in a thick marble unit. The ore body dips at 70° to the west and plunges at 14° to the north and it is mined by open-cast method to a depth of over 250 meters.

The plant was commissioned in November 1989, with full production being achieved in January 1990. Lower and marginal grade ore of less than 1.20 g/t Au is passed through the PCP plant prior to being fed to the CIP plant. Upgraded concentrate and high-grade ROM ore is blended and sent to the CIP plant. The process is a typical CIP comminution circuit comprising a semi-autogenous grinding (SAG) and the ARGO mill supplied by a jaw crusher, then XRT/Pebble regrind circuit followed by treatment (thickening, leaching, absorption, regeneration, and elution), followed by recovery (electro-winning and smelting). After smelting the furnace crucible contents are poured into cascading moulds to produce gold Doré bars. The gold bars are then packed into boxes supplied by Rand Refinery in Johannesburg for shipment to the refinery. This is undertaken under contract by an armed security service that transports the gold bars to the Hosea Kutako International Airport in Windhoek.

4.3 EMPLOYMENT

The Project is expected to employ approximately 20 specialists and technicians for design, investigations, and approvals during 2022 to 2023, and 10 to 20 direct jobs and 20 to 50 indirect jobs during construction. The indirect jobs would primarily be related to services and supplies for the construction workers. Construction of the facility is estimated to take 18 to 24 months. Navachab Gold Mine is expected to use its own non-mineralised rock materials, heavy equipment, operators, and workers for much of the construction. Navachab Gold Mine's existing tailings operations team will operate, inspect, and manage TSF3 and its systems.

4.4 GEOLOGY AND MINERALISATION

The mine is located within the Southern Central Zone of the Pan-African Damara Orogen which comprises three mobile belts. The rock formations within these belts have undergone multiple deformation periods, metamorphism, and intrusions (associated with the Etendeka volcanism).

In the last stage of the Damara Orogeny plutons intruded upwards into the newly formed mountain range at several kilometres depth and solidified to granites at subsurface. In addition to these large plutons further gas and rock melts intruded into the surrounding formation in the form of dykes and pegmatite bodies. The tectonic alteration allowed for several different types of ore deposits in the Southern Central Zone including intrusion-hosted U and Sn deposits, pegmatitic rare earth elements (REE) occurrences, and a variety of base and precious metal ore deposits hosted by Damaran metasediments, many with skarn alteration (Friese, 2003).

The lithologies consist of calc-silicates, marbles and volcano-clastic rocks that have been intruded by granites, pegmatites, and quartz porphyry dykes. Navachab Gold Mine is situated in the planar, north north-east (NNE) -trending, steeply west north-west (WNW)-dipping to locally overturned, western limb of a major north-west (NW)-verging, asymmetrical, doubly plunging syncline. Figure 6 presents a portion of the 1: 10 000 scale geological map of the area, the map indicates the associated anticline adjacent to Navachab Gold Mine. In this limb, the Damara Sequence comprises:

- Etusis Formation (Nosib Group) – Arkosic quartzite;
- Chuos Formation – diamictites;
- Spes Bona Formation - fine-grained biotite-rich, quartzitic schist interbedded with metabasic and calc-silicate layers;
- Okawayo Formation - marbles and calc-silicates;
- Oberwasser Formation - biotite-rich schist and metabasites; and
- Karibib Formation - interbedded calcitic and dolomitic marbles with numerous layers of syn-sedimentary breccias.

This stratigraphic sequence is unconformably overlain by approximately 40 m of calcrete and alluvial material, situated in palaeochannels that crosscut the pit on a northeast-southwest orientation. A zone of weathering extends from the original ground surface (1150 mamsl) to 60 m depth in the Oberwasser Formation (upper schist) unit and to an approximate 20 m depth in the more competent Okawayo Formation.

Figure 6 presents the lithostratigraphy at the Navachab Gold Mine as described above and Figure 7 shows a west-east cross-section across the Navachab Gold Mine.

Age	Group	Formation		Lithology
Quaternary				Calcrete and alluvial cover
400 – 650 Ma	Swakop	Karibib	CM	**CM Unit:** White or grey marble
		Oberwasser	OUS	**US Unit:** An approximately 150 m wide unit of metamorphosed, interbedded siliciclastic and;
			US	volcanoclastic rocks (biotite schist). Weathered US is abbreviated to **OUS**
		Okawayo	MDM	MDM Unit: ***Lower MDM unit:*** A 30-40m wide unit of intensely deformed grey-white dolomitic marbles ***Upper MDM unit:*** A 40-50m wide unit of greyish-white, massive marbles **MDMV Unit (Main Marker Horizon):** An approximately 10m wide unit of two meta-lamprophyre dyke segments
			MC	**MC Unit:** The basal unit is a 40-50m wide zone of interlayered marbles and calc-silicate rocks
		Spes Bona	OLS	**LS Unit:** Fine-grained biotite-cordierite schist interbedded with quartzite, calc-silicate and marble layers and minor mafic hornblende-rich horizons. Weathered LS is abbreviated to **OLS**
			LS	
< 746 Ma	Otavi	Chuos	CH	**CH Unit:** Diamictites rich in basement clasts, iron-formation, and dropstones
	Nosib	Etusis		Quartzite, quartzitic conglomerate, and biotite schist

Figure 6 - the lithostratigraphy at the Navachab Gold Mine (SRK, 2008)

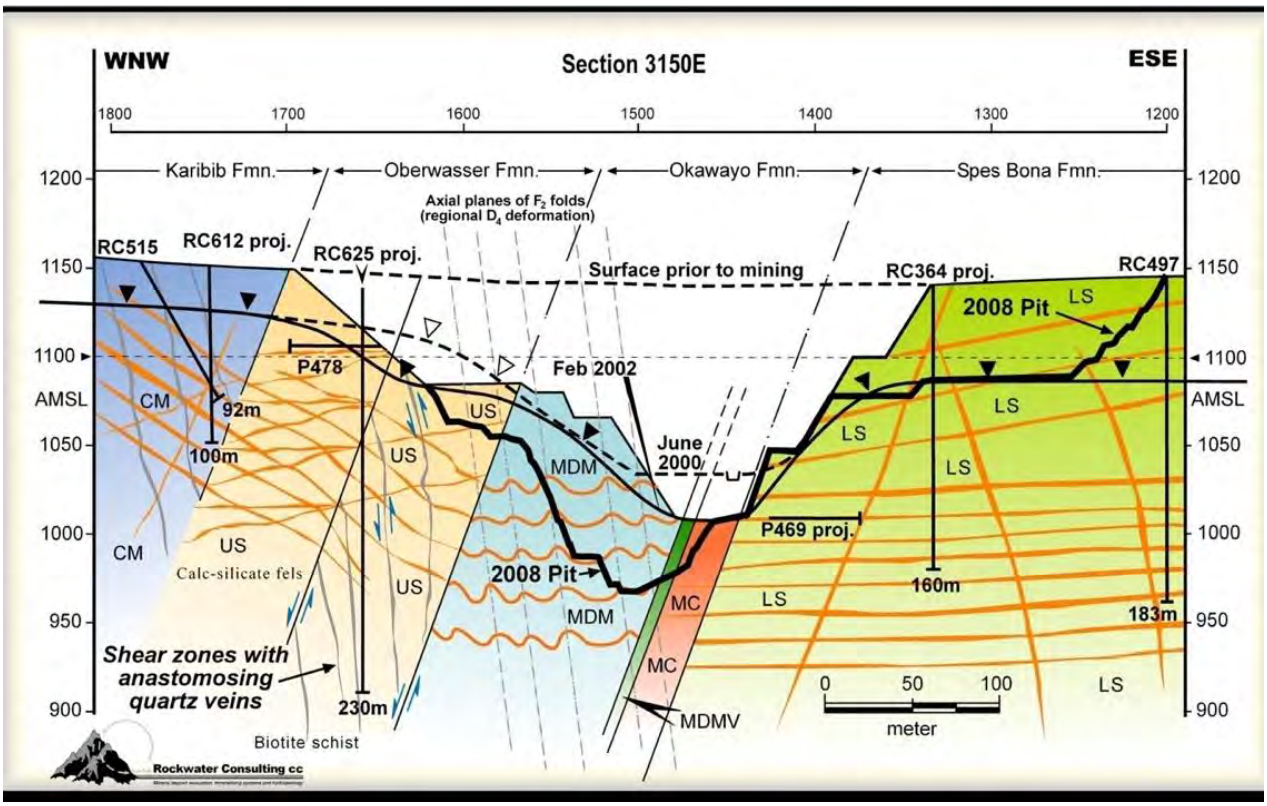

Figure 7 - West-east cross-section across the Navachab Gold Mine

Navachab Gold Mine is a classical carbonate-hosted replacement skarn deposit with strata bound style of mineralised rock. Gold mineralisation at Navachab Gold Mine occurs in:

- A steeply inclined to sub-vertical, shallow north north-east (NNE)-plunging, lens-shaped ore body confined to the Massif Central (MC) unit (interlayered calc-silicates and marbles) in the basal parts of marbles of the Okawayo Formation; and
- Sets of shallow north-west (NW) to north-east (NE) dipping mineralised sheeted quartz-sulphide-gold veins that are developed both in the hanging wall (marbles of the Okawayo Formation (MDM) and biotite schist of the Oberwasser Formation (US), as well as in the footwall (biotite schist of the Spes Bona Formation (LS) of the MC unit.

The veins have recently comprised much of the ore mined at Navachab Gold Mine. According to Katharina Wulff, Nick M. Steven, Kim A.A. Hein, Judith A. Kinnaird, 2017, within "the veins, quartz, pyrrhotite and chalcopyrite are the most common minerals. Microscopically, minor amounts of clinopyroxene (often replaced by secondary actinolite and calcite) as well as sphalerite, arsenopyrite, native bismuth, native gold, bismuthinite and an unidentified Bi-Te-Se-S-mineral were observed (Nörtemann et al., 2000; Wulff, 2009; Dziggel et al., 2009a, 2009b).

The gold commonly occurs as small grains (few µm to 0.1 mm) of free gold surrounded by quartz, or in contact with native bismuth and other bismuth minerals."

4.5 MINERALISED AND NON-MINERALISED WASTE

Low-term stockpiles as of December 2022 contained approximately 25.5 million tonnes of material at 0.59 g/t gold, for a total gold stock of 0.49 Moz gold (Au). The material ranges from 0.4 g/t to 1.2 g/t Au. The lower grade are expected to be processed after the processing the high grade run-of-mine ore, and later in the life of mine.

Navachab Gold Mine produces mine waste rock and tailings. The mine waste rock is below a grade of 0.4 g/t currently stored permanently on several mine waste rock dumps (WRD), which are listed and visually illustrated in Figure 8:

1. South waste rock dump
2. Anomaly 16
3. Gecko WRD
4. East WRD + EZ1
5. HME WRD
6. Grid A WRD

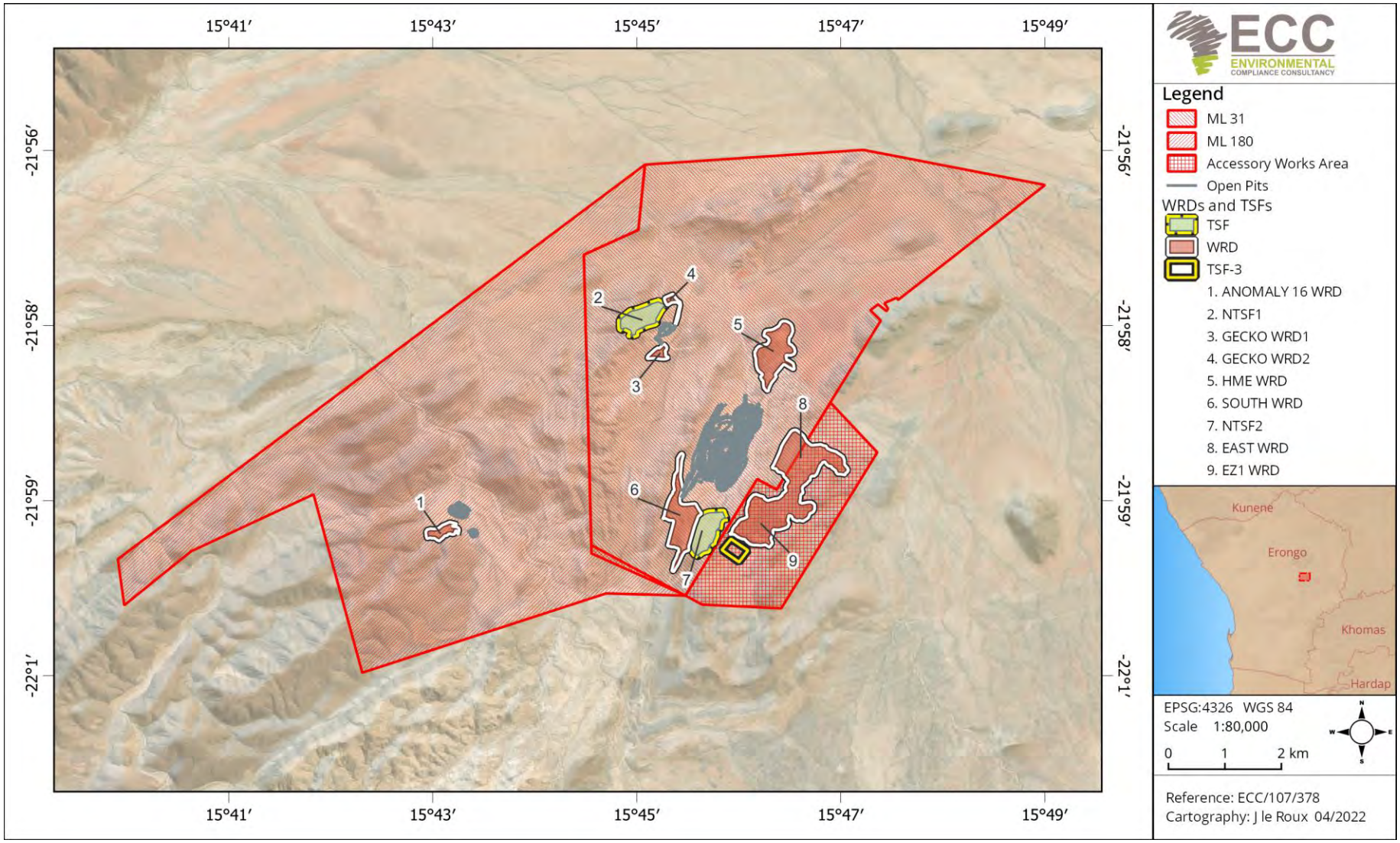

Figure 8 - illustration of the locations and footprints of the tailing's storage facilities and waste rock dumps

The waste rock placement and dumping strategy is to reduce hauling distance and enable progressive rehabilitation of a waste rock dump wherever possible.

- Dumps are designed as close to the pit exits as possible in order to optimise productivity and minimise waste mining costs. A shorter haul road to the East Waste Dump, through the mountain, was developed in 2011. Rehabilitation requirements are considered in dump location and design by the Proponent. All dumping areas are sterilised prior to waste dumping.
- Currently the following waste rock dump sites are in use:
    - East waste dump;
    - HME waste dump; and
    - South waste dump.

Annually and in monthly short-term planning, Talpac simulations are run to optimise productivity and trade-off between extending the dump and lifting the dump.

4.6 GEOCHEMISTRY

Mine waste characterisation studies have determined that the waste rock and tailings contain small amounts of iron sulphides in the form of pyrrhotite. However, no toxic metals have been identified in these characterisation studies. The pyrrhotite can form dilute acid which may dissolve metals such as iron or zinc. Several of the groundwater monitoring boreholes have returned elevated concentrations of sulphate, iron, and zinc. To date, however, the buffering and neutralising character of the host rock and bulk of the mine and processing wastes results in high pH with no results of acidic groundwater. Further investigations will be conducted as part of the detailed closure planning and management is expected to ramp up in 2022. The tailings to be deposited within TSF3 will be of the same geochemical makeup as that of TSF 2 and therefore no acid mine drainage (AMD) is expected to occur within TSF 3.

The use of cyanide by the gold mining industry has been a significant source of stakeholder concern since its introduction, and cyanide is carefully managed at Navachab Gold Mine. Cyanide Code requirements form an integral part of the Navachab Gold Mine's Environmental, Health and Safety Management System. The Company took a decision to adhere to the principles of International Cyanide Management Code (ICMC), which supports the responsible use, transportation, and disposal of cyanide in gold mining, enhances measures for the protection of human health, and reduces the potential for environmental impacts.

4.7 TAILINGS STORAGE

Navachab Gold Mine currently has one active tailings storage facility (TSF2) and one rehabilitated tailings storage facility (TSF1):

- TSF1 is located 2km to the west of the CIP plant in a valley. It is no longer used and has been rehabilitated, with additional waste rock buttresses being installed.
- TSF2 is located in a valley south of the CIP plant and the open pit is about 2 km away. The wall of the TSF is constructed with pit overburden. The tailing is deposited within this impoundment and in 2009 when the conceptual design for TSF3 was done, there was approximately 10 to 15 m of deposition space available. The impoundment was subsequently expanded to accommodate tailings until early 2024.
- TSF3 as a concept was developed from 2008 to date by Navachab Gold Mine and its team of consultants (i.e., Golder & Associates) as the next tailings storage facility after the decommissioning of TSF2. TSF3 is designed to accommodate mine tailings for the anticipated next phase of its 15 years Life of Mine (LoM).

