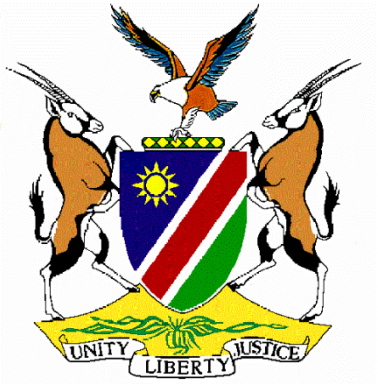
UPGRADING OF THE KRANZBERG TO TSUMEB, OTAVI TO GROOTFONTEIN RAILWAY LINES

A PROJECT BY THE MINISTRY OF WORKS AND TRANSPORT



FINAL ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT

PHASE 1

Kranzberg Station to Otjiwarongo Station

16 FEBRUARY 2023

PROJECT INFORMATION

Study Phase	**STATUTORY APPROVAL**
Project Title	Phase A – Upgrade of the Railway Line from Kranzberg Station to Otjiwarongo Station
Project Location	Erongo- & Otjozondjupa Regions
Project Number	2022/12/MWT
Competent Authority	Ministry of Environment, Forestry and Tourism (fauna & flora) Ministry of Agriculture, Water and Land Reform (fauna & flora & water) National Heritage Council (archaeology)
Approving Authority	Directorate of Environmental Affairs (Ministry of Environment, Forestry and Tourism)
Proponent	Ministry of Works and Transport (railway lines) Private Bag 13341 6719 Bell Street Windhoek
Executing Agent	Ministry of Works and Transport Private Bag 13341 6719 Bell Street Windhoek
Financier	Africa Development Bank Group AFRICAN DEVELOPMENT BANK GROUP
Consulting Engineers	Windhoek Consulting Engineering (PTY) Ltd. CONSULTING ENGINEERS

Environmental Assessment Practitioner	Urban Green cc PO Box 11929 Klein Windhoek Telephone: +264-61-300 820 Fax: +264-61-401 294 E-mail: urbangreen@iway.na Website: www.urbangreenafrica.net
Environmental Sub Consultants	*Ecology:* Environment & Wildlife Consulting, Namibia (Mr. P. Cunningham) Nature Unlimited Consultants (PTY) Ltd (Mrs. C. Tromp) *Hydrogeology:* Dynamic Water Resources Management (Mr. O. van Vuuren) *Archaeology:* RC Heritage Services cc (Dr. A. Nankela) ESM Archaeological and Cultural Heritage Consultants (Dr. E. Mowa & Mr. Nekale) *Socio-economic:* Ms Maike Prickett

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF PHOTOS

LIST OF TABLES

APPENDICES

1st Round of Public Participation Activities

Appendix D1a: List of I&APs

Appendix D1b: List of Vulnerable Communities

Appendix D2: Notification email with Background Information Document and public notice distributed to I&APs and Authorities

Appendix D3: Background Information Document (BID)

Appendix D4: Public Notice

Appendix D5: Notification email with Background Information Document (BID) and copy of letter addressed to Farm owners

Appendix D6: Copy of letter addressed to Farm owners

Appendix D7: Notification letter with BID and request to register as an I&AP send via courier to Regional and Local Authorities outside Windhoek

Appendix D8: Copy of courier waybill of notification letter with BID send to Regional and Local Authorities outside Windhoek

Appendix D9: Notification letter with BID and request to register as an I&AP hand delivered to line Ministries and State-Owned Enterprises in Windhoek

Appendix D10: Copy of hand delivery receipts of notification letter with BID hand delivered to line Ministries and State-Owned Enterprises in Windhoek

Appendix D11: Notification letter sent with registered post to neighbouring farm owners (Kranzberg Station to Omaruru)

Appendix D12: Proof of registered pail to neighbouring farm owners (Kranzberg Station to Omaruru)

Appendix D13: Notification letter sent with registered post to Neighbouring Farm Owners (Omaruru to Otjiwarongo)

Appendix D14: Proof of registered post to neighbouring farm owners (Otjiwarongo to Omaruru)

Appendix D15: Notices published in Newspapers

Appendix D16: Public Notices placed at Regional and Local Authority Offices in the Erongo and Otjozondjupa Regions

Appendix D17: Radio Live Broadcasting Confirmations

Appendix D18a: Karibib Usab Hall Public Meeting Attendance Register; Power Point Presentation and Meeting Minutes

Appendix D18b: Omaruru Rest Camp Conference Hall Public Meeting Attendance Register; Power Point Presentation and Meeting Minutes

Appendix D18c: Otjiwarongo C`Est Si Bon Hotel Conference Venue Public Meeting Attendance Register; Power Point Presentation and Meeting Minutes

Appendix D19: Email with Minutes of the Meetings to attendees of the public meetings at Karibib Usab Hall, Omaruru Rest Camp Conference Hall and Otjiwarongo C`Est Si Bon Hotel Conference Venue

Appendix D20: Email notification with a Survey Questionnaire, as well as BID and Stakeholder Engagement Meeting Presentation sent to neighbouring farm owners

Appendix D21a: Survey questionnaire sent to Farm Owners

Appendix D21b: Survey questionnaire received from Farm Owners

Appendix D22: Email notification with a Survey Questionnaire, as well as BID and Stakeholder Engagement Meeting Presentation sent to businesses making use of bulk transportation along the proposed railway upgrade sections

Appendix D23: Survey questionnaire sent to businesses making use of bulk transportation along the proposed railway upgrade sections

Appendix D24: Email notification with BID, as well as Stakeholder Engagement Meeting Presentation (Appendix D19b) sent to various vulnerable communities

Appendix D25: Register of I&APs

2nd Round of Public Participation Activities

Appendix D26: Notification email informing all affected authorities and registered I&APs of the availability of the Draft ESIA Report and request for comment

Appendix D27: Correspondence with I&APs

Appendix E: List of Deviations

Appendix E1: List of Deviations between Kranzberg and Omaruru

Appendix E2: List of Deviations between Kranzberg and Omaruru

Appendix F: Maps indicating deviations onto adjacent portion of land

Appendix F1: Maps of Deviations between Kranzberg and Omaruru

Appendix F2: Maps of Deviations between Kranzberg and Omaruru

Appendix G: Curriculum Vitae

LIST OF ACRONYMS

AfDB	African Development Bank
ARAP	Abbreviated Resettlement Action Plan
AU	African Union
BID	Background Information Document
˚C	degrees Celsius
CBD	Convention on Biological Diversity
CCA	Climate Change Adaptation
CCRA	Climate Change Risk Assessment
CIfA	Chartered Institute for Archaeologists
CMS	Convention on Migratory Species
DEA	Directorate of Environmental Affairs
DRC	Democratic Republic of Congo
DWA	Directorate Water Affairs
EA	Environmental Assessment
EAP	Environmental Assessment Practitioner
ECC	Environmental Clearance Certificate
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EP	Equator Principles
EPRP	Occupational Health and Safety Plan (OHS) and an Emergency Preparedness and Response Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
GBV	Gender-based Violence
GoN	Government of Namibia

Ha	Hectare
HPP	Harambee Prosperity Plan
I&AP	Interested and Affected Parties
IBA	Important Bird Area
i.e.	Example
IFC PS	International Finance Corporation Performance Standards
IUCN	International Union for Conservation of Nature
MAWLR	Ministry of Agriculture, Water and Land Reform (formerly)
MAW	Ministry of Agriculture & Water
MET	Ministry of Environment and Tourism (formerly)
MEFT	Ministry of Environment, Forestry and Tourism
MLR	Ministry of Agriculture, Water and Land Reform
NamPower	Namibia Power Corporation (Pty) Ltd
NCCSAP	National Climate Change Strategy and Action Plan
NDP5	Namibia's 5th National Development Plan
NEEEB	National Economic Empowerment Bill
NIRP	National Integrated Resource Plan
O&M	Operations and Maintenance
OECD	Organisation for Economic Co-operation and Development
PPA	Primary Project Area
PPP	Public Participation Process
RPA	Regional Project Area
SPA	Secondary Project Area
STI	Sexually Transmitted Infections
SACU	South African Customs Union
SADC	South African Development Community
SDG`s	Sustainable Development Goals
ToR	Terms of Reference
VEC	Valued Environmental Component
WCE	Windhoek Consulting Engineers

GLOSSARY OF TERMS

Adaptation - defined as any adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploit beneficial opportunities (harness any beneficial opportunities).

Alternatives - A possible course of action, in place of another, that would meet the same purpose and need but which would avoid or minimize negative impacts or enhance project benefits. These can include alternative locations/sites, routes, layouts, processes, designs, schedules and/or inputs. The "no-go" alternative constitutes the 'without project' option and provides a benchmark against which to evaluate changes; development should result in net benefit to society and should avoid undesirable negative impacts.

Artificial Water Resource - A natural source or occurrence of water, which is artificially confined.

Assessment - The process of collecting, organising, analysing, interpreting and communicating information relevant to decision making.

Bulk Water Supply - The wholesale supply of water on a business-orientated basis, in large quantities, whether in treated or untreated form, for any utilisation purpose to a customer for own use or for subsequent supply by the customer to consumers.

Climate change risk - is the actual change in climate predicted for an area and the specific risks these changes pose.

Climate risk management (CRM) - is an approach to climate-sensitive decision making. The approach seeks to promote sustainable development by reducing the vulnerability associated with climate risk. CRM aims to maximise the positive and minimise negative outcomes for communities and societies in climate-sensitive areas such as agriculture, food security, water resources and health.

Climate change impacts - are the consequences of climate change on natural systems.

Climate change adaptation - defined as a process by which strategies to moderate, cope with, and take advantage of the consequences of climatic events are enhanced, developed, and implemented.

Competent Authority - means a body or person empowered under the local authorities act or Environmental Management Act to enforce the rule of law.

Cumulative Impacts - in relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Environment - As defined in the Environmental Assessment Policy and Environmental Management Act - "land, water and air; all organic and inorganic matter and living organisms as well as biological diversity; the interacting natural systems that include components referred to in sub-paragraphs, the human environment insofar as it represents archaeological, aesthetic, cultural, historic, economic, paleontological or social values".

Environmental Impact Assessment (EIA) - Process of assessment of the effects of a development on the environment.

Environmental Management Plan (EMP) - A working document on environmental and socioeconomic mitigation measures, which must be implemented by several responsible parties during all the phases of the proposed project.

Evaluation – means the process of ascertaining the relative importance or significance of information, the light of people's values, preference, and judgements in order to make a decision.

Hazard - Anything that has the potential to cause damage to life, property and/or the environment. The hazard of a particular material or installation is constant; that is, it would present the same hazard wherever it was present.

Interested and Affected Party (I&AP) - any person, group of persons or organisation interested in, or affected by an activity; and any organ of state that may have jurisdiction over any aspect of the activity.

Mitigate - The implementation of practical measures to reduce adverse impacts.

Natural Water Resource - A natural source or occurrence of water, which is not artificially confined.

Preparedness - is the state of being ready or prepared for action, which relates directly to adaptation.

Proponent (Applicant) - Any person who has submitted or intends to submit an application for an authorisation, as legislated by the Environmental Management Act no. 7 of 2007, to undertake an activity or activities identified as a listed activity or listed activities; or in any other notice published by the Minister or Ministry of Environment, Forestry & Tourism.

Public - Citizens who have diverse cultural, educational, political and socio-economic characteristics. The public is not a homogeneous and unified group of people with a set of agreed common interests and aims. There is no single public. There are a number of publics, some of whom may emerge at any time during the process depending on their particular concerns and the issues involved.

Stakeholder Engagement / **Public Consultation** - The process of engagement between stakeholders (the proponent, authorities, and I&APs) during the planning, assessment, implementation and/or management of proposals or activities. The level of stakeholder engagement varies depending on the nature of the proposal or activity as well as the level of commitment by stakeholders to the process. Stakeholder engagement can therefore be described by a spectrum or continuum of increasing levels of engagement in the decision-making process. The term is considered to be more appropriate than the term "public participation".

The term therefore includes the proponent, authorities (both the lead authority and other authorities) and all interested and affected parties (I&APs). The principle that environmental consultants and stakeholder engagement practitioners should be independent and unbiased excludes these groups from being considered stakeholders.

Sustainable Development – Development that meets the needs of the current generation without compromising the ability of future generations to meet their own needs and aspirations.

EXECUTIVE SUMMARY

1. PROJECT OVERVIEW

1.1 INTRODUCTION

Namibia provides access to international shipping routes via the port of Walvis Bay to its land locked neighbours and other Southern African Development Community (SADC) countries. It is recognised that currently the transportation of export freight from neighbouring countries to Walvis Bay is done via road, and the heavy vehicle traffic has a significant impact on the quality and maintenance of road infrastructure in Namibia. In addition to the mentioned, the increased numbers of heavy vehicle transport have compromised general traffic safety, while known for other socio-economic impacts (i.e. HIV/AIDS infections). The current preferred method of transportation, i.e., road to rail, is contributing to higher levels of emissions, being counterproductive to Namibia's goal to reduce GHG emissions.

Namibia's railway infrastructure is deteriorating due to a combination of many contributing factors including but not limited to aging rail infrastructures, which reached its finite life. Weather, material degradation (track components), widespread fatigue and damage, but more especially maintenance and safety challenges are all contributing factors, as much of the railway system dates back from German period at the end of the 19th century, which was subsequently re-laid in the 1950's during the South African period.

The Government of Namibia (GoN) in its Vision 2030 sets to transform Namibia into a prosperous and an industrialized nation by the year 2030. The proposed railway upgrade from Kranzberg Station – Tsumeb and Otavi - Grootfontein ties in with the proposed Trans-Zambezi Railway extension from Grootfontein to Katima Mulilo via Rundu in Namibia, for which a feasibility study has recently been completed. The result of the feasibility study indicates the favourability and importance of this multinational Project (M R Technofin Consultants, 2022). This railway extension is part of a cross-border railway between Namibia and Zambia, which aims to link mines in the Copperbelt region (Zambia and Democratic Republic of Congo (DRC)) with the port of Walvis Bay in Namibia.

Financing for this Project has been sourced from the African Development Bank Group. The African Development Bank (AfDB) has actively supported various elements within the larger transportation sector drive within Namibia through inter-alia technical support (National Logistics Master Plan) and as lender (Walvis Bay Port Expansion and Walvis Bay to Kranzberg Station railway upgrade).

The proposed railway line covers a distance of about 500km with the new proposed deviations affecting a number of private farms in Erongo-, Otjozondjupa- and Oshikoto regions. Given the extent and scale of the Project, it has been divided into two phases, with Phase 1 being the section from Kranzberg Station to Otjiwarongo (content of this report) and Phase 2 the section between Otjiwarongo to Tsumeb and from Otavi to Grootfontein. Phase 1 has an approximate length of 392km extending from Kranzberg station through Omaruru, Kalkfeld settlement to the town of Otjiwarongo. Phase 1 has further been divided into section 1

extending from Kranzberg Station to Omaruru, and section 2 extending from Omaruru to Otjiwarongo, as presented in section 4.4 of Chapter 4 of this executive summary.

Significant disturbances within the railway servitude are not anticipated since this area has already been disturbed from previous railway earthworks and related structures, as well as ongoing maintenance activities. The concern is the associated camp facilities; borrow pits and boreholes locations, and loss of land for railway purpose.

The AfDB categorised the Project as a Category 1 project, as per AfDB's Operational Safeguard System 1, requiring an Environmental and Social Impact Assessment (ESIA) inclusive of an Environmental and Social Management Plan (ESMP).

To meet the requirements as set by the Namibian Environmental Management Act (No. 7 of 2007) and that of the Africa Development Bank Group, the Proponent initiated an Environmental and Social Impact Assessment (ESIA), as per The Act's Environmental Impact Assessment Regulations (GG. No. 30 of 2012) and African Development Bank (AfDB) Guidelines for the Environmental and Social Assessment procedures (ESAP) of 2015.

1.2 PROJECT DESCRIPTION

1.2.1 Objectives & Expected Benefits

Although Namibia's railway infrastructure is reported to be adequate for the current business levels nationally, the quality of the railway infrastructure no longer meets the acceptable SADC requirements to provide service regionally. Securing Namibia's position as a regional hub is the main motivating objective of this Project, with expectations that the Trans-Zambezi extension will spur trans-border trade to/from Walvis Bay from neighbouring countries and to give effect to Namibia's Vision 2030 to become the transport hub for land lock countries (MR Technofin Consultants Ltd., March 2022).

Subject to the main objective, the Project set to improve the movement of goods and people along the length of the railway network and enhance connectivity between the Regions and throughout the larger SADC as it is part of the Trans -Zambezi. The Namibian rail network in its current condition is however insufficient to serve the expected volumes and freight type due to the very old age of the rails, sleepers, and ballast that have reached their life expectancy.

1.2.2 Existing Railway Infrastructure & Challenges

Some sections of the railway line located between Kranzberg Station and Tsumeb Station, as well as the section between Otavi Station and Grootfontein Station have been problematic due to the very old age of the rails, sleepers, and ballast (permanent way materials having exceeded their useful life). The embankment on which the rails, sleepers, and ballast are located have deteriorated over the years and lost its structural integrity, which results in unwanted movements and shifting of the rails.

The current Fifteen (15) steel bridges were constructed in the 1960`s and does not meet the structural capacity of carrying the proposed new 18.5-ton train axle load, thus requiring

reconstruction. Many of the railway crossings of roads hold a potential risk, as some of the infrastructure and signage are old and dilapidated.

For safety reasons, passengers cannot be transported over it while goods trains are at risk of derailment. At present the general speed restriction imposed is 40km/h while on some sections it is as low as 15km/h. These factors have resulted in excessive transport times, forfeiting valuable income earning traffic to road transport which in turn causes undue damage to the country's national roads and increased GHG emissions.

1.2.3 Project's Need & Desirability

Namibia provides access to international shipping routes via the port of Walvis Bay to its land locked neighbours and other Southern African Development Community (SADC) countries. It is recognised that currently the transportation of export freight from neighbouring countries to Walvis Bay is done via road, and the heavy vehicle traffic has a significant impact on the quality and maintenance of road infrastructure in Namibia and contributes to increased GHG emissions.

The upgrade of the railway line in between Kranzberg Station to Tsumeb and Otavi to Grootfontein (Phase 1 – between Kranzberg Station and Otjiwarongo Town), is in line with: (i) NDP5; (ii) the Harambee Prosperity Plan II 2021 – 2025 (a goal set out under Pillar 4: Infrastructure Development (Goal 3: Strengthening Namibia's Position as a Transport & Logistics Hub)); (iii) the Sustainable Development Goals (SDGs) set out by the United Nations Development Programme (UNDP) (specifically Goal 9: Industry, Innovation and Infrastructure and Goal 11: Sustainable Cities and Communities); and (iv) Agenda 2063 of the African Union (AU).

A railway infrastructure upgrade in Namibia has become necessary. Not only have safety issues become a serious concern, taking into consideration the Country's recent history with derailments and train accidents, but also service delivery which is inadequate and forcing people to opt for means of transportation via road, which is faster and more reliable, but possibly more expensive and have both social and environmental negative effects. The current condition of the rail infrastructure in Namibia prevents further development of the rail transport sector.

The upgrade of Namibia's rail network has become important and crucial, taking into consideration the plans to develop Namibia into an International Logistics Hub and to promote an increase in trade and transportation of goods by making use of rail transport. Further to the mentioned, the erratic provision of annual funding for maintenance on the existing rail network has made it extremely difficult to adhere to an effective long-term program of work.

1.2.4 Project Location

The Project stretches over a total distance of approximately 500km, from Kranzberg Station located approximately 11km east from Usakos within the Erongo Region, proceeding north-east wards towards Otjiwarongo in the Otjozondjupa Region, and onwards to Tsumeb in the

Oshikoto Region. From Otavi the railway line branches off in an easterly direction turning north-east towards Grootfontein (see Figure 1.2.4-1 below).

1.2.5 Project Specifications & Designs

The recommended general specifications are based on “Planning and Technology Railway Engineering Specification, E.10 – 1996 Railway Track Work” (1996) published by Spoornet, South Africa. The recommended design parameters are based on “Infrastructure Engineering – Manual for Track Maintenance” (2012) published by Transnet, South Africa.

The Kranzberg – Tsumeb and Otavi – Grootfontein railway sections fall under N2 Classification of Running lines. The *design Axle Load* for the Kranzberg – Tsumeb and Otavi – Grootfontein railway sections is recommended as 18.5-ton with an 80km/h speed for freight and 100km/h for passengers.

Although the Railway Operator’s current rolling stock fleet does not have the ability to negotiate speeds more than 60 km/h, provision is made in the design for train speeds of up to 100 km/h.

The *embankment* is an important constituent of the track, as it supports the entire track structure. Considering the changing topography over the extent of the railway line, embankments (i.e., when the formation is in the shape of a raised bank constructed above the natural ground) and cuttings (i.e., formation at a level below the natural ground) will be constructed. To meet the desired performance requirements for concrete sleepers, *ballast* must be limited to crushed granites, trap rocks, or quartzite. For an N2 class of line, the ballast depth of 200 mm has been recommended in the Transnet Freight Rail (TFR) Manual.

In Namibia, the newly constructed sections and also sections which are being upgraded (i.e., existing railway between Kranzberg Station and Otjiwarongo) are being provided with P2 type of *concrete sleepers*. For this Project, 48 Kg/m *rail* grade R260 having minimum hardness of 260 HB is recommended for use on this corridor for now.

Elastic fastenings which have an e-clip with liners (generally glass filled Nylon) and a neoprene pad below the sleepers are recommended. New *rail sidings* will be constructed at the applicable localities.

The existing railway will serve as the *future service road* for the upgraded railway line. Where *fence* lines will be affected by the new alignment, the existing fence will be relocated to the new position as required. New fences to be installed will be as per the existing fence standards of the Farm being affected. Any borrow pits, and haul roads will be fully fenced off to the nearest public road and gates installed before any work in these areas will commence. All areas of land that may be acquired temporarily for spoil areas, borrow pits and haul roads will be fenced and maintained by the contractor until issue of the performance certificate at the end of the defect’s liability/notification period.

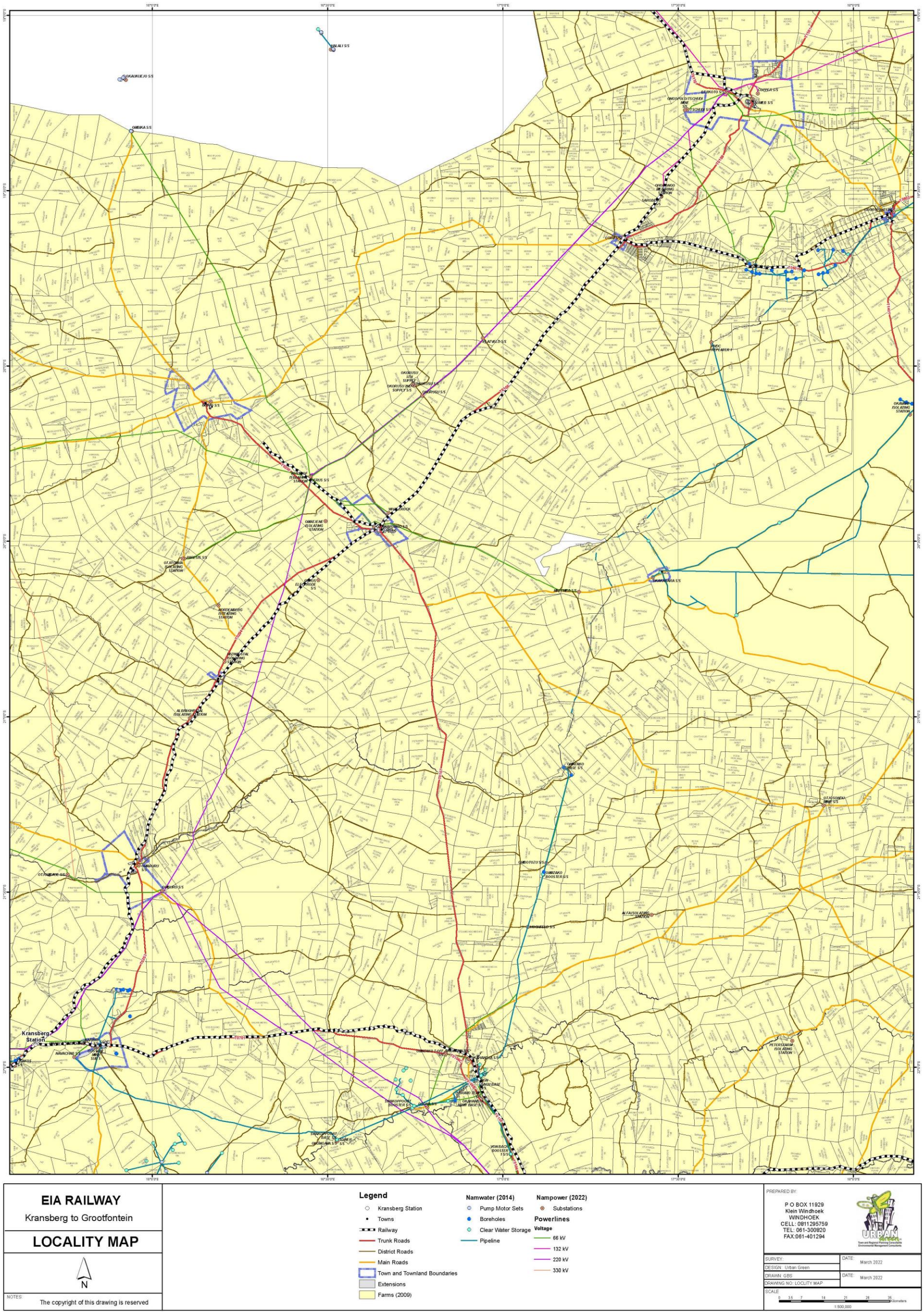


Figure 1.2.4-1: Locality Map – Railway Line from Kranzberg Station to Tsumeb & Otavi to Grootfontein

The alignment of the new railway will predominantly remain within the existing railway servitude, with deviation at horizontal curves needing to be eased to satisfy the 100 km/h maximum train speed. A *servitude* width of 60m will remain, which will result in the new servitude slightly extending into adjacent farmlands, while larger servitude changes can be expected at the designed deviations.

All existing *stations* will remain at their current positions with no major variances in alignment. There are three (3) stations within the project limits: Kranzberg Station, Omaruru Station, and Otjiwarongo Station.

1.2.6 Main Activities

The main project features would be the construction of a new railway embankment within the existing servitude, the reuse of P2 concrete sleepers, reclaiming of ballast stone, relaying of track on to the new embankment, the procurement and placement of new 48 kg/m rails, and the procurement and placement of new ballast stone for full profile as specified.

The planning phase is the current phase within which the proposed Project is, the phase where conceptual designs and plans are drafted for discussion and evaluation, which will result in the final designs and plans for implementation.

The activities associated with the operational phase are as presented below -

- Clearance of vegetation (that might have naturally revegetated) along the railway reserve;
- Maintain service road and resulting clearance of vegetation (that might have naturally revegetated);
- Monthly inspection along the servitude inspecting status of fences; and
- Emergency repairs to any infrastructure.

1.2.7 Inputs and Material (Resources)

The resources required for the Project, includes additional land (railway deviations), aggregate (ballast stone), gravel and soil (embankments), and water (construction and compaction).

Land - The Project engineer has identified 29 deviations onto adjacent farmlands and 47 areas where the farm fence will have to be relocated.

Gravel & Soil (borrow pits) - For purpose of the construction of new embankments, gravel and soil is required, which will be sourced from adjacent farms. It is expected that each of the adjacent farms will be affected and that borrow pits will be ± 5km apart in distance for the length of the railway line. Existing borrow pits will be considered and subjected to an investigation to determine the grade and available volumes.

*Ballast / Aggregate -*Aggregate (ballast) will be sourced from existing suppliers and transported via rail to the particular locality along the railway line.

Water - Water for purpose of construction and compaction will be sourced from adjacent farms and other available sources (i.e., NAMWATER off takes). The estimated volume of water that will be required for construction is 358,000 m^3, which represents 6,000m^3 per month.

For this purpose, boreholes will be drilled at locations still to be identified following the hydrogeological assessment. The ESIA recommends that other alternative source also be considered and investigated to alleviate pressure on the scares underground water resource.

1.2.8 Outputs and Wastes

The most significant types of waste to be generated on site will be the rails, sleepers and ballast that will be removed and replaced. The rails that are removed from site will be transported via rail to the nearest station where it will be stored for auction. The same will apply for the old steel sleepers that are removed.

1.2.9 Workforce & Construction Camps

Given the nature of the Project and AfDB requirements to contribute to employment creation, construction will be labour based, of which the majority of people will be sourced from the local areas. It is expected that ± 150 people will be employed as labourers for the duration of the construction period, while the specialised work force will be ± 50 people.

1.2.10 Infrastructure Lifespan

For the railway, a calculation period is set to 60 years. All activities from construction start to the following 60 years are included in the calculations.

1.3 PROJECT ALTERNATIVES

From the 167 proposed deviations 5 deviations are considered problematic for various reasons and alternative alignments were accordingly proposed and accepted.

1.3.1 Problem Localities & Reason/s & Alternatives

Following the field survey (i.e., trolley inspection) and evaluation of the overlay data (i.e., engineering horizontal and vertical sections), the following areas were identified as potentially problematic justifying consideration of alternative alignment.

(i) Goodhope Development (Otjiwarongo) - The proposed new railway line will thus be located on available land in between the existing railway line and the Kalkfeld-Otjiwarongo T0204 main road to avoid private land.

(ii) Erongo Park Estate (Omaruru) - Considering the potential loss of land from already small agricultural portions of land and the legal implications to change land densities, it is recommended to realign the new railway line not to affect these portions of land, but move eastwards onto the larger available portion of land.

(iii) Omaruru Unproclaimed Township - Considering the potential loss of planned urban land already occupied, it is recommended to realign the new railway line not to affect the mentioned township, but move westwards onto the larger available portion of land.

2. THE PROJECT SITE & MAJOR ENVIRONMENTAL AND SOCIAL CHALLENGES

2.1 SPATIAL BOUNDARIES

Three levels of spatial boundaries have been identified and considered as part of this ESIA study, i.e., the Primary Project Area (PPA); the Secondary Project Area (SPA) and the Regional Project Area (RPA).

2.2 BASELINE CONDITIONS

2.2.1 Atmospheric Environment

Namibia has an arid climate, and the absence of moisture is due to Namibia's south-western position on the continent. The Project area experience moderate temperature fluctuations with mean lowest 4-8˚C in June and mean highest 32-36 ˚C recorded in January (Mendelson et al., 2002). The average annual rainfall increases from south-west to north-east with 250 - 300 mm recorded at Kranzberg Station to 400 – 450 mm recorded for Otjiwarongo. The air quality in Section 1 and 2 is good, since the railway line runs through rural environment for most of the way.

2.2.2 Ambient Noise

The larger section of the railway line runs through rural rangeland between towns or settlements, so ambient noise levels are low to very low for these sections.

2.2.3 Geology

At Kranzberg Station the railway line starts off in rocks of the Central Zone of the Damara Orogen and crosses the lineament forming the northern boundary of the zone to end off in rocks of the Northern Zone of the Damara Orogen near Omaruru. The railway crosses the Khan River, Omaruru River and Ugab River, and passes the Erongo Mountains, Giftkuppe and Omaruru Kuppe, both prominent granite inselberg. The railway line passes several outcrops of syn- to post-tectonic Damara granites on the remainder of Section 1 towards Omaruru.

2.2.4 Topography

Section 1 and 2 of the railroad extends through the central western plains of Namibia. From Kranzberg station northwards, the railroad winds through relative flat plains that pass residual hills, isolated schist, dolomite, granite, etjo sandstones, basalt, siltstones and limestone rocky outcrops, calcrete rocks and some inselbergs along its way.

2.2.5 Hydrology and Geohydrology

The railroad in between Kranzberg Station to Otjiwarongo passes three major ephemeral west-flowing drainage systems. To accommodate west-flowing stormwater, the new railroad design incorporates 15 bridge constructions.

A few well-studied aquifers are present in the study area that either supplied water in the past, or are still supplying water, for bulk abstraction to supply in municipal water demands.

An overview of the yields of those boreholes assessed as part of the Hydrological Assessment Report (Appendix B1 to the ESIA) gives an indication of the generally low groundwater potential to supply in construction water, where high yielding boreholes are required to supply in large volumes of water on a daily basis.

Without having details on the required volume of water for construction it can be safely estimated that the existing groundwater potential would not be sufficient to supply in a demand for water associated with a project of this scale, without having a negative impact on ground water volumes and quality. This expected impact as a result of the Project is accordingly highlighted as having a potential significant impact, requiring a Construction Water Demand Management Plan and Underground Water Monitoring Plan.

2.2.6 Soils and Sediments

As a result of Namibia's arid climate, deep soils over much of the Country are absent and the levels of nutrients in the soil are low.

2.3 HIGH RISK POLLUTION AREAS

The hydrogeological characteristics of these environments are (a) usually high transmissivities and (b) high storability, i.e., in laymen's term, groundwater flows at a high rate through these aquifers, and the percentage of the rock volume available to store water in is high respectively.

The biggest concern is that, once a pollutant enters the groundwater in such aquifers, it spreads very rapidly through the aquifer, and it becomes almost impossible to remove such pollutants.

2.4 BIOLOGICAL ENVIRONMENT

2.4.1 Biodiversity Context

The project area falls within the *Tree and Shrubland Savanna* Biome of Africa (*Mendelson et al. 2002*). The vegetation of Section 1 from Kranzberg to Omaruru forms part of the *western highlands* of Namibia and vegetation type in Section 2 from Omaruru to Otjiwarongo change to *Thornbush Shrubland (Mendelson et al. 2002)*. To this effect vegetation changes from grassland with dispersed small to medium shrubs and solitary trees in the south-western part of Section 1 to more woody *Acacia* shrub vegetation that become encroached in some areas as one move north-eastwards toward Section 2. In Section 2 towards Otjiwarongo the vegetation become further encroached with *Acacia* shrubs that become taller shrubs and trees in the north-eastern part.

The general area is viewed as an area of importance for local endemic plant species, especially the Erongo Mountains with between 26-35 endemic species (*Mendelsohn et al. 2002*). The overall plant diversity (all species) in the general area is estimated at between 150-299 species and the Erongo Mountain area between 400-499 species (*Mendelsohn et al. 2002*). These estimates are limited to "higher" plants as information regarding "lower" plants are sparse. Plant endemism, other than the Erongo Mountains, is viewed as "medium to high" – with between 6-15 endemics expected from the general area (Mendelsohn *et al.* 2002). Furthermore, Mendelsohn *et al.* (2002) views the overall plant production as medium to low in the general area although high in the Erongo Mountains, the availability of hardwoods as medium and the grazing and browse as average in the general area.

2.4.2 Baseline Ecology & Species of Conservation Interest

(i) Grass Diversity

It is estimated that at least 52-72 grasses (Müller 2007 [72 spp.], Van Oudshoorn 2012 [52 spp.]) – approximate total of 80 species – occur in the general Kranzberg-Omaruru area. Of the approximately 80 grasses that are expected in the general area, 2 species are viewed as endemic (*Eragrostis omahekensis*) – *Eragrostis omahekensis* is virtually only found on disturbed soils – e.g., close to watering points – while *Eragrostis scopelophila* is associated with mountainous areas under trees and shrubs.

None of the grass species known/expected to occur in the general Kranzberg-Omaruru area are however exclusively associated with the proposed development areas.

(ii) Tree and Shrub Diversity

It is estimated that at least 74-101 species of larger trees and shrubs (>1m) (Coats Palgrave 1983 [85 spp.], Curtis and Mannheimer 2005 [101 spp.], Mannheimer and Curtis 2009 [91 spp.], Mannheimer and Curtis 2018 [101 spp.], Van Wyk and Van Wyk 1997 [62 spp. and 12 spp. endemic]) occur in the general Kranzberg-Omaruru area. According to Mannheimer and Curtis (2018) at least 91 species of larger trees and shrubs are known and/or expected to occur in the general area of which 8 species are classified as endemic (7.9%), 4 species as near endemic (4%), 21 species (20.8%) are protected by the Forest Act No 12. of 2001, 5 species (5%) are protected under the Nature Conservation Ordinance No. 4 of 1975 while 6 species (5.9%) are classified as CITES Appendix 2 species. All the trees with some kind of conservation and/or protected status are viewed as important in the general Kranzberg-Omaruru area. The most important species are viewed as *Commiphora dinteri*, *Commiphora saxicola*, *Commiphora virgata*, *Cyphostemma bainesii*, *Cyphostemma currorii* and *Erythrina decora* (e.g. most often associated with rocky substrate).

None of the larger tree and shrub species known/expected to occur in the general Kranzberg-Omaruru area and Omaruru-Otjiwarongo area are however exclusively associated with the proposed development areas.

(iii) Reptile Diversity

The most important species expected to occur in the general area are viewed as the tortoises *Stigmochelys pardalis* and *Psammobates oculiferus*; pythons – *P. anchietae* and *P. natalensis*; Namibian wolf snake (*Lycophidion namibianum*) – *Varanus albigularis* and some of the endemic and little-known gecko species – e.g., *Pachydactylus* species. Tortoises, snakes and monitor lizards are routinely killed for food or as perceived threats. Other important species are those viewed as "rare" – i.e., *Rhinotyphlops lalandei*, *Mehelya vernayi* and *Afroedura africana* – although very little is known about these species.

None of the reptile species known/expected to occur in the general Kranzberg-Omaruru area and are Omaruru-Otjiwarongo area however exclusively associated with the proposed development areas.

(iv) Amphibian Diversity

The most important species are the endemic *Poyntonophrynus hoeschi* and *Phrynomantis annectens* although they are widespread in Namibia and not exclusively associated with the Otjiwarongo area and Kranzberg-Omaruru in particular. Permanent water bodies viewed as amphibian habitat in the area include the ephemeral Omaruru and Omatjene Rivers and their tributaries, Otjiwarongo sewage works. Other potential habitats in the area include farm reservoirs and earth dams although the latter are also dependant on localised showers and temporary of nature.

None of the amphibian species known/expected to occur in the general Kranzberg-Omaruru area and Omaruru-Otjiwarongo area are however exclusively associated with the proposed development areas.

(v) Mammal Diversity

The most important species from the general area are probably all those classified as near threatened (*Eidolon helvum*, *Hipposideros vittatus*, *Rhinolophus blasii*, *Hyaena brunnea* and *Panthera pardus*) and vulnerable (*Acinonyx jubatus* and *Felis nigripes*) by the IUCN (2021) and rare (*Cistugo seabrai*, *Atelerix frontalis angolae* and *Felis nigripes*) under Namibian legislation.

None of the mammal species known/expected to occur in the general Omaruru-Otjiwarongo area are however exclusively associated with the proposed development area.

(vi) Avian Diversity

The most important endemic species known/expected to occur in the general area are viewed as Monteiro's hornbill (*Tockus monteiri*), Damara hornbill (*Tockus damarensis*), *Ammomanopsis grayi* (Gray's Lark), *Namibornis herero* (Herero chat), *Eupodotis rueppellii* (Rüppell's korhaan) and *Poicephalus rueppellii* (Rüppell's parrot). The species listed as critically endangered (Cape vulture), endangered (violet wood-hoopoe, Ludwig's bustard, white-backed vulture, bateleur, black harrier, tawny eagle, booted eagle, martial eagle, black stork, saddle-billed stork), vulnerable (lappet-faced vulture, white-headed vulture, African fish

eagle, Secretarybird) and near threatened (European roller; Rűppel's parrot, kori bustard, pallid harrier, Verreaux's eagle, red-footed falcon, peregrine falcon, marabou stork) by Simmons *et al.* (2015) as well as those listed by the IUCN (2021) as critically endangered (white-backed vulture), endangered (Ludwig's bustard, lappet-faced vulture, bateleur, black harrier, martial eagle, Secretarybird), vulnerable (Cape vulture, tawny eagle, red-footed falcon) and near threatened (kori bustard, pallied harrier). The Cape vulture is a cliff breeder and although the last remnants are known to occur in the Waterberg Area (i.e., greater Otjiwarongo area). The larger raptors (e.g., vultures, eagles, etc.) are often persecuted due to actual and perceived livestock mortalities or succumb when feeding on poisoned carcasses set for problem predators while the bustards are viewed as pylon sensitive birds and prone to pylon strikes.

None of the bird species known/expected to occur in the general Kranzberg-Omaruru area and Omaruru-Otjiwarongo area are however exclusively associated with the proposed development areas.

2.4.3 Critical Habitats

The most important areas along the Kranzberg-Omaruru and Omaruru-Otjiwarongo rail upgrade route are the (i) ephemeral rivers and associated drainage lines (The Khan and Omaruru Rivers (Kranzberg-Omaruru) and the Omaruru and Omatjene Rivers (Omaruru-Otjiwarongo); (ii) Erongo Mountains; (iii) granite outcrops/ridges; (iv) ephemeral dams and pans; and Otjiwarongo sewage works.

2.5 SOCIO-ECONOMIC PROFILE

2.5.1 Regional and Constituency Demographics

The Project section of the railway line (Phase 1) from Kranzberg to Otjiwarongo falls within the Erongo and Otjozondjupa regions, located to the western central parts of Namibia.

Population characteristics for both the Erongo and Otjozondjupa regions, as well as the national figures are presented in Table 5.4.3-1 of the ESIA Report. The Erongo region represents 7.8% of the Namibian population with a population density of 2.9%. The Otjozondjupa region represents a slightly lower 6.6% of the Namibian population with a much lower population density of 1.5. In both Regions, males are slightly more than the women, with the largest age group being the 15 to 59 group, representing 67% (Erongo) and 56% (Otjozondjupa).

2.5.2 Economic Profile

In 2021, most sectors of the Namibian economy have shown a slight degree of positive growth; however, others continue to suffer. The mining (9.1% contribution to GDP) and fishing (2.5% contribution to GDP) sectors, which are key economic sectors in the Erongo region, have shown growth (mining 13.6%; fishing 2.8%) in 2021. (CoM, 2021; IPPR, 2022b). Of all the economic sector contributions made to the economy in 2021, 57.9% were made by the service sector, see Figure 2.5.2.-1 (IPPR, 2022b).

Agriculture (6.9% contribution to GDP) is a key sector in the Otjozondjupa region and with positive growth in crop production, but negative growth in livestock farming in 2021 (IPPR, 2022b). The agricultural sector is severely affected by the high variation in rainfall and drought, and pest and disease outbreaks, all of which there have been a number of incidences in the past.

According to the agricultural census in 2013/2014, 83.4% of all commercial land was used for grazing, 7.4% was fenced for game, 3.5% was land under permanent pasture, 1.6% was forest land, and 0.12% was land under permanent crops (10,958 ha). Sixty percent (59.9%) of the crops planted was white maize, 23.9% was yellow maize, 21.1% was beans, and 12.8% was fodder. In total, 67% of farmers rear livestock and/or poultry on their farms, of which 5% of farmers are in the Erongo region and 18.2% in the Otjozondjupa region (NSA, 2015). Tourism is also a contributor to the national GDP (3.5% in 2015) and an important economic sector to both the Erongo and Otjozondjupa regions.

2.5.3 Employment, Unemployment and Poverty

In 2018, the Labour Force Participation Rate (LFPR) for the Erongo and Otjozondjupa regions was 80.9% and 76.1%, respectively. The LFPR in both regions are higher than the national rate of 71.2%, in fact, the Erongo region has the highest LFPR in the country.

Main industries by employment in Namibia are agriculture, forestry and fishing industry (23%); 11.4% are employed in the accommodation and food service industry; 11.1% in wholesale and retail trade; 9.9% activities of households as employers (self-employed); 6.5% in education and 6.2% in both manufacturing and construction (each).

Namibia recorded an unemployment rate of 33.4% (32.5% male vs. 34.3% female) in 2018, which is an increase of 5.5% from 2014. The Erongo region (29.7%) has the lowest unemployment rate in the country, while the unemployment rate for the Otjozondjupa region is 36.1% (and higher than the national average of 33.4%).

Poverty levels in the Erongo region are significantly lower than the national averages; 1.1% to 2.2% of regional population is severely poor, while between 4.4% and 8.8% are poor. In the Otjozondjupa region, 2.3% to 11.4% of people are severely poor, while between 15.4% and 27.9% are regarded as poor (NSA, 2018a).

2.5.4 Land Tenure and Ownership

Namibia has a total area of 82,400,000 hectares (ha) of which: 48% is freehold land (39,728,364 ha); 17% is state land (13,906,437 ha); and 35% is communal land (28,720,443 ha).

Land tenure along the Project Route is mainly freehold (commercial) land, including resettlement farms and three urban areas.

2.5.5 Household characteristics

The Otjiwarongo Constituency has the largest number of households, at 7,959, while the lowest is within the Omaruru Constituency (2,432). The number of households within the two constituencies of the Otjozondjupa are 6,073 households more than the two constituencies within the Erongo region. Average household size is very much the same at 3.5 (Erongo) and 3.9 (Otjozondjupa).

2.5.6 Bulk Infrastructure

(i) Telecommunications - In the Erongo region (2011), 78.2% of households owned radios, 69.5% mobile phones, 64.9% televisions, 22.9% computers and laptops, 14.8% had fixed line telephones, and 8.4% had internet connectivity at home. Sixty nine percent (68.7%) of households in the Otjozondjupa region owned radios, 65.4% owned mobile phones, 46.3% owned televisions, 13.5% owned computers and laptops, 10% owned fixed line telephones, and 3.7% home internet connection (NSA, 2014a; NSA, 2014b).

(ii) Air Transport - Of the eight airports in Namibia that are managed by the Namibia Airports Company (NAC), one can be found in the Erongo region and is located close to Walvis Bay. Located in the Erongo and Otjozondjupa regions are two Airforce Bases owned by the Namibian Ministry of Defence and Veteran Affairs. A few smaller airstrips can be found in the vicinity of the Project area, some of which are privately owned, i.e., Otjiwarongo; Omaruru; Mount Etjo Safari Lodge; and Ruimte.

(iii) Road Transport - In the Erongo region, and of the 3,525 km of road network, 387 km are trunk roads (bitumen), 999 km are main roads (bitumen, gravel or salt), 3,510 km are district roads (bitumen, gravel or salt). The Otjozondjupa region contains 7,360 km of the country's roads, of which 956 km are trunk roads (bitumen), 1,426 km are main roads (bitumen or gravel), 4,913 km are district roads (bitumen or gravel).

(iv) Rail Transport - The railway network in Namibia covers 2,682 km and stretches from Oshakati in the north to Nakop in the south, and to the western towns of Lüderitz, Walvis Bay and Swakopmund.

(v) Electricity -

In Namibia, the power network (overhead lines from 66 kV to 400 kV and spanning over 11,700 kilometres) is owned by the Namibia Power Corporation (NamPower), a state-owned enterprise. The CENORED license area covers the Otjozondjupa region and part of the Omaheke, Oshikoto and Kunene regions and has a customer base of approximately 34,000 in its main supply area; the ErongoRED license area covers the Erongo region and uses about 21% of the national electricity requirement.

(vi) Water - The Namibia Water Corporation (NAMWATER) is the bulk supplier of water in Namibia. The Project lies within in the central business unit area, where the demand for water remains high and its availability a challenge. Commercial farms and localities along the Project Route have their own boreholes; however, updated information on boreholes are

outdated and very limited, as stated by the Hydrogeologist following his investigation with the Ministry of Agriculture, Water and Land Reform.

2.5.7 Literacy & Education

The literacy rate (2016) in Namibia's urban areas was 94.1% and lower in the rural areas at 82.7% (vs. the national rate of 88.7%). On a regional level, the Erongo region recorded a higher literacy rate (95.9%) than the Otjozondjupa region (83.0%).

2.5.8 Health & Safety

The provision of primary health care (PHC) services is the focus of the Namibian government and through the MoHSS has made healthcare provision available to the population through hospitals (district or intermediate), clinics, and health centres, and through mobile clinics and outreach programmes serving communities in remote locations. The Erongo region provides for more health care facilities (22) in total, with the Otjozondjupa region at 17 facilities

HIV infections have decreased by 31.3% between 2009 and 2019, but HIV/AIDS remains the leading cause of death in Namibia. The incidence of TB cases in Namibia has seen a decline since 2009, yet the number of cases for all forms of TB in a global context remains relatively high. According to the WHO, and for the period between March 2020 and June 2022, the country recorded a total number of 164,298 Covid-19 cases and 4,039 deaths. According to the Centre for Disease Control and Prevention (CDC), the current life expectancy in Namibia is 64 years (67 years for females and 61 years for males).

2.5.9 Gender

Violence in Namibia remains a concern. One in three females (32.9%) and two in five males (41.2%) experienced physical violence before age 18 (2019 figures). More males (25.7%) than females (13.0%) experienced physical violence by a peer during their childhood (Ministry of Gender Equality, Poverty Eradication and Social Welfare (MGEPESW), 2020).

2.5.10 Indigenous People

"While most people in Namibia can be characterised in a strict sense as indigenous to the area, the San, Himba, Ovatue, Ovatjimba, and Ovazemba are recognized by the Government of Namibia as particularly marginalized groups and have been identified in various Namibian laws and policies as groups that merit special attention and concern.

As per the information obtained from the Ministry of Agriculture, Water and Land Reform, none of these communities' own land (affected farmland) within the parameters of the existing railway servitude.

2.5.11 Vulnerable Groups & Social Organisations

Various organisations and institutions in both Regions exist providing support to the vulnerable residents of the communities. These fall under the Ministry of Gender Equality, Poverty Eradication and Social Welfare (MGEPESW); Ministry of Sport, Youth and National Services

(MSYNS); Non-Governmental Organisations (NGO`s) and Civil Society Organisations (CSO`s).

2.5.12 Archaeology and Cultural Heritage

Namibia has a long and remarkably comprehensive archaeological record in southern Africa. Decades of detailed archaeological research and surveys has established a well archaeological sequence of human occupation.

The desktop assessment has confirmed the existence and presence of paleontological and historical heritage sites located approximately 500m from the project receiving environment particularly between Otjiwarongo and Omaruru section. However, it is important to stress that these sites do not fall within the railway line itself and the service road within the servitude.

2.5.13 Development Plans

Most developments in Namibia take place in line with the country's Vision 2030, National Development Plan 5 (NDP5), the Harambee Prosperity Plan II, and Africa's Agenda 2063 and their respective goals and principles.

Several development programs by different ministries in Namibia have been included in the medium-term Development Budget for 2022/23 – 2024/25 for both the Erongo and Otjozondjupa regions. These developments include construction; renovation or upgrading of facilities/infrastructure (education, health, road and rail transport, mining, immigration, defence, IT, services); value chain development schemes in the agricultural and environmental sectors; and resource management (water, wildlife), etc. (NPC, 2022).

3 INSTITUTIONAL AND LEGAL FRAMEWORKS

3.1 INSTITUTIONAL FRAMEWORK

The entities that will be responsible for the implementation of the Project for the construction phase and the operational phase, as well as the authority responsible for sustainable development are briefly presented below.

3.1.1 Ministry of Works and Transport

The Department of Transport within the Ministry is responsible for transport in the different modes, namely road, rail, air and sea. Its mandate is to ensure the provision of safe and efficient transport services and infrastructure in the Country in balance with demand in the different modes.

The Ministry is the implementation authority of the Project, through the Directorate Transport.

3.1.2 TransNamib Holdings Limited (TransNamib)

TransNamib will be responsible for the operational side, while ownership vests with the Government of Namibia.

3.1.3 Namibian Transport Advisory Board

The objects of the Board are to develop, promote and encourage transport in Namibia and to coordinate transport services in Namibia to ensure that transport services are carried on and maintained in, from or to Namibia in the best interest of Namibia and its inhabitants in the most effective and economic manner.

3.1.4 Sustainable Development Advisory Council

The functions of the Sustainable Development Advisory Council, outlined in Article 7 of the Environmental Management Act of 2007, are to promote the sustainable management of the environment and the use of natural resources by establishing principles for decision making on matters affecting the environment.

3.1.5 Ministry of Environment, Forestry and Tourism

The Directorate Environmental Affairs within the Department of Environmental Affairs and Forestry is tasked with the implementation of the Environmental Management Act (No. 7 of 2007) and evaluation of all environmental impact assessments done, as provided for by the Environmental Impact Assessment Regulations (GG. No. 30 of 2012).

3.1.6 Ministry of Agriculture, Water and Land Reform

The Directorate Land Reform and Resettlement, which main function is to administer the Agricultural (Commercial) Land Reform Act, Act No. 6 of 1995 (ACLRA) and the Communal Land Reform Act, Act No. 5 of 2002. The National Land Policy was also developed and is being implemented by the Directorate.

he responsibility of compensation for the temporary and/or permanent loss of land and/or damage to land and assets resides with the Directorate Land Reform and Resettlement within the Ministry of Agriculture, Water and Land Reform.

3.2 INSTITUTIONAL CAPACITIES AND STRENGTHENING PLAN

Considering the pivot roles to play and currant challenges experienced within the mentioned Ministries, strengthening of their respective institutional capacities are necessary and will contribute to the successful management and implementation of the proposed Project.

3.3 LEGISLATIVE AND REGULATORY REQUIREMENTS FOR IMPLEMENTATION

The ESIA process, which includes evaluation and approval from the applicable authority, as well as monitoring, is also regulated by specific national and international legislative and regulatory requirements.

For purpose of this Project various national and international legislative and regulatory requirements exists applicable to both the natural environment and the social environment, as enacted by certain sectoral laws applicable to specific sectors such as forestry, water, health and safety, gender and so forth.

3.3.1 Legislative Requirements to the Assessment Process

(i) The Namibia Environmental Management Act (No 7 of 2007)

National legislation requiring and regulating the environmental and social impact assessment is the Environmental Management Act (No 7 of 2007) (EMA) along with the Environmental Impact Assessment Regulations (No. 30 of 2012). It is administered by the Directorate of Environmental Affairs (DEA), under the auspices of the Ministry of the Environment, Forestry and Forestry.

(ii) International Standards

For purpose of preparing the ESIA, standards from two main organisations were considered, i.e., International Finance Corporation (IFC) and that from the African Development Bank (AfDB), as well as the latest revision of the Equator Principle (2020). These are presented in section 3.4 of the ESIA Report.

3.3.2 Legislative Requirements to Sustainable Environmental and Social Practises

Various legislation, nationally and internationally, exists that are applicable to sustainable practises and protection of the natural and social environments. Each of these legislations is presented within section 3.3 of the ESIA Report, as well as the Constitutional requirement for environmental protection (section 3.1 of the ESIA Report).

3.3.3 Applicable International Standards

Implementation of the ESMP should be done considering the standards from two main organisations, i.e., International Finance Corporation (IFC) and that from the African Development Bank (AfDB), as well as the latest revision of the Equator Principle (2020).

3.4 GAP ANALYSIS

Table 3.8-1 within the ESIA Report presents a comparison of Namibian Government policies and regulations related to environmental and social safeguards against the IFC Performance standards. It further provides recommendations on how the project will fill any gaps.

4 STAKEHOLDER ENGAGEMENT

4.1 INTRODUCTION AND OBJECTIVES

Considering the nature of the Project and the affected environment through which the existing railway passes, and proposed railway will pass, a detailed identification exercise was completed at the early stage of the Project to record potentially interested and affected parties.

4.2 OVERVIEW OF ENGAGEMENT REQUIREMENTS

Stakeholder engagement was done as per the requirements of the International Finance Corporation (IFC) Performance Standards (PS) on Environmental and Social Sustainability, 2012, relevant IFC Guidance Notes (GN), Operational Standards of the African Development

Bank and the Environmental Impact Assessment Regulations (GG. Notice 30 of 2012) of the Environmental Management Act (No. 7 of 2007).

Details to the national and international requirements are presented within section 6.2 of the ESIA Report.

4.3 ENGAGEMENT APPROACH: AFFECTED COMMUNITIES AND OTHER STAKEHOLDERS

The ESIA-SEP activities planned for the Study included (i) a notice in the printed media notifying the general public of the study and Project and request to register with the Environmental Assessment Practitioner as (EAP) as I&AP; (ii) direct email communication to identified I&APs informing them of the Study and Project, and request for registration and comment; (iii) distribution of the Background Information Document to pre-identified I&APs and calling for registration and submission of comments/questions/concerns, (iv) placing a series of notices in the printed media and radio reads informing the public of the study and proposed Project and calling for registration, and (v) conducting three public consultation meetings at places along the length of the Project area. All comments received from I&APS during the consultative stage are presented within Tables 6.4.1.2-1 & 6.4.1.2-2 & 6.4.2.2-1.

The list of stakeholders identified and registered to the Study is attached as Appendix D1a and Appendix D25 to the ESIA Report.

Grievance management is one of the important pillars of responsible and effective public consultation. A Grievance Redress Mechanism (GRM) provides for the reception, treatment, and documentation of I&APs grievances. The GRM applies to all stages of the Project: from preparation (ESIA) to construction and operation. GRM requirements to this Project for implementation by the Proponent and his/her Contractor is presented in Stakeholder Engagement Plan.

4.4 SUMMARY OF CONCERNS RAISED

The important issues raised from the side of the Stakeholders focussed on safety and security, impact of water abstraction for construction purposes, pollution during construction, general health and safety of the work force and impacts on the vulnerable section of the community.

4.6 Social Acceptability

Considering the involvement and communication from the side of I&APs it can be argued that I&APs and authorities agree to the proposed Project, as long as it responds to the needs of the communities affected, i.e., do not result in short and/or long-term negative impacts. In addition to addressing the raised concerns, it is important to ensure that the needs of the communities are met and that continues consultation and distribution of information takes place. A grievance mechanism (see section 10.8 of the ESIA Report) will be put in place, as well as the appointment of an independent environmental consultant responsible to oversee the construction phase and monitor compliance with the ESMP. Continues consultation and

communication through the proposed Stakeholder Engagement Plan (Appendix D to the ESIA Report) is required for implementation from the side of the appointed contractor.

5 CLIMATE CHANGE RISK ASSESSMENT

Although climates across Africa have always been erratic, the continent is expected to face even greater droughts, floods, rising sea-levels, food insecurity, loss of biodiversity and depletion in the water supply (*Dirkx et al., 2008*). Being the country with the most arid climate in Southern Africa, Namibia's economy is already exposed to difficult and harsh conditions, with water accessibility a serious threat. Prolonged droughts, although considered "normal" to some extent, have devastating impacts on livelihoods, food availability, health and wellbeing in many of the country's rural communities.

The United Nations Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (4AR, 2007) suggests African countries are most vulnerable, especially those which are already arid to semi-arid. Namibia, in particular, has been classified as one of the most vulnerable countries to the impacts of climate change.

6 ENUMERATIONS OF THE MAJOR AND MODERATE IMPACTS

6.1 VALUED ENVIRONMENTAL COMPONENTS (VEC)

Table 2.5-1 in the ESIA Report presents the selected VECs and an explanation of the influence each might have on the Project. These VECs are further evaluated in more details in the Impact Assessment and Mitigation Chapter (Chapter 8) of the ESIA Report.

6.2 BENEFICIAL AND ADVERSE IMPACTS

6.2.1 Beneficial - Reduced Travel/Transport Times; Improved Safety/Reliability; Economic Impacts for Travellers; Economic Impacts for Road Maintenance; Economic Impacts for Regional and Country Wide Development; Employment Generation; Reduced Hazardous Liquids Spills and Pollution; the Project will source 100% of labour by value and 80% of materials by value (excluding petroleum and petroleum products) for construction sourced in Namibia; and Reduced GHG Emissions.

6.2.2 Adverse – Over abstraction of underground water during construction; pollution from construction of underground water source; increased theft and poaching; increased veld fires; impacts towards vulnerable part of the communities; and effects on touristic activities during construction through the creation of nuisances, i.e., noise, delayed traveling times; etc.).

6.3 MAJOR ENVIRONMENTAL AND SOCIAL CHALLENGES

6.3.1 Hydrology - Water Resource Sustainability (Quantity & Quality)

Groundwater quantity will be impacted during the pre-construction and construction phases. Construction activities of this nature, extent and duration are expected to require large

volumes of water for daily construction activities. Water resource sustainability will be impacted at the construction phase. According to the Hydrological Desktop Study, increased abstraction **may** therefore pose significant threats to the groundwater source's quantity and quality. By applying the proposed mitigation measures (see Table 10.2-1 in the ESIA Report), in specific the Construction Water Demand Management Plan and Underground Water Monitoring Programme, it can be expected to reduce the impact significance to ***medium***, which is however subject to further investigation and assessment. The proposed mitigation measures therefore may contribute to reduced adverse impacts on human health and the environment by reducing groundwater abstraction, as required by IFC PS3 and PS4.

6.3.2 Local Livelihood and Economic Activities – Land-Based Livelihood Activities (Land Use and Occupation)

Given that very little land will permanently be loss to railway use and a change to gravel dam use, while these are located adjacent to and in close proximity to the railway servitude, it will be easily compensated and avoid land fragmentation (i.e., creating uneconomical agricultural land). The anticipated impact intensity of the loss of farmland on economic activities is considered ***low***. The extent will be on land around and near the existing railway servitude so it will be local, while duration will be permanent. The impact on the Goodhope Development and Erongo Park Estate at Otjiwarongo, as well as the unproclaimed township of Omaruru, will be ***high***. The pre-mitigated significance of the impact and in specific relating to the borrow pits would be ***medium***. The rehabilitation as per agreement with owner and/or regulatory requirements will ensure the impact significance reducing to ***low***.

6.3.3 Residents General Health, Safety and Security

With limited resources and large areas to police, the regional branch of the Namibian Police is not effective in countering animal theft and poaching. Private security established amongst the farmers have contributed to better policing and control of illegal activities, but not without incident. Increased crime is considered of potential ***high*** significance, as a result of increased construction activities and workers into the area. Continues communication with residents to ensure that information and planned activities are communicated in time. A strict Construction Safety & Security Conduct Plan should be drafted, signed by all workers, implemented and monitored throughout the Project's lifetime. This should be done through the Stakeholder Engagement Plan. Other mitigations are presented within Table 10.2-1 in the ESIA Report.

With high levels of unemployment and an increase in the number of men, either as construction workers or in search of income and/or employment, and additional money available, exploitation of the vulnerable can be expected. This is considered to be of ***high*** significance, with various health and social implications to the receiving community. A strict Construction Safety & Security Conduct Plan should be drafted, signed by all workers, implemented and monitored throughout the Project's lifetime. Talks and educational programmes focussed on the vulnerable members of the community should be undertaken and communicated through the Stakeholder Engagement Plan. Vulnerable members should be made aware of the Grievance Redress Mechanism that exists to their benefit. Other mitigations are presented within Table 10.2-1 in the ESIA Report.

Adverse impacts on health, safety and security will therefore be minimized, as required by IFC PS4 and OS5.

6.3.4 Labour Conditions

Living conditions within construction camps are many times very basic providing for the bear minimum. Poor living conditions again have various negative spin-offs, which are mostly feld by the receiving community. Contractors' camp should provide for all required facilities to international standards for the duration of the Project's lifetime. The contractors' camps should be managed and monitored as per the requirements set within the ESMP.

6.3.5 Social Acceptability

A transparent and continuous communication with authorities and I&APs should provide social acceptability or at least, social acceptance. This can be achieved by transparent implementation of the Stakeholder Engagement Plan, as well as effective implementation and monitoring of the Project, as per the Environmental and Social Management Plan. In addition to the mentioned, it is important to ensure that the needs of the communities are met and that continues consultation and distribution of information takes place. A grievance mechanism (see section 10.8 of the ESIA Report) will be put in place, as well as the appointment of an independent environmental consultant responsible to oversee the construction phase and monitor compliance with the ESMP. Continues consultation and communication through the proposed Stakeholder Engagement Plan (Appendix D to the ESIA Report) is required for implementation from the side of the appointed contractor.

6.3.6 Institutional Capacity

The Ministry of Works and Transport, assisted by the AfDB will have to develop a capacity-building program for their responsible Department and/or Division and appointed contractor on the implementation and monitoring of the proposed Project and the ESMP. Continues follow-up programmes should be implemented throughout the duration of the Project.

The Ministry of Environment, Forestry and Tourism, assisted by the AfDB should develop a capacity-building program for both the Department and/or Division and appointed contractor on the implementation and monitoring of the Project and the ESMP, as pert he National and International standards. In addition to the mentioned, the Ministry of Environment, Forestry and Tourism should budget for a staff member of the Directorate of Environmental to be stationed at Otjiwarongo for the remainder of the proposed Project, i.e., 5 years.

Given the Ministry's current organisational structure and strength, it is not expected that any delays to the Project may be experienced. It is however advisable that the Proponent request the Minister of the Ministry of Agriculture, Water and Land Reform to dedicate two staff members (i.e., senior, and junior) to the Project for the duration of the Project (i.e., 5 years).

7 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

7.1 OVERVIEW

The Environmental and Social Management Plan (ESMP) is a presentation of the required mitigation and monitoring measures for the impacts identified and assessed in Chapter 8 of the ESIA Report, while indicating the implementation and supervision responsibilities for both the mitigation and monitoring measures, as well as estimated costs. The ESMP is applicable to the construction phase. The internal monitoring measures indicated in the ESMP tables refer to measures to be taken on a regular basis by the appointed contractor, independent environmental consultant and the Proponent to ensure the correct implementation of impact mitigation measures.

As per the AfDB's ISS, mid-term and project completion E&S compliance and performance Audits should be conducted by the project management unit through a contracted independent environmental consultant. A detailed and standalone ESMP has been compiled for this Project.

8 CONCLUSION

Considering the nature and scale of the proposed Project against the sensitivity of both the natural and social receiving environments this ESIA concludes that there are both positive and negative impacts of different nature and scale, which can be avoided and/or mitigated to different levels of acceptability.

The proposed Project holds extensive socio-economic benefits and potential to enhance Namibia's strategy of becoming an International Logistics Hub for SADC Countries. Positive impacts are expected to be experienced from grassroot level and beyond the Project's study area, directly and indirectly contributing to socio-economic upliftment. The Project will contribute to the Government of Namibia's (GoN) vision to transform Namibia into a prosperous and an industrialized nation by the year 2030 by improving and expanding its regional transportation and trade links as expressed in national Development Plans (NDP4 and NDP5) and Vision 2030. Namibia´s National Development Plan 4 propagated the vision of transforming Namibia as a whole nation into an international logistics hub for SADC region by 2025.

Impacts of different scale, nature and duration has been identified, assessed and mitigations proposed, so as to avoid or minimise the negatives on the receiving natural and social environments. Of greatest concern is without a doubt the impact on the underground water resource, both from a demand (construction waters) and quality point of view. For purpose of avoiding and/or mitigating any potential negative impact to the receiving community with negative socio-economic consequences, it has been recommended that a Groundwater Monitoring Program be implemented and monitored by a qualified and well experienced Hydrogeologist. Other negatives identified to be mitigated and monitored are general health, safety and security of the community, as well as the health and wellbeing of marginalised groups.

Institutional challenges expected relates to limited capacity with the Directorate of Environmental Affairs with the Ministry of Environment, Forestry and Tourism to monitor construction Implementation on-site. For this reason, it is recommended that the Ministry of Environment, Forestry and Tourism appoint or relocate a staff member to an office within Otjiwarongo, located halfway in between the entire Project length. The staff member should be equipped with supporting equipment to become a satellite office of the Directorate of Environmental Affairs and primarily be responsible for this Project.

Based on the project information as provided by the Proponent, Consulting Engineers and specialist inputs, the nature and extend of the Project, setting the sensitivity of the receiving environment, the ESIA study concludes that there is currently no evidence indicating that any of the impacts identified are of such significance that it cannot be reasonably mitigated and that the proposed Project, as presented in this report, should not be allowed to continue. It is however required that the mitigations and recommendations as presented in the ESIA Report and this ESMP be implemented by the Proponent and appointed Contractors, along with the required management and monitoring plans.

Given this, it is not to say that there will be no further impact/s and potential threats as highlighted by the ESIA study. Construction, operations and decommissioning and closure activities need to be strictly controlled by the Proponent and Contractor/s, and monitored by the appointed specialist and applicable Competent Authority to ensure that all potential impacts identified in this study and other impacts that might arise during implementation are properly identified in time and addressed in an effective manner.

1 INTRODUCTION

1.1 PROJECT BACKGROUND

Namibia provides access to international shipping routes via the port of Walvis Bay to its land locked neighbours and other Southern African Development Community (SADC) countries. It is recognised that currently the transportation of export freight from neighbouring countries to Walvis Bay is done via road, and the heavy vehicle traffic has a significant impact on the quality and maintenance of road infrastructure in Namibia. In addition to the mentioned, the increased numbers of heavy vehicle transport have compromised general traffic safety, while known for other socio-economic impacts (i.e., HIV/AIDS infections). The current preferred method of transportation, i.e., road to rail, is contributing to higher levels of emissions, being counterproductive to Namibia's goal to reduce GHG emissions.

Namibia's railway infrastructure is deteriorating due to a combination of many contributing factors including but not limited to aging rail infrastructures, which reached its finite life. Weather, material degradation (track components), widespread fatigue and damage, but more especially maintenance and safety challenges are all contributing factors, as much of the railway system dates back from German period at the end of the 19th century, which was subsequently re-laid in the 1950's during the South African period.

The Government of Namibia (GoN) in its Vision 2030 sets to transform Namibia into a prosperous and an industrialized nation by the year 2030. One of the strategies in achieving the goal set for Vision 2030, aim at improving and expanding its regional transportation and trade links as expressed in national Development Plans (NDP4 and NDP5). Namibia´s National Development Plan 4 propagated the vision of transforming Namibia as a whole nation into an international logistics hub for SADC region by 2025.

The Government of Namibia, represented by the Ministry of Works & Transport (MoWT) is engaged in a process towards the upgrade of the existing railway line extending from Walvis Bay – Kranzberg Station – Omaruru – Kalkfeld – Otjiwarongo – Otavi - Tsumeb, Otavi - Grootfontein and extension from Grootfontein - Rundu - Katima Mulilo to directly link the Namibian Railways with Zambia, while also facilitating connectivity with Angola, Botswana and the Southern Democratic Republic of Congo (DRC).