The TSF3 design for the southern containment wall developed by SRK Consulting (SRK) is shown in

, **Error! Reference source not found.** and Figure 11. The design is based on the best available industry safety protocols, including the Mining Association of Canada (MAC) Towards Sustainable Mining (TSM) tailings protocols and tailings management and operations guidance, and the ICMM global industry standard on tailings management. An open deposition method is preferred by the Proponent on the southern wall.

A. TSF3 conceptual design parameters (Waste Rock Structure) as designed by SRK.
   - 50m wide crest @ elevation 1240 m
   - Slopes (Phase 1) = @ natural angle of repose = ± 1: 1.5 downstream & upstream
   - Starter/guidance/deposition walls
   - Only unsaturated flow or “unconfined compressive strength” (UF) as interface layers (subject to SRK satisfied with waste rock fines content).
     - The use of unconfined compressive strength as the interface layers are considered to be a best practice in the design and construction of tailings storage facilities, as it helps to ensure the safety and integrity of the facility over time.

- Phase 1 upstream drain = 10 m wide x 1.5 m deep (min.)
- Phase 1 & 2 downstream drains = 5 m wide x 1.5 m deep (min.)
- UF placed at slope of ± 1: 2 (assumed)

B. TSF3 conceptual construction sequence (Waste Rock Structure) as designed by SRK

- 500 mm deep box cut, stockpile & compact in-situ soil.
- 2 m deep localised box cut, stockpile & compact in-situ soil.
- Construct phase 1 downstream & upstream main drains & outfall drains.
- Construct phase 1 downstream & upstream starter/guidance and deposition walls.
- Place phase 1 waste rock at a natural angle of repose (± 1: 1.5).
- Place UF.
- Construct phase 2 downstream main drain.
- Construct phase 2 downstream starter/guidance wall.
- Place phase 2 waste rock at a 1: 3 downstream slope.

The construction of the TSF3 (for both containment walls) is estimated to take approximately 18 to 24 months to complete. Dense media separated (DMS) tailings of 60 mm will be used to construct the northern wall's southern toe wall interface and interlaced with finer discard material that has not gone through the processing circuit. A possible filter system called "Bidem" may be added to the circuit to remove sediment from the tailings dam. The return water that will be seeped from the TSF will be pumped back into the processing plant for re-use.

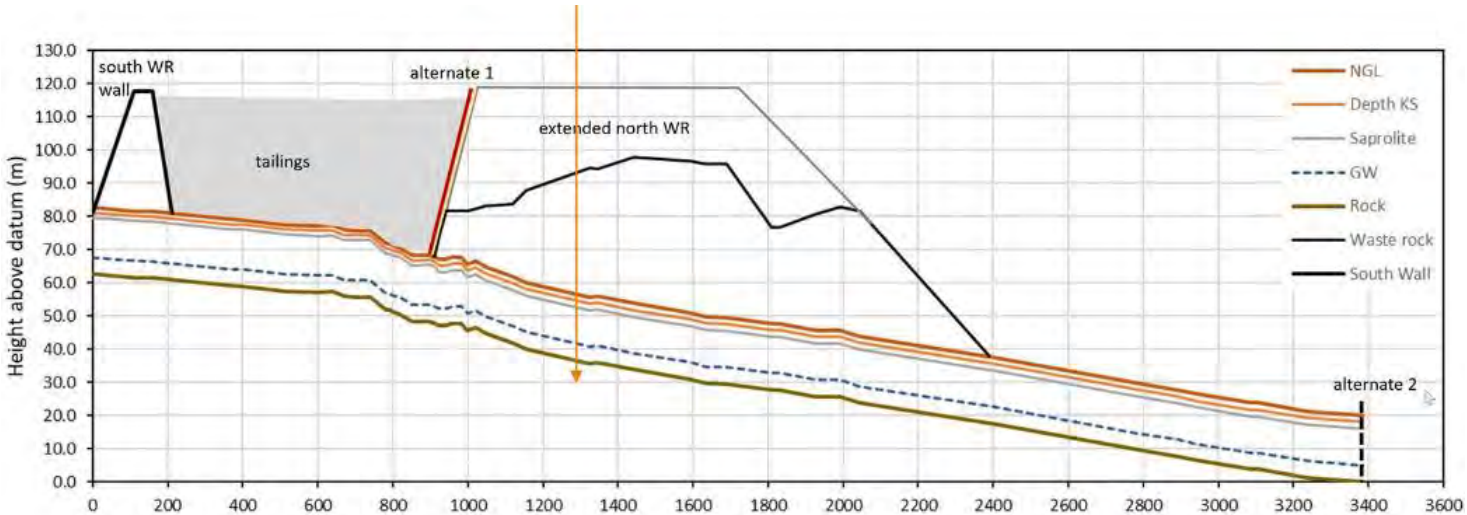

Figure 10 - cross-section of the northern containment wall design from a western view. Source: SRK, 2022

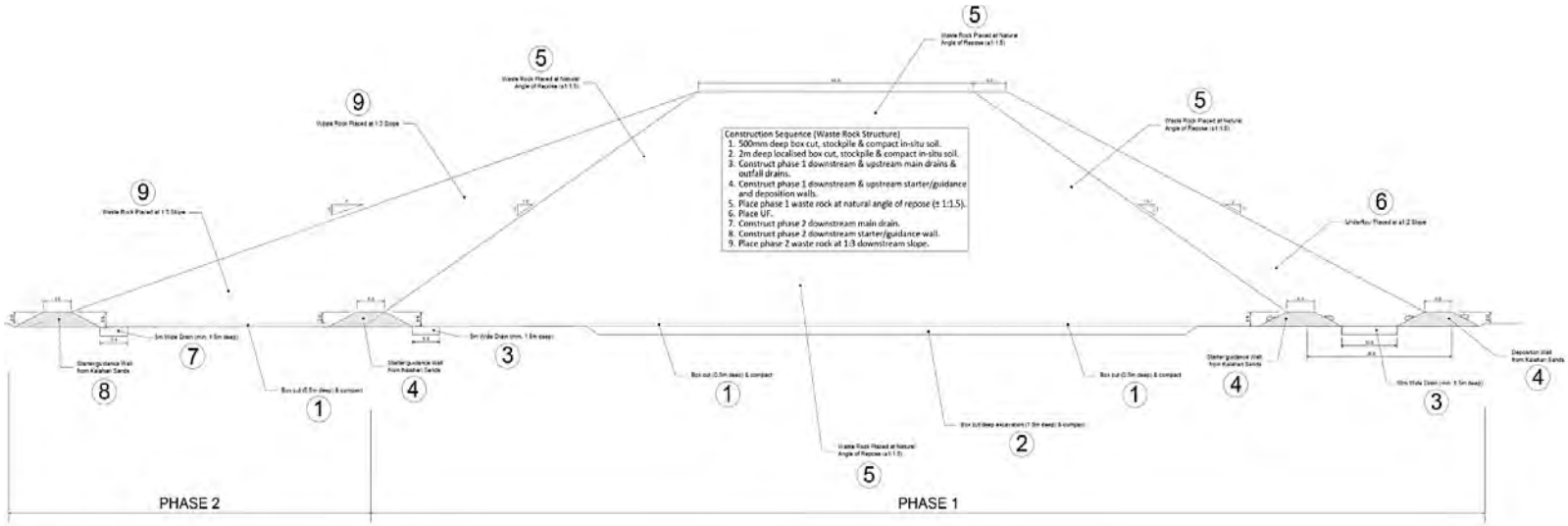

Figure 9 – Cross section of the southern containment wall design. Source SRK, 2022)

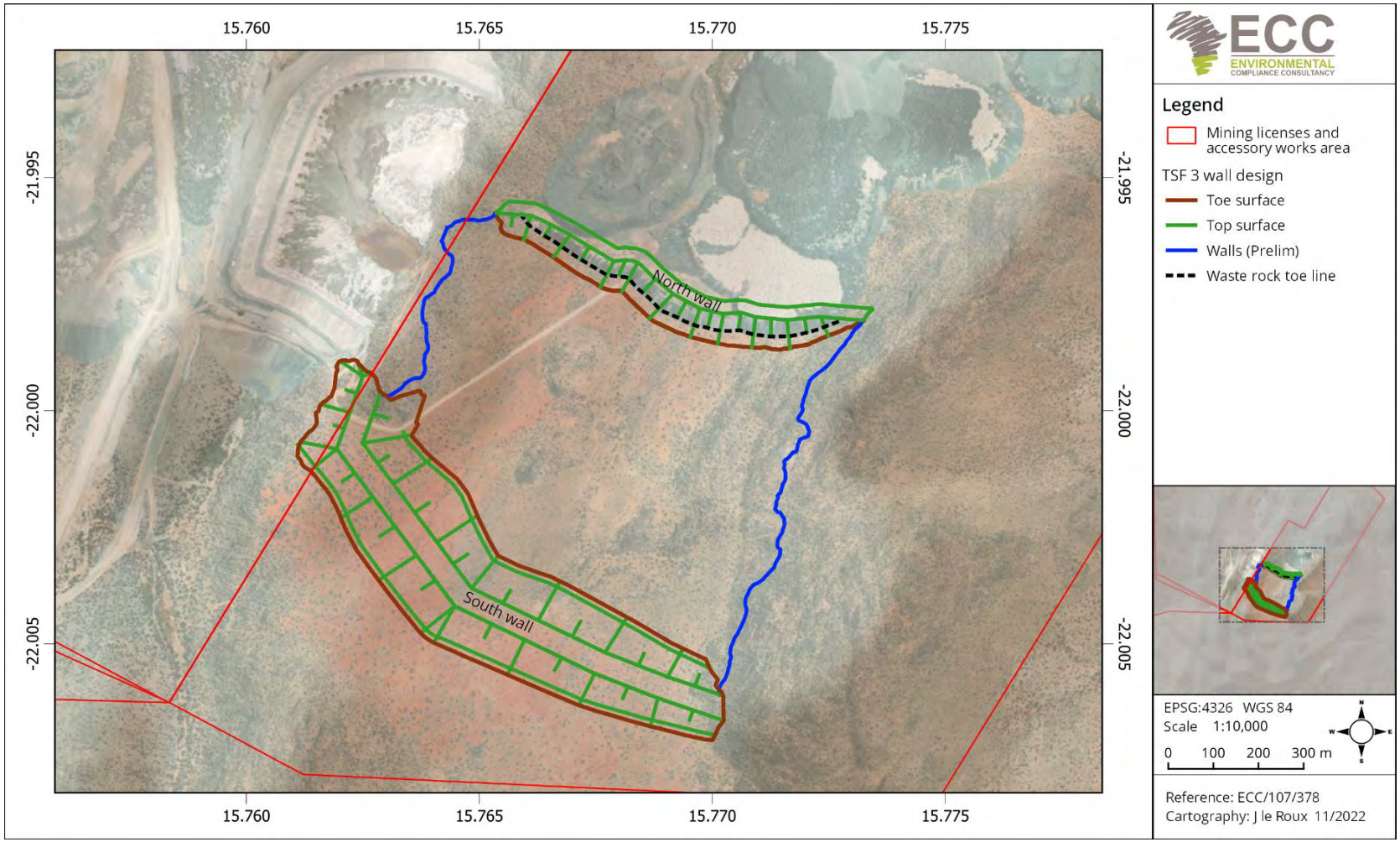

Figure 11 - TSF3 northern and southern wall design

4.8 TAILINGS STORAGE FACILITY SUPPORT SERVICES

The operation, and maintenance of TSF3 is not expected to require additional support services. The design, approvals, and construction will require the support of specialists, their work and efforts are not expected to require additional or special support. A new access / servitude ramp is in the process of being constructed on the TSF2 eastern wall buttress. This course way will house the linear services (pumps and pipelines) needed to transport tails into the TSF3 basin.

4.9 GEOTECHNICAL STABILITY

Geotechnical work is required to improve the stability of the containment walls during tailings deposition. Geotechnical analysis will assist to identify any potential problems or concerns related to the soil or rock formations.

The geotechnical work currently underway by SRK will evaluate the physical properties of the soil and rock formations in the area where the facility will be built. This includes assessing the soil's strength, compressibility, and ability to support the weight of the tailings materials, as well as the potential for subsidence or other types of movement that could impact the stability of the containment walls. The results of the study will be described in the assessment stage of the Project.

4.10 UTILITIES

All infrastructure required for the Project is in place at the mine, this includes:

- Power line, substations, and power supply;
- Borefield and pipelines for water supply;
- Access roads from highway;
- Security fencing and gates;
- Workshops and offices for the mine and plant;
- Stockpiles and waste storage facilities; and
- PCP and CIP plant.

4.10.1 POWER

An extension of the existing power lines to the barge and pump currently operating in TSF2 will be part of the construction phase for TSF3. A similar decant pond will be operated in TSF3. The pond will be on the opposite side of the rock ridge from the TSF2 pond to keep any extensions as short as possible. The Proponent will also commission upgrades to the existing electricity transformers on site.

4.10.2 WATER

An extension of the existing tailings and recycle water pipeline operating as part of TSF2 will be constructed to operate within TSF3. As noted above, a decant pond similar to TSF2 will be operated

in the TSF3. The pond, barge, and water pipeline will be on the opposite side of the rock ridge from the TSF2 pond to keep any extensions as short as possible. The tailings pipeline will be positioned as close to existing pipelines as possible but optimised for delivery of the tailings to the cyclones. The existing cyclones operating within TSF2 will be moved for use within TSF3. The cyclones separate the coarser fraction of the tailings from the fine portion. The coarse fraction is deposited on the tailings sand beaches along the perimeter of the facility, either against the rock ridges or waste rock foundation material.

4.11 RAW WATER STORAGE REQUIREMENT BY THE MINE.

The Proponent intends to construct an additional 10 000 m^3 raw water storage dam on site (Figure 12) as a water storage mechanism for mine-based operations. The raw water storage dam will be sealed using a high-density polyethylene (HDPE) lining. The design of the dam is illustrated in Figure 13. The main feed into the dam will be the overflow of the NamWater concrete reservoir.

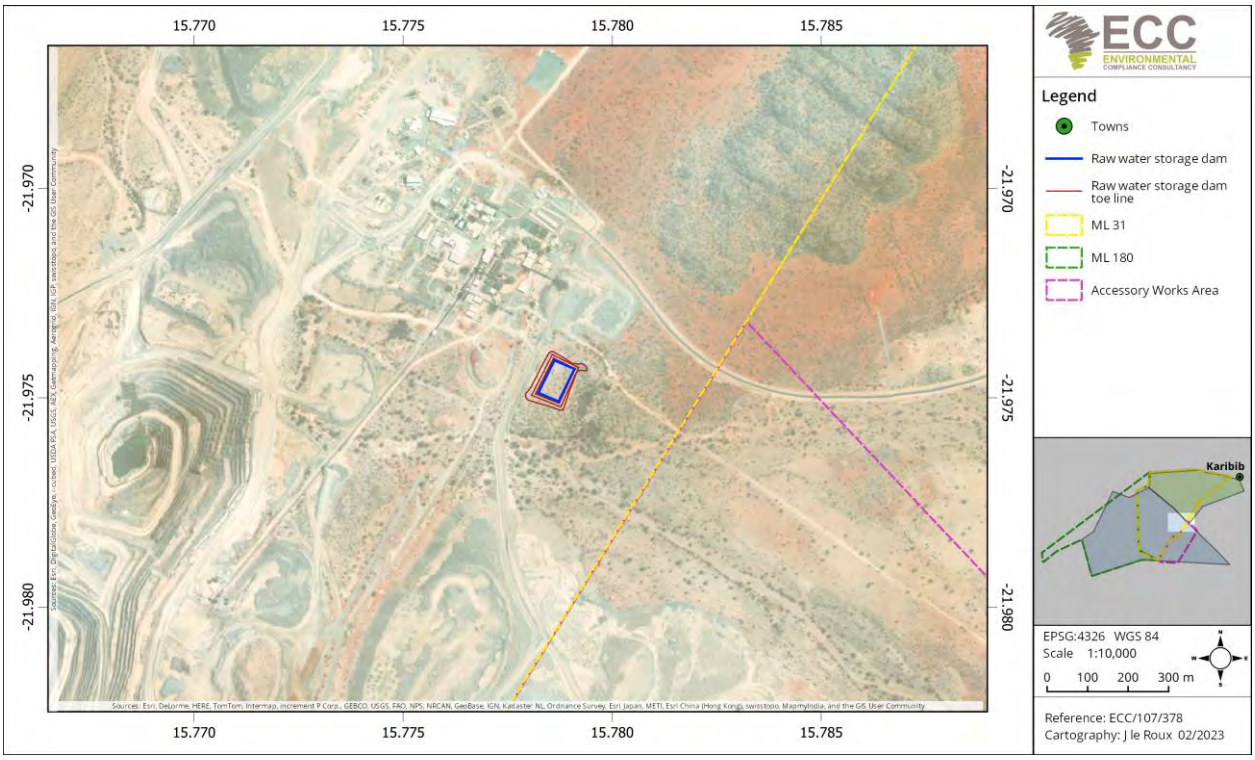

Figure 12 – Location of the additional raw water storage dam. Source: Navachab Gold Mine, 2022

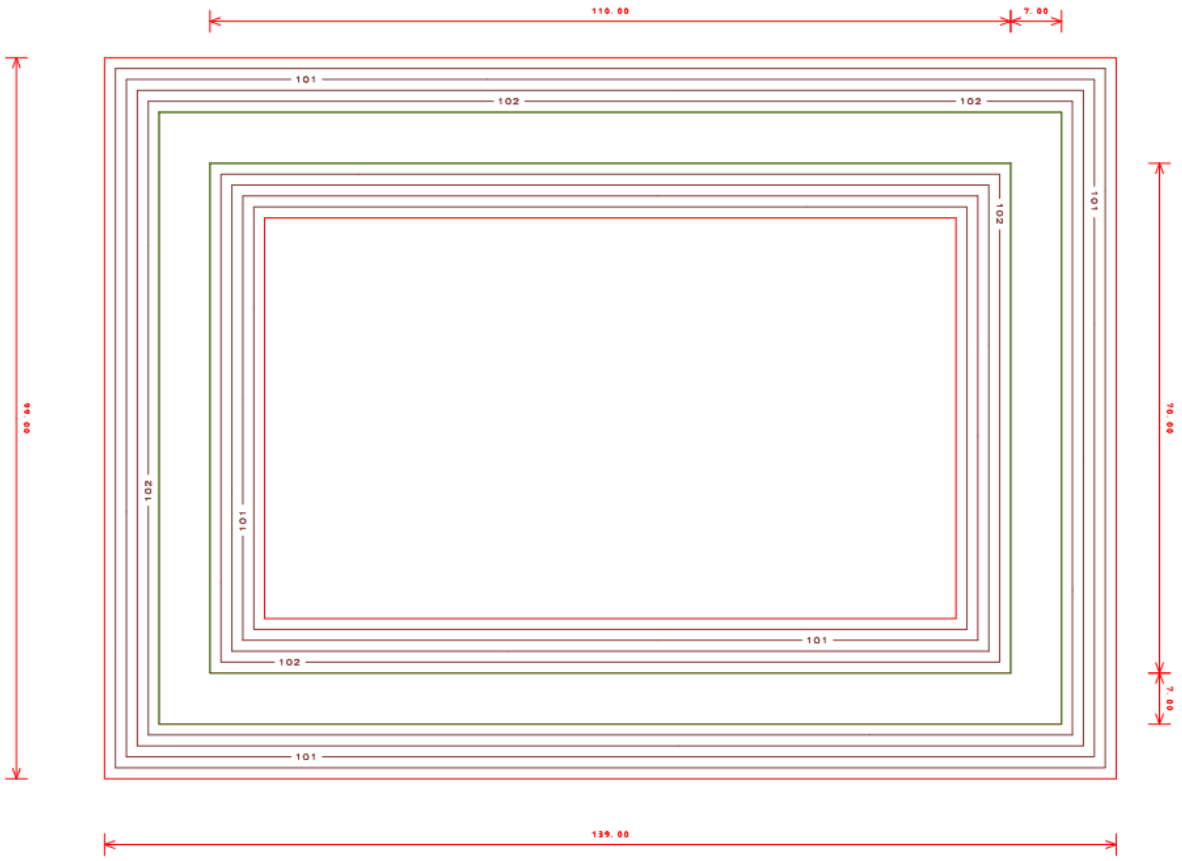

Figure 13 - Raw water storage dam wall design. Source: Navachab, 2022

4.12 SEWERAGE

No significant changes are expected in the operation and management of site sewerage systems. A permanent ablution block with a sewage collection and treatment system will be constructed on top of the service ramp between TSF2 and TSF3 for personnel utilisation, for both male and female use in separate spaces to ensure privacy and compliance with local labour standards. This will be included in the monitoring regime of the site.

4.13 GENERAL WASTE

No significant changes are expected in the operation and management of the sites general waste facilities compared to that of the existing operations.

4.14 CO DISPOSAL ON WASTE ROCK DUMPS

The mine deposits approximately 2 million tonnes of filter cake onto its active waste rock dumps and on average approximately 20 million tonnes of rock waste. It is therefore assumed that an equal split can be achieved which means it's approximately 0.5 - 0.7 million tonnes of filter cake

per dump and approximately 6 - 7 million tonnes of waste rock. The height of the dump design is still expected to remain as per the initial mine calculations done and shown in Figure 14.

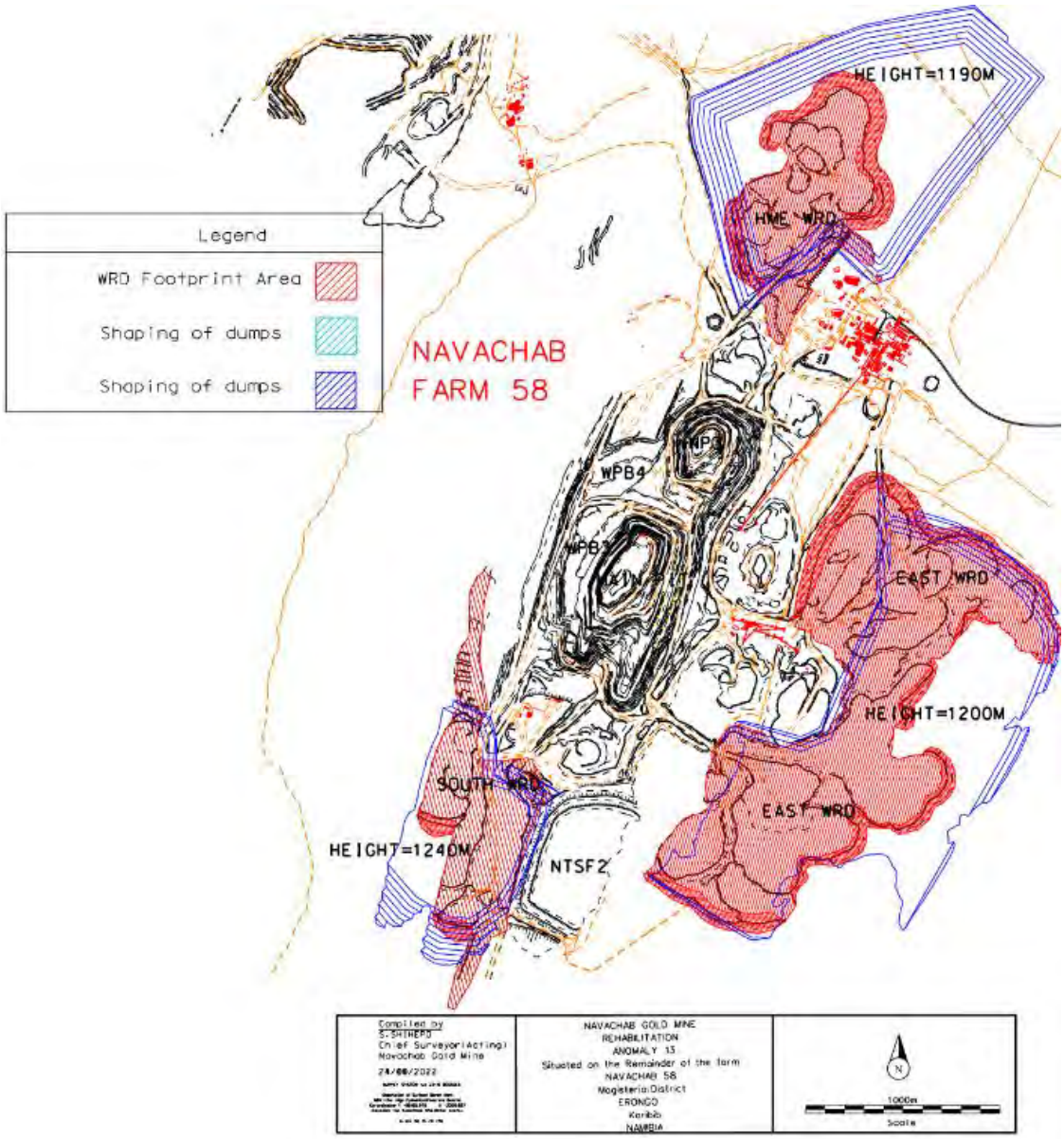

Figure 14 - Waste rock dumps profile (shape and height). Source: Navachab Gold Mine, 2022

4.15 ALTERNATIVES CONSIDERED

In order to accommodate the design volume three possible location scenarios were identified. They were as follows:

- To increase the height of the TSF2;
- To extend TSF2 into the adjacent valley to the west; and
- The valley to the east of TSF2

Various approaches were investigated by the mine as detailed below.

Existing TSF2.

- Fill TSF2 up to the top earth wall (1204 m);
- Fill TSF2 and its west extension up to the top of the wall, level 1204 m;
- Raise both by 4 m to level 1208 m;
- Raise both by 20 m to level 1224 m; and
- Raise only TSF2 by 20 m to level 1224 m.

New TSF3 (The preferred option)

- In all the above instances the remaining production waste was placed on TSF3;
- TSF3 is limited in extent to the north by the location of the overburden waste dump currently in use;
- As the deposit rises the southern end reaches the extent of the valley and low containment walls are needed; and
- The northern wall can be constructed either as an earth fill impoundment or as an earth starter wall with a cyclone wall above that.

The preferred option was recommended and selected due to the following:

- the TSF3 valley is already used for waste rock disposal, and therefore any potential impact is incremental;
- the TSF3 valley surface and ground water flow are toward the site;
- the TSF3 storage facility height is lower than that of an expanded TSF2, and therefore a lower stability risk; and
- the selection of a new facility ensures that all aspects of TSF3 are compliant with international standards from conceptual planning to post closure.

4.16 Rehabilitation

The rehabilitation of the TSF1 has been substantially completed, both with resloping, buttressing, and revegetation. Navachab Gold Mine's tailings design engineers and ECC will provide further input on the management and monitoring of the rehabilitation.

TSF2 rehabilitation will form part of the site's detailed closure planning and its consolidated management plan, developed by ECC in 2022 and leveraging the experience from TSF1 rehabilitation. Rehabilitation preparation work has commenced with the deposition of the southern buttress.

The TSF3 rehabilitation methodology will form part of the ESIA and detailed in the site's detailed closure plan being developed by ECC.

The activities are expected to include resloping and / or buttressing, if required, monitoring and management of water and seepage, if required, and revegetation both to manage dust, visual impacts, and potential impacts to flora and fauna. Clean waste rock continues to be used for buttressing of TSF1 and TSF2.

5 ENVIRONMENTAL AND SOCIAL BASELINE

5.1 BASELINE DATA COLLECTION

Initial desktop baseline studies relevant to the Project formed part of the initial environmental assessments conducted for the exclusive prospecting licences on which the Project is situated. As part of this assessment, the baseline was studied in detail, with inputs from specialist studies commissioned as part of the environmental and social impact assessment process.

5.2 SPECIALIST STUDIES

The following specialist studies as outlined in Table 7 were commissioned and completed, to determine the current state of the baseline environments:

Table 7 - Specialist studies conducted for the ESIA.

Study area	Purpose	Specialists
Farm Navachab	– Archaeological survey	– Dr. J Kinahan
TSF 2	– Avifauna survey	– Smith & Bouwman
Farm Navachab and TSF3	– Biodiversity assessment (management plan)	– Van Zyl & Steenkamp – Mr. Peter Cunningham (2022)
Farm Navachab and TSF3	– Air quality study	– Airshed
Farm Navachab and TSF3	– Noise assessment	– Airshed
Farm Navachab and TSF3	– Geohydrology, zone of influence revision and slope stability analysis	– SRK

5.3 LOCATION

TSF3 is located approximately 9 km west of Karibib on the Navachab Gold Mine leasehold. TSF3 falls within the approved accessory works area adjacent to ML31. The ML31 and the accessory works area (AWA) falls within Farm Navachab No. 58/Rem, owned by the QKR. Figure 3 illustrates the position of TSF3 in relation to Navachab Farm No.58.

5.4 LAND USE

From a regional perspective the Project is situated in a commercial agricultural region and the surrounding area land use is dominated by cattle, game, and small stock farming. Figure 15 outlines the current mining licence area map with surrounding farms. The mine is situated approximately 9 km from Karibib.

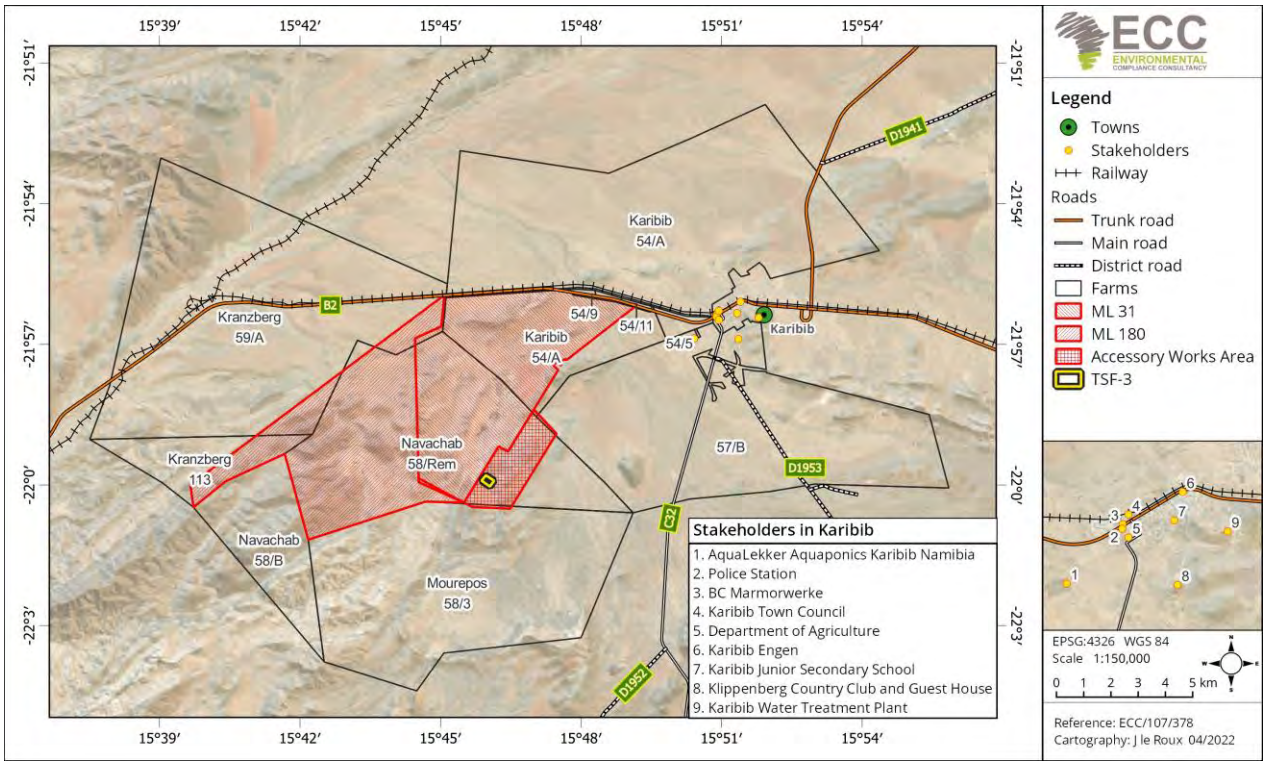

Figure 15 - Stakeholder map illustrating the ML area and surrounding farms

The Project area is not part of a communal conservancy. The closest is ǂGaingu, which is located in the Spitzkoppe area 9 km to the west of Karibib. Furthermore, the Project area is not situated within a freehold conservancy (Mendelsohn et al. 2002).

5.5 CLIMATE

Meteoblue Navachab - 21.99°S 15.76°E

The Navachab Gold Mine is situated southwest of Karibib in the Erongo Region, Namibia, which is about 1159 meters above sea level (masl). The climatic conditions characterising the Project area are hot summers and cool winters with the mean temperatures hovering around 20 ˚C, and mean maximum temperatures ranging between 25˚C and 34˚C and mean minimum temperatures ranging between 4˚C to 18˚C. The hottest months of the year are between October and January and the coolest months are in June and July (Bubenzer, 2002 & meteoblue, 2022) (Figure 16). **Error! Reference source not found.** illustrates further details relating to temperature ranges per month over a 12-month period.

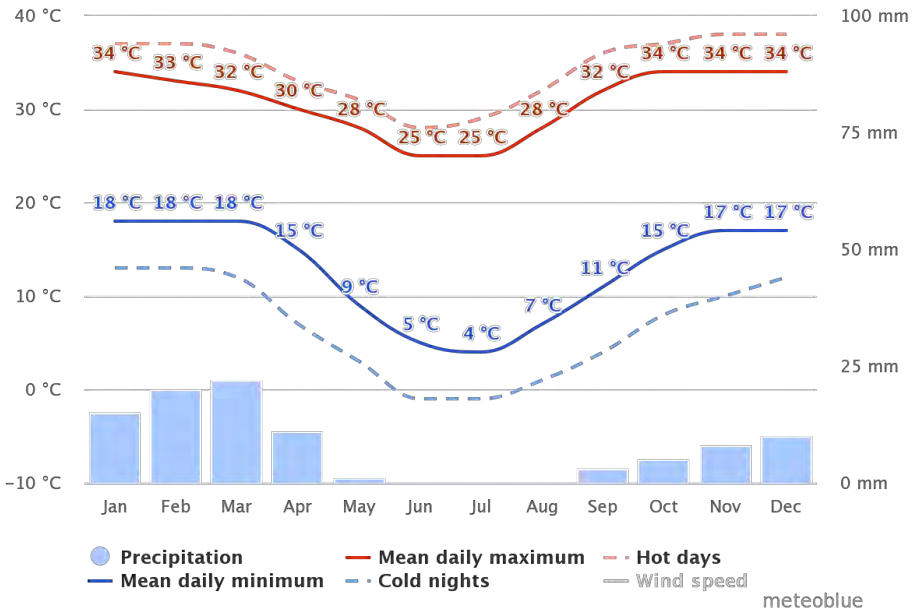

Figure 16 - Yearly expected weather conditions

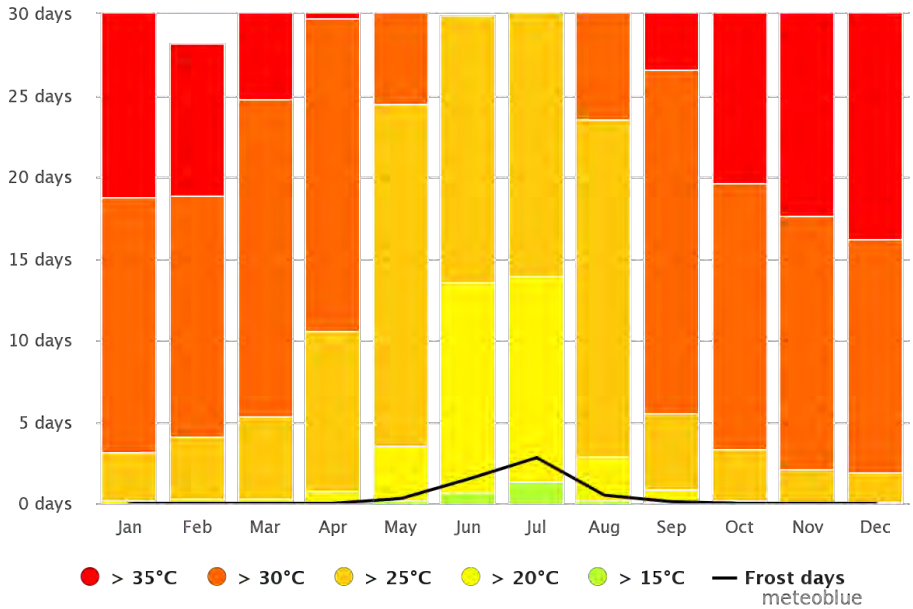

Figure 17 - Temperature and frost days per month

The area can be foggy between 1 and 5 days per year and can experience days with frost mostly in June and July (Bubenzer, 2002 & Meteoblue, 2022). Similarly, the area can experience frost between 1 and 5 frost days per year (Figure 17).