The proposed railway upgrade from Kranzberg Station – Tsumeb and Otavi - Grootfontein ties in with the proposed Trans-Zambezi Railway extension from Grootfontein to Katima Mulilo via Rundu in Namibia, for which a feasibility study has recently been completed. The result of the feasibility study indicates the favourability and importance of this multinational Project (M R Technofin Consultants, 2022). This railway extension is part of a cross-border railway between Namibia and Zambia, which aims to link mines in the Copperbelt region (Zambia and Democratic Republic of Congo (DRC)) with the port of Walvis Bay in Namibia.

The upgrade of the railway line in between Kranzberg Station to Tsumeb and Otavi to Grootfontein (Phase 1 – Railway Line between Kranzberg Station and Otjiwarongo Town), is in line with: (i) NDP5; (ii) the Harambee Prosperity Plan II 2021 – 2025 (a goal set out under

Pillar 4: Infrastructure Development (Goal 3: Strengthening Namibia's Position as a Transport & Logistics Hub); (iii) the Sustainable Development Goals (SDGs) set out by the United Nations Development Programme (UNDP) (specifically Goal 9: Industry, Innovation and Infrastructure and Goal 11: Sustainable Cities and Communities); and (iv) Agenda 2063 of the African Union (AU).

The Master Plan for Development of an International Logistics Hub for SADC Countries includes the rehabilitation, development, and expansion of the Namibian railway network to further exploit the potential of becoming an international logistics hub for the SADC inland areas. Cargo volume along the main transportation routes in Namibia is expected to grow by 9.3% on average between 2013 and 2025 (GRN, 2015).

Financing for this Project has been sourced from the African Development Bank Group. The African Development Bank (AfDB) has actively supported various elements within the larger transportation sector drive within Namibia through inter-alia technical support (National Logistics Master Plan) and as lender (Walvis Bay Port Expansion and Walvis Bay to Kranzberg Station railway upgrade).

The Namibian Government through the Ministry of Works & Transport (MoWT) (herein referred to as the proponent) now intends to upgrade the section of existing railway line between Kranzberg Station near Karibib/Usakos to Tsumeb, Otavi to Grootfontein, as part of the proposed Trans-Zambezi Railway extension in line with the Master Plan for Development of an International Logistics Hub for SADC Countries. Such rehabilitation development takes place under the provisions of the National Transport Services Holdings Company Act, (No. 28 of 1998).

The proposed railway line covers a distance of about 500km with the new proposed deviations affecting a number of private farms in Erongo-, Otjozondjupa- and Oshikoto regions. Given the extent and scale of the Project, it has been divided into two phases, with Phase 1 being the section from Kranzberg Station to Otjiwarongo (content of this report) and Phase 2 the section between Otjiwarongo to Tsumeb and from Otavi to Grootfontein. Phase 1 has an approximate length of 392km extending from Kranzberg station through Omaruru, Kalkfeld settlement to the town of Otjiwarongo. Phase 1 has further been divided into section 1 extending from Kranzberg Station to Omaruru, and section 2 extending from Omaruru to Otjiwarongo, as presented in section 4.4 of Chapter 4.

The proposed railway line upgrade project will concentrate mainly on enlarging and or construction of a new railway embankment and bridges, replacement of existing old steel rails, metal sleepers and ballast to meet SADC requirements.

The proposed railway line alignment will follow the existing railway line for most of the length between Kranzberg Station and Otjiwarongo Station, with some deviations to ensure that rail curvature is in accordance with safety standards (taking into consideration the design speed and load). For the section in between Kranzberg Station to Omaruru, a total of 79 deviations are planned, with 16 of these deviations extending onto neighbouring portions of land (see Appendix E). For the section in-between Omaruru and Otjiwarongo, a total of 88 deviations

are planned, with 13 of these deviations extending onto neighbouring portions of land (see Appendix E). The engineering drawings indicating the deviations onto adjacent portions of land are attached as Appendix F. From the 167 proposed deviations 5 deviations are considered problematic for various reasons and alternative alignments were accordingly proposed and accepted.

Significant disturbances within the railway servitude are not anticipated since this area has already been disturbed from previous railway earthworks and related structures, as well as ongoing maintenance activities. The concern is the associated camp facilities; borrow pits and boreholes locations, and loss of land for railway purpose.

The Project scope primarily includes:

- Construction of new embankments, bridges and stormwater drainage structures;
- Laying of concrete sleepers, railway tracks, and ballast stone;
- Removal of old railway sleepers, railway tracks and ballast stone (that which cannot be reused); and
- Rehabilitation of old embankment and reuse for purpose of railway service road.

The AfDB categorised the Project as a Category 1 project, as per AfDB's Operational Safeguard System 1, requiring an Environmental and Social Impact Assessment (ESIA) inclusive of an Environmental and Social Management Plan (ESMP).

To meet the requirements as set by the Namibian Environmental Management Act (No. 7 of 2007) and that of the Africa Development Bank Group, the Proponent initiated an Environmental and Social Impact Assessment (ESIA), as per The Act's Environmental Impact Assessment Regulations (GG. No. 30 of 2012) and African Development Bank (AfDB) Guidelines for the Environmental and Social Assessment procedures (ESAP) of 2015.

Windhoek Consulting Engineers (WCE), a multi-disciplinary engineering consulting firm, has appointed by MoWT to perform engineering, procurement, and construction management of the Project, while Urban Green Environmental Consultants has been appointed to undertake the environmental and social impact assessment, as well as application for an environmental clearance certificate provided for by section 27 of the Namibian Environmental Management Act (No. 7 of 2007).

1.2 PROJECT OBJECTIVES & EXPECTED BENEFITS

Although Namibia's railway infrastructure is reported to be adequate for the current business levels nationally, the quality of the railway infrastructure no longer meets the acceptable SADC requirements to provide service regionally. Over the last few years, Government has invested in the maintenance and upgrades of its historic railway structures, but the rehabilitation in rail and sleepers hasn't been adequate to ensure ongoing serviceability to sustain an infrastructure attracting high volume growth beyond Namibia (Phillip 2001). This is

exacerbated by the insufficient annual budgets to maintain serviceability of railways for the long term.

Securing Namibia's position as a regional hub is the main motivating objective of this Project, with expectations that the Trans-Zambezi extension will spur trans-border trade to/from Walvis Bay from neighbouring countries and to give effect to Namibia's Vision 2030 to become the transport hub for land lock countries (MR Technofin Consultants Ltd., March 2022).

Subject to the main objective, the Project set to improve the movement of goods and people along the length of the railway network and enhance connectivity between the Regions and throughout the larger SADC as it is part of the Trans -Zambezi. The Namibian rail network in its current condition is however insufficient to serve the expected volumes and freight type due to the very old age of the rails, sleepers, and ballast that have reached their life expectancy.

The Project is expected to have the following benefits:

- Reduced Travel/Transport Times: Improved railway conditions and standards will reduce travelling and transportation time, which again has economic benefit to both the transporter and client. Reduced traveling times has the benefit of less fuels being consumed, which has a positive environmental impact (i.e., combating Climate Change).
- Improved Safety/Reliability: The existing railway line network is known for frequent derailments, which is primarily because of the current state of the rail infrastructure, which the Project will mitigate. The proposed Project includes provision of a new railway embankment, bridges, and culverts. Other proposed measures such as major and minor junction improvements, enhancement of sight distances and signage for safe intersections, vehicles, cattle, wildlife and pedestrian overpass and underpass crossings will help in increasing safety and reliable service.
- Economic Impacts for Travellers: Savings are anticipated in passenger transportation cost in comparison to ever increasing fuel prices of road transport.
- Economic Impacts for Road Maintenance: Transportation of freight, animals and goods via rail will result in reduced road transportation, which again place less of a burden on roads and resulting maintenance frequency and/or reconstruction of roads.
- Economic Impacts for Regional and Country Wide Development: Improved rail transport will result in reduced transaction costs in transportation and create more certainty in using the Project rail for transport, given the elevated standard. Furthermore, availability of reliable transport infrastructure and efficient transportation services is an essential requirement for achieving goals of any development plan. The proposed railway improvement will facilitate efficient and reliable transportation of freight to and from Walvis Bay harbour throughout Namibia and neighbouring SADC countries.
- Employment Generation: Infrastructure projects of this nature and scale provide direct and indirect employment opportunities to skilled, as well as unskilled labourers. The Project is expected to employ ± 150 people as labourers for the duration of the

construction period, while the specialised work force will be ± 50 people. The enhanced income of the local skilled and unskilled work force will have a positive impact on other sectors of the economy.

- Local Content: The Project will source 100% of labour by value and 80% of materials by value (excluding petroleum and petroleum products) for construction sourced in Namibia.

1.3 ESIA OBJECTIVES AND CONTENT

Under the laws of Namibia, and as per International Finance Corporation Performance Standards (IFC PS) and the African Development Bank (AfDB) safeguards, the Project requires the completion of an Environmental and Social Impact Assessment (ESIA) with Environmental and Social Management Plan (ESMP), as well as an Environmental and Social Management System (ESMS).

The main objectives of the ESIA are to:

- identify and evaluate potential environmental and social impacts associated with the Project planning, construction, and operation;
- ensure that anticipated impacts are adequately mitigated or enhanced; and
- Propose adequate management and follow-up mechanisms to monitor the potential impacts predicted.

The ESMP, which builds on the findings of the ESIA, set-out the mitigation-, monitoring- and institutional measures to be taken by the Proponent and appointed consultants or sub-consultants to eliminate adverse impacts, offset them, or reduce impacts to acceptable levels.

As no resettlement is expected, an Abbreviated Resettlement Action Plan (ARAP) has also been developed as a standalone document, as required by AfDB's Safeguards and Sustainability Series (November 2015).

1.4 ESIA REPORT STRUCTURE

The ESIA is presented within eleven chapters, the contents of each are described as follows:

Chapter 1 – Introduction: outlines the background for the Project and ESIA;

Chapter 2 – Approach and Methodology: outlines the approach and methodology used to complete the ESIA and establishes the project's spatial boundaries considered;

Chapter 3 – Legal, Regulatory and Institutional Frameworks: describes the legal, institutional, and regulatory frameworks applicable to the Project and conducting the Study;

Chapter 4 – Project Description: provides a detailed description of Project components and activities;

Chapter 5 - Baseline of Environmental and Social Conditions: describes the existing conditions for the physical, biological and human environments;

Chapter 6 – Stakeholder Engagement (Public Consultation): provides a description of the consultations completed during the ESIA process. It also offers a summary of the observations, requests and comments expressed by the participating I&APs;

Chapter 7 – Project Alternatives and Results of Comparison: provides an analysis of the various project design options considered, as well as the process and justification for the selection of preferred options;

Chapter 8 – Impact Assessment and Mitigations: provides an assessment of Project impacts on the physical, biological, and socio-economic environments and a list of proposed mitigation measures. Assessment of cumulative impacts is also presented;

Chapter 9 - Climate Change Risk Assessment: presents an outline of climate change conditions in Namibia, in compliance with IFC Performance Standard 1.

Chapter 10 – Environmental and Social Management Plan: presents an overview of some of the components of the ESMS and ESMP to be prepared and implemented by the Proponent and the Contractors. The chapter includes a summary of the ESIA impacts and mitigation measures, a highlight of the proposed governance structure, a brief presentation of the ESMS and associated management/action plans and considers the monitoring and follow-up activities to be applied during construction and operation activities to ensure application and success of proposed mitigation measures.

Chapter 11 – Conclusion: highlights the environmental and social acceptability of the Project, considering the impacts and measures identified during the assessment process, and other conditions or external requirements to ensure the success of the project.

As part of the ESIA, an ESMS is prepared and constitutes the framework for the implementation, monitoring and reviewing of the mitigation and optimization measures identified through of the ESIA. It provides tools to ensure the environmental, social, community and occupational health and safety measures that are recommended to control the identified impacts and risks, are effective and properly implemented. This ESMS is presented as a starting point for the on-going development of a sound management system including a set of environmental and social management plans. It covers the construction, operational and decommissioning phases of the Project. It is expected that the system will be modified and updated as the Project progresses.

1.5 ESIA TERMS OF REFERENCE

No formal Terms of Reference (ToR) were provided, but rather were inferred from the requirements of the applicable National legislation namely the Environmental Impact Assessment Regulations (Government Notice No. 30 of 2012), to enable an application for an ECC with the Environmental Commissioner, as required by Section 27(3) of the Environmental Management Act (No. 7 of 2007). In addition to the mentioned, the ToR was also inferred by

the environmental and social performance standards set forth in the Performance Standards on Environmental and Social Sustainability of the International Finance Corporation (IFC Performance Standards) and the environmental and social standards set forth in the Operational Safeguards (OS 1-5) of the AfDB.

The purpose of this Study is to apply for an ECC for the proposed Project. All other permits and/or licenses required for the operation of the proposed Project still need to be applied for by the Proponent and/or his/her appointed contractor.

1.6 ESIA ASSUMPTIONS AND LIMITATIONS

In undertaking the ESIA and compiling of the ESIA report, the following assumptions and limitations apply:

- It is assumed that all the information provided by the Proponent and authorities consulted are accurate and that those aforementioned have disclosed all necessary information available.
- Available information from the DWA database is not complete, i.e., not all existing boreholes are captured in the database; hence an evaluation based on the database boreholes may not give an accurate reflection of the true situation. It was also realised that the information captured in the DWA database are not accurate.
- It is assumed that all permit or licence requirements, other than the ECC, associated with the proposed Project will be addressed by the Proponent or appointed consultant and are not provided for as part of this ESIA process.
- It is assumed that there will be no significant changes to the proposed Project (see Chapter 4) or the affected environment (see Chapter 5) between the time of the ESIA and implementation of the proposed Project that could substantially influence findings, recommendations with respect to mitigation and management, etc.
- The ESIA process involved the assessment of impacts on the current conservation value of affected land and not on either the historic or potential future conservation value. This ESIA process included an evaluation of impacts on the archaeology of the affected area.
- Information of farm owners and contact details was not available and had to be sourced from various sources, i.e., Ministry of Agriculture, Water and Land Reform, and the Ministry of Agriculture, Water and Land Reform.
- The assessment is based on the prevailing environmental (social and biophysical) and legislative context at the time of undertaking the ESIA.

1.7 ESIA CONSULTANTS

Given the nature of the Project and the objectives of the Study, a tailor-made team of specialists has been put together capable of successfully delivering a high-quality product to satisfy the legal requirements, as set by the Environmental Management Act (No. 7 of 2007)

and other applicable legislation. The study team consists of senior personnel with experience in environmental impact assessments and management, hydrology and hydrogeology, ecology, public consultation, socio-economic profiling, archaeology, and GIS, assisted by supporting staff with experience in their respective fields of qualification and profession.

The study team for purpose of this Study is headed by Urban Green Environmental Consultants along with project-specific-specialists, as presented below in sections 1.7.1 and 1.7.2.

1.7.1 Urban Green Environmental Consultants

Urban Green Environmental Consultants has been appointed via Windhoek Consulting Engineers by the Ministry of Works and Transport to conduct the ESIA.

The environmental assessment practitioners (EAP) from Urban Green Environmental Consultants leading the Study are presented in Table 1.7.1-1 below. The CVs of the respective EAPs are attached as Appendix G.

Table 1.7.1-1 – Qualifications and expertise of the environmental assessment practitioners

NAME	**Brand van Zyl**
RESPONSIBILITY ON THE PROJECT	EAP Public consultation, impact assessment and mitigation formulation, reporting and application for Environmental Clearance
QUALIFICATIONS	M. Degree in Environmental Management; M. Degree Town and Regional Planning; Bachelor of Arts Urban Geography
PROFESSIONAL REGISTRATION	Namibian Council for Town and Regional Planners Member of the Green Building Council of South Africa
EXPERIENCE IN YEARS	17
EXPERIENCE	Brand van Zyl has been involved in various Environmental Impact Assessment studies throughout Namibia and of different kind.
NAME	**Christina Tromp**
RESPONSIBILITY ON THE PROJECT	EAP and Ecologist Ecological baseline assessment, impact assessment and mitigation formulation, reporting and application for Environmental Clearance
QUALIFICATIONS	M. Phil Degree in Environmental Management and Bachelor of Science Degree in Agriculture, majoring in Nature Conservation

PROFESSIONAL REGISTRATION	Environmental Assessment Professional Association of Namibia (EAPAN)
EXPERIENCE IN YEARS	12
EXPERIENCE	Christina Tromp is an educated environmentalist with work experience in the Namibian environment in Rural Development, Agricultural and Environmental sectors. She is a registered Environmental Assessment Practitioner. Her work experience was gathered in most regions of Namibia.

1.7.2 ESIA Sub-consultants

Considering the scale and nature of the Project and affected environment, various specialists was appointed by Urban Green Environmental Consultants to undertake subject-specific baseline work and on-site assessments/verifications. These specialists are presented in Table 1.7.2-1. The CVs of the respective consultants are attached as Appendix G.

Table 1.7.2-1 – Qualifications and expertise of the environmental assessment practitioners (Sub-Consultants)

NAME	**Environment & Wildlife Consulting, Namibia (Peter Cunningham)**
RESPONSIBILITY ON THE PROJECT	Vertebrate fauna & flora; ecology; mitigation for power line & pipeline
QUALIFICATIONS	MSc; BSc Honours; BSc (Conservation Ecology)
PROFESSIONAL REGISTRATION	N/A
EXPERIENCE IN YEARS	26
EXPERIENCE	Peter Cunningham has been involved as ecologist in various Environmental Impact Assessment studies throughout Namibia (including Angola, South Africa, Swaziland, Tanzania, United Arab Emirates & Saudi Arabia).
NAME	**Dynamic Water Resources Management (Otto van Vuuren)**
RESPONSIBILITY ON THE PROJECT	Assessing the pumping test report by NAMWATER for the geohydrological input into the Environmental Impact Assessment and the Environmental Management Plan for the Kuiseb Delta New Scheme

QUALIFICATIONS	B. Sc (Geological sciences); B. Sc (Hons) (Hydrology and Geohydrology)
PROFESSIONAL REGISTRATION	Awaiting registration as Senior Geoscientist at the Geosciences Council of Namibia. (Application submitted, see attached confirmation)
EXPERIENCE IN YEARS	35
EXPERIENCE	Otto van Vuuren has more than 30 years' experience in the groundwater sector and related services in Namibia.
NAME	**RC Heritage Services cc (Dr. A. Nankela)**
RESPONSIBILITY ON THE PROJECT	Archaeological/Heritage Impact assessment and mitigation formulation, reporting and application for the Heritage Consent
QUALIFICATIONS	PhD and Masters majoring in Quaternary and Prehistory as well as Bachelor Degree in History and Geography.
PROFESSIONAL REGISTRATION	Association of Southern African Professional Archaeologists (ASAPA); Namibia Scientific Society (NSS); The Society of Africanist Archaeologists (SafA) and the International Council on Monuments and Sites (ICOMOS).
EXPERIENCE IN YEARS	12+
EXPERIENCE	Dr Nankela worked as an archaeologist and heritage specialist at the National Heritage Council of Namibia for more than a decade. She has conducted extensive archaeological research across Namibia, developed archaeological policies and operational guidelines; carried out heritage assessments, management and conservation work at various UNESCO and national heritage sites in Namibia; curated archaeological objects and jointly developed human remains policy and its operational guidelines for the National Museum of Namibia.
NAME	**ESM Archaeological and Cultural Heritage Consultants (Dr. E. Mowa)**
RESPONSIBILITY ON THE PROJECT	Heritage impact assessment and on – site assessment, reporting and application for Heritage Consent
QUALIFICATIONS	• B. ed Education. (UNAM)

	• Maritime Archaeology (University of Bristol). • PhD. Archaeology (University of Pretoria).
PROFESSIONAL REGISTRATION	National Heritage Council of Namibia, Member of ASAPA
EXPERIENCE IN YEARS	12
EXPERIENCE	Dr E. Mowa is an experienced archaeologist and heritage practitioner who has been working in the museum and heritage sector for almost 12 years, carried out heritage impact assessment on behalf of national heritage council seven years ago on the oil terminal construction project in Walvis Bay. Since then, he has been involved in various Heritage Impact Assessment studies throughout Namibia. He further attended international meetings as a Namibian representative as well as training activities in heritage.
NAME	**ESM Archaeological and Cultural Heritage Consultants (Mr. H Nakale)**
RESPONSIBILITY ON THE PROJECT	Heritage impact assessment and on – site assessment, reporting and application for Heritage Consent
QUALIFICATIONS	Master of Social Science in Tangible Heritage Conservation & Management. Bachelor of Arts Honour Degree in Archaeology, Museums and Heritage Studies. Bachelor of Social Science in Heritage and Museum Studies.
PROFESSIONAL REGISTRATION	National Heritage Council of Namibia, Member of ASAPA
EXPERIENCE IN YEARS	10
EXPERIENCE	Henry Nakale is an experienced archaeologist and heritage practitioner who has been involved in various Heritage Impact Assessment studies throughout Namibia and of different kind.
NAME	**Ms Maike Prickett**
RESPONSIBILITY ON THE PROJECT	Socio-Economist
QUALIFICATIONS	B. Sc (Information Systems and Geography)

PROFESSIONAL REGISTRATION	N/A
EXPERIENCE IN YEARS	16
EXPERIENCE	Maike Prickett has been involved with GIS/Mapping and socio-economic baseline studies on projects throughout Namibia (as well as Tanzania and Ethiopia).

2 APPROACH AND METHODOLOGY

The study's approach and methods were guided by the Terms of Reference (section 1.6), relevant Namibian legislation and requirements from the International IFC Performance Standards and the environmental and social standards set forth in the Operational Safeguards (OS 1-5) of the AfDB.

This chapter presents the approach and methodology (i.e., process) that was followed for the Study as presented within this ESIA, including the following aspects:

- Methodological approaches used for the collection of desktop data and field surveys;
- Assessment methodology used to characterize the Project-related construction and operation impact on physical, biological, and socioeconomic VECs;
- Delineation of spatial boundaries considered;
- Selection of valued environmental components (VECs) described in the Description of Baseline Condition chapter (Chapter 5) and further evaluated in the Impact Assessment and Mitigation chapter (Chapter 8); and
- Assessment methodology used to characterize the Project-related cumulative impact.

2.1 ESIA PROCESS

The steps followed as part of this ESIA process are; (i) screening; (ii) registration of application for an ECC with the Competent Authority and the Approving Authority; and (iii) execution of the ESIA (content of this report). A flowchart indicating the process followed is presented by Figure 2.1-1 below.

2.1.1 Screening

The first step as part of this ESIA process was to subject the proposed Project and receiving environment to a screening process with the aim of identifying the listed activities, which the proposed Project includes, as stipulated in the '*List of Activities that may not be undertaken without an Environmental Clearance Certificate'* (GN. No. 29 of 2012). The screening process was undertaken by all specialist involved in the study. The initial listed activities are listed below in Table 2.1.1-1.

Considering that the proposed Project includes listed activities, it is required that an environmental clearance certificate (ECC) be obtained from the Environmental Commissioner (Ministry of Environment, Forestry and Tourism) in accordance with Section 27(3) of Namibia's Environmental Management Act (No. 7 of 2007).

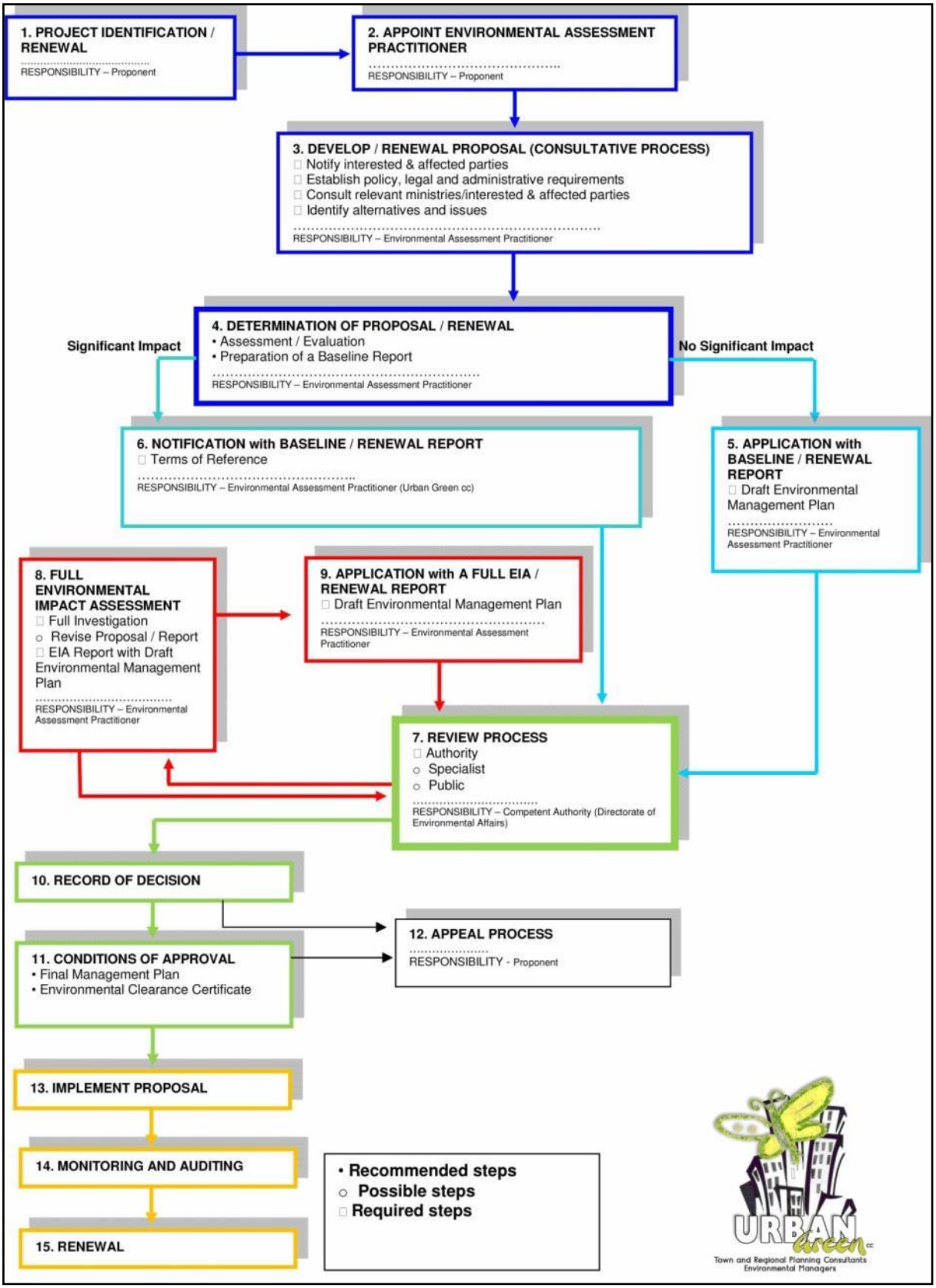


Figure 2.1-1: Diagrammatic representation of Namibia's Environmental Assessment process

Table 2.1.1-1 - Listed activities applicable to the proposed Project as per Government Notice 29 of 2012

Activity No.	Activity Description
MINING AND QUARRYING ACTIVITIES	
Activity 3(2)	Other forms of mining or extraction of any natural resource whether regulated by law or not *(i.e., borrow pits & quarries)*
FORESTRY ACTIVITIES	
Activity 4	Any other related activity that requires authorisation in terms of the Forest Act, 2001 *(i.e., removal and relocation of protected species)*
WATER RESOURCE DEVELOPMENTS ACTIVITIES	
Activity 8.1	The abstraction of groundwater for commercial purpose *(i.e., construction waters)*
Activity 8.8	Construction and other activities in water courses within flood lines *(i.e., culverts and bridges within rivers and tributaries)*
HAZARDOUS SUBSTANCE TREATMENT, HANDLING AND STORAGE	
Activity 9(4)	The storage and handling of a dangerous goods, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic meters at any one location *(i.e., diesel storage and use during construction)*
INFRASTRUCTURE ACTIVITIES	
Activity 10.1.C	The construction of railways

2.1.2 Application for an ECC & Project Registration

In accordance with Regulation 6(1) of the EIA Regulations (GN. 30 of 2012), an application was submitted to the Competent Authority (Ministry of Works and Transport) on 14 April 2022 (Appendix A) of which copies was submitted with the office of the Environmental Commissioner with the Ministry of Environment, Forestry and Tourism (Appendix A).

2.1.3 ESIA

Following the application for an ECC and project registration with the applicable authorities, the environmental and social assessment commenced with public consultation being the first step, as prescribed by Regulation 21 to 24 of the EIA Regulations (GN. No. 30 of 2012) and Equator Principle 5.

The methodology followed with the baseline assessment and detailed impact assessment, as well as the ecological verification inspection is presented in section 2.2 below.

2.2 DATA COLLECTION METHODOLOGIES

This section presents the methodological approaches followed during both the desktop analysis and on-site surveys undertaken by the EAP and specialists, to complete the impact evaluation and assessments for the above listed VECs and to complete the cumulative impact assessment.

2.2.1 Desktop Analyses

2.2.1.1 Review of Environmental Scoping Report (2017)

An Environmental Scoping Assessment with Environmental Management Plan was conducted by Consulting Services Africa in 2017 for the 'Upgrade of the existing Railway Line between Kranzberg Station and Tsumeb Station'. The Environmental Scoping Assessment with Environmental Management Plan was prepared and completed with the objective of meeting Namibia's environmental legal requirements, to obtain an environmental clearance certificate (ECC) from the office of the Environmental Commissioner (then Ministry of Environment and Tourism) for the project. The ECC was issued during December 2017. This Report was reviewed by the African Development Bank and comments/observations were provided to guide the ESIA study to be conducted (contents of this report).

2.2.1.2 Existing Environmental Baseline Data

The Government of Namibia recognises the value and importance of its arid, sensitive environment and since its independence in 1990, Namibia has achieved significant conservation successes. A rich and extensive source of baseline information is available through the Ministry of Environment, Forestry and Tourism, the Namibia Chamber of Environment through its Environmental Information Services of Namibia, as well as through various environmental NGOs that operate successfully in Namibia. Existing baseline data from studies and expertise in Namibia were investigated and used during the desktop study.

Ecological Desktop Analysis

An ecological desktop study (i.e., literature review) was conducted on the vertebrate fauna (e.g., reptiles, amphibians, mammals, and birds) and flora (larger trees and shrubs and grasses) expected to occur in the general Kranzberg Station to Otjiwarongo area along Section 1 and 2 of Phase 1. This is presented in section 5.3 of Chapter 5. The aim was to

determine the effect that the proposed rail link upgrade project, may have on the bio-physical environment (vertebrate fauna & flora).

Details to the methodology of the analyses are presented in the attached vertebrate fauna and flora report, attached as Appendix B2a.

Hydrogeological Desktop Assessment

This desktop assessment was undertaken with the objective to investigate the groundwater potential (based on existing boreholes and prevailing geology and associated hydrogeology near the railway line) and to consider the potential impact of groundwater abstraction on the environment, and to propose mitigation measures to negate these impacts.

The approach and methodology, as presented within the Hydrogeological Report (Appendix B1) was followed:

- Desktop study, evaluating the groundwater potential from existing boreholes and based on the prevailing geology;
- Identify and recommend most viable areas to be investigated for establishing groundwater abstraction points;
- Identify and recommend existing boreholes that could possibly be used to supply water [note that the use of such boreholes will eventually depend on negotiations for the use with the borehole owner(s)];
- Assess the potential impact of groundwater abstraction on the environment and propose mitigation measures; and
- Compilation and submission of a report.

Archaeological

Desktop research was achieved through available data on historical, ethnographic, and archaeological data in the assessment areas. Such data were generated from a series of reports and publications harvested from research and surveys carried out during similar developmental led infrastructures. Data was then supplemented by other relevant data from the internal registry of the National Heritage Council and Museum databases as well as through physical examination of the railway line of potentially sensitive heritage features that were identified during the site visit. Geological maps provided relevant and intensive examination of the general landscape to ascertain typical archaeological terrains while interviews with local communities including small miners were crucial in locating and identification of known sensitive heritage resources.

Details to the methodology of the desktop research are presented in the attached archaeological baseline reports, attached as Appendix B3a and B4a.

Climate

Namibia Meteorological Service provided information on climate for two meteorological stations situated in Otjimbingwe (near Kranzberg Station) and Otjiwarongo. Meteoblue website data was used for meteorological graphs used to display historical data in the report. This is presented in Chapter 5.

GHG emissions

Available desktop information regarding current GHG emissions and documented climate change impacts in Namibia was consulted. This is presented in Chapter 9.

Biophysical

Available dataset on topography, soil, vegetation, etc. from various sources were used for purpose of analysis and presentation thereof in map format.

Development Plans

National and Regional Development Plans applicable to the study area was consulted and considered for impact identification and mitigation formulation.

Legal

Legal requirements applicable to the ESIA process, as well as laws, conventions, and treaties applicable to the affected social and natural environment was considered for incorporation into the ESIA and the ESMP. This is presented in Chapter 3.

Socioeconomic

In the absence of a socio-economic survey, only a desktop study was used to compile the socio-economic baseline condition report which was compiled using data from various sources[1].

Other existing socioeconomic baseline information relating to the study and study area (i.e., administrative framework, land tenure, demographic data, housing and living conditions, education, healthcare facilities and health issues, labour and workforce, livelihood, employment and income, life expectancy, economic activities (e.g., tourism, industry,

[1] Government publications: the Namibia Household Income & Expenditure Survey NHIES 2015/2016 (Namibia Statistics Agency (NSA, 2018); the Namibia 2011 Population & Housing Census Main Report (NSA, 2013); the Erongo 2011 Census Regional Profile (NSA, 2014a); the Otjozondjupa 2011 Census Regional Profile (NSA, 2014b); the Namibia Population Projections 2011 – 2041 (NSA, 2014c);the Namibia Inter-censual Demographic Survey (NIDS) 2016 Report (NSA, 2017); Namibia's 5th National Development Plan (GRN, 2017); the Sustainable Development Goals Baseline Report 2019 (NSA, 2019); the Master Plan for Development of an International Logistics Hub for Southern African Development Community (SADC) Countries in the Republic of Namibia - Final Report Summary (GRN, 2015); the Agricultural Census 2014/2015 (NSA, 2015); the Namibia Labour Force Survey 2018 (NSA, 2019); the Education Management Information System (EMIS) Education Statistics 2019 Report (Ministry of Education, Arts and Culture (MoEAC), 2020); the National Strategic Framework for HIV and AIDS Response in Namibia 2017/18 to 2021/22 (Ministry of Health and Social Services (MoHSS), 2017); the Surveillance Report of the 2016 National HIV Sentinel Survey (MoHSS, 2016); the Namibia Population-Based HIV (Human Immunodeficiency Virus) Impact Assessment (NAMPHIA) (MoHSS, 2018); the Namibia COP 2021 Strategic Direction Summary (PEPFAR Namibia, 2021); a Year of Living with Covid-19 (NSA, 2021); Namibia Tuberculosis Disease Prevalence Survey Report 2019 (MoHSS, 2019a) and National Tuberculosis and Leprosy Programme Annual Report: 2019-2020 (MoHSS, 2019b)

commerce, farming/grazing/fishing, etc.), access to water, security, and human rights, etc. were reviewed. This is presented in Chapter 5.

2.2.2 Detailed Assessment & On-site Surveys

Three different field surveys were conducted to support the desk top analysis, as presented below.

2.2.2.1 Environmental Field Survey

An environmental field survey was undertaken in April 2022 on a rail trolley that moves between 40-60 km/h on the railroad tracks and enabled the specialists to get an overview of the entire Project Site. The objective of the field survey was to screen the entire Primary Project Area (PPA) to identify potential sensitive areas or hot spots that was further investigated on foot and confirmed.

Photo 2.2.2.1-1 - Rail trolley for Project Site inspection

The Project Site falls within the *Tree and Shrubland Savanna* Biome of Africa and Section 1 of Phase 1 lies within the *Western Highlands* of Namibia, whilst Section 2 changes to *Thornbush Shrubland.* This relative homogeny ecology warranted general sampling of the PDA. Sampling was thus done by dividing the railway line Section 1 and 2 of Phase 1 into 16 samples of approximately 10 – 18 km within the 60 m wide servitude between consecutive sidings. April is the end of the rain season in the area, which further accommodated general vegetation sampling. This allowed species identification and whether species of concern are present, which might be destroyed during vegetation clearance of the PPA. Fauna was surveyed through ad hoc siting and suitable habitat identification during the field survey. Observations in each sample area are noted in the Environmental Field Survey Report, Appendix A, attached as Appendix B2 to this ESIA report.

2.2.2.2 Archaeological Field Survey (Omaruru - Otjiwarongo Section)

The site visits for the Otjiwarongo to Omaruru section was conducted on the 20th of April 2022 whereas the Omaruru to Kranzberg section on 21 April 2022.

A detailed archaeological investigation was undertaken during May 2022 in relation to the objectives in the ToR of the baseline report. This archaeological impact assessment followed a basic three-phase process of evaluation – the desk study (step 1) where a scoping/ baseline report was produced followed by assessment based on field survey (step 2) involving detailed field investigation (current report) including management plans (step 3). Field investigation fulfilled conditions in the Heritage Research Permit 2/2022 from the National Heritage Council. Therefore, both primary and secondary data sources were applied. Interviews with local communities (near Omaruru and Kalkfeld) were crucial in this study and these were supplemented by field investigations. The existing railway service road was used to access most localities identified in the baseline report. The evaluation of the site's significance and vulnerability rating followed the Guidelines of the National Heritage Council (2021) (see Chapter 5) developed by the Quaternary Research Services (Kinahan 2012).

2.2.2.3 Soil Sampling Survey

Soil sampling for the Project was conducted according to a Centreline Materials Survey as per the Namibian Roads Authority Materials Manual Rev 2014-10. A total of 79 samples were taken every 5,000m for the entire 395,000m of the Project Site between Kranzberg Station and Tsumeb. The purpose of the centreline materials survey was to establish the quality of the materials in the area available for construction. Soil samples also gave an indication of dust and erosion qualities of the soil in the Project Site.

Photos 2.2.2.3-1 & 2.2.2.3-2 - Soil Sampling

2.2.2.4 Socio-economic Opinion Collection & Questionnaire

Opinions, comments, and concerns were gathered from stakeholders through the elaborate stakeholder engagement phase (see Chapter 6) and a questionnaire. Opinions, comments, and concerns have been taken into consideration and have been included as part of the Study and Project. These are presented within Chapter 6 of this ESIA.

2.3 ASSESSMENT OF PROJECT IMPACT/S

Given the nature of the proposed Project (see Chapter 4), evaluated against the sensitivity of the receiving environment (see Chapter 5), various impacts on the immediate and surrounding receiving socio-economic and biophysical environments can be expected. An understanding of these expected impacts together with active control measures and mitigating factors can minimise such impacts, even avoid impacts in certain cases, as presented in Chapter 8.

Each of the potential impacts identified during the baseline assessment was screened according to a set of questions (Figure 2.3-1), which resulted in highlighting those impacts that can be mitigated within the framework of the baseline study (i.e., general impacts) and the key impacts or VECs that required further assessment and mitigation formulation to avoid or minimise the expected impact/s.

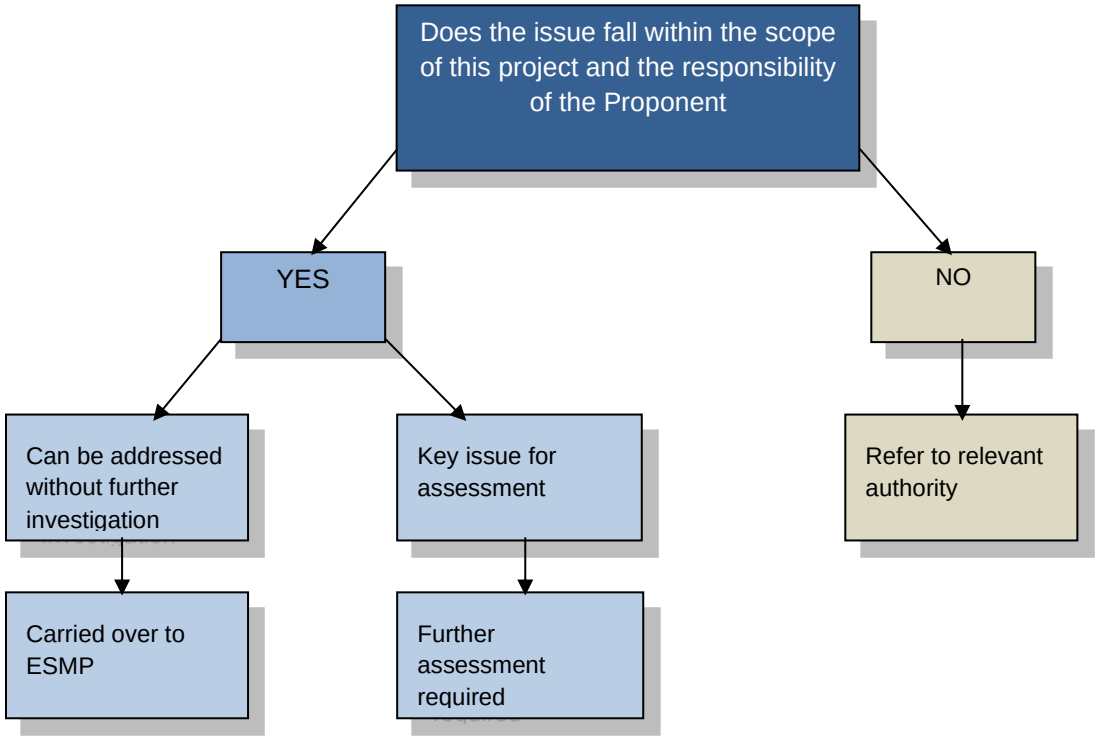


Figure 2.3-1 - Screening process for determining key impacts (VECs)

2.3.1 Sources of Impact Considered

Following the project initiation briefing by Windhoek Consulting Engineers (WCE) on the proposed Project, a systematic process was followed whereby the Project's activities were broken-up and further dissected to establish which activities would have a direct and indirect effect on the selected VECs. These sources of impact by Project phase: i.e., pre-construction, construction, and operation (including maintenance), are listed in bullet format below.

Pre-construction Phase:

- Land acquisition & compensation – Discussions with affected landowners for land and compensation.

Construction Phase:

- Clearing of grass-, shrub-, tree- and other vegetation species where required for the railway line, borrow pits quarries and laydown areas;
- Opening-up and excavation of areas for the abstraction (i.e., borrow pits & quarries), transportation (i.e., roads) of material to the railway servitude and storage thereof;
- Sinking of new boreholes and abstraction of water or collecting water from existing water network for purpose of construction of new railway embankments;
- Temporary construction camps and laydown areas;
- Introduction of workers and job seekers into the receiving environment;
- Transportation of material (i.e., concrete sleepers; railway tracks, ballast) to the new railway section and assembly of railway line on top of new embankments;
- Transportation of water for purpose of construction of embankments, bridges and stormwater drainage structures;
- Management and storage of waste, hazardous substances, and other materials to be removed, including hydrocarbons;
- Construction of new embankments, bridges, and stormwater drainage structures;
- Laying of concrete sleepers, railway tracks, and ballast stone;
- Removal of old railway sleepers, railway tracks and ballast stone (that which cannot be reused);
- Transportation of construction workers from nearby urban areas to the railway line;
- Temporary accommodation and ablution of construction personnel along the railway line within the rail reserve;
- Installation of traffic safety signs; and
- Site clean-up, de-establishment, and rehabilitation of disturbed areas.

Operational Phase:

- Railway infrastructure operations and management; and
- Railway infrastructure maintenance and repairs.

2.3.2 Impacts Considered

Considering the sources of impact, the following impacts were identified, which were subject to further assessment (Chapter 8) and identification of appropriate mitigation measures (Chapter 10):

- Loss of agricultural land and change in land use (farms);
- Loss of peri-urban land (Otjiwarongo & Omaruru);
- Health, safety, and wellbeing;
- Crime (theft, poaching, stock theft, trespassing, violence);
- Habitat destruction and loss of biodiversity;
- Ground and surface water pollution;
- Natural resource impact (i.e., ground water over abstraction);
- Soil erosion and sedimentation;
- Dust and emissions;
- Noise and vibration;
- Feld fires and loss of agricultural land, wildlife and stock;
- Visual and sense of place;
- Traffic safety;
- Restriction in movement and related economic losses;
- Exploitation of women and children and people with disabilities; and
- Violence, spreading of HIV AIDS, TB and other illnesses.

2.3.3 Mitigation Measures

There is a hierarchy of actions which can be undertaken to respond to any development or activity. These cover avoidance, minimisation, and compensation. It is possible and considered sought after to enhance the environment by ensuring that positive gains are included in the development. If negative impacts occur then the hierarchy, as a guiding philosophy, recommends the following steps.

Impact avoidance: This step is most effective when applied at an early stage of project planning. It can be achieved by:

1. Not undertaking certain actions or elements that could result in adverse impacts;
2. Avoiding areas that are environmentally sensitive; and
3. Putting in place preventative measures to stop adverse impacts from occurring.

Impact minimisation: This step is usually taken during impact identification and prediction to limit or reduce the degree, extent, magnitude, or duration of adverse impacts. It can be achieved by:

4. Scaling down or relocating the proposal;
5. Redesigning elements of the project; and
6. Implementing mitigation measures to manage the impacts.

Impact compensation: This step is usually applied to remedy unavoidable residual adverse impacts. It can be achieved by:

7. Rehabilitation of the affected site or environment, for example, by habitat enhancement;
8. Restoration of the affected site or environment to its previous state or better; and
9. Replacement of the same resource values at another location (off-set), for example, by wetland engineering to provide an equivalent area to that lost to drainage or infill.

2.3.4 Characterization of Impact

All impacts, both the general- and key impacts, were evaluated in terms of duration (time scale), extent (spatial scale), intensity (magnitude), probability, and status, in combination providing the expected significance.

The means of arriving at the different significance ratings is explained in Table 2.3.4-1 below. This criterion is used to ascertain the *significance* of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The significance of an impact is derived by considering the temporal and spatial scales and magnitude. Such significance is also informed by the context of the impact, i.e., the character and identity of the receptor to the impact.

Table 2.3.4-1: Criteria for impact evaluation

CRITERIA	CATEGORY
Impact	This is a description of the expected impact
Nature	**Positive** – environment overall will benefit from the impact **Negative** – environment overall will be adversely affected by the impact **Neutral** – environment overall will not be affected
Geographic Extent	The extent of an impact refers to the geographic area over which the impact will be felt. **Site Specific:** Expanding only as far as the activity itself *(onsite)* **Local:** Restricted to immediate environment within 5 km of the site

CRITERIA	CATEGORY
	Regional: Within the Karas region **National:** Within Namibia
Duration	Reviews the lifetime of the impact, as being - **Very short** – days, <3 days **Short** - days, <1 month) **Medium** - months, <1 year **Long** - years, 1 -10 years **Permanent** - >10 years
Intensity	The intensity of the impact indicates the degree to which the assessed VECs are disturbed. The evaluation shall consider the VECs sensitivity and ability to accommodate to change as a result of a project activity. **None** (No environmental functions and processes are affected); **Low** (Environmental functions and processes are negligibly affected); **Medium** (Environment continues to function but in a noticeably modified manner); **High** (Environmental functions and processes are altered such that they temporarily or permanently cease and/or exceed legal standards/requirements).
Probability	Considers the likelihood of the impact occurring and is described as – **Improbable** (low likelihood), **Probable** (distinct possibility), **Highly probable** (most likely) or **Definite** (impact will occur regardless of prevention measures).
Significance / Magnitude **(without mitigation)**	The magnitude of the impact reflects the intensity of the impact, its extent, and its duration. **None** (A concern or potential impact that, upon evaluation, is found to have no significant impact at all) **Low** (Any magnitude, impacts will be localised and temporary. Accordingly, the impact is not expected to require amendment to the project design) **Moderate** (Impacts of moderate magnitude locally to regionally in the short term. Accordingly, the impact is expected to require modification of the project design or alternative mitigation) **High** (Impacts of high magnitude locally and in the long term and/or regionally and beyond. Accordingly, the impact could have a “no go”

CRITERIA	CATEGORY
	implication for the project unless mitigation or re-design is practically achievable)
Mitigation	Description of possible mitigation measures
Significance / Magnitude (with mitigation)	**None** (A concern or potential impact that, upon evaluation, is found to have no significant impact at all) **Low** (Any magnitude, impacts will be localised and temporary. Accordingly, the impact is not expected to require amendment to the project design) **Moderate** (Impacts of moderate magnitude locally to regionally in the short term. Accordingly, the impact is expected to require modification of the project design or alternative mitigation) **High** (Impacts of high magnitude locally and in the long term and/or regionally and beyond. Accordingly, the impact could have a "no go" implication for the project unless mitigation or re-design is practically achievable)
Confidence level	The degree of confidence in the predictions, based on the availability of information and specialist knowledge. **Low** (based on the availability of specialist knowledge and other information) **Medium** (based on the availability of specialist knowledge and other information) **High** (based on the availability of specialist knowledge and other information)

The table below (Table 2.3.4-2) present the assessment of both pre-mitigation and post-mitigation or residual impact. The list of key impact or VECs that were subjected to further assessment is presented in Table 2.5-1, as per the evaluation criteria presented in Table 2.3.4-1 above.

Table 2.3.4-2 - Example of the Pre-Mitigation Impact Summary Table

CRITERIA	DESCRIPTION
Nature	Loss of topsoil as a result of erosion and downstream sedimentation
Status (+ or -)	Negative
Extent	Local

Duration	Short
Intensity	Very short
Probability	Probable
Significance (no mitigation)	**None**
Mitigation	See table 10.2-1
Significance (with mitigation)	**None**
Confidence level	High

2.4 SPATIAL BOUNDARIES

Three levels of spatial boundaries have been identified and considered as part of this ESIA study:

- The Primary Project Area (PPA) being the area defined by the existing and proposed 60m railway servitude combined, as well as the deviations to the east and west thereof and nearby outcrops, plain areas and rivers/drainage lines for the extend of the area from Kranzberg Station to Otjiwarongo. The PPA is expected to be directly affected during the construction phase;
- The Secondary Project Area (SPA) is defined as the area extending from the PPA into adjacent farms and urban areas where certain project impacts can be expected;
- The Regional Project Area (RPA) includes the broader geographical zone used to capture the regional context and where some potential Project impact can be expected for a reduced number of valued components.

Spatial boundaries for the Environmental Field Survey were limited to the PPA. At this stage of the Study, borrow pits on adjacent farms for the Project, i.e., SPA, have not been identified yet. Once the geotechnical survey has been completed the study will include and consider the applicable areas.

For the Ecology Baseline Description, the PPA as well as the general area, with similar ecological features around it, were described and taken into consideration during the ESIA. The SPA for the Ecological Baseline Description thus covers an area of approximately 10 km to each side of the railroad. Borrow pits that will be selected during the construction phase of the Project will fall within the SPA.

The RPA becomes applicable in considering the Climate Change Risk Assessment (CCRA) and the hydrogeological baseline characteristics. For the CCRA, Namibia as an arid country were studied, but the RPA for the CCRA specifically covers the regions of Erongo-, Otjozondjupa- and Oshikoto, as well as the Khomas Region where Namibia's institutional headquarters are situated.

2.5 VALUED ENVIRONMENTAL COMPONENTS (VEC)

This ESIA study focus on VECs that have an important environmental and social interest to affected farmers and local communities, as well as regulatory authorities that are likely to be directly or indirectly affected by the construction activities of the proposed Project.

The receiving social and natural environment's characteristics (i.e., PPA, SPA & RPA) define the sensitivities to be considered during the planning, construction, and operation of the Project. Subsequently Valued Environmental Components (VECs) were directly identified following the baseline assessments, field survey and public consultations. These VECs are further evaluated in the Impact Assessment and Mitigation chapter (Chapter 8).

Further VECs were identified using specialist input, experience on previous EIAs of similar projects conducted in the region and guidance from the International Finance Corporation (IFC) Performance Standards and Guidelines.

Chapter 5 of this ESIA report provides baseline information according to which the likely negative and positive impacts of the Project was assessed, as well as the significance thereof (as presented in Chapter 8), which in turn will inform the need for any further detailed assessments and/or applicable mitigating measures.

Table 2.5-1 is a diagrammatic presentation of selected VECs and an explanation of the influence each might have on the Project.

2.6 SOCIAL ACCEPTABILITY ASSESSMENT

Although stakeholders have not indicated any objection to the proposed Projects, a general concern about the successful operation of the new infrastructure, once construction has been completed, has been raised. From past experiences, it can be stated that social acceptability of a project generally increases as the project progresses, with the understanding that the expectations of stakeholders are met, and that effective project monitoring and management is done.

In the absence of a socio-economic survey and site visit, detailed information and individual opinions could not be considered, but rather comments and concerns expressed at the public consultation meetings were taken into consideration.

2.7 CUMULATIVE IMPACT ASSESSMENT

Cumulative impacts are defined as “impacts that result from the successive, incremental and/or combined effects of an action, project, or activity, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably anticipated future ones at the time the risks and impacts identification process is conducted” (International Finance Corporation, 2013).

The Project’s cumulative impact assessment is done through a combined evaluation of the Project impact, together with those of other projects that have occurred in the past in the sector, and of existing projects or of projects that are currently planned in the area and its surroundings. This is dependent on available baseline information and foreseeable impact of future projects. Unless accurate data is available, the environmental effects of projects, other than the main Project, are estimated based on the typical effects resulting from similar projects.

Given the lack on accurate data applying to other projects, it is therefore appropriate, based on available information or logical assumptions by professional judgement from the specialists, to list the environmental effects that can be combined with the impact of the Project, resulting in cumulative impact.

Cumulative impacts are presented in section 8.5 of Chapter 5.

Table 2.5-1 - Diagrammatic presentation of selected VECs

Valued Environmental Component (VEC)	Motivation for Identifying as an VEC	Baseline description	Environmental Assessment	Possible impacts
Physical Environment				
Climate	Climatic conditions of the project area are described to give an understanding of the vulnerability of the receiving environment. It also gives an understanding of the conditions in which construction and operational activities will take place. Climate conditions are also linked with several other dimensions of the biophysical environment. Baseline climate conditions are documented in the Description of Baseline Condition chapter (Chapter 5) to fully describe the Project's environmental setting. However, this subcomponent is not further considered in the impact assessment as the construction and operation activities will not have any impact on the climate conditions.	Yes	No	Change in climate conditions
Air quality	Ambient air quality affects human well-being and health. Air quality might be affected during construction due to dust emissions from heavy construction vehicles and activities. Dust nuisance is assessed under Soil. Once the railway line is in operation, increasing number of trips can also generate atmospheric contaminants. Considering the status ambient quality, distance to the closest receptor during construction and low level of dust to be generated air quality per say is not further investigated.	Yes	No	Deteriorating air quality
GHG emissions	Greenhouse gases (GHGs) are known to contribute to global warming and climate change. Namibia is party to the 1992 United Nations Framework Convention on Climate Change and has a responsibility towards Climate Change mitigation measures. This project is in line with Namibia's Policy on Climate Change and the Climate Change Action Plan to reduce GHG emission with the understanding that freight transported via railroad instead of trucks on roads cause less CO^2 emissions.	Yes	No	Rising emissions
Noise levels	Ambient noise is important as it may affect human well-being and health. Construction activities as well as running trains during operation may result in increased noise levels, especially in urban areas and was accordingly identified as a VEC.	Yes	Yes	Noise and vibration
Geology	Geology must be considered as part as the project design by the engineers. These are accordingly presented in the Description of Baseline Condition chapter (Chapter 5), but will not be further considered in the impact assessment as the construction and operation activities will not have any impact on these components of the physical environment.	Yes	No	N/A
Topography	Railway line infrastructure has a horizontal gradient limitation and topography accordingly plays an important role during design. Construction of embankments at certain areas may result in erosion. Consequently, topography is documented in the Description of Baseline Condition chapter (Chapter 5) to provide an overview, but is not further considered in the impact assessment as the construction and operation activities will not have any impact on topography.	Yes	No	Railway line alignment
Hydrology	Some areas along the railway line have been subject to flooding. Efficient drainage storm waters are important to minimize the impact on surrounding communities. This component is accordingly presented within the Description of Baseline Condition chapter (Chapter 5) and carried forward to be evaluated in the Impact Assessment and Mitigation chapter (Chapter 8).	Yes	Yes	Flooding

Valued Environmental Component (VEC)	Rationale for selection	Baseline description	Environmental Assessment	Possible impacts
Surface water quality	The existing and proposed railway alignment crosses various seasonal rivers and smaller water courses. Construction activities may impact surface water quality during the rainy season, especially through erosion and sediment transport by runoff water. Given that the railway does not cross any perennial rivers surface water is not expected to be significantly affected by the construction and operational activities and is accordingly not further considered.	Yes	No	Deteriorating surface water quality
Groundwater quantity	The Project is located within the Omaruru River Basin, located on a watershed and as a result has limited underground water available. Underground water is supplemented mainly by rainfall confirming that contamination from construction or operation activities are of concern. Water within the area, predominantly obtained via boreholes, is extensively used for domestic, agricultural, and industrial uses. Additional use of groundwater for the Project is expected to influence groundwater volumes and sustainability. As a result, a Hydrological Input and Assessment of the Groundwater Potential (Appendix B) was undertaken as part of this ESIA and considered in the impact assessment (Chapter 8).	Yes	Yes	Over abstraction and lower water volumes
Groundwater quality	The railway line crosses various rivers and drainage lines where bridges will be constructed. These rivers are known to be supplied mainly by rainfall confirming that contamination derived from construction or operation activities could have an impact on groundwater. As a result, this component is described in the Description of Baseline Condition chapter (Chapter 5) and considered in the impact assessment (Chapter 8).	Yes	Yes	Deteriorating groundwater quality
Soil stability/erosion/quality	Considering certain section of the railway line, those where infilling and build-up (i.e., embankments) would require to be flatted, the natural topography, erosion and/or sedimentation are likely to occur. Spillages during construction can occur and need to be addressed as per the requirements of the ESMP. This aspect is accordingly presented within the Description of Baseline Condition chapter (Chapter 5) and the possible impact evaluated in the impact assessment chapter (Chapter 8).	Yes	Yes	Habitat destruction and loss of biodiversity
<u>Bio-physical Environment</u>				
Flora	Most of the new alignment will be within the existing 60m railway servitude, which has been subjected to habitat disturbance already. Existing vegetation cover in the servitude can be defined as short herbaceous and shrubby vegetation, typical of disturbed land. To the side of the railway reserve several terrestrial habitats are likely to be affected, although very small given the extent of the proposed deviations. Considering the importance of habitats and flora within the larger ecological system, flora and their related habitat are considered a VEC, and are accordingly covered within the Description of Baseline Condition chapter (Chapter 5) and project impact assessment chapter (Chapter 8).	Yes	Yes	Habitat destruction and loss of biodiversity
Grass		Yes	Yes	
Shrubs		Yes	Yes	
Trees		Yes	Yes	
Other species		Yes	Yes	

Valued Environmental Component (VEC)	Rationale for selection	Baseline description	Environmental Assessment	Possible impacts
Fauna	Considering the existence of a railway line and maintenance activities within the 60m servitude (i.e., direct study area), the habitat for fauna has been heavily disturbed with resulting affects. The directly affected study area is accordingly not considered as sensitive anymore, although some species of smaller mammals, reptiles, birds, etc. are expected. Threatened and/or endemic fauna are known and expected within the larger area, surrounding the study area. Given the existence of fences and the existing railway alignment, restrictions in movement and resulting affect are not considered significant. The proposed railway alignment crosses non-perennial rivers and drainage lines, which may be affected by habitat degradation through pollution and sedimentation or hydrological changes during construction and operation. Riverine habitats are important to numerous flora and fauna species and are as a result considered a VEC. This VEC is presented in the Description of Baseline Condition chapter (Chapter 5) and evaluated in the Impact Assessment and Mitigation chapter (Chapter 8).	Yes	Yes	Loss of fauna species
Insects		Yes	Yes	
Reptiles		Yes	Yes	
Amphibians		Yes	Yes	
Mammals		Yes	Yes	
Avifauna		Yes	Yes	
<u>Social environment</u>				
Population, Land Development, Use and Occupation; livelihood activities	This component relates to the characteristic of the population living or undertaking activities in the vicinity of the highway or in the Road Reserve. The study area is predominantly confined to the 60m railway reserve with some deviations into adjacent commercial farmlands, of limited extent. Small pockets of land will be taken up by borrow pits. In addition, the railway line passes through the towns of Otjiwarongo, Otavi, Tsumeb and Grootfontein. Land use along the larger part of the railway line is 'commercial agriculture', which includes cattle farming and game farming, as well as tourism. Commercial agriculture, game farming, conservation and tourism play a very important role within the area and larger Region's economy. The proposed Project may have effects on touristic activities during construction through the creation of nuisances. Poaching, theft and feld fires, either as a direct or indirect result of construction activities is currently of great concern and has been raised by the I&APs as an aspect of the Project to be effectively addressed and managed. The proposed Project, as per the alternative alignments, is not expected to result in any resettlement of people. The loss of agricultural land to provide for the railway line deviations will be discussed and compensation paid to the applicable landowners. The consultation with affected landowners and compensation discussion will follow the geotechnical studies during which time the borrow pits will also be discussed with the affected landowners. Compensation will be done by the MLR and is accordingly excluded from the scope of the ESIA. Land uses and population is discussed in the Description of Baseline Condition chapter (Chapter 5) and the expected impacts evaluated in the Impact Assessment and Mitigation chapter (Chapter 8).	Yes	Yes	Loss of land, resettlement, loss of income, negative socio-economic results

Valued Environmental Component (VEC)	Rationale for selection	Baseline description	Environmental Assessment	Possible impacts
General Health and Safety	Construction and operation of the proposed Project is expected to have some impacts to the neighbouring residents' general health and safety. There are various direct and indirect impacts associated with construction related activities, which can affect quality of life, well-being, movement, nuisance, and the health and safety of surrounding communities. Influx of workers and job seekers may impact communities through nuisances, increased traffic, and social problems among others. Uncontrolled access to neighbouring farms via the railway servitude, poor hygiene facilities (i.e., lack of toilets) and feld fires as a resulting of open fires is currently of great concern and has been raised by the I&APs as an aspect of the Project to be effectively addressed and managed. This VEC is accordingly discussed in the Description of Baseline Condition chapter (Chapter 5) and the impacts evaluated in the Impact Assessment and Mitigation chapter (Chapter 8).	Yes	Yes	Deteriorating health conditions and safety risks
Labour Conditions	Social impacts associated with poor labour conditions can lead to significant reputational risk for the Project, which is accordingly covered within the Description of Baseline Condition chapter (Chapter 5) and addressed in the Impact Assessment and Mitigation chapter (Chapter 8).	Yes	Yes	N/A
Vulnerable and Marginalized Groups (VMGs)	The Project does not directly affect any groups of people considered historically underserved. Consultative engagements with the organisations representing the VMG`s affirmed the unemployment challenges which is affecting the majority of their members. This aspect is addressed in the Description of Baseline Condition chapter (Chapter 5) and Impact Assessment and Mitigation chapter (Chapter 8).	Yes	Yes	Un-manageable labour practices and deteriorating health and safety risks
Gender aspects	Given that good international practices recommend that an ESIA dedicate a section to women's' challenges and risks associated with labour influx, such as gender-based violence, this aspect addressed in the Description of Baseline Condition chapter (Chapter 5) and Impact Assessment and Mitigation chapter (Chapter 8).	Yes	Yes	Exploitation of women and children for sexual activities; physical abuse and violence associated with alcohol abuse; neglect of woman and children left behind by construction workers

3 LEGAL, REGULATORY AND INSTITUTIONAL FRAMEWORKS

To ensure environmental protection and sustainable renewable resource management to the benefit of all, legislation from different spheres under control of different Ministries have been adopted and enacted by Parliament.

There are several sectoral laws that fall under the general rubric of environmental laws. Sectoral laws are generally specific and apply to sectors such as forestry, water, mining and so forth. Any development, such as the proposed Project, is expected to have certain impacts and would therefore have to comply with some or other legislative requirement/s before commencement.

This chapter of the ESIA Report presents the legal and regulatory aspects that are relevant to the preparation of the ESIA, as well to the Project. Other relevant national regulations and policies are discussed along with International Finance Corporation (IFC) performance standards, and international conventions and treaties to which Namibia is a party. The institutional framework, capacities and strengthening proposals are also presented. This chapter of the ESIA is done in compliance with Equator Principle 3.

3.1 CONSTITUTIONAL REQUIREMENTS FOR ENVIRONMENTAL PROTECTION (1990)

Namibia's environmental policies are based on the requirements of the Namibian Constitution to endorse the concept of sustainable development. The Constitution of the Republic of Namibia (1990) is the principal and guiding supreme legislation whereby the country commits itself to sustainable development through environmental protection and wise resource management.

Article 95 (1) of the Constitution covers environmental and social sustainability by promoting the welfare of the people through protection of the environment, according to which this Project will be conducted.

> *"…the State shall actively promote and maintain the welfare of the people by adopting, inter alia, policies aimed at… maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of natural resources on a sustainable basis for the benefit of all Namibians both present and future.*"

Article 100 of the Constitution further provides that all natural resources (i.e., water, soils, plants, and wild animals), are vested in the state, unless otherwise legally owned. The use of such resources is only allowed within reasonable limits and beyond such limits, permission should be obtained from a competent authority (for instance a line ministry) responsible for the use and governance of the concerned natural resources. Natural resource (i.e., water and soil) for the Project, which is owned by Government, will be sourced from neighbouring Farms, as provided for by Article 100, with the consent of the applicable landowner, as provided for by the Constitution (Articles 5 & 13).

The responsibility of Government to promote socio-economic development through projects of different kinds is addressed throughout the Constitution. In accordance with the Constitution, it is thus necessary that the right of the individual is respected and that socio-economic development to all Namibia's is achieved through infrastructure development and international trade agreements.

The Constitution does not address the requirement for environmental impact assessment per se, which is addressed by the Environmental Management Act (No. 7 of 2007).

The Constitution therefore commits the State to actively promote and sustain environmental and social welfare of the nation by formulating and institutionalising policies to accomplish sustainable development objectives, as presented in Vision 2030, National Development Plans and National Acts.

3.2 POLICY PROVISIONS

3.2.1 Vision 2030

Namibia adopted Vision 2030 in 1994, a policy framework for Long-Term National Development presenting the Country's development programmes and strategies to achieve its national objectives. Vision 2030 focuses on eight themes to realise the Country's long-term vision. These are:

- Inequality and social welfare;
- Human resources development and institutional capacity building;
- Macro-economic issues;
- Population, health, and development;
- Namibia's natural resources sector;
- Knowledge, information, and technology; and
- Factors of the external environment.

The concept of social and environmentally sustainable development to promote socio-economic welfare is the cornerstone on which Vision 2030 was based. Namibia has subscribed to this approach in its National Constitution, and has committed itself internationally, by adopting the United Nations Agenda 21 principles.

Vision 2030 is built on the National Development Plans (NDP), which contains a five-year development strategy focusing on Sustainable Development Goals (SDG`s), which includes economic progression, social transformation, environmental sustainability, and good governance.

The Project, i.e., upgrade of the railway line, will indeed contribute to achieving the goals set by Vision 2030, but should be done in such a manner as to ensure sustainable social and environmental practises during all phases (i.e., construction phase and the operational phase).

3.2.2 Namibia's 5th National Development Plan

The Fifth National Development Plan (NDP5) is the fifth in the series of seven five-year national development plans, which outline the objectives and aspirations of Namibia's long-term vision as expressed in Vision 20130.

The strategies of relevance to the Project are –

- Rural Economic Development Strategies, which focuses on –
  - **Improve rural development through sustainable infrastructure**;
  - **Develop and promote community based and social enterprises**;
  - Train rural communities in the sustainable use of natural resources;
  - Strengthen planning structures to foster sustainable rural economic development; and
  - Improve the land tenure system.
- Transport And Logistics Strategies, which focuses on –
  - Implement the Transport and Logistic Master Plan;
  - **Upgrade** road, **rail**, port and aviation **infrastructure to world class standards**; and
  - Expand the capacity of the Walvis Bay port.
- Strengthened Export Capacity and Greater Regional Integration Strategies, which focuses on –
  - Increase export potential by focusing on greater industrialization;
  - **Leverage Namibia's membership within SACU and SADC**;
  - **Collaborate with regional neighbours**; and
  - Standardize customs procedures with regional neighbours to facilitate trade.
- Conservation and Sustainable Use of Natural Resources Strategies, which focuses on –
  - **Strengthen sustainable land management**;
  - Safeguard ecosystems, species, and genetic diversity;
  - Enhance value addition and the sustainable utilization of biodiversity; and
  - Sustain environmental awareness campaigns.

- Environmental Management and Climate Change Strategies, which focus on –
  - Strengthen environmental protection; and
  - **Promote environmentally sound investments** and production systems.

Namibia´s National Development Plan 5 propagated the vision of transforming Namibia as a whole nation into an international logistics hub for SADC region by 2025.

The focus of the Project should thus be to achieve these mentioned high-level strategies, which can be summarised as follows:

- Increase the prosperity of the Namibian people, and must contribute to an increased standard of living;
- Ensure sustainable economic growth and strive to achieve environmentally sustainable outcomes; and
- Transparent planning, ensuring consultative participation of the people during both the planning-, construction- and operational phases.

3.2.3 The Harambee Prosperity Plan II

The Harambee Prosperity Plan II (covering the period 2021-2025) builds on the solid foundation of the inaugural HPP 2016-2020. It continues to prioritise the implementation of targeted policy programmes to enhance service delivery, contribute to economic recovery and engender inclusive growth.

The HPPII remains a targeted Impact Plan, consisting of prioritised short to medium term goals and strategic actions to accelerate national development towards Vision 2030.

One of the major objectives of Government and of this Project in particular, is to extend economic opportunities and entrepreneurial capacity to all localities by the optimum utilisation of the resources existing in the vicinity of projects, the development of these resources in the execution of the project, and by maximising the amount of project funds retained within the project locality.

3.2.4 Environmental Assessment Policy for Sustainable Development and Environmental Conservation (1995)

Namibia's Environmental Assessment Policy was the first formal effort in the Country to regulate the application of environmental impact assessment (EIA) that was endorsed by Cabinet and published in 1995 (MET, 1995). The Policy provides for the procedure to be followed in conducting an environmental assessment (EA), as well as a list of policies, programs and projects for which an EA is required (Annexure B of the Policy) whether initiated by the government or the private sector.