The most humid months of the year are between February and March at approximately 60% relative humidity (RH), and the driest months are between August and September with approximately 20% RH. The average rainfall in this area during the year is between 150 to 250 mm

and rainfall events are limited to the summer months, mainly between November and April. Potential evaporation is between 3200 and 3400 mm per year (Bubenzer, 2002). See Figure 18.

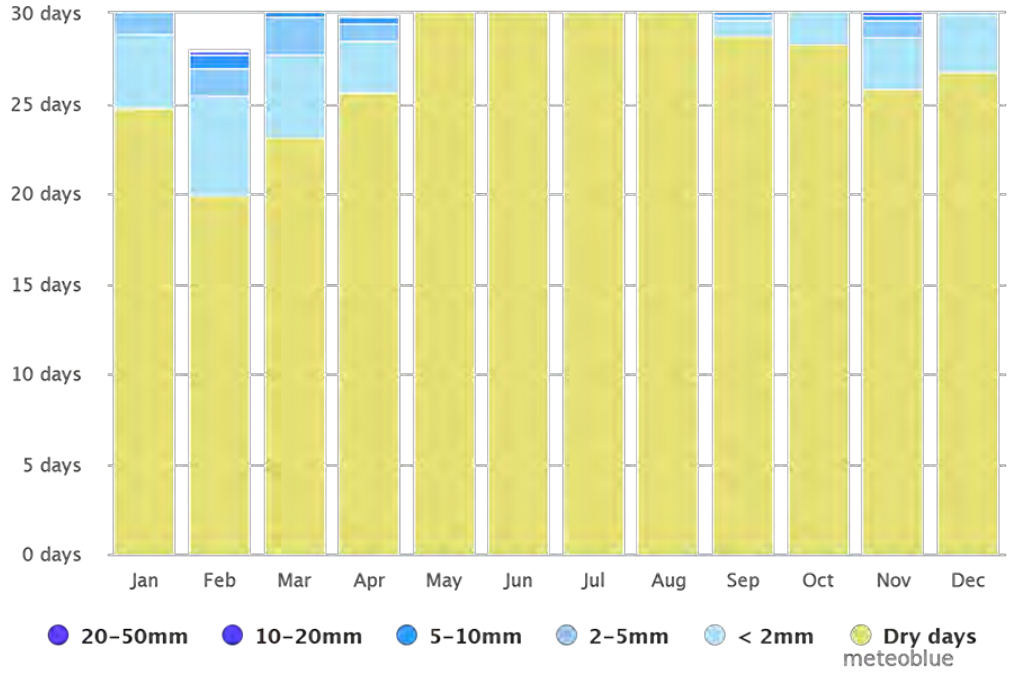

Figure 18 - Rainy and dry days per year

The area has average wind speeds between 5 km/h and more than 28 km/h. The months of July to January are known to have the strongest winds (Figure 19). Wind can occur any time of the day and the most predominant wind directions for this area are ENE (Figure 20). As seen in Figure 20 July could also experience wind speeds of more than 38 km/h.

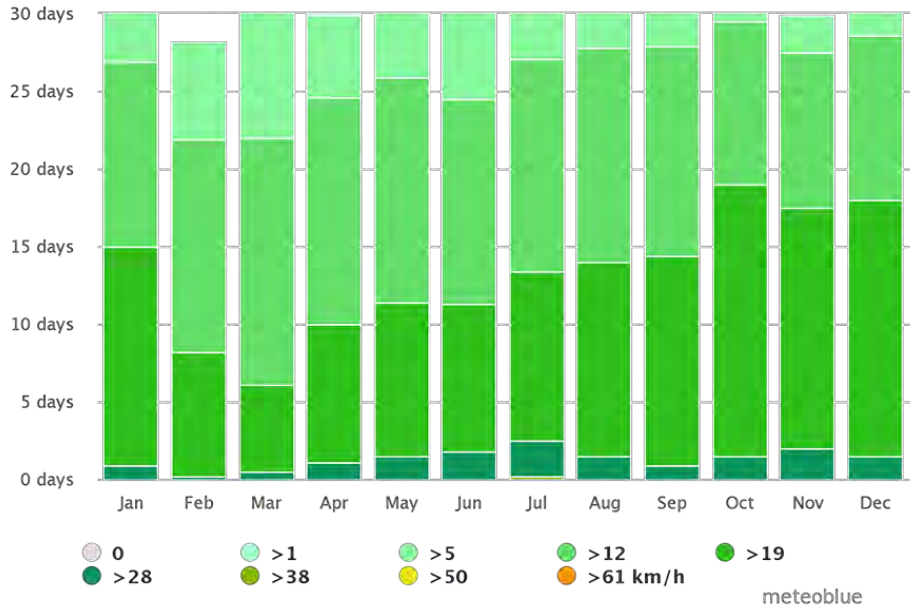

Figure 19 - Windy days and associated wind speeds per month

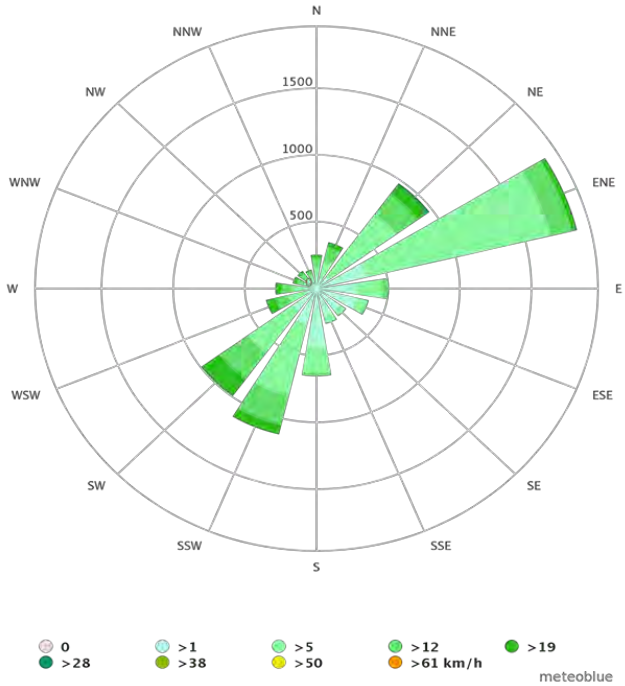

Figure 20 - Average wind directions for this area

5.6 GEOLOGICAL SETTING

Most of Namibia's valuable mineral resources have been found in the western part of Namibia where the oldest rocks are exposed to the surface, i.e., the Damara Supergroup, where the mine is situated (Mendelsohn et al., 2002). Most of these formations (of various ages and compositions) are exposed in the west as rugged landscapes of mountains, hills, valleys and plains with sparse vegetation.

The regional geology of this area consists mainly of the Swakop Group, where the main rock types are schists and dolomites (Figure 21). The Swakop Group is part of the Damara Supergroup and Gariep Complex (Bubenzer, 2002). The Swakop group is further divided into the Navachab and Usakos subgroups as seen in Table 8, which is then even further divided into different formations and members (Wulff et al. 2017).

According to Wulff et al. (2017) the Navachab gold deposit is situated in "the Southern Central Zone (SCZ) of the Pan-African Damara Belt in Namibia" Figure 22). The SCZ consists of "Neoproterozoic, shelf-type metasedimentary rocks metamorphosed" under high temperature /low pressure (HT/LP) conditions. The metamorphism was accompanied by large granite magmatism (Wulff et al. 2017).

A "vein swarm" that covers the whole northwest portion of the Karibib Dome and occupies a 5 x 3 km region serving as the host for the Navachab gold deposit. Additionally, high-grade mineralisation can be found in "replacement bodies near the base of the Okawayo Member that are skarn-style and sulphide-rich."

At the areas where veins crosscut metapelites, calc-silicate rocks and marbles (of the Arandis formation at the periphery of the anticline) it tends to be mineralised with gold (Wulff et al. 2017). In contrast where veins crosscut “diamictites of the Chuos formation and continental quartzites and arkoses of the Etusis formation”, gold is usually absent. This is possibly a result of marine units containing accessory graphite which aided a “favourable reducing environment for the precipitation of gold” (Wulff et al. 2017).

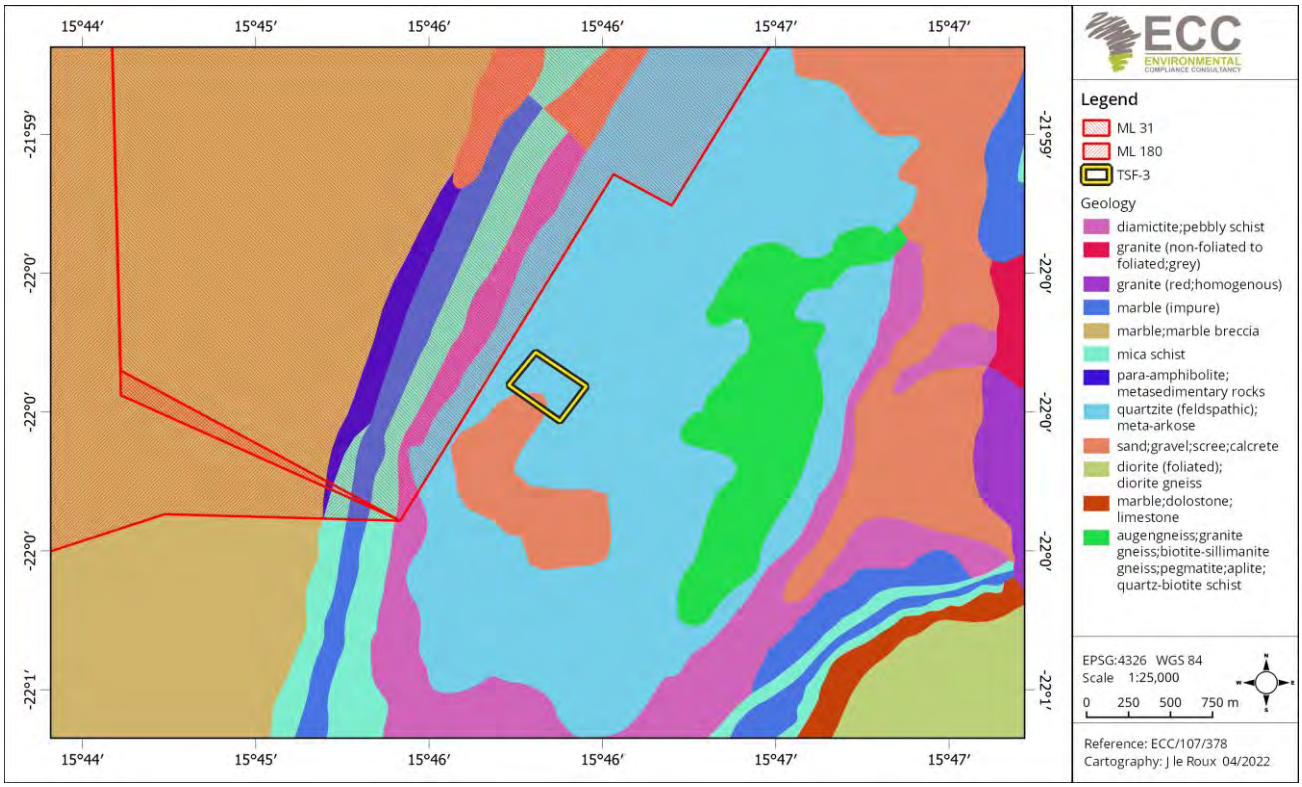

Figure 21 - Regional geology of the Project area and broader Karibib area.

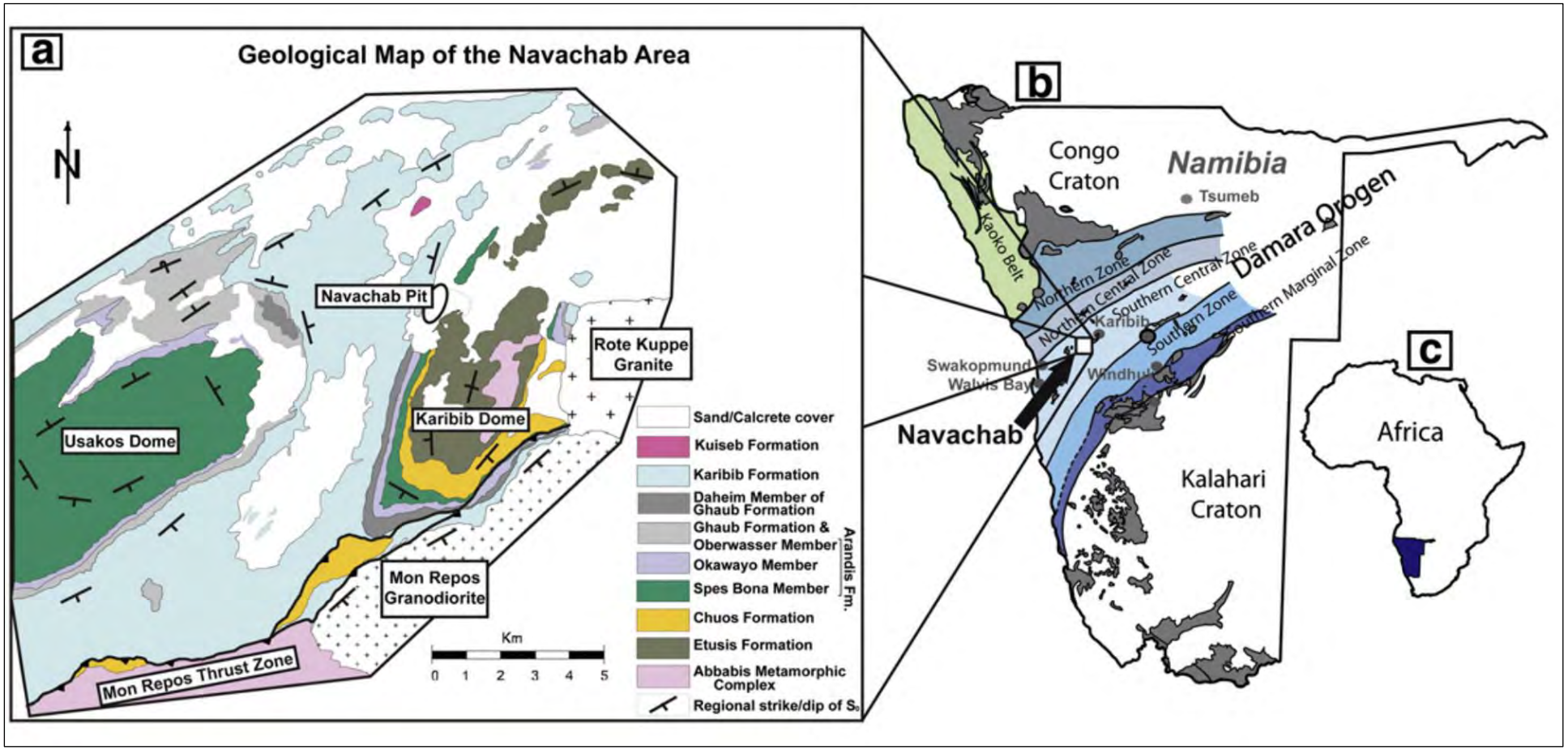

Figure 22 - a) Geological map of the Navachab area b) Shows the tectonostratigraphic zones of the Damara Orogen defined (Wulff et al. 2017)

Table 8 - "Lithostratigraphy of the pre-Damaran Basement and the Damara Sequence in the Navachab area" (Wulff et al. 2017).