Namibia`s Environmental Assessment Policy details the principles of achieving and maintaining sustainable development that support all policies, programmes and seek to

ensure that the environmental consequences of development projects and policies are considered, understood, and incorporated into the planning process, and that the term 'environment' (in the context of IEM and EA's) is broadly interpreted to include biophysical, social, economic, cultural, historical, and political components.

The Policy has since the implementation of the Environmental Management Act (Act No. 7 of 2007) been replaced by the mentioned Act.

3.2.5 Namibian Transport Policy (2018)

In 2018, the Ministry of Works and Transport, with support from GIZ, launched the Namibian Transport policy. The aim is an integrated, sustainable, and inclusive transport system, cognisant of the requirements of Namibia's international and regional network connectivity and the welfare of its citizens.

The transport policy document is aligned to the legal frameworks/instruments including national policies (such as NDP IV, Vision 2030, etc.), as well as the regional and international protocols and conventions ratified by Namibia.

Chapter 4 of the Policy provides a summary of the key policy reforms in the rail transport sub-sector, calling for infrastructure expansion and upgrading, improved service delivery and save transport, business realignment and involvement of the private sector, which is the main objective of the Project. Chapters 8 and 9 provide a summary of the main crosscutting policy reforms relating to social and environmental aspects of Transport. The social strategies focus on the spreading of HIV and other diseases, promote gender equality in the sector, and assisting people with disability. The environmental strategies focus on the protection of the environment and to respond to the challenges of climate change, all in line with international requirements.

The Policy takes cognisance of climate change stating that investment decisions will apart from lifetime cost, economic, social, and other returns on the investment to the country; returns to the transport system itself; and returns to the customer of the investment decision also considers resilience to climate changes impacts.

In terms of the 2018 Namibian Transport Policy, the current rail management arrangement is not compliant with administrative law, as TransNamib is a functionary in the areas of railway operations and management, as well as responsible for oversight of these activities. As part of its development strategy, the Policy suggests a separation of infrastructure (retained with government) from operations (engaging private operators). The Policy suggests that an institutional restructuring of the present rail sector is needed, which will be linked to the legislative changes, to provide for among other things, open network access (MR Technofin Consultants Ltd., March 2022).

3.2.6 Expropriation and Compensation

Considering the realignment of the railway line and resulting passing of the railway over adjacent private owned land and/or the railway servitude extending into adjacent privately owned land, compensation of the loss of land becomes applicable.

According to Article 16(2) of the Namibian Constitution, expropriation of property in the public interest by the State must be subject to the payment of "just compensation". Part IV of the Agricultural (Commercial) Land Reform Act (No. 6 of 1995) deals with compulsory acquisition of agricultural land and in specific compensation for land, to be done within a sustainable and lawful manner. Although it does not specify the amount of compensation to be paid for land that is expropriated, it does establish relevant criteria for the assessment of the amount to be compensated.

In addition to the Constitution addressing compensation, there are two pieces of legislation governing the acquisition of land for public purposes, namely the Expropriation Ordinance 19 of 1978 as amended and the Railway Expropriation Act No 37 of 1955, as amended (Urban Dynamics Africa, December 2006). Given the procedures to be followed, which are long and cumbersome, the Ministry of Works and Transport normally opts to first negotiate with landowners by requesting them to submit a claim for losses of improvements, land use and property taken, i.e., the route of compensation for losses is preferred and will accordingly be applied for the Project.

In international law, the payment of compensation is also a prerequisite for the valid expropriation of private property by a sovereign state. The international standard is in line with the "Hull formula", enunciated by United States Secretary of State Cordell Hull in 1938 and subsequently adopted by industrialised nations. This formula requires that compensation must be "prompt, adequate and effective" (Dr. C. Treeger, May 2004).

In the absence of a compensation policy for railway projects, the Roads Authority Compensation Policy will be used and applied for this Project. Compensation will be done by the Ministry of Agriculture, Water and Land Reform, which falls outside of the scope of this ESIA.

In accordance with the Constitution, above mentioned Acts and Policy, the Government must make prompt and reasonable payment for land acquisition compensation.

The Project will use the current railway servitude (60m) for the construction of the new railway, but in case where the new alignment will have to pass over adjacent private owned land there will be a need for land acquisition. The Proponent in collaboration with the Ministry of Agriculture, Water and Land Reform will address all issues related to land acquisition and compensation before the project commences.

3.2.7 Namibia's Second National Biodiversity Strategy and Action Plan (2013-2022)

Namibia's Second National Biodiversity Strategy and Action Plan (NBSAP2) is a strategic and planning instrument with a multi-sectoral approach and national coverage, relating to the

period 2013-2022. The vision of NBSAP2 is for Namibia's biodiversity to be healthy and resilient to threats, and the conservation and sustainable use are key drivers of poverty alleviation and equitable economic growth, particularly in rural areas. NBSAP2 has five key strategic objectives. There are a total of 17 targets, closely aligned to the Aichi Targets. In line with the CBD Strategic Plan (2011-2020), the strategic goals of NBSAP2 are to: 1) address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society; 2) reduce the direct pressures on biodiversity and promote the sustainable use of biological resources; 3) improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity; 4) enhance the benefits to all from biodiversity and ecosystem services; 5) enhance implementation of NBSAP2 through participatory planning, knowledge management and capacity building.

The instrument aims to help eliminate food insecurity. Strategic Goal 3 to improve the status of biodiversity by safeguarding ecosystems, species, and genetic diversity) gives special attention to genetic diversity, which offers opportunities for more climate resilient agriculture and improved food security. Strategic initiatives are foreseen to maintain and enhance the genetic diversity of livestock and crop species through effective in-situ and ex-situ conservation measures and the safe use of biotechnology to improve food security and climate resilience of agriculture.

Biodiversity conservation and sustainable use of natural resources are considered for purposes of reduction of rural poverty.

Furthermore, NBSAP2 seeks to increase the resilience of livelihoods to disasters. In accordance with Target 9, by 2016 ecosystems most vulnerable to climate change and their anthropogenic pressures shall be identified, and by 2018 appropriate adaptation measures shall be developed and implemented in priority areas.

3.2.8 National Policy on Climate Change for Namibia (2011)

The National Policy on Climate Change (NPCC) pursues constitutional obligations of the Government of the Republic of Namibia, namely for the state to promote the welfare of its people and protection of Namibia's environment for both present and future generations.

The policy seeks to outline a coherent, transparent, and inclusive framework on climate risk management in accordance with Namibia's national development agenda, legal framework, and in recognition of environmental constraints and vulnerability. Similarly, the policy takes cognizance of Namibia comparative advantages with regard to the abundant potential for renewable energy exploitation.

The goal of the National Policy on Climate Change is to contribute to the attainment of sustainable development in line with Namibia's Vision 2030 through strengthening of national capacities to reduce climate change risk and build resilience for any climate change shocks.

The Policy specifies the importance of taking into consideration future climate change in the design and construction of any infrastructure related project, which should equally be

considered for this Project. Section 5.6 of the National Climate Change Policy includes sustainable energy and exploration of low carbon development.

3.2.9 National Climate Change Strategy & Action Plan 2013 – 2020

It was recognized that National Policy on Climate Change (NPCC) of 2011 is in itself not enough, and that a more specific framework in the shape of a Strategy and Action Plan is needed. Namibia thus formulated a Climate Change Action Plan, the National Climate Change Strategy & Action Plan 2013 – 2020 (NCCSAP). The NPCC was thus implemented through the NCCSAP to deal with the threats associated with climate change. The NCCSAP lays out the guiding principles responsive to climate change that is effective, efficient, and practical. It further identifies priority action areas for adaptation and mitigation.

The NCCSAP further outlines activities to be carried out within various sectors to adapt and mitigate to climate change. "Planning" in this NCCSAP refers to the ongoing efforts to develop, monitor and evaluate the performances of the NDPs, (i.e., NDP 4, 5, 6) to ensure that climate change adaptation (CCA) and climate change mitigation (CCM) are investigated at the macro-economic impact level.

One of the means to achieve the goal of reduce impact on climate change, is through this Project which aims to increase rail transport of goods.

3.2.10 National Policy on HIV/AIDS (2007)

The National Policy on HIV/AIDS has been developed to provide an overall reference framework for all HIV/AIDS related policies and to guide the national HIV/AIDS responses of all sectors in society. It aims to guide current and future health and multi-sectoral responses to HIV/AIDS in Namibia, to encourage all Namibian institutions to fulfil their obligations for responding to HIV/AIDS and to serve as a guiding frame for a coherent and sustained approach enhancing political commitment and participation of civil leadership at all levels.

The goal of the national HIV/AIDS policy is to provide a supportive policy environment for the implementation of programmes to address HIV/AIDS that reduce new infections, improve care, treatment, and support, and mitigate the impact of HIV/AIDS – this in turn will assist with achieving vision 2030.

The mandate for HIV and AIDS sector responses derives from several international and regional declarations as well as from key national and sectoral development instruments and policies. The Southern African Development Community (SADC) and its Member States agreed on several targets and priorities of which some refer to the importance of sectoral engagement. The need to access health facilities and HIV and AIDS services is given attention to by the Vision 2030, the National Development Plan 4 (NDP4), the National Policy on HIV and AIDS 2007 (currently revised) and other documents. The Public Works and Transport HIV and AIDS/Wellness Sector Strategy have been adopted by MoWT in 2013; the Sector Policy exists in draft form (will be finalised in 2015/2016), which can be equally considered applicable to rail transport and this Project (Republic of Namibia, March 2007).

Labour intensive projects such as large-scale rail projects could result in increased HIV/AIDS prevalence rates in an area. This will originate from influx of workers from other regions/areas into the local area with monthly wages and possibly away from their families. The contractor and the Proponent are expected to abide by the above provisions during and for the duration of the construction period. Gender inequality is a key driver of HIV and AIDS in the male-dominated workforce. The hiring of local labour could be encouraged to avoid high rates of labour migration.

3.2.11 National Water Policy for Namibia (2000)

The Policy stipulates the water resources management principles and ideas of Namibia, which have emerged internationally during the 1990's. The National Water Policy objectives are based on the following applicable principles:

- Resource sustainability;
- Sustainable utilization; and
- Access to water.

These concepts were first fully articulated internationally at the United Nations Conference on the Environment and Development (UNCED), popularly known as the Earth Summit, held in Rio de Janeiro in 1992. Chapter 18 of Agenda 21, the key document of the Earth Summit, called for a new approach to water resources management, an approach based on respect for the value of water, and on principles of sustainability, social equity, and environmental integrity. Since the Earth Summit, international consensus concerning the new approach has been reinforced in various international and regional forums (in which Namibia has participated), for example at the International Conference on Water and the Environment held in Dublin in January 1992.

These principles have been subsequently endorsed at several post-Rio Ministerial meetings and in several water related UN forums. Namibia forms part of the international consensus surrounding these core principles. The Namibian Government regards the 'Dublin principles' as an appropriate basis for the development of national policy. This Water Policy has, however, taken the process a step further by developing detailed policy principles to address the different facets of water resources management, development, utilisation, and protection.

3.2.12 Water and Sanitation Policies

The existing water and sanitation policies in place are the National Water Policy (NWP) adopted in 2000, the Water Supply and Sanitation Sector Policy (WSASP) adopted in 2008, and the National Sanitation Strategy of 2009, which is based on this WSASP policy.

In terms of the Act and the Water Supply and Sanitation Policy, the developer will:

- Take steps to prevent "any public or private water on or under that land, including rainwater that falls on or flows over or penetrates such land" from being polluted; and

- Require a permit for the disposal of effluent and industrial wastewater.

Of particular concern is the prevention of surface- and groundwater pollution, therefore the collection, storage, disposal, and re-use of sewage- and storm water is of utmost importance.

In terms of the National Sanitation Strategy 2010/11 – 2014/15, the developer must put in place strategies:

- Guaranteeing safe and affordable sanitation, encouraging decentralised sanitation systems where appropriate; and
- That should promote recycling through safe and hygienic recovery and use of nutrients, organics, trace elements, water and energy, and the safe disposal of all human and other wastes, including sewage and industrial effluent, in an environmentally sustainable fashion.

3.2.13 Environmental Guidelines for Borrow Pit Rehabilitation (July 2013)

The Plan provides technical methods for the rehabilitation of borrow pits to an environmentally acceptable state. The Plan considers a sensitive and balanced approach, reflecting the land use requirements as well as safety and aesthetics.

The multitude of potential negative environmental impacts has been consolidated to a 4-tier Severity Class System to describe the potential hazard risk. This easy-to-use guideline enables the Engineer on-site to assess the hazard risk of any borrow pit and to instruct the required mitigation measures to rehabilitate any borrow pit technically sound, safe, and aesthetically pleasing. The Roads Authority's Environmental Guidelines for Borrow Pit Rehabilitation Plan will be used for this Project, attached as Appendix H.

Only after the rehabilitation meeting all requirements, the borrow pit can be handed over to the landowner and officially considered as rehabilitated.

3.2.14 Road Drainage Manual (2014)

Inspired by the first Road Drainage Manual (RDM) developed in South Africa in 1981 (1.1), the former Department of Transport in Namibia adapted sections of the Road Drainage Manual and published its own "Drainage Manual" (1.2) under the auspices of the Ministry of Works, Transport and Communication, Government of the Republic of Namibia in 1993. Later, the manual was updated in the year 2014 and is now known as Road 'Drainage Manual 2014'.

As far as hydrology and drainage is concerned, TransNamib has not developed any specific manual / code for the same. TransNamib has accepted the Drainage Manual 2014 as one of the many Road Manuals suitable for use on railway projects too.

3.3 NATIONAL REGULATORY FRAMEWORK

3.3.1 National Transport Services Holding Company Act (No. 28 of 1998)

The National Transport Services Holding Company Act (Act No. 28 of 1998) provides for the incorporation of a holding company, in this instance TransNamib, to undertake, either by itself or through any subsidiary company, transport services in Namibia or elsewhere; and to provide for matters incidental thereto.

Section 14 (1) (a) provides for the transfer of ownership in all the movable and immovable property, the assets and liabilities, and the rights and obligations, to TransNamib with certain exceptions, i.e., "railway", which vests in the State. In this instance "railway" means, any main railway line and the railway reserve fences, including any such railway line in any station or siding and all rails and check rails, jointing materials of rails, sleepers and longitudinal ties, fastenings, ballast stone, turnouts, stop blocks, turntables, clearance marks, derailing devices and small fittings of that line of the railway, and any signalling system including all rail track regulatory signs, warning signs and information and guiding signs on or in respect of that line of the railway (MR Technofin Consultants Ltd., March 2022).

In addition, the Minister may direct the minimum maintenance standards for purposes of achieving and maintaining a safe and functional railway and to protect the environment. Subsequently, TransNamib will be held responsible for the cost's incidental to the maintenance of the railway. Claims for damages in respect of the management or failure thereof by TransNamib, will be instituted against it (MR Technofin Consultants Ltd., March 2022).

Pursuant to section 13 of the Holding Company Act, an agreement was entered into on or about 1 April 1999 between the Government of Namibia and TransNamib to fulfil the objectives of the aforesaid Act. The Railway Management Agreement by and large provides for maintenance work on the existing railway in accordance with certain minimum standards and includes the replacement or repair of railway material. Clause 2.5 of the Agreement relates to control of maintenance, a clear duty and cost implication that is placed on TransNamib, to manage the requisite inspections and condition appraisals of the railway. Finally, the Agreement governs the financing aspect of routine railway maintenance, proper accounting and reporting to the Minister (MR Technofin Consultants Ltd., March 2022).

The Rail Sector in Namibia is not regulated in terms of modern technology and modern state institutional management principles. The National Transport Services Holding Company Act, 1998, is the only piece of legislation that regulates rail in the country.

At present rail safety standards are not formally incorporated into Namibian legislation. Safety requirements need to be formalised; inspections need to be undertaken and sanctions need to be imposed by an independent organisation (MR Technofin Consultants Ltd., March 2022).

TransNamib's rail safety management system is governed by the Rail Safety Authority, which regulates train operations in Namibia. The system is obliged to ensure compliance with the following legislation:

- Labour Act, 11 of 2009;
- Petroleum Products and Energy Act, 1990 (13 of 1990);
- Explosive Act 1956 (26 of 1956);
- National Railway Regulatory Act of the RSA (16 of 2002) regarding cross-border operations in conjunction with Transnet; and
- SARA Standard; TransNamib Rules and Regulations, Rail Safety Authority & Policy, Road Traffic Act.

For the immediate future, TransNamib will remain the only operator.

3.3.2 Namibian Transport Advisory Board Act (No. 23 of 1991)

The Namibian Transport Advisory Board Act No. 23 of 1991 provides for the establishment of the Namibian Transport Advisory Board and the composition and functions thereof; and to provide for matters incidental thereto.

The objectives of the Board shall be the development, promotion, and encouragement of transport in Namibia and the co-ordination of transport services in Namibia to ensure that transport services are carried on and maintained in, from or to Namibia in the best interest of Namibia and its inhabitants in the most effective and economic manner.

To achieve its objectives, the Board shall make such investigations as it may deem necessary, and shall advise the Minister generally or in respect of a particular case.

3.3.3 The Public Private Partnerships Act (No. 4 of 2017)

With the introduction of the Public Private Partnerships Act in 2017, the Government of Namibia advanced its stated policy objective of providing the principles, framework and guiding procedures that is to assist Government agencies in applying PPPs across Namibia.

The Namibian Public Private Partnership Act No. 4 of 2017 (PPP) provides a legal framework for public private partnership projects; to establish the Public Private Partnership Committee; to regulate public private partnership projects through the stages of initiation, preparation, procurement, conclusion of public private partnership agreement and implementation; and to provide for incidental matters (MR Technofin Consultants Ltd., March 2022).

The PPP Act applies to the initiation, preparation, procurement, management, and implementation of PPP projects, which are defined as any project with the following elements are present:

- A private entity provides public infrastructure assets or services for use (directly or indirectly) by the public.
- The private entity will take on investments in, and management of, the infrastructure assets or services for a specified period.
- Risk, optimally, would be shared between the private entity and the public entity.

- The private entity receives performance-linked payments.

The principle features of PPP include the provision of a service that will involve the creation or use of an asset involving private sector participation, a contribution by the State through for instance land, capital works, risk sharing, revenue diversion, purchase of the agreed services or other supporting mechanism; and the private sector receiving payments from government and/or through user charges or third party revenues that will be contingent on the private sector's performance in supplying the related services or facilities. The PPP Act does not, however, apply to the procurement of goods, works or services contemplated under the Public Procurement Act (MR Technofin Consultants Ltd., March 2022).

3.3.4 The Public Procurement Act (No. 15 of 2015)

The Namibian Public Procurement Act (No. 15 of 2015) regulates the procurement of goods, works and services, the letting or hiring of anything or the acquisition or granting of rights for or on behalf of, and the disposal of assets of, public entities. Furthermore, it establishes the Procurement Policy Unit and the Central Procurement Board of Namibia and other related committees.

By virtue of section 2(a) of the Act, the Ministry of Works and Transport as well as TransNamib are 'public entities' and when they procure goods, works and/or services, such actions are subject to the Public Procurement Act.

There is no need for PPP exemption from the provisions of the PPA. Either of the two statures will apply, depending on the procurement method that is chosen. If the Project is identified as a PPP, the Central Procurement Board of Namibia will not have statutory power to deal with the project. That will be left for the PPP Unit as it has the statutory mandate to deal with PPPs (MR Technofin Consultants Ltd., March 2022).

3.3.5 Expropriation Ordinance (No. 13 of 1978)

At present the Ordinance serves as enabling legislation which provides for the expropriation of land and other property for public and certain other purposes, and for matters incidental thereto. "Property" means both movable and immovable property and "immovable property" includes a real right in or over immovable property.

The Ordinance came into force on 24 July 1978 and was subsequently amended by National Transport Corporation Act 21 of 1987. The South African Expropriation Act 63 of 1975, which deals with the expropriation of land (and commenced on 1 January 1977, in terms of RSA Proc. 273 of 1976) once applied to the then Southwest Africa in respect of expropriations by the Railway Administration under section 4 of the aforesaid Act.

Section 4(4) of that Act stated: "The provisions of this section, and the other provisions of this Act, in so far as they are connected with the application of this section, shall also apply in the territory of South West Africa, including the Eastern Caprivi Zipfel", thus making sections 7 to 24 of the Act applicable to expropriations by the Railway Administration in terms of the

Railways and Harbours Control and Management (Consolidation) Act 70 of 1957 (which is no longer in force in Namibia). However, section 4 of this Act was repealed by the National Transport Corporation Act 21 of 1987, thus effectively ending the applicability of any part of the Act to then Southwest Africa.

The National Transport Corporation Act, as amended, has been repealed by the Holding Company Act, the consequence of which is that there is no statutory framework for expropriation specifically earmarked for railway, other than by way of the broad application of the Ordinance.

The Ordinance however presents its own shortcomings. The Ordinance vests the power to expropriate in the "Executive Committee". The Executive Committee means the Executive Committee constituted under section 4 of the Southwest Africa Constitution Act, 1968 (Act 39 of 1968). This Act has been repealed by Article 147 of the Namibian Constitution, the effect of which renders the establishment of the "Executive Committee" as administrative functionary to expropriate movable or immovable property pursuant to section 2 of the Ordinance, ineffective.

The Ordinance has not been amended to fill this void. This means that there remains a material void in the enforceability of the Ordinance and as such, a lack of a proper statutory framework in the form of an act of parliament which should specifically provide for expropriation for development of railway (MR Technofin Consultants Ltd., March 2022).

3.3.6 Environmental Management Act (No. 7 of 2007) & EIA Regulations (2012)

The Environmental Management Act (No 7 of 2007) (EMA) was promulgated in December 2007 and commenced on 6 February 2012 (Government Notice 28 of 6 February 2012) along with the promulgation of the Environmental Impact Assessment Regulations (No. 30 of 2012). It is administered by the Directorate of Environmental Affairs (DEA), under the auspices of the Ministry of the Environment, Tourism and Forestry.

Its main objectives capture the essence and importance of this legislation, which are to:

- Ensure that the significant effects of activities on the environment are considered in time and carefully;
- Ensure that there are opportunities for timeous participation of interested and affected parties throughout the assessment process; and
- Ensure that the findings of an assessment are considered before a decision is made in respect of activities.

In Section 3(2) of the EMA, a set of principles are established which give effect to the provisions of the Constitution for integrated environmental management. Although these principles are not enforceable, it is incumbent upon decision makers to consider them when deciding on the approval of a project.

The EMA stipulates that no party, whether private or governmental, can conduct a listed activity without an Environmental Clearance Certificate to be obtained from the Environmental Commissioner (Section 27.3). Depending on the type of activity/ies being applied for, the Commissioner may request that an Environmental Impact Assessment be conducted. Section 27(2) of the Act refers to the *List of activities that may not be undertaken without an Environmental Clearance Certificate* (GN. No. 29 of 2012).

The EMA under Section 56 provides for the EIA Regulations (No. 30 of 2012), which guides and regulates the assessment process to be conducted for the listed activity/ies and application for an Environmental Clearance Certificate.

Section 3(2)(l) states that *"damage to the environment must be prevented and activities which cause such damage must be reduced, limited or controlled"*. If such pollution cannot be prevented, then appropriate measures must be taken to minimise or rectify such pollution.

Section 56 of the Act further stipulates the Environmental Impact Assessment (EIA) Regulations that apply to an environmental impact assessment process, as set out in Government Notice No. 30 of 6 February 2012.

The mentioned Regulations specify in addition to the assessment process to be followed, also the responsibilities of the Proponent and his/her appointed environmental assessment practitioner, as well as that of the Ministry. An important requirement stipulated with the Regulations is the one of public consultation as specified in Regulations 21, 22 and 23 of the Act. Detailed requirements are set for how public consultation should be done, as well as record keeping of public consultation undertaken. The Regulations also makes provision for appeals against the decision of the Minister.

The Proponent and appointed consultants and contractor have the responsibility to ensure that the Project as well as the assessment process conforms to the principles of the Environmental Management Act (No. 7 of 2007). In conducting the ESIA, Urban Green cc, have been cognisant of this need, and accordingly the ESIA process has been informed by the underlying principles of the Act.

3.3.7 Water Act (No. 54 of 1956)

This Act is still the only enforced legislation applicable to water legislation in in Namibia. Only certain Articles in the Act relevant to Namibia were made applicable in the Country according to Article 180 of the Act. The Act remains in force in Namibia in terms of Article 140 of the Constitution, until such time as it is repealed or amended by an Act of the Namibian Parliament.

This existing Water Act in Namibia is expected to be repealed by the Water Resources Management Act, No. 11 of 2013, promulgated by Parliament in November 2013, but not yet enforced.

The Water Act makes provision for several functions pertaining to the management, control and use of water resources, water supply and the protection of water resources. A distinction

is made between private and public water in terms of ownership, control, and use. The Act recognises the natural environment as a water user.

The Water Act (Act 54 of 1956), see below, also stipulates that no wastewater, effluent, or waste shall be discharged without a licence issued by the Minister *[Refers to Sections 105 and 107 of the Water Act (Act 54 of 1956)].*

This Act, along with the Water Resources Management Act, No. 11 of 2013 requires the Proponent and Project team to investigate and implement measures to ensure sustainable use of water resources and ensure that no pollution of any above or below ground water takes place.

This Act requires the proposed Project to investigate and implement measures to ensure sustainable use of water resources and ensure that no pollution of any above or below ground water takes place. For this purpose, a Hydrogeological Assessment was conducted to determine the available sources of water and estimated volumes available (see Appendix B1).

3.3.8 Water Resources Management Act (No. 11 of 2013)

The Water Resource Management Act No. 11 of 2013 provides for the management, protection, development, use and conservation of water resources; and provides for the regulation and monitoring of water services and to provide for incidental matters. The objects of this Act are thus to ensure that the water resources of Namibia are managed, developed, used, conserved, and protected.

This Act stipulates conditions to ensure that proper wastewater treatment is provided and operated to ensure that effluent produced be of certain standard. It also controls the disposal of sewage, the purification of effluent, the prevention of surface and groundwater pollution, and the sustainable use of water resources.

The Act's Regulations provides for water pollution control and the purpose is to control wastewater discharge to ensure that no surface-, ground- or seawater is polluted in such a way that it becomes less fit for purposes for which it would ordinarily be used, or for sustaining aquatic life or for recreational or any other legitimate purpose. These Regulations is an extension to the Water Resources Management Act (Act 11 of 2013), and all subsequent amendments.

The following sections of the Act are of importance to the proposed Project and are thus included in this ESIA Report for action by the Proponent.

Part 9 of the Act stipulates all requirements pertaining to the water supply, abstraction and use of water, while Part 11 refers to obtaining a licence to abstract and use water. Considering the proposed development, a combined licence to abstract and use water and to discharge effluent should be obtained from the Ministry of Agriculture and Water.

Subject to the Water Resources Management Act (Act No. 11 of 2013), the General Guidelines (July 2008) developed by the Department of Water Affairs and Forestry addresses treatment of wastewater by means of different systems. It includes design information and strives to

present information that may be helpful to owners and operators of a particular system (e.g., Biological Filtration System, Pond System, Septic Tank System, and Biological Treatment Activated Sludge Process), individuals performing compliance inspections, sampling, and writing or assessing technical reports on which permit conditions are based.

This Act will replace the Water Act (Act No. 54 of 1956) once it is implemented by Government.

All activities of the proposed Project must comply with this Act and be scrutinised for potential effects on the quality and quantity of water resources, be it surface or underground.

3.3.9 Forest Act, as amended (No. 12 of 2001)

The Act deals with forests in general and matters incidental thereto. Of importance to the proposed Project is that the Act affords general protection of the environment (Part IV). Section 22 affords protection to natural vegetation stipulating that no living tree, bush, or shrub within 100m from any river, stream or watercourse may be removed without the necessary license. Permits are required for the removal of trees, bushes or shrubs, or any indigenous plants.

Given the requirements of the mentioned Act, an on-site ecological verification (Appendix B2) was done to determine the existence of any sensitive and/or ecological hotspots to be avoided. Should any protected and/or endangered species be identified during the implementation phase, the particular species should be protected as per the requirements stipulated within the ESMP. In the event that these species need to be removed, the necessary permits need to be obtained from the Ministry of Environment, Forestry and Tourism.

3.3.10 Nature Conservation Ordinance Act (No. 4 of 1975)

This Ordinance covers game parks and nature reserves, the hunting and protection of wild animals (including game birds), problem animals, fish, and of importance to the proposed Project affords protection of certain indigenous plant species. It is administered by the Ministry of Environment, Forestry and Tourism and provides for the establishment of a Nature Conservation Board. The Ordinance includes several schedules listing threatened and endangered species of plants and wild animals. If any of these are identified as being affected by the proposed development, a permit has to be obtained from the mentioned Ministry.

Given the requirements of the mentioned Act, an on-site ecological verification (Appendix B2) was done to determine the existence of any sensitive and/or ecological hotspots to be avoided. Should any protected and/or endangered species be identified during the implementation phase, the particular species should be protected as per the requirements stipulated within the ESMP. In the event that these species need to be removed, the necessary permits need to be obtained from the Ministry of Environment, Forestry and Tourism.

3.3.11 Soil Conservation Act, as amended Act (No. 76 of 1969)

The Soil Conservation Act provides to consolidate and amend the law relating to the combating and prevention of soil erosion, the conservation, improvement, and manner of use

of the soil and vegetation and the protection of the water sources and to provide for matters incidental thereto.

Partially similar to the other conservation Acts and ordinances above, this Act address the issues of vegetation and ground water, but also include the matter of soil. In specific the Act focuses on combating and preventing soil erosion; the conservation, protection and improvement of soil and vegetation and water sources and resources.

The contractor should take cognisance of the legal requirements and apply the necessary precursory steps and provide for the necessary actions as presented in the ESMP.

3.3.12 Pollution Control and Waste Management Bill (September 2003)

The Bill relates to preventing and regulating the discharge of pollutants to the air, water and land; to regulate noise, dust and odour pollution; and establish a system of waste planning and management. Reference is also made to hazardous substances being a parcel duplication of what is covered in the Hazardous Substance Ordinance.

The Bill amalgamates a variety of Acts and Ordinances, mainly inherited from the South African administration, that provide protection for particular species, resources or components of the environment.

Namibia is in the process of developing further legislation to regulate waste management and public health, as reflected in the Pollution Control and Waste Management Bill (circa 2003) and the Public and Environmental Health Bill (2014). Regulations will be made dealing with the standards, objectives, and requirements in relation to any activities relating to waste, that are liable to cause pollution. Persons involved in the collection, transport, storage, treatment, recovery or disposal of waste will be required to apply for a waste management licence.

There is the possibility that this Bill will be promulgated within the following year or two, which might become applicable considering the intended construction date of 2025. The various phases, i.e., construction, operation and decommissioning of the railway line involve the generation of general and hazardous wastes and the use and possible transport of hazardous substances. The Proponent and contractor need to take note of the principles contained in this Bill, and that waste management licences are likely to be required for the construction and operational phases of the project. The contractor's waste management procedure should consider the intentions of these Bills.

3.3.13 Atmospheric Pollution Prevention Ordinance (No. 11 of 1976)

This Ordinance generally provides for the prevention of the pollution of the atmosphere. Part IV of this ordinance deals with dust control and provides for the proclamation of dust control areas. The entire area of Namibia, apart from the east Zambezi Strip (formerly Caprivi) is classified as a controlled area, as laid out in section 4(1)(a) of the Ordinance (GN 309/1976).

The Ordinance is clear in requiring that –

(1) Any person who in a dust control area –

> *(b) has at any time or from time to time, whether before or after the commencement of this Ordinance, deposited or caused or permitted to be deposited on any land a quantity of matter which exceeds, or two or more quantities of matter which together exceed, twenty thousand cubic metres in volume, or such lesser volume as may be prescribed, and which in the opinion of the Director causes or is liable to cause a nuisance to persons residing or present in the vicinity of such land on account of dust originating from such matter becoming dispersed in the atmosphere.*

The activities associated with this Project are expected to cause dust pollution, which requires the contractor to apply the necessary dust suppression strategies, as per the ESMP. Care should further be taken during the construction phase to limit the dust pollution from the development site given the existence of other activities in the area and for the fact that it could be categorized as causing a public nuisance under common law.

3.3.14 Public and Environmental Health Act (No. 1 of 2015)

The Namibian Public and Environmental Health Act No. 1 of 2015 provide a framework for a structured uniform public and environmental health system in Namibia; and provides for incidental matters. It repeals the Public Health Act 36 of 1919 (SA GG 979).

The Act covers a variety of aspects with relevance to the general wellbeing and health of the public. With relevance to the Project, this Act refers to the control of nuisance, but also the prevention of pollution of public waters.

Part 10 of this Act prohibits the existence of a ‘nuisance’ on any land owned or occupied by any person, while section 59 stipulates what constitutes health nuisance.

Part 7 of the Act focus on the prevention of pollution of public waters by various means. If correctly operated very little opportunity exists for any public waters to be polluted, but still requires caution during the construction and operational phase of the proposed Project.

Poor sanitation and resulting implications are considered a health nuisance, which should be effectively managed by the contractor for the duration of the construction period.

3.3.15 Public Health Covid-19 General Regulations: Public and Environmental Health Act, 2015

The Regulations provides for restrictive measure applicable to COVID-19 to be implemented by all in Namibia.

3.3.16 Labour Act (No. 11 of 2007)

The Namibian Labour Act (No. 11 of 2007) provides for the consolidation and amendment of matters relating to the labour law and establishes a comprehensive labour law for all

employers and employees. It also ensures the health, safety, and welfare of employees and to protect employees from unfair labour practices.

The Act also refers to among others to safety relating to hazardous substances, exposure limits and physical hazards. Special consideration must be given to, welfare and facilities at the workplaces, safety of machinery, hazardous substances, physical hazards, and general provision.

Working conditions, accommodation, and related matters, as well as safety and health of workers should comply with the mentioned Act.

3.3.17 Hazardous Substances Ordinance (No. 14 of 1974)

The Namibian Hazardous Substance Ordinance (No. 14 of 1974) provides apart from other for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby and to provide for the prohibition and control of the disposal or dumping of such substances.

Considering the scale and nature of the proposed Project different kinds of petroleum products will be transported and stored on-site for use during the construction period. It is important that all matters relating to these hazardous substances are done as per the requirements of this Ordinance and applicable health and safety requirements be met as stated in the applicable Acts.

3.3.18 National Heritage Act (No. 27 of 2004)

In Namibia, the legal instrument for the protection of heritage resources is set out within the National Heritage Act, (No. 27 of 2004). As defined in Part 1 of the Act, 'heritage resources' implies places and objects of archaeological, palaeontological, and rare geological objects including meteorites, cultural, historical, anthropological, ethnographical, scientific and social significance or "any remains of human habitation or occupation that are 50 or more years old found on or beneath the surface". The legal protection extends beyond the tangible heritage resources to include "the natural or existing condition or topography of land", as well as the "trees, vegetation or topsoil". Furthermore, the newly developed "Guidelines for Heritage Impact Assessment in Namibia of 2021" have been formulated for the implementation of the National Heritage Act, especially Section 51 (3) which outlines requirements for heritage impact assessment in Namibia. Here, the aspects of intangible heritage such as sacred sites "places to which oral traditions are attached or which are associated with living heritage, graves and burials, historic settlements and military sites by means of a building, garden or a tree" are considered to be of heritage significance.

Apart from the Heritage Act, Heritage impact assessment in Namibia also takes place under the provisions of the Environmental Management Act, (No. 7 of 2007) which includes man-made features in its definition of the environment as "anthropogenic factors" such as archaeological remains or any other evidence of human activity. The need for Environmental Impact Assessment forms part of the Act, and this requires that "Namibia's cultural heritage

must be protected and respected for the benefit of present and future generations". Other applicable laws and policies relevant to the protection of heritage resources globally are the international standards and protocols expected to be followed to ensure best practice during development activities. For instance, the Performance Standard 8 of the International Finance Corporation's (IFC) Performance Standards on Environmental and Social Sustainability (2012) addresses both national and World Cultural and Natural Heritage. Therefore, the requirement 7 states "Where the risk and identification process determine that there is a chance of impacts to cultural heritage, the client will retain competent professionals to assist in the identification and protection of cultural heritage."

The standards apply whether or not the heritage material is protected, and irrespective of whether it may have been previously disturbed. To comply with these standards, a baseline survey and assessment is required. The European Investment Bank's Environmental and Social Handbook (2013) includes cultural heritage impact assessment amongst its list of requirements. The details of this requirement are contained within Section 5 which specifies the scope of impact assessment for Cultural Heritage as "screening for risks… assessing and mitigating the impact" on cultural heritage employing techniques to establish baseline conditions such as "field surveys and expert assessment of the significance of cultural heritage". Relevant standards for impact assessment in relation to fieldwork and data dissemination, standard methodologies are recommended to follow the Standards and Guidance set within the Chartered Institute for Archaeologists (CIfA) where both field survey and desk-based assessments are universally recognized.

The ICOMOS Principles Guidelines for Conservation of Industrial Heritage sites, Structures, Areas and Landscapes is equally critical to this study in assessing the built heritage. Additionally, the African Development Bank (AfDB) Guidelines to the environmental and social assessment procedures (ESAP) of 2001 further guide this assessment. Its guidance is integrated in addressing all crosscutting themes promoting sustainable development.

Given the requirements of the Act and other mentioned legislation an archaeological baseline assessment and impact assessment was conducted for the entire stretch from Otjiwarongo to Tsumeb, Otavi to Grootfontein (see Appendix B3).

3.3.19 Road Traffic and Transport Act (No. 22 of 1999)

The Namibian Traffic and Transport Act (No. 22 of 1999) as amended provides for the establishment of the Transportation Commission of Namibia; for the control of traffic on public roads, the licensing of drivers, the registration and licensing of vehicles, the control and regulation of road transport across Namibia' s borders; and for matters incidental thereto.

Any reference in any law or any document to the Transportation Commission of Namibia established by section 2A of the Road Transportation Act, 1977 (Act No. 74 of 1977), shall be construed as a reference to the Commission established by subsection (1) of this section.

3.3.20 Fencing Proclamation Ordinance (No. 57 of 1921), as amended

The Ordinance, as amended, regulates the erection and maintenance of dividing fences between adjoining properties, including jackal-proof fences.

Chapter 1 of the Fencing Proclamation consists of sections 4, 5, 6, 7 and 8, which deal mainly with the contributions of costs towards the erection of fences.

Section 4 of the Fencing Proclamation deals with the case where an owner has under that Proclamation or any other law or otherwise lawfully, erected a dividing fence on the boundary lines of his or her holding in an area in which contributions towards the costs thereof are not obligatory, and the owner of an adjoining holding has adopted means whereby the fence is rendered of beneficial use to the last-mentioned owner. In such a case either owner may, in default of agreement, demand that an assessment be made of the value to each owner of the fence, regard being had to the extent to which and the time at which the beneficial use is being or has been made. The value must be determined as a dispute in accordance with the Second Schedule to the Proclamation, and thereupon it is obligatory upon the owner who has made beneficial use of the fence to contribute towards the costs of the fence in accordance with the assessment.

According to section 5(1), contributions towards the cost of a dividing fence are obligatory in any area in which the contributions are declared obligatory by the President by notice in the Gazette and contributions when so declared obligatory in any area must be made as from a date to be determined by the notice.

3.3.21 Deeds Registries Act (No. 47 of 1937)

Article 16 of the Namibian Constitution guarantees the right to property, with paragraph 1 thereof providing everyone with the right to acquire, own and dispose of property, alone or in association with others, and to bequeath such property. The right to own property is also recognised as a fundamental right of the individual under international law. This right can be found in most constitutions and international conventions.

Namibia’s contemporary legal framework on land tenure comprises of common law, customary law, Namibia’s Constitution, and several acts, like the Agricultural (Commercial) Land Reform Act, 1996; the Communal Land Reform Act, 2002 and The Flexible Land Tenure Act, 2012.

Private ownership of a parcel of land, also called freehold title, has its basis in common law. Article 66 of the Constitution of Namibia recognises the common law in Namibia, unless it conflicts with the Constitution or any other legislation in force. The registration of ownership under the Deeds Registries Act (No. 47 of 1937) in the Deeds Registry provides the title holder with the most comprehensive real right recognised in law.

Private ownership can be enjoyed on both urban and rural land. The use of agricultural land is restricted to agricultural purposes. Commercial farmland can only be transferred when the land was first offered to the State. Sale of commercial farmland to a foreigner requires the

consent of the Minister (Agricultural (Commercial) Land Reform Act, 1995, ss. 17, 58). Transfer or a bequest may further not be in respect of a portion of land only, it must be the whole land (Subdivision of Agricultural Land Act of 1970).

State land is not necessarily surveyed and registered in the Deeds Registry Office. Article 100 and Schedule 5 of the Namibian Constitution (2010) confirms the common law position in providing that all land and natural resources belong to the State, unless otherwise lawfully owned.

3.3.22 The Agricultural (Commercial) Land Reform Act (Act 6 of 1995)

Article 16 (2) of the Namibian Constitution is concerned with the expropriation of property. It provides for the state, or a competent body authorised by law, to expropriate property in the public interest, subject to payment of just compensation and in accordance with requirements and procedures to be determined by an Act of Parliament. The Namibian Constitution does not, however, define what constitutes “public interest”.

The Agricultural (Commercial) Land Reform Act (Act 6 of 1995), which was promulgated as an “Act of Parliament” to provide for an expropriation policy as determined by Article 16 of the Namibian Constitution, allows in Article 14 (2) (a-d) for the compulsory acquisition of agricultural land classified as under-utilised, excessive or acquired by a foreign national, or of land where the application of the willing-seller, willing-buyer principal has failed.

According to Article 14 (1) of the Agricultural (Commercial) Land Reform Act, the Minister of Lands, Resettlement and Rehabilitation may, after consulting with the Land Reform Advisory Commission (Article 3), decide to expropriate any farm identified as being suitable for resettlement. The Commission, which is composed of all stakeholders, was established in accordance with Article 4 of the Agricultural (Commercial) Land Reform Act to assist the Minister in administering the Act.

According to the Namibian Constitution, expropriation is in principle lawful, provided that the conditions of public interest and just compensation are met. The Namibian Agricultural (Commercial) Land Reform Act is, however, the legal foundation for expropriation and its stipulations must therefore be adhered to. Article 14 of the Agricultural (Commercial) Land Reform Act is in line with Article 18 of the Namibian Constitution, which gives persons aggrieved by governmental actions the general right to seek redress before a competent court or tribunal (Konrad-Adenauer-Stiftung, Dr. C. Treeger, May 2004).

3.3.23 Urban and Regional Planning Act (No. 5 of 2018)

The objectives of Urban and Regional Planning Act of 2018, are to (i) provide for legal framework for spatial planning in Namibia; (ii) provide for principles and standards of spatial planning; (iii) establish the urban and regional planning board; (iv) provide for the preparation, approval and review of the national spatial development framework, regional structure plans and urban structure plans; and (v) provide for the preparation, approval, review and amendment of zoning schemes; and the establishment of townships.

Section 19 (1) and Section 26 of the Urban and Regional Planning Act (No. 5 of 2018) provides for the preparation of the National Spatial Development Framework (NSDF) and the Regional Structure Plan, respectively, having the objective to provide for a uniform, effective and integrated regulatory framework for spatial planning and development at national- and regional levels.

Section 31 (subsection 1 to 5) and section 41 of the Act, deals with the preparation of the Urban Structure Plan and Town Planning Scheme, respectively. Urban structure plans differ from the Regional Structure Plans only in terms of the spatial extent they cover. The Regional Structure Plans cover the whole region of concern, while the Urban Structure Plans are prepared for cities, towns, and villages only which are proclaimed urban areas. The purpose of the TPS is to promote the orderly development of the area to which a zoning applies, to determine land use rights and provide for control over the rights for which the zoning scheme applies.

Land use of the affected agricultural land along the railway line is falling under the National Spatial Development Framework (NSDF) and the Regional Structure Plan, while the erven/farm portions located within a proclaimed urban area is falling under the Urban Structure Plan and Town Planning Scheme.

3.4 APPLICABLE INTERNATIONAL STANDARDS

For purpose of preparing the ESIA, standards from two main organisations were considered, i.e., International Finance Corporation (IFC) and that from the African Development Bank (AfDB), as well as the latest revision of the Equator Principle (2020).

3.4.1 International Finance Corporation Performance Standards

The Project corresponds to an IFC Category A project and as such the ESIA is developed and implemented according to the environmental and social performance standards set forth in the Performance Standards on Environmental and Social Sustainability of the International Finance Corporation (IFC Performance Standards).

In compliance with the IFC requirements, the Project will also follow the established public disclosure expectations which, for a Category A project implies a 60-day disclosure period prior to consideration by IFC's Board of Directors.

The IFC Performance Standards that was considered during the ESIA includes:

- PS1: Management of Social and Environmental Risks and Impacts underscore the importance of managing environmental and social performance throughout the life of a Project. It requires the Proponent to conduct a process of environmental and social assessment and to establish and maintain an Environmental and Social Management System (ESMS), appropriate to the nature and scale of the Project and commensurate with the level of its environmental and social risks and impacts. The concept of mitigation hierarchy is central to PS1, whereas it requires projects to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts

remain, compensate/offset for risks and impacts to workers, affected communities, and the environment. It also requires effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them. In this report, avoidance measures are presented in chapter 7, mitigation measures in chapters 8 and 10, stakeholder engagement in Chapter 6. Compensations will be presented in a standalone Plan to be implemented by the Ministry of Agriculture, Water and Land Reform;

- PS2: Labour and Working Conditions recognize that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. In this report, labour and working conditions are addressed in sections 8.2.13 and 10.2;
- PS3: Resource Efficiency and Pollution Prevention recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. In this report, resource efficiency and pollution prevention are addressed in sections 8.2.3, 8.2.4 and 10.2;
- PS4: Community Health, Safety and Security recognize that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. In this report, PS4 is addressed in sections 8.2.1, 8.2.2, 8.2.3, 8.2.4, 8.2.10 and 10.2;
- PS5: Land Acquisition and Involuntary Resettlement recognizes that project related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. For this Project no resettlement is expected, but compensation for loss of land is applicable. Land compensation remains the full responsibility of Ministry of Agriculture, Water and Land Reform to prepare and apply the Project's resettlement action plan and to compensate the affected people. In this report, compensation and related impacts is addressed in sections 8.2.9, 8.2.11 and 10.2;
- PS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainable management of living natural resources are fundamental to sustainable development. In this report, biodiversity conservation and sustainable management is addressed in sections 8.2.7, 8.2.9 and 10.2;
- PS7: Indigenous Peoples seeks to ensure business activities minimize negative impacts, foster respect for human rights, dignity, and culture of indigenous populations, and promote development benefits in culturally appropriate ways. For the proposed Project, no indigenous community is affected by land acquisition and/or resettlement. Involvement of the local people and in specific for employment is however recommended. In this report, PS7 is addressed in sections 8.2.14 and 10.2;
- PS8: Cultural Heritage recognizes the importance of cultural heritage for current and future generations. The archaeological impact assessment concluded that there are

not any sites of archaeological value existing within the proposed Project's footprint. In this report, cultural heritage is addressed in sections 8.2.16 and 10.2;

(International Finance Corporation, January 2012).

3.4.2 African Development Bank Operational Safeguards

The environmental and social standards set forth in the Operational Safeguards (OS 1-5) of the African Development Bank (AfDB) were taken into consideration for the preparation of this ESIA, which include:

- OS1: Environmental and Social Assessment which aims to mainstream environmental and social considerations- including those related to climate change vulnerability-into bank operations and thereby contribute to sustainable development. This is addressed in Chapter 9 of this report.
- OS2: Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation which seeks to ensure that when people must be displaced they are treated fairly, equitably, and in a socially and culturally sensitive manner; that they receive compensation and resettlement assistance so that their standards of living, income-earning capacity, production levels and overall means of livelihood are improved; and that they share in the benefits of the project that involves their resettlement. For this Project no resettlement is expected, but compensation for loss of land is applicable. Land compensation remains the full responsibility of Ministry of Agriculture, Water and Land Reform to prepare and apply the Project's resettlement action plan and to compensate the affected people. In this report, compensation and related impacts is addressed in sections 8.2.9, 8.2.11 and 10.2.
- OS3: Biodiversity, Renewable Resources and Ecosystem Services which aims to identify and implement opportunities to conserve and sustainably use biodiversity and natural habitats, and observe, implement, and respond to requirements for the conservation and sustainable management of priority ecosystem services. In this report, biodiversity conservation and sustainable management is addressed in sections 8.2.7, 8.2.9 and 10.2.
- OS4: Pollution Prevention and Control, Hazardous Materials and Resource Efficiency which outlines the main pollution prevention and control requirements for borrowers or clients to achieve high quality environmental performance, and efficient and sustainable use of natural resources, over the life of a project. In this report, resource efficiency and pollution prevention are addressed in sections 8.2.3, 8.2.4 and 10.2.
- OS5: Labour Conditions, Health and Safety which outlines the main requirements for borrowers or clients to protect the rights of workers and provide for their basic needs. In this report, labour and working conditions are addressed in sections 8.2.13 and 10.2, while health and safety is addressed in sections 8.2.1, 8.2.2, 8.2.3, 8.2.4, 8.2.10 and 10.2. (Africa Development Bank Group, September 2012).

3.4.3 Equator Principles

The Equator Principles (EP) is a risk management framework, adopted by financial institutions, for determining, assessing, and managing environmental and social risk in project finance. It is primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. The Equator Principles were formally launched in Washington DC on 4 June 2003 and have subsequently been revised periodically. The fourth iteration of the Equator Principles was published in July 2020 and applies to transactions mandated on/after 1 October 2020. The ESIA is developed in consideration with iteration no. 4 of Equator Principles which include:

- P1: Review and Categorisation requires project categorization based on the magnitude of its potential environmental and social risks and impacts, using the environmental and social categorisation process of the International Finance Corporation (IFC). The required environmental and social due diligence is then commensurate with the nature, scale and stage of the Project, and with the categorised level of environmental and social risks and impacts. The Project corresponds to an EP Category A project.
- P2: Environmental and Social Assessment requires to conduct an appropriate Assessment process to address environmental and social risks, including measures to minimise, mitigate, and where residual impacts remain, to compensate/offset/remedy for risks and impacts, in a manner relevant and appropriate to the nature and scale of the proposed Project. An ESIA is required for Category A projects.
- P3: Applicable Environmental and Social Standards requires compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues. Legal and regulatory frameworks applicable to this Project are presented in Chapter 3 of this report.
- P4: Environmental and Social Management System requires all Category A projects to develop and / or maintain an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the assessment process and incorporate actions required to comply with the applicable standards. The ESMP is presented in Chapter 10 of this Report.
- P5: Stakeholder Engagement requires all Category A projects to demonstrate effective stakeholder engagement, as an on-going process in a structured and culturally appropriate manner, with affected communities, workers and, where relevant other stakeholders. For Projects with potentially significant adverse impacts on affected communities, an informed consultation and participation process is also required. All Projects affecting indigenous peoples will also be subject to a process of informed consultation and participation as per IFC Performance Standard 7, and will need to comply with the rights and protections contained in relevant national law for indigenous peoples. For this Project no significant impact/s is expected and no indigenous people are affected by land acquisition and/or resettlement. Stakeholder engagement is

presented in Chapter 6, while the impacts on indigenous people are presented in section 8.2.14.

- P6: Grievance Mechanism requires all Category A projects to establish effective grievance mechanisms as part of the ESMS, which are designed for use by affected communities and workers, as appropriate, to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance. Affected communities and workers also need to be informed about the grievance mechanisms during the stakeholder engagement process. For this Project a grievance mechanism has been introduced, which will apply for the duration of the construction and operational phases. The ESMS is presented in Chapter 10 of this report, with the grievance mechanism covered in section 10.6
- P7: Independent review requires that an independent environmental and social consultant carries out an independent review of the ESIA process including the ESMPs, the ESMS, and the stakeholder engagement process documentation to assist the financial institution's due diligence and determination of Equator Principles compliance.
- P8: Covenants incorporates covenants linked to compliance. Where a project is not in compliance with its environmental and social covenants, remedial actions are requested to be implemented to bring the project back into compliance.
- P9: Independent Monitoring and Reporting. To assess project compliance with the Equator Principles after financial close and over the life of the loan, independent monitoring and reporting will be required by the financial institution. Monitoring and reporting should be provided by an Independent Environmental and Social Consultant to be hired either by the financial institution or the borrower.
- P10: Reporting and Transparency requires borrowers to ensure that, at a minimum, a summary of the ESIA is accessible and available online and that it includes a summary of human rights and climate change risks and impacts when relevant (The Equator Principles, July 2020).

3.5 INTERNATIONAL AGREEMENTS

Namibia is party to various international environmental and social development agreements that advocate for environmental conservation and better working conditions. Table 3.5-1 present relevant international environmental and social development agreements to which Namibia is a party.

Table 3.5-1 - International Environmental Agreements Relevant to Namibia

Theme	Convention	Objective
Biodiversity	Convention on Biological Diversity 1992	Regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use. Promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings. Removal of vegetation cover and destruction of natural habitats should be avoided and where not possible minimised.
	Convention on International Trade in Endangered Species of Wild Flora and Fauna, and amendments.	To ensure that international trade in specimens of wild animals and plants does not threaten their survival.
	Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR Convention on Wetlands), RAMSAR, 1971, and amendments	Provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.
	The Revised (Algiers) Convention on the Conservation of Nature and Natural Resources (revised) 2003	The New Convention covers a wide spectrum of issues, including quantitative and qualitative management of natural resources such as soil and land, air and water, and biological resources.
	SADC Protocol on Forestry, 2002 (entered into force within SADC on 1 September 2006)	The SADC Protocol on Forestry of 2002 aims to promote the development, conservation, sustainable management and utilisation of all types of forest and trees; trade in forest products and achieve effective protection of the environment, and safeguards the interests of both the present and future generations.

Theme	Convention	Objective
	SADC Protocol on Wildlife Conservation and Law Enforcement, 1999	To establish a common framework for conservation and sustainable use of wildlife in the region.
	United Nations Sustainable Development Goals (SDGs) 2015	The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership.
Tourism	SADC Protocol on Tourism	Was adopted to increase regional tourism trade and to utilise the wide range of natural, cultural, and historic sites in the region as a means of achieving sustainable social and economic development.
Health	SADC Protocol on Health 1999	The Protocol encourages the establishment of institutional mechanisms within the health sector of the region to effectively implement the Protocol.
Gender	SADC Protocol on Gender and Development 2008	The Protocol aims to provide for the empowerment of women, to eliminate discrimination and achieve gender equality by encouraging and harmonising the development and implementation of gender responsive legislation, policies and programmes and projects.
Climate Change	Kyoto Protocol to the United Nations Framework Convention on Climate Change	To reduce or limit the emission of gases contributing to the "greenhouse effect" and causing climate change in the industrialized countries

Theme	Convention	Objective
	United Nations Framework Convention on Climate Change (UNFCCC)	To achieve stabilization of greenhouse gas concentrations
	The Paris climate change agreement-UNFCCC	Its goal is to limit global warming to well below 2, preferably to 1.5 degree Celsius, compared to pre-industrial levels.
Cultural Heritage	UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage	To ensure that effective and active measures are taken for the protection, conservation and presentation of the “cultural and natural heritage" on its territories.
	UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage 2003	To safeguard and ensure respect for the world’s Intangible Cultural Heritage, including raising awareness of the importance of intangible heritage and encouraging international cooperation and assistance.
	UNESCO Convention on the protection of underwater cultural heritage 2001	This Convention aims to ensure and strengthen the protection of underwater cultural heritage.
	Convention on the protection and promotion of the diversity of cultural expressions 2005	The objectives of this Convention are to protect and promote the diversity of cultural expressions and to create the conditions for cultures to flourish and to freely interact in a mutually beneficial manner.
Desertification	United Nations Convention to Combat Desertification 1994	Focuses on land degradation in the dry lands where some of the most vulnerable ecosystems and people in the world exist. To combat desertification and mitigate the effects of drought with a view to achieving sustainable development.

Theme	Convention	Objective
Ozone Layer Depletion	Vienna Convention for the Protection of The Ozone Layer	To ensure effective protection of the ozone layer by regulating trade in substances that depletes it.
	Montreal Protocol On Substances That Deplete The Ozone Layer, and adjustments	The Montreal Protocol on Substances that Deplete the Ozone Layer (the Montreal Protocol) is an international agreement made in 1987. It was designed to stop the production and import of ozone depleting substances and reduce their concentration in the atmosphere to help protect the earth's ozone layer.
Development	SADC Regional Indicative Strategic Development Plan	The Regional Indicative Strategic Development Plan (RISDP) is a comprehensive development and implementation framework guiding the Regional Integration agenda of the Southern African Development Community (SADC) over a period of fifteen years (2005-2020).

3.6 INSTITUTIONAL FRAMEWORK

3.6.1 Ministry of Works and Transport

The Ministry of Works and Transport is responsible for sectoral policy and regulation, and has a mandate to ensure infrastructure development and maintenance on transport and state asset management through operational excellence and prudent management of resources.

The Department of Transport within the Ministry is responsible for transport in the different modes, namely road, rail, air, and sea. Its mandate is to ensure the provision of safe and efficient transport services and infrastructure in the Country in balance with demand in the different modes.

The Directorate Railway Infrastructure Management within the Department of Transport deals with railway network development, maintenance, rehabilitation, as well as modernization of rolling stock fleet.

Directorate of Transportation Infrastructure consists of two divisions, the Division Transport Infrastructure Planning and Division Transport Infrastructure Management, which objective are:

- To ensure the development of modern transport infrastructure for roads, aerodromes, harbours, and waterways.
- To ensure optimal utilization and management of transport infrastructure projects assigned to the Directorate.
- Ensure integrated sectoral planning.
- Advise the Minister on all transport infrastructure planning matters.

The Directorate of Transportation Policy & Regulation within the Department of Transport deals with:

- Formulating and ensuring implementation of appropriate transport related policies;
- Regulating the quality of transport services and the level of safety;
- Ensuring efficient, effective, and correct utilisation of transportation infrastructure; and
- Development, promulgation and administration of transport and transportation legislation.

The Ministry is the implementation authority of the Project, through the Directorate Transport.

3.6.2 TransNamib Holdings Limited (TransNamib)

TransNamib is enacted by the National Transport Services Holding Act (No. 28 of 1998) to undertake, either by itself or through any subsidiary company, transport services in Namibia or elsewhere. It is a self-regulating body in respect of management, safety, operations, accident, and incident investigations and as the sole provider of rail transport services in Namibia.

TransNamib has the power to enter into an agreement with any person, organisation or authority to perform a particular act or to render a particular service on behalf of or in favour of or to the benefit of TransNamib if it considers it necessary for the efficient performance of any act or service so contemplated.

Statutorily TransNamib will play a significant role in the planning, design, construction, maintenance, control, and development of the Trans-Zambezi Railway Corridor notwithstanding the fact that railway vests in the State (MR Technofin Consultants Ltd., March 2022).

TransNamib will be responsible for the operational side, while ownership vests with the Government of Namibia.

3.6.3 Namibian Transport Advisory Board

The Namibian Transport Advisory Board is enacted by the Namibian Transport Advisory Board Act (No. 23 of 1991).

The objects of the Board are to develop, promote and encourage transport in Namibia and to coordinate transport services in Namibia to ensure that transport services are carried on and maintained in, from or to Namibia in the best interest of Namibia and its inhabitants in the most effective and economic manner.

As part of achieving the objects of the Board, it is tasked with making investigations and advising the Minister of Works and Transport on:

- Policies that should be followed and implemented in Namibia in relation to transport;
- The appropriate choice and combination of infrastructure investments, rail as well as road, transport system development, commercial and economic viability of different solutions and financial arrangements for infrastructure investments;
- Measures that are necessary to co-ordinate transport services in Namibia; and
- Any matter which in the opinion of the Board is connected therewith or that is assigned to the Board by the Minister

The Board has the power to conduct investigations to achieve its objects, but its core function is to serve as advisor to the Minister. It does not have statutory power to be consulted over or approve public procurement processes or the creation of a public private partnership to implement the Project. In either instance however, the Board has the power to make investigations and to advise the Minister accordingly (MR Technofin Consultants Ltd., March 2022).

3.6.4 Sustainable Development Advisory Council

The Sustainable Development Advisory Council was inaugurated in 2013 mandated under Article 6 of the Environmental Management Act of 2007:

> *"to promote the sustainable management of the environment and the use of natural resources by establishing principles for decision making on matters affecting the environment; to establish the Sustainable Development Advisory Council; to provide for the appointment of the Environmental Commissioner and environmental officers; to provide for a process of assessment and control of activities which may have significant effects on the environment; and to provide for incidental matters"*

The functions of the Sustainable Development Advisory Council, outlined in Article 7 of the Environmental Management Act of 2007, are:

(a) To promote co-operation and co-ordination between organs of state, non- governmental organisations, community-based organisations, the private sector and funding agencies, on environmental issues relating to sustainable development;

(b) To advise the Minister -

(i) On the development of a policy and strategy for the management, protection and use of the environment;

(ii) On the conservation of biological diversity, access to genetic resources in Namibia and the use of components of the environment in a way and at a rate that does not lead to the long-term decline of the environment, thereby maintaining its potential to meet the needs and aspirations of present and future generations;

(iii) On appropriate methods of monitoring compliance with the principles set out in section 3 of the Environmental Management Act (see text box below);

(iv) On the need for, and initiation or amendment of legislation, on matters relating to the environment; and

(c) To perform other functions assigned to it by the Minister.

The Council is expected to advise on appropriate methods of monitoring compliance to the twelve principles, which apart from other includes *'Renewable resources must be used on a sustainable basis for the benefit of present and future generations'; 'The participation of all interested and affected parties must be promoted and decisions must take into account the interest, needs and values of interested and affected parties'; 'Equitable access to environmental resources must be promoted and the functional integrity of ecological systems must be taken into account to ensure the sustainability of the systems and to prevent harmful effects'; 'Assessments must be undertaken for activities which may have a significant effects on the environment or the use of natural resources'; 'Sustainable development must be promoted in all aspects relating to the environment'; 'Namibia's cultural and natural heritage including, its biological diversity, must be protected and respected for the benefit of present and future generations'; 'The option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term must be adopted to reduce the generation of waste and polluting substances at source'; 'Damage to the environment must be prevented and activities which cause such damage must be reduced, limited or controlled'.*

3.6.5 Ministry of Environment, Forestry and Tourism

The Ministry of Environment, Forestry and Tourism's (MEFT) mandate is derived from the Constitution of Namibia, specifically Chapter 11 "Principles of State Policy" and Article 95 "Promotion of the Welfare of the People".

MEFT is responsible for safeguarding Namibia's environmental resources and to promote biodiversity conservation in the Namibian environment through the sustainable utilisation of natural resources and tourism development for the maximum social and economic benefit of its citizens.

The Department of Environmental Affairs (DEA) under direct responsibility of the office of the Environmental Commissioner is responsible for policing and regulating of all listed activities

requiring an environmental clearance certificate as provided for by Section 27(3) of Namibia's Environmental Management Act (No. 7 of 2007).

The Environmental Commissioner serves as head of the DEA, which is also home to three divisions. The Office of the Environmental Commissioner takes responsibility for managing the DEA and for the following functions in terms of Section 5 of the Environmental Management Act No. 7 of 2007:

- Advise organs of state on the preparation of environmental plans;
- Receive and record applications for environmental clearance certificates;
- Determine whether a listed activity requires an assessment;
- Determine the scope, procedure, and methods of an assessment;
- Review the assessment report in accordance with this Act;
- Issue environmental clearance certificates in terms of this Act;
- Maintain a register of environmental assessments undertaken in terms of this Act;
- Maintain a register of environmental clearance certificates issued and environmental plans approved in terms of this Act;
- Conduct inspections for monitoring compliance with this Act; and
- Perform any other duty or function, which the Minister may assign or prescribe.

The Division of Environmental Assessment, Waste Management and Pollution Control, and Inspections (EAWMPCI) consists of the Subdivision: Environmental Assessments; Subdivision: Waste Management and Pollution Control; and Subdivision: Environmental Inspections.

The core functions of this Division are to:

- Receive and review Environmental Assessments and provide recommendations on the issuing of environmental clearance certificates;
- Promote the management of waste, hazardous substances and pollution in an environmentally sound manner;
- Monitor and enforce Environmental Management Plans and general measures for environmental protection; and
- Serve as national focal point and coordinate national level implementation of relevant international conventions (including the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal, and the Stockholm Convention on Persistent Organic Pollutants).

The Directorate Environmental Affairs within the Department of Environmental Affairs and Forestry is tasked with the implementation of the Environmental Management Act (No. 7 of

2007) and evaluation of all environmental impact assessments done, as provided for by the Environmental Impact Assessment Regulations (GG. No. 30 of 2012).

The Directorate Environmental Affairs with the Ministry of Environment, Forestry and Tourism is accordingly the institution responsible for evaluating, approving and overseeing environmental and social impact mitigation and monitoring of this Project for both the construction and operational phase.

3.6.6 Ministry of Agriculture, Water and Land Reform

According to Article 16(2) of the Namibian Constitution, expropriation of property in the public interest by the State must be subject to the payment of "just compensation". Part IV of the Agricultural (Commercial) Land Reform Act (No. 6 of 1995) deals with compulsory acquisition of agricultural land and in specific compensation for land, to be done within a sustainable and lawful manner.

The responsibility of compensation for the temporary and/or permanent loss of land and/or damage to land and assets resides with the Directorate Land Reform and Resettlement within the Ministry of Agriculture, Water and Land Reform.

Within the Ministry, three Directorates comes into play considering that agricultural land will be required for the Project for which the value need to be determined and landowners compensated, being the Directorate Land Reform and Resettlement; Directorate Valuation and Estate Management; and the Directorate Survey and Mapping.

The Directorate Land Reform and Resettlement, which main function is to administer the Agricultural (Commercial) Land Reform Act, Act No. 6 of 1995 (ACLRA) and the Communal Land Reform Act, Act No. 5 of 2002. The National Land Policy was also developed and is being implemented by the Directorate.

The Directorate of Land Reform consists of three main divisions namely, the Division of Land Boards, Tenure and Advice (LBTA), the Division of Land Use Planning and Allocation (LUPA), and the Division Resettlement, as briefly outlined below.

- The Division of Land Boards, Tenure and Advice (LBTA) mission is to fairly administer Namibia's communal land policies and legislation, implementers such as the Communal Land Boards and Traditional Authorities execute effective development and sustainable utilization of communal land. The Division is therefore tasked to administer the National Land Policy, the National Land Tenure Policy and the Communal Land Reform Act.
- The Division of Land Use Planning and Allocation is the national systematic assessor of the natural resources' potential. The mandate of this Division is to avail alternative of land use options considering economic and social conditions in the process of selecting the best land use options. LUPA is responsible for developing land use plans for commercial and communal land by coordinating inter-sectoral land use activities. Land Use Planning is a sector that use an integrative decision-making process

approach that facilitates the allocation of land to the users whose land use plans are deemed likely to provide the greatest sustainable benefit. It is a crucial instrument for government to manage land resources within the overall context of rural and urban development.

- The Division Resettlement is responsible for facilitating, coordinating and implementing the resettlement process and activities, and for keeping and maintaining a database of information on the resettled beneficiaries. The major functions of this Division are:
    - Allocation of resettlement farms (resettlement process);
    - Resettlement rental fees and lease agreement;
    - Post-settlement support;
    - Resolution of disputes; and
    - Group resettlement projects.

The Directorate Valuation and Estate Management provides valuations of agricultural land for the purpose of administering the Land Tax. The Land Tax is provided for in the Agricultural (Commercial) Land Reform Act 6 of 1995 (ACLRA), read together with the Land Valuation and Taxation Regulations of 2007. Revenue generated from the Land Tax accrues to the Land Acquisition and Development Fund and is to be used for the acquisition of land for resettlement, and development of infrastructure on the farms acquired.

The Land Tax is based on the value – known as the Unimproved Site Value – of a parcel of land. Land valuation entails valuing a parcel of land in its natural form as though undeveloped; it does not take into consideration any infrastructural improvements. Any factors that increase the value of a piece of land also raise the level of taxation, provided that the rate remains unchanged or is increased.

As the main entity responsible for Land Tax, the Ministry of Land Reform (MLR) appoints a Valuer who is in charge of the valuation of agricultural land and is responsible for preparing a Provisional Valuation Roll for each piece of land being valued. Each Provisional Valuation Roll (PVR) contains/reflects:

- a description of the agricultural land in question;
- the name and address of the landowner;
- the size of the land in hectares and the carrying capacity; and
- the Unimproved Site Value of the land.

This Division is divided into urban valuation, agricultural valuation, and market-research subdivisions.

- Subdivision Urban Valuation: Involved in the valuation of all urban properties, rental assessment of leasehold units and assessment of compensation for land and

improvements where land is acquired for township development as requested by Offices, Ministries and Agencies (OMAs).

- Subdivision Rural Valuation: Ensures that the State pays a fair price for properties acquired for land reform purposes, and that the Government disposes of its properties at a value that is in line with the market. Also provides valuations for rental purposes for the resettlement units and other rural state land.
- Subdivision: Market Research: Ensures that the Division, through up-to-date market research and valuation standards, produces quality property-market reports to support the valuation process within the Directorate and for decision-making purposes

The Directorate Survey and Mapping (DSM) provide professional services and advice to the government, parastatals, private companies, and the general public on the matter relating to survey and mapping, and derives its main mandate from Land Survey Act, 1993 (No. 33 of 1993).

Essentially the DSM is responsible for:

- Defining and demarcating Namibia's internal boundaries and national borders;
- Developing the related topographical information; and
- Generating spatial records of land ownership, access rights, licenses and concessions.

The DSM performs these essential functions through three core divisions: the Division of Survey and Land Information, the Division of Mapping and GIS; and the Division of Geomatics.

The DSM is run by a Surveyor-General, and its staff includes professionals in land surveying, experts on Geographical Information Systems(GIS), cartographers, photogrammetrists and administrators.