Group	Subgroup	Formation	Member	Description	Thickness	Age
Swakop	Navachab	Kuiseb		Turbiditic meta-pelites and meta-psammites,	> 3300m, ~ 15-40 m exposed in Navachab area	
		Karibib		Calcitic and dolomitic marbles, intraformational marble breccias, minor calc-silicate rocks intercalated	up to 1500 m	
		Ghaub	Daheim	Continental alkali basalt pillows, pyroclastic breccias and tuffs, locally intercalated with Kachab Member	0- ~ 50m	635.5±1.2 Ma (Hoffmann et al. 2004)
			Kachab	Diamictite with marble clasts, meta-pelites (biotite ±cordierite schists) and intercalated calc-silicate rocks	0-150 m, ~ 0.5 m diamictite	
	Usakos	Arandis	Oberwasser	Meta-pelites (biotite ±cordierite schists) and intercalated calc-silicate rocks	60-240 m	
			Okawayo	Marble and calc-silicate rocks	70-150 m	
			Spes Bona	Meta-pelites (biotite ±cordierite schists), calc-silicate rocks, minor marble, meta-psammite,	up to 600 m	
			Karub	Calc-silicate rocks and marble, cap carbonate of Chuos (Sturtian) glaciation	< 10 m, 0.3-2m common	
		Chuos		Diamictite	up to 180 m	
Nosib		Etusis		Quartzites, arkoses, minor volcanics	up to 3000 m	756±2 to 746±2 Ma (Hoffmann et al. 1996)
Abbabis Basement				"Quartzo-feldspathic" gneisses, quartzites, mica schists, calc-silicate rocks, marbles, metabasites and meta-andesites, granitic orthogneisses and meta-pegmatites, meta-syenites		2.1-1.9 Ga, (Jacob et al., 1978; De Kock et al., 2000; Jacob et al., 2000)

5.7 TOPOGRAPHY AND SOILS

The topography of the Project site is relatively rough with various rock outcrops/hills as seen in Figure 23. The elevation gradually decreases but varies between just below 1100 m above sea level (north-western corner) to just below 1300 m above sea level (1287 m hills) from the south-eastern side of the mine site towards the north-western side (Figure 24).

The mine area is largely covered by rock outcrops and small sections of the north-western and north-eastern areas of the ML is covered by petric Calcisols (Bubenzer, 2002). Namibian soils vary a great deal, variations occur on a broad scale but there is even a great deal of variability at a local level. The basin of the TSF3 area is covered by thin, poorly developed Kalahari aeolian sands of shallow depth and a reddish colour.

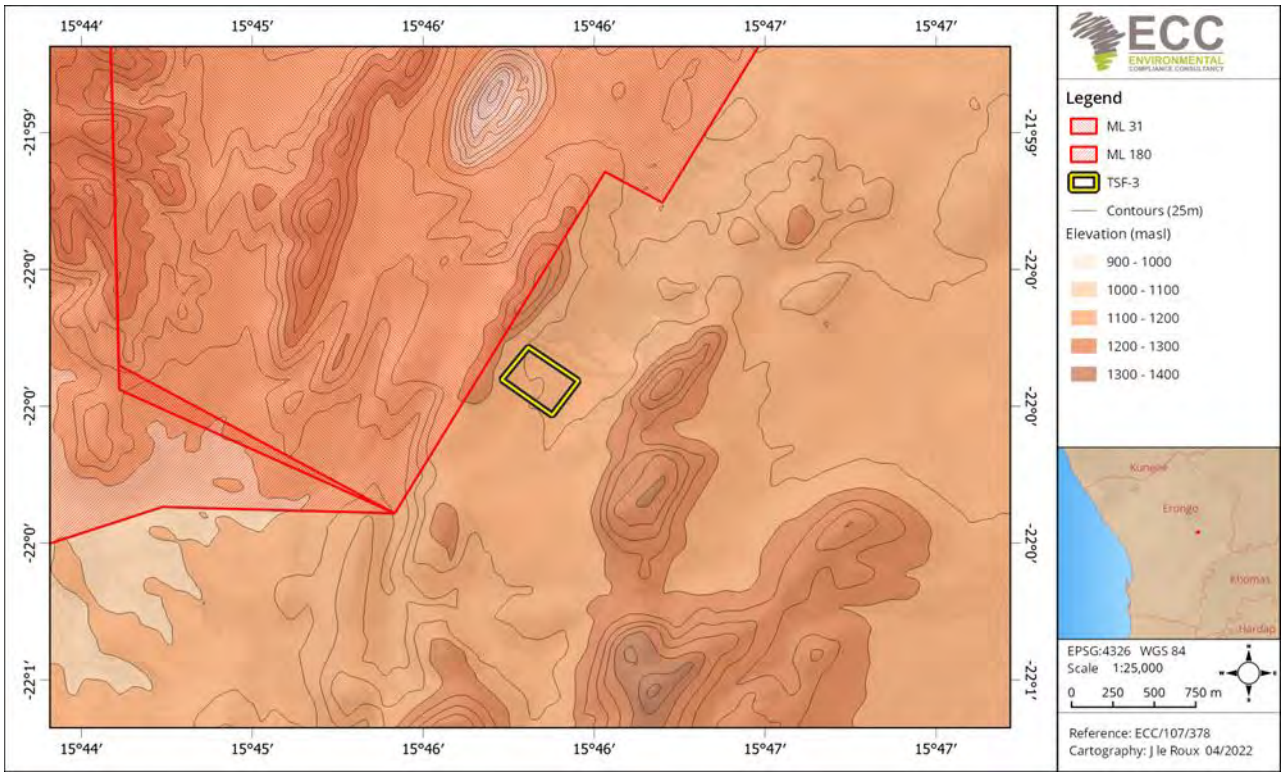

Figure 23 - Elevation profile of the project area

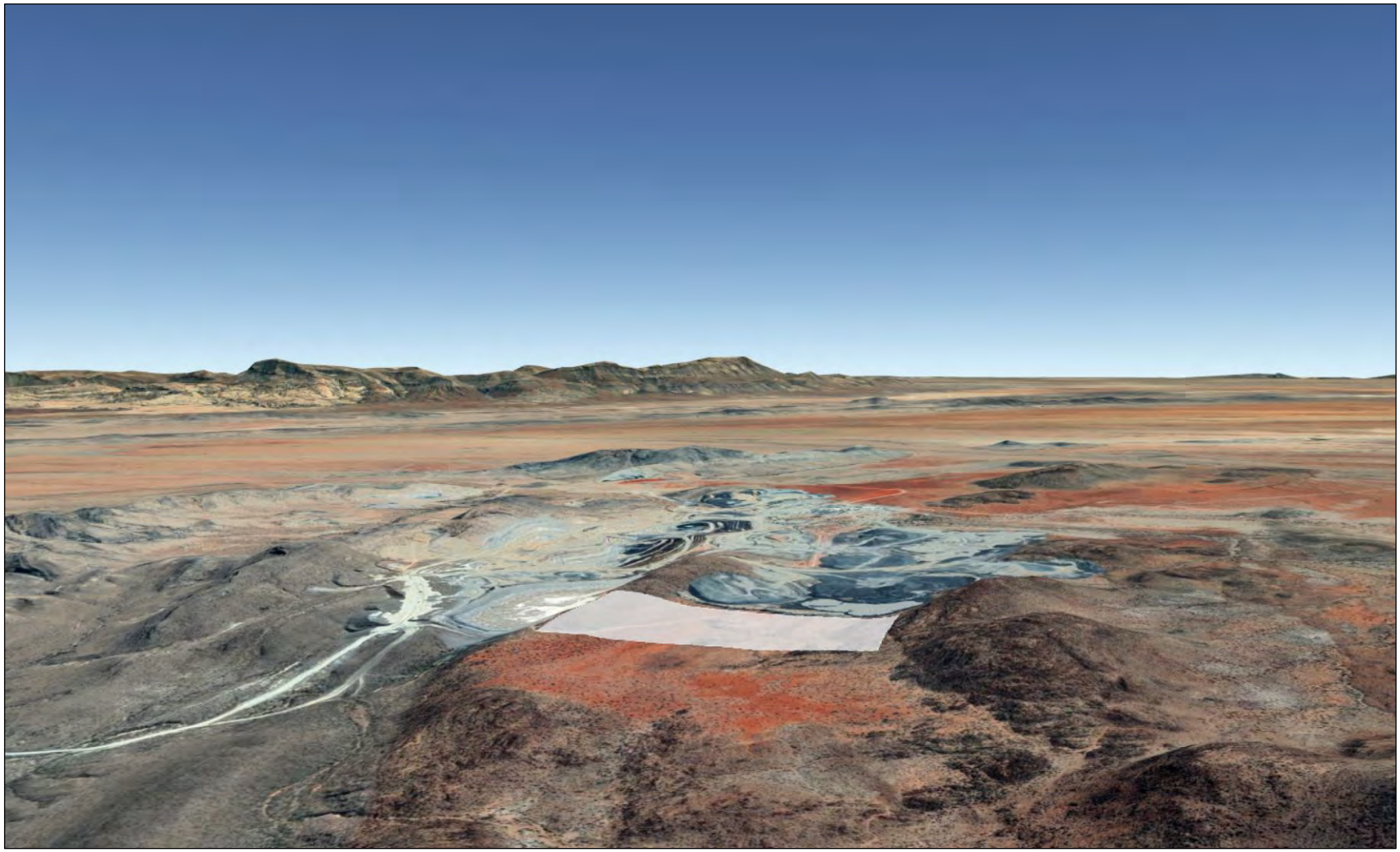

Figure 24 - 3D screenshot from Google earth showing the topography of Navachab mining area and the proposed location of TSF3 (White rectangle)

5.8 HYDROLOGY

The schist and marble aquifers around Karibib mainly provide moderate water yields, and although in some area like Otjiwarongo where marbles supply the town with water the recharge in the Karibib area is insufficient to maintain required yields. Water supply to Karibib and Navachab Gold Mine is enhanced by the Swakoppoort Dam as seen **Error! Reference source not found.** (Christelis & Struckmeier, 2011).

According to Steven et al. (2013), hydrogeological management of the qausi-karstic Okawayo Formation layer (also a fractured rock aquifer) is essential to reduce water access into the mining area. The "strontium and stable isotope signature of waters" in the four most important hydrological units, namely Okwayo, Spes Bona, Oberwasser and Karibib Formations could be used for the development of a water management plan at Navachab Gold Mine.

According to the Namibian Monitoring Information System & Hydrological Map of Namibia (https://na-mis.com/), the site falls over a fractured, fissured or karstified aquifer with moderate groundwater potential. The groundwater vulnerability in this area is considered to be high, and groundwater recharge within this area is considered to be moderate (>1 to 1.5% of the total average rainfall). However, to date the mine's water recycling systems and water management and usage is sustainable and have been such that the groundwater aquifers generally recharge adequately. The performance of the aquifer in the area of one of the abstraction wells is being confirmed and monitored closely. Site personnel must continue to maximise water recycling efforts, ensure water use is minimised, confirm all abstraction flow meters are working effectively and monitored regularly, and closely track groundwater and aquifer levels to confirm seasonal and annual rebound of levels and recharge of the aquifer. Groundwater in this area is generally of good to excellent quality (Group A and B), but to the south, south-west and west of the site, water quality is generally poor and not suitable for human consumption (Group D) shown in Figure 25.

According to a floodline assessment conducted by Knight Piésold Consulting (2012) it is "clearly evident from the floodline mapping (Figure 26) that the existing mining infrastructure is located within the flood inundation areas". This might thus pose a significant risk to both the infrastructure as well as the downstream environment (Knight Piésold Consulting 2012). In order to minimise the impact of the flooding to mine infrastructure, mitigation includes the development of adequately sized diversion canals throughout the project area. The proposed diversion strategy and canals have been sized to safely contain the 1 in 50- and 1 in 100-year flood events in a contained and controlled manner. Regardless of the floodline assessment findings, there is no major flood risk in the area where TSF3 is proposed to be located, as seen in **Error! Reference source not found.**. Surface and groundwater flow from TSF3 is to the north under existing waste rock dumps and mine infrastructure and does not pose a new potential impact.

Figure 27 shows the hydrology on and surrounding the Project area. No major drainage line transects the proposed TSF3 location.

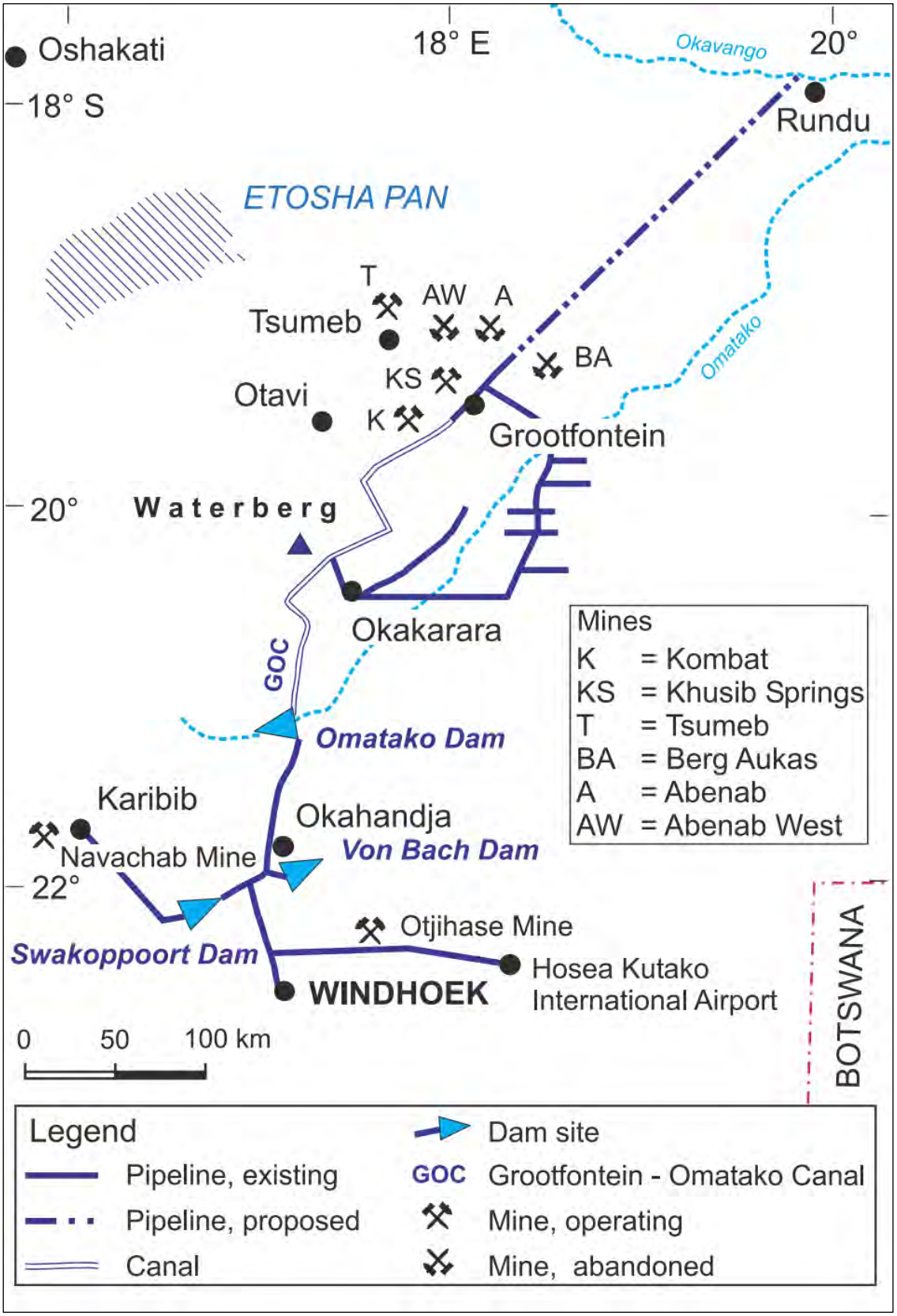

Figure 25 - Water Supply map (Christelis & Struckmeier, 2011).