Considering the number of land portions affected (40), considered to be small, the Project is not expected to result in any delay in compensating, surveying, processing and registration of new land portions, if so required.

Funding for compensations will form part of the Project cost- for which funding is sourced from the AfDB.

3.7 INSTITUTIONAL CAPACITIES AND STRENGTHENING PLAN

Considering the pivot roles to play and currant challenges experienced within the below mentioned Ministries, strengthening of their respective institutional capacities are necessary and will contribute to the successful management and implementation of the proposed Project.

3.7.1 Ministry of Works and Transport

The Ministry of Works and Transport via the applicable Division within the Department of Transport is responsible for the implementation of the Project and by default also for environmental and social matters of relevance to the Project, as presented within this ESIA and related ESMP.

With the involvement of the AfDB and required international standards compliance, it is necessary to strengthen all role players' capacities on environmental and social matters. Capacity building and training within the Department of Transport and applicable Division/s, as well as the appointed Contractor and Health, Safety and Environmental (HSE) Representative is essential to ensure effective implementation. Please refer to the section 10.6 for the proposed training and capacity building topics.

With no Environmental and Health Division within the Ministry, implementation of the environmental and health requirements is not possible and will have to be sourced out or alternatively such Division will have to be created, which is expected to take some time.

The Ministry of Works and Transport, assisted by the AfDB will have to develop a capacity-building program for their responsible Department and/or Division and appointed contractor on the implementation and monitoring of the proposed Project and the ESMP. The contractor is again responsible to train his/her workers on the ESMP implementation including EHS requirements during the induction session or by conducting additional sessions. This capacity building shall be performed before the commencement of any work to prevent exposure to construction activities associated and be made aware of national regulatory requirements, the AfDB's requirements as per the ISS requirements. Continues follow-up programmes should be implemented throughout the duration of the Project.

3.7.2 Ministry of Environment, Forestry and Tourism

The Ministry of Environment, Forestry and Tourism (MEFT) has Regional Offices within seven (7) of the Regions, although limited in Departments and Divisions, as applicable to the particular Region.

The office of the Environmental Commissioner with the Department of Environmental Affairs (DEA) stationed within Windhoek is the only office in Namibia responsible for environmental compliance. The office of the Environmental Commissioner is responsible for policing and regulating of all listed activities, as well as evaluation of all environmental impact assessments done throughout Namibia. With restricted capacity and resources, the responsibilities to evaluate environmental impact assessments effectively and efficiently within a timeous manner is understandably not achieved.

Shortcomings within the Directorate Environmental Affairs are –

- Neither the Environmental Management Act (No. 7 of 2007) and the related Environmental Impact Assessments (GG. No. 30 of 2012) requires on-site inspection

and monitoring of construction activities, although this requirement is stipulated within the Environmental Clearance Certificate issued;

- No regional offices exist within the rest of Namibia, apart from the central office in Windhoek; and
- Shortage in staff to inspect and conduct on-site monitoring of approved projects throughout Namibia.

This project will have a cumulative load on the already restricted capacity from both an evaluation perspective as well as an implementation monitoring perspective.

With the involvement of the AfDB and required international standards compliance, it is necessary to strengthen the capacity of the Department of Environmental Affairs and in specific that of the office of the Environmental Commissioner to achieve sustainable development within Namibia. Capacity building and training within the Department of Environmental Affairs and applicable Division (office of the Environmental Commissioner), as well as the appointed Contractor and Health, Safety and Environmental (HSE) Representative is essential to ensure effective implementation and monitoring.

The Ministry of Environment, Forestry and Tourism, assisted by the AfDB will develop a capacity-building program for both the Department and/or Division and appointed contractor on the implementation and monitoring of the ESMP. The contractor is again responsible to train his/her workers on the ESMP implementation including EHS requirements during the induction session or by conducting additional sessions. This shall be performed before the commencement of any work to prevent exposure to construction activities associated and be made aware of national regulatory requirements, the AfDB's requirements as per the ISS requirements.

In addition to the mentioned, the Ministry of Environment, Forestry and Tourism should budget for a staff member of the Directorate of Environmental to be stationed at Otjiwarongo for the remainder of the proposed Project, i.e., 5 years. This person should be equipped and supported to enable effective and efficient on-site construction inspection, monitoring and reporting. This person should be well qualified and experienced in local and international legalisation and practises applicable to environmental monitoring and reporting.

3.7.3 Ministry of Agriculture, Water and Land Reform

Given the Ministry's current organisational structure and strength, it is not expected that any delays to the Project may result as a result of the Project itself. It is however advisable that the Proponent request the Minister of the Ministry of Agriculture, Water and Land Reform to dedicate the required availability staff to the Project for the duration of the Project (i.e., 5 years).

3.8 GAP ANALYSIS

This section of the ESIA provides a gap analysis between Namibian requirements and the IFC Performance Standards, as required by the AfDB.

Table 3.8-1 below provides a comparison of Namibian Government policies and regulations related to environmental and social safeguards against the IFC Performance standards. It further provides recommendations on how the project will fill any gaps.

Table 3.8-1 – Gap Analysis

IFC Performance Standards	Namibian Legal Framework	Gaps and recommendations for gap closure
PS1: Assessment and management of environmental and social risks and impacts: It establishes the importance of (i) integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) the client's management of environmental and social performance throughout the life of the project. It underscores the importance of managing environmental and social performance throughout the life of a project, through an effective Environmental and Social Management System (ESMS). The ESMS, initiated and supported by management, follows a methodological approach in managing identified environmental and social risks and impacts in a structured way on an on-going basis. In addition, this Performance Standard supports the use of an effective grievance mechanism that can facilitate early indication of, and prompt remediation for those who believe that they have been harmed by a client's actions.	Article 95 (1) of the Constitution covers environmental and social sustainability by promoting the welfare of the people through protection of the environment and that the use of natural resources is only allowed within reasonable limits and beyond such limits, permission should be obtained from a competent authority, provided by the applicable legislation. For purpose of the Project and as required by the Constitution, approval is required from various Line Ministries of which the environmental and social assessment process and sustainable environmental practises is regulated by the Environmental Management Act No. 7 of 2007. Approval for the abstraction of water for construction purpose is regulated and required as per the Water Act No. 54 of 1956 and Water Resource Management Act No. 11 of 2013. Protection of the natural environment and consideration for human health and safety as a result of developments are covered in various legislations provide a framework for an integrated approach to planning and sustainable management of Namibia's environment and natural resources. Article 32(3)h of the Namibian Constitution recognises public consultation as a means of good governance in the respect that consultation with the	Although the Constitution of Namibia outlaws' ethnic discrimination, it does not uphold any rights specifically for 'Indigenous Peoples'. Furthermore, the government deals with legislation over "marginalized communities" rather than explicitly addressing issues regarding Indigenous groups. It is worth mentioning that the Project does not affect any indigenous people. Referring to 'marginalized groups', these have been identified in various Namibian laws and policies as groups that merit special attention and concern. The conditions of these groups, especially relative to other segments of the population of Namibia, can be identified as similar to those groups identified as indigenous worldwide (Anaya, 2013). The process of conducting an environmental assessment is sufficiently addressed within the Environmental Impact Assessment Regulations (GG. No. 30 of 2012), although no requirements are stated with respect to impact monitoring during construction and operations of the development. Public consultation during the assessment process is sufficiently addressed with the Environmental Impact Assessment Regulations (GG. No. 30 of 2012), although no requirements are stated with

IFC Performance Standards	Namibian Legal Framework	Gaps and recommendations for gap closure
It strongly promotes and provides means for adequate stakeholder engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated. Special reference is made to Indigenous People and that their Free, Prior, and Informed Consent (FPIC) should be obtained. Indigenous Peoples are covered in Performance Standard 7.	public on matters relating to the functions, powers and duties of Government. The Environmental Management Act No. 7 of 2007 confirm and supports the necessity to request and consider the opinion of the public by requiring public consultation as part of the decision-making process (section 36(1)b and section 44). The Environmental Impact Assessment Regulations (GG. No. 30 of 2012) to the Environmental Management Act No. 7 of 2007, stipulates the requirements to public consultation (sections 7.1, 9, 21) and the process of conducting the environmental assessment and evaluation from the side of the authority.	respect to public consultation during construction and operations of the development. To bridge this gap, an effective Environmental and Social Management System (ESMS) is to be used to ensure meaningful and efficient engagement between the Project and local communities directly affected by the Project for the duration of the Project, i.e., construction and operation. Strengthening of institutional capacities at the Ministry of Environment, Forestry and Tourism (Directorate Environmental Affairs) are necessary to ensure smooth and effective project construction monitoring and reporting.
PS2: Labour and working conditions: Provides for the protection of the fundamental rights of workers at the workplace. The objectives are to; • Promote the fair treatment, non-discrimination, and equal opportunity of workers; • Establish, maintain, and improve the worker management relationship. • Promote compliance with national employment and labour laws.	Namibia's Labour Act, No. 11 of 2007 establish a comprehensive labour law for all employers and employees to entrench fundamental labour rights and protections through the regulation of basic terms and conditions of employment, ensuring the health, safety and welfare of employees, and the protection of employees from unfair labour practices. It further regulates the registration of trade unions and employers' organisations, as well as collective labour relations and provide for the systematic prevention and resolution of labour disputes. It requires that employee recruitment, contract and grievance management, disciplinary measures and	The local labour laws and related Acts are considered sufficient and up to international labour organization standards. For efficiency and easier coordination with respect to grievance redress mechanism, the project will apply a Workers Grievance Redress Mechanism, which will include a Code of Conduct.

IFC Performance Standards	Namibian Legal Framework	Gaps and recommendations for gap closure
• Protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain. • Promote safe and healthy working conditions, and the health of workers; and, • Avoid the use of forced labour. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the Environmental and Social Management System (ESMS), the elements of which are outlined in Performance Standard 1.	retrenchment and termination of service should be rational, fair and just. Other relevant Acts in support to safe and healthy labour relations are the Social Security Act & Regulations (No. 34 of 1994), the Affirmative Action Employment Act (29 of 198), the Social Work & Psychology Act (No. 6 of 2004), Pension Fund Amendment Act and Regulations (No. 4 of 1994), the Employee Compensation Amendment Act (No. 5 of 1995), Medical Aid Funds Act and Regulations (No. 23 of 1995), the Married Persons Equality Act (No. 1 of 1996), the Racial Discrimination Prohibition Act (No. 26 of 1991), and the Immigration Control Act (No. 7 of 1993). Employment of children under the age of 14 is prohibited in the Namibian Labour Act (No. 11 of 2007) and the Child Care and Protection Act (No. 3 of 2015) and its regulations. The Constitution provides that children under the age of 16 are to be protected from economic exploitation and are not to be employed or required to perform work that is likely to be hazardous, harmful to their health or physical, mental, spiritual, moral, or social development, or to interfere with their education. The Constitution prohibits slavery and forced labour, but does not specifically refer to children. The Prevention of Organized Crime Act, enacted in	

IFC Performance Standards	Namibian Legal Framework	Gaps and recommendations for gap closure
	November 2004, specifically prohibits trafficking in persons. Section 14 in the Combating of Immoral Practices Act of 1980, prohibits any male from having sexual relations with, or soliciting an indecent act from, any girl who is under the age of 16.	
PS3: Resource efficiency and pollution prevention: This Performance Standard outlines a project-level approach to resource efficiency and pollution prevention and control in line with internationally disseminated technologies and practices. It is established during the environmental and social risks and impacts identification process and aims: • To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities. • To promote more sustainable use of resources, including energy and water. • To reduce project related GHG emissions.	Prevention to pollution to the benefit of human health and the environment is addressed within the Constitution covering environmental and social sustainability through the protection of the environment, as well as Namibia's 5th National Development Plan. Sustainable practises and protection of the environment is also addressed in Namibia's 2nd Biodiversity Strategy and Action Plan, the National Water Policy for Namibia (2000), Water and Sanitation Policies, Environmental Management Act (Act No. 7 of 2007), Water Act (No. 54 of 1956), Water Resources Management Act (Act No. 11 of 2013), Soil Conservation Act, as amended (Act No. 76 of 1969), Pollution Control and Waste Management Bill (September 2003), Atmospheric Pollution Prevention Ordinance (No. 11 of 1976), and the Public and Environmental Health Act (Act No. 1 of 2015). Of the mentioned Acts, the Water Act (No. 54 of 1956) and the Public and Environmental Health Act (Act No. 1 of 2015) becomes more important, as it focus on ground water sources and the protection	With multiple legislation focusing on pollution prevention and protection (i.e., use) of natural resources such as water, it can be considered to be sufficient and in line with international legislation. However, implementation and policing of these laws however remains problematic. These laws are not stringent on monitoring, follow up and enforcement, as they don't provide guidelines for inspection and continuous audit of projects to ensure they comply with licensing conditions. Namibia does not yet have legislation that explicitly address Climate Change, but many relevant general concepts and principles applicable to climate change are contained in the legal environmental framework. One example is the Environmental Management Act No. 7 of 2007, which promotes sustainable management of the environment and the use of natural resources by establishing principles for decision-making on matters affecting the environment. Other examples are the Forest Act No. 12 of 2001, which provides for the protection of the environment and the control and management of forest fires as well as the Disaster Risk Management

IFC Performance Standards	Namibian Legal Framework	Gaps and recommendations for gap closure
	thereof against pollution and over exploitation to the benefit of humans and the environmental. The Water Act (No. 54 of 1956) along with the Water Resources Management Act, No. 11 of 2013 requires the Proponent and Project team to investigate and implement measures to ensure sustainable use of water resources and ensure that no pollution of any above or below ground water takes place. Abstraction of underground water above a certain volume is prohibited without a permit, which is subject to a detailed impact assessment and mitigation measures. Climate change is addressed within Namibia's 5th National Development Plan, Namibia's 2nd Biodiversity Strategy and Action Plan, as well as the Namibian Transport Policy (2018), National Policy on Climate Change for Namibia (2011) and the National Climate Change Strategy & Action Plan 2013 – 2020. The National Climate Change Strategy & Action Plan (NCCSAP) 2013 – 2020 recognized that the National Policy on Climate Change (NPCC) of 2011 in itself was not enough, and that a more specific framework in the shape of a Strategy and Action Plan was needed. The NCCSAP lays out the guiding principles responsive to climate change that is effective, efficient and practical. It further identifies priority action areas for adaptation and mitigation.	Act No. 10 of 2012, which provides for an integrated and coordinated disaster management approach that focus on reducing the risk of disasters, mitigating the severity of disasters, emergency preparedness, rapid and effective response to disasters and post-disaster recovery. The Namibian Government, however, do recognise that there is an urgency to review existing legislation, regulations and norms to frame these in accordance with climate change concerns in the country. To bridge the gap an effective Environmental and Social Management System (ESMS) is to be used to ensure meaningful and efficient mitigation implementation relevant to resource efficiency (i.e., energy) and greenhouse gases. Strengthening of institutional capacities at the Ministry of Environment, Forestry and Tourism (Directorate Environmental Affairs) are necessary to ensure smooth and effective project construction monitoring and reporting.

IFC Performance Standards	Namibian Legal Framework	Gaps and recommendations for gap closure
PS4: Community health, safety and security: This Performance Standard addresses the client's responsibility to avoid or minimize the risks and impacts to community health, safety, and security that may arise from project related activities, with particular attention to vulnerable groups. It is established during the environmental and social risks and impacts identification process and aims: • Anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances; and • Ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities. This Performance Standard addresses potential risks and impacts to the Affected Communities from project activities, while occupational health and safety requirements for workers are included in Performance Standard 2, and environmental standards to avoid or minimize impacts on human health and the environment due to pollution are included in Performance Standard 3.	The right to a healthy and safe environment is a Constitutional right. All above mentioned laws have as their overall goal to protect and promote community health, safety and security, by regulating a specific sector, i.e., water, air, fauns, etc. Namibia's Public and Environmental Health Act (No. 1 of 2015), which replaced the Health Act of 1919, addresses a variety of aspects with relevance to the general wellbeing and health of the public. Part 3 addresses the prevention and control of diseases in general, while sexually transmitted infections are also addressed (Part 4). Waste collection, disposal and sanitation are addressed in Part 9. Part 10 of this Act prohibits the existence of a 'nuisance' on any land owned or occupied by any person, while section 59 stipulates what constitutes health nuisance.	These laws are not stringent on monitoring, follow up and enforcement, as they don't provide guidelines for inspection and continuous audit of projects to ensure they comply with licensing conditions. To cover this, the project will use the IFC PS4 since it provides for continuous monitoring and audits throughout the project life cycle ensuring anticipation and early avoidance and /or mitigation of adverse impacts on the health and safety of workers and the Affected Community.

IFC Performance Standards	Namibian Legal Framework	Gaps and recommendations for gap closure
PS5: Land acquisition and involuntary resettlement: This performance standard recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. They apply to economic and /or physical displacements related to land rights or land use rights. This Performance Standard does not apply to resettlement resulting from voluntary land transactions. The guidelines support that involuntary resettlement should be avoided. Where involuntary resettlement is unavoidable, it should be minimized and appropriate measures to mitigate adverse impacts on displaced persons and host communities should be carefully planned and implemented. The objectives of this PS are: • To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs. • To avoid forced eviction. • To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or	The right to own land and property in Namibia is considered a Constitutional right. According to Article 16(2) of the Namibian Constitution, expropriation of property in the public interest by the State must be subject to the payment of "just compensation". Part IV of the Agricultural (Commercial) Land Reform Act (No. 6 of 1995) deals with compulsory acquisition of agricultural land and in specific compensation for land, to be done within a sustainable and lawful manner. Although it does not specify the amount of compensation to be paid for land that is expropriated, it does establish relevant criteria for the assessment of the amount to be compensated. According to Article 14 (1) of the Agricultural (Commercial) Land Reform Act, the Minister of Lands, Resettlement and Rehabilitation may, after consulting with the Land Reform Advisory Commission (Article 3), decide to expropriate any farm identified as being suitable for resettlement. The Commission, which is composed of all stakeholders, was established in accordance with Article 4 of the Agricultural (Commercial) Land Reform Act in order to assist the Minister in administering the Act. The Expropriation Ordinance (No. 13 of 1978) was amended by National Transport Corporation Act 21 of 1987 who again has been repealed by the Holding	The rules defined by the Namibian Constitution and the Agricultural (Commercial) Land Reform Act for expropriation of farmland are in line with national and international law. In the absence of a compensation policy for railway projects, the Roads Authority Compensation Policy will be used and applied for this Project. Compensation will be done by the Ministry of Agriculture, Water and Land Reform, as per the ARAP and Stakeholder Engagement Plan.

IFC Performance Standards	Namibian Legal Framework	Gaps and recommendations for gap closure
restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. • To improve, or restore, the livelihoods and standards of living of displaced persons. • To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System, the elements of which are outlined in Performance Standard 1.	Company Act, the consequence of which is that there is no statutory framework for expropriation specifically earmarked for railway, other than by way of the broad application of the Ordinance.	
PS6: Biodiversity conservation and sustainable management of living natural resources: Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development.	Article 95 (1) of the Constitution covers environmental and social sustainability by promoting the welfare of the people through protection of the environment and that the use of natural resources is only allowed within reasonable limits and beyond such limits, permission should be obtained from a competent authority, provided by the applicable legislation.	These laws are not stringent on monitoring, follow up and enforcement, as they don't provide guidelines for inspection and continuous audit of projects to ensure they comply with licensing conditions. To cover this, the project will use the IFC PS6 since it provides for continuous monitoring and audits throughout the project life cycle ensuring anticipation

IFC Performance Standards	Namibian Legal Framework	Gaps and recommendations for gap closure
This Performance Standard addresses how clients can sustainably manage and mitigate impacts on biodiversity and ecosystem services throughout the project's lifecycle. The objectives are set to: • To protect and conserve biodiversity. • To maintain the benefits from ecosystem services. • To promote the sustainable management of living natural resources through the adoption of practices that integrates conservation needs and development priorities. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System, the elements of which are outlined in Performance Standard 1.	Sustainable practises and protection of the environment is also addressed in Namibia's 5th National Development Plan, Namibia's 2nd Biodiversity Strategy and Action Plan, the Forest Act, as amended (Act No. 12 of 2001), and the Nature Conservation Ordinance (Act No. 4 of 1975). The Forest Act, as amended (Act No. 12 of 2001) deals with forests in general and matters incidental thereto. Of importance to the proposed Project is that the Act affords general protection of the environment (Part IV). Section 22 affords protection to natural vegetation stipulating that no living tree, bush or shrub within 100m from any river, stream or watercourse may be removed without the necessary license. Permits are required for the removal of trees, bushes or shrubs, or any indigenous plants. This Nature Conservation Ordinance (Act No. 4 of 1975) covers game parks and nature reserves, the hunting and protection of wild animals (including game birds), problem animals, fish, and of importance to the proposed Project affords protection of certain indigenous plant species. Other legislation of indirect relevance to biodiversity are the National Water Policy for Namibia (2000), Water and Sanitation Policies, Environmental Management Act (Act No. 7 of 2007), Water Act (No. 54 of 1956), Water Resources Management Act (Act No. 11 of 2013), Soil Conservation Act, as amended	and early avoidance and /or mitigation of adverse impacts on biodiversity. In addition, an effective Environmental and Social Management System (ESMS) is to be used to ensure meaningful and efficient mitigation implementation relevant to protection and conservation of biodiversity.

IFC Performance Standards	Namibian Legal Framework	Gaps and recommendations for gap closure
	(Act No. 76 of 1969), Pollution Control and Waste Management Bill (September 2003), Atmospheric Pollution Prevention Ordinance (No. 11 of 1976), and the Public and Environmental Health Act (Act No. 1 of 2015).	
PS7: Indigenous people: Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded. The objectives of this PS are defined as: • To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples. • To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts.	Indigenous people are not recognized in Namibia's Constitution and have little political representation, besides the appointment of traditional authorities, which has proven to be a slow and problematic process. Although the Constitution of Namibia does not specifically use the term 'Indigenous Peoples', it is robust in articles that define vulnerability and marginalization. The Constitution outlaw's ethnic discrimination, but it does not uphold any rights specifically for Indigenous Peoples. Furthermore, the government deals with legislation over "marginalized communities" rather than explicitly addressing issues regarding Indigenous groups. Namibia has signed several of the international agreements upholding human and Indigenous rights, including the African Charter on Human and People's Rights, the International Convention on the Elimination of All Forms of Racial Discrimination, the International Covenant on Civil and Political Rights,	These laws are not stringent on monitoring, follow up and enforcement, as they don't provide guidelines for inspection and continuous audit of projects to ensure they comply with licensing conditions. To cover this, the project will use the IFC PS6 since it provides for continuous monitoring and audits throughout the project life cycle ensuring anticipation and early avoidance and /or mitigation of adverse impacts on biodiversity. In addition, an effective Environmental and Social Management System (ESMS) is to be used to ensure meaningful and efficient mitigation implementation relevant to protection and conservation of biodiversity. PS7: Indigenous peoples: With no specific law addressing the protection and concerns of indigenous people per se and complications with the interpretation of laws having some relevance, there is little that protects indigenous people to the extend internationally required.

IFC Performance Standards	Namibian Legal Framework	Gaps and recommendations for gap closure
• To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner. • To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life cycle. • To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present. • To respect and preserve the culture, knowledge, and practices of Indigenous Peoples. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System, the elements of which are outlined in Performance Standard 1. The PS also recognises critical cultural heritage (PS8) and the protection thereof by avoidance as first priority.	and voted for the UN Declaration on the Rights of Indigenous Peoples (UNDRIP) in 2007.	To avoid a potential gap of coverage the project has treated all vulnerable and marginalized groups through the measures of the PS7 on Indigenous Peoples. During the planning process at local level and public consultation all potentially groups have been consulted and requested to voice their concern if their rights, interests, needs, livelihoods, or culture are affected by the project and how they can be benefited. For Indigenous Peoples, in addition to ICP, their Free, Prior, and Informed Consent (FPIC) will be sought.

IFC Performance Standards	Namibian Legal Framework	Gaps and recommendations for gap closure
PS08: Cultural Heritage; Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities. In addition, the requirements of this Performance Standard on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity. The objectives set by PS8 are: • To protect cultural heritage from the adverse impacts of project activities and support its preservation. • To promote the equitable sharing of benefits from the use of cultural heritage. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System, the elements of which are outlined in Performance Standard 1.	The protection and administration of Namibia's cultural heritage is informed by the National Heritage Act (No. 27 of 2004).	The Constitution does not address 'heritage' per say, but refers to culture in Article 19 as to 'Every person shall be entitled to enjoy, practise, profess, maintain and promote any culture, language, tradition or religion subject to the terms of this Constitution and further subject to the condition that the rights protected by this Article do not impinge upon the rights of others or the national interest.' To address these possible limitations, the project will apply provisions to IFC performance Standard 8 which ensures that the rights of the communities whose cultural heritage resources utilized in the project are protected and fair and equitable benefit sharing according to PS1 is applied. PS8 also applies to all cultural heritage, regardless of it being protected legally or not.

4 PROJECT DESCRIPTION AND JUSTIFICATION

This chapter provides first a brief overview of the existing railway infrastructure and related challenges currently experienced and then a description of the proposed Project.

The content of this chapter is based on and derived from secondary information as provided by the Project Engineers, WCE.

4.1 EXISTING RAILWAY INFRASTRUCTURE & CHALLENGES

The railway line from Kranzberg to Tsumeb connects the Port of Walvis Bay to the Northern Regions, forming a crucial transport link in Namibia. Namibia's railway network operates about 2,687 km of route on 3 ft. 6 in (1,067 mm) track gauge, often referred to as 'Cape Gauge'. The current Walvis Bay - Kranzberg, Kranzberg - Tsumeb and Otavi- Grootfontein sections can carry a maximum of 16.5-ton axle-load at an allowable maximum speed of 50 km/h. The railway servitude is generally 60m wide but varies in some areas and at stations and sidings. The service road is located alongside the railway within the servitude for the entire length of the project limits.

Some sections of the railway line located between Kranzberg Station and Tsumeb Station, as well as the section between Otavi Station and Grootfontein Station have been problematic due to the very old age of the rails, sleepers, and ballast (permanent way materials having exceeded their useful life).

The embankment on which the rails, sleepers, and ballast are located have deteriorated over the years and lost its structural integrity, which results in unwanted movements and shifting of the rails. A comprehensive materials investigation of the existing formation was done with samples taken at various depths at 5 km intervals. The results of material investigation indicated that the material used for the construction of the embankment is highly variable and in various cases of poor quality. In most areas an additional 200 mm sub-ballast layer must be introduced to comply with the minimum design standard. There are also numerous areas where the quality of the material does not conform to selected subgrade specifications which will require the introduction of a 300 mm A-layer as well as a 200 mm sub-ballast layer in order to comply with the minimum design standard. In addition, Dynamic Cone Penetration Testing was done at 250 m intervals to obtain the In-Situ California Bearing Ration (CBR). The results for layers directly below the ballast at 1 km intervals for the first 100 km as an extract indication are shown graphically below (Figure 4.1-1). The required CBR of 30 for the sub ballast layer is indicated in red. Except for the sections between km 9 and km 13, and km 85 to km 97, the majority of values are below standard.

The current Fifteen (15) steel bridges were constructed in the 1960`s and does not meet the structural capacity of carrying the proposed new 18.5-ton train axle load, thus requiring reconstruction. Many of the railway crossings of roads hold a potential risk, as some of the infrastructure and signage are old and dilapidated.

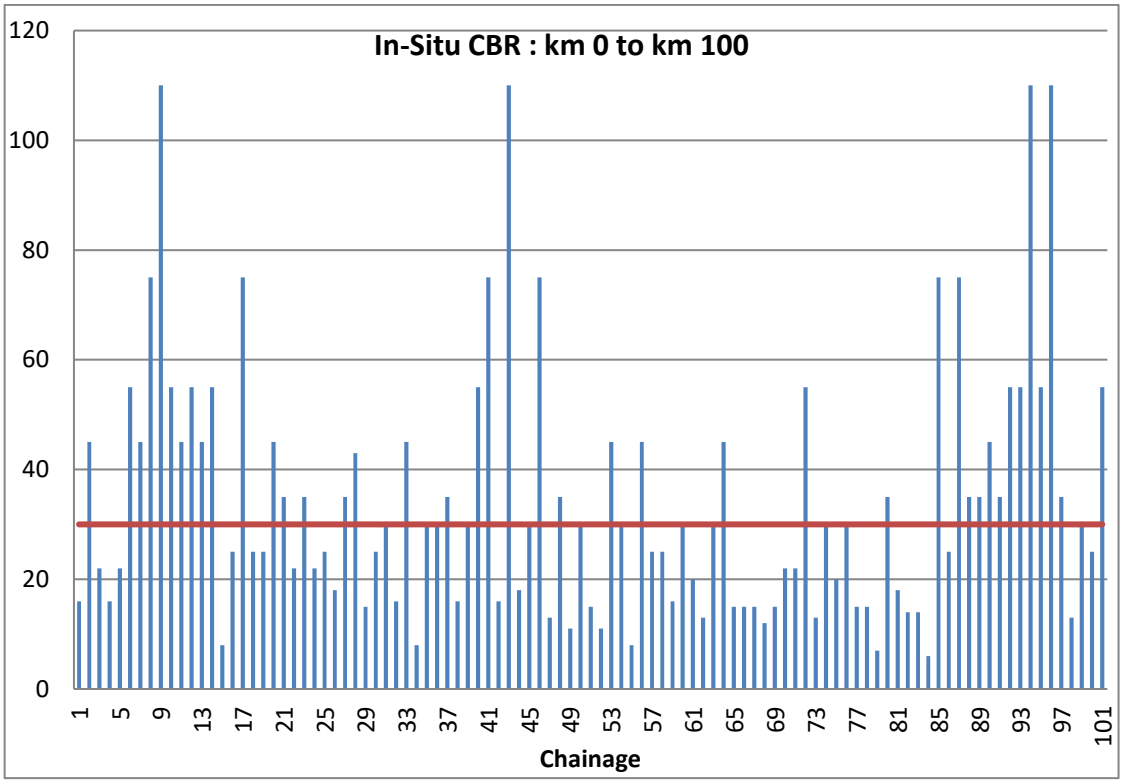


Figure 4.1-1 - Extract depiction of In-Situ CBR results of existing embankment

For safety reasons, passengers cannot be transported over it while goods trains are at risk of derailment. At present the general speed restriction imposed is 40km/h while on some sections it is as low as 15km/h. These factors have resulted in excessive transport times, forfeiting valuable income earning traffic to road transport which in turn causes undue damage to the country's national roads and increased GHG emissions.

In general, the current service road is in good condition with minor effort required with regards to refurbishment and upgrading. Where poor condition of stream crossings makes the service road impassable maintenance will be conducted. The entire section of the railway line servitude is currently fenced off on both sides, except for those sections where the railway line is running parallel with the national highway, i.e., sections in between Otjiwarongo and Tsumeb, as well as sections in between Otavi and Grootfontein. The existing fencing of the railway line varies between game and stock fencing. The fences are predominantly within a general good condition, although certain section's fences are delipidated. Gates are present along the route providing access to certain farms and power line servitudes, crossing the railway reserve. The current rail servitude varies between 40m and 60m (total width). The existing rail servitude and alignment constructed in the 1960`s was predominantly based on the narrow gauge (900 mm) railway that was constructed during the German Colonial era (early 1900`s).

The railway infrastructure consists, of a single-track rail with sidings along the length of the railway, with bridges, culverts, road crossings and station buildings, as presented by the photos below.

Images credits: (RCHS, April 2022)

Images credits: (CSA, September 2017)

Images credits: (CT, April 2022)

Images credits: (CT, April 2022)

Images credits: (CSA, September 2017)

Images credits: (CT, April 2022)

The Ministry of Works and Transport, responsible for railway affairs in Namibia, is currently engaged on a project aimed at upgrading the railway line between Kranzberg and Tsumeb in order to meet the requirements for transporting 2.0 million tons per annum at a speed of 100 km/h with allowable axle loads of 18.5 tons.

Windhoek Consulting Engineers (Pty) Ltd (the “Consultant”) had originally been appointed to provide professional services for the rehabilitation and upgrading of the railway line.

When the project was initiated by Government during 2011, the line was in a precarious condition resulting in several costly derailments. Apart from the damage to infrastructure and rolling stock, customer confidence in rail transport also suffered.

Firstly, a permanent way contractor was appointed to conduct necessary emergency repairs eliminating the worst track conditions. This process was, however, not enough to guarantee the safety of trains.

Secondly, the section from Kranzberg to Otjiwarongo was rehabilitated, replacing broken steel sleepers, rails, and fish plates, tightening all fastenings, and improving the alignment. This being an intensive maintenance effort without replacing rails and sleepers, and because of increased rail traffic, major deterioration has taken place since 2012 and the line is now due for major upgrading.

In terms of upgrading works the railway section from Otjiwarongo to Tsumeb was addressed first. The materials, including ballast, were in such a poor condition that rehabilitation would have been fruitless, and a waste of funds and it was decided to commence with upgrading/partial upgrading (Partial upgrading means replacing the steel sleepers with P2 concrete, providing a full ballast profile and re-instating, and continuously welding the old 30kg/m rails after removing dipped ends). Where 48kg/m rails were made available, full upgrading was conducted (exclusive of the construction of new railway embankments). The age and fatigue of the 30kg/m rails constitute a significant safety risk due to the possibility of rail breaks, with regular patrolling being essential. It has been frequently recommended that the rails be ultrasonically tested to identify and eliminate potential and latent rail breaks. The ultimate solution is however to replace the existing 30 kg/m rails with new 48 kg/m rails.

Finally, and most importantly, it must be stated that, despite all the above actions to enhance the safety of trains, improvement of the embankment has not been commenced with because of the urgency of eliminating emergency conditions with the available funds. From the original report on the infrastructure condition, it is evident that the existing embankment is generally substandard and an increase in the frequency of higher axle loading will cause failure of the whole structure. The preliminary design has been completed by the Consultant for a new embankment adjacent to the existing one.

The erratic provision of annual funding has made it extremely difficult to adhere to an effective long-term program of work.

Investment in the infrastructure on this railway section is crucial in order to:

- Ensure that Government`s commitment is honoured concerning the safe transport of Sulphuric Acid from Tsumeb to Arandis and Walvis Bay;
- Ensure that the railway section remains open for traffic; and
- Ensure for further future extension to the railway network, i.e., the Trans-Zambezi railway to connect to Zambia. The Kranzberg – Tsumeb, and Otavi – Grootfontein railway sections play a vital role for the transport of freight between the port of Walvis Bay and the north of Namibia and neighbouring SADC counties.

4.2 PROJECT CONTEXT, NEED & DESIRABILITY

A railway infrastructure upgrade in Namibia has become a necessary. Not only have safety issues become a serious concern, taking into consideration the Country's recent history with derailments and train accidents, but also service delivery which is inadequate and forcing people to opt for means of transportation via road, which is faster and more reliable, but possibly more expensive. The current condition of the rail infrastructure prevents further development of the rail transport sector.

The upgrade is important, taking into consideration the plans to develop Namibia into an International Logistics Hub and to promote an increase in trade and transportation of goods by making use of rail transport.

Upgrading of the railway line has become necessary for the following reasons –

- It is a national economic priority of the Namibian Government that the railways are upgraded to SADC standards to facilitate more efficient regional trade and transport of goods.
- There has been a history of safety issues along this section of Namibia's railways which needs to be fully rectified. In addition to the serious safety problem of train derailments, the poor condition of the railway infrastructure has caused trains to travel at considerably slower speeds.
- The embankments, bridges and stormwater drainage infrastructure were designed and constructed decades ago, which has reached it useful lifespan.

4.3 EXPECTED BENEFITS

The Project is expected to have the following benefits:

- Reduced Travel/Transport Times: Improved railway conditions and standards will reduce travelling and transportation time, which again has economic benefit to both the transporter and client. Reduced traveling times has the benefit of less fuels being consumed, which has a positive environmental impact (i.e., combating Climate Change).
- Improved Safety/Reliability: The existing railway line network is known for frequent derailments, which is primarily because of the current state of the rail infrastructure, which the Project will mitigate. The proposed Project includes provision of a new railway embankment, bridges, and culverts. Other proposed measures such as major and minor junction improvements, enhancement of sight distances and signage for safe intersections, vehicles, cattle, wildlife and pedestrian overpass and underpass crossings will help in increasing safety and reliable service.
- Economic Impacts for Travellers: Savings are anticipated in passenger transportation cost in comparison to ever increasing fuel prices of road transport.

- Economic Impacts for Road Maintenance: Transportation of freight, animals and goods via rail will result in reduced road transportation, which again place less of a burden on roads and resulting maintenance frequency and/or reconstruction of roads.
- Economic Impacts for Regional and Country Wide Development: Improved rail transport will result in reduced transaction costs in transportation and create more certainty in using the Project rail for transport, given the elevated standard. Furthermore, availability of reliable transport infrastructure and efficient transportation services is an essential requirement for achieving goals of any development plan. The proposed railway improvement will facilitate efficient and reliable transportation of freight to and from Walvis Bay harbour throughout Namibia and neighbouring SADC countries.
- Employment Generation: Infrastructure projects of this nature and scale provide direct and indirect employment opportunities to skilled, as well as unskilled labourers. The Project is expected to employ ± 150 people as labourers for the duration of the construction period, while the specialised work force will be ± 50 people. The enhanced income of the local skilled and unskilled work force will have a positive impact on other sectors of the economy.
- Local Content: The Project will source 100% of labour by value and 80% of materials by value (excluding petroleum and petroleum products) for construction sourced in Namibia.

4.4 PROJECT LOCATION

The Project stretches over a total distance of approximately 500km, from Kranzberg Station located approximately 11km east from Usakos within the Erongo Region, proceeding north-east wards towards Otjiwarongo in the Otjozondjupa Region, and onwards to Tsumeb in the Oshikoto Region. From Otavi the railway line branches off in an easterly direction turning north-east towards Grootfontein (see Figure 4.4-1 below).

The Kranzberg Station to Tsumeb Station section of the railway line to be upgraded has an approximate length of 392km and passes through the towns and settlement of: Omaruru, Kalkfeld, Otjiwarongo, Otavi and Tsumeb, while the Otavi Station to Grootfontein Station section has an approximate length of 91km, and passes through the towns and settlement of: Otavi, Kombat and Grootfontein.

The Phase 1 part of the Project, i.e., content of this ESIA, entails the upgrading of the railway section in between Kranzberg Station to Otjiwarongo Station, as presented by Figures 4.4-2 and 4.4-3.

The larger part of the railway line passes through predominantly commercial farmlands, with a few urban areas along the way, i.e., Omaruru, Kalkfeld and Otjiwarongo.

The upgraded railway line will follow the existing railway line for the entire length between Kranzberg Station and Otjiwarongo Station, with some deviations, leaving the railway

servitude onto adjacent farms. The alignment through urban areas will remain as is, without any change or deviation.

4.5 PROJECT PHASES

The Project consists of various phases, i.e., preliminary design & planning; environmental assessment & authorisation; detailed planning & design (including financing); construction and implementation; rehabilitation and environmental audit; and project completion.

The Project is currently within the environmental assessment & authorisation phase.

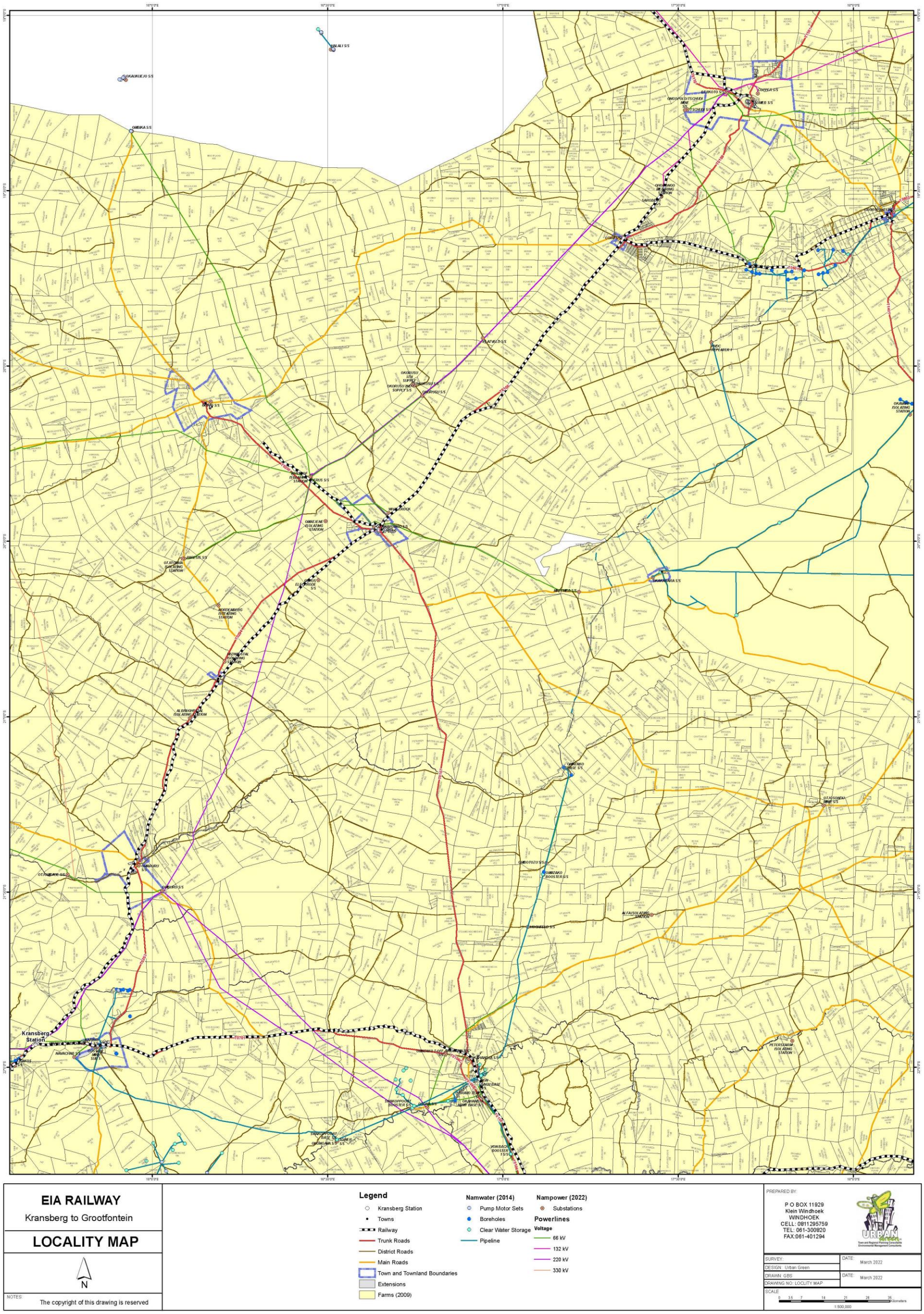


Figure 4.4-1: Locality Map – Railway Line from Kranzberg Station to Tsumeb & Otavi to Grootfontein

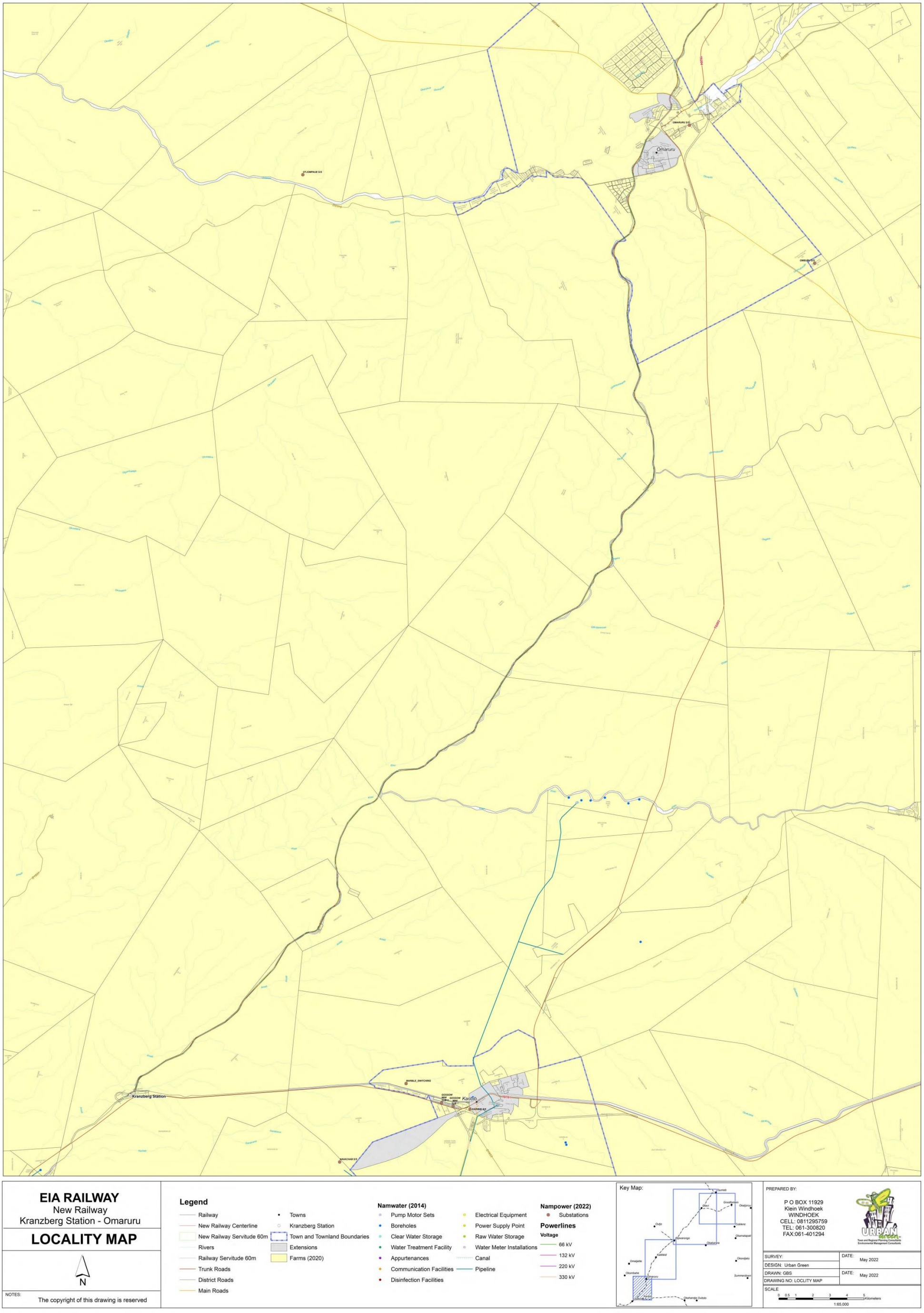


Figure 4.4-2: Locality Map – Railway Line from Kranzberg Station to Omaruru

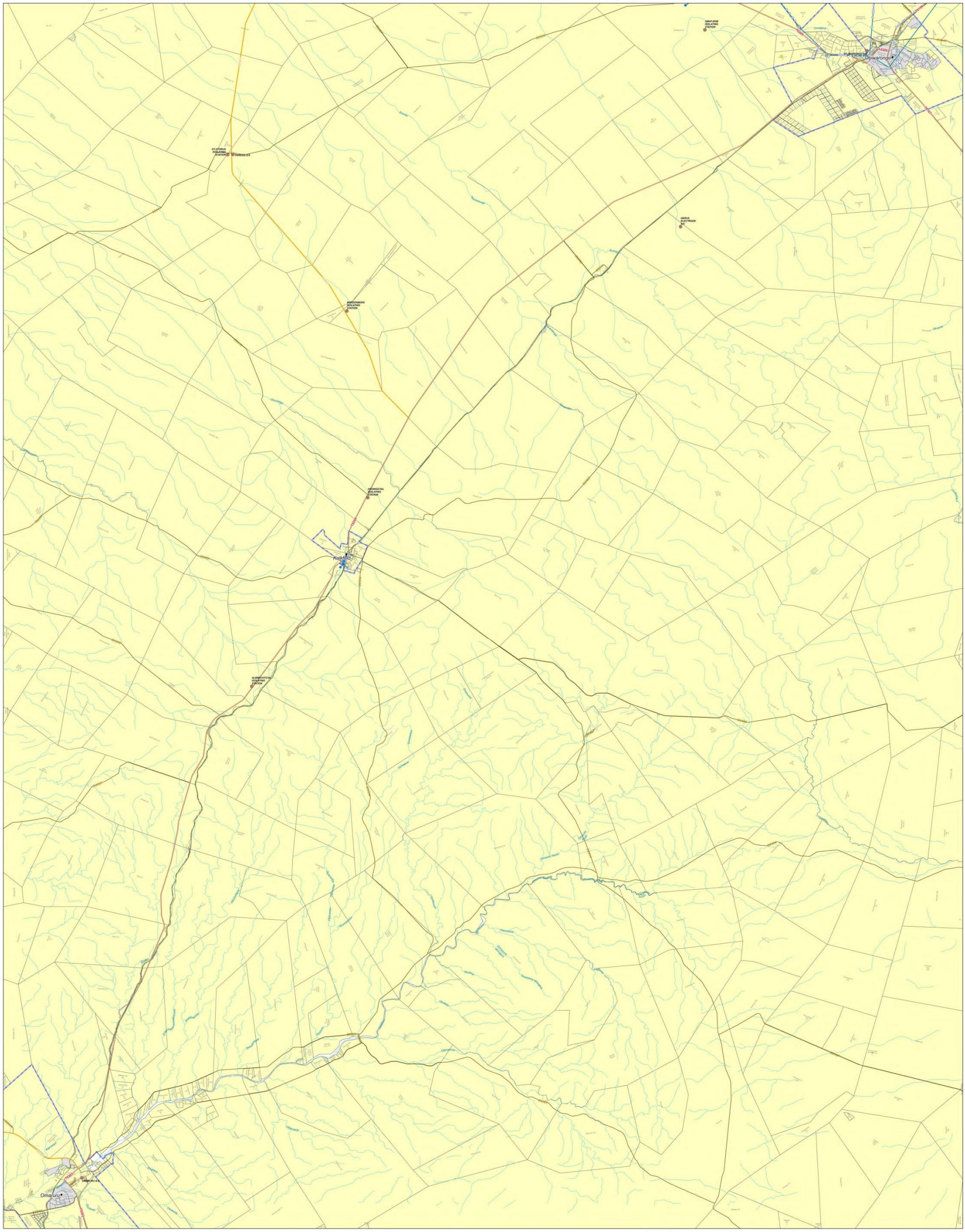


Figure 4.4-3: Locality Map – Railway Line from Omaruru to Otjiwarongo

4.6 PROJECT SPECIFICATIONS & DESIGNS

4.6.1 Overview

The section below provides details to the specifications and design of the railway infrastructure of the Project.

The recommended general specifications are based on “Planning and Technology Railway Engineering Specification, E.10 – 1996 Railway Track Work” (1996) published by Spoornet, South Africa. The recommended design parameters are based on “Infrastructure Engineering – Manual for Track Maintenance” (2012) published by Transnet, South Africa.

4.6.2 Track Gauge

The Namibian railway network consist of a total of 2,687 km`s of route on 1,067 mm track gauge, more commonly referred to as ‘Cape Gauge’. In 2007, the Africa Union resolved that ‘Standard Gauge’ (SG) 1,435 mm should be adopted for the construction of new railway lines to promote interpolarity on the continent. However, no instruction was issued by the Namibian Government to shift to Standard Gauge, and while the Walvis Bay – Kranzberg railway section is currently being upgraded on the Cape Gauge it will remain as such for the Kranzberg – Tsumeb and Otavi – Grootfontein railway sections.

4.6.3 Axle Load and Design Speed

The Kranzberg – Tsumeb and Otavi – Grootfontein railway sections fall under N2 Classification of Running lines. Although the Transnet Manual specifies the Axle Load for a give track structure, it is silent on the Allowable Speed. Given a particular track geometry, the overall stresses on the track are a combination of forces induced by superimposed load (axle-load), static as well as dynamic; tractive and breaking forces (speed); and climatic stresses (temperature variation).

The design Axle Load for the Kranzberg – Tsumeb and Otavi – Grootfontein railway sections is recommended as 18.5-ton with the following speed potential.

Table 4.6.3-1 - Design speeds for train type

Type of Train	Design Speed
Freight	80 km/h
Passenger	100 km/h

An 80 km/h for freight trains is suitable because (1) railway administrators in the SADC region specify this speed for goods trains and (2) the bogies for freight trains travelling at more than 80 km/h require specialized rolling stock designs and manufacturing. Such rolling stock would require more intensive maintenance and safety protocols/systems.

4.6.4 Geometry

Although the Railway Operator's current rolling stock fleet does not have the ability to negotiate speeds more than 60 km/h, provision is made in the design for train speeds of up to 100 km/h.

i.e., Passenger train speed of 100 km/h and Freight train speed of 80 kmh.

4.6.5 Super Elevation

The following table reflects maximum speed and super elevation on curves with a radius of more than 850 m:

Table 4.6.5-1 – Super elevation

Radius (m)	Maximum Speed (km/h)	Super elevation
850 – 899	100	40
900 - 999	100	40
1000 - 1199	100	40
1200 - 1499	100	30
1500 - 1699	100	20
1700 - 1999	100	20
2000 - 2999	100	10
3000 - - -	100	0

4.6.6 Vertical Gradient

Grades on open lines:

The ruling (maximum) grade on a railway line is a function of tonnage hauled and capacity of traction power for trains operated on the railway. On the Namibian rail network, the ruling grade is 1:67.

The maximum change of grade applicable is 0.04m/20m/20m.

Suitable formulae are applied for grades on horizontal curves to compensate for the increased friction created by curvature.

Grades in Station yards and Crossing loops:

Ideally crossing loops and stations should be built on grades of at least 1:800 as a safety measure against runaway rolling stock. While this provision is mandatory when constructing new railway lines, its application on existing lines being upgraded is seldom possible due to topographic circumstances and extremely high associated cost of construction. For this reason, most loops and stations are being designed on the existing grade.

4.6.7 Embankment

The formation is an important constituent of the track, as it supports the entire track structure. Considering the changing topography over the extent of the railway line, embankments (i.e., when the formation is in the shape of a raised bank constructed above the natural ground) and cuttings (i.e., formation at a level below the natural ground) will be constructed. The height/depth of the formation depends upon the ground contours and the gradients adopted.

The detail pavement design parameters applied, are tabled below for the service road and railway embankment respectively.

Table 4.6.7-1 - Service Roads design parameters

Layer	Thickness	CBR	Compaction	Max. PI
Roadbed	150	7 at 90% Mod AASHTO	90% Mod AASHTO	15
Fill	Varies	15 at 93% Mod AASHTO	93% Mod AASHTO	15
Wearing Course	150 mm	25 at 95% Mod AASHTO	95% Mod AASHTO	15

Table 4.6.7-2 - Railway Embankment design parameters

Layer	Thickness	CBR	Compaction	Max. PI
Roadbed	150	7 at 90% Mod AASHTO	90% Mod AASHTO	15
Fill	Varies	15 at 93% Mod AASHTO	93% Mod AASHTO	15
A-Layer	300 mm	20 at 95% Mod AASHTO	95% Mod AASHTO	15*
Sub Ballast	200 mm	30 at 95% Mod AASHTO	95% Mod AASHTO	10**

* 17 for calcrete provided LS≤6 and (% passing .425mm sieve) xLS≤320

** 15 for calcrete provided LS≤7 and (% passing .425mm sieve) xLS≤320

An investigation into identifying potential borrow areas in obtaining suitable materials for new embankment construction along the railway line is scheduled to commence in April 2023.

4.6.8 Ballast

To meet the desired performance requirements for concrete sleepers, ballast must be limited to crushed granites, trap rocks, or quartzite. For an N2 class of line, the ballast depth of 200 mm has been recommended in the Transnet Freight Rail (TFR) Manual. The newly inserted ballast on the existing railway will be screened and reused at the new upgraded railway line. A total of 1,250 m^3 per kilometre of track will be required.

4.6.9 Sleepers

In Namibia, the newly constructed sections and also sections which are being upgraded (i.e., existing railway between Kranzberg Station and Otjiwarongo) are being provided with P2 type of concrete sleepers. The newly installed sleepers (± 208 km) on the existing railway will be reused and installed on this upgraded railway with a sleeper spacing of 700 mm. A total of 1,429 sleepers per kilometre will be required.

4.6.10 Rails

For this Project, 48 Kg/m rail grade R260 having minimum hardness of 260 HB is recommended for use on this corridor for now. The newly installed rails (± 60 km) on the existing railway will be reused and installed on this upgraded railway.

4.6.11 Fastenings

Elastic fastenings which have an e-clip with liners (generally glass filled Nylon) and a neoprene pad below the sleepers are recommended.

4.6.12 Rail Sidings

New rail sidings will be constructed at the applicable localities.

The design makes provision for the installation of 1:12 turnouts on the main line and 1:9 turnouts in back roads. The speed at which trains may cross 1:12 turnouts is limited. The extremely high cost of providing 1:20 turnouts (including the provision of electric power for its operation) is not considered feasible.

Ideally crossing loops and stations should be built on grades of at least 1:800 as a safety measure against runaway rolling stock. While this provision is mandatory when constructing new railway lines, its application on existing lines being upgraded is seldom possible due to topographic circumstances and extremely high associated cost of construction.

The average length from clearance marker to clearance marker of existing crossing loops is 500 meter which will allow 2 locomotives and 31 wagons to stage freely in the siding. This loop length has been increased to 760 m in the design of the upgraded line to allow for longer train consists.

The layout of stations has been left unchanged, but the configuration of tracks in stations yards is being reviewed for economic reasons as well as functionality. Permanent way materials in most station yards are worn to beyond its serviceable life.

4.6.13 Service Road

The existing railway will serve as the future service road for the upgraded railway line. Once the rails, sleepers and ballast has been removed and installed on the new railway alignment, the formation will be prepared for purpose of a basic gravel road.

Apart from some sections of the existing services road that will continue to be used, the larger part of the existing service road will be rehabilitated after construction completion. It should be kept in mind that permanent way materials will be transported by road and therefore the service road will need to be trafficable by large trucks. Concrete drifts have already been constructed at locations which have experienced access problems in the past.

4.6.14 Fencing

Where fence lines will be affected by the new alignment, the existing fence will be relocated to the new position as required. New fences to be installed will be as per the existing fence standards of the Farm being affected.

Any borrow pits, and haul roads will be fully fenced off to the nearest public road and gates installed before any work in these areas will commence. All areas of land that may be acquired temporarily for spoil areas, borrow pits and haul roads will be fenced and maintained by the contractor until issue of the performance certificate at the end of the defect's liability/notification period.

4.6.15 Servitude

The alignment of the new railway will predominantly remain within the existing railway servitude, with deviation at horizontal curves needing to be eased to satisfy the 100 km/h maximum train speed.

A servitude width of 60m will remain, which will result in the new servitude slightly extending into adjacent farmlands, while larger servitude changes can be expected at the designed deviations.

4.6.16 Bridges

Alignment was designed to suit existing Road-over-Rail and Rail-over-Road structures as to avoid the high cost of reconstruction. There is a total of fifteen (15) new bridges (crossing main watercourses) required for reconstruction between Kranzberg and Otjiwarongo.

Table 4.6.16-1 - Location of the 16 steel bridges

Bridge No.	Location (km)	Bridge No.	Location (km)
N/A - Kranzberg Station	0km	9	54.161
1	0.920	10	56.408
2	4.887	11	64.938
3	8.434	12	66.903
4	9.089	13	70.296
5	18.753	14	88.949
6	23.991	15	178.587
7	43.619	N/A – Otjiwarongo Station	208,384
8	49.467		

4.6.17 Surface Water Management (culverts)

The project catchment areas stretch over 200km through areas with different rainfall characteristics.

All existing drainage structures were checked for adequacy to handle design floods as indicated below (these are in line with the South African Railways Bridge Code 1983, SATS, which code is used for design of new culverts on railway lines all over SADC countries).

- Pipe culverts (Area<1 km²) 1:50 years
- Box culverts (Area<1 km²) 1:50 years
- Bridges (1 km²<Area<100 km²) 50% of RMF
- Bridges (100 km²<Area) 60% of RMF
- Service road crossings 1:2 years
- A minimum free board of 300 mm will be allowed below the bridge decks.

The railway line from Kranzberg Station to Otjiwarongo Station crosses Khan River and Omaruru River.

4.6.18 Level Crossings

New level crossings will be constructed to the specification:

- Earthworks to the same as that for service roads;
- Level crossings on district roads will be equipped with concrete level crossing blocks where it crosses the tracks;
- The top width will be 4.0 m and side slopes 1:2;
- The approach grade will be 1:15;
- 3.0 m on either side of the rails must be level to improve the view along the track;
- The crossing will be at right angles to the track; and
- All road- and track signs as provided for in the Track Maintenance Manual will be installed.

When repairing or extending existing level crossings the above requirements will be complied with as far as practicable, not losing sight of safety of vehicles using the crossing.

4.6.19 Stations Urban/Rural

All existing stations will remain at their current positions with no major variances in alignment. There are three (3) stations within the project limits: Kranzberg Station, Omaruru Station, and Otjiwarongo Station.

Excluding the three main stations listed above; there are 11 siding locations between Kranzberg Station and Otjiwarongo Station. A siding is a short stretch of railway line, or lines that runs parallel to the main railway line, which may provide a refuelling point, or a loading & unloading dock, or is simply used to let another train pass by on the main line. At each siding, there are switches which direct trains to one track or the other. All the siding switches are operated manually. There are no immediate plans to automate the switches.

4.6.20 Operation and Maintenance Centres

There will be three (3) main operation and maintenance centres for the Phase 1 part of the Project namely, Kranzberg Station, Omaruru Station, and Otjiwarongo Station.

4.6.21 Project Feature Classification

The main project features would be the construction of a new railway embankment within the existing servitude, the reuse of P2 concrete sleepers, reclaiming of ballast stone, relaying of track on to the new embankment, the procurement and placement of new 48 kg/m rails, and the procurement and placement of new ballast stone for full profile as specified.

4.7 DESIGN STANDARDS

Namibian design standards and specification as available and applicable will apply to the Project designs and facilities. Where Namibian standards do not include references to Project applicable standards and specifications, International Standards and Specifications for design and construction works will be applied.

The proposed railway line shall follow the existing railway alignment keeping within the existing 60m rail servitude for the entire length of the railway, with some deviations, leaving the railway servitude onto adjacent farmlands. The alignment through urban areas will remain as is, with minor changes or deviations.

Climate change resilience will be integrated in the Project's design. This aspect is discussed in Chapter 9 - Climate Change Risk Assessment.

4.8 PROJECT ACTIVITIES

The anticipated construction and operational activities associated with the proposed Project are briefly described below.

4.8.1 Pre-Construction Activities

The planning phase is the current phase within which the proposed Project is, the phase where conceptual designs and plans are drafted for discussion and evaluation, which will result in the final designs and plans for implementation.

4.8.2 Construction Activities

The Project, i.e., upgrade of the railway line in between Kranzberg Station to Otjiwarongo Station, entails the construction of a completely new railway line, which includes the following activities –

- Clearing of vegetation where required for the railway line, borrow pits and quarries;
- Opening-up of areas for the abstraction (i.e., borrow pits & quarries) and transportation (i.e., roads) of material to the railway servitude;
- Sinking of new boreholes and abstraction of water or collecting water from existing water network for purpose of construction of new railway embankments;
- Transportation of material (i.e., concrete sleepers; railway tracks) to the new railway section and assembly of railway line on top of new embankments;
- Transportation of water for purpose of construction of bridges and stormwater drainage structures;
- Construction of new embankments, bridges, and stormwater drainage structures;
- Laying of concrete sleepers, railway tracks, and ballast stone;

- Removal of old railway sleepers, railway tracks and ballast stone (that which cannot be reused);
- Transportation of construction workers from nearby urban areas to the railway line;
- Temporary accommodation of construction personnel along the railway line within the rail reserve;
- Site clean-up, de-establishment, and rehabilitation of disturbed areas; and
- Discussions with affected farm owners affected by the deviations (i.e., loss of land) to obtain consent and discuss compensation.

4.8.3 Operational Activities

The activities associated with the operational phase are as presented below -

- Clearance of vegetation (that might have naturally revegetated) along the railway reserve;
- Maintain service road and resulting clearance of vegetation (that might have naturally revegetated);
- Monthly inspection along the servitude inspecting status of fences; and
- Emergency repairs to any infrastructure.

4.9 INPUTS AND MATERIAL (EXPECTED AMOUNT/VOLUME/NUMBER OF RESOURCES)

4.9.1 Construction

The resources required for the Project, includes additional land (railway deviations), aggregate (ballast stone), gravel and soil (embankments), and water (construction and compaction).

Land:

Given the increased load and speed capacity (see point 3.6. below) of the upgraded railway, deviations from the existing railway alignment are inevitable. The Project engineer has identified 29 deviations onto adjacent farmlands and 47 areas where the farm fence will have to be relocated.

Each of the affected farm owners will be contacted to present the extent of the land affected and discuss the compensation process.

Gravel & Soil (borrow pits)

For purpose of the construction of new embankments, gravel and soil is required, which will be sourced from adjacent farms. The availability of the correct grade gravel and soil is subject to geotechnical investigations still to be undertaken.

It is expected that each of the adjacent farms will be affected and that borrow pits will be ± 5km apart in distance for the length of the railway line. Existing borrow pits will be considered and subjected to an investigation to determine the grade and available volumes.

Each of the affected farm owners will be contacted to obtain access for purpose of the geotechnical investigations and to obtain consent for the borrow pit/s.

The method of opening-up, managing the borrow pit/s during construction and rehabilitation will be done as per the Roads Authority's Materials Manual and Borrow Pit Rehabilitation Plan, July 2013 (Appendix H).

Aggregate:

Aggregate (ballast) will be sourced from suppliers and transported via rail to the particular locality along the railway line.

Water:

Water for purpose of construction and compaction will be sourced from adjacent farms and other available sources (i.e., NAMWATER off takes).

For this purpose, boreholes will be drilled at locations still to be identified following the hydrogeological assessment. Once the possible localities of these boreholes have been identified each affected farm owner will be contacted to obtain access for purpose of further investigation and to obtain consent for purpose of abstraction.

4.10 OUTPUTS AND WASTES (EXPECTED AMOUNT OF WASTE)

The most significant types of waste to be generated on site will be the rails, sleepers and ballast that will be removed and replaced. Currently, the rails that are removed from site are transported back to a town where they are stored until they are sold by auction. The same is true for the old steel sleepers that are removed.

Other types of solid waste and construction that are generated by the workforce will be collected and transported to licensed landfill facilities.

Sewage will be captured in portable toilets stationed on site and later discharged into municipal sewage treatment facilities.

4.11 WORKFORCE & CONSTRUCTION CAMPS

4.11.1 Pre-Construction and Construction

Given the nature of the Project and AfDB requirements to contribute to employment creation, construction will be labour based, of which most people will be sourced from the local areas. It is expected that ± 150 people will be employed as labourers for the duration of the construction period, while the specialised work force will be ± 50 people.

The options of either transporting construction workers on a daily basis to and from site or establishing contractors' camp along the length of the railway line, was considered and it was concluded that no accommodation camp is allowed and that workers should be accommodated within the nearest urban centre. A contractor's camp to accommodate the materials and construction machinery will be set-up along the railway line within the 60m railway servitude. This contractor's camp will relocate as the work progresses along the length of the railway line.

4.11.2 Operation and Maintenance

The work force required for daily maintenance requirements is 15. None of the workers are allowed to overnight within the servitude.

4.12 INFRASTRUCTURE LIFESPAN

For the railway, a calculation period is set to 60 years. All activities from construction start to the following 60 years are included in the calculations. It can of course be difficult to estimate technical data (e.g., transport work) for such a long time but the aim of the calculation period is not to give a clear picture of the transport and infrastructure development over the next 60 years. The aim of the calculation period is instead to create a balance between construction, maintenance, and operation of the railway system. The calculation period is set to a time-period close to the lifetime of most railway components. In this way, one can receive a balanced picture for the influence of construction, maintenance, and operation. This also implies that technical data of today can be used in the calculations in absence of technical data during the next 60 years.

5 DESCRIPTION OF BASELINE CONDITIONS

5.1 INTRODUCTION

This chapter describes the details pertaining to the larger study area's existing physical, biophysical, and socio-economic environments, which defines the sensitivities to be considered during the planning, construction, and operation of the proposed Project.

It provides baseline information according to which the likely negative and positive impacts of the Project will be assessed, as well as the significance thereof, which in turn will inform the applicable mitigating measures and need for detailed assessments, as presented in Chapter 8.

This chapter is based on the specialist input during the baseline assessments, field surveys and the detailed on-site assessments, attached as Appendixes to this ESIA Report.

5.2 PHYSICAL ENVIRONMENT

The proposed Project will by its nature impact on the project site's physical character and vice-versa, which again will affect the bio-physical environment.

5.2.1 Atmospheric Environment

Climate

Namibia has an arid climate, and the absence of moisture is due to Namibia's south-western position on the continent. It is situated around the Tropic of Capricorn for several hundred kilometres to the north and south and is consequently located between two climate systems. The Intertropical Convergence Zone, which feeds in moist air from the north and the Subtropical High-Pressure Zone, which pushes the moist air back with dry air. It is the latter system that usually dominates and causes dry weather. Dry air means that there are few clouds, radiation from the sun is intense, daytime temperatures are high and water evaporates rapidly (Mendelson et al., 2002).

Temperature

The Project area experience moderate temperature fluctuations with mean lowest 4-8˚C in June and mean highest 32-36 ˚C recorded in January (Mendelson et al., 2002). Coldest temperature recorded in winter is 4˚C, while temperatures can rise as high as 36˚C. Refer to Figure 5.2.1-1 for coldest temperature and Figure 5.2.1-2 for hottest temperature recordings. These extreme temperatures are important to consider the shrinking and expansion of the railway tracks.

Frost is not common, but may occur 1-5 days of the year.