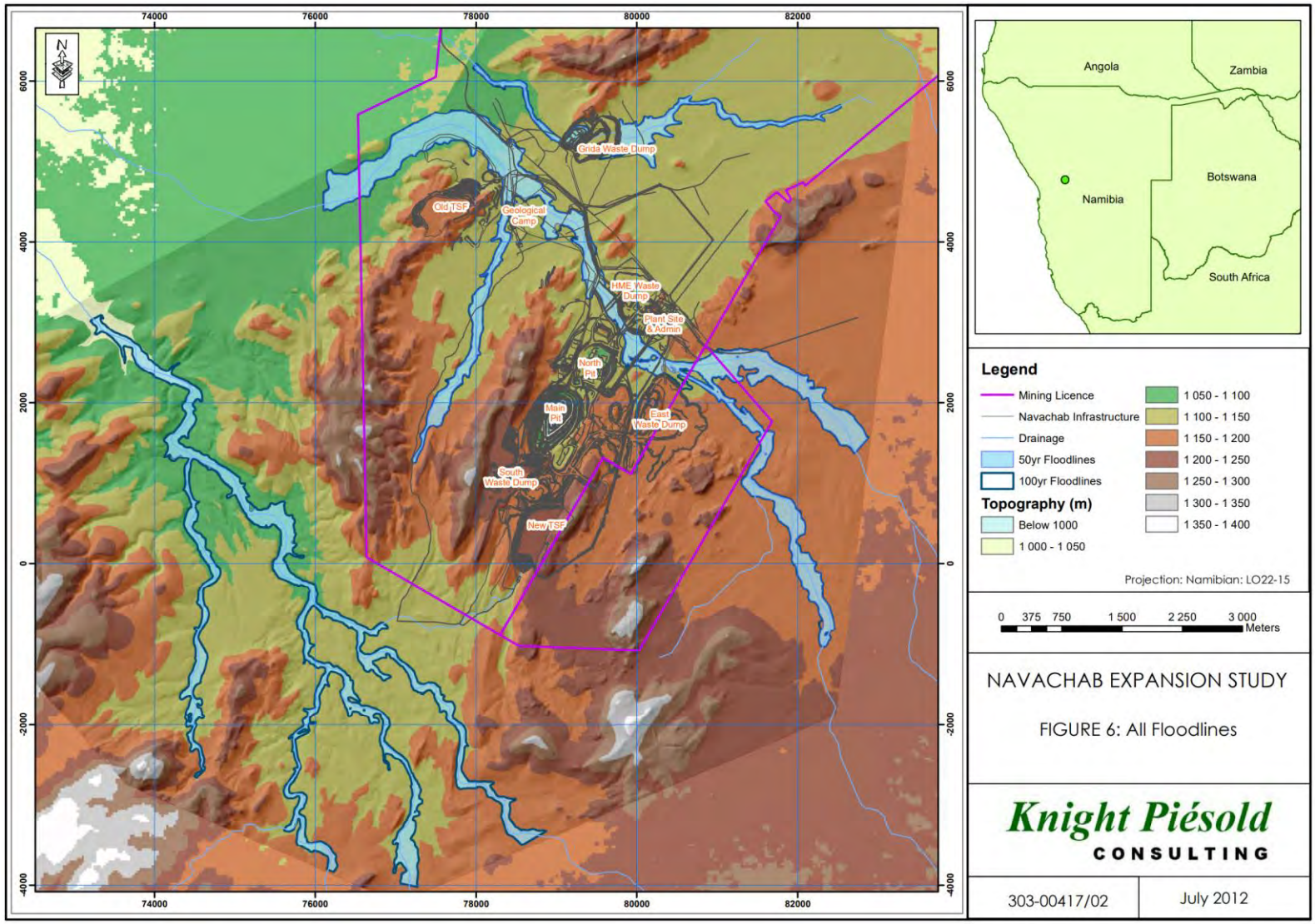

Figure 26 - Flood line assessment (Knight Piésold Consulting 2012).

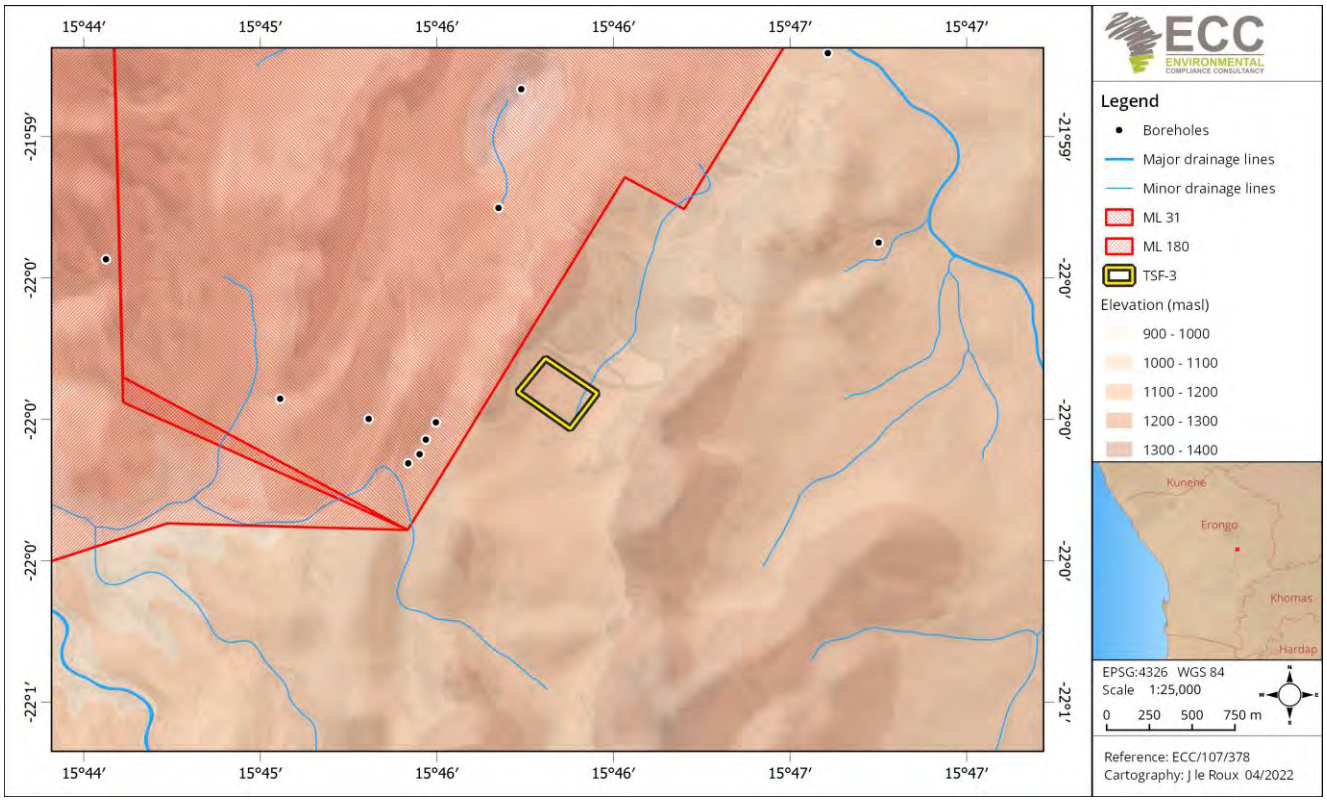

Figure 27 - Hydrology of the Project area illustrating minor and major drainage lines.

5.9 BIODIVERSITY BASELINE

5.9.1 FLORA

Vegetation in Namibia is strongly influenced by rainfall. The vegetation type of the Project area is known as Western highlands and the dominant vegetation structure is classified as sparse shrubland (Figure 28). This area falls within the savanna biome (Bubenzer, 2002 & Mendelsohn et al., 2002). The plant diversity (150 to 300 species) and endemism (between 6 and 35 endemic) (Namibian Botanical research institute (NBRI), 2022) for this area is moderate to high (Bubenzer, 2002 & Mendelsohn et al., 2002).

In this part of Namibia, the following tree and shrub species are either protected under national legislation, endemic, near-endemic or listed in the CITES appendices:

- *Aloe dichotoma* (near endemic, Nature Conservation Ordinance and CITES II),
- *Aloe littoralis* (Nature Conservation Ordinance and CITES II),
- *Ficus Cordata* (Forestry protected),
- *Ficus sycomorus* (Forestry protected),
- *Obetia carruthersiana* (near-endemic),
- *Boscia albitrunca* (Forestry protected),
- *Maerua schinzii* (Forestry protected),
- *Moringa ovalifolia* (Forestry protected and near-endemic),
- *Albizia anthelmintica* (Forestry protected),

- *Vachellia erioloba* (Forestry protected),
- *Faidherbia albida* (Forestry protected),
- *Parkinsonia africana* (Forestry protected),
- *Erythrina decora* (Forestry protected and endemic),
- *Commiphora dinteri* (endemic),
- *Commiphora glaucescens* (near-endemic),
- *Commiphora saxicola* (endemic),
- *Commiphora virgata* (endemic),
- *Euphorbia guerichiana* (CITES II),
- *Euphorbia virosa* (CITES II),
- *Ozoroa crassinervia* (Forestry protected),
- *Ziziphus mucronata* (Forestry protected),
- *Cyphostemma currorii* (Nature Conservation Ordinance),
- *Cyphostemma bainesii* (Nature Conservation Ordinance and endemic),
- *Sterculia africana* (Forestry protected),
- *Tamarix usneoides* (Forestry protected) and
- *Manuleopsis peasonii* (endemic) (Mannheimer & Curtis, 2009).

The findings of Cunningham, P (2022) shows a total of 19 species of larger trees and shrubs were identified throughout the TSF3 area. The six (6) most important protected species confirmed on the plains and hilly locations of the TSF3 area (including endemic/near endemic, etc.) include:

Plains

- *Acacia erioloba*, *Albizia anthelmintica*, *Boscia albitrunca* (**Error! Reference source not found.**)

Hills

Rocky areas generally have high biodiversity and consequently viewed as important habitat for all vertebrate fauna and flora in the general TSF3 area.

- *Boscia albitrunca*, *Commiphora glaucescens*, *Moringa ovalifolia* and *Sterculia africana* (Figures 14-16)

The Navachab Gold Mine area has been heavily impacted due to current/past mining activities and none of the unique trees/shrubs are expected to be exclusively associated with the TSF3 area (Cunningham, 2022). The significance of the potential disturbance to these tree species within the two habitats will be presented in the assessment phase. Should there be a potential significant impact identified in the assessment phase, then the specialist will propose specific mitigation and protection/preservation for the important protected flora species within the proposed TSF3 basin and construction area.

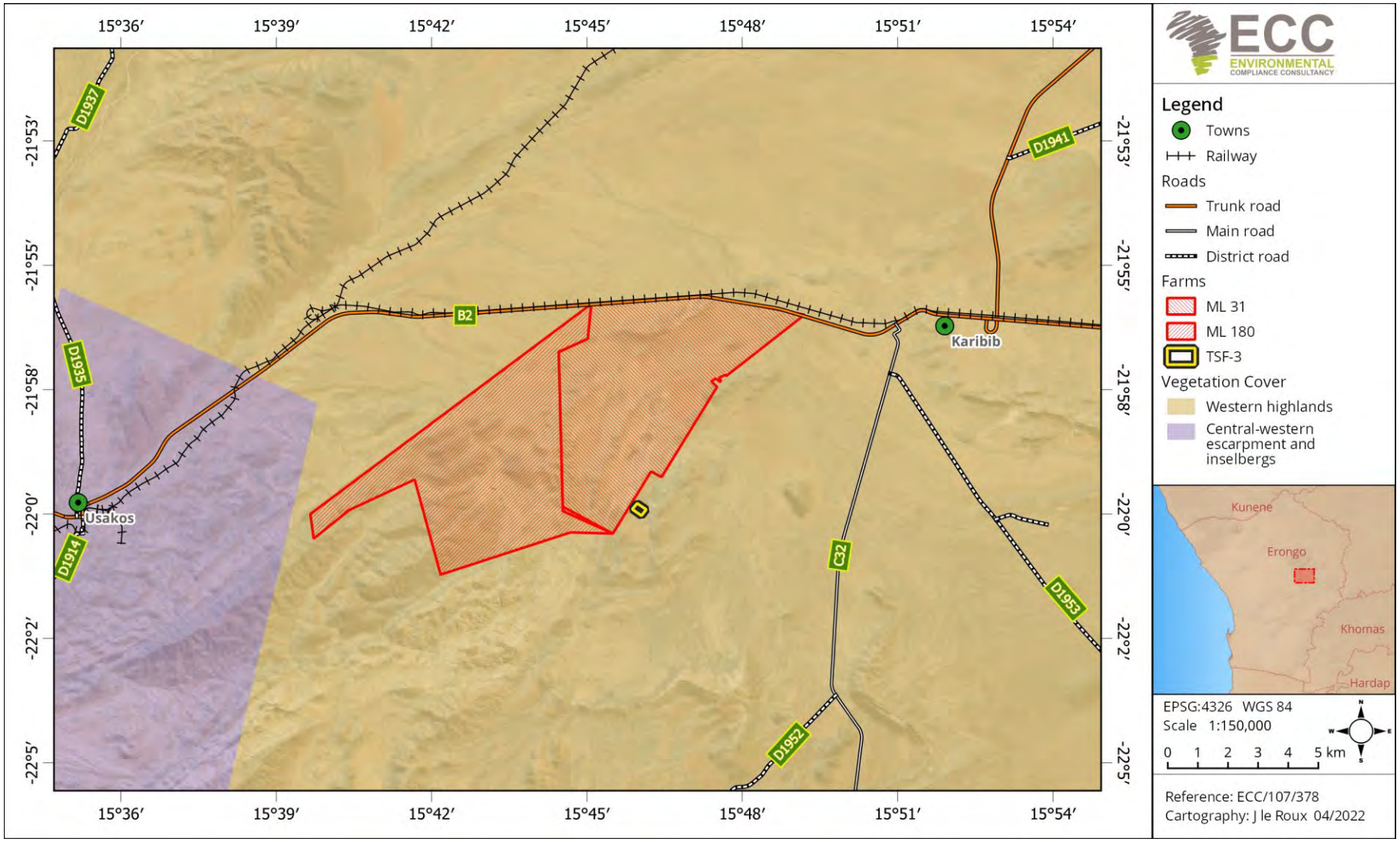

Figure 28 - Vegetation cover over the Project area

5.9.2 FAUNA

The overall terrestrial diversity for the Project is moderate compared to other parts of the country. The area within and surrounding the Project has a moderate bird diversity status of between 171 and 200 species, with high bird endemism (between 8 to 10 species) and represents an area with moderate mammal diversity of between 61 to 75 species (5 to 6 of these species are endemic). Four larger carnivore species have been recorded in the Project area (Bubenzer, 2002, IUCN, 2021, Mendelsohn et al., 2002, Oberprieler and Cillié, 2008 & Stuart and Stuart, 2015).

Furthermore, the reptile diversity within this area is moderate to high with between 61 and 80 species, of which 21 to 24 species are endemic (high). The number of observed lizard species for this area is between 32 to 35 of which 9 to 11 species are endemic and the different snakes recorded are between 30 to 34 species (more than 10 endemic species).

This area has a low frog diversity of between 4 to 7 species. Then there is also a high scorpion diversity (16 to 17 species) around which 5 to 6 species are endemic (Bubenzer, 2002 & Mendelsohn et al., 2002).

In this area, there are approximately 66 mammal species of which 9 are bats and the remaining 57 species are small to large mammals (i.e., rodents, rabbits and hares, ungulates (Zebra), pigs, ruminants (antelopes), primates, carnivores, Aardvark and pangolins).

Various protected or threatened mammal species may occur on the Project site of which one is classified as near threatened (Brown Hyena) and four are classified as vulnerable (Cheetah, Leopard, Pangolin, Black-footed cat, Hartmann's Mountain Zebra) according to the IUCN red list of threatened species (IUCN 2022).

Furthermore, all tortoise species, rock monitors and pythons (dwarf and rock pythons) might potentially be encountered within the Project boundaries and are protected under the Nature Conservation Ordinance No. 4 of 1975.

According to the biodiversity management plan conducted by van Zyl & Steenkamp (2011), the area/habitat where TSF3 is proposed is of moderate ecological and functional importance.

Most bird species in Namibia fall under Schedule 4: Protected Game within the Namibian Conservation Ordinance No. 4 of 1975, except for the following excluded species: Weavers, Sparrows, Mousebirds, Redheaded Quela, Bulbul, and Pied crow as well as 19 huntable game bird species identified in Schedule 6 of the Nature Conservation Ordinance (Nature Conservation Ordinance No. 4 of 1975).

Many bird species are highly migratory and pass-through Namibia sporadically, thus some of the species might be very rare to identify during the year, nonetheless could potentially be spotted within the Project area periodically. It is believed that rock pools, TSF pond(s) and surface water during the rainy season will attract waterbirds (either resident or migratory).

In this part of Namibia, some species are either additionally protected under the regulations of the Exploitation of Marine Resources Act No. 241 of 2001, section 18 or listed within the CITES appendices. Some of these species might potentially be found or encountered near or within the Project site during a given year (depending on the season and migratory patterns).

Of these species six are Near-threatened, two are Vulnerable, seven are Endangered and one Critically Endangered (White-backed Vulture) according to the IUCN red list of threatened species (CITES 2019, IUCN 2022, Irish 2021 & Oberprieler and Cillié 2008 & Regulations relating to the Exploitation of Marine Resources Act No. 241).

An avifauna specialist study was conducted by Smith & Bouwman (2009) on impacts on birds in the area with regards to cyanide bearing tailings. The study was conducted at four survey locations during summer and winter and a total of 93 bird species have been observed (27 were near-endemic). Insects and seeds in the area near the tailings seem to attract most of the birds. Vegetation and infrastructure near the tailings (or in tailings) also provide a habitat structure attracting living organisms (i.e., insects) that in turn also attracts birds (Smith & Bouwman 2009). A follow up biodiversity study was commissioned by the Proponent to investigate biodiversity occurrences and endemism for the TSF 3 area, the results of which will be contained in the assessment report.

Supernatant and tailings contain variable amounts of cyanide and can regularly exceed the upper limit of 50 ppm weak acid dissociable (WAD) cyanide which is deemed safe for wildlife. This can usually be found on top of tailing where birds and other wildlife might encounter cyanide through breathing, skin contact, drinking and eating food that might contain cyanide (Smith & Bouwman 2009).

Rocky boulders at TSF walls has/forms crevices that attract small mammals that will attract raptors to the area. According to Smith & Bouwman (2009) during the site visit, leaking water pipes and open water containers also attracted various birds to the TSF top and light near the TSF also attracted insects during the night that attracts birds the next day.

The avifauna specialist studies indicated that wading birds (i.e., Cranes, Egrets, Flamingos, Curlews, Snipes etc.) are most at risk from impacts related to a TFS. Insectivores, Frugivores and Granivores showed to be less at risk, and Raptors, Martins, Swifts and Swallows were least at risk, with Nectarines having basically no risk (Smith & Bouwman 2009).

5.10 Social and Socio-economic baseline

5.10.1 GOVERNANCE

Since its independence in 1990, Namibia is led by a democratically elected and stable government. The country ranked top 5 out of 54 African countries in the Ibrahim Index of African Governance in 2015 for the indicators including the quality of governance and the government's ability to support human development; sustainable economic opportunity; rule of law and human rights; and development of smart information and communication technology to access information for socio-economic growth (National Planning Commission, 2017).