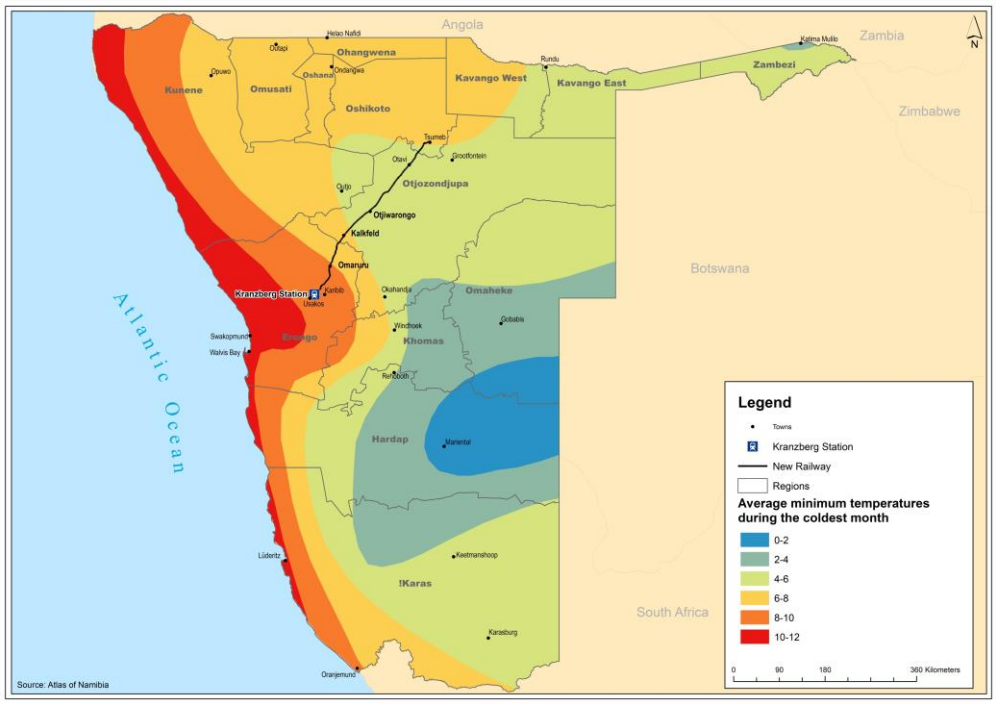


Figure 5.2.1-1 – Average Minimum Temperatures

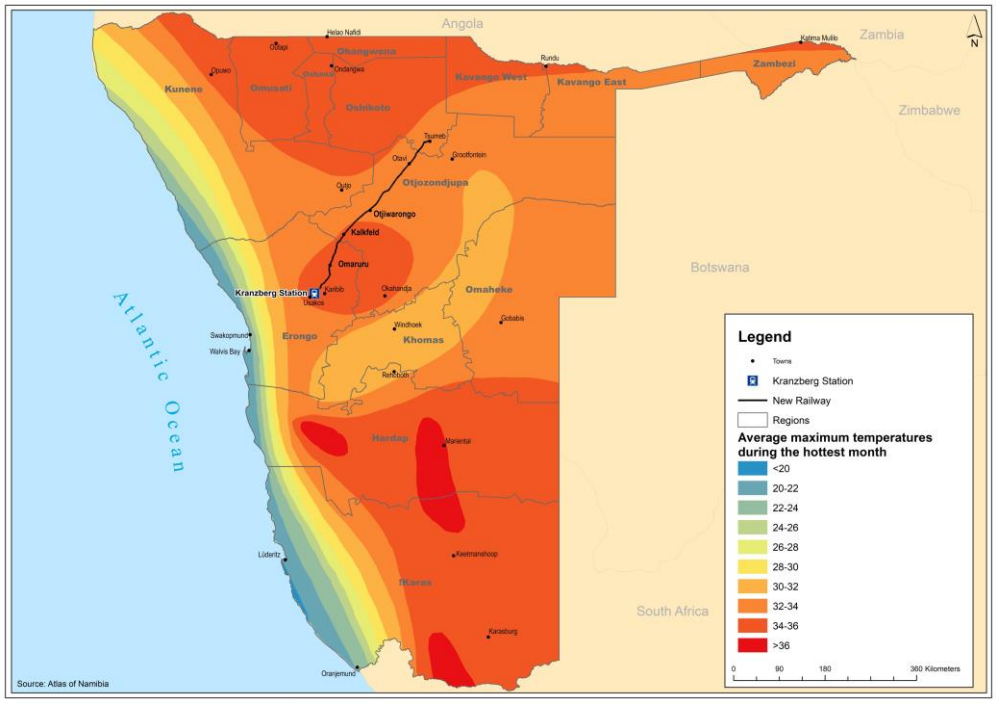


Figure 5.2.1-2 – Average Maximum Temperatures

Rainfall

Namibia is largely an arid country. Rainfall is lowest along the coast and just north of the southern boundary. From here rainfall increases in a north-easterly direction from less than 50 mm to more than 600 mm in the far north-east eastern parts of the country (Mendelson et al. 2002) (Figure 5.2.1-3).

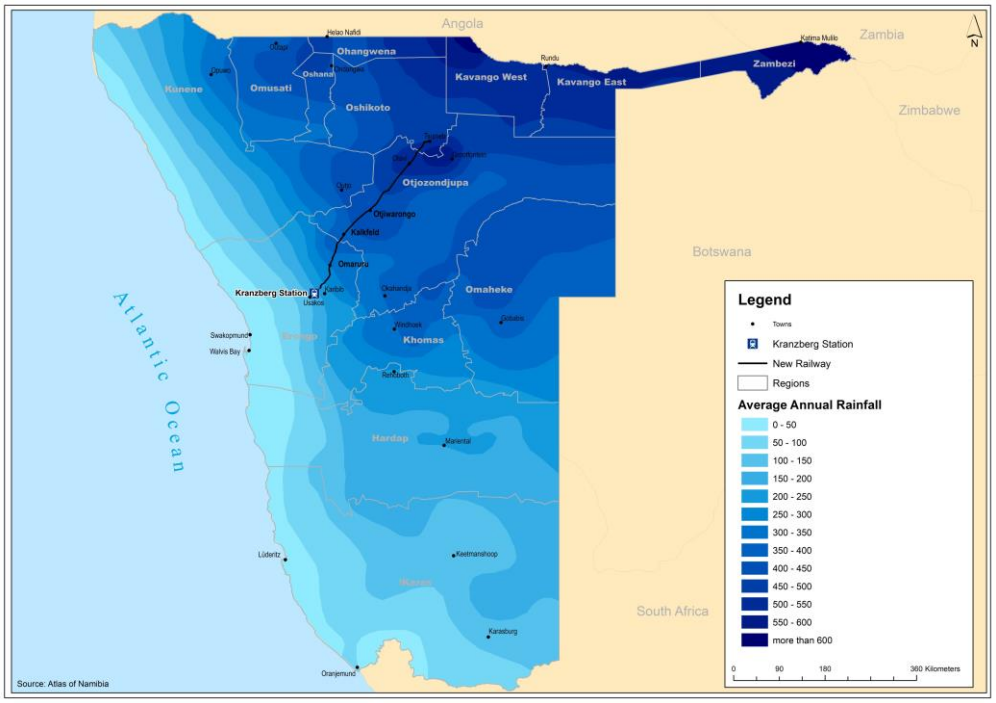


Figure 5.2.1-3 – Average Annual Rainfall

In Namibia most rain fall during sporadic storms in the summer months from September to April and total annual rainfall vary greatly from year to year. The flow of moisture from the north makes northern Namibia considerably wetter than other areas in the country.

Mostly summer rain is experienced in the Project area. The average annual rainfall increases from south-west to north-east with 250 - 300 mm recorded at Kranzberg Station to 400 – 450 mm recorded for Otjiwarongo. Annual evaporation rate of 2240 – 2380 mm/year occur.

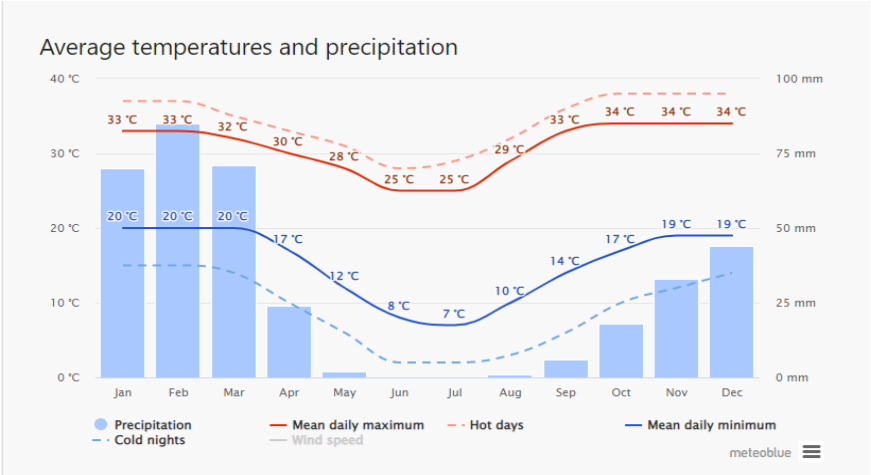
Number of days per year with more than 1 mm of rain (thus wet railway line) is estimated at 25 – 30 days near Kranzberg and increasing to 40 – 45 days near Otjiwarongo. (Mendelson et al., 2002)

Fog

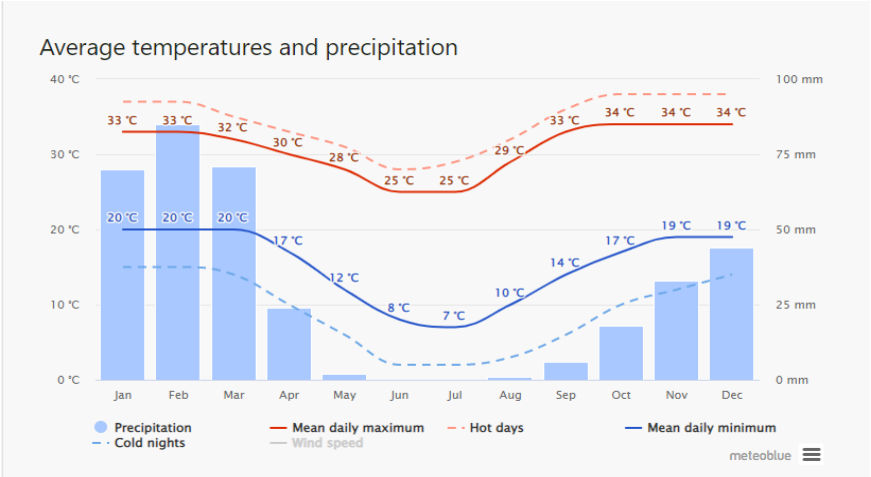
The Project Site falls east of the Namib Desert fog belt and fog is not common this far inland of the cold Atlantic Ocean (Mendelson et al., 2002).

The following graphs were abstracted from www.meteoblue based on 30 years of hourly weather model simulations of three localities (south, central and north) along Phase 1 of the railway line:

Karibib



Omaruru



Otjiwarongo

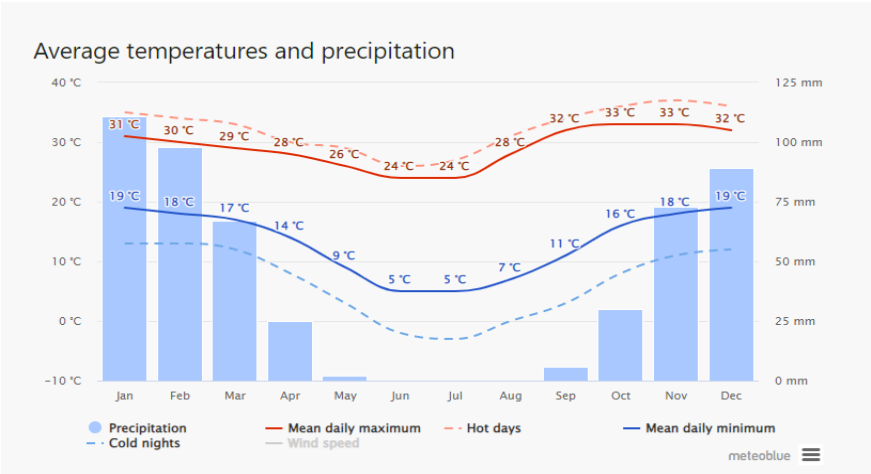


Figure 5.2.1-4 – Mean Daily Maximum & Minimum Temperatures

The Figure above shows the mean daily maximum (solid red line) shows the maximum temperature of an average day for every month and the *mean daily minimum* (solid blue line)

shows the average minimum temperature. The *hot days* and *cold nights* (dashed red and blue lines) show the average of the hottest day and coldest night of each month of the last 30 years (*source www.meteoblue*).

Wind

Prevailing wind is east-north-east near Kranzberg and becomes more east towards Otjiwarongo (see Fig. 5.2.1-5)

Karibib

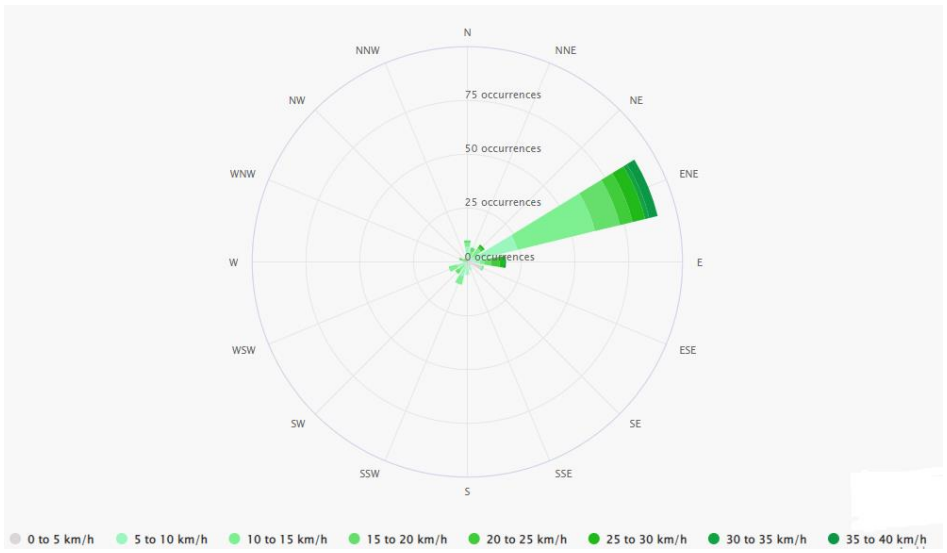


Figure 5.2.1-5 - The windrose for Karibib shows how many hours per year the wind blows from which direction.

Omaruru

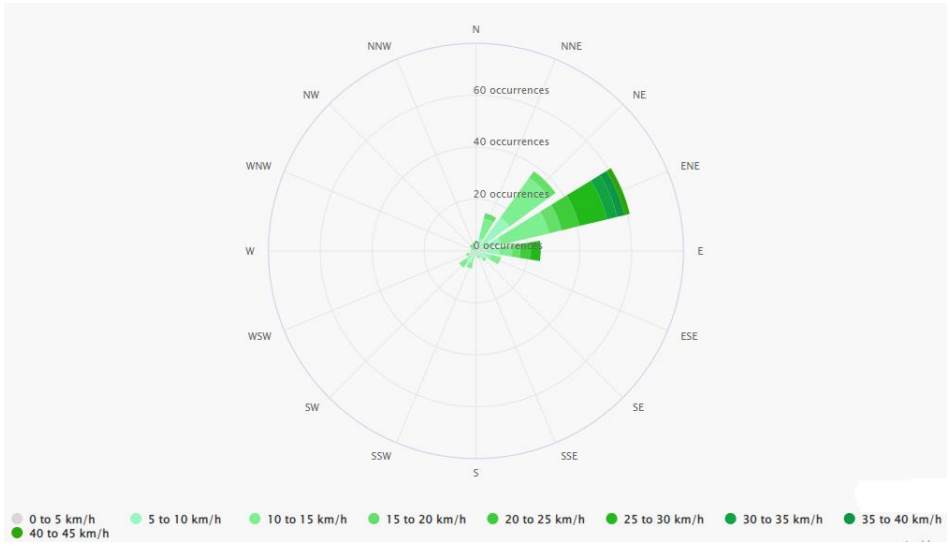


Figure 5.2.1-6 - The windrose for Omaruru shows how many hours per year the wind blows from which direction

Otjiwarongo

Figure 5.2.1-7 - The windrose for Otjiwarongo shows how many hours per year the wind blows from which direction

Air quality

The air quality in Section 1 and 2 is good, since the railway line runs through rural environment for most of the way. The only nuisance in the servitude is occasional dust from maintenance vehicles on the service road next to the railway line, as well as smoke from charcoal burning activities taking place on neighbouring farms.

Photos 5.2.1-1 & 5.2.1-2 – Dust from maintenance vehicles operating within the servitude


Photos 5.2.1-3 & 5.2.1-4 – Smoke from local charcoal burning on adjacent farms

Around Omaruru and Otjiwarongo towns the railway line passes through an industrial area, but no manufacturing or air emissions are present here.

5.2.2 Ambient Noise

The railway line runs through rural rangeland between towns or settlements, so ambient noise levels are low to very low.

Between Omaruru and Otjiwarongo the railway line runs parallel to the C33 main road. This road does carry freight trucks, but the traffic density is low. Ambient noise levels on this road are thus relatively low and the bush thickets between the road and railway line act as noise barriers.

Construction noise will include heavy vehicle movement and construction machinery operation. There are, however, no recipients in the rural rangeland areas and construction noise might only have an impact in rural towns or settlements of Omaruru, Kalkfeld and Otjiwarongo, as well as the lower density estates on the fringe of the mentioned urban areas. Mitigation measures for noise during the construction phase must be implemented in these urban areas.

During the operation phase the train will generate noise from different sources, which can contribute to the total noise output. Sources include:

- rolling noise generated by the contact between wheel and rail during normal movement and braking;
- aerodynamic noise generated by the train pushing air at a higher speed than the current 60km/h; and
- traction noise generated by the engine and cooling fans;
- Nuisance impact noise from train whistle.

Noise level for diesel freight trains at a distance of 40 m from the railway line (outside the servitude) is calculated at 75 dB, which is above the maximum noise level of 70dB for human comfort (*Miskinyte et al., 2021*).

Mitigation measures for noise must thus be implemented during the operational phase. This is only required near settlements and towns, due to lack of recipients along the railway line between stations.

5.2.3 Geology

Namibia has a great variety of rock formations that are clearly visible for most of the western part of the country as well as in the Project area. The predominant rock types identified are:

- *Sedimentary rock: sand (alluvium), sandstone*

  Sand or alluvium possesses primary porosity, while sandstone can possess both primary and secondary porosity. The alluvium occurs in riverbeds, while sandstone is present in the Etendeka and Omingonde Formations just to the north of the Etiro siding. Sedimentary rocks generally have high groundwater potential.

- *Igneous rock: granite*

  Granite possesses secondary porosity, and unless it is fractured and / or deeply weathered, it has very low groundwater potential. Granite is present over most of the area, but diminishes closer to Otjiwarongo.

- *Metamorphic rock: schist and limestone (marble)*

  Schist and marble possess secondary porosity. Schist has very low groundwater potential, even when fractured, as it weathers to clay, which has a very good water retention capacity and as a result do not transmit groundwater easily. If intruded by extensive vein quartz, which are fractured, schist can however yield quite productive aquifers, but sustainability is a real concern.

  Inherently marble also has very low groundwater potential. However, if fractured or dissolution of the rock took place, marble can host moderate to very productive aquifers.

  Schist is present extensively over most of the area, while marble is mostly limited to the Swakop Group between Kranzberg and Karibib, to the north of Omaruru and around Kalkfeld, while there is also some marble present in the Otjiwarongo area.

Geology of the Project Site is described in a linear transition from Kranzberg towards Omaruru (Figure 5.2.3-1) and from there to Otjiwarongo (Figure 5.2.3-2).

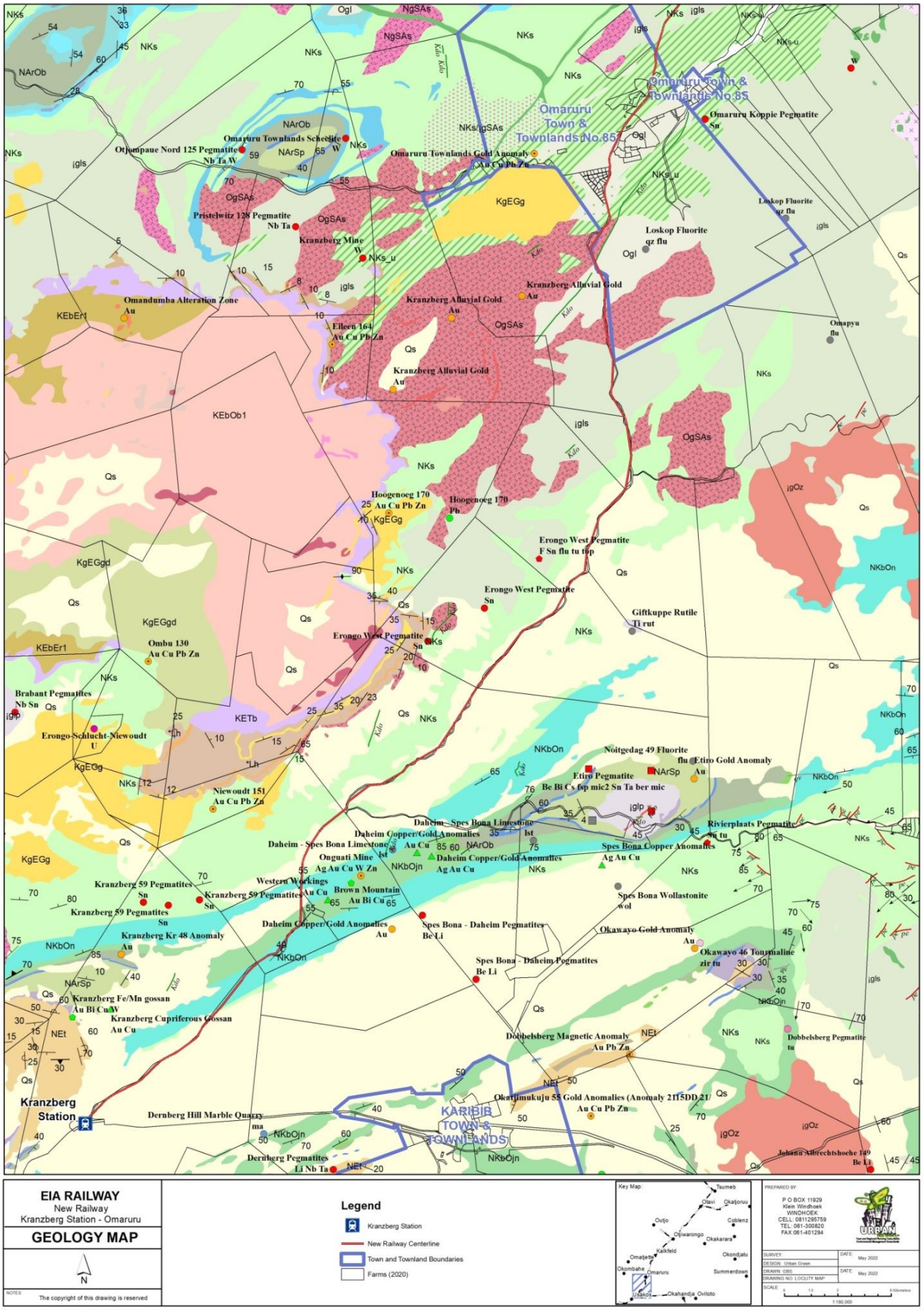


Figure 5.2.3-1 - Geology between Kranzberg Station and Omaruru

Kranzberg Station to Omaruru (Section 1 of Phase 1):

At Kranzberg Station the railway line starts off in rocks of the Central Zone of the Damara Orogen and crosses the lineament forming the northern boundary of the zone to end off in rocks of the Northern Zone of the Damara Orogen near Omaruru.

Geology of the *Khan River* consists of mica schist, impure marble and calc-silicate bands of the Karibib Formation.

The *Erongo Mountain* to the west of the railway line has smoothly weathered Damara granite, intrusive into Kuiseb Formation schist, which is exposed at the base. Karoo sediment of the Lion's Head Formation unconformably overlies the granite and the schist. The Karoo sediments consist of poorly sorted conglomerate, quartzite and arkose with a distinct horizontal layering. The vertical cliff face of the Etiromund Member can be seen near the top. This unit consists of gritstone and forms the boundary between the lower and middle units of the Lion's Head Formation. The sediments are unconformably overlain by basaltic lava flows of the basal Etendeka Group. At the top of the Erongo Mountain rhyolitic ash-flow tuffs of the Ombu Member are exposed.

Photo 5.2.3-1 – View of Erongo Mountains west of railway line

The *Giftkuppe* is another prominent granite inselberg visible to the east of the railway line near Erongo Siding. It consists of albitite granite, which has been intruded by sheeted pegmatite dykes.

Photo 5.2.3-2 – View of Giftkuppe east of railway line

The railway line passes several *outcrops* of syn- to post-tectonic Damara granites on the remainder of Section 1 towards Omaruru.

South-east of Omaruru is another prominent Damara-age granite inselberg, the *Omaruru Kuppe*. Like many of the granites and pegmatites of this area, it hosts a small occurrence of tourmaline. The *Omaruru River* depression lies on Erongo Complex.

Photo 5.2.3-3 – View of Omaruru Outcrops

Omaruru to Otjiwarongo (Section 2 of Phase 1):

Between Omaruru and Otjiwarongo, the geological scenario comprises sedimentary and intrusive rocks belonging to the Damara and Karoo Sequences.

Omaruru to Kalkfeld

Moving north of Omaruru a flat-topped mountain range is visible on the eastern horizon. This was formed by almost horizontally bedded clastic sediments of the Omingonde Formation, Karoo Sequence. Several hillocks of porphyritic Salem granite of Damara age rise above the plain in the middle distance.

Photo 5.2.3-4 – View of mountains north of Omaruru

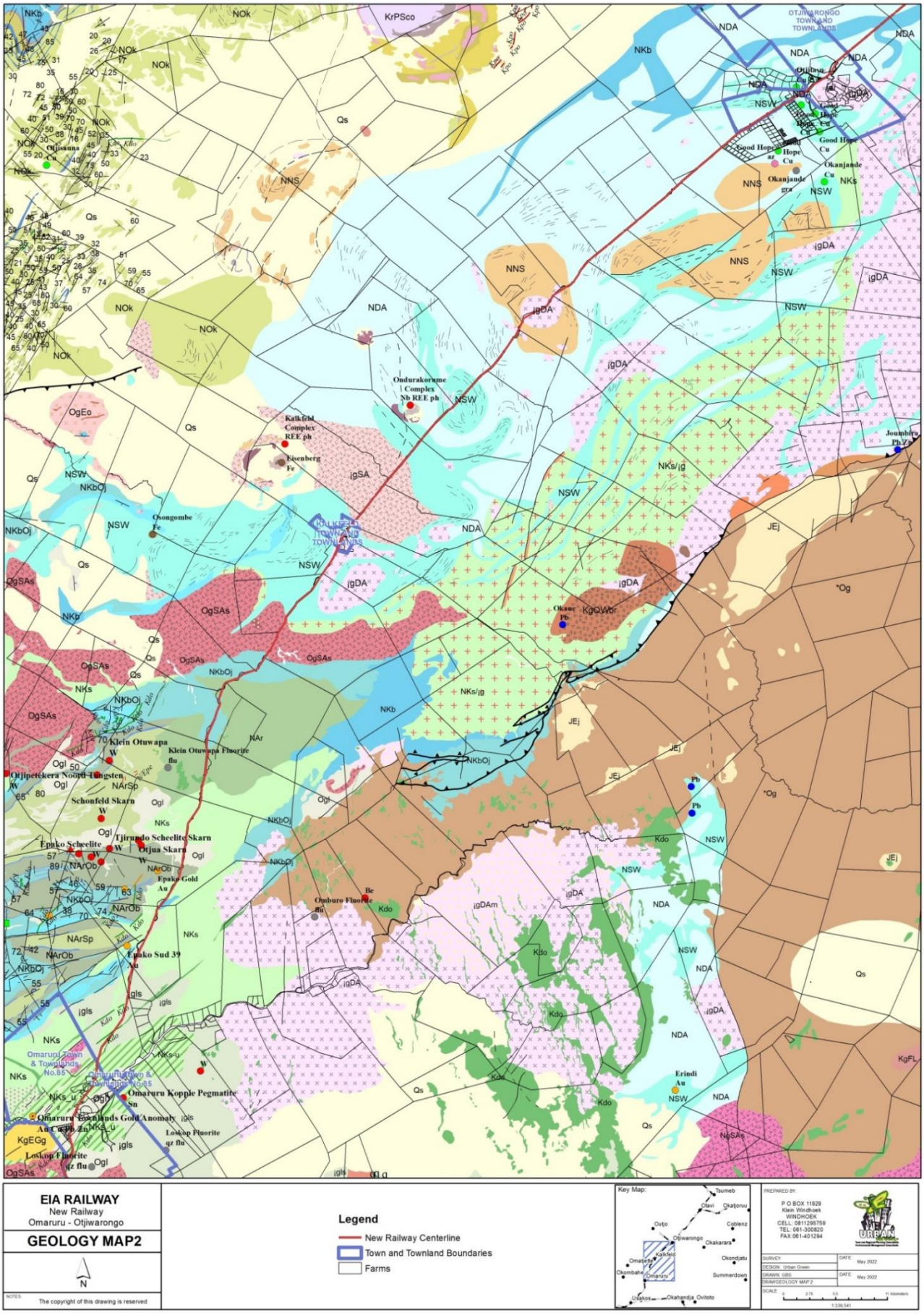


Figure 5.2.3-2 - Geology between Omaruru and Otjiwarongo

The railway line then passes a couple of distinctive ranges, which consist of marbles of the Damara-age Karibib Formation to the north west.

The *Epako* range and *Elefantenberg* to the west, is formed by massive calcitic marble of the Arises River Member. It overlies the banded marbles of the Otjongeama Member of the more distant, higher Tjirundo range.

Photo 5.2.3-5 – View of Epako and Elefanteberg ranges

Further north is a post-Karoo olivine-dolerite dyke, which runs parallel to the railroad for several kilometres. This forms dark outcrops to the east, which belongs to the Cretaceous swarm of dykes that follow the Omaruru Lineament, a zone of crustal weakness that existed from Damara to post-Karoo times. The dykes cut older sedimentary and intrusive Damara rocks, and in this area are related to the Erongo ring dyke.

Further north, Damara marble is intruded by Damara granite, resulting in the formation of tungsten-bearing skarns.

Then the double peak of the *Okongue Koppie* is visible to the south-west of the railroad. This koppie and other less prominent koppies form distinctive domes that consist of Damara leucogranite, which intruded the surrounding Damara metasediments.

The railway line further passes porphyritic Salem granite of Damara-age outcrops and is cut by a dolerite dyke showing distinctive blocky weathering. Within the granite remnants of light-coloured skarn are visible. A little further another prominent granite outcrop with skarn formation and a dolerites intrusion can be seen in the south-east, while the largely flat country to the north-west is underlain by Kuiseb schist, Swakop Group, Damara Sequence.

Damara marble outcrops are then seen to the west of the railway line and the next few kilometres are characterised by a complex amalgamation of Damara metasediments and granites, and locally, post-Karoo dykes. The granites form distinctive outcrops, while low hills near the railway line consist of skarn.

The landscape in the last stretch to Kalkfeld has typical granite domes.

Photo 5.2.3-6 – View of outcrops south of Kalkfeld

Photo 5.2.3-7 – View of outcrops south of Kalkfeld

Kalkfeld to Otjiwarongo

From Kalkfeld the railway line continues over Damara metasediments and granites, with a low range of Damara granites to the south-east. To the south-west the Kalkfeld Carbonatite Complex can be seen. The pyramid-shaped Etaneno Complex lies a few kilometres to the west and the sharp-peaked Ondumakorume Complex lies to the east.

Photo 5.2.3-8 – View of mountain between Kalkfeld and Avond, east of railway line

North-west of Etaneno is a low range of hills consisting of Nosib Group quartzite. To the north the jagged crest of Klein Parasis and the massive Groot Parasis Complex can be seen. The highest peak is 1,806 m above sea level.

Photo 5.2.3-9 – View of Parasis Mountain

The Ohiwa Mountains are formed by a larger intrusion of Damara granite and further along the railway line, the Nosib Group quartzites of the Good Hope range, with a peak of 1,773 m at Alter Römer Berg, can be seen to the north-east. These are replaced before Otjiwarongo, by numerous pinnacles of Damara granite, which rise above the flat landscape in the far distance. Continuing towards Otjiwarongo are isolated outcrops of Damara granite.

5.2.4 Topography

Section 1 and 2 of the railroad extends through the central western plains of Namibia. From Kranzberg station northwards, the railroad winds through relative flat plains that pass residual hills, isolated schist, dolomite, granite, etjo sandstones, basalt, siltstones and limestone rocky outcrops, calcrete rocks and some inselbergs along its way.

Given the limitations of railroad infrastructure alignment, the railroad must follow the path with the smallest gradient and that originally determined the route.

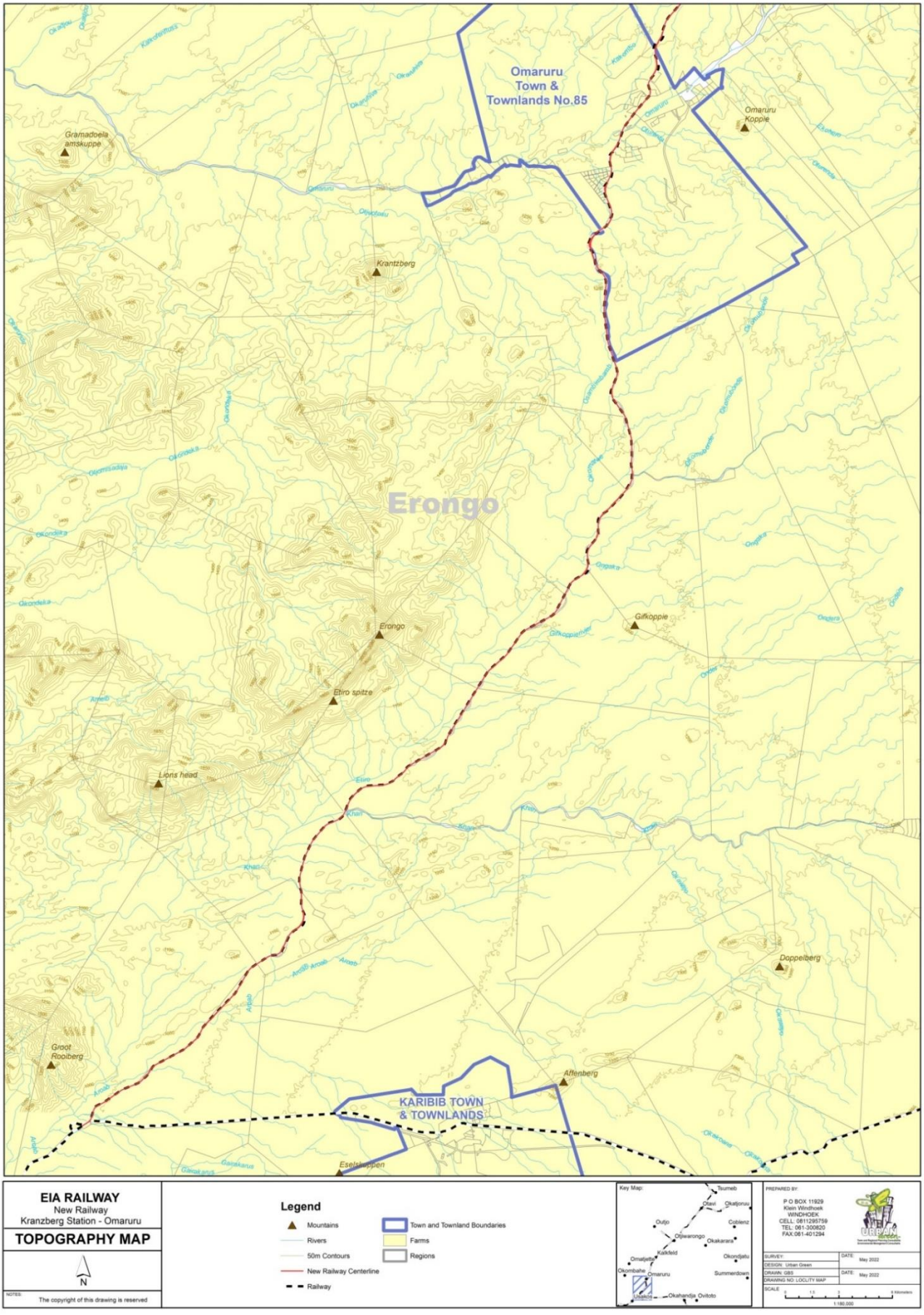


Figure 5.2.4-1 – Topographical Map for area in between Kranzberg Station and Omaruru

Figure 5.2.4-2 – Topographical Map for area in between Omaruru and Otjiwarongo

5.2.5 Hydrology and Geohydrology

The railroad in between Kranzberg Station to Otjiwarongo passes three major ephemeral west-flowing drainage systems. The first part winds through the *Khan River* drainage area from Kranzberg to Omaruru, then through the *Omaruru River* drainage area from Omaruru to Kalkfeld and extends into the *Ugab River* drainage area from Kalkfeld to Otjiwarongo.

The railroad consequently crosses the Khan River, a tributary thereof, the Kanona River, the Omaruru River, the Epaku River and the Erundu River. To accommodate west-flowing stormwater, the new railroad design incorporates 15 bridge constructions.

A few well-studied aquifers are present in the study area that either supplied water in the past, or are still supplying water, for bulk abstraction to supply in municipal water demands. These aquifers are shortly discussed in the attached Hydrogeological Report (Appendix B1).

An overview of the yields of those boreholes assessed as part of the Hydrological Assessment Report (Appendix B1) gives an indication of the generally low groundwater potential to supply in construction water, where high yielding boreholes are required to supply in large volumes of water on a daily basis.

The Hydrological Assessment (Appendix B1) concludes that of the four available aquifers, the Spes Bona Aquifer is unsustainable, the Kranzberg and Omaruru Aquifers are used to its maximum capacity, while the Otjiwarongo Aquifer may have potential for additional groundwater abstraction. All four of the mentioned aquifers are located within either proclaimed water protection areas, or exploit river alluvial, thus in public streams. According to the Water Act, permits are therefore required to 1) drill boreholes, and 2) abstract groundwater for any use other than domestic use. Permits should accordingly be applied for by the Proponent and/or appointed contractor.

Areas where the water quality is poorer, are just south of Okanono siding, south and west of Norman siding, and between Avond- Erundu- and Paresis sidings. The TDS-value gets into the range from 3,001 ppm to 5,000 ppm (Appendix B1).

5.2.6 Soils and Sediments

As a result of Namibia’s arid climate, deep soils over much of the Country are absent and the levels of nutrients in the soil are low.

For most part of Section 1 and 2, the railroad runs over *Eutric Regosols* (Figure 5.2.6-1). This is relative fertile soil with high base saturation. Regosols are medium- or fine-textured soils of actively eroding landscapes. The thin layers lie directly above the rock surfaces from which they formed. These soils do not reach depths of more than 50 cm and where there is a degree of slope they are susceptible to erosion.

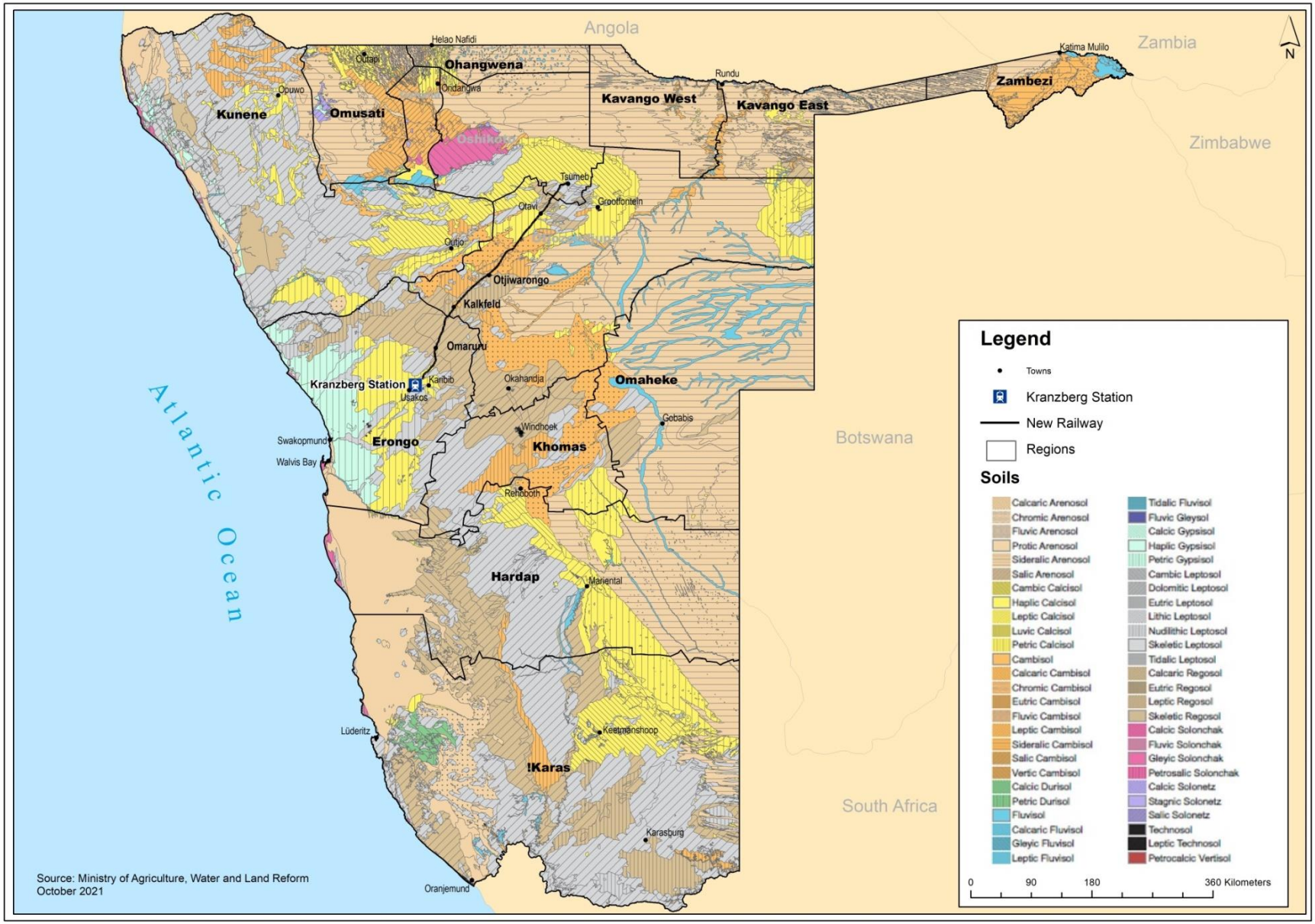


Figure 5.2.6-1 – Soils Map

Soil samples that were taken on the railroad shows that the top layer comprise of ballast for 240 – 500 mm. In Section 1 Phase 1 the second layer consists mostly of calcrete gravelly sand/calcrete sandy gravel between km 0 – 40. From here calcrete is missing from the gravelly sand/sandy gravel in km 45 - 70. Third layers comprise mostly of silty sand or gravel.

In Section 2 calcrete is less prevalent from the sandy gravel/gravelly sand and the second and third layers of the samples have more silty sandy gravel/gravelly sand.

5.2.7 High Risk Pollution Areas

Considering the hydrogeological environment and more specifically the nature of the aquifers in the study area, there are three main types of areas that are prone to high pollution risk, namely:

- primary alluvial aquifers
- secondary aquifers where high-transmissivity preferential flow paths have been created through fracturing
- secondary limestone (marble) aquifers with solution features

The first two aquifer types are rather easy to identify as the rivers alluvial can be clearly seen and the fractures are mostly mapped and / or visible where it manifests on the ground. Although the marble itself is easily identifiable, those parts of marble formations that are actually good aquifers caused by solution features are unfortunately not that easily identifiable due to the lack of available hydrogeological information and the insufficiency of recorded borehole information.

The hydrogeological characteristics of these environments are a) usually high transmissivities and b) high storability, i.e., in laymen’s term, groundwater flows at a high rate through these aquifers, and the percentage of the rock volume available to store water in is high respectively.

The biggest concern is that, once a pollutant enters the groundwater in such aquifers, it spreads very rapidly through the aquifer, and it becomes almost impossible to remove such pollutants.

Where the above hydrogeological environments prevail, utmost care must therefore be taken to prevent and avoid causing pollution, or any negative impacts for that matter, to occur. Even more so, where a river flows over or along a fracture, extra care must be taken to prevent and avoid causing pollution.

The areas where primary river alluvial aquifers and fractures have been mapped are shown in Figure 5.2.7-1.

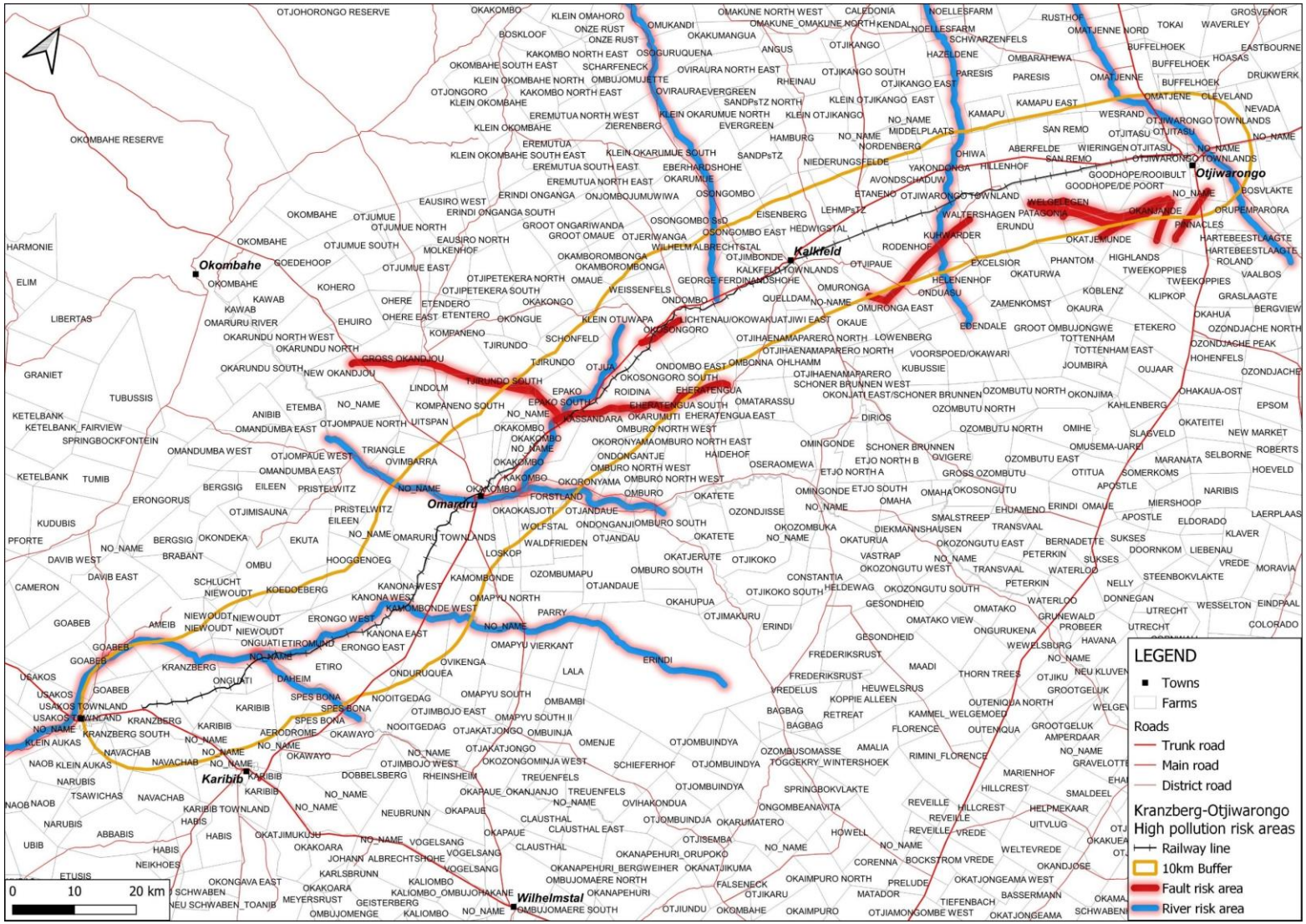


Figure 5.2.7-1 - Areas with high pollution risk based on mapped rivers and fractures

NOTE: The Rivers shown in **Figure 5.2.7-1** are only those mapped on the 1:1 000 000 scale geological map of Namibia, and *it does not show all the rivers, irrelevant of their size*. **All rivers must be treated as potential high-risk pollution areas.**

5.3 BIOLOGICAL ENVIRONMENT

5.3.1 Methodological Considerations

A desktop study (i.e. comprehensive and intensive literature review) was conducted on the vertebrate fauna (reptiles, amphibians, mammals and birds) and flora (larger trees and shrubs (>1m in height) and grasses) expected to occur in the general area from Kranzberg to Otjiwarongo along the Phase 1 sections of the proposed Project. A list of references consulted can be viewed in Section 5.3 and under References. The aim was to determine the effect that the proposed railway line upgrade project, may have on the bio-physical environment (vertebrate fauna & flora).

This literature review was to determine the actual, as well as potential vertebrate fauna and flora associated with the general Kranzberg-Otjiwarongo area which falls within two broad vegetation types discussed in the following Section 5.3.2.2.

5.3.2 Biodiversity Context

5.3.2.1 National Context

Flora

According to Maggs (1998) there are approximately 4344 higher plant species with the most species being within the grasses (422), composites (Asteraceae) (385), legumes (Fabaceae) (377) and fygies (Mesembryanthemaceae) (177), recorded from Namibia. Total species richness depends on further collecting and taxonomic revisions. High species richness is found in the Okavango, Otavi/Karsveld, Kaokoveld, southern Namib and Central Highland (Windhoek Mountains) areas. Endemic species – approximately 687 species in total – are mainly associated with the Kaokoveld (north-western) and the succulent Karoo (southwestern) Namibia. The major threats to the floral diversity in Namibia are:

1). Conversion of the land to agriculture (with associated problems) and,

2). poorly considered development (Maggs 1998, Mendelsohn *et al.* 2002).

Reptiles

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

Amphibians

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

Mammals

Namibia is well endowed with mammal diversity with at least 250 species occurring in the country. These include the well-known big and hairy as well as a legion of smaller and lesser-known species. Currently 14 mammal species are considered endemic to Namibia of which 11 species are rodents and small carnivores of which very little is known. Most endemic mammals are associated with the Namib and escarpment with 60% of these rock-dwelling (Griffin 1998c). According to Griffin (1998c) the endemic mammal fauna is best characterized by the endemic rodent family *Petromuridae* (Dassie rat) and the rodent genera *Gerbillurus* and *Petromyscus*. Habitat alteration and overutilization are the two primary processes threatening most mammals (Griffin 1998c) with species probably underrepresented in Table 3 for the general area being the bats and rodents, as these groups have not been well documented from the arid southern part of Namibia.

Avifauna

Although Namibia's avifauna is comparatively sparse compared to the high rainfall equatorial areas elsewhere in Africa, approximately 658 species have already been recorded with a diverse and unique group of arid endemics (Brown *et al.* 1998, Maclean 1985). Fourteen species of birds are endemic or near endemic to Namibia with the majority of Namibian endemics occurring in the savannas (30%) of which ten species occur in a north-south belt of dry savannah in central Namibia (Brown *et al.* 1998).

5.3.2.2 Regional Context

The project area falls within the *Tree and Shrubland Savanna* Biome of Africa (*Mendelson et al. 2002*). The vegetation of Section 1 from Kranzberg to Omaruru forms part of the *western highlands* of Namibia and vegetation type in Section 2 from Omaruru to Otjiwarongo change to *Thornbush Shrubland (Mendelson et al. 2002)*. To this effect vegetation changes from grassland with dispersed small to medium shrubs and solitary trees in the south-western part of Section 1 to more woody *Acacia* shrub vegetation that become encroached in some areas as one move north-eastwards toward Section 2. In Section 2 towards Otjiwarongo the

vegetation become further encroached with *Acacia* shrubs that become taller shrubs and trees in the north-eastern part.

The general Kranzberg-Otjiwarongo area which falls within two broad vegetation types:

a) Western Highlands (*Mendelsohn et al. (2002) or* Semi-desert Savannah and Transition Zone [Escarpment area] (as referred to by *Giess 1971, Van der Merwe 1983*) is regarded as "moderate" in overall (all terrestrial species) diversity while the overall terrestrial endemism in the area on the other hand is "high" (*Mendelsohn et al. 2002*). The overall diversity and abundance of large herbivorous mammals (big game) is viewed as "moderate" with 3-4 species expected – e.g. gemsbok, kudu, mountain zebra and springbok – while overall diversity and density of large carnivorous mammals (large predators) is viewed as "moderate" with 4 species expected – e.g. leopard, cheetah, spotted and brown hyena (*Mendelsohn et al. 2002*).

The general area is viewed as an area of importance for local endemic plant species, especially the Erongo Mountains with between 26-35 endemic species (*Mendelsohn et al. 2002*). The overall plant diversity (all species) in the general area is estimated at between 150-299 species and the Erongo Mountain area between 400-499 species (*Mendelsohn et al. 2002*). These estimates are limited to "higher" plants as information regarding "lower" plants are sparse. Plant endemism, other than the Erongo Mountains, is viewed as "medium to high" – with between 6-15 endemics expected from the general area (Mendelsohn *et al.* 2002). Furthermore, Mendelsohn *et al.* (2002) views the overall plant production as medium to low in the general area although high in the Erongo Mountains, the availability of hardwoods as medium and the grazing and browse as average in the general area.

It is estimated that at least 75 species of reptile, 7 amphibian, 88 mammal, 217 birds (breeding residents), 74-101 larger trees and shrubs and up to 80 grass species occur in the general Kranzberg-Omaruru area of which a high proportion are endemics (e.g. reptiles – 45.3%).

b) Thornbush Savannah [Tree and Shrub Savannah] (*Giess 1971*) or Thornbush Shrubland (*Mendelsohn et al. 2002*) plant endemism in the general Otjiwarongo area are estimated at between 1 and 20 species depending on the locality (*Simmons (1998b*). The overall plant diversity (all species - "higher" plants) in the general area is "high" and estimated at 300-399 species (Mendelsohn *et al.* 2002). Plant endemism is "average" with 6-15 species expected from the general area.

It is estimated that at least 77 reptile, 9 amphibian, 84 mammal, 218 bird species (breeding residents), at least 79-109 larger trees and shrubs and up to 111 grasses are known to or expected to occur in the general Omaruru-Otjiwarongo area of which a high proportion are endemics (e.g. 35.1% endemic reptiles).

Only 7% of the Savannah biome is formally protected compared to the Namib Desert biome which is well protected with parks in this biome making up 69% of the protected area network (*Barnard 1998*). Escarpments, mountains and inselbergs are generally considered as sites of special ecological importance with granite domes (Karibib and Omaruru districts) high in biotic richness and endemism (*Curtis and Barnard 1998*).

Protected Areas

The Western Highlands do not fall within a Communal Conservancy with the closest being ǂGaingu located in the Spitskoppe area to the west of Karibib/Omaruru, neither within a Freehold (i.e. commercial) Conservancy with Okawi being the closest, east of Kranzberg (Mendelsohn et al. 2002, NACSO 2021, See: www.nacso.org.na). The closest formally protected area are the !Dorob (size: 107,540km²) and Namib-Naukluft National Parks (size: 49,768km²) located approximately 50-100km west and southwest of Kranzberg Stations, respectively.

The Thornbush Savannah in the Otjiwarongo area is not part of the communal conservancy system in Namibia with the closest such conservancy being the Ozonahi Conservancy to the east of the Waterberg Plateau Park, east of Otjiwarongo (*Mendelsohn et al. 2002, NACSO 2021*). The closest Freehold Conservancies are the Owipuka (farms to the south of Otjiwarongo) and Waterberg (farms to the east of Otjiwarongo) Conservancies (*Mendelsohn et al. 2002*, See: *www.canam.iway.na*). The closest formally protected area is the Waterberg Plateau Park (size: 405km²) located approximately 50km southeast of Otjiwarongo.

Main Threat and Issues affecting Biodiversity

The greatest variants affecting the diversity of plants are habitat and climate with the highest plant diversity generally associated with high rainfall areas. Pockets of high diversity are found throughout Namibia in “unique” habitat – often transition zones – e.g. mountains, inselbergs, drainage lines, etc.

Bush thickening (encroachment) is viewed as problematic throughout the area with and *Acacia reficiens* (red-bark Acacia) the dominant problem species (Bester 1996, Cunningham 1998, Mendelsohn *et al.* 2002).

Bush thickening or encroachment is viewed as an economic problem in the general area with an estimated 4,000 to 12,000 plants/ha – mainly *Acacia mellifera* being the dominant problematic species (*Bester 2001, Cunningham 1998, Mendelsohn et al. 2002*).

Land Use Analysis

Commercial Farmland

The railway line runs through commercial farmlands for most of the way in Section 1 and 2. Cattle farming forms the basis of agriculture in the region, but more and more farms replace or complement this economic activity with wildlife farming and tourism.


Photos 5.3.2.2-1 & 5.3.2-2 - Cattle and game farming are the predominant farming activities, with tourism

A conspicuous form of rangeland degradation in southern African savannas is shrub encroachment resulting from heavy grazing by domestic livestock. The increase in shrubs at the cost of palatable vegetation reduces the carrying capacity of rangelands. It also has a negative impact on species diversity (*Blaum, N. et al., 2008*)


Photos 5.3.2.2-3 & 5.3.2.2-4 - Bush encroachment in Section 1 and Section 2

Bush encroachment is visible in areas with dense *Acacia* thickets in and around the servitude. Charcoal production is an important activity for managing bush encroachment and forms another important part of on-farm diversification that offer farmers a valuable source of additional income.

Land use in Section 1 and 2 thus comprise mostly of cattle farming over centuries with game farming and tourism development over the last 30 years and charcoal harvesting over the last 20 years.

5.3.3 Ecology

The project area falls within the *Tree and Shrubland Savanna* Biome of Africa. The vegetation of Section 1 from Kranzberg to Omaruru forms part of the *Western Highlands* of Namibia and vegetation type in Section 2 from Omaruru to Otjiwarongo change to *Thornbush Shrubland*

(Mendelson et al. 2002). To this effect vegetation changes from grassland with dispersed small to medium shrubs and solitary trees in the south-western part of Section 1 to more woody *Acacia* shrub vegetation that become encroached in some areas as one move north-eastwards toward Section 2. In Section 2 towards Otjiwarongo the vegetation become further encroached with *Acacia* shrubs that become taller shrubs and trees in the north-eastern part.

Photo 5.3.3-1 - Grassland with dispersed small to medium shrubs north of Kranzberg Station

Photo 5.3.3-2 - *Acacia* shrubs become woody and dense north of Omaruru

Photo 5.3.3-3 – Taller *Acacia* trees and shrubs near Otjiwarongo

Vegetation along cross-cutting ephemeral rivers and drainage lines, mentioned in Section 5.3.9, are mostly riverine trees.


Photos 5.3.3-4 & 5.3.3-5 – Bridge of tributary of the Khan River & tributary of Erundu River

a) Western Highlands *(Mendelsohn et al. (2002)* or Semi-desert Savannah and Transition Zone [Escarpment area] (as referred to by *Giess 1971, Van der Merwe 1983*). This semi-desert and savannah transition zone as referred to by *Giess (1971)* is typified by shrubs ("fodder bushes") such as *Blepharis pruinosa*, *Leucosphaera bainesii* and *Monechma genistifolia*. Larger woody species such as *Acacia erioloba* are confined to the drainage lines. The area is characterised by *A. senegal* shrubs while *Cyphostemma currorii* and *C. bainesii* also occur in this region. The trees common in the area are *Commiphora glaucescens*, *C. virgata* and *C. dinteri* as well as *Boscia albitrunca* and *B. foetida*. The grass cover is sparse and consists of the climax grasses *Stipagrostis obtusa* and *S. uniplumis* (*Giess 1971*).

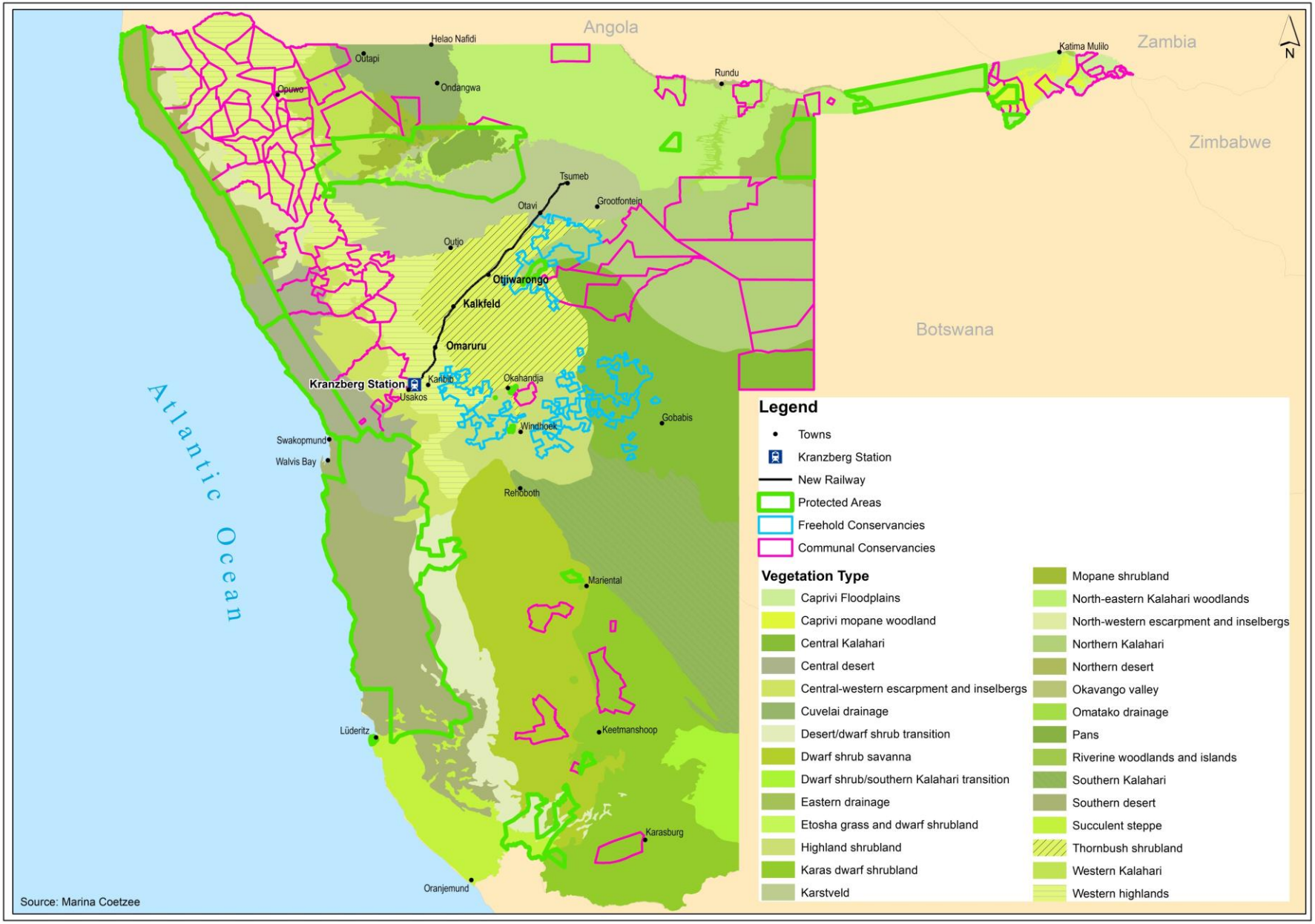


Figure 5.3.3-1 - The Phase 1 section between Kranzberg and Otjiwarongo falls within the Semi-Desert and Savannah Zone and the Thornbush Savannah vegetation types – See dashed arrow (Source: Giess 1971).

b) Thornbush Savannah or Tree and Shrub Savannah (Giess 1971) or Thornbush Shrubland (Mendelsohn *et al.* 2002). The vegetation structure is classified as *Acacia* shrublands (Mendelsohn *et al.* 2002). The Thornbush Savannah is the dominant vegetation type in central Namibia. Although the vegetation in the Thornbush Savannah/Thornbush Shrubland varies considerably with large areas dominated by *Acacia* species, characteristic species include *Acacia mellifera* subsp. *detinens*, *A. reficiens*, *A. hebeclada* subsp. *hebeclada*, *A. erubescens*, *A. fleckii* and in some places *A. tortilis* subsp. *heteracantha*. Another tree species usually present is *Boscia albitrunca* with *Philenoptera nelsii* and *Ziziphus mucronata* also occurring in this vegetation type (*Giess 1971*).

Grass cover varies depending on soil type with climax grasses such as *Anthephora pubescens, Brachiaria nigropedata* and *Digitaria* species and *Urochloa bolbodes* representative. *Stipagrostis uniplumis* and *Schmidtia pappophoroides* also occur in this vegetation type in the course of succession (*Giess 1971*). The average plant production is "very high" with the variation in green vegetation biomass viewed as "medium" estimated at 10-15% (*Mendelsohn et al. 2002*).

5.3.3.1 Grass Diversity

Kranzberg-Omaruru

It is estimated that at least 52-72 grasses (Müller 2007 [72 spp.], Van Oudshoorn 2012 [52 spp.]) – approximate total of 80 species – occur in the general Kranzberg-Omaruru area.

Of the approximately 80 grasses that are expected in the general area, 2 species are viewed as endemic (*Eragrostis omahekensis*) – *Eragrostis omahekensis* is virtually only found on disturbed soils – e.g., close to watering points – while *Eragrostis scopelophila* is associated with mountainous areas under trees and shrubs (Table 5.3.3.1-1).

None of the grass species known/expected to occur in the general Kranzberg-Omaruru area are however exclusively associated with the proposed development areas.

Omaruru-Otjiwarongo

It is estimated that at least 106 grasses (Müller 2007 [88 spp.], Van Oudshoorn 1999 [73 spp.]) – approximate total of 73 to 88 species – occur in the general Omaruru-Otjiwarongo area.

Up to 106 grasses are expected in the general Omaruru-Otjiwarongo area of which 4 species are viewed as endemic (*Eragrostis omahekensis*, *Eragrostis scopelophila*, *Pennisetum foermeranum* and *Setaria finita*). *Pennisetum foermeranum* is associated with rocky mountainous terrain and consequently only expected is such suitable habitat. *Eragrostis omahekensis* is virtually only found on disturbed soils – e.g. close to watering points – while *Eragrostis scopelophila* is associated with mountainous areas under trees and shrubs. The endemic *Setaria finita* is associated with drainage lines in the general area; never very common and probably the grass species most likely to be affected most by development in the area (Table 5.3.3.1-1).

Table 5.3.3.1-1 - Grass diversity known and/or expected to occur in the general Kranzberg-Otjiwarongo (Phase 1) – i.e. central-western Namibia – area. The grasses known, and/or expected to occur in the general area (derived from [1]Müller 2007 and [2]Van Oudtshoorn 2012).

Species: Scientific name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Ecological Status *	Grazing Value *
[1,2]Andropogon chinensis		√	Decreaser	High
[1,2]Andropogon chinensis	√		Increaser 1	Average
[2]Andropogon eucomus	√		Increaser 2	Low
[1]Anthephora argentea	√		Decreaser	High
[1,2]Anthephora pubescens	√	√	Decreaser	High
[1]Anthephora schinzii	√	√	Increaser 2	Low
[1,2]Aristida adscensionis	√	√	Increaser 2	Low
[1,2]Aristida congesta	√	√	Increaser 2	Low
[1]Aristida effusa	√	√	Increaser 2	Low
[1,2]Aristida meridionalis	√	√	Increaser 2	Low
[1]Aristida rhiniochloa	√	√	Increaser 2	Low
[1,2]Aristida stipitata		√	Increaser 2	Low
[1]Aristida stipoides		√	?	Low
[1,2]Brachiaria deflexa	√	√	Increaser 2	Average
[2]Brachiaria eruciformis		√	Increaser 2	Average
[1]Brachiaria malacodes	√	√	?	Low
[1]Brachiaria glomerata	√		Decreaser	Average
[,2]Brachiaria marlothii		√	Increaser 2	Low
[1,2]Brachiaria nigropedata	√	√	Decreaser	High
[,2]Bothriochloa radicans		√	Increaser 2	Low
[1,2]Cenchrus ciliaris	√	√	Decreaser	High
[1,2]Centropodia glauca	√	√	Decreaser	High
[1,2]Chloris virgata	√	√	Increaser 2	Average
[2]Cladoraphis spinosa	√		Increaser 1	Low
[1,2]Cymbopogon caesius		√	Increaser 1	Low
[2]Cymbopogon plurinodis		√	Increaser 1	Low
[1,2]Cymbopogon pospischilii		√	Increaser 1	Low
[1,2]Cynodon dactylon	√	√	Increaser 2	High
[1,2]Dactyloctenium aegyptium	√	√	Increaser 2	Low
[1]Danthoniopsis ramosa	√	√	?	High
[1,2]Dichanthium annulatum	√	√	Decreaser	High

Species: Scientific name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Ecological Status *	Grazing Value *
[1,2]Digitaria eriantha		√	Decreaser	High
[1,2]Digitaria velutina		√	Increaser 2	Low
[2]Diplachne fusca	√	√	Decreaser	High
[1]Echinochloa colona	√		?	Low
[1,3]Echinochloa holubii		√	Increaser 2	Average
[2]Eleusine coracana		√	Increaser 2	Low
[2]Elionurus muticus	√	√	Increaser 2	Low
[1,2]Enneapogon cenchroides	√	√	Increaser 2	Low
[1,2]Enneapogon desvauxii	√	√	Intermediate	Average
[1,2]Enneapogon scaber	√	√	?	Low
[1,2]Enneapogon scoparius	√	√	Increaser 2	Low
[1]Entoplocamia aristulata	√	√	Intermediate	Low
[1,2]Eragrostis annulata	√	√	Increaser 2	Low
[1]Eragrostis cylindriflora	√		?	Low
[1,2]Eragrostis bicolor		√	?	Low
[2]Eragrostis biflora	√	√	Increaser 2	Low
[2]Eragrostis cilianensis	√	√	Increaser 2	Low
[2]Eragrostis curvula		√	Increaser 2	High
[1]Eragrostis cylindriflora		√	Increaser 2	Low
[1]Eragrostis dinteri		√	Increaser 2	Average
[1,2]Eragrostis echinochloidea	√	√	Increaser 2	Average
[2]Eragrostis gummiflua		√	Increaser 2	Low
[1]Eragrostis homomalla	√		?	Low
[2]Eragrostis lehmanniana	√	√	Increaser 2	Average
[1,2]Eragrostis nindensis	√	√	Increaser 2	Average
[1]Eragrostis omahekensis [E]	√	√	?	Low
[1]Eragrostis porosa	√	√	Intermediate	Low
[1]Eragrostis rigidior	√	√	Increaser 2	Average
[1,2]Eragrostis rotifer	√	√	Intermediate	Low
[1]Eragrostis scopelophila [E]	√	√	?	High
[1,2]Eragrostis superba	√	√	Increaser 2	Average
[1,2]Eragrostis trichophora	√	√	Increaser 2	Average
[1,2]Eragrostis viscosa	√	√	Increaser 2	Low
[1,2]Fingerhuthia africana	√	√	Decreaser	Average
[1,2]Heteropogon contortus	√	√	Increaser 2	Average

Species: Scientific name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Ecological Status *	Grazing Value *
[1,2]Hyparrhenia hirta	√	√	Increaser 1	Average
[2]Imperata cylindrica		√	Increaser 1	Low
[1]Leptochloa fusca	√	√	?	Average
[1,2]Microchloa caffra	√	√	Increaser 2	Low
[1]Monelytrum luederitzianum	√	√	?	Average
[1,2]Melinis repens	√	√	Increaser 2	Low
[1]Odyssea paucinervis	√	√	?	Average
[1,2]Oropetium capense	√	√	?	Low
[1,2]Panicum coloratum	√	√	Decreaser	High
[1]Panicum lanipes		√	?	High
[1,2]Panicum maximum	√	√	Decreaser	High
[1]Panicum novemnerve		√	Decreaser	High
[2]Panicum repens	√	√	Decreaser	High
[1]Panicum stapfianum		√	Decreaser	High
[1]Pennisetum foermeranum [E]		√	?	Low
[1]Pogonarthria fleckii	√	√	Increaser 2	Low
[1,2]Pogonarthria squarrosa		√	Increaser 2	Low
[2]Polypogon monspeliensis	√		?	Average
[1,2]Schizachyrium sanguineum		√	Increaser 1	Low
[1,2]Schmidtia kalahariensis	√	√	Increaser 2	Low
[1,2]Schmidtia pappophoroides	√	√	Decreaser	High
[1]Setaria appendiculata	√		?	Average
[1]Setaria finita [E]		√	?	Low
[2]Setaria incrassata		√	Decreaser	High
[2]Setaria pallide-fusca		√	Increaser 2	Average
[1,2]Setaria verticillata	√	√	Increaser 2	Average
[1]Sorghum bicolour	√	√	?	Average
[1,2]Sporobolus festivus	√	√	Increaser 2	Low
[1,2]Sporobolus fimbriatus		√	Decreaser	High
[1,2]Sporobolus ioclados		√	Increaser 2	Average
[2]Sporobolus pyramidalis		√	Increaser 2	Low
[1,2]Stipagrostis ciliata	√	√	Decreaser	High
[1]Stipagrostis giessii	√		?	Average
[1,2]Stipagrostis hirtigluma	√	√	Increaser 2	Low
[1]Stipagrostis hochstetteriana	√	√	Decreaser	Average

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

Endemic – (Müller 2007)

? – not classified in literature, but often similar to other species within the genus

Source for literature review: Müller (2007), Van Oudtshoorn (2012)

None of the grass species known/expected to occur in the general Omaruru-Otjiwarongo area are however exclusively associated with the proposed development areas.

5.3.3.2 Tree and Shrub Diversity

Kranzberg-Omaruru

It is estimated that at least 74-101 species of larger trees and shrubs (>1m) (Coats Palgrave 1983 [85 spp.], Curtis and Mannheimer 2005 [101 spp.], Mannheimer and Curtis 2009 [91 spp.], Mannheimer and Curtis 2018 [101 spp.], Van Wyk and Van Wyk 1997 [62 spp. and 12 spp. endemic]) occur in the general Kranzberg-Omaruru area.

According to Mannheimer and Curtis (2018) at least 91 species of larger trees and shrubs are known and/or expected to occur in the general area of which 8 species are classified as endemic (7.9%), 4 species as near endemic (4%), 21 species (20.8%) are protected by the Forest Act No 12. of 2001, 5 species (5%) are protected under the Nature Conservation Ordinance No. 4 of 1975 while 6 species (5.9%) are classified as CITES Appendix 2 species. All the trees with some kind of conservation and/or protected status are viewed as important in the general Kranzberg-Omaruru area.

The most important species are viewed as *Commiphora dinteri*, *Commiphora saxicola*, *Commiphora virgata*, *Cyphostemma bainesii*, *Cyphostemma currorii* and *Erythrina decora* (e.g., most often associated with rocky substrate) (See Table 5.3.3.2-1).

None of the larger tree and shrub species known/expected to occur in the general Kranzberg-Omaruru area are however exclusively associated with the proposed development areas.

Omaruru-Otjiwarongo

It is estimated that at least 60-110 species of larger trees and shrubs (>1m) (Coats Palgrave 1983 [81 spp.], Curtis and Mannheimer 2005 [79 spp.], Mannheimer and Curtis 2009 [110 spp.], Mannheimer and Curtis (2018) [107 spp.], Van Wyk and Van Wyk 1997 [60 spp.]) occur in the general Omaruru-Otjiwarongo area.

According to Mannheimer and Curtis (2018) at least 107 species of larger trees and shrubs are known and/or expected to occur in the general area of which 3 species are classified as endemic (2.8%), 4 species classified as near endemic (3.7%), 13 species are protected by the Forest Act No. 12 of 2001 (12.1%), 4 species are protected by the Nature Conservation Ordinance No. 4 of 1975 (3.7%) and 3 species are classified as CITES Appendix 2 species (2.8%) – i.e. 22 species (including endemic and near endemic) have some form of conservation status (20.6%).

The most important species are viewed as *Cyphostemma currorii*, *Cyphostemma juttae*, *Erythrina decora* and *Manuleopsis dinteri* (e.g., most often associated with rocky substrate) (See Table 5.3.3.2-1).

Table 5.3.3.2-1 - Tree and shrub diversity known and/or expected to occur in the general Kranzberg-Otjiwarongo (Phase 1) – i.e. central-western Namibia – area. The trees and shrubs known, and/or expected to occur in the general area are derived from Mannheimer and Curtis (2018).

Species Expected: Scientific name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status
Acacia ataxacantha		√	
Acacia erioloba	√	√	Protected (F#)
Acacia erubescens	√	√	
Acacia fleckii		√	
Acacia hebeclada	√	√	
Acacia hereroensis	√	√	
Acacia karroo	√	√	
Acacia luederitzii		√	
Acacia mellifera	√	√	
Acacia reficiens	√	√	
Acacia senegal	√	√	
Acacia tortilis	√	√	
Adenia pechuelii	√		End
Adenolobus garipensis	√		
Adenolobus pechuelii	√		
Albizia anthelmintica	√	√	Protected (F#)
Aloe dichotoma	√		Protected (F#), NC, C2, N-end
Aloe litoralis	√	√	NC, C2
Azima tetracantha	√	√	
Boscia albitrunca	√	√	Protected (F#)
Boscia foetida	√	√	
Cadaba aphylla	√		
Caesalpinia rubra	√		
Catophractes alexandri	√	√	
Combretum apiculatum	√	√	
Combretum collinum		√	
Combretum hereroense	√	√	
Combretum imberbe	√	√	Protected (F#)
Commiphora africana	√	√	
Commiphora angolensis		√	
Commiphora dinteri	√		Protected (F#), End
Commiphora glandulosa	√	√	
Commiphora glaucescens	√	√	N-end
Commiphora pyracanthoides	√	√	
Commiphora saxicola	√		Protected (F#), End
Commiphora tenuipetiolata	√	√	
Commiphora virgata	√		Protected (F#), End
Cordia sinensis	√	√	
Croton gratissimus	√	√	
Cyphostemma bainesii	√	√	Protected (F#), End, NC
Cyphostemma currorii	√	√	Protected (F#), NC
Dichrostachys cinerea	√	√	
Diospyros lycioides	√	√	
Dombeya rotundifolia	√	√	
Ehretia alba	√	√	
Ehretia namibiensis		√	
Erythrina decora	√		Protected (F#), End
Elephantorrhiza suffruticosa	√	√	
Euclea pseudebenus	√		Protected (F#)
Euclea undulata	√	√	
Euphorbia avasmontana	√	√	C2

Species Expected: Scientific name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status
Euphorbia damarana	√		End, C2
Euphorbia guerichiana	√	√	C2
Euphorbia virosa	√		C2
Faidherbia albida	√	√	Protected (F#)
Flueggea virosa	√	√	
Ficus cordata	√	√	Protected (F#)
Ficus ilicina	√	√	
Ficus sycomorus	√	√	Protected (F#)
Gossypium anomalum	√		
Gossypium triphyllum	√		
Grewia avellana	√	√	
Grewia bicolor	√	√	
Grewia falcistipula		√	
Grewia flava	√	√	
Grewia flavescens	√	√	
Grewia olukondae		√	
Grewia retinervis		√	
Grewia schinzii		√	
Grewia subspathulata		√	
Grewia tenax	√	√	
Grewia villosa	√	√	
Gossypium triphyllum		√	
Gymnosporia buxifolia		√	
Gymnosporia senegalensis	√	√	
Ipomoea adeniodes	√	√	
Kirkia acuminata		√	
Laggera decurrens	√	√	
Lycium bosciifolium	√	√	
Lycium cinereum	√	√	
Lycium eenii	√	√	
Maerua juncea	√	√	
Maerua parvifolia	√	√	
Maerua schinzii	√	√	Protected (F#)
Manuleopsis dinteri	√	√	End
Melianthus comosus		√	
Montinia caryophyllacea	√	√	
Moringa ovalifolia	√	√	Protected (F#), NC, N-end
Mundulea sericea	√	√	
Obetia carruthersiana	√	√	N-end
Olea europaea	√	√	
Osyris lanceolata		√	
Ozoroa crassinervia	√	√	
Ozoroa insignis		√	
Ozoroa paniculosa		√	
Parkinsonia africana	√		
Pechuel-Loeschea leubnitziae	√	√	
Phaeoptilum spinosum	√	√	
Philenoptera nelsii		√	
Pouzolzia mixta		√	
Rhigozum brevispinosum		√	
Rhigozum trichotomum	√	√	
Rotheca myricoides	√	√	
Salsola spp.	√		
Securidaca longepedunculata		√	
Salvadora persica	√		
Searsia ciliata	√	√	

Species Expected: Scientific name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status
Searsia lancea	√	√	Protected (F#)
Searsia marlothii	√	√	
Searsia pyroides	√	√	
Searsia tenuinervis		√	
Searsia undulata		√	
Steganotaenia araliacea	√	√	
Sterculia africana	√	√	Protected (F#)
Strophanthus amboensis	√	√	
Tamarix usneoides	√		Protected (F#)
Tarchonanthus camphoratus	√	√	
Tetradenia riparia	√		
Tinnea rhodesiana	√		
Terminalia pruniodes	√	√	
Terminalia sericea		√	
Vangueria cyanescens	√	√	
Vangueria infausta	√	√	
Vernonia cinerascens	√		
Ximenia americana	√	√	
Ximenia caffra var. *caffra*		√	
Ziziphus mucronata	√	√	Protected (F#)

Endemic and Near-endemic – (Mannheimer and Curtis 2018)

F# – Forest Act No. 12 of 2001

NC – Nature Conservation Ordinance No. 4 of 1975

C2 – CITES Appendix 2 species

Source for literature review: CITES (2021), Coats Palgrave (1983), Curtis and Mannheimer (2005), Loots (2005), Mannheimer and Curtis (2009), Mannheimer and Curtis (2018), Rothmann (2004), Steyn (2003), Van Wyk and Van Wyk (1997)

None of the larger tree and shrub species known/expected to occur in the general Omaruru-Otjiwarongo area are however exclusively associated with the proposed development areas.

5.3.4 Reptile Diversity

Reptile diversity known and/or expected to occur along the Phase 1 section of the route is divided between the Kranzberg-Omaruru and Omaruru-Otjiwarongo areas, and presented in Table 5.3.4-1.

Approximately 261 species of reptiles are known or expected to occur in Namibia thus supporting approximately 30% of the continent's species diversity (Griffin 1998a). At least 22% or 55 species of Namibian lizards are classified as endemic. The occurrence of reptiles of "conservation concern" includes about 67% of Namibian reptiles (Griffin 1998a). Emergency grazing and large-scale mineral extraction in critical habitats are some of the biggest problems facing reptiles in Namibia (Griffin 1998a). The overall reptile diversity and endemism in the general Karibib area is estimated at between 41-70 species and 21-28 species, respectively (Mendelsohn *et al.* 2002). Griffin (1998a) presents figures of between 21-30 and 7-8 for endemic lizards and snakes, respectively, from the general area, while the closest protected areas, the Skeleton Coast and Namib-Naukluft National Parks, have an estimated 77 and 100 species, respectively. There is currently no data for the !Dorob National Park.

Kranzberg-Omaruru

At least 75 species of reptiles are expected to occur in the Kranzberg-Omaruru area with 34 species being endemic – i.e., 45.3% endemic. These consist of at least 30 snakes (1 blind snake, 2 thread snake, 2 python, 2 burrowing snakes and 23 typical snakes), 11 of which are endemic (33.3%) to Namibia, 2 tortoises, 1 terrapin, 42 lizards (1 worm lizard, 10 skinks, 6 Old World lizards, 2 plated lizards, 1 girdled lizard, 1 monitor lizard, 3 agamas, 1 chameleon and 17 geckos), 23 (54.8%) of which are endemic to Namibia. Skink's (10 species), Old World lizards (6 species) and gecko's (17 species) are the most numerous lizards expected from the general area. Namibia with approximately 129 species of lizards (Lacertilia) has one of the continents richest lizard fauna (Griffin 1998a). Geckos have the highest occurrence of endemics in the general area with 13 of the 17 species (76.5%) expected and/or known to occur in the area, being endemic to Namibia.

According to the Namibian legislation 3 species are viewed as rare (*Rhinotyphlops lalandei*, *Limaformosa (Mehelya) vernayi*, *Afroedura africana*), 4 species as vulnerable (*Stigmochelys pardalis*, *Psammobates oculiferus*, *Python natalensis*, *Varanus albigularis*), 5 species as protected game, 4 species insufficiently known and 3 species as peripheral. The IUCN (2021) classifies 37 species as least concern although not all the reptiles have yet been assessed by the IUCN Red List. The SARDB (2004) classifies 1 species as vulnerable, 1 species as safe to vulnerable and 2 species as peripheral while CITES lists 7 species under Appendix 2 and 1 species under Appendix 3.

The most important species expected to occur in the general area (See Table 1) are viewed as the tortoises *Stigmochelys pardalis* and *Psammobates oculiferus*; pythons – *P. anchietae* and *P. natalensis*; Namibian wolf snake (*Lycophidion namibianum*) – *Varanus albigularis* and some of the endemic and little-known gecko species – e.g. *Pachydactylus* species. Tortoises, snakes and monitor lizards are routinely killed for food or as perceived threats. Other important species are those viewed as "rare" – i.e. *Rhinotyphlops lalandei*, *Mehelya vernayi* and *Afroedura africana* – although very little is known about these species.

Due to the fact that reptiles are an understudied group of animals, especially in Namibia, it is expected that more species may be located in the Kranzberg-Omaruru area than presented in Table 5.3.4-1.

None of the reptile species known/expected to occur in the general Kranzberg-Omaruru area are however exclusively associated with the proposed development areas.

Omaruru-Otjiwarongo

At least 77 species of reptiles are expected to occur in the general Omaruru-Otjiwarongo area with 27 species being endemic – i.e., 35.1% endemic. These consist of at least 35 snakes (3 blind snakes, 2 thread snakes, 2 python, 1 burrowing asp, 2 quill snouted and 25 typical snakes) of which 10 species (28.6%) are endemic and 1 species vulnerable/protected game, 2 tortoises (100% vulnerable and protected game), 1 terrapin, 2 worm lizard, 17 lizards of which 5 species classified as endemic (29.4% endemic), 2 plated lizards, 1 girdled lizard (endemic), 1 monitor (vulnerable/protected game), 3 agamas (1 endemic), 2 chameleon and 10 geckos of which 8 species classified as endemic (i.e. 80% endemic).

Four species expected to occur in the area of which 2 are tortoises (*Stigmochelys pardalis*, *Psammobates oculiferus, Python natalensis* and *Varanus albigularis*) are classified as vulnerable and protected game. One species – *Python anchietae* – is classified as protected game, but not as vulnerable. Fourteen species have an international conservation status (10 CITES Appendix 2 and 3 species and 4 SARDB species; *Python natalensis* has both a CITES and SARDB status) with *Python natalensis* classified as vulnerable and *Naya nigricincta* as rare although *N. nigricincta* is however more common in Namibia than South Africa. However, the IUCN has not yet assessed most reptiles for the IUCN Red List.

Snakes (35 species with 10 species being endemic) and lizards (17 species with 5 species being endemic) are the most important groups of reptiles expected from the general Otjiwarongo area followed by geckos (10 species with 8 species being endemic). Namibia with approximately 129 species of lizards (Lacertilia) has one of the continents richest lizard fauna (Griffin 1998a). Geckos expected and/or known to occur in the general Omaruru-Otjiwarongo area have the highest occurrence of endemics (80%) of all the reptiles in this area.

Griffin (1998a) confirms the importance of the gecko fauna in Namibia. Tortoises are viewed as the group of reptiles most under threat in Namibia (Griffin 1998a) making *Stigmochelys pardalis* and *Psammobates oculiferus* probably the most important reptiles expected in the area followed by the pythons – *P. anchietae* and *P. natalensis* – and *Varanus albigularis*. All

the above-mentioned species are either consumed as food or indiscriminately killed when encountered – e.g. *Python natalensis*.

Due to the fact that reptiles are an understudied group of animals, especially in Namibia, it is expected that more species may be located in the Omaruru-Otjiwarongo area than presented in Table 5.3.4-1.

None of the reptile species known/expected to occur in the general Omaruru-Otjiwarongo area are however exclusively associated with the proposed development areas.

5.3.5 Amphibian Diversity

Amphibian diversity known and/or expected to occur along the Phase 1 section of the route is divided between the Kranzberg-Omaruru and Omaruru-Otjiwarongo areas, and presented in Table 5.3.5-1.

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

Kranzberg-Omaruru

According to Mendelsohn *et al.* (2002), the overall frog diversity in the general Kranzberg-Omaruru area is estimated at between 4-7 species. Griffin (1998b) puts the species richness in the general area at 10 species, while the closest protected areas, the Skeleton Coast and Namib-Naukluft National Parks, have an estimated 10 and 9 species, respectively. There is currently no data for the !Dorob National Park.

At least 7 species of amphibians are expected to occur in suitable habitat in the Kranzberg-Omaruru area. The area is underrepresented, with 2 toads, and 1 species each for rubber, puddle, bullfrog, sand and platanna known and/or expected (i.e. potentially could be found in the area) to occur in the area. Of these, 2 species are endemic (*Poyntonophrynus* (*Bufo*) *hoeschi* and *Phrynomantis annectens*) (Griffin 1998b) and 1 species is classified as “near threatened” (*Pyxicephalus adspersus*) (Du Preez and Carruthers 2009) – i.e. high level (42.9%) of amphibians of conservation value from the general area. *Pyxicephalus adspersus* is more common in northern Namibia where their numbers are also declining due to overutilization as food by humans (Griffin pers. com.). The IUCN (2021) lists all the species as “least concern”.

Table 5.3.4-1 - Reptile diversity known and/or expected to occur in the general Kranzberg-Otjiwarongo (Phase 1) – i.e., central-western Namibia – area.

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International status		
					SARDB	IUCN	CITES
TORTOISES AND TERRAPINS							
Stigmochelys pardalis	Leopard Tortoise	√	√	Vulnerable; Peripheral; Protected Game		LC	C2
Psammobates oculiferus	Kalahari Tent Tortoise	√	√	Vulnerable; Protected Game			C2
Pelomedusa subrufa	Marsh/Helmeted Terrapin	√	√	Secure			C3
SNAKES							
Blind Snakes							
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	√		Insufficiently known; Rare?			
Rhinotyphlops boylei	Boyle's Beaked Blind Snake		√	Endemic; Secure			
Rhinotyphlops schinzi	Schinz's Beaked Blind Snake		√	Endemic; Secure	P		
Rhinotyphlops schlegelii	Schlegel's Beaked Blind Snake		√	Secure			
Thread Snakes							
Namibiana (Leptotyphlops) occidentalis	Western Thread Snake	√	√	Endemic; Secure	P	LC	
Namibiana (Leptotyphlops) labialis	Damara Thread Snake	√		Endemic; Secure		LC	
Namibiana (Leptotyphlops) scutifrons	Peters' Thread Snake		√	Secure			
Pythons							
Python anchietae	Dwarf Python	√	√	Endemic; Insufficiently known; Protected game		LC	C2
Python natalensis	Southern African Python	√	√	Vulnerable; Peripheral; Protected Game	V		C2
Burrowing Snakes							
Atractaspis bibronii	Bibron's Burrowing Asp	√	√	Secure			
Xenocalamus bicolour bicolor	Bicoloured Quill-snouted Snake	√	√	Secure			
Xenocalamus mechowii	Elongate Quill-snouted Snake		√	Secure			

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International status		
					SARDB	IUCN	CITES
Typical Snakes							
Boaedon (Lamprophis) fuliginosus	Brown House Snake	√	√				
Lycophidion capense	Cape Wolf Snake	√	√				
Lycophidion namibianum	Namibian Wolf Snake	√		Endemic; Secure		LC	
Mehelya capensis	Cape File Snake	√		Secure			
Limaformosa (Mehelya) vernayi	Angola File Snake	√		Insufficiently known; Rare?		LC	
Pseudaspis cana	Mole Snake	√	√	Secure			
Pythonodipsas carinata	Western Keeled Snake	√		Endemic; Secure		LC	
Prosymna bivittata	Two-striped Shovel-snout		√	Secure			
Prosymna frontalis	South-western Shovel-snout	√	√	Endemic; Secure	P	LC	
Hemirhagerrhis viperinus	Viperine Bark Snake	√		Endemic; Secure			
Dipsina multimaculata	Dwarf Beaked Snake	√	√	Endemic; Secure			
Psammophylax tritaeniatus	Striped Skaapsteker		√	Secure			
Psammophis trigrammus	Western Sand Snake	√	√	Endemic; Secure		LC	
Psammophis notostictus	Karoo Sand Snake	√	√	Secure			
Psammophis leightoni namibensis	Namib Sand Snake	√	√	Secure		LC	
Psammophis brevirostris leopardinus	Leopard Grass Snake	√	√	Endemic; Secure			
Philothamnus semivariegatus	Spotted Bush Snake	√	√	Secure			
Dasypeltis scabra	Common/Rhombic Egg Eater	√	√	Secure		LC	
Telescopus semiannulatus polystrictus	Eastern Tiger Snake	√	√	Secure			
Telescopus beetzii	Beetz's Tiger Snake		√	Secure			
Dispholidus typus	Boomslang		√	Secure			
Aspidelaps lubricus infuscatus	Coral Snake	√	√	Secure			
Aspidelaps scutatus	Shield-nose Snake	√	√	Secure			
Elapsoidea sunderwallii	Sundevall's Garter Snake		√	Endemic; Secure			
Naja anchietae	Snouted Cobra		√	Secure			
Naja nivea	Cape Cobra	√	√	Secure			
Naya nigricincta	Black-necked Spitting Cobra	√		Endemic; Secure			
Dendroaspis polylepis	Mamba		√	Secure			

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International status		
					SARDB	IUCN	CITES
Bitis arietans	Puff Adder	√	√	Secure			
Bitis caudalis	Horned Adder	√	√	Secure			
WORM LIZARDS							
Zygaspis quadrifrons	Kalahari Round-headed Worm Lizard	√	√	Secure			
Monopeltis infuscata	Dusky Spade-snouted Worm Lizard		√	Secure			
LIZARDS							
Skinks							
Typhlosaurus braini	Brain's Blind Legless Skink	√		Endemic; Secure		LC	
Typhlacontias brevipes	FitzSimon's Burrowing Skink	√		Endemic; Secure		LC	
Typhlosaurus lineatus	Striped Blind Legless Skink		√	Secure			
Acontias occidentalis	Percival's Legless Skink		√	Secure			
Lygosoma sundevallii	Sundevall's Writhing Skink		√	Secure			
Trachylepis acutilabris	Wedge-snouted Skink	√	√	Secure		LC	
Trachylepis capensis	Cape Skink	√	√	Secure			
Trachylepis hoeschi	Hoesch's Skink	√	√	Endemic; Secure		LC	
Trachylepis occidentalis	Western Three-striped Skink	√	√	Secure			
Trachylepis spilogaster	Kalahari Tree Skink	√	√	Endemic; Secure			
Trachylepis striata wahlbergi	Striped Skink	√	√	Secure			
Trachylepis sulcata	Western Rock Skink	√	√	Secure			
Trachylepis variegata	Variegated Skink	√	√	Secure			
Old World Lizards							
Heliobolus lugubris	Bushveld Lizard	√	√	Secure			
Ichnotropis squamulosa	Common Rough-scaled Lizard		√	Secure			
Meroles suborbitalis	Spotted Desert Lizard	√	√	Secure		LC	
Nucras intertexta	Spotted Sandveld Lizard		√	Endemic; Secure			
Pedioplanis lineoocellata	Spotted Sand Lizard		√	Endemic; Secure			
Pedioplanis breviceps	Short-headed Sand Lizard	√		Endemic; Secure		LC	
Pedioplanis namaquensis	Namaqua Sand Lizard	√	√	Secure			
Pedioplanis undata	Western Sand Lizard	√	√	Endemic; Secure		LC	
Pedioplanis inornata	Plain Sand Lizard	√		Endemic; Secure		LC	
Plated Lizards							

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International status		
					SARDB	IUCN	CITES
Cordylosaurus subtessellatus	Dwarf Plated Lizard	√	√	Endemic; Secure		LC	
Matabosaurus maltzahani (Gerrhosaurus validus)	Giant Plated Lizard	√	√	Secure		LC	
Girdled Lizards							
Karusasaurus (Cordylus) jordani	Jordan's Girdled Lizard	√	√	Endemic; Secure		LC	C2
Monitors							
Varanus albigularis	Rock or White-throated Monitor	√	√	Vulnerable; Peripheral; Protected Game	S to V		C2
Agamas							
Agama achuleata	Ground Agama	√	√	Secure			
Agama anchietae	Anchietae's Agama	√	√	Secure		LC	
Agama planiceps	Namibian Rock Agama	√	√	Endemic; Secure		LC	
Chameleons							
Chamaeleo namaquensis	Namaqua Chameleon	√		Secure		LC	C2
Chamaeleo namaquensis	Namaqua Chameleon		√	Secure		LC	C2
Geckos							
Afroedura africana	African Flat Gecko	√		Endemic; Insufficiently known; Rare		LC	
Chondrodactylus angulifer	Giant Ground Gecko	√	√	Endemic; Secure		LC	
Lygodactylus bradfieldi	Bradfield's Dwarf Gecko	√	√	Endemic; Secure			
Narudasia festiva	Festive Gecko	√	√	Endemic; Secure		LC	
Pachydactylus bicolour	Velvety Thick-toed Gecko	√	√	Endemic; Secure			
Pachydactylus capensis	Cape Thick-toed Gecko	√	√	Endemic; Secure			
Pachydactylus fasciatus	Banded Thick-toed Gecko	√		Endemic; Secure		LC	
Pachydactylus kochii	Koch's Thick-toed Gecko	√		Endemic; Secure		LC	
Pachydactylus turneri	Turner's Thick-toed Gecko	√	√	Secure			
Pachydactylus punctatus	Speckled Thick-toed Gecko	√	√	Secure			
Pachydactylus rugosus	Rough Thick-toed Gecko	√	√	Endemic; Secure		LC	
Pachydactylus serval	Western Spotted Thick-toed Gecko		√	Endemic; Secure			
Pachydactylus scherzi	Namib Variable Gecko	√		Endemic; Secure		LC	
Pachydactylus weberi	Weber's Thick-toed Gecko	√		Secure		LC	
Ptenopus garrulus	Common Barking Gecko	√	√	Secure		LC	

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International status		
					SARDB	IUCN	CITES
Rhoptropus afer	Common Namib Day Gecko	√		Endemic; Secure		LC	
Rhoptropus boultoni	Boulton's Namib Day Gecko	√		Endemic; Secure		LC	
Rhoptropus bradfieldi	Bradfield's Namib Day Gecko	√		Endemic; Secure		LC	

Namibian conservation and legal status according to the Nature Conservation Ordinance No 4 of 1975

Endemic – includes Southern African Status (Branch 1998)

SARDB (2004): S to V – Safe to Vulnerable; V – Vulnerable; P – Peripheral

IUCN (2021): LC – Least Concern [All other species not yet assessed]

CITES: CITES Appendix 2/3 species

Source for literature review: Alexander and Marais (2007), Bonin *et al.* (2006), Branch (1998), Branch (2008), Boycott and Bourquin (2000), Broadley (1983), Buys and Buys (1983), Cunningham (2006), Griffin (2003), Hebbard (n.d.), IUCN (2021), Marais (1992), SARDB (2004), Schleicher (2020), Tolley and Burger (2007)

The most important species are the endemic *Poyntonophrynus hoeschi* and *Phrynomantis annectens* although they are widespread in Namibia and not exclusively associated with the Kranzberg-Omaruru area in particular. Permanent water bodies viewed as amphibian habitat in the area include the ephemeral Khan and Omaruru Rivers and their tributaries. Other potential habitats in the area include rocky pool areas in the Erongo Mountains, farm reservoirs and earth dams although the latter are also dependant on localised showers and temporary of nature.

Due to the fact that amphibians are an understudied group of animals, especially in Namibia, it is expected that more species may be located in the Kranzberg-Omaruru area than presented in Table 5.3.5-1. However, the overall lack of suitable habitat around Kranzberg-Omaruru is expected to negatively affect the presence of most amphibians.

None of the amphibian species known/expected to occur in the general Kranzberg-Omaruru area are however exclusively associated with the proposed development areas.

Omaruru-Otjiwarongo

According to Mendelsohn *et al.* (2002), the overall frog diversity in the general Omaruru-Otjiwarongo area is estimated at between 12-15 species. Griffin (1998b) puts the species richness in the general area at between 14-15 species. The closest protected area – Waterberg Plateau Park – has an estimated 13 species of amphibians (Griffin 1998b).

At least 9 species of amphibians are expected to occur in suitable in the Omaruru-Otjiwarongo area. The area is underrepresented, with 2 toads and 1 species each for kassina, rubber, puddle, caco, bullfrog, sand and platanna known and/or expected (i.e., potentially could be found in the area) to occur in the area. Of these, 2 species are endemic (*Poyntonophrynus* (*Bufo*) *hoeschi* and *Phrynomantis annectens*) (Griffin 1998b) and 1 species classified as “near threatened” due to habitat loss and development (*Pyxicephalus adspersus*) (Du Preez and Carruthers 2009) – i.e. 33.3% of amphibians of conservation value from the general area. *Pyxicephalus adspersus* is more common in northern Namibia where their numbers are also declining due to overutilization as food by humans (Griffin pers. com.). The IUCN (2021) lists all the species as “least concern”.

The most important species are the endemic *Poyntonophrynus hoeschi* and *Phrynomantis annectens* although they are widespread in Namibia and not exclusively associated with the Otjiwarongo area in particular. Permanent water bodies viewed as amphibian habitat in the area include the ephemeral Omaruru and Omatjene Rivers and their tributaries, Otjiwarongo sewage works. Other potential habitats in the area include farm reservoirs and earth dams although the latter are also dependant on localised showers and temporary of nature.

Due to the fact that amphibians are an understudied group of animals, especially in Namibia, it is expected that more species may be located in the Omaruru-Otjiwarongo area than presented in Table 5.3.5-1. However, the overall lack of suitable habitat around Omaruru-Otjiwarongo is expected to negatively affect the presence of most amphibians.

Table 5.3.5-1 - Amphibian diversity known and/or expected to occur in the general Kranzberg-Otjiwarongo (Phase 1) – i.e. central-western Namibia – area.

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International Status: IUCN
Toads					
Amietophrynus poweri	Western Olive Toad	√	√		LC
Poyntonophrynus hoeschi	Hoesch's Pygmy Toad	√	√	Endemic	LC
Rubber Frog					
Phrynomantis annectens	Marbled Rubber Frog	√	√	Endemic	LC
Kassinas					
Kassina senegalensis	Bubbling Kassina		√		LC
Puddle Frog					
Phrynobatrachus mababiensis	Dwarf Puddle Frog	√	√		LC
Cacos					
Cacosternum boettgeri	Boettger's Caco		√		LC
Bullfrogs					
Pyxicephalus adspersus	Giant Bullfrog	√	√	Near threatened	LC
Sand Frogs					
Tomopterna tandyi	Tandy's Sand Frog	√	√		LC
Platannas					
Xenopus laevis	Common Platanna	√	√		LC

Endemic – (Griffin 1998b)
Near threatened – (Du Preez and Carruthers 2009)
IUCN (2021): LC – Least Concern
Source for literature review: Carruthers (2001), Channing (2001), Channing and Griffin (1993), Du Preez and Carruthers (2009), IUCN (2021), Passmore and Carruthers (1995), SARDB (2004)

None of the amphibian species known/expected to occur in the general Omaruru-Otjiwarongo area are however exclusively associated with the proposed development area.

5.3.6 Mammal Diversity

Mammal diversity known and/or expected to occur along the Phase 1 section of the route is divided between the Kranzberg-Omaruru and Omaruru-Otjiwarongo areas, and presented in Table 5.3.6-1.

Namibia is well endowed with mammal diversity with at least 250 species occurring in the country. These include the well-known big and hairy as well as a legion of smaller and lesser-known species. Currently 14 mammal species are considered endemic to Namibia of which 11 species are rodents and small carnivores of which very little is known. Most endemic mammals are associated with the Namib and escarpment with 60% of these rock-dwelling (Griffin 1998c). According to Griffin (1998c) the endemic mammal fauna is best characterized by the endemic rodent family *Petromuridae* (Dassie rat) and the rodent genera *Gerbillurus* and *Petromyscus*. Habitat alteration and overutilization are the two primary processes threatening most mammals (Griffin 1998c) with species probably underrepresented in Table 3 for the general areas being the bats and rodents, as these groups have not been well documented from Namibia.

Kranzberg-Omaruru

Overall terrestrial diversity and endemism – all species – is classified as “average” and “high” respectively in the general Kranzberg-Omaruru area (Mendelsohn *et al.* 2002). The overall diversity (5-6 species) and abundance of large herbivorous mammals is “high” in the general area with kudu, mountain zebra and oryx having the highest densities of the larger species (Mendelsohn *et al.* 2002). The overall abundance and diversity of large carnivorous mammals is “average” (4 species) in the general area with leopard and cheetah having the highest densities of the larger species (Mendelsohn *et al.* 2002). The overall mammal diversity in the general Kranzberg-Omaruru area is estimated at between 61-75 species with 5-6 species being endemic to the area (Mendelsohn *et al.* 2002). Griffin (1998c) puts the species richness distribution of endemic mammals between 7-8 species in the general area, while the closest protected areas, the Skeleton Coast and Namib-Naukluft National Parks, at 87 and 80 species, respectively. There is currently no data for the !Dorob National Park.

According to the literature at least 87 species of mammals are known and/or expected to occur in the general Kranzberg-Omaruru area of which 10 species (11.5%) are classified as endemic. The Namibian legislation classifies 2 species as “rare”, 5 species as “vulnerable”, 3 species as “specially protected game”, 9 species as “protected game”, 5 species as “insufficiently known”, 4 species as “huntable game” and 4 species as “problem animals”. Five species of bat are not listed – i.e. according to Monadjem *et al.* (2010) these bats potentially could occur in the general Kranzberg-Omaruru are according to a habitat modelling programme although not yet actually confirmed.

At least 31% (27 species) of the mammalian fauna that occur or are expected to occur in the general Kranzberg-Omaruru b area are represented by rodents of which 5 species (18.5%)

are endemic. This is followed by bats 27.6% (24 species) of which 1 species is classified as "rare". Twenty-nine species (33.3%) have IUCN, CITES and SARDB international conservation status (some species have more than one conservation status). The IUCN (2021) classifies 4 species each as vulnerable (cheetah, leopard, Hartmann's Mountain zebra, giraffe) and near threatened (African straw-coloured fruit bat, Commerson's roundleaf bat, striped leaf-nosed bat, brown hyena). The SARDB (2004) classifies 1 species as rare, 1 species as endangered, 2 species as vulnerable, 12 species as near threatened and 6 species as data deficient while CITES lists 2 species as Appendix 1 and 5 species as Appendix 2. The House Mouse (*Mus musculus*) is viewed as an invasive alien species to the area. *Mus musculus* are generally known as casual pests and not viewed as problematic although they are known carriers of "plague" and can cause economic losses (Picker and Griffiths 2011).

Of the 87 species of mammals known and/or expected to occur in the general Kranzberg-Omaruru area, 9 species (10.3%) are classified as endemic. Rodents (of which 5 species – 18.5% – are endemic) and bats (of which 1 species is classified as rare) are the groups least studied. Species of greatest concern in the general area are those viewed as rare in Namibia – i.e. Namibian wing-gland bat and Southern African hedgehog – and species classified as vulnerable (cheetah, leopard, Hartmann's mountain zebra, giraffe) and near threatened (African straw-coloured fruit bat, Commerson's roundleaf bat, striped leaf-nosed bat, brown hyena) by the IUCN (2021). Another important and unique species known to occur in the general area is the endemic Kaokoland slender or black mongoose (See: Cowley and Cunningham 2004, Warren *et al.* 2009).

Due to the fact that bats and rodents are understudied groups of animals, especially in Namibia, it is expected that more species may be located in the Kranzberg-Omaruru area than presented in Table 5.3.6-1.

None of the mammal species known/expected to occur in the general Kranzberg-Omaruru area are however exclusively associated with the proposed development area.

Omaruru-Otjiwarongo

Overall terrestrial diversity and endemism – all species – is classified as "moderate to high" in the central part of Namibia (Mendelsohn *et al.* 2002). The overall diversity (7-8 species) and abundance of large herbivorous mammals is "high" in the general Omaruru-Otjiwarongo area with kudu, red hartebeest and oryx having the highest density of the larger species (Mendelsohn *et al.* 2002). The overall abundance and diversity of large carnivorous mammals is "average" (4 species) in the general area with cheetah and leopard having the highest density of the larger species (Mendelsohn *et al.* 2002). The overall mammal diversity in the general Omaruru-Otjiwarongo area is estimated at between 76-90 species with 1-2 species being endemic to the area (Mendelsohn *et al.* 2002). Griffin (1998c) puts the species richness distribution of endemics also between 7-8 species. The closest protected area – Waterberg Plateau Park – has an estimated 82 species of mammals (Griffin 1998c).

According to the literature at least 84 species of mammals are known and/or expected to occur in the general Omaruru-Otjiwarongo area of which 4 species (4.8%) are classified as endemic.

The Namibian legislation classifies 8 species as vulnerable, 3 species as rare, 1 species as specially protected game, 9 species as protected game, 4 species as insufficiently known, 1 species as peripheral, 1 species as migrant, 4 species as huntable game, 3 species as problem animals and 4 species not listed. At least 29.8% (25 species) of the mammalian fauna that occur or are expected to occur in general Omaruru-Otjiwarongo area are represented by rodents of which 3 species (12%) are endemic. This is followed by bats with 26.2% (22 species) of which 1 species (i.e., *Cistugo seabrai*) is endemic and rare (4.5%) and carnivores with 20.2% (17 species) of which 1 species (5.9%) are endemic.

Thirty species (35.7%) have some form of international conservation status (some species have more than one status) of which the IUCN (2016) classifies 2 species as vulnerable and 5 species as near threatened; SARDB (2004) classifies 1 species as rare, 3 as vulnerable, 12 as near threatened and 5 as data deficient while CITES classifies 3 species as Appendix 1 species and 5 species as Appendix 2 species. Furthermore Monadjem *et al.* (2010) classifies 2 species as near threatened although this is probably using old IUCN status revised in IUCN (2021). The House Mouse (*Mus musculus*) is viewed as an invasive alien species to the area. *Mus musculus* are generally known as casual pests and not viewed as problematic although they are known carriers of “plague” and can cause economic losses (Picker and Griffiths 2011).

The most important species from the general area are probably all those classified as near threatened (*Eidolon helvum*, *Hipposideros vittatus*, *Rhinolophus blasii*, *Hyaena brunnea* and *Panthera pardus*) and vulnerable (*Acinonyx jubatus* and *Felis nigripes*) by the IUCN (2021) and rare (*Cistugo seabrai*, *Atelerix frontalis angolae* and *Felis nigripes*) under Namibian legislation.

Due to the fact that bats and rodents are understudied groups of animals, especially in Namibia, it is expected that more species may be located in the Omaruru-Otjiwarongo area than presented in Table 5.3.6-1.

None of the mammal species known/expected to occur in the general Omaruru-Otjiwarongo area are however exclusively associated with the proposed development area.

Table 5.3.6-1 - Mammal diversity known and/or expected to occur in the general Kranzberg-Otjiwarongo (Phase 1) – i.e. central-western Namibia – area.

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International status		
					SARDB	IUCN	CITES
Elephant Shrews							
Macroscelides proboscideus	Round-eared Elephant-shrew	√	√	Endemic; Secure			
Elephantulus rupestris	Western Rock Elephant-shrew	√	√	Secure			
Elephantulus intufi	Bushveld Elephant-shrew	√	√	Secure	DD		
Aardvark							
Orycteropus afer	Aardvark	√	√	Secure; Protected Game			
Shrews				Secure	DD		
Crocidura fuscomurina	Tiny Musk Shrew	√	√				
Crocidura cyanea	Reddish-grey Musk Shrew	√	√	Secure	DD		
Hyrax							
Procavia capensis	Rock Hyrax	√	√	Secure; Problem animal			
Bats							
Eidolon helvum	African Straw-coloured Fruit Bat	√	√	Secure (Migrant)	NT	NT	
Mops midas	Midas Free-tailed Bat	√		Secure			
Miniopterus natalensis	Natal Long-fingered Bat	√	√	Secure	NT		
Mimetillus thomasi	Thomas's Flat-headed Bat	√		Not listed			
Sauromys petrophilus	Flat-headed Free-tailed Bat	√		Secure			
Tadarida aegyptiaca	Egyptian Free-tailed Bat	√	√	Secure			
Chaerephon nigeriae	Nigerian Free-tailed Bat		√	Secure			
Neoromicia capensis	Cape Serotine Bat	√	√	Secure			
Neoromicia zuluensis	Zulu Serotine Bat	√	√	Secure			
Nycticeinops schlieffeni	Schleiffen's Twighlight Bat	√		Secure			
Pipistrellus rueppellii	Rüppell's Pipistrelle	√	√	Insufficiently known; Peripheral			
Pipistrellus rusticus	Rusty Pipistrelle	√	√	Not listed			
Cistugo seabrai	Namibian Wing-gland Bat	√	√	Endemic; Rare	V		
Eptesicus hottentotus	Long-tailed Serotine Bat	√	√	Secure			
Scotophilus dinganii	African Yellow Bat	√	√	Secure			
Nycteris thebaica	Egyptian Slit-faced Bat	√	√	Secure			
Rhinolophus fumigatus	Rüppell's Horseshoe Bat	√	√	Secure	NT		
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	√	√	Secure	NT		
Rhinolophus darlingi	Darling's Horseshoe Bat	√	√	Secure	NT		
Rhinolophus denti	Dent's Horseshoe Bat	√	√	Secure	NT		
Rhinolophus hildebrandtii	Hildebrandt's Horseshoe Bat	√	√	Not listed			

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International status		
					SARDB	IUCN	CITES
Rhinolophus blasii	Blasius's Horseshoe Bat		√	Not listed	NT		
Macronycteris (Hipposideros) commersoni	Commerson's Roundleaf Bat	√		Secure		NT	
Hipposideros caffer	Sundevall's Roundleaf Bat	√		Secure	DD		
*Macronycteris (Hipposideros) gigas**	Giant Leaf-nosed Bat	√		Not listed			
Macronycteris (Hipposideros) vittatus	Striped Leaf-nosed Bat	√		Not listed		NT	
Taphozous mauritianus	Mauritian Tomb Bat		√	Secure			
Hares and Rabbits							
Lepus capensis	Cape Hare	√	√	Secure			
Lepus saxatilis	Scrub Hare	√	√	Secure			
Pronolagus randensis	Jameson's Red Rock Rabbit	√	√	Secure			
Rodents							
Porcupine							
Hystrix africaeaustralis	Cape Porcupine	√	√	Secure			
Molerat							
Cryptomys damarensis	Damaraland Mole-Rat		√	Secure			
Rats and Mice							
Petromys typicus	Dassie Rat	√	√	Endemic; Secure	NT		
Pedetes capensis	Springhare	√	√	Secure			
Xerus inaurus	South African Ground Squirrel	√	√	Secure			
Xerus princeps	Damara Ground Squirrel	√	√	Endemic	NT		
Graphiurus rupicola/platyops	Western Rock Dormouse	√		Endemic; Secure	DD		
Graphiurus murinus	Woodland Dormouse	√	√	Secure			
Rhabdomys pumilio	Four-striped Grass Mouse	√	√	Secure			
Mus indutus	Desert Pygmy Mouse	√	√	Secure			
Mastomys natalensis	Natal Multimammate Mouse	√		Secure			
Mastomys coucha	Southern Multimammate Mouse	√	√	Secure			
Thallomys paedulcus	Acacia Rat	√	√	Secure			
Thallomys nigricauda	Black-tailed Tree Rat	√	√	Secure			
Aethomys chrysophilus	Red Veld Rat	√	√	Secure			
Micaelamys namaquensis	Namaqua Rock Mouse	√	√	Secure			
Desmodillus auricularis	Cape Short-tailed Gerbil	√	√	Secure			
Gerbillurus paeba	Hairy-footed Gerbil	√	√	Secure			

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International status		
					SARDB	IUCN	CITES
Gerbillurus setzeri	Setzer's Hairy-footed Gerbil	√		Endemic			
Tatera leucogaster	Bushveld Gerbil	√	√	Secure	DD		
Tatera brantsii	Highveld Gerbil		√	Secure			
Saccostomus campestris	Pouched Mouse	√	√	Secure			
Malacothrix typica	Gerbil Mouse	√	√	Secure			
Petromyscus collinus	Pygmy Rock Mouse	√	√	Endemic; Secure			
Mus musculus	House Mouse	√	√	Invasive alien			
Primates							
Galago moholi	South African Galago	√	√	Vulnerable; Protected Game			C2
Papio ursinus	Chacma Baboon	√	√	Secure; Problem animal			C2
Hedgehog							
Atelerix frontalis angolae	Southern African Hedgehog	√	√	Insufficiently Known; Rare; Protected Game	NT; R		
Pangolin							
Manis temminckii	Ground Pangolin		√	Vulnerable; Peripheral; Protected Game		V	C2
Carnivores							
Proteles cristatus	Aardwolf	√	√	Insufficiently known; (Vulnerable?) Peripheral			
Parahyaena (Hyaena) brunnea	Brown Hyena	√	√	Insufficiently known; (Vulnerable?) Peripheral	NT	NT	
Crocuta crocuta	Spotted Hyena	√	√	Secure?; Peripheral	NT		
Acinonyx jubatus	Cheetah	√	√	Vulnerable; Protected Game	V	V	C1
Panthera pardus	Leopard	√	√	Secure?; Peripheral; Protected Game		V	C1
Caracal	Caracal	√	√	Secure; Problem Animal			C2
Felis silvestris	African Wild Cat	√	√	Vulnerable			C2
Felis nigripes	Black-footed Cat		√	Indeterminate; Rare		V	C1
Genetta	Small Spotted Genet	√	√	Secure			
Suricata suricatta marjoriae	Suricate	√	√	Endemic; Secure			
Cynictis penicillata	Yellow Mongoose	√	√	Secure			
Galerella sanguinea	Slender Mongoose	√	√	Secure			

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International status		
					SARDB	IUCN	CITES
Galerella flavescens (nigrata)	Kaokoland/Black Slender Mongoose	√		Endemic; Secure			
Otocyon megalotis	Bat-eared Fox	√	√	Vulnerable?; Peripheral			
Vulpes chama	Cape Fox	√	√	Vulnerable?			
Canis mesomelas	Black-backed Jackal	√	√	Secure; Problem animal			
Mellivora capensis	Honey Badger/Ratel	√	√	Secure; Protected Game	NT		
Ictonyx striatus	Striped Polecat	√	√	Secure			
Equidae							
Equus zebra hartmannae	Hartmann's Mountain Zebra	√		Endemic; Secure; Specially Protected Game	E	V	C2
Suidae							
Phacochoerus africanus	Common Warthog	√	√	Secure; Huntable Game			
Antelopes							
Giraffa camelopardalis	Giraffe	√		Vulnerable; Peripheral; Specially Protected Game		V	
Tragelaphus strepsiceros	Greater Kudu	√	√	Secure; Huntable Game			
Alcelaphus buselaphus	Red Hartebeest		√	Secure; Protected Game			
Oryx gazella	Gemsbok	√	√	Secure; Huntable game			
Sylvicapra grimmia	Common Duiker	√	√	Secure			
Antidorcas marsupialis	Springbok	√	√	Secure; Huntable game			
Madoqua damarensis	Damara Dik-dik	√	√	Insufficiently Known; Protected Game			
Raphicerus campestris	Steenbok	√	√	Secure; Protected Game			
Oreotragus oreotragus	Klipspringer	√	√	Secure; Specially Protected Game			

SARDB (2004): R – Rare, E – Endangered, V – Vulnerable, NT – Near Threatened, DD – Data Deficient

IUCN (2021): V – Vulnerable, NT – Near Threatened. All other species not listed are viewed as "Least Concern" by IUCN (2021)

CITES: CITES Appendix 1/2 species

*Monadjem *et al.* (2010)

Source for literature review: De Graaff (1981), Griffin and Coetzee (2005), Estes (1995), IUCN (2021), Joubert and Mostert (1975), Monadjem *et al.* (2010), Picker and Griffiths (2011), SARDB (2004), Skinner and Smithers (1990), Skinner and Chimimba (2005), Stander and Hanssen (2003) and Taylor (2000)

5.3.7 Avian Diversity

Bird diversity known and/or expected to occur along the Phase 1 section of the route is divided between the Kranzberg-Omaruru and Omaruru-Otjiwarongo areas, and presented in Table 5.3.7-1.

Although Namibia's avifauna is comparatively sparse compared to the high rainfall equatorial areas elsewhere in Africa, approximately 658 species have already been recorded with a diverse and unique group of arid endemics (Brown *et al.* 1998, Maclean 1985). Fourteen species of birds are endemic or near endemic to Namibia with the majority of Namibian endemics occurring in the savannas (30%) of which ten species occur in a north-south belt of dry savannah in central Namibia (Brown *et al.* 1998).

Kranzberg-Omaruru

Bird diversity and endemism is viewed as "high" in the general Kranzberg-Omaruru area with 171-200 species, of which 8 species being endemic (Mendelsohn *et al.* 2000). Simmons (1998a) suggests 7-9 endemic species and a "high" ranking for southern African endemics and "average" ranking for red data birds expected from the general area. Although the Kranzberg-Omaruru area is not classified as an Important Birding Area (IBA) in Namibia (Simmons 1998a) the closest such sites are located to the west at the coast – i.e., Walvis Bay, Sandwich and Mile 4 Saltworks – while the closest inland IBA's are Brandberg and Naukluft.

According to the literature at least 217 bird species [mainly terrestrial "breeding residents"] occur and/or could occur in the general Kranzberg-Omaruru area at any time (Hockey *et al.* 2006, Maclean 1985, Tarboton 2001). Twelve of the 14 Namibian endemics are expected to occur in the general area (85.7% of all Namibian endemic species or 5.6% of all the species expected to occur in the area). Eight species are classified as endangered (violet wood-hoopoe, Ludwig's bustard, white-backed vulture, black harrier, tawny eagle, booted eagle, martial eagle, black stork), 2 species as vulnerable (lappet-faced vulture, secretary bird) and 5 species as near threatened (Rűppel's parrot, Kori bustard, Verreaux's eagle, peregrine falcon, marabou stork) (Simmons *et al.* 2015). The IUCN (2021) classifies 1 species as critically endangered (white-backed vulture), 4 species as endangered (Ludwig's bustard, lappet-faced vulture, martial eagle, secretary bird), 1 species as vulnerable (tawny eagle) and 1 species as near threatened (Kori bustard). Fifty-seven species have a southern African conservation rating with 8 species classified as endemic (14% of southern African endemics or 3.7% of all the birds expected) and 49 species classified as near endemic (86% of southern African endemics or 22.7% of all the birds expected) (Hockey *et al.* 2006).

The most important bird species from the general area are those classified as endemic to Namibia of which the Damara hornbill and Herero chat are viewed as the most important due to the overall lack of knowledge of these species. Although also viewed as important, Rüppels korhaan is migratory throughout its range while the rockrunner inhabits inaccessible terrain and is widespread throughout mountainous areas in Namibia. Other species of concern are those classified as endangered (violet wood-hoopoe, Ludwig's bustard, black harrier, tawny eagle, booted eagle, martial eagle, black stork) and near threatened (Rűppel's parrot,

Verreaux's eagle, peregrine falcon, marabou stork) (Simmons *et al.* 2015) and those species classified by the IUCN (2021) as critically endangered (white-backed vulture), endangered (Ludwig's bustard, lappet-faced vulture, martial eagle, secretary bird), vulnerable (tawny eagle) and near threatened (Kori bustard).

None of the bird species known/expected to occur in the general Kranzberg-Omaruru area are however exclusively associated with the proposed development areas.

Omaruru-Otjiwarongo

Bird diversity is viewed as "high" in the general Omaruru-Otjiwarongo area with 201-230 species estimated and 4-5 species being endemic (Mendelsohn *et al.* 2000). Simmons (1998a) suggests 1-3 endemic species and "average" rankings for southern African endemics and red data birds expected from the general area. Although the Otjiwarongo area is not classified as an Important Birding Area (IBA) in Namibia (Simmons 1998a) the closest such site is located at the Waterberg approximately 50km to the southeast. The Omatako Dam area located approximately 90km southeast of Otjiwarongo is viewed as important breeding, feeding and roosting sites for a variety of aquatic birds (Brown *et al.* 2006).

At least 218 species of terrestrial ["breeding residents"] birds occur and/or could occur in the general Omaruru-Otjiwarongo area at any time (Hockey *et al.* 2006, Maclean 1985, Tarboton 2001). All the migrant and aquatic species have been excluded here. Ten of the 14 Namibian endemics are expected to occur in the general area (71.4% of all Namibian endemic species or 4.6% of all the species expected to occur in the area). One species (Cape vulture) is viewed as critically endangered, 10 species as endangered, 4 species as vulnerable and 8 species as near threatened (Simmons *et al.* 2015). Other species of conservation concern although not listed in Table 4 above as they are aquatic species are maccoa duck (NT), black-necked grebe (NT), rufous-bellied heron (E) and great white pelican (V). The IUCN (2021) classifies 1 species as critically endangered (white-backed vulture), 6 species as endangered (Ludwig's bustard, lappet-faced vulture, bateleur, black harrier, martial eagle, secretary bird), 3 species as vulnerable (Cape vulture, tawny eagle, red-footed falcon) and 2 species as near threatened (Kori bustard, pallied harrier).

Sixty-one (28% of all the birds expected) species have a southern African conservation rating with 13 species classified as endemic (21.3% of southern African endemics or 6% of all the birds expected) and 48 species classified as near endemic (78.7% of southern African endemics or 22.1% of all the birds expected) (Hockey *et al.* 2006).

The most important endemic species known/expected to occur in the general area are viewed as Monteiro's hornbill (*Tockus monteiri*), Damara hornbill (*Tockus damarensis*), *Ammomanopsis grayi* (Gray's Lark), *Namibornis herero* (Herero chat), *Eupodotis rueppellii* (Rüppell's korhaan) and *Poicephalus rueppellii* (Rüppell's parrot). The species listed as critically endangered (Cape vulture), endangered (violet wood-hoopoe, Ludwig's bustard, white-backed vulture, bateleur, black harrier, tawny eagle, booted eagle, martial eagle, black stork, saddle-billed stork), vulnerable (lappet-faced vulture, white-headed vulture, African fish eagle, secretary bird) and near threatened (European roller; Rűppel's parrot, Kori bustard,

pallid harrier, Verreaux's eagle, red-footed falcon, peregrine falcon, marabou stork) by Simmons *et al.* (2015) as well as those listed by the IUCN (2021) as critically endangered (white-backed vulture), endangered (Ludwig's bustard, lappet-faced vulture, bateleur, black harrier, martial eagle, secretary bird), vulnerable (Cape vulture, tawny eagle, red-footed falcon) and near threatened (Kori bustard, pallied harrier). The Cape vulture is a cliff breeder and although the last remnants are known to occur in the Waterberg Area (i.e., greater Otjiwarongo area). The larger raptors (e.g. vultures, eagles, etc.) are often persecuted due to actual and perceived livestock mortalities or succumb when feeding on poisoned carcasses set for problem predators while the bustards are viewed as pylon sensitive birds and prone to pylon strikes.

None of the bird species known/expected to occur in the general Omaruru-Otjiwarongo area are however exclusively associated with the proposed development areas.

Table 5.3.7-1 - Avian diversity known and/or expected to occur in the general Kranzberg-Otjiwarongo (Phase 1) – i.e. central-western Namibia – area.

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International status	
					Southern African status	IUCN
Struthio camelus	Common Ostrich	√	√			
Scleroptila levaillantoides	Orange River Francolin	√	√		Near endemic	
Pternistis hartlaubi	Hartlaub's Spurfowl	√	√	Endemic	Near endemic	
Pternistis adspersus	Red-billed Spurfowl	√	√		Near endemic	
Pternistis swainsonii	Swainson's Spurfowl	√	√			
Coturnix	Common Quail	√	√			
Coturnix delegorguei	Harlequin Quail	√	√			
Numida meleagris	Helmeted Guineafowl	√	√			
Turnix sylvaticus	Kurrichane Buttonquail	√	√			
Indicator minor	Lesser Honeyguide	√	√			
Campethera bennettii	Bennett's Woodpecker		√			
Campethera abingoni	Golden-tailed Woodpecker	√	√			
Dendropicos fuscescens	Cardinal Woodpecker	√	√			
Dendropicos namaquus	Bearded Woodpecker	√	√			
Tricholaema leucomelas	Acacia Pied Barbet	√	√		Near endemic	
Tockus monteiri	Monteiro's Hornbill	√	√	Endemic		
Tockus damarensis	Damara Hornbill	√	√	Endemic	Near endemic	
Tockus leucomelas	Southern, yellow-billed Hornbill	√	√		Near endemic	
Tockus nasutus	African Grey Hornbill	√	√			
Upupa africana	African Hoopoe	√	√			
Phoeniculus purpureus	Green Wood-Hoopoe	√	√			
Phoeniculus damarensis	Violet Wood-Hoopoe	√	√	E; Endemic		
Rhinopomastus cyanomelas	Common Scimitarbill	√	√			
Coracias garrulus	European Roller		√	NT		
Coracias caudatus	Lilac-breasted Roller	√	√			
Coracias naevius	Purple Roller	√	√			
Merops hirundineus	Swallow-tailed Bee-eater	√	√			
Merops apiaster	European Bee-eater	√	√			
Merops persicus	Blue-cheeked Bee-eater		√			
Colius colius	White-backed Mousebird	√	√		Endemic	
Urocolius indicus	Red-faced Mousebird	√	√			
Clamator jacobinus	Jacobin Cuckoo	√	√			
Clamator glandarius	Great Spotted Cuckoo	√	√			

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International status	
					Southern African status	IUCN
Cuculus clamosus	Black Cuckoo	√	√			
Cuculus gularis	African Cuckoo	√	√			
Chrysococcyx klaas	Klaas's Cuckoo	√	√			
Chrysococcyz caprius	Diderick Cuckoo	√	√			
Poicephalus rueppellii	Rüppell's Parrot	√	√	NT; Endemic	Near endemic	
Agapornis roseicollis	Rosy-faced Lovebird	√	√	Endemic	Near endemic	
Cypsiurus parvus	African Palm Swift	√	√			
Tachymarptis melba	Alpine Swift	√	√			
Apus bradfieldi	Bradfield's Swift	√	√		Near endemic	
Apus affinis	Little Swift	√	√			
Apus horus	Horus Swift		√			
Apus caffer	White-rumped Swift	√	√			
Corythaixoides concolor	Grey Go-away Bird	√	√			
Tyto alba	Barn Owl	√	√			
Otus senegalensis	African Scops Owl	√	√			
Ptilopsis granti	Southern White-faced Scops Owl	√	√			
Bubo africanus	Spotted Eagle Owl	√	√			
Bubo lacteus	Verreaux's Eagle-Owl	√	√			
Glaucidium perlatum	Pearl-spotted Owlet	√	√			
Glaucidium capense	African Barred Owlet		√			
Caprimulgus pectoralis	Fiery-necked Nightjar	√	√			
Caprimulgus tristigma	Freckled Nightjar	√	√			
Caprimulgus rufigena	Rufous-cheeked Nightjar	√	√			
Caprimulgus europaeus	European Nightjar	√				
Columba livia	Rock Dove	√	√			
Columba guinea	Speckled Pigeon	√	√			
Streptopelia capicola	Cape Turtle Dove	√	√			
Streptopelia senegalensis	Laughing Dove	√	√			
Oena capensis	Namaqua Dove	√	√			
Neotis ludwigii	Ludwig's Bustard	√	√	E	Near endemic	E
Ardeotis kori	Kori Bustard	√	√	NT		NT
Lophotis ruficrista	Red-crested Korhaan	√	√		Near endemic	
Afrotis afraoides	Northern Black Korhaan	√	√		Endemic	
Eupodotis rueppellii	Rüppell's Korhaan	√	√	Endemic	Near endemic	

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International status	
					Southern African status	IUCN
Pterocles namaqua	Namaqua Sandgrouse	√	√		Near endemic	
Pterocles bicinctus	Double-banded Sandgrouse	√	√		Near endemic	
Pterocles burchelli	Burchell's Sandgrouse		√		Near endemic	
Burhinus capensis	Spotted Thick-knee	√	√			
Charadrius tricollaris	Three-banded Plover	√				
Vanellus armatus	Blacksmith Lapwing	√	√			
Vanellus coronatus	Crowned Lapwing	√	√			
Rhinoptilus africanus	Double-banded Courser	√	√			
Rhinoptilus chalcopterus	Bronze-winged Courser	√	√			
Cursorius rufus	Burchell's Courser	√	√		Near endemic	
Cursorius temminckii	Temminck's Courser	√	√			
Elanus caeruleus	Black-shouldered Kite	√	√			
Milvus migrans	Black Kite	√	√			
Gyps africanus	White-backed Vulture	√	√	E		CE
Gyps coprotheres	Cape Vulture		√	CE		V
Aegypius tracheliotos	Lappet-faced Vulture	√	√	V		E
Terathopius ecaudatus	Bateleur		√	E		E
Haliaeetus vocifer	African Fish-Eagle		√	V		
Circaetus pectoralis	Black-chested Snake-Eagle	√	√			
Circaetus cinereus	Brown Snake-Eagle	√	√			
Circus maurus	Black Harrier		√	E		E
Circus macrourus	Pallid Harrier		√	NT		NT
Polyboroides typus	African Harrier-Hawk		√			
Melierax canorus	Southern Pale Chanting Goshawk	√	√		Near endemic	
Melierax gabar	Gabar Goshawk	√	√			
Accipiter badius	Shikra	√	√			
Accipiter minullus	Little Sparrowhawk	√	√			
Accipter ovampensis	Owambo Sparrowhawk	√				
Buteo vulpinus	Steppe Buzzard	√	√			
Buteo augur	Augur Buzzard	√	√			
Buteo rufofuscus	Jackal Buzzard	√	√			
Aquila nipalensis	Steppe Eagle	√				
Aquila rapax	Tawny Eagle	√	√	E		V
Aquila verreauxii	Verreaux's Eagle	√	√	NT		

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International status	
					Southern African status	IUCN
Aquila spilogaster	African Hawk-Eagle	√	√			
Aquila pennatus	Booted Eagle	√	√	E		
Aquila wahlbergi	Wahlberg's Eagle		√			
Polemaetus bellicosus	Martial Eagle	√	√	E		E
Sagittarius serpentarius	Secretarybird	√	√	V		E
Polihierax semitorquatus	Pygmy Falcon	√	√			
Falco rupicolus	Rock Kestrel	√	√			
Falco rupicoloides	Greater Kestrel	√	√			
Falco chicquera	Red-necked Falcon	√	√			
Falco vespertinus	Red-footed Falcon		√	NT		V
Falco biarmicus	Lanner Falcon	√	√			
Falco peregrinus	Peregrine Falcon	√	√	NT		
Egretta garzetta	Little Egret	√	√			
Egretta intermedia	Yellow-billed Egret	√				
Ardea cinerea	Grey Heron	√	√			
Ardea melanocephala	Black-headed Heron	√	√			
Bubulcus ibis	Cattle Egret	√	√			
Scopus umbretta	Hamerkop	√	√			
Ciconia nigra	Black Strork	√	√	E		
Ephippiorhynchus senegalensis	Saddle-billed Stork		√	E		
Ciconia abdimii	Abdim's Stork	√				
Leptoptilos crumeniferus	Marabou Stork	√	√	NT		
Dicrurus adsimilis	Fork-tailed Drongo	√	√			
Terpsiphone viridis	African Paradise-Flycatcher	√	√			
Nilaus afer	Brubru	√	√			
Dryoscopus cubla	Black-backed Puffback	√				
Tchagra australis	Brown-crowned Tchagra	√	√			
Laniarius atrococcineus	Crimson-breasted Shrike	√	√		Near endemic	
Telophorus zeylonus	Bokmakierie	√	√		Near endemic	
Prionops plumatus	White-crested Helmet-Shrike	√				
Lanioturdus torquatus	White-tailed Shrike	√	√	Endemic	Near endemic	
Batis pririt	Pririt Batis	√	√		Near endemic	
Corvus capensis	Cape Crow	√	√			
Corvus albus	Pied Crow	√	√			

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International status	
					Southern African status	IUCN
Lanius collurio	Red-backed Shrike	√				
Lanius minor	Lesser Grey Shrike	√				
Lanius collaris	Common Fiscal	√	√			
Eurocephalus anguitimens	Southern, White-crowned Shrike	√	√		Near endemic	
Anthoscopus minutes	Cape Penduline Tit	√	√		Near endemic	
Parus carpi	Carp's Tit	√	√	Endemic	Near endemic	
Parus cinerascens	Ashy Tit	√	√		Endemic	
Riparia paludicola	Brown-throated Martin	√	√			
Hirundu albigularis	White-throated Swallow		√			
Hirundo dimidiata	Pearl-breasted Swallow		√			
Hirundo rustica	Barn Swallow	√				
Hirundo dimidiata	Pearl-breasted Swallow	√	√			
Hirundo cucullata	Greater Striped Swallow	√	√			
Hirundo semirufa	Red-breasted Swallow		√			
Hirundo spilodera	South African Cliff-Swallow	√	√			
Hirundo fuligula	Rock Martin	√	√			
Delichon urbicum	Common House Martin	√	√			
Pycnonotus nigricans	African, Red-eyed Bulbul	√	√		Near endemic	
Achaetps pycnopygius	Rockrunner	√	√	Endemic	Near endemic	
Sylvietta rufescens	Long-billed Crombec	√	√			
Eremomela icteropygialis	Yellow-bellied Eremomela	√	√			
Eremomela gregalis	Karoo Eremomela	√	√			
Eremomela usticollis	Burnt-necked Eremomela	√	√			
Acrocephalus baeticatus	African Reed Warbler	√				
Turdoides bicolor	Southern Pied Babbler	√	√		Endemic	
Parisoma layardi	Layard's Tit-Babbler	√	√		Endemic	
Parisoma subcaeruleum	Chestnut-vented Tit-Babbler	√	√		Near endemic	
Zosterops pallidus	Orange River White-eye	√	√			
Cisticola chiniana	Rattling Cisticola		√			
Cisticola rufilatus	Tinkling Cisticola		√			
Cisticola subruficapilla	Grey-backed Cisticola	√	√		Near endemic	
Cisticola jaridulus	Desert Cisticola	√	√			
Prinia flavicans	Black-chested Prinia	√	√			
Malcorus pectoralis	Rufous-eared Warbler	√	√			

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International status	
					Southern African status	IUCN
Camaroptera brevicaudata	Grey-backed Camaroptera	√	√			
Cisticola juncidis	Zitting Cisticola		√			
Calamonastes fasciolatus	Barren Wren-Warbler	√	√			
Mirafra passerina	Monotonous Lark	√	√			
Mirafra fasciolata	Eastern Clapper Lark	√	√		Near endemic	
Mirafra sabota	Sabota Lark	√	√			
Calendulauda africanoides	Fawn-coloured Lark	√	√		Near endemic	
Pinarocorys nigricans	Dusky Lark	√	√			
Ammomanopsis grayi	Gray's Lark	√	√	Endemic		
Chersomanes albofasciata	Spike-heeled Lark	√	√		Near endemic	
Certhilauda subcoronata	Karoo Long-billed Lark	√	√		Near endemic	
Eremopterix leucotis	Chestnut-backed Sparrowlark	√	√			
Eremopterix verticalis	Grey-backed Sparrowlark	√	√		Near endemic	
Calandrella cinerea	Red-capped Lark	√	√			
Alauda starki	Stark's Lark	√	√		Near endemic	
Monticola brevipes	Short-toed Rock Thrush	√	√			
Psophocichla litsitsirupa	Groundscraper Thrush	√	√			
Bradornis infuscatus	Chat Flycatcher	√	√		Near endemic	
Melaenornis mariquensis	Marico Flycatcher	√	√		Near endemic	
Muscicapa striata	Spotted Flycatcher	√	√			
Cercotrichas leucophrys	White-browed Scrub-Robin	√	√			
Cercotrichas paena	Kalahari Scrub-Robin	√	√			
Namibornis herero	Herero Chat	√		Endemic	Near endemic	
Oenanthe monticola	Mountain Wheatear	√	√		Near endemic	
Oenanthe pileata	Capped Wheatear	√	√			
Cercomela schlegelii	Karoo Chat	√	√		Near endemic	
Cercomela tractrac	Tractrac Chat	√			Near endemic	
Cercomela familiaris	Familiar Chat	√	√			
Myrmecocichla formicivora	Ant-eating Chat	√	√		Endemic	
Onychognathus nabouroup	Pale-winged Starling	√	√		Near endemic	
Lamprotornis nitens	Cape Glossy Starling	√	√			
Lamprotornis australis	Burchell's Starling	√	√			
Cinnyricinclus leucogaster	Violet-backed Starling	√	√			
Creatophora cinerea	Wattled Starling	√	√			

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International status	
					Southern African status	IUCN
Chalcomitra senegalensis	Scarlet-chested Sunbird	√	√			
Nectarinia fusca	Dusky Sunbird	√	√		Near endemic	
Cinnyris mariquensis	Marico Sunbird	√	√			
Bualornis niger	Red-billed Buffalo-Weaver	√	√			
Sporopipes squamifrons	Scaly-feathered Finch	√	√		Near endemic	
Plocepasser mahali	White-browed Sparrow-Weaver	√	√			
Philetairus socius	Sociable Weaver	√	√		Endemic	
Ploceus intermedius	Lesser Masked-Weaver	√	√			
Ploceus velatus	Southern Masked-Weaver	√	√			
Ploceus rubiginosus	Chestnut Weaver	√	√			
Quelea	Red-billed Quelea	√	√			
Euplectes orix	Southern Red Bishop		√			
Ortygospiza atricollis	African Quailfinch		√			
Amadina erythrocephala	Red-headed Finch	√	√		Near endemic	
Estrilda erythronotos	Black-faced Waxbill	√	√			
Estrilda astrild	Common Waxbill	√	√			
Granatina granatina	Violet-eared Waxbill	√	√			
Pytilia melba	Green-winged Pytilia	√	√			
Vidua macroura	Pin-tailed Whydah		√			
Vidua paradisaea	Long-tailed Paradise-Whydah	√	√			
Vidua regia	Shaft-tailed Whydah	√	√			
Passer domesticus	House Sparrow	√	√			
Passer motitensis	Great Sparrow	√	√		Near endemic	
Passer melanurus	Cape Sparrow	√	√		Near endemic	
Passer griseus	Southern Grey-headed Sparrow	√	√			
Motacilla aguimp	African Pied Wagtail		√			
Motacilla capensis	Cape Wagtail	√	√			
Anthus cinnamomeus	African Pipit	√	√			
Anthus vaalensis	Buffy Pipit	√	√			
Anthus similes	Long-billed Pipit	√	√			
Serinus alario	Black-headed Canary	√	√		Endemic	
Crithagra atrogulariis	Black-throated Canary	√	√			
Serinus flaviventris	Yellow Canary	√	√		Near endemic	
Serinus albogularis	White-throated Canary	√	√		Near endemic	

Species: Scientific name	Species: Common name	Kranzberg-Omaruru	Omaruru-Otjiwarongo	Namibian conservation and legal status	International status	
					Southern African status	IUCN
Emberiza impetuani	Lark-like Bunting	√	√		Near endemic	
Emberiza tahapisi	Cinnamon-breasted Bunting	√	√			
Emberiza capensis	Cape Bunting	√	√		Near endemic	
Emberiza flaviventris	Golden-breasted Bunting	√	√			

This table excludes migratory birds (e.g., Petrel, Albatross, Skua, etc.), aquatic species (e.g., ducks, etc.) and species breeding extralimital (e.g. stints, sandpipers, etc.) and rather focuses on birds that are breeding residents or can be found in the area during any time of the year. This would imply that many more birds (e.g., Palaearctic migrants) could occur in the area depending on "favourable" environmental conditions.