Erongo Region is governed by the Erongo Regional Council as a statutory body promulgated under the Regional Act, Act No. 22 of 1922 and led by the Governor, Honourable Neville Andre Itope. The proposed Project is located in the Karibib constituency of the Erongo Region. The Erongo Regional Council is responsible for the planning and development of the region in a sustainable manner for the benefit of its inhabitants by establishing, managing, and controlling settlement areas and focusing on core services. The council is accountable for an area of 63,586 km^2, or approximately 7.7 % of the total area of Namibia (Erongo Regional Council, 2017).

As a result of sound governance and stable macroeconomic management, Namibia has experienced rapid socio-economic development. Namibia has achieved the level of 'medium human development and ranks 125th on the Human Development Index out of 188 countries (National Planning Commission, 2017).

5.10.2 POPULATION AND GROWTH RATE

Namibia is one of the least densely populated countries in the world (2.8 persons per km^2). Vast areas of Namibia are without people, in contrast to areas of dense concentrations, such as the central-north and along the Kavango River. Windhoek, the capital, is not only the main urban area with the largest population, but the concentration of private and public head offices attracts Namibians from all parts of the country in search of a better life.

The national population growth rate is estimated at less than 2%, which is lower than that of most African countries. Namibia's population is young – although 57% falls into the age group 15 to 59, 37% of the total population is younger than 15 (Namibia Statistics Agency, 2017). Since 2005, there has been a steady improvement in life expectancy, which is currently estimated at 65 years.

In 2018, it was estimated that 50% of all Namibians are urbanised, i.e. living in an urban settlement (retrieved from www.worldpopulationreview.com). The last national census was conducted in 2011, and counted 2.1 million Namibians (Namibia Statistics Agency, 2011). An inter-censal demographic survey was conducted in 2016 and estimated the total population at 2.3 million (Namibia Statistics Agency, 2017).

It is predicted that urbanisation will continue, with an increase from 43% of the population living in urban areas in 2011, to 67% in 2041.

The populations of the Khomas and Erongo regions are projected to increase the most, with over a third of Namibia's population expected to live in these two regions (Namibia Statistics Agency, 2011). Karibib is approximately 9 km by road from the mine, whereas Usakos is about 38.5 km and Omaruru is 74 km by road. Karibib is known for the Navachab Gold Mine, and over 750 employees live in the town, contributing significantly to Karibib's economy.

Table 9 presents the population statistics for the Erongo Region in comparison to Karibib.

Table 9 - Socio-economic baseline study summary of key indicators

Indicator	Erongo Region	Karibib
Population estimate 2018	195 652	15 183
Gender ratio	53% male, 47% female	48% male, 52% female
Average age	26	24
Number of households	57 000	3 500
Formal houses	65%	67%
Informal houses	33%	31%
Schools	19	5 schools: 2 Gvt secondary 2 Gvt primary 1 Pvt primary and secondary
Health facilities	4 hospitals 2 health centres 18 clinics	1 district hospital 3 clinics

5.11 POVERTY AND UNEMPLOYMENT

The Erongo Region is one of the most affluent regions in Namibia, with the second-highest per capita income in Namibia at NAD16 819 per annum (Environ Dynamics, 2010). In Walvis Bay, most employment is through the harbour, fishing industry, and the processing of sea salt (Walvis Bay Municipality, 2008).

The labour force participation rate is the proportion of the economically active population, given as a percentage of the working-age portion of the population (i.e. older than 15 years of age). The rate of labour force participation for the Erongo Region was 80.9% compared to the average of 71.2% for Namibia in 2018 (Namibian Statistics Agency, 2019).

In 2018, 53.4% of all working Namibians were employed in the private sector, and 21.5% by the State. State-owned enterprises employ a further 7.6%, and private individuals 16.6%. Agriculture (combined with forestry and fishing) is the economic sector with the most employees – 23% of all employed persons in Namibia work in this sector. Wages and salaries represented the main income source of 47.4% of households in Namibia (Namibian Statistics Agency, 2019).

Low education levels affect employability and prevent many households from earning a decent income. Of all employed people in Namibia, 63.5% do not have more than a junior secondary level qualification (Grade 10 and lower), and 11.8% of all employed people have no formal education. In total, 29.1% of all employed people fall into the category of “elementary occupation”, and 15.2% into the category of “skilled agriculture”.

Overall, the rate of unemployment is estimated at 33.4% for Namibia, using the broad definition of unemployment. The unemployment rate in rural and urban areas is almost the same – 33.4% in urban areas and 33.5% in rural areas. The highest unemployment rates are found amongst persons with education levels lower than junior secondary. The unemployment rate of persons with no formal education is 28.6%, with primary education at 34.6%, and junior secondary education at 32.7% (Namibian Statistics Agency, 2019).

According to the Namibian Chamber of Mines 2020 annual review, the mining industry employs over 9,000 people directly in the industry – 800 temporary employees and over 6 500 contractors. Namibia’s mining industry spent more than NAD100 million on skills expenditure per year over the past few years, including operating mines, and exploration and development companies, although the annual contributions and delivery of training have been affected by COVID-19 pandemic and related restrictions.

5.12 CRIME

Namibia's crime rate has been on the decline, in general, and in the Erongo Region, since 2011. Namibia's crime index is 65.49 as of October 2021. A rising trend of substance abuse in Karibib has been reported. The reason for this increasing trend is associated with the limited recreational and entertainment facilities in the Karibib area and is fuelled by the increase in disposal income from those working in the mining and quarrying industry in the area.

5.13 ECONOMIC DEVELOPMENT

Key economic activities of the Erongo Region include agriculture, forestry and fishing, mining and quarrying, manufacturing, tourism, and retail.

Mining plays a pivotal role in the economy of Namibia. Since independence, it has consistently been the biggest contributor to Namibia's economy in terms of revenue and accounts for 25% of the country's income. Mining is one of the main contributors to GDP, and one of the largest economic sectors of Namibia. Mining is a pronounced industry in the Erongo Region, and the main commodities are uranium, gold, salt, gemstones and dimension stones.

In addition to the sectors mentioned, the economy of the Erongo Region is dominated by the local economies of Swakopmund and Walvis Bay. In the rural parts of the region, extensive livestock farming is a common activity, but intensive farming is also practised along the lower part of the Swakop River, and at Omaruru. Several fresh crops are produced, mainly for local consumption.

In the Erongo Region, 67.5 % of all households depend on salaries and wages as the main income (Namibian Statistics Agency, 2019). Exact figures do not exist, but this high percentage can be ascribed to the dominance of the mining, fishing, and manufacturing and processing sectors, together with the prominence of state departments and the administrative sectors in the Erongo Region. A total of 12.6 % of households receive their income from business activities (Namibian Statistics Agency, 2019).

Since 2016, Namibia has recorded slow economic growth, registering an estimated growth of only 1.1 % in 2016. The primary and secondary industries contracted by 2.0 % and 7.8 % respectively. During 2017 the economy contracted by 1.7 %, 0.7 % and 1.9 % in the first, second and third quarters respectively (NSA, 2019). Despite the more positive expectations, the economy retracted to an average growth of not more than 1 % annually since 2017. In 2018, growth of 1.1 % continued followed by a decrease in the GDP by 0.8 % in 2019, decrease of 8.1 % in 2020, and a return to growth in 2021 and 2022.

During the second quarter of 2020, the domestic economy contracted by 11.1 %, which is the largest quarterly contraction since 2013; despite the Bank of Namibia's (BoN) outlook that the Gross Domestic Product (GDP) would grow by 1.9 % in 2021 and by 2.8 % in 2022., the actual change was 3.5 % in 2021 and estimated at 4.6 % for 2022, primarily due to increased diamond production. (BON Quarterly Bulletin, 2023 March). Although the BON outlook for 2023 and 2024 suggests growth performance will slow due to weaker global demand, mining is expected to continue to contribute to growth, albeit down from the robust 2022 rates, in the coming two years (BON Economic Outlook – March 2023).

The impact assessment also showed that 96.5 % of tourism businesses were affected by COVID-19 in 2020, the manufacturing and construction sectors contracted by 9.2 % and 5.7 % respectively and there was also a 2 % to 3 % decline in net exports (United Nations Namibia 2020).

5.14 HEALTH AND DISEASE

Since independence in 1990, the health status of Namibia has increased steadily, with a remarkable improvement in access to primary health facilities and medical infrastructure. In 2015, the World Health Organisation (WHO) recommended strategic priorities for the health system in Namibia, which entailed improved governance, an improved health information system, emergency preparedness, risk reduction and response, preventative healthcare, and the combating of HIV / AIDS and TB (WHO, 2016). Karibib has only one district hospital and three clinics available to serve its population.

According to the website of the Ministry of Health and Social Services (MHSS), the Erongo Region has a total of 18 primary healthcare facilities, including two health centres, and four district hospitals.

As with elsewhere in Namibia, HIV / AIDS remains a major reason for low life expectancy and is one of the leading causes of death in the region. HIV / AIDS remains the leading cause of death and premature mortality for all ages, killing up to half of all males and females aged 40 to 44 years in 2013 (IHME, 2016).

Tuberculosis (TB) is a leading killer of people infected by HIV / AIDS, and Namibia had a high burden in 2018 – 35 % of people with TB were infected with HIV. The country is included among the top 30 high-burden TB countries in the world, with an estimated incidence rate of 423 per 100,000 people, and 60 fatalities per 100,000 people in 2018 (retrieved from www.mhss.gov.na).

As of the beginning of 2020, the coronavirus (COVID-19), caused illness in humans at a pandemic scale and has resulted in an increasing number of deaths worldwide.

The viral outbreak has adversely affected various socioeconomic activities globally, and with reports of a continually increasing number of people testing positive, it is anticipated that this may have significant impacts on the operations of various economic sectors in Namibia too. The disease caused many countries to enter a state of emergency, which included various levels of lockdown restrictions that had dire economic consequences. In addition, these measures have had a detrimental effect on tourism, and Namibia is, in both cases, no exception.

5.15 CULTURAL HERITAGE

According to an archaeological specialist study conducted by Dr Kinahan (2009) a total of seventeen archaeological sites were recorded during the duration of the study. The distribution of the sites is shown in Figure 29, and as seen in the figure there are no Archaeological finds near the proposed TSF3 site.

During the site survey at two sites, stone artefact materials were found from the mid to late Pleistocene (QRS 114/11 and 114/15), but according to Dr. Kinahan, there was insufficient material to conduct a more detailed study. Six sites (QRS 114/1, 5, 12, 14 and 17) contained stone artefact materials from the Holocene period but were “low density surface scatters of quartz artefact debris and contained no formal tool types or dateable organic remains” (Kinahan 2009). At some of the other sites pre-colonial and colonial period features such as hut and stone cairn formations (QRS 114/3 and 10), two suspected burial sites (QRS 114/2 and 114/4), and the guano mining site and related site (QRS 114/7 and 114/8) (Kinahan 2009).

The sites examined during the site survey showed “thinly scattered remains of human settlement dating from the late Pleistocene to recent colonial period.” To date, the general characteristics of the archaeology in this area indicate that mining operations at Navachab Gold Mine have had a negligible impact on the “QRS Job 114: Navachab 12 regional archaeological record”. The sites surveyed mainly represented low to medium significant sites (Kinahan 2009).

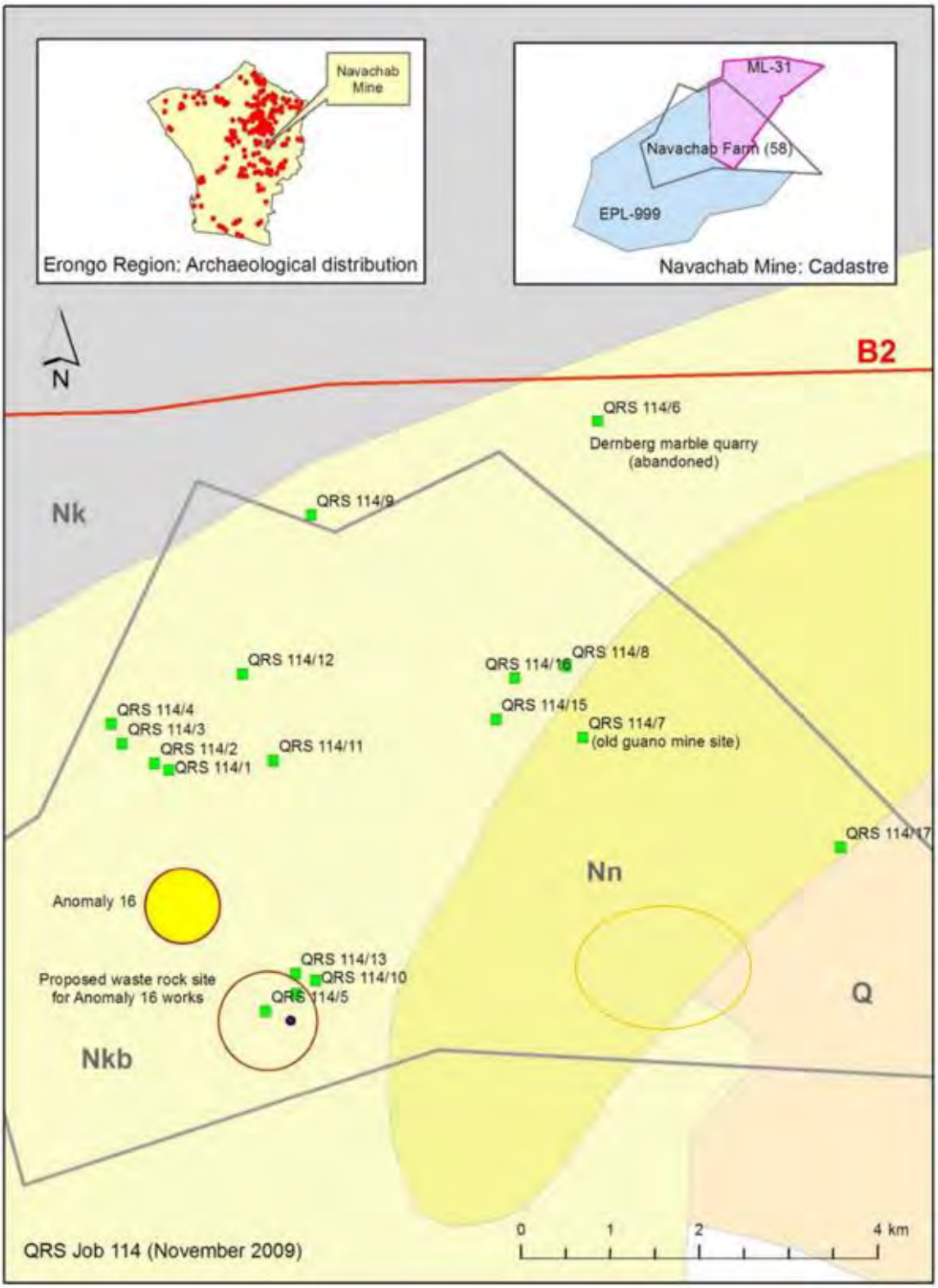

Figure 29 - Archaeological sites identified on Farm Navachab and near the current mine site (Kinhan, 2009) and the orange oval has been added by ECC to indicate the approximate location of the proposed TSF 3.

6 IMPACT IDENTIFICATION & EVALUATION METHODOLOGY

6.1 INTRODUCTION

An overview of the ESIA approach in Chapter 2 of this final scoping Report listed and described each of the steps undertaken to date. Predication and evaluation of impacts is a key step in the ESIA process. This chapter outlines the methods followed, to identify and evaluate the impacts arising from the proposed Project. The findings of the assessment are presented in Chapter 7.

This Chapter provides comprehensive details of the following:

- The assessment guidance used to assess impacts;
- The limitations, uncertainties, and assumptions with regards to the assessment methodology;
- How impacts are identified and evaluated, and how the level of significance derived;
- How mitigation is applied in the assessment, and how additional mitigation will be identified, and
- The cumulative impact assessment (CIA) method used.

The aims of this assessment are to determine which impacts are likely to be significant; to scope the available data and identify any gaps that need to be filled; to determine the spatial and temporal scope; and to identify the assessment methodology.

The scope of the assessment was determined through undertaking a preliminary assessment of the proposed Project against the receiving environment, and was obtained through a desktop review, available site-specific literature, monitoring data, and site reports, as set out in this report and the ESIA report.

6.2 ASSESSMENT GUIDANCE

The following principal documents were used to inform the assessment method:

- The Navachab Gold Mine Expansion Study Environmental Scoping Report by A. Speiser Environmental Consultants (ASEC), 2012 and the 2008 feasibility study by Golder and Associates.
- International Finance Corporation standards and models, in particular performance standard 1: 'Assessment and management of environmental and social risks and impacts' (International Finance Corporation, 2012 and 2017).
- International Finance Corporation Cumulative Impact Assessment (CIA) and Management Good Practice Handbook (International Finance Corporation, 2013)
- Namibian Draft Procedures and Guidance for EIA and E[S]MP (Republic of Namibia, 2008).

6.3 LIMITATIONS, UNCERTAINTIES AND ASSUMPTIONS

The following limitations and uncertainties associated with the assessment methodology were considered in the assessment phase:

- Topic specific assessment guidance has not been developed in Namibia. A generic assessment methodology will be applied to all topics using IFC guidance and professional judgement.
- Guidance for CIA has not been developed in Namibia, but a single accepted state of global practice has been established. The IFC's guidance document (International Finance Corporation, 2013) will be used for the CIA.