Namibian status: E – Endangered, V- Vulnerable, NT – Near Threatened (Simmons *et al.* 2015)

Southern African status: Hockey *et al.* (2006)

IUCN (2021): CE – Critically Endangered, E – Endangered, V- Vulnerable, NT – Near Threatened. All other species not listed are viewed as "Least Concern" by IUCN (2020)

Source for literature review: Brown *et al.* (1998), Hockey *et al.* (2006), IUCN (2021), Komen (n.d.), Little and Crowe (2011), Maclean (1985), Peacock (2015), Simmons *et al.* (2015), Tarboton (2001)

5.3.8 Species of Conservation Interest

5.3.8.1 Reptiles

Kranzberg-Omaruru

The most important species expected to occur in the general area (See Table 5.3.4-1) are viewed as the tortoises *Stigmochelys pardalis* and *Psammobates oculiferus*; pythons – *P. anchietae* and *P. natalensis*; Namibian wolf snake (*Lycophidion namibianum*) – *Varanus albigularis* and some of the endemic and little-known gecko species – e.g., *Pachydactylus* species. Tortoises, snakes and monitor lizards are routinely killed for food or as perceived threats. Other important species are those viewed as "rare" – i.e., *Rhinotyphlops lalandei*, *Mehelya vernayi* and *Afroedura africana* – although very little is known about these species.

Omaruru-Otjiwarongo

The most important species expected to occur in the general area (See Table 5.3.4-1) are viewed as the tortoises *Stigmochelys pardalis* and *Psammobates oculiferus* probably; pythons – *P. anchietae* and *P. natalensis* – and *Varanus albigularis*. All the above-mentioned species are either consumed as food or indiscriminately killed when encountered – e.g. *Python natalensis*.

5.3.8.2 Amphibians

Kranzberg-Omaruru

The most important species are the endemic *Poyntonophrynus hoeschi* and *Phrynomantis annectens* although they are widespread in Namibia and not exclusively associated with the Kranzberg-Omaruru area in particular. Permanent water bodies viewed as amphibian habitat in the area include the ephemeral Khan and Omaruru Rivers and their tributaries. Other potential habitats in the area include rocky pool areas in the Erongo Mountains, farm reservoirs and earth dams although the latter are also dependant on localised showers and temporary of nature.

Omaruru-Otjiwarongo

The most important species are the endemic *Poyntonophrynus hoeschi* and *Phrynomantis annectens* although they are widespread in Namibia and not exclusively associated with the Otjiwarongo area in particular. Permanent water bodies viewed as amphibian habitat in the area include the ephemeral Omaruru and Omatjene Rivers and their tributaries, Otjiwarongo sewage works. Other potential habitats in the area include farm reservoirs and earth dams although the latter are also dependant on localised showers and temporary of nature.

5.3.8.3 Mammals

Kranzberg-Omaruru

The most important species from the general area are probably all those classified as vulnerable (cheetah, leopard, Hartmann's Mountain zebra, giraffe) and near threatened (African straw-coloured fruit bat, Commerson's roundleaf bat, striped leaf-nosed bat, brown hyena) by the IUCN (2021) and rare (Namibian wing-gland bat and Southern African

hedgehog) under Namibian legislation. Another important and unique species known to occur in the general area is the endemic Kaokoland slender or black mongoose (See: Cowley and Cunningham 2004, Warren *et al.* 2009).

Omaruru-Otjiwarongo

The most important species from the general area are probably all those classified as near threatened (African straw-coloured fruit bat, Commerson's roundleaf bat, striped leaf-nosed bat, brown hyena and leopard) and vulnerable (cheetah and black-footed cat) by the IUCN (2021) and rare (Namibian wing-gland bat and Southern African hedgehog and black-footed cat) under Namibian legislation.

5.3.8.4 Birds

Kranzberg-Omaruru

The most important endemic species known/expected to occur in the general area are viewed as Damara hornbill and Herero chat. Although also viewed as important, Rüppell's korhaan is migratory throughout its range while the rockrunner inhabits inaccessible terrain and is widespread throughout mountainous areas in Namibia. Other species of concern are those classified as endangered (violet wood-hoopoe, Ludwig's bustard, black harrier, tawny eagle, booted eagle, martial eagle, black stork) and near threatened (Rűppel's parrot, Verreaux's eagle, peregrine falcon, marabou stork) (Simmons *et al.* 2015) and those species classified by the IUCN (2021) as critically endangered (white-backed vulture), endangered (Ludwig's bustard, lappet-faced vulture, martial eagle, secretary bird), vulnerable (tawny eagle) and near threatened (kori bustard).

Omaruru-Otjiwarongo

The most important endemic species known/expected to occur in the general area are viewed as Monteiro's hornbill, Damara hornbill, Gray's lark, Herero chat, Rüppell's korhaan and Rüppell's parrot. The species listed as critically endangered (Cape vulture), endangered (violet wood-hoopoe, Ludwig's bustard, white-backed vulture, bateleur, black harrier, tawny eagle, booted eagle, martial eagle, black stork, saddle-billed stork), vulnerable (lappet-faced vulture, white-headed vulture, African fish eagle, Secretarybird) and near threatened (European roller; Rűppel's parrot, kori bustard, pallid harrier, Verreaux's eagle, red-footed falcon, peregrine falcon, marabou stork) by Simmons *et al.* (2015) as well as those species classified by the IUCN (2021) as critically endangered (white-backed vulture), endangered (Ludwig's bustard, lappet-faced vulture, bateleur, black harrier, martial eagle, Secretarybird), vulnerable (Cape vulture, tawny eagle, red-footed falcon) and near threatened (kori bustard, pallied harrier). The Cape vulture is a cliff breeder and although the last remnants are known to occur in the Waterberg Area (i.e. greater Otjiwarongo area).

5.3.8.5 Flora

Kranzberg-Omaruru

The most important species are viewed as *Commiphora dinteri*, *Commiphora saxicola*, *Commiphora virgata*, *Cyphostemma bainesii*, *Cyphostemma currorii* and *Erythrina decora* (e.g., most often associated with rocky substrate).

Important plant species known and/or expected from the general Kranzberg-Omaruru area and included in the Red Data Book for Namibia include at least 16 species of which 1 species is listed as rare (*Diclis tenuissima*), 1 species as vulnerable (*Lithops werneri*) and 1 species as near threatened (*Adenia pechuelii*) (Table 5.3.8.5-1) (Loots 2005). All the species included in Table 5.3.8.5-1 are viewed as important.

Table 5.3.8.5-1 - Important species – i.e. Red Data spp. – known to occur in the general Kranzberg-Omaruru area according to Loots (2004).

Species: Scientific name	Conservation status
Adenia pechuelii	Endemic, NT
Aloe dinteri	Endemic, NC, C2, LC
Aloe namibensis	Endemic, NC, C2, LC
Australluma peschii	Endemic, LC
Chamaegigas intrepidus	Endemic, LC
Crassula capitella subsp. *nodulosa*	LC
Cyphostemma bainesii	Endemic, LC
Diclis tenuissima	Endemic, Rare
Dombeya rotundifolia var. *velutina*	Endemic, LC
Euphorbia monteiroi subsp. *brandbergensis*	Endemic, C2, LC
Lithops gracilidelineata subsp. *gracilidelineata*	NC, LC
Lithops ruschiorum	Endemic, NC, LC
Lithops werneri	Endemic, NC, V
Namacodon schinzianum	Endemic, LC
Nicotiana africana	Endemic, LC
Trema orientalis	LC

Endemic (Loots 2005)
NC – Nature Conservation Ordinance No. 4 of 1975
Rare; V – Vulnerable; NT – Near Threatened; LC – Least Concern (Loots 2005)
C2 – CITES Appendix 2 spp.

Omaruru-Otjiwarongo

The most important species are viewed as *Cyphostemma currorii*, *Cyphostemma juttae*, *Erythrina decora* and *Manuleopsis dinteri* (e.g., most often associated with rocky substrate).

Important plant species known and/or expected from the general Omaruru-Otjiwarongo area and included in the Red Data Book for Namibia include at least 10 species of which 2 species is listed as rare (*Eriospermum citrinum*, *Eriospermum flexum*), and 2 species as near threatened (*Ceropegia mafekingensis*, *Dintera pterocaulis*) (Table 5.3.8.5-2) (Loots 2005). All the species included in Table 5.3.8.5-2 are viewed as important.

Table 5.3.8.5-2 - Important species – i.e., Red Data spp. – known to occur in the general Kranzberg-Omaruru area according to Loots (2004).

Species: Scientific name	Conservation status
Brachystelma schultzei	LC
Ceropegia dinteri	Endemic, NC, LC
Ceropegia mafekingensis	NC, NT
Crinum paludosum	LC
Cyphostemma juttae	Endemic, LC
Dintera pterocaulis	Endemic, NT
Eriospermum citrinum	Endemic, Rare
Eriospermum flexum	Endemic, Rare
Lithops pseudotruncatella subsp. pseudotruncatella	Endemic; NC, LC
Pentatrichia avasmontana	Endemic, LC

Endemic (Loots 2005)
NC – Nature Conservation Ordinance No. 4 of 1975
Rare; V – Vulnerable; NT – Near Threatened; LC – Least Concern (Loots 2005)
C2 – CITES Appendix 2 spp.

5.3.8.6 Other species

Aloes

Aloes are protected throughout Namibia with 3 other aloe species not included in Table 5.3.3.2-1, but which potentially occur in the general Kranzberg-Omaruru area, and also viewed as important are *Aloe asperifolia*, *A. hereroensis* and *A. zebrina*. Three other Aloe species also potentially occur in the Omaruru-Otjiwarongo area and include *Aloe dinteri*, *A. hereroensis* and *A. zebrina* (Rothmann 2004).

Commiphora

Many endemic Commiphora species are found throughout Namibia with Steyn (2003) indicating that *Commiphora crenato-serrata* (not included in the Table 5) potentially also occurring in the general Kranzberg-Omaruru and Omaruru-Otjiwarongo areas. *Commiphora* species have economic potential (i.e., resin properties used in the perfume industry – e.g. *C. wildii*) making them an important species (Nott and Curtis 2006).

Euphorbias

At least 47 species of Euphorbia occur throughout Namibia of which 4 species are listed as rare, 1 endangered, 1 vulnerable and 1 near threatened (Möller and Becker 2019). Euphorbia species known/expected to occur in the general Kranzberg-Omaruru and Omaruru-Otjiwarongo area include at least 7 species (*Euphorbia avasmontana*, *E. gariepina*, *E. guerichiana*, *E. lignosa*, *E. mauritanica*, *E. monteiroi* and *E. virosa*).

Ferns

At least 64 species of ferns, of which 13 species being endemic, occur throughout Namibia. Ferns in the general Kranzberg-Omaruru area include at least 15 indigenous species

(*Actiniopteris radiata*, *Asplenium cordatum*, *Cheilanthes dinteri*, *C. eckloniana*, *C. marlothii*, *C. parviloba*, *Marselia aegyptiaca*, *M. ephippiocarpa*, *M. farinosa*, *M. macrocarpa*, *M. nubica*, *M. unicornis*, *M. vera*, *Ophioglossum polyphyllum* and *Pellaea calomelanos*) while in the Omaruru-Otjiwarongo area at least 23 indigenous species (*Actiniopteris radiata*, *Adiantum capillus-veneris*, *A. poiretii*, *Asplenium cordatum*, *Blechnum australe*, *Cheilanthes dinteri*, *Cheilanthes involuta*, *C. marlothii*, *C. viridis*, *Christella chaseana*, *Marsilea aegyptiaca*, *M. ephippiocarpa*, *M. farinosa*, *M. marcocarpa*, *M. nubica*, *M. unicornis*, *M. vera*, *Microlepia speluncae*, *Ophioglossum polyphyllum, Pellaea calomelanos*, *P. pectiniformis*, *Thelypteris confluens*) are known/expected (Crouch *et al.* 2011). Although ferns require specific habitat – often rocky substrate – the general Kranzberg-Omaruru-Otjiwarongo area is under collected with more species probably occurring than presented above.

Lichens

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

Lithops

Lithops species – all protected (See Nature Conservation Ordinance No. 4 of 1975) – are also known to occur in the general Kranzberg-Omaruru area and often difficult to observe, especially during the dry season when their aboveground structures wither. The closest species are currently only known to occur west of Kranzberg and include *Lithops gracilidelineata* var. *gracilidelineata* and *L. werneri* while the closest species in the Otjiwarongo area is *Lithops pseudotruncatella* subsp. *pseudotruncatella* var. *elisabethiae* located south-east of Otjiwarongo (Cole and Cole 2005, Earle and Round n.d.).

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

5.3.9 Critical Habitat Assessment

The most important areas along the Kranzberg-Omaruru and Omaruru-Otjiwarongo rail upgrade route are presented in Figures 5.3.9-1 & 5.3.9-2 and briefly discussed below.

- Ephemeral rivers and associated drainage lines
    - The Khan and Omaruru Rivers (Kranzberg-Omaruru) and the Omaruru and Omatjene Rivers (Omaruru-Otjiwarongo) as well as all the larger well vegetated other ephemeral drainage lines are important habitat to larger trees, especially protected species such as *Acacia erioloba*, *Euclea pseudebenus*, *Faidherbia albida* and *Ziziphus mucronata*, etc. These larger trees serve as habitat to a wide variety of important vertebrate fauna (e.g., large raptor breeding and roosting sites; cavity dwelling birds (e.g., hornbill and parrots), bark and cavity dwelling small mammals (e.g., bats, gallago) and reptiles (e.g., monitor lizard, various geckos) (See Table 5.3.3.2-1, Figures 5.3.9-1 & 5.3.9-2). These larger trees also stabilise riverbanks and prevent erosion related issues – i.e., valuable ecosystem service function.

- Erongo Mountains
    - Escarpments, mountains, and inselbergs are generally considered as sites of special ecological importance in Namibia (Curtis and Barnard 1998). The Erongo Mountains have a high number of endemic species (26-35) and a high overall plant diversity (all species) of between 400-499 species (Mendelsohn *et al.* 2002). Pockets of high diversity are found throughout Namibia in “unique” habitat – often transition zones – e.g., mountains, inselbergs, etc.

- Granite outcrops/ridges
    - Escarpments, mountains, and inselbergs are generally considered as sites of special ecological importance with granite domes (Karibib and Omaruru districts) high in biotic richness and endemism (Curtis and Barnard 1998).

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

- Otjiwarongo sewage works
    - The Otjiwarongo sewage works located just to the north of the town is an important site, albeit an artificial habitat, especially for aquatic bird species.

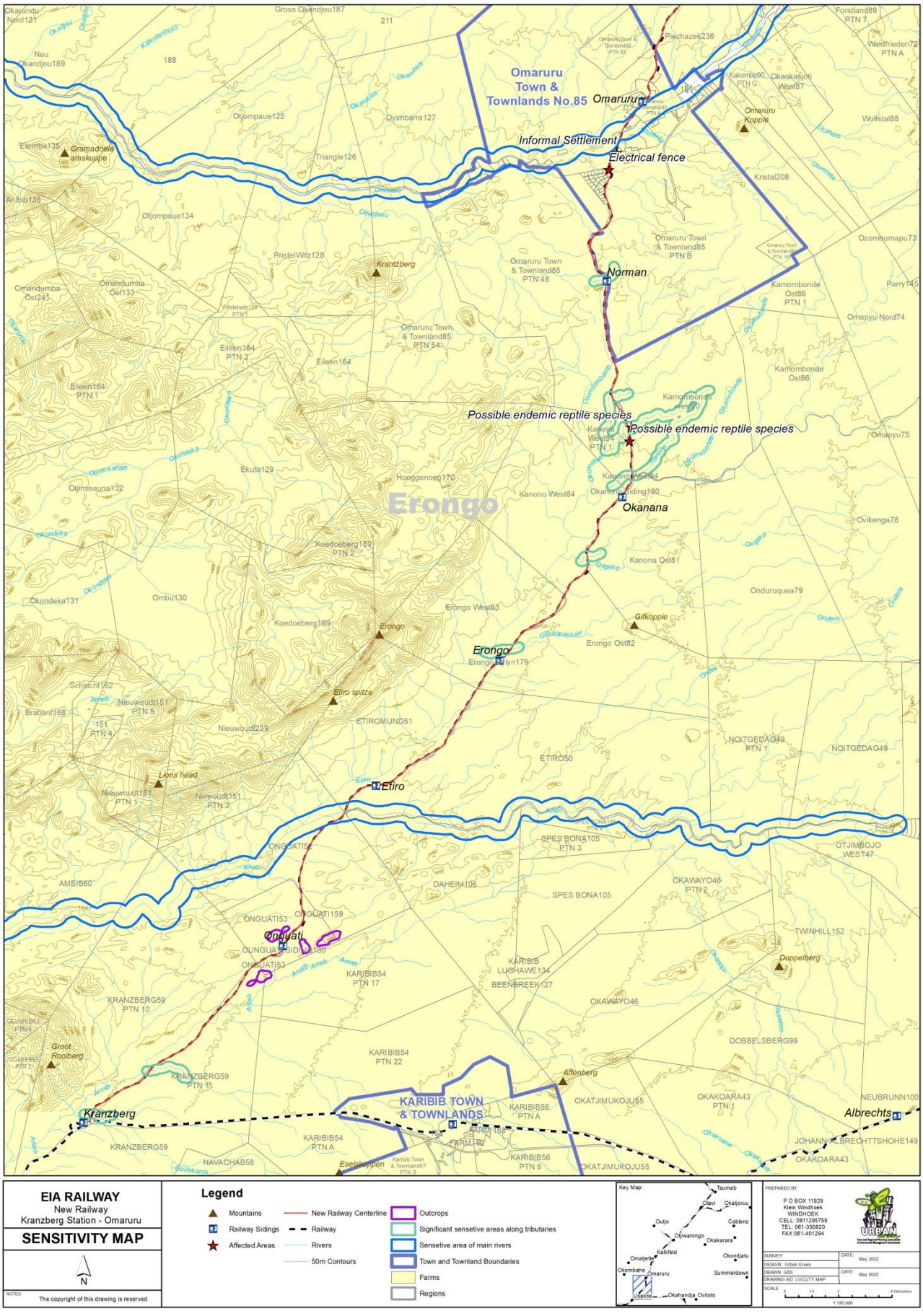


Figure 5.3.9-1 – Critical Habitats located in between Kranzberg Station and Omaruru

Figure 5.3.9-2 - Critical Habitats located in between Omaruru and Otjiwarongo

5.3.10 Ecosystem Services

Ecosystem services provide benefits that are used by humans and in doing so affect human wellbeing such as livestock, ground/surface/fresh/salt water, fish, soil formation/composition, tourism, recreation, spiritual interactions, etc. According to Harper-Simmonds *et al.* (n.d.) the key ecosystem services in Namibia include:

- Provisioning;
- Regulation and Maintenance; and
- Cultural.

The proposed Kranzberg-Otjiwarongo (Phase 1) rail link upgrades fall within 2 ecosystem zones known as: (i) Western Highlands (Kranzberg-Omaruru section) and (ii) Highland Acacia Savannah (Omaruru-Otjiwarongo section) with the main ecosystem services under each of the above headings viewed as:

(i) Western Highlands (Kranzberg-Omaruru section):

Provisioning

- Livestock;
- Wild animals;
- Plants for material and energy use;
- Surface water; and
- Ground water.

Regulation and Maintenance

- Soil formation and composition;
- Ground water recharge;
- Mediation of waste and pollution;
- Global and regional climate regulation; and
- Ventilation and transpiration.

Cultural

- Physical interactions; and
- Spiritual, symbolic and intellectual interactions.

The broad drivers of change in the Western Highlands ecosystem zone, with their ecosystem specific pressures (in parenthesis), are viewed as:

- Habitat change (overgrazing);
- Exploitation (abstraction of groundwater, increase in livestock numbers);

- Pollution (no relevant pressures identified);
- Invasive species (no relevant pressures identified);
- Climate change (more extreme climatic conditions such as current drought being experienced); and
- Illegal use (poaching – e.g., black rhino).

Overall, Harper-Simmonds *et al.* (n.d.) expect no major declines in ecosystem services in the Western Highlands zone.

ii) Highland Acacia Savannah (Omaruru-Otjiwarongo section):

Provisioning

- Cultivated crops;
- Livestock;
- Wild animals;
- Plants for material and energy use;
- Surface water; and
- Ground water.

Regulation and Maintenance

- Soil formation and composition;
- Ground water recharge;
- Mediation of waste and pollution;
- Global and regional climate regulation;
- Ventilation and transpiration; and
- Maintaining nursery populations and habitats.

Cultural

- Physical interactions; and
- Spiritual, symbolic, and intellectual interactions.

The broad drivers of change in the Highland Acacia Savannah ecosystem zone, with their ecosystem specific pressures (in parenthesis), are viewed as:

- Habitat change (overgrazing and fire control and prevention measures leading to bush encroachment, conversion of freehold farms to resettlement farms);

- Exploitation (abstraction of groundwater, harvesting of game, increase in livestock numbers);
- Pollution (pollution from industry and urban settlement of watercourses – effluent and human waste, air emissions from vehicles and industry);
- Invasive species (cactus and other alien species are common around towns and farmsteads and may spread further into this zone);
- Climate change (potential to increase rate of bush encroachment); and
- Illegal use (no relevant pressures in this zone).

Overall, Harper-Simmonds *et al.* (n.d.) expect that the provisioning services of livestock and groundwater (as a result of habitat change through bush encroachment and the impacts of climate change) and surface water (due to overexploitation primarily as a result of growing demand from Windhoek) all face threats to their continued flow. The regulation and maintenance services relating to soil formation and composition and groundwater recharge are also under increasing pressures from bush encroachment and climate change in ecosystem services in the Highland Acacia Savannah zone.

5.4 HUMAN ENVIRONMENT (SOCIO-ECONOMIC PROFILE)

5.4.1 Overview

In the absence of a socio-economic survey, only a desktop study was used to compile the socio-economic baseline condition report which was compiled using data from several Government publications[2].

5.4.2 National Context

Namibia is located along the south-western coast of Africa and is bordered by the Atlantic Ocean to the west, Angola to the north, Zimbabwe and Zambia to the north-east, Botswana to the east and South Africa to the south. Namibia is a vast country which is approximately 825,000 square kilometres (km^2) in size and has one of the lowest population densities in the

[2] The Namibia Household Income & Expenditure Survey NHIES 2015/2016 (Namibia Statistics Agency (NSA, 2018); the Namibia 2011 Population & Housing Census Main Report (NSA, 2013); the Erongo 2011 Census Regional Profile (NSA, 2014a); the Otjozondjupa 2011 Census Regional Profile (NSA, 2014b); the Namibia Population Projections 2011 – 2041 (NSA, 2014c);the Namibia Inter-censal Demographic Survey (NIDS) 2016 Report (NSA, 2017); Namibia's 5th National Development Plan (GRN, 2017); the Sustainable Development Goals Baseline Report 2019 (NSA, 2019); the Master Plan for Development of an International Logistics Hub for Southern African Development Community (SADC) Countries in the Republic of Namibia - Final Report Summary (GRN, 2015); the Agricultural Census 2014/2015 (NSA, 2015); the Namibia Labour Force Survey 2018 (NSA, 2019); the Education Management Information System (EMIS) Education Statistics 2019 Report (Ministry of Education, Arts and Culture (MoEAC), 2020); the National Strategic Framework for HIV and AIDS Response in Namibia 2017/18 to 2021/22 (Ministry of Health and Social Services (MoHSS), 2017); the Surveillance Report of the 2016 National HIV Sentinel Survey (MoHSS, 2016); the Namibia Population-Based HIV (Human Immunodeficiency Virus) Impact Assessment (NAMPHIA) (MoHSS, 2018); the Namibia COP 2021 Strategic Direction Summary (PEPFAR Namibia, 2021); a Year of Living with Covid-19 (NSA, 2021); Namibia Tuberculosis Disease Prevalence Survey Report 2019 (MoHSS, 2019a) and National Tuberculosis and Leprosy Programme Annual Report: 2019-2020 (MoHSS, 2019b).

world. In 2011, Namibia had a population of 2,113,077 (42.8% urban, 57.2% rural); this figure is estimated to have increased to 2,324,388 (47.9% urban, 52.1% rural) in 2016 and is projected to increase to 3,400,000 by 2041. Although a large portion of the population still lives in rural areas, Namibia is still experiencing rapid urbanisation and in 2011, 42.8% of the population lived in urban areas and this figure has increased to an estimated 47.9% in 2016. (Namibia Statistics Agency (NSA), 2014; 2017).

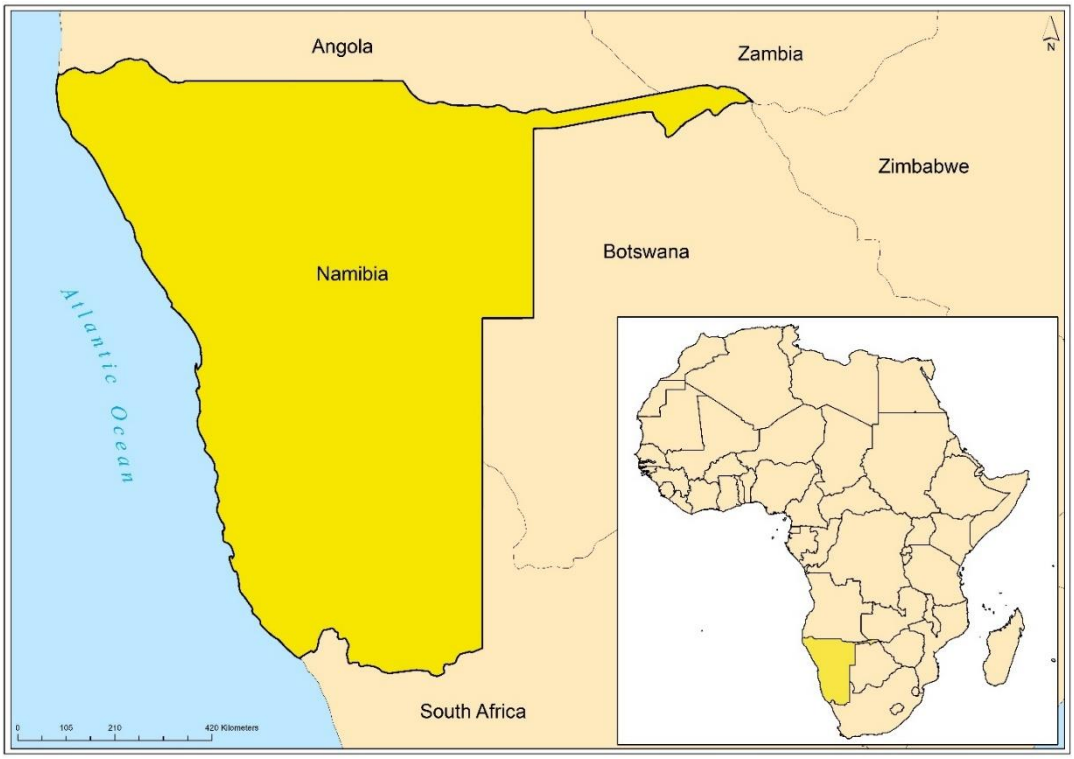


Figure 5.4.2-1 - Map showing the location of Namibia, Africa
(Source: Geo Business Solutions (GBS), June 2022)

Namibia is a country of wide-open spaces, breath-taking landscapes and it is rich in biodiversity and natural resources (minerals, wildlife, landscapes, agriculture, marine fauna and flora), but it is generally dry and arid with a high variability in rainfall.

Namibia is striving towards achieving the long-term goals set out in Vision 2030, the objectives and goals which are outlined in the seven (7) series of five-year National Development Plans (NDPs). Namibia currently finds itself in the 5th National Development Plan Phase (NDP5). The four pillars of the NDP5, aimed at achieving sustainable development are:

1. Economic Progression
2. Social Transformation
3. Environmental Sustainability
4. Good Governance (Government of the Republic of Namibia (GRN), 2017)

Namibia provides access to international shipping routes via the port of Walvis Bay to its land locked neighbours and other Southern African Development Community (SADC) countries. It

is recognised that currently the transportation of export freight from neighbouring countries to Walvis Bay is done via road, and the heavy vehicle traffic has a significant impact on the quality and maintenance of road infrastructure in Namibia.

The railway upgrade Kranzberg – Tsumeb and Otavi - Grootfontein ties in with the proposed Trans-Zambezi Railway extension from Grootfontein to Katima Mulilo via Rundu in Namibia, for which a feasibility study has recently been completed, the result of which indicated the favourability and importance of the multinational Project (M R Technofin Consultants (MRT), 2022).

This railway extension is part of a cross-border railway between Namibia and Zambia and this Project aims to link mines in the Copperbelt region (Zambia and Democratic Republic of Congo (DRC)) with the port of Walvis Bay in Namibia.

The Upgrade of the Railway Line in Between Kranzberg Station to Tsumeb and Otavi to Grootfontein (Phase 1 – Railway Line between Kranzberg Station and Otjiwarongo Town), is in line with: i)NDP5; ii) the Harambee Prosperity Plan II 2021 – 2025 (a goal set out under Pillar 4: Infrastructure Development (Goal 3: Strengthening Namibia's Position as a Transport & Logistics Hub)); iii) the Sustainable Development Goals (SDGs) set out by the United Nations Development Programme (UNDP) (specifically Goal 9: Industry, Innovation and Infrastructure and Goal 11: Sustainable Cities and Communities); and iv) Agenda 2063 of the African Union (AU).

The Master Plan for Development of an International Logistics Hub for SADC Countries includes the rehabilitation, development and expansion of the Namibian railway network to further exploit the potential of becoming an international logistics hub for the SADC inland areas. Cargo volume along the main transportation routes in Namibia is expected to grow by 9.3% on average between 2013 and 2025 (GRN, 2015).

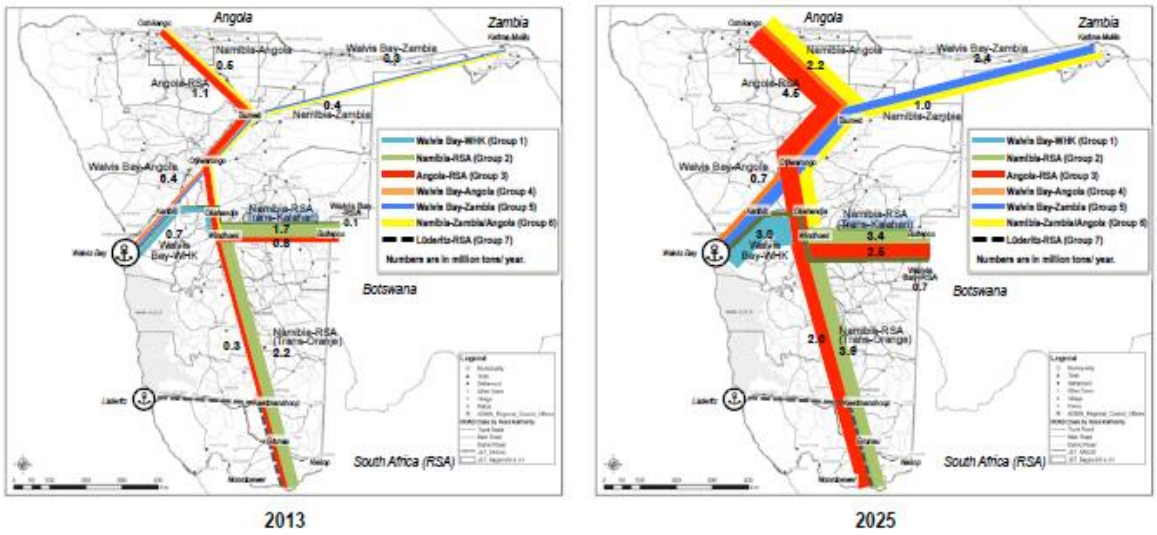


Figure 5.4.2-2 - Cargo volumes along transport routes in 2013 and the prediction for 2025 (GRN, 2015)

5.4.3 Regional and Constituency Demographics

Namibia is divided into 14 administrative regions (Figure 5.4.3-1) with 121 constituencies. The Khomas Region has the largest number of inhabitants and is home to the country's capital, Windhoek. Regions in Namibia are run by Governors which are appointed by the President and that act as the link between the Government and the Regional Councils, as well as the Local and Traditional Authorities.

The Project section of the railway line (Phase 1) from Kranzberg to Otjiwarongo falls within the Erongo and Otjozondjupa regions.

The Erongo region borders the Atlantic Ocean to west, the Kunene region to the north, the Otjozondjupa region to the northeast, the Khomas region to the southeast and the Hardap region to the south.

The Erongo region is well known for its harbour in the town of Walvis Bay which provides shipping route access to SADC countries that are landlocked; the regional capital Swakopmund is a well-known tourist and holiday destination (NSA, 2014). The region has shown significant economic growth in recent years and still holds a lot of potential for future growth through its infrastructure developments and natural resource availability. Not only are all Namibia's uranium mines located in the Erongo region, mines for other commodities such as gold, marble, gemstones, granite and sea salt can also be found here. The transportation sector through the port in Walvis Bay, its well-developed road network and airports provide links for regional, national, and international trade. The Atlantic Ocean provides resources for the fishing and processing industries both of which are major industries and sources of employment in Namibia (see http://www.erc.com.na/).

The Otjozondjupa region borders Botswana to the east and the Oshikoto, Kavango East and West regions to the north, the Kunene region to the northwest, the Omaheke region to the southeast, the Khomas region to the south, and the Erongo region to the southwest.

The region is well known for its farming activities, not only cattle breeding, but also crop production mainly on commercial farms.

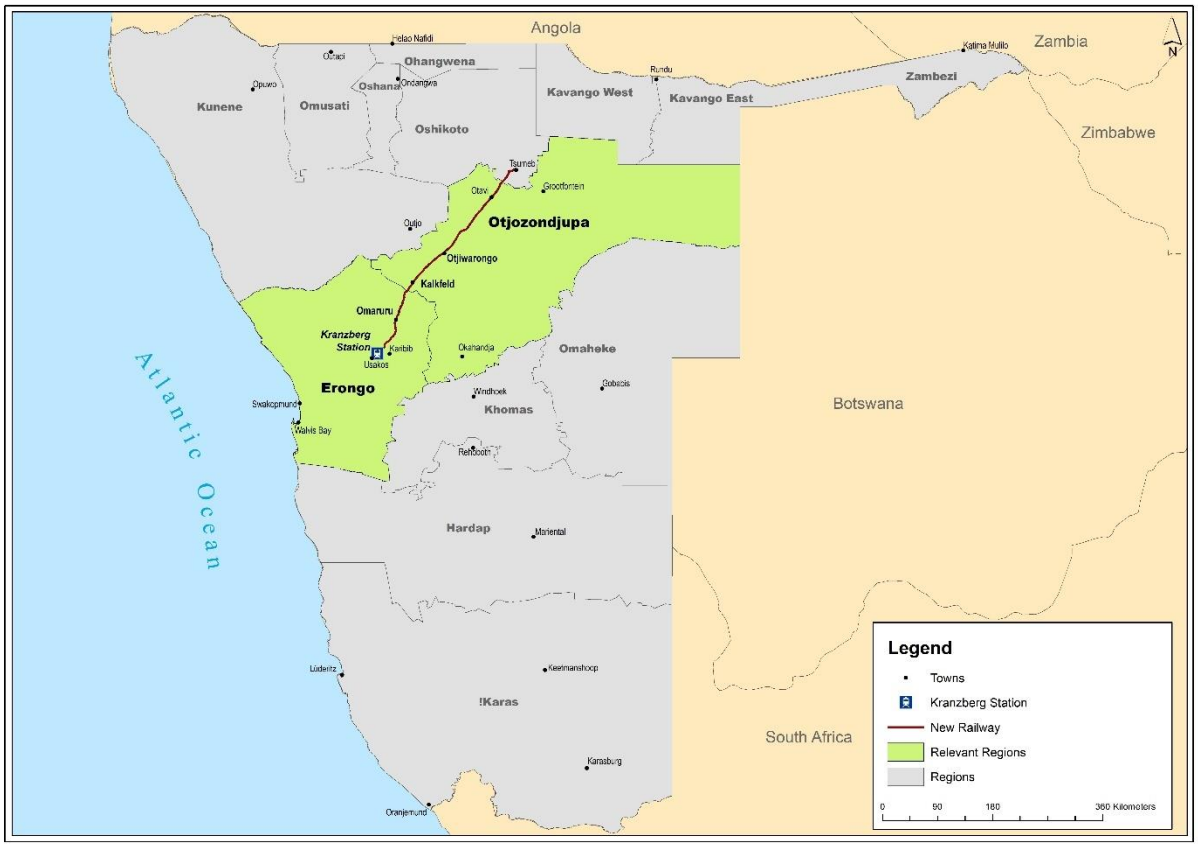


Figure 5.4.3-1 - Map showing the regions of Namibia (Source: GBS, June 2022)

Population characteristics for both the Erongo and Otjozondjupa regions, as well as the national figures are presented in Table 5.4.3-1.

Table 5.4.3-1 - National and Regional Population Characteristics (NSA, 2017)

Regional Population Characteristics	**2016 Erongo Region (2011)**	**2016 Otjozondjupa Region (2011)**	**2016 Namibia (2011)**
Population Size	182,402 (150,809)	154,432 (143,903)	2,324,388 (2,113,077)
% of total population	7.8%	6.6%	100%
Urban (%)	92% (87%)	66% (54%)	48% (43%)
Rural (%)	8% (13%)	34% (46%)	52% (57%)
Growth rate (%) (2011 – 2016)	3.8% (3.4%)	1.4% (0.6%)	1.9% (1.4%)
Population density	2.9 (2.4)	1.5 (1.4)	2.8 (2.6)
Sex Composition			

Males to 100 Females	112	106	95
Age Group Structure %			
0 – 4	12.6	15.4	13.8
5 – 14	15.7	22.3	22.6
15 – 59	66.9	56.3	57.3
60+	4.8	6.0	6.3
Fertility Rate (CBR per 1,000 population)	22.5	24.5	32.6
Three (3) main languages spoken at home (% households)			
Oshiwambo	44%	29%	50%
Otjiherero	~	29%	~
Afrikaans	19%	~	~
Nama/Damara	18%	17%	11%
Kavango			10%
Literacy Rate % (15+ years)	96%	83%	89%
Education Rate % (15+ years)			
Never attended school	4%	19%	11%
Currently at school	8%	15%	18%
Left school	85%	64%	71%

Both the Erongo and Otjozondjupa regions are made up of seven (7) constituencies, these are Omaruru, Karibib, Arandis, Swakopmund, Daures, Walvis Bay Urban and Walvis Bay Rural and then Grootfontein, Okahandja, Okakarara, Omatako, Otavi, Otjiwarongo and Tsumkwe, respectively.

Affected by Phase 1 of the railway upgrade Project is the following constituencies: Karibib and Omaruru in the Erongo region, and Otjiwarongo and Omatako in the Otjozondjupa region (see Figure 5.4.3-2 and Table 5.4.3-2: Population Characteristics for the relevant constituencies).

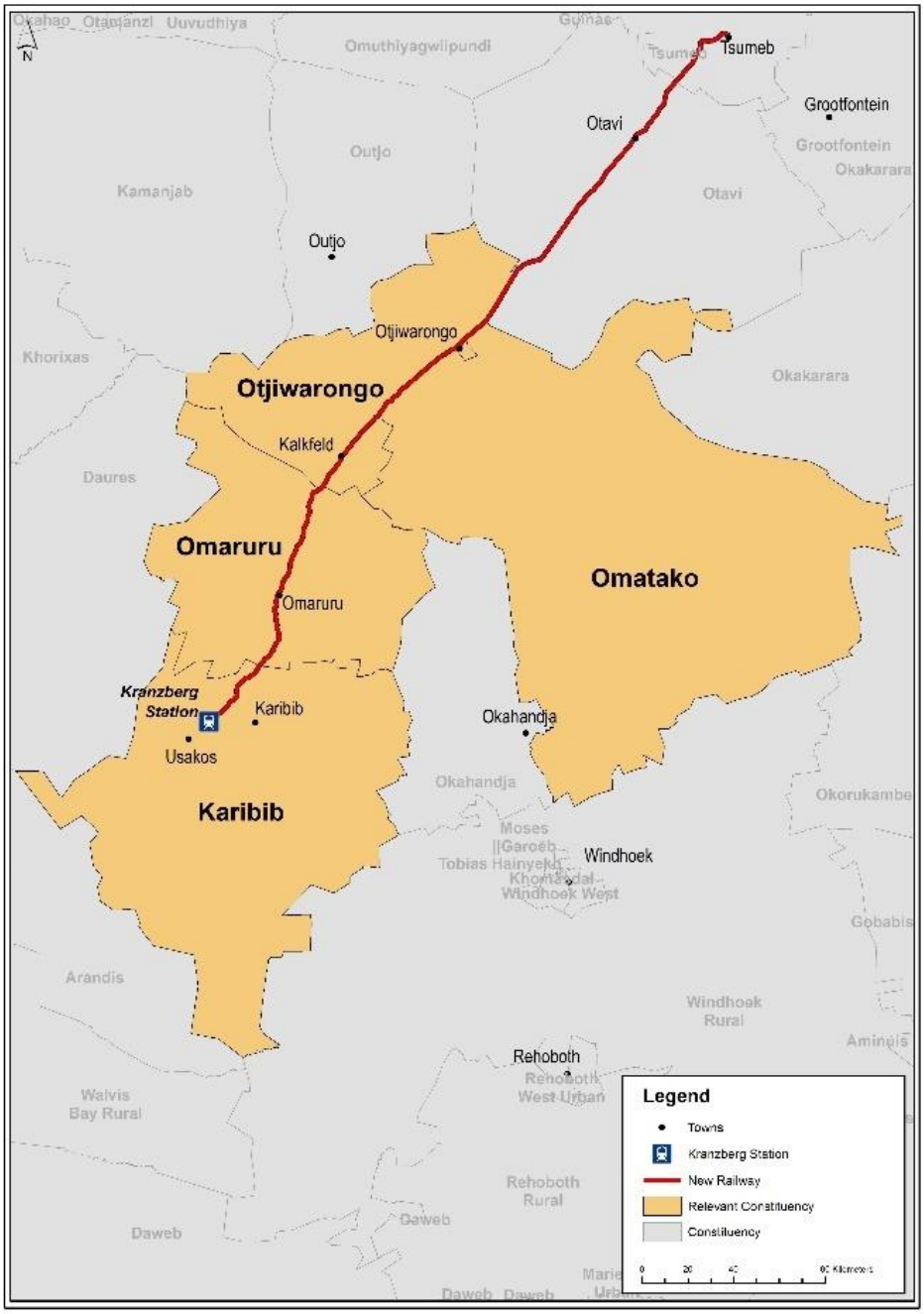


Figure 5.4.3-2 - Map showing the regions and constituencies that may be impacted by Phase 1 of the Project (Source: GBS, June 2022)

Note that the last population and housing census for Namibia was done in 2011, the census scheduled for 2021 was postponed due to the Covid-19 pandemic.

Table 5.4.3-2 - Population Characteristics by Constituency (NSA, 2014a; 2014b)

	Erongo Region		**Otjozondjupa Region**	
	Karibib	**Omaruru**	**Otjiwarongo**	**Omatako**
Population size	13,320	8,557	31,813	17,619
Females	*6,412*	*4,131*	*16,275*	*7,664*
Males	*6,908*	*4,446*	*15,538*	*9,955*
Number of households	3,471	2,432	7,959	4,017
Population distribution				
0-14	33%	32.2%	33.6%	38%
15-59	59.7%	60.8%	61.1%	57.2%
60+	7.3%	7.0	5.2%	4.7%
Disability %	4.4%	3.6%	3.9%	4.4%
Orphanhood				
Lost one parent	8.7%	8.6%	9.1%	7.4%
Lost both parents	1.6%	1.9%	1.6%	1.6%

Urban areas relevant to the Project are Omaruru, Kalkfeld and Otjiwarongo. Both Omaruru and Otjiwarongo are classified as municipalities, while Kalkfeld is classified as a village.

Table 5.4.3-3 - Population numbers of localities along Project route (NSA, 2013)

Localities	**Population 2011**	**Increase from 2001 to 2011**
Omaruru	6,300 (*6,500)	32.2%
Kalkfeld	(*2000)	
Otjiwarongo	28,249 (*33,000)	44.0%

*Figures adopted from the Upgrade of Railway Line between Kranzberg Station and Tsumeb Station – Environmental Scoping Report (Ministry of Works and Transport (MWT, 2017).

5.4.4 Economic Profile

The projected Namibian Gross Domestic Product (GDP) for FY2022/2023 is N$197 billion, of which revenue and grants are estimated to be N$59.7 billion (30.2% of forecasted GDP), and this shows an increase of 11% from the revised total of N$53.6 billion in FY2021/2022. Expenditure is estimated to total N$70.8 billion in FY2022/23, of which N$61.1 billion is due for appropriation and N$ 9.2 billion is due in interest and other statutory payments. Expenditure, which is 35.8% of the forecasted GDP, is broken down into operational (N$65.8 billion) and development (N$ 5.0 billion) spending. This means that the revenues generated will be insufficient to cover operational spending in FY2022/2023 (-5.6% of the forecasted GDP). The public sector wage bill makes up 42.5% of total spending. Namibia has an estimated budget deficit of N$ 11.1 billion or 5.6% of the estimated GDP for FY2022/23 and although debt is increasing at a slower rate compared to the 8.0% in FY2020/21, Namibia's debt is expected to reach an all-time high of 71% (vs 62.1% FY2020/21) of GDP by the end of FY2022/23 (Institute for Public Policy Research (IPPR), 2022a; MOF, 2022).

Table 5.4.4-1 - Namibian Budget FY2022/23 (IPPR, 2022a)

Item in FY2022/23	N$m
GDP (estimated)	197,460
Total Revenue and Grants	59,678
Total Expenditure including Statutory	70,766
Overall balance	-11,088
Cash Requirement	1,900
Project Financing	1,162
Provision for Bond Redemption	
GI22 (15 October 2022)	2,584
NAM01 JSE (ZAR) (19 November 2022)	1,560
Foreign Debt Repayment (including IMF RFI)	1,082
Total Funding Requirement	19,377
Sinking Fund	2,600
Net Borrowing Requirement	16,777
Foreign Funding and Project Funding by Loans	3,162
Domestic Borrowing	13,614
Less Debt Rollover	2,584
New Domestic Borrowing	11,030
Public and guaranteed debt	140,185
Total debt as % of GDP	71.0%

In 2021, most sectors of the Namibian economy have shown a slight degree of positive growth; however, others continue to suffer (see Figure 5.4.4-1).

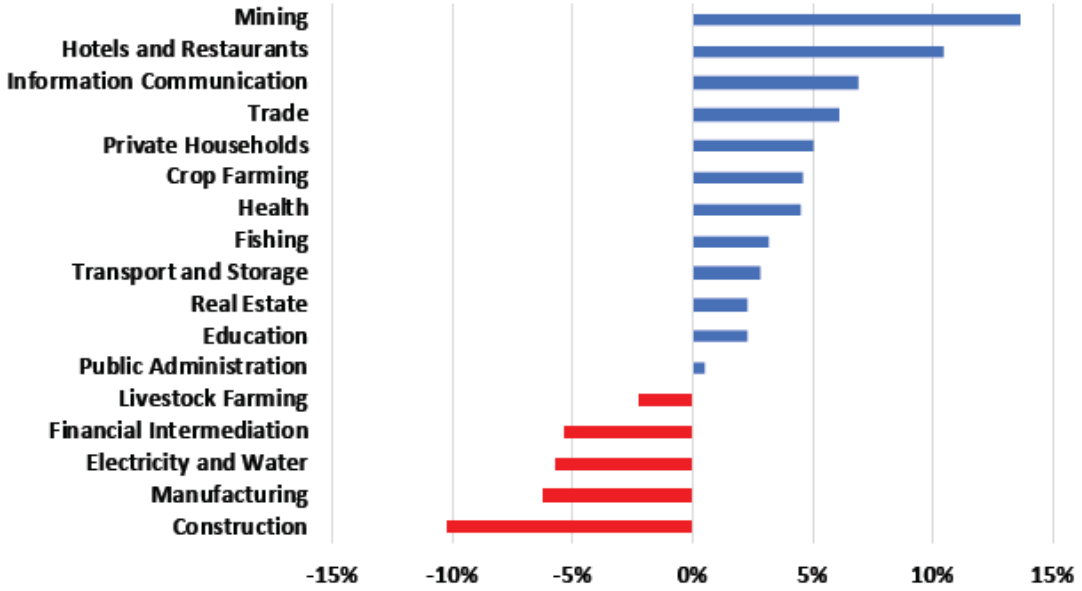


Figure 5.4.4-1 - Estimated growth of economic sectors in Namibia for 2021 (IPPR, 2022b)

The mining (9.1% contribution to GDP) and fishing (2.5% contribution to GDP) sectors, which are key economic sectors in the Erongo region, have shown growth (mining 13.6%; fishing 2.8%) in 2021. (CoM, 2021; IPPR, 2022b).

Of all the economic sector contributions made to the economy in 2021, 57.9% were made by the service sector, see Figure 5.4.4.-2 (IPPR, 2022b).

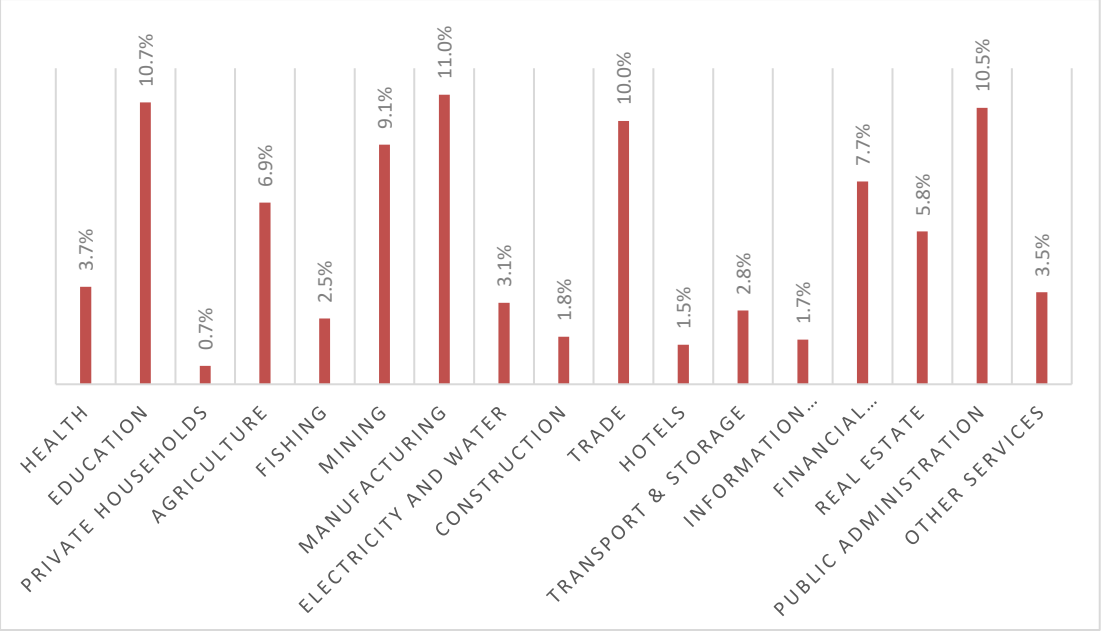


Figure 5.4.4-2 - GDP contributions by economic sector (IPPR, 2022b)

5.4.4.1 Mining

The mining sector makes a substantial contribution to the national GDP. The sector recorded a turnover of N$32.2 billion in 2021, a slight decrease from N$33.9 billion in 2020 (Chamber of Mines, 2021). The ownership of mines is unbalanced, that is 88.1% of the mines are foreign-owned and only 11.9% are owned by Namibian citizens (National Planning Commission (NPC), 2021).

Amongst the commodities that are mined in Namibia are uranium, precious stones, gold, granite, marble, salt, and offshore petroleum mining along the Namibian coast.

Several Exclusive Prospecting License (EPL) and Mining Claim (MC) areas lie across the Project site or within the vicinity thereof (CoM GIS Shape file, February 2022).

An EPL is a 3-year licence that allows systematic prospecting in areas of up to 1,000 km. It gives exclusive exploration rights to the land and may be extended twice for two-year periods if demonstrable progress is shown. An EPL is meant for detailed investigations such as geological mapping, ground geophysics, geochemical sampling, trenching, drilling, bulk sampling, trial mining, etc.

Mining Claims are only available to Namibian citizens for the development of small-scale mining. Mining claims are valid for three years and two-year extension periods are possible, provided that the claim is being developed or worked (Ministry of Mines and Energy (MME), 2022; see https://www.mme.gov.na/mines/mrrd/).

5.4.4.2 Agriculture

Agriculture (6.9% contribution to GDP) is a key sector in the Otjozondjupa region and with positive growth in crop production, but negative growth in livestock farming in 2021 (IPPR, 2022b). The agricultural sector is severely affected by the high variation in rainfall and drought, and pest and disease outbreaks, all of which there have been a number of incidences in the past.

According to the agricultural census in 2013/2014, 83.4% of all commercial land was used for grazing, 7.4% was fenced for game, 3.5% was land under permanent pasture, 1.6% was forest land, and 0.12% was land under permanent crops (10,958 ha). Sixty percent (59.9%) of the crops planted was white maize, 23.9% was yellow maize, 21.1% was beans, and 12.8% was fodder. In total, 67% of farmers rear livestock and/or poultry on their farms, of which 5% of farmers are in the Erongo region and 18.2% in the Otjozondjupa region (NSA, 2015).

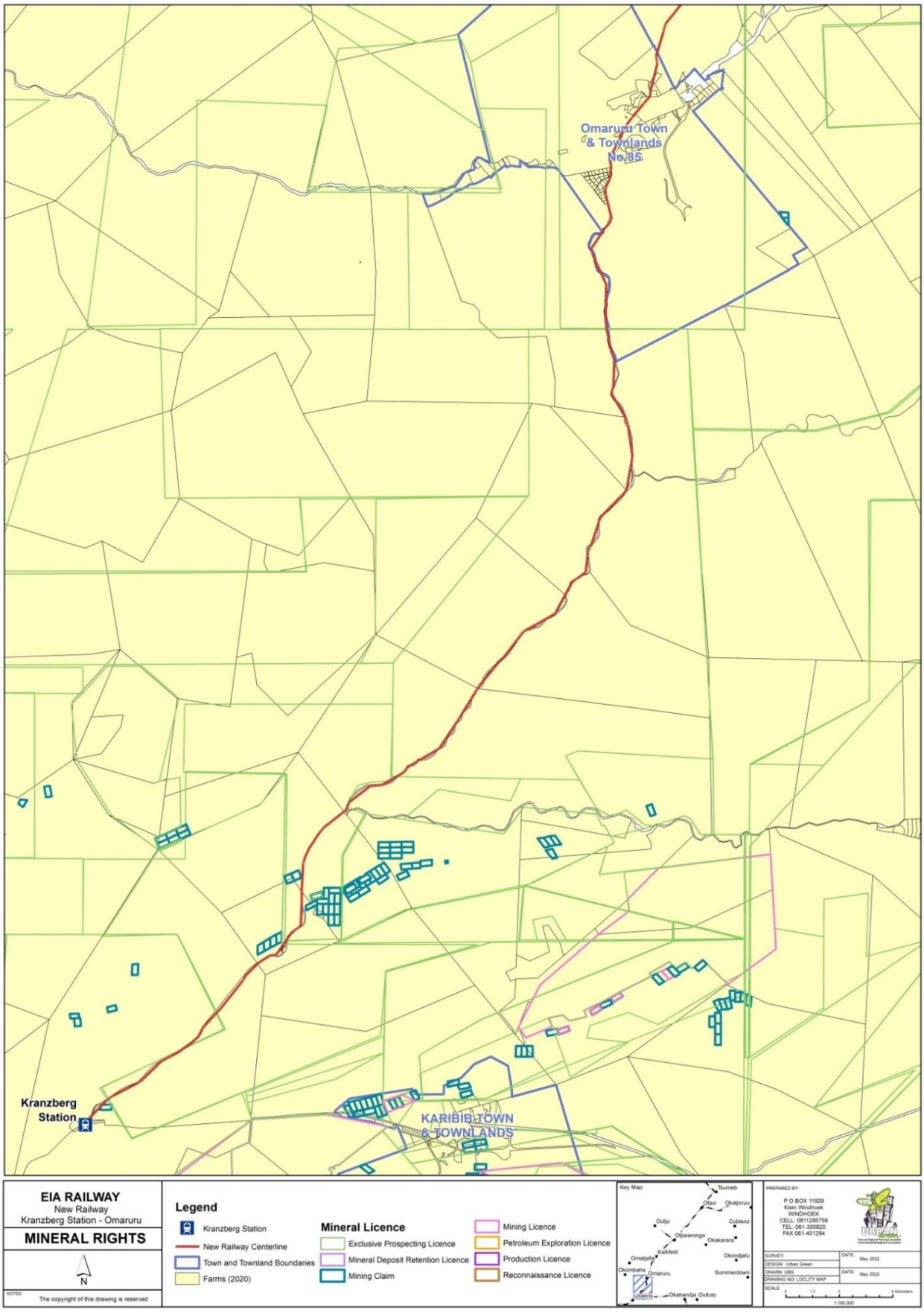


Figure 5.4.4.1-1 - Map showing the Mineral Licences in the area between Kranzberg and Omaruru (Source: GBS, June 2022)

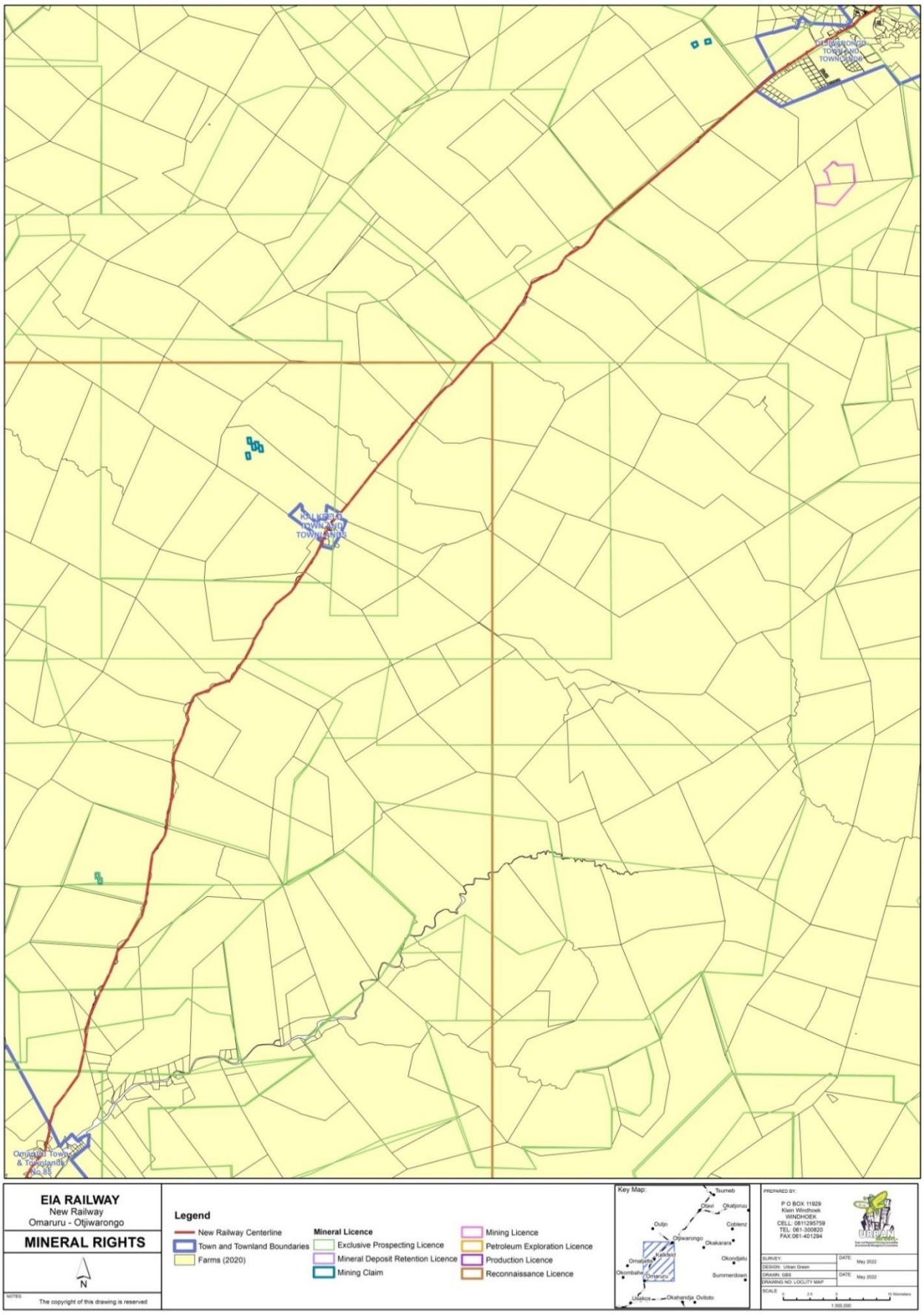


Figure 5.4.4.1-2 - Map showing the Mineral Licences in the area between Omaruru and Otjiwarongo (Source: GBS, June 2022)

5.4.4.3 Tourism

Tourism is also a contributor to the national GDP (3.5% in 2015) and an important economic sector to both the Erongo and Otjozondjupa regions. In 2019, 94.4% (1.6 million people) of all foreign arrivals in Namibia were tourists (60% male and 40% female). In 2019, 49.5% of tourists were under the age of 40 and the remainder was above 40 years of age. A 2.5% growth in tourist arrivals was recorded between 2018 and 2019, and although this was still a positive growth rate, the growth rate has been declining since 2015. Challenges that affected the tourism sector, and that contributed to the declining growth rate of tourist arrivals prior to the Covid-19 pandemic, were the world financial crisis, seasonality, and air connectivity (Ministry of Environment, Forestry and Tourism (MEFT), 2019; Namibia Tourism Board (NTB), 2015).

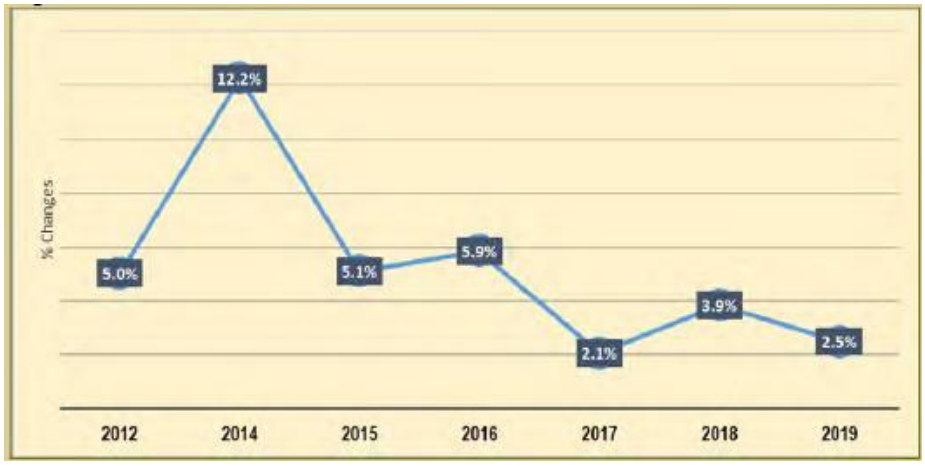


Figure 5.4.4.3-1 - Tourist arrival growth rate 2012 - 2019 (MEFT, 2019)

In 2015, the tourism sector contributed N$5.2 billion (3.5%) to the national GDP and directly supported 44,700 jobs (see https://www.namibian.com.na/173740/archive-read/Tourism-sector-largest-earning-industry# *25/01/2018*).

During the Covid-19 pandemic this sector has come to a standstill but has since slowly begun to recover. Several tourism establishments can be found along the Project Route depicted in Figures 5.4.4.3-1 and 5.4.4.3-2. Both regions are home to some well-known tourist destinations or serve as the gateway to destinations in other regions.

5.4.4.4 Employment, Unemployment and Poverty

In 2018, the Labour Force Participation Rate (LFPR) for the Erongo and Otjozondjupa regions was 80.9% and 76.1%, respectively. The LFPR in both regions are higher than the national rate of 71.2%, in fact, the Erongo region has the highest LFPR in the country.

Main industries by employment in Namibia are agriculture, forestry and fishing industry (23%); 11.4% are employed in the accommodation and food service industry; 11.1% in wholesale and retail trade; 9.9% activities of households as employers (self-employed); 6.5% in education and 6.2% in both manufacturing and construction (each).