6.4 ASSESSMENT METHODOLOGY

The ESIA methodology applied to this assessment has been developed by ECC using the International Finance Corporation (IFC) standards and models, in particular performance standard 1: 'Assessment and management of environmental and social risks and impacts' (International Finance Corporation, 2017); Namibian Draft Procedures and Guidance for EIA and E[S]MP (Republic of Namibia, 2008); international and national best practice; and over 25 years of combined ESIA experience. The methodology is set out in Figure 30 and Figure 31.

Both the criteria used in the A. Speiser assessment in 2008 to assess the impacts and the method of determining the significance of the impacts is fundamentally the same as the ECC methodology of identifying and assessing impact significance. Therefore, the assessment that will be undertaken for the current scope of the Project will draw from the findings of the prior assessment. The evaluation and identification of the environmental and social impacts require the assessment of the Project characteristics against the baseline characteristics, ensuring that all potentially significant impacts are identified and assessed. The significance of an impact is determined by taking into consideration the combination of the sensitivity and importance/value of environmental and social receptors that may be affected by the proposed Project, the nature and characteristics of the impact, and the magnitude of any potential change. The magnitude of change (the impact) is the identifiable changes to the existing environment that may be negligible, low, minor, moderate, high, or very high; temporary/short-term, long-term, or permanent; and either beneficial or adverse.

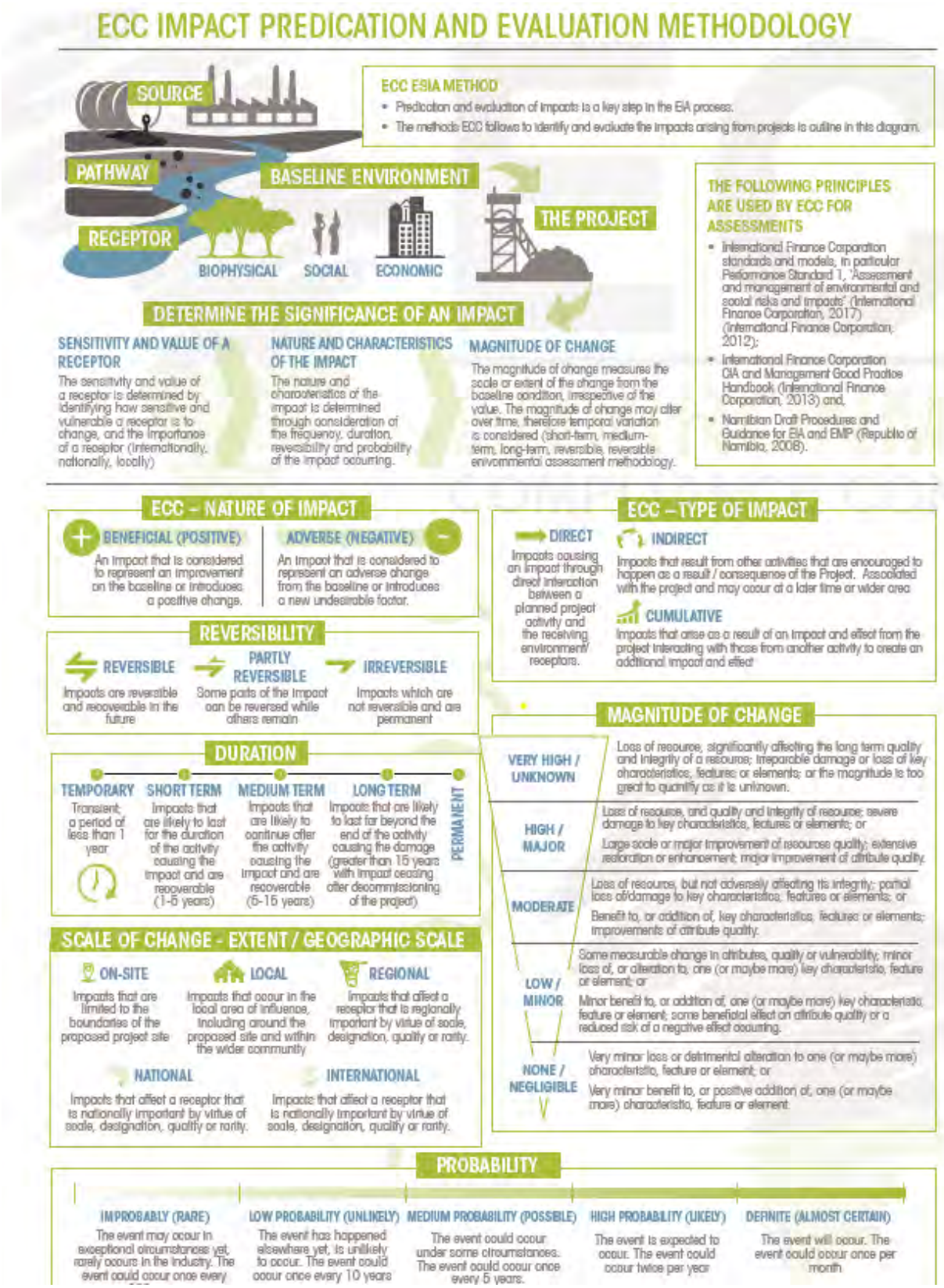

Figure 30 - ECC ESIA methodology based on IFC standards.

- The significance of impacts has been derived at by applying the identified thresholds for receptor sensitivity and magnitude of change, as well as the definition of significance. Moderate and major adverse impacts are considered as significant.
- The following thresholds were therefore used to double check the assessment of significance had been applied appropriately: a significant impact would meet at least one of the following criteria:
- It exceeds widely recognized levels of acceptable change;
- It threatens or enhances the viability or integrity of a receptor or receptor group of concern; and
- It is likely to be material to the ultimate decision about whether or not the environmental clearance certificate is granted.

			Significance of Impact	Impacts are considered to be local factors that are unlikely to be critical to decision-making	Impacts are considered to be important factors but are unlikely to be key decision-making factors. The impact will be experienced, but the impact magnitude is sufficiently small (with and without mitigation) and well within accepted standards, and/or the receptor is of low sensitivity/value. Impacts are considered to be short-term, reversible and/or localized in extent.	Impacts are considered within acceptable limits and standards. Impacts are long-term, but reversible and/ or have regional significance. These are generally (but not exclusively) associated with sites and features of national importance and resources/ features that are unique and which, if lost, cannot be replaced or relocated.	Impacts are considered to be key factors in the decision-making process that may have an impact of major significance, or large magnitude impacts occur to highly valued/sensitive resource/receptors. Impacts are expected to be permanent and non-reversible on a national scale and/ or have international significance or result in a legislative non-compliance.
	Biophysical	Social		Low	Minor (2)	Moderate (3)	Major (4)
SENSITIVITY	A biophysical receptor that is protected under legislation or international convention (CITIES) listed as rare, threatened or endangered IUCN species. Highly valued/ sensitive resource/ receptors.	Those affected people/ communities will not be able to adapt to changes or continue to maintain pre-impact livelihoods.	High (3)	Minor (3)	Moderate (6)	Major (9)	Major (12)
	Of value, importance/ rarity on a regional scale, and with limited potential for substitution; and/or not protected or listed (globally) but may be a rare or threatened species in the country; with little resilience to ecosystem changes, important to ecosystem functions, or one under threat or population decline.	Able to adapt with some difficulty and maintain pre-impact status but only with a degree of support	Medium (2)	Low (2)	Minor (4)	Moderate (6)	Major (8)
	Not protected or listed as common/abundant; or not critical to other ecosystems functions.	Those affected are able to adapt with relative ease and maintain pre-impact status. There is no preceptible chnage to people's livelihood.	Low (1)	Low (1)	Low (2)	Minor (3)	Moderate (4)

SENSITIVITY AND VALUE

Low
Of value, importance or rarity on a local scale; and/or not particularly sensitive to change or has considerable capacity to accommodate a change.

Medium
Of value, importance or rarity on a regional scale, and with limited potential for substitution; and/or moderate sensitivity to change, or moderate capacity to accommodate a change.

High
Of value, importance or rarity on an international and national scale, and with very limited potential for substitution; and/or very sensitive to change or has little capacity to accommodate a change.

MITIGATION

Mitigation comprises a hierarchy of measures ranging from preventative environmental impacts by avoidance, to measures that provide opportunities for environmental enhancement. The mitigation hierarchy is avoidance; reduction at source; reduction at receptor level; repairing and correcting; compensation; remediation; and enhancement.

Mitigation measures can be split into three distinct categories, broadly defined as:

- Standard practices and other best practice measures for avoiding and minimizing environmental impacts. These are considered as good practice measures.
- Actions undertaken by the EIA process that influence the design process, through implementing design measures that would entirely avoid or eliminate an impact or modifying the design through the inclusion of environmental features to reduce the magnitude of change. These are considered as embedded mitigation.
- Specified additional measures or follow-up action to be implemented to further reduce adverse impacts that remain after the incorporation of embedded mitigation. These are considered as additional mitigation.

The EIA is an iterative process whereby the outcomes of the environmental and social assessments inform the project.

The EMP provides the good practice mitigation measures and specified additional measures or follow-up action ECC has recommended for the project.

SIGNIFICANCE DESCRIPTION

Low - Major Beneficial (All Scores)
Impacts are considered to be beneficial to the environment and society.

Low (negative) 0 - 25
Impacts are considered to be local factors that are unlikely to be critical to decision-making.

Minor (negative) 25 - 50
Impacts are considered to be important factors but are unlikely to be key decision-making factors. The impact will be experienced, but the impact magnitude is sufficiently small (with and without mitigation) and well within accepted standards, and/or the receptor is of low sensitivity/value. Impacts are considered to be short-term, reversible and/or localized in extent.

Moderate (negative) 50 - 75
Impacts are considered within acceptable limits and standards. Impacts are long-term, but reversible and/ or have regional significance. These are generally (but not exclusively) associated with sites and features of national importance and resources/ features that are unique and which, if lost, cannot be replaced or relocated.

Major (negative) 75 - 100
Impacts are considered to be key factors in the decision-making process that may have an impact of major significance, or large magnitude impacts occur to highly valued/sensitive resource/receptors. Impacts are expected to be permanent and non- reversible on a national scale and/or have international significance or result in a legislative non- compliance.

Figure 31 - ECC ESIA methodology based on IFC standards.

6.5 MITIGATION

Impacts that are identified throughout the ESIA process will be subjected to a process of impact mitigation, which is inherent in all aspects of the ESIA system. Embedded mitigation and good practice mitigation will be taken into account in the assessment. Additional mitigation measures will be identified when the significance of an impact requires it and causes the impact to be further reduced.

The principle of impact mitigation comprises a hierarchy of measures ranging from preventative environmental impacts by avoidance, to measures that provide opportunities for environmental enhancement, and will be applied to all impacts associated with the TSF3 Project. The mitigation hierarchy is: avoidance; reduction at source; reduction at receptor level; repairing and correcting; compensation; remediation; and enhancement. The ESMP (Appendix A) for the TSF3 Project provides the good practice measures of impact mitigation and specifies additional measures or follow-up action where required.

Mitigation measures can be split into three distinct categories, broadly defined as:

1. Actions undertaken by the ESIA process that influence the design process, through implementing design measures that would entirely avoid or eliminate an impact or modifying the design through the inclusion of environmental features to reduce the magnitude of change. These are considered as embedded mitigation.
2. Standard practices and other best practice measures for avoiding and minimising environmental impacts. These are considered as good practice measures.
3. Specified additional measures or follow-up action to be implemented, in order to further reduce adverse impacts that remain after the incorporation of embedded mitigation. These are considered as additional mitigation.

Embedded mitigation and good practice mitigation continue to be considered during this assessment process. Additional mitigation measures will be identified when the significance of impact requires it and causes the impact to be further reduced. Where additional mitigation is identified, a final assessment of the significance of impacts (residual impacts) will be carried out, taking into consideration the additional mitigation.

7 ASSESSMENT TERMS OF REFERENCE

A full environmental and social impact assessment (ESIA) is required for the construction and operation of the TSF 3 Project. The scope of work for the impact assessment report is defined with due consideration of the range of potential impacts to be identified resulting from the proposed construction and operation of tailings storage facilities as outlined in the Background Information Document (BID), as well as consideration of the concerns/comments raised through the public and stakeholder engagements proposed by the Proponent.

The objectives of the ESIA are:

- To address the issues and concerns raised by authorities, the public (both interested and affected parties) and the specialist consultants through the public consultation and scoping process;
- To identify and evaluate actual and potential impacts resulting from the proposed construction and operation on the accessory works area, that potentially may influence the receiving environment;
- To recommend management, mitigation and monitoring programmes to be implemented before and or during mining;
- To define an appropriate Environmental and Social Management Plan (ESMP) for the proposed TSF 3 operations.

Various specialist studies will be undertaken, previous assessment studies will be reviewed and reassessed based on the findings from the public participation phase. A final ESMP will be produced to manage residual impacts that cannot be mitigated through the Project evolution process.

The scope of the ESIA report that will be developed will comprise an updated impact assessment based on both existing and new data from related specialist studies as noted below. The terms of references (ToR) for the various studies are described within this chapter.

7.1 BIODIVERSITY ASSESSMENT

Scope of work:

Assess the bio-physical (vertebrate fauna & flora) issues relevant to the Project and assess the significance of development and environmental impact that the Project may have on the vertebrate fauna and flora at the proposed site including general comments. A comprehensive literature review on the existing as well as “recent” relevant publications pertinent to the topic will be conducted. A literature study to be conducted on the vertebrate fauna and flora known or expected to occur in the general area of the mining licence. This would include rare and

endangered, threatened, protected, endemic, etc. species as determined by the Namibian and International legal status for such species.

The necessary verification fieldwork for the Project area will include the following:

- Small mammal transects to determine small mammal diversity in the area,
- Larger mammal presence will be determined in the area,
- Reptile & amphibian transects (diurnal & nocturnal) to determine reptile & amphibian diversity in the area,
- Bird transects to determine avian diversity in the area, and
- Flora transects to determine plant diversity in the area.

Fieldwork conducted over two periods – i.e., wet & dry seasons – to confirm as many species as possible as well as for comparative purposes with the 2017 biodiversity impact assessment conducted.

The field work provided input for the specialist and ECC impact assessment, helped identify and describe relevant mitigation, followed by re-assessment and revision of the draft ESMP to include any newly identified mitigation.

7.2 NOISE IMPACT ASSESSMENT

Scope of work:
The assessment should include a study of the effects of noise from various sources including buttress access roads on the biophysical and social environments on and surrounding the proposed TSF site during the construction phase.

7.3 AIR QUALITY IMPACT ASSESSMENT

Scope of work:
The assessment should include a study of the legal requirements pertaining to air quality applicable to international legal guidelines and international industry best practice guidelines for dam construction, limits and dust control regulations. The assessment should also include a desktop review of all available Project data, including meteorological data, previous air quality assessments, EIAs, and technical air quality data and modelled results.

7.4 HERITAGE IMPACT ASSESSMENT

Scope of work:
A heritage assessment will be required to comply with Namibian national legislature, including the National Heritage Act, 2004 (Act No 27 of 2004) and the National Heritage Regulations (if applicable), Government Notice (GN) 3490 of 2005.

Additionally, the proposed assessment process will comply with the requirements encapsulated in IFC Performance Standard 8. The assessment process aims to identify potentially significant heritage resources, as defined in Part I of the National Heritage Act, 2004. This should be through fieldwork and desktop research to formulate recommendations and propositions for the management or mitigation of these potential impacts. The work will consider existing literature and investigations and field studies and related assessments.

The archaeological assessment should address the following:

- The identification and assessment of potential impacts on archaeological/heritage resources, including historical sites arising from the proposed construction activities.
- The identification and demarcation of highly sensitive archaeological/heritage sites requiring special mitigation measures to eliminate, avoid, or compensate for possible destructive impacts.
- Formulation and motivation of specific mitigation measures for the Project to be considered by the authorities.

7.5 HYDROLOGY, GEOHYDROLOGY AND DAM BREACH ANALYSIS

Assess the hydrogeological issues relevant to the Project and assess the significance of development and environmental impact that the Project may have on the hydrogeological environment at the proposed site (TSF3) including general comments. A comprehensive literature review on the existing as well as “recent” relevant publications pertinent to the topic will be conducted.

A literature study is to be conducted on the water balance of the general area of the mining licence.

Scope of works:
The scope of TSF3 water and dam stability assessments includes:

- Update the hydrogeological site assessment and conceptual groundwater model compiled for the mine;
- Assess current stormwater management approaches for the mine;
- Recommend strategic measures to control seepage into underground water sources;
- Review zone of influence and failure hazard classification for TSF 3; and
- Site geotechnical characterisation.

8 CONCLUSION AND NEXT PHASE

ECC will use the terms of reference and scoping information to finalise the baseline conditions. It will work with the proponent and its design engineers to ensure the Project description and Project activities are fully defined. With the baseline and the Project description, ECC will complete its assessment of the potential impacts of the Project activities on the existing environmental and socio-economic conditions in the Project area.

Since numerous specialist studies have been completed in the Project area in the past, ECC will complete its assessment with those studies.

This is the third tailings storage facility to be constructed and operated at the Navachab Gold Mine, therefore ECC and its specialists will leverage the site's design, construction, operation, and rehabilitation/closure experience for the impact assessment.

Navachab Gold Mine expects to begin TSF3 construction in 2023.

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APPENDIX A – OPERATIONAL ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

APPENDIX B – PUBLIC CONSULTATION DOCUMENT

APPENDIX C – EAP CVS