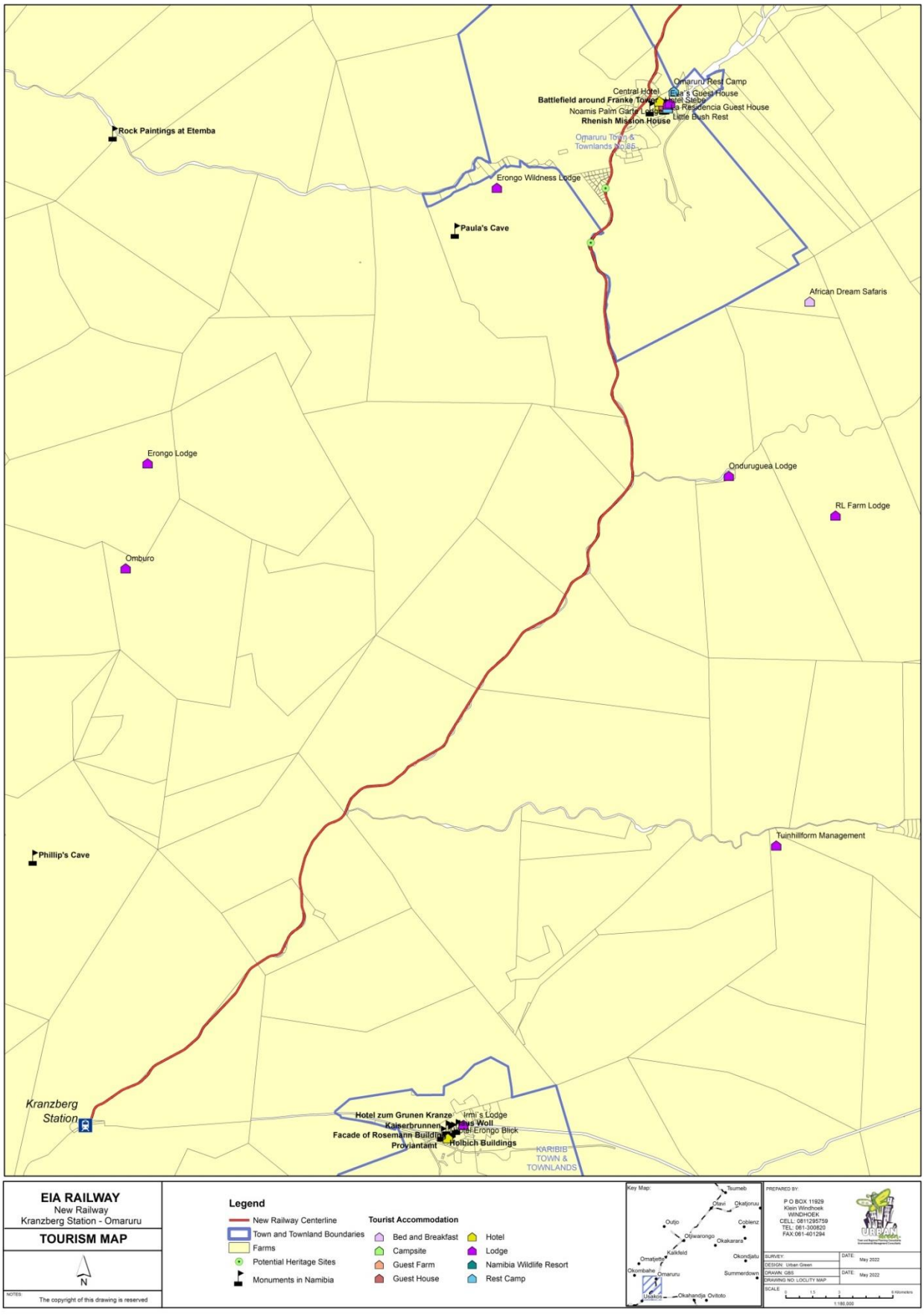


Figure 5.4.4.4-1 - Map showing some of the tourism establishments/destinations in the area between Kranzberg and Omaruru (Source: GBS, June 2022)

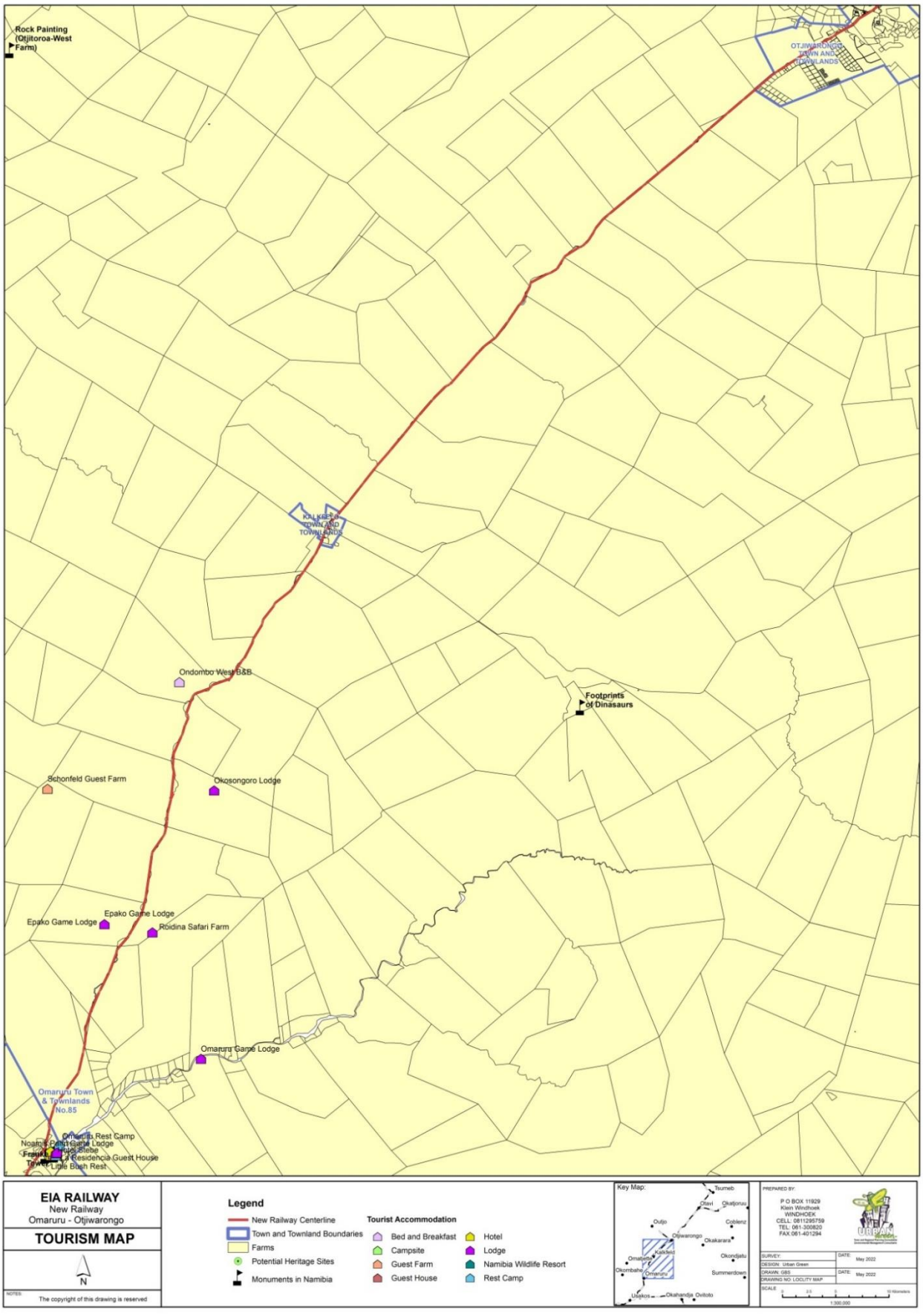


Figure 5.4.4.4-2 - Map showing some of the tourism establishments/destinations in the area between Omaruru to Otjiwarongo (Source: GBS, June 2022)

Namibia recorded an unemployment rate of 33.4% (32.5% male vs. 34.3% female) in 2018, which is an increase of 5.5% from 2014. The Erongo region (29.7%) has the lowest unemployment rate in the country, while the unemployment rate for the Otjozondjupa region is 36.1% (and higher than the national average of 33.4%).

In 2018, 35.4% of youth in Namibia (aged 15 to 34 years) were employed, while 30.3% were unemployed, resulting in a LFPR of 65.8% for this age group (NSA, 2019).

The average annual consumption (household) and per capita consumption in Namibia in 2015 was N$119,065 and N$28,434, respectively. The Erongo region (N$42,752) had higher per capita consumption in than the national average, while this figure was lower for the Otjozondjupa region (N$25,051). Average annual household consumption for the Erongo and Otjozondjupa regions were N$128,616 and N$ 99,805, respectively. Households in the Erongo region spent 38% of their total expenditure on housing, while in the Otjozondjupa region 38.4% of household expenditure was spent on food and beverages (NSA, 2018a).

Poverty is defined as the inability of people to command sufficient resources to satisfy basic needs. Poverty levels remain, but have decreased between 2003/2004 and 2015/2016. In 2015/2016, 6.1% (the food poverty line is N$293 adult/month) of the Namibian population could not afford to buy the minimum food required per day and 10.7% were severely poor (the lower bound poverty line is N$389 adult/month) while 17.4% were considered to be poor (the upper bound poverty line is N$521 adult/month). Poverty levels in the Erongo region are significantly lower than the national averages; 1.1% to 2.2% of regional population is severely poor, while between 4.4% and 8.8% are poor. In the Otjozondjupa region, 2.3% to 11.4% of people are severely poor, while between 15.4% and 27.9% are regarded as poor (NSA, 2018a).

For the duration of the construction period, it is expected that +-150 labourers will be employed, of which the specialised workforce will be approximately 50 persons (Urban Green, 2020).

5.4.5 Land Tenure and Ownership

Land tenure is defined as the relationship among people with respect to land. In Namibia, land tenure is classified under three categories: freehold (commercial) land, state land, and communal land.

Namibia has a total area of 82,400,000 hectares (ha) of which: 48% is freehold land (39,728,364 ha); 17% is state land (13,906,437 ha); and 35% is communal land (28,720,443 ha).

Table 5.4.5-1 - Statistics for commercial land ownership, which covers 48% of the total area of Namibia

Freehold land/Commercial farms (48%) *(including government owned commercial farms)*		
	61% Farms (total no. of 7,506 farms)	39% Portions of Farms (total no. of 4,876 farms)
Land ownership	86% Privately owned (Individuals, CC's, trusts, etc.)	14% Government owned *(Resettlement and research farms, servitudes)*
Ownership status (Privately owned)	70% Previously Advantaged	16% Previously Disadvantaged
Utilisation of land (Government owned)	55% Resettlement farms	45% Other government *(Servitudes, research farms, etc.)*
Ownership by Nationality	96.5% Namibians | 3.0% non-Namibians | 0.4% Namibians & non-Namibians	

State owned land constitutes 17% of the total area of Namibia (excluding government owned commercial farms); 94% of this land covers National Parks and Restricted areas, and 6% Local Authority areas, while communal land constitutes 35% of the total area (NSA, 2018b).

Land tenure along the Project Route is mainly freehold (commercial) land, including resettlement farms and three urban areas.

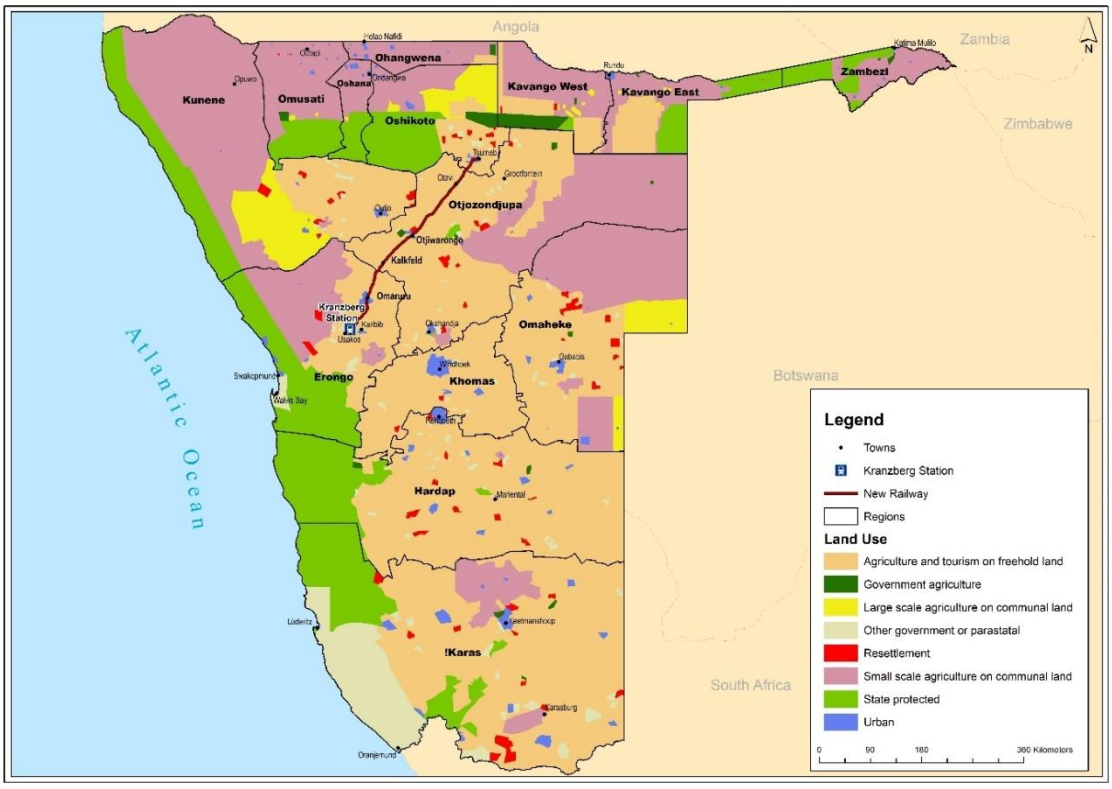


Figure - 5.4.5-1 - Map showing and use/land tenure in Namibia (Source: GBS, June 2022)

5.4.6 Household Characteristics

According the 2011 Population and Housing Census, households are defined as a group of people living in the same housing unit, regardless of whether they are related or not. The household characteristics summarised in Table 5.4.6-1 is for the four constituencies which are impacted by the proposed upgrade of the railway line.

Table 5.4.6-1 - Household characteristics per Constituency (NSA, 2014)

	Erongo Region		**Otjozondjupa Region**	
	Karibib	**Omaruru**	**Otjiwarongo**	**Omatako**
Number of households	3,471	2,432	7,959	4,017
Average household size	3.7	3.4	3.8	4.0
Households headed by males	62.8%	61.2%	56.0%	73.2%
Households headed by children	1.1%	0.9%	1.5%	2.4
Household Income				
Wages & Salaries	58.2%	67.2%	65.8%	57.4%
Old-Age Pension	13.4%	9.5%	8.3%	5.6%
Business (non-farming)	9.1%	9.0%	12.7%	6.8%
Cash remittances	7.3%	7.0%	8.2%	3.9%
Farming	6.3%	2.5%	1.6%	13.1%
Household Assets				
Radio	75.4%	74.6%	75.1%	61.4%
Telephone (Mobile)	60.6%	66.9%	75.8%	57.3%
Computer/Laptop	11.5%	16.6%	17.4%	8.9%
Type of housing				
Detached House	45.5%	55.9%	58.2%	69.2%
Improvised Housing Unit (Shack)	29.3%	24.9%	21.3%	9.5%
Semi-Detached House	12.7%	8.7%	8.8%	12.9%
Materials used for construction				
Cement Blocks/Brick	57.3%	67.6%	56.3%	57.4%
Corrugated Iron/Zinc	34.1%	23.6%	27.5%	21.0%

	Erongo Region		Otjozondjupa Region	
	Karibib	Omaruru	Otjiwarongo	Omatako
Main source of water for cooking/drinking				
Access to safe water	88.9%	97.2%	98.4%	91.1%
Piped water inside	32%	36.6%	43.0%	17.3%
Public Pipe	26.7%	25.9%	39.9%	22.3%
Main toilet facilities				
No toilet facilities	37.6%	27.7%	20.1%	34.1%
Private Flush connected to sewer	38.6%	33.1%	38.7%	23.1%
Fuel for cooking				
Wood/charcoal	52.8%	54.4%	43.2%	68.5%
Electricity from mains	38.1%	33.3%	49.3%	18.5%
Energy for lighting				
Electricity from mains	47.9%	52.3%	72.9%	40.7%
Candles	35.9%	36.3%	21.5%	24.3%

5.4.7 Bulk Infrastructure

Figures 5.4.7-1 and 5.4.7-2 show the infrastructure and services such as roads, railway, electricity network, water networks and airfields that are in the vicinity of the Project.

5.4.7.1 Telecommunications

Developments in the telecommunications sector are evident by the increased number of people that have access to telecommunication devices and services.

In the Erongo region (2011), 78.2% of households owned radios, 69.5% mobile phones, 64.9% televisions, 22.9% computers and laptops, 14.8% had fixed line telephones, and 8.4% had internet connectivity at home. Sixty nine percent (68.7%) of households in the Otjozondjupa region owned radios, 65.4% owned mobile phones, 46.3% owned televisions, 13.5% owned computers and laptops, 10% owned fixed line telephones, and 3.7% home internet connection (NSA, 2014a; NSA, 2014b).

In 2016, 74.8% of the Namibian population had access to a mobile phone, an increase from 52.6% in 2011. The number of people with access to internet also increased from 8.8% in 2011 to 20.5% in 2016 (NSA, 2017).

5.4.7.2 Air Transport

Of the eight airports in Namibia that are managed by the Namibia Airports Company (NAC), one can be found in the Erongo region and is located close to Walvis Bay. The Walvis Bay International Airport is the second largest airport in Namibia and a point of entry and departure for international air traffic and all relevant formalities are carried out there (Namibia Civil Aviation Association (NCAA), 2019a)

Located in the Erongo and Otjozondjupa regions are two Airforce Bases owned by the Namibian Ministry of Defence and Veteran Affairs; these Bases are located close to the towns of Karibib and Grootfontein, respectively (NCAA, 2019b).

A few smaller airstrips can be found in the vicinity of the Project area, some of which are privately owned:

- Otjiwarongo.
- Omaruru.
- Mount Etjo Safari Lodge.
- Ruimte.

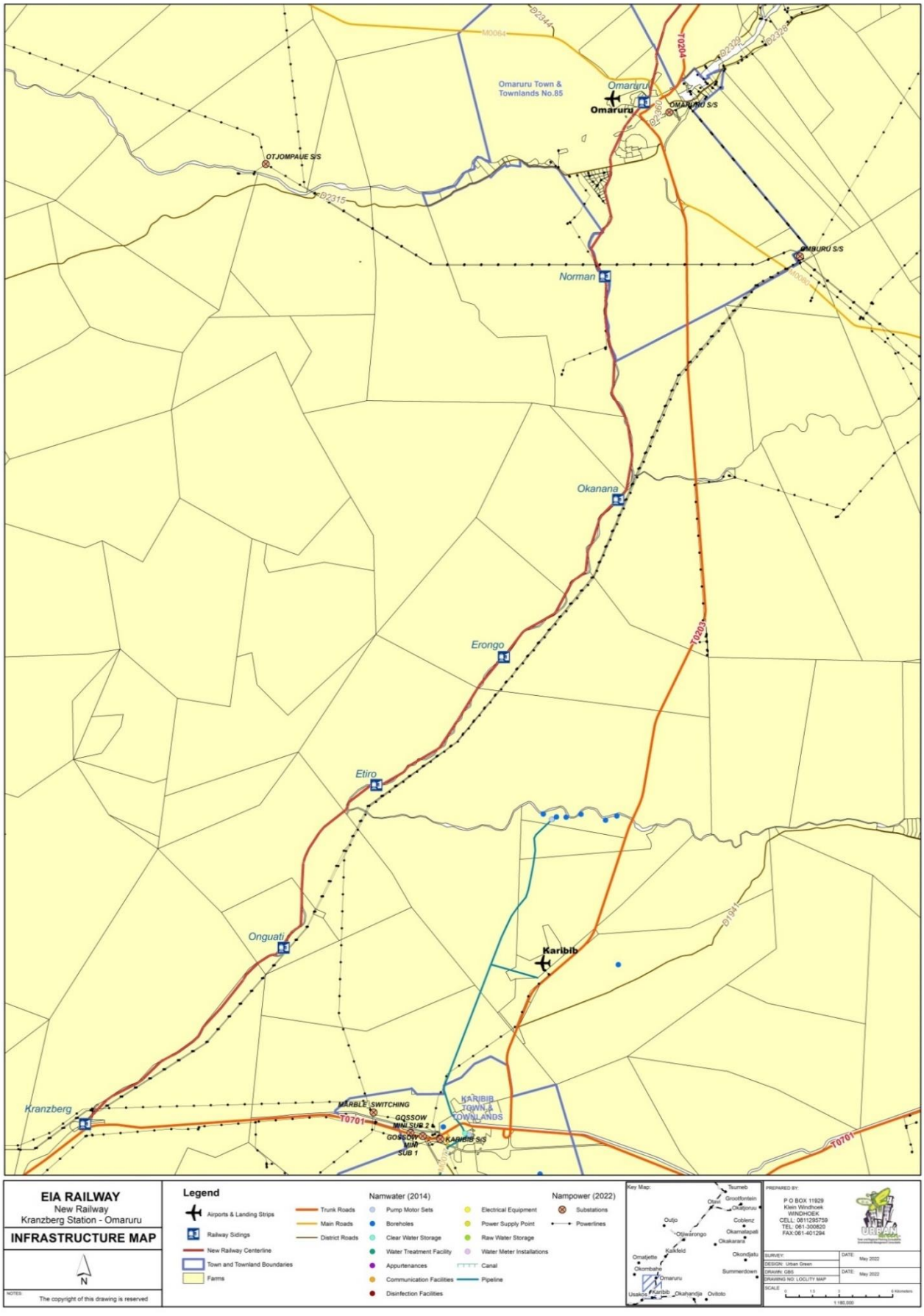


Figure 5.4.7-1 - Infrastructure Map - Kranzberg to Omaruru (Source: GBS, June 2022)

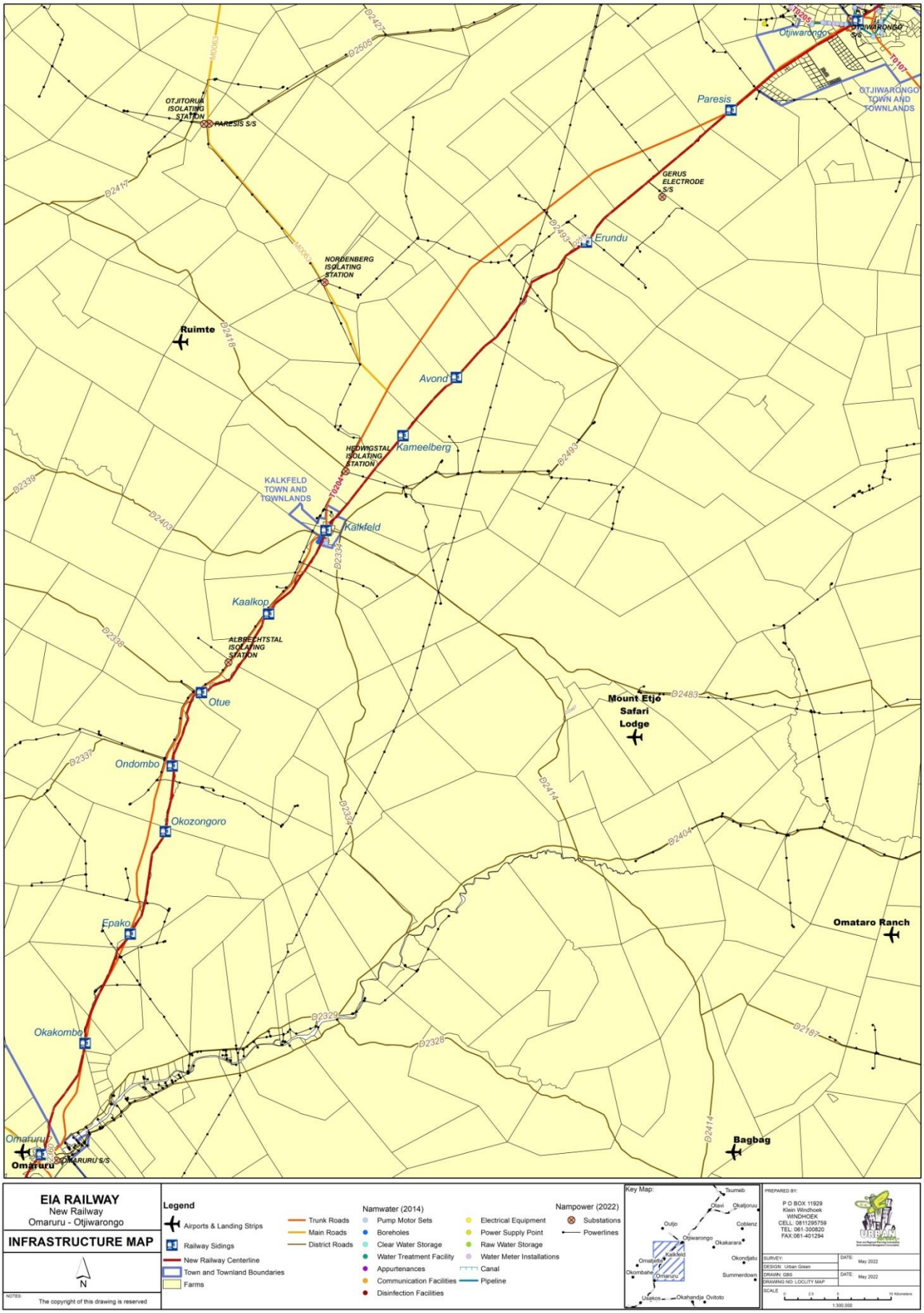


Figure 5.4.7-2 - Infrastructure Map - Omaruru to Otjiwarongo (Source: GBS, June 2022)

5.4.7.3 Road Transport

Namibia has a well-developed road network covering 48,875 kilometres (km); of these roads 5,007 km are classified as trunk roads (bitumen), 11,357 km as main roads (bitumen, gravel or salt), and 31,190 km are district roads (bitumen, gravel or salt). Around one thousand three hundred (1,320 km) of the roads have been proclaimed only and still need to be constructed (Roads Authority (RA), 2018).

In the Erongo region, and of the 3,525 km of road network, 387 km are trunk roads (bitumen), 999 km are main roads (bitumen, gravel or salt), 3,510 km are district roads (bitumen, gravel or salt), and 14.2km are proclaimed only.

The Otjozondjupa region contains 7,360 km of the country's roads, of which 956 km are trunk roads (bitumen), 1,426 km are main roads (bitumen or gravel), 4,913 km are district roads (bitumen or gravel), and 66 km are proclaimed only (RA, 2017).

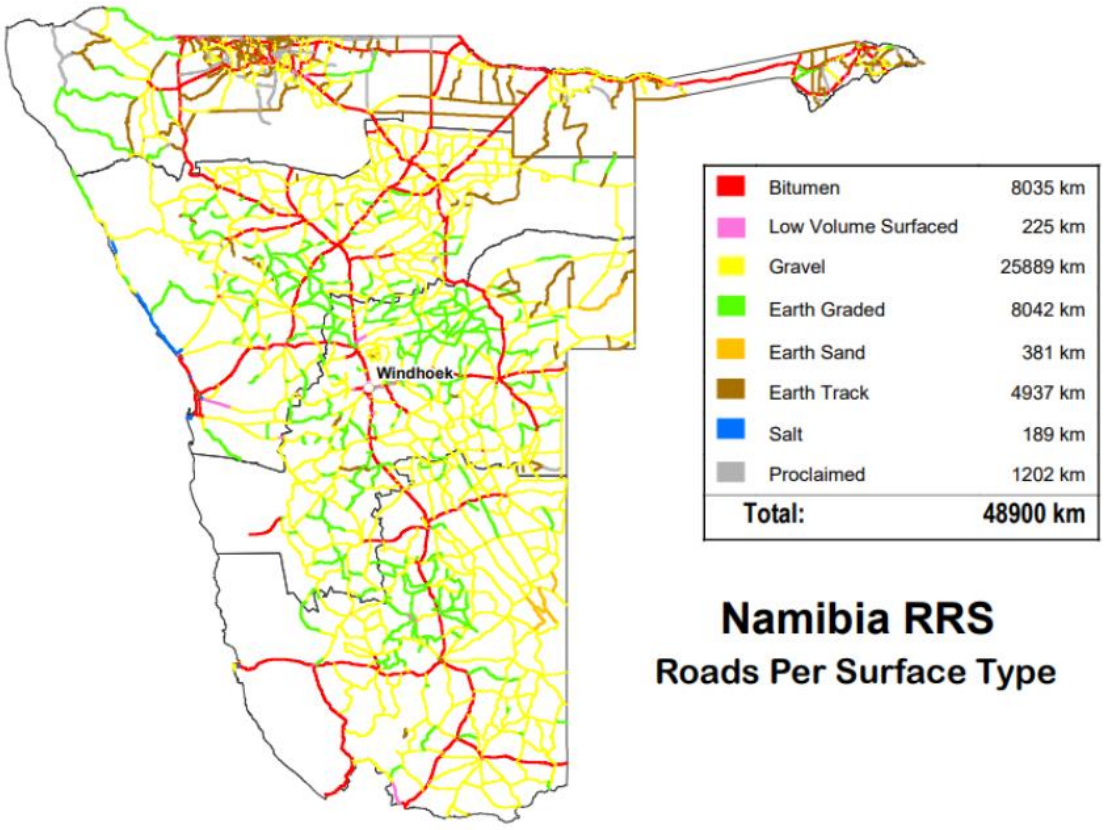


Figure 5.4.7.3-1 - Road network per surface type (RA, 2022; (see http://www.ra.org.na/Pages/network.aspx)

5.4.7.4 Rail Transport

The railway network in Namibia covers 2,682 km and stretches from Oshakati in the north to Nakop in the south, and to the western towns of Lüderitz, Walvis Bay and Swakopmund. The railway lines to the east and north-east end at Gobabis and Grootfontein, respectively, see Figure 5.4.7.4-1 (TransNamib, 2020).

Figure 5.4.7.4-1 - Railway network - existing and proposed routes (TransNamib, 2022)

5.4.7.5 Electricity

In Namibia, the power network (overhead lines from 66 kV to 400 kV and spanning over 11,700 kilometres) is owned by the Namibia Power Corporation (NamPower), a state-owned enterprise. NamPower supplies bulk electricity to Regional Electricity Distributors (REDs), Mines, Farms and Local Authorities (where REDs are not operational) throughout Namibia (NamPower, 2021). Regionally, electricity is distributed by Central-North Regional Electricity Distributor (CENORED), Northern Regional Electricity Distributor (NORED), and ErongoRED. The REDs' purchase electricity from NamPower for both urban and rural customers. The CENORED license area covers the Otjozondjupa region and part of the Omaheke, Oshikoto and Kunene regions and has a customer base of approximately 34,000 in its main supply area; the ErongoRED license area covers the Erongo region and uses about 21% of the national electricity requirement (https://www.cenored.com.na/about-us/an-overview-of-the-cenored/493/ accessed 10/06/2022; https://www.erongored.com/about-us/ accessed 10/06/2022).

5.4.7.6 Water

The Namibia Water Corporation (NAMWATER) is the bulk supplier of water in Namibia and "is mandated to provide water of a high quality and to the satisfaction of its stakeholders, as well as provide all water-related services, taking the environment, the issue of scarcity and universal dependency on water into consideration." NAMWATER is also a state-owned entity, which has decentralised its operations through four business units serving the country over four designated areas (north, central, coastal and south).

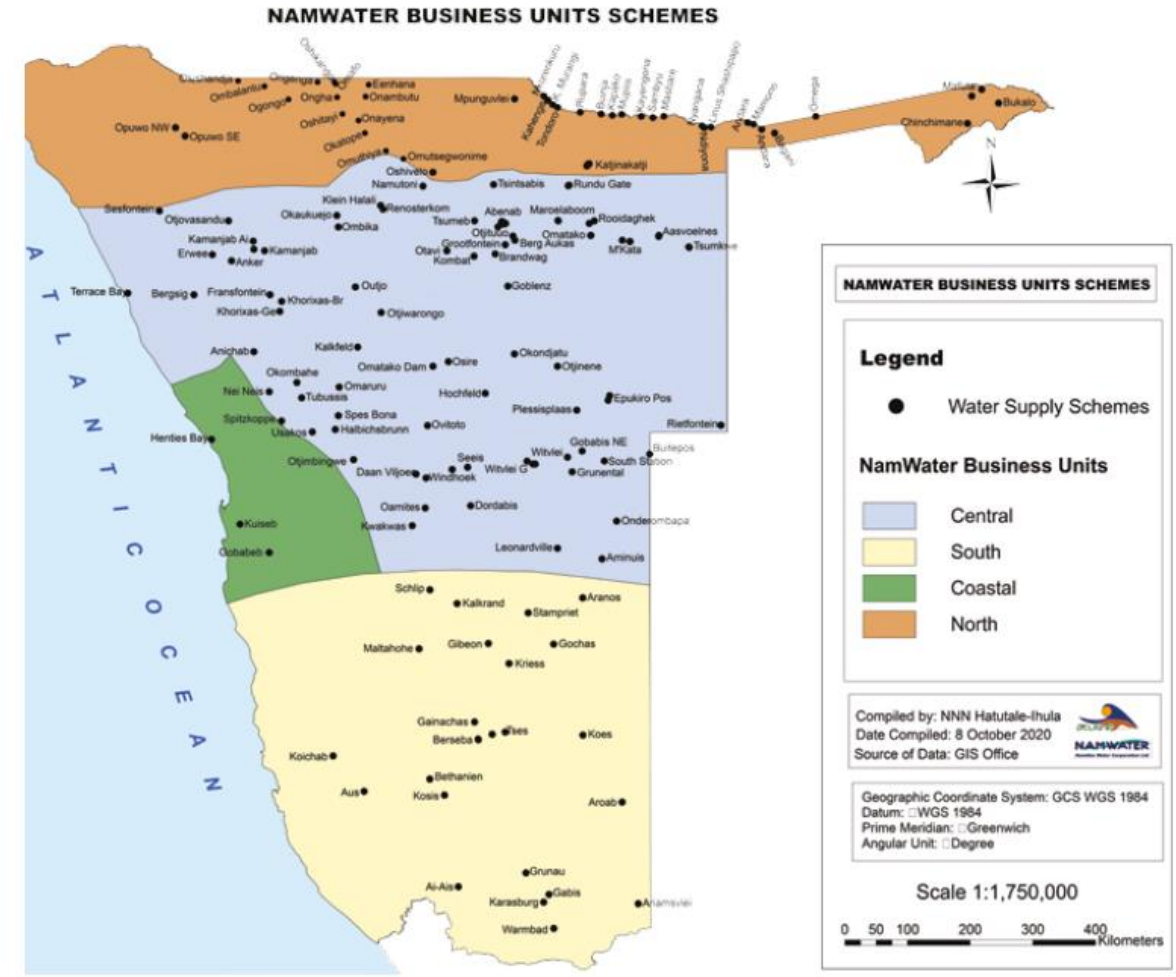


Figure 5.4.7.6 -1 - NAMWATER business unit schemes (NAMWATER, 2020)

The Project lies within in the central business unit area, where the demand for water remains high and its availability a challenge. The central area has 89 water-supply schemes of which two are raw water and 87 are potable water. The primary supply sources in this area are seven dams (Von Bach Dam, Swakoppoort, Omatako, Oanob, Daan Viljoen, Otjivero, and Tilda Viljoen) and 63 boreholes. The largest consumer in this area is the City of Windhoek (NAMWATER, 2020).

Commercial farms and localities along the Project Route have their own boreholes; however, information about the quantity and availability of water needs to be assessed.

5.4.8 Literacy & Education

The literacy rate (2016) in Namibia's urban areas was 94.1% and lower in the rural areas at 82.7% (vs. the national rate of 88.7%). On a regional level, the Erongo region recorded a higher literacy rate (95.9%) than the Otjozondjupa region (83.0%).

In 2016, an estimated 89% of the Namibian population had either left school or were still enrolled, an increase from the 83% in 2011, while 11% had never attended school (see Figure 5.4.8-1). School enrolment for children aged 7 – 13 years had increased in the Erongo region

from 91.2% in 2011 to 96.8% in 2016; the enrolment rate also increased in the Otjozondjupa region from 81.9% (2011) to 92.7% (2016) (NSA, 2013; 2017).

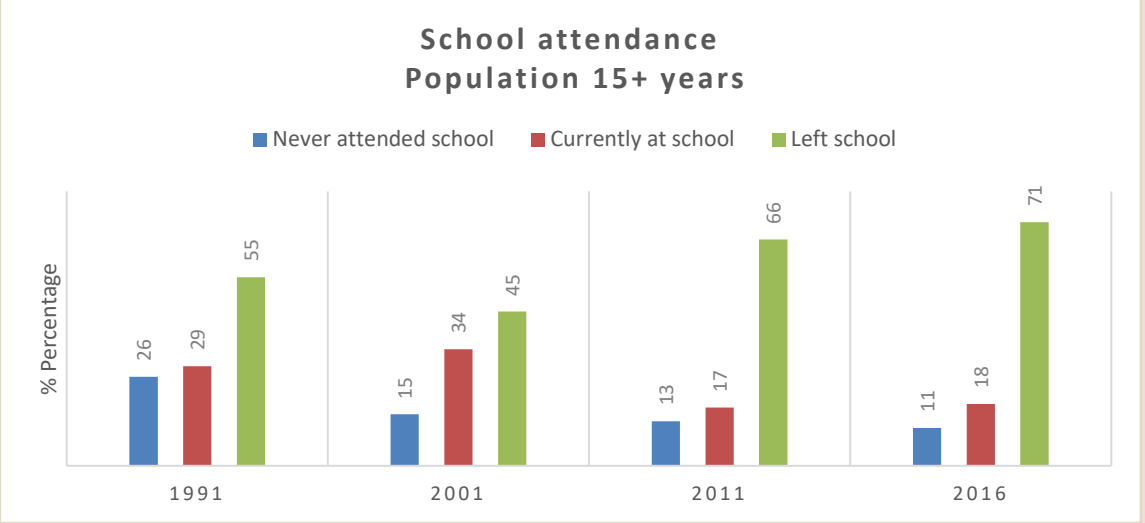


Figure 5.4.8-1 - School attendance by population 15 + years (NSA, 2017)

Since 1991, Namibia has seen a decline (from 26% in 1991 to an estimated 11% in 2016) in the percentage of the population that had never attended school. This decrease is most likely due to the increased development and provision of education facilities throughout the country and especially in rural and remote areas. In 2019, Namibia had a total of 1,894 education facilities (vs 1,848 in 2017) and of these, 1,695 were state owned and 199 were privately owned. Seventy-five of the schools were in the Erongo region (42 primary schools, 16 combined schools, and 17 secondary schools), while the Otjozondjupa region had 82 schools (49 primary schools, 14 combined schools, 17 secondary schools, and 2 “other”) (MoEAC, 2018; 2020).

Along the project route, all the schools can be found in the urban areas (Omaruru, Kalkfeld and Otjiwarongo) (see Figure 5.4.8-2).

Figure 5.4.8-2 - Map showing the educational facilities in the Project area (Source: GBS, June 2022)

5.4.9 Health & Safety

The provision of primary health care (PHC) services is the focus of the Namibian government and through the MoHSS has made healthcare provision available to the population through hospitals (district or intermediate), clinics, and health centres, and through mobile clinics and outreach programmes serving communities in remote locations. The three (3) components of health services in Namibia are: primary, district health services (secondary), and tertiary health services. Almost forty four percent (43.9%) of Namibians receive health care services from clinics and 28.1% from hospitals. Common healthcare service providers in rural areas are clinics (54%) and health centres (15.1%) and in urban areas, healthcare service providers include both hospitals (33.7%) and private doctors (17.8%).

The MoHSS, in collaboration with the World Health Organisation (WHO), has launched the National eHealth Strategy (2021 – 2025) in 2020 as a response to the national vision of “a healthy nation enjoying a high standard of living and quality health and social welfare services enabled by eHealth.” The objective of this strategy is to strengthen the delivery of health services by responding to needs by use of electronic solutions. The continuity of health care provision is compromised by the existing systems that are either outdated or not functional. In addition, vast distances between health care facilities, and the low population density, make the provision of health care services expensive (MoHSS, 2020).

The number and type of health care facilities by region are listed in Table 5.4.9-1 and facilities in the immediate Project area are displayed on a map in Figure 5.4.9-1 (see https://mfl.mhss.gov.na/location-manager/locations
https://mhss.gov.na/web/mhss/otjozondjupa | https://mhss.gov.na/web/mhss/erongo).

Table 5.4.9-1 - Health care facilities in the Project area (MoHSS, 2022)

Health Facilities	Erongo Region	Otjozondjupa Region
Hospitals (district and intermediate)	4	4
Health Care Centres	2	3
Clinics (PHC sites)	22	17

Figure 5.4.9-1 - Map showing health care facilities in the Project area (Source: GBS, June 2022)

In Namibia, health service provision through hospitals (district or intermediate), health centres, clinics and mobile clinics/outreach programmes is 82% public and 18% private. (African Journal Primary Health Care & Family Medicine. 2020;12(1), a2242. https://doi.org/10.4102/phcfm.v12i1.2242).

Clinics provide primary health care services for common diseases (HIV, etc.), syndromic management of Sexually Transmitted Infections (STIs), and Antenatal Care (ANC), as well as

counselling by community councillors. Clinics and health centres refer patients to district hospitals which refer patients to intermediate hospitals. Mobile clinics or outreach programmes provide immunizations, health education, and HIV testing.

The Workload Indicators of Staffing Need (WISN) survey of health facilities in Namibia found that facilities were severely under-staffed, and workloads cannot be met. Hospitals in Namibia only have 34% of the doctors required and 12% of the required pharmacists, based on the workload-based requirement. Only 61% of the nursing staff requirement is met and the distribution of nurses is unequal and tends mostly towards hospitals (MoHSS, 2016c).

5.4.9.1 HIV

HIV infections have decreased by 31.3% between 2009 and 2019, but HIV/AIDS remains the leading cause of death in Namibia.

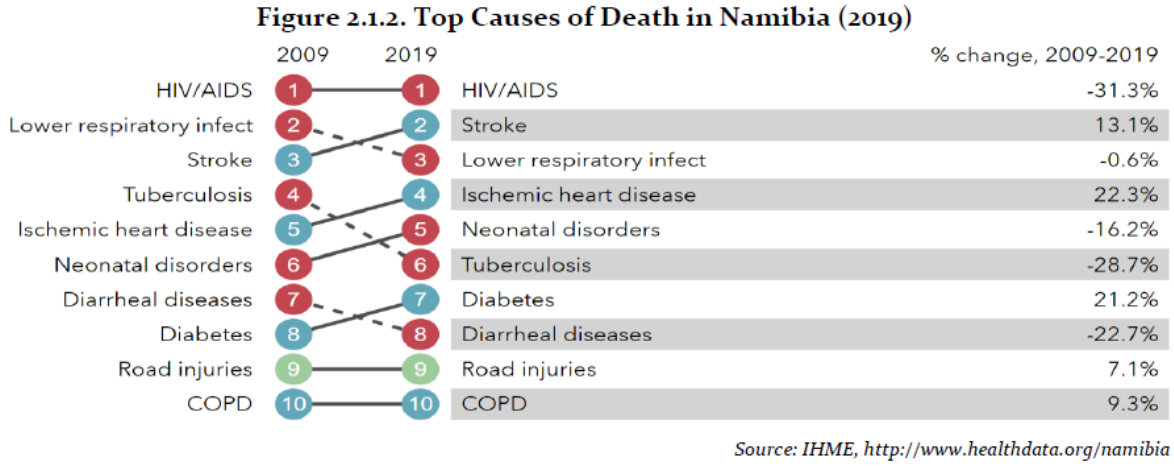


Figure 5.4.9.1-1 - Top Causes of Death in Namibia (2019) (Pepfar, 2021)

According to the Namibia Population-Based HIV Impact Assessment (NAMPHIA) conducted in 2017, the prevalence of HIV in adults aged 15 – 64 years in Namibia is 12.6% (15.7% among females and 9.3% among males). In 2017, the number of people living with HIV (PLHIV) in Namibia aged 0 – 64 years was estimated at 185,000. Both the populations of the Erongo and Otjozondjupa regions have an HIV prevalence that is lower than the national average, being 10.6% and 8.5% respectively. Namibia has made excellent progress with HIV intervention programs in achieving the UNAIDS (Joint United Nations Programme on HIV/AIDS) 90-90-90 goals. Eighty-six (86%) of PLHIV in the age group 15 – 64 years, know their HIV status (89.5% females and 79.6% males); among this group, 96.4% were on antiretroviral therapy (ART) and 91.3% were virally supressed (Namibia Population-Based HIV Impact Assessment (NAMPHIA), 2017).

Region	HIV Prevalence (%)	95% CI
Erongo	10.6	5.2-16.0
Hardap	9.3	5.5-13.1
Karas	9.7	7.3-12.0
Kavango East	14.5	11.5-17.4
Kavango West	12.1	9.3-14.9
Khomas	8.3	6.6-10.1
Kunene	7.6	4.9-10.3
Ohangwena	17.9	16.0-19.8
Omaheke	8.4	6.7-10.2
Omusati	16.9	14.9-18.9
Oshana	15.8	12.0-19.5
Oshikoto	17.3	13.9-20.7
Otjozondjupa	8.5	6.0-11.0
Zambezi	22.3	17.5-27.0

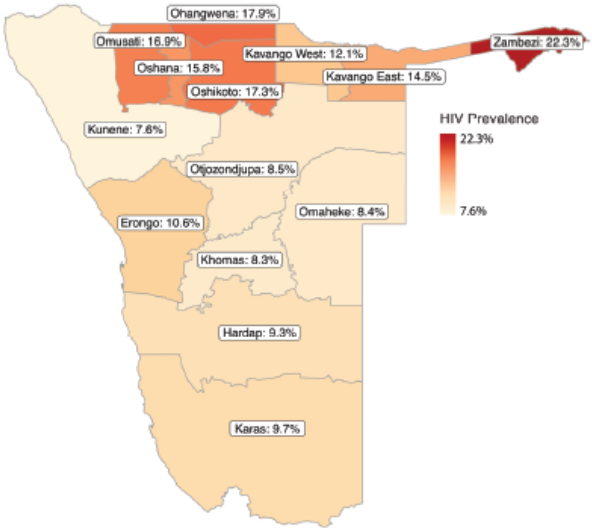
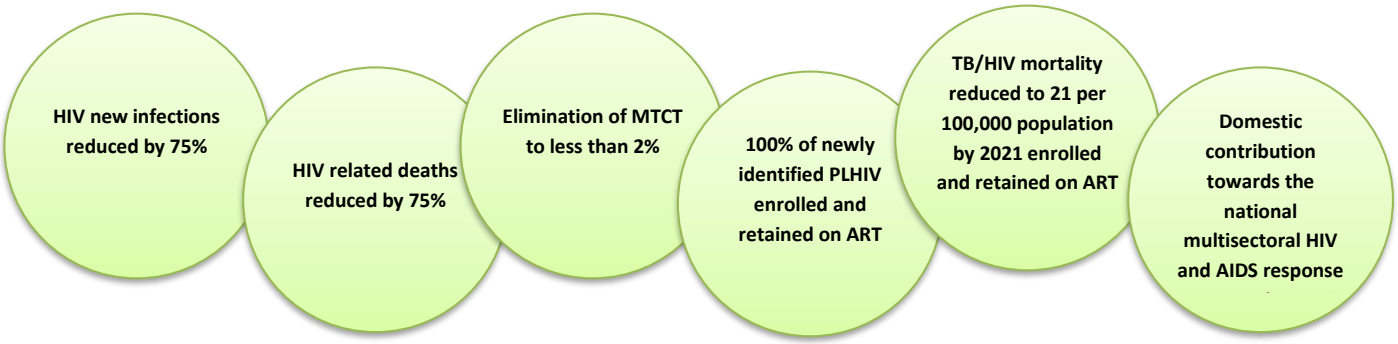


Figure 5.4.9.1-2 - HIV prevalence by region (NAMPHIA, 2017)

The National Strategic Framework for HIV and AIDS in Namibia (2017/2018 – 2021/2022) indicated that “Namibia has high HIV prevalence and incidence rates, a generalized and mature HIV epidemic, with the majority of new HIV infections transmitted through unprotected heterosexual sex. Co-morbidities and opportunistic infections add to the HIV burden.” New infections have decreased, but the southern African region has remained vulnerable to HIV infection, especially amongst young females.

The National Strategic Framework (NSF) goal is “To reduce new HIV infections and AIDS related mortality by 75% by 2022 from 2015 levels and move towards ending AIDS as a public health threat by 2030.” The country has thus prioritised the following interventions that will contribute to achieving results set out in Vision 2030, NDP5, and the National HIV/AIDS Policy by 2022:



To achieve the abovementioned goals and their expected results, several programs and interventions have been prioritised by the government through the NSF (MoHSS, 2017):

1. Adolescent Girls and Young Women
2. Pre-Exposure Prophylaxis (PrEP)
3. Voluntary Male Medical Circumcision (VMMC)
4. Prevention of Mother to Child Transmission (PMTCT)
5. Prevention programmes for key populations – Men who have Sex with Men (MSM) and Female Sex Workers (FSW)
6. Treatment care and support (provision of ART)
7. Condom Promotion and distribution
8. HIV Testing Services (HTS)
9. Male Involvement

Namibia appears to be in a period of stabilisation, where new HIV infections still occur, but they are slowly decreasing. The highest infection rates are amongst women of child-bearing age and remain of concern. The national HIV prevalence in women 15-24 years was 8.5% in 2016 and is higher than the NSF target for 2022 of 5% for the same age group.

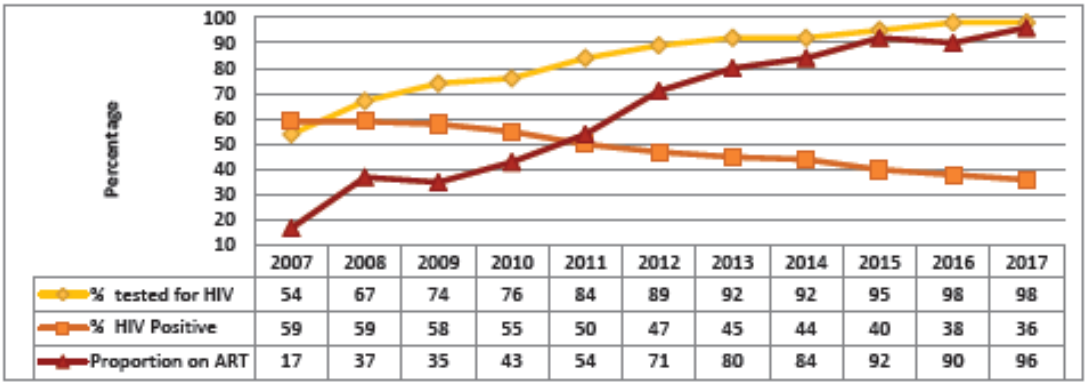
The HIV prevalence amongst pregnant women (15 to 49 years) in Omaruru was 13.9% in 2016, decreasing from 18.6% in 2010. In Otjiwarongo, HIV prevalence amongst pregnant women (15 to 49 years) was 22.5% in 2016 (vs 16.9% in 2010). The highest HIV prevalence was observed in women aged 25-39 years (32.2%) and women aged 45-49 years (31.6%). In 2016, 55.3% of HIV positive women living in Otjiwarongo were already on antiretroviral therapy (ART) vs 57.7% of HIV positive women living in Omaruru. During the NHSS 2016, 62.5% of all women who tested positive for HIV were already on ART in comparison with the 49.1% of the 2014 survey; this indicates a notable success of the ART and Prevention of Mother to Child Transmission (PMTCT) programmes. Estimated during the NHSS in 2016, the Mother to Child Transmission (MTCT) rate was 22.5% for Otjiwarongo and 13.9% for Omaruru (MoHSS, 2016a).

As a global HIV response, an investment framework was developed by a group of experts under the Joint United Nations Programme on HIV/AIDS (UNAIDS). One of the program aims is to increase efficiency in HIV prevention, treatment, and care. This program has six basic activities (UNAIDS, 2011):

1. Programmes focused on key high-risk population (sex workers, drug users, etc.)
2. Distribution and promotion of condoms
3. Changing social norms and behaviour to reduce risk of exposure
4. Eliminate new infections in children
5. Treatment, care and support for PLHIV
6. Voluntary male circumcision

5.4.9.2 TB/HIV

HIV has a significant contribution to the prevalence of TB in Namibia. Sixty seven percent (67%) of patients with TB were HIV positive in 2006; this number decreased to 36% in 2017. In 2017, 98% of all TB patients knew their HIV status; this figure increased from 54% in 2007. Coverage of HIV care services (testing, counselling, and ART) through public health facilities in Namibia has significantly increased for TB patients between 2007 and 2017. Nine percent (9%) of all new and relapse TB cases in 2017 were children under the age of 15 years (MoHSS, 2019).



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
% tested for HIV	54	67	74	76	84	89	92	92	95	98	98
% HIV Positive	59	59	58	55	50	47	45	44	40	38	36
Proportion on ART	17	37	35	43	54	71	80	84	92	90	96

Figure 5.4.9.2-1 - Trend on Coverage of HIV Care Services for TB Patients (2007-2017) Namibia (MoHSS, 2019)

5.4.9.3 TB

The incidence of TB cases in Namibia has seen a decline since 2009, yet the number of cases for all forms of TB in a global context remains relatively high. In 2019, Namibia had 7,718 cases of all forms of TB and a case notification rate (CNR) of 413 cases per 100,000 population.

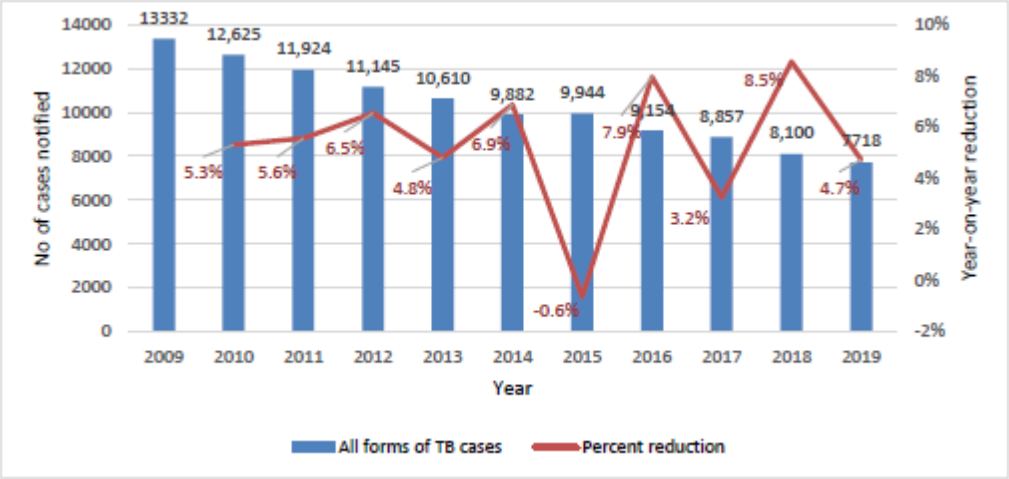


Figure 5.4.9.3-1 - Trend in the Number of all Forms of TB cases in Namibia (2009 – 2019) (MoHSS, 2019)

The highest prevalence of drug resistant TB (DR-TB) can be observed amongst the males between the ages of 25 and 44 years (MoHSS, 2019b). Targeted interventions to address TB in males are necessary, because of the high prevalence rate and lower participation in health-seeking activities (MoHSS, 2019a).

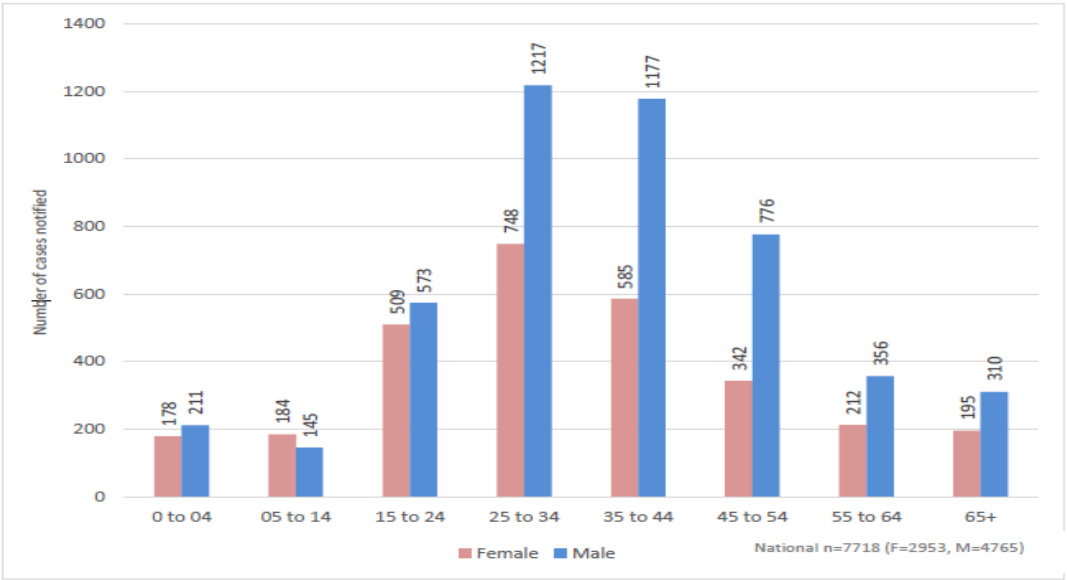


Figure 5.4.9.3-2 - TB cases (all forms) by Age Group and Sex, 2019 (MoHSS, 2019)

The prevalence of TB cases in the Erongo region are amongst the highest and account for 11% (843) of all TB cases in Namibia, vs 6% (458) in the Otjozondjupa region (MoHSS, 2019).

Table 5.4.9.3-1 - TB cases in Namibia and project regions (MoHSS, 2019)

	Namibia	Erongo Region	Otjozondjupa Region
Notified cases of all forms of TB	7,718	843 (11%)	458 (6%)
Case notification rate (per 100,000)	436	417	286
Cured			
New PTB B+ (Bacteriologically positive cases)	77%	92%	90%
All forms of TB	52%	64%	53%
Treatment completed			
New PTB B+	10%	5%	0%
All forms of TB	33%	28%	34%
Died			
New PTB B+	5%	2%	8%
All forms of TB	7%	5%	7%

5.4.9.4 Hepatitis E Virus (HEV)

Over the past four (4) decades, Namibia has experienced three (3) Hepatitis E Virus (HEV) outbreaks, which are in 1983, 1995 and 2017. Although the general fatality rate is less than 2%, for unknown reasons it is the leading cause of maternal fatalities. The maternal fatality rate is as much as 40%, and these are usually women pregnant in the last trimester being exposed to genotypes 1 and 2. HEV has four (4) genotypes known to affect humans. The outbreaks in 1983 and 1995 may have genotype 1 and genotype 2 respectively, and these outbreaks were confined to the Rundu area. The genotype of the 2017 outbreak has not been clearly defined, but was claimed to be type 2. The outbreak was nationwide, and it was declared an epidemic in September 2019. The lack of clean water and proper sanitation facilities are the main factors spreading HEV, and it is assumed that increased road traffic may have been a contributing factor in the nationwide spread of the 2017 outbreak. Eighty four percent (84%) of the HEV cases during the 2017 outbreak were recorded in the Khomas and Erongo regions, and specifically in the informal settlements of Windhoek and Swakopmund. Migration from rural to urban areas is estimated to be between 8 and 15% per annum and approximately 40% of all urban households can be found in informal settlements with limited access to clean water and sanitation facilities (African Journal for Health Sciences 2021 34(4): 422 - 436 (AJHS), 2021).

Table 5.4.9.4-1 - HEV Outbreaks in Namibia (AJHS, 2021; see https://www.afro.who.int/countries/namibia/news/end-hepatitis-e-virus-outbreak-namibia)

HEV Outbreaks	1983 (AJHS, 2021)	1995 (AJHS, 2021)	2017 – 2022 (WHO, 2022)
Number of infections	64	600	8,092
Male	46 (72%)	~	~
Female	18 (28%)	~	~
Fatalities	7	~	66 (0.8%)
Male	1 (14%)	~	~
Total Female	6 (86%)	~	~
Pregnant Women	*6 (86%)*	~	*27 (41%)*
			~no details available

5.4.9.5 Covid-19

The Covid-19 virus is a contagious respiratory illness caused by a novel coronavirus called the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Since the first recorded case in Namibia in March 2020, the virus has spread to all 14 regions of the country (NSA, 2021).

According to the WHO, and for the period between March 2020 and June 2022, the country recorded a total number of 164,298 Covid-19 cases and 4,039 deaths. Since the global outbreak in 2019 and to date (June 2022), 529,410,287 cases and 6,296,771 deaths were recorded to the WHO (WHO, 2022).

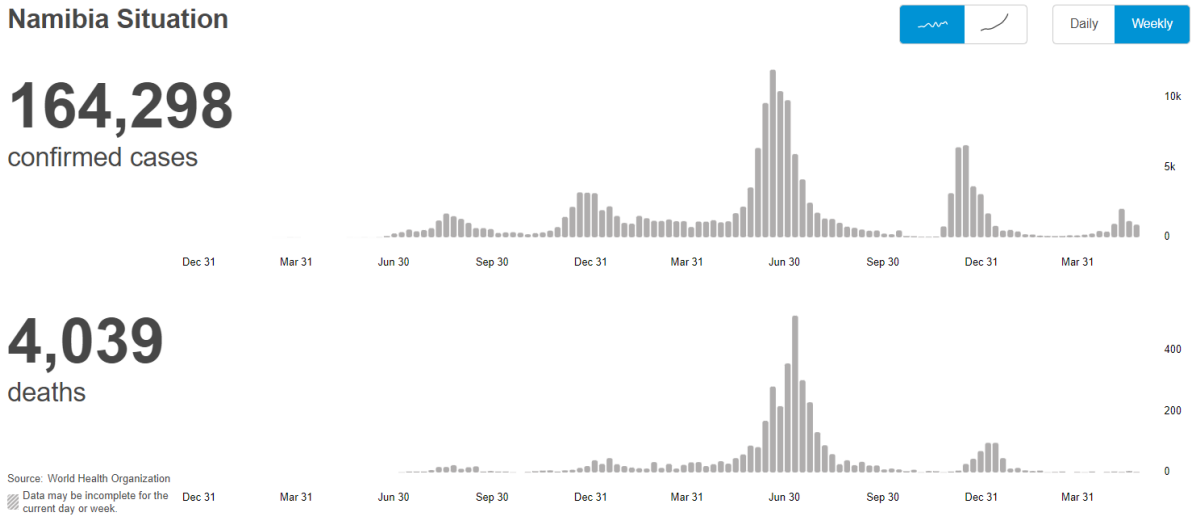


Figure 5.4.9.5-1 - Covid-19 pandemic - Namibia Situation (WHO, 6 June 2022)
(see https://reliefweb.int/report/namibia/namibia-covid-19-situation-report-no-781-09052022)

The NSA conducted a telephonic study in 2021 to gain an understanding of what impact the disease had on households and people. Regulations to combat the spread of Covid-19 brought about significant social changes and to curb infections 96.6% of respondents indicated they wore masks, while 86.1% reported more frequent washing of hands, 78.2% avoided large

gatherings and 84.3% avoided handshakes. Ninety percent (90%) of the surveyed households had water to wash their hands, some had little or no access to water, 33.8% reported a reduction in water supply 13% could not afford water, and 15.8% had no access to water.

Due to the Covid-19 restrictions enforced by the Government, 47.6% of the people surveyed lost their jobs due to business closures, while others were laid off while businesses continued to operate (18% of people in the urban and 12% of people in the rural areas of Namibia lost their jobs). A loss or reduction of income was reported by different sectors: livestock farming and fishing (49%); non-farming business (65%), and properties, investments, and savings (55%). Increases in food prices and lack of food security during the pandemic were major causes of concern and shock. Thirty days prior to the survey, 61% of respondents did not eat sufficient food, while 15% tried to adjust and reduce their food consumption. Almost eleven percent (10.9%) of respondents attempted to earn an additional income, used their savings, or received assistance from family/friends. Sixty one percent (60.6%) of the surveyed households indicated a willingness to take the vaccine, while 23% were against being vaccinated (NSA, 2021).

According to the Namibia Covid-19 Situation Report No. 781, the number of cases reported until 9 May 2022 represents about 6% of the total Namibian population, of which 53% are females. The Khomas and Erongo regions had the highest number of cases, 33% and 14% respectively. Ninety two percent (92%) of the total number of fatalities were Covid-19 deaths, while 8% were Covid-19-related deaths. Namibia has a recovery rate of 98% (WHO, 2022).

5.4.9.6 Life Expectancy and Mortality Rates

According to the Centre for Disease Control and Prevention (CDC), the current life expectancy in Namibia is 64 years (67 years for females and 61 years for males). The CDC also reports an infant mortality rate (IMR) of 30 deaths per 1,000 live births; this figure declined from 44 deaths in 2011 (NSA, 2013; CDC, 2021;).

In 2016, the crude death rate (CDR) for twelve months was 10.8 per 1,000 people. The CDR of the Erongo region (9.9) is lower than the national average, while the CDR of the Otjozondjupa region (13.1) is among the higher rates in the country; the CDR for both regions has increased since 2011 (NSA, 2017).

5.4.10 Gender

The Namibian Constitution provides the foundation for principles of gender equality in Namibia.

Article 10 of the Constitution states that: *“All persons are equal before the law. No persons may be discriminated against on the grounds of sex, race, colour, ethnic origin, religion, creed or social or economic status”.*

In addition, Article 23(3) states that: *“In the enactment of legislation and the application of any policies and practices contemplated by [the Constitution], it shall be permissible to have regard to the fact that women in Namibia have traditionally suffered special discrimination, and that*

they need to be encouraged and enabled to play a full, equal and effective role in the political, social, economic and cultural life of the nation".

Another relevant provision of the Constitution is Article 95(a), which stipulates that: *"The State shall actively promote and maintain the welfare of the people by adopting, inter alia, policies aimed at the following: enactment of legislation to ensure equality of opportunity for women, to enable them to participate fully in all spheres of Namibian society" …*

The National Gender Policy 2010 – 2020 which was compiled and adopted in 1997, is designed to provide guidance for stakeholders and institutions at all levels, and to ensure that they always consider a gender perspective in their planning and programming processes (Ministry of Gender Equality and Child Welfare (MGECW), 2010).

5.4.10.1 Violence against Children and Gender Based Violence

Violence in Namibia remains a concern. Additional to Article 10 mentioned under Section 9, the Namibian Constitution provides principles to address Gender-Based Violence (GBV) in Namibia:

Article 8(1) state that *"The dignity of all persons shall be inviolable."*

In addition, Article 8(2)(b) states that *"No person shall be subject to torture or to cruel, inhuman or degrading treatment or punishment."*

Namibia has the following legislations: Combating of Rape Act 8 of 2000 and the Combating of Domestic Violence Act 4 of 2003.

One in three females (32.9%) and two in five males (41.2%) experienced physical violence before age 18 (2019 figures). More males (25.7%) than females (13.0%) experienced physical violence by a peer during their childhood (Ministry of Gender Equality, Poverty Eradication and Social Welfare (MGEPESW), 2020).

5.4.10.2 Domestic Violence

The National Plan of Action on Gender-Based Violence describes "domestic violence" as a range of violent conduct that takes place within a domestic relationship, such as between spouses, intimate partners, or family members. According to the Combating of Domestic Violence Act 4 of 2003, this violence can take the form of physical, sexual, and/or economic abuse, intimidation, harassment/stalking, trespassing and emotional, verbal and psychological abuse. Often, domestic violence is the outcome of social challenges that households or individuals face such as unemployment, poverty, alcohol abuse, changing family, and community norms. Victims of domestic violence are mainly women (86%) compared to 14 % of men. More than ninety percent (93%) of abusers are males. At a national level, 31.5% of women between the ages of 15 and 49 have experienced physical violence since the age of 15; the figures for the Erongo and Otjozondjupa region are 27% and 33.5%, respectively. Domestic violence against children can include excessive discipline, neglect, sexual abuse, cultural and traditional practices, exposure to domestic violence between family members, and encouraging alcohol abuse (NSA, 2014; LAC, 2016;).

In 2013, 27.9% of women in the Erongo region were victims of domestic violence, while a substantial amount more women (42.9%) were affected in the Otjozondjupa region (NSA, 2019).

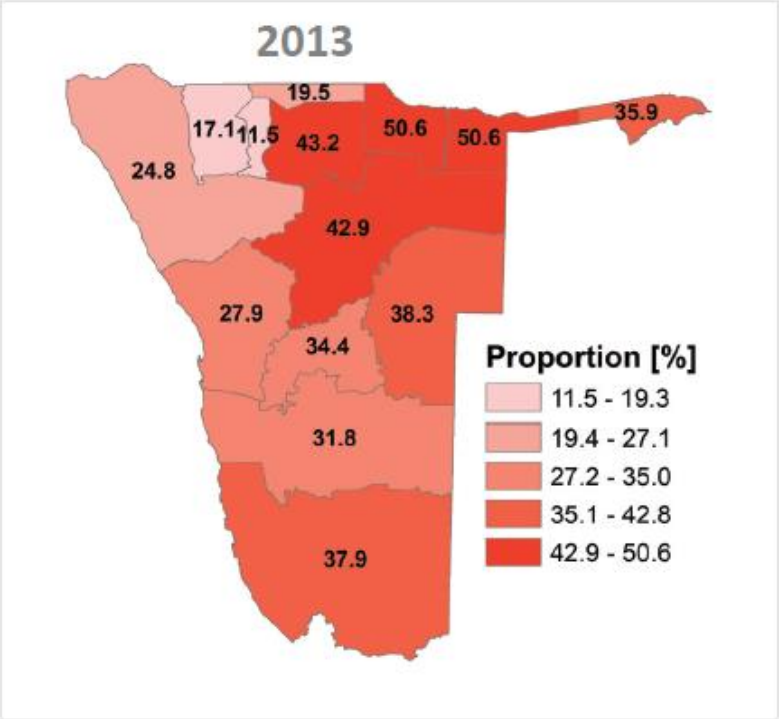


Figure 5.4.10.2-1 - Domestic violence against women by region. (NSA, 2019)

5.4.10.3 Crime

Major crimes reported in Namibia include:

- Drug possession
- Rape
- Domestic violence
- Robbery
- Theft - stock theft, motor vehicle theft, etc.
- Housebreaking
- Poaching
- Reckless and negligent driving

Police stations can be found in all three towns along the Project Route.

- Omaruru Police Station
- Kalkfeld Police Station
- Otjiwarongo Police Station

In close vicinity to the Kranzberg station, where the Project will commence, are the additional police stations of Karibib and Usakos (GBS, 2022).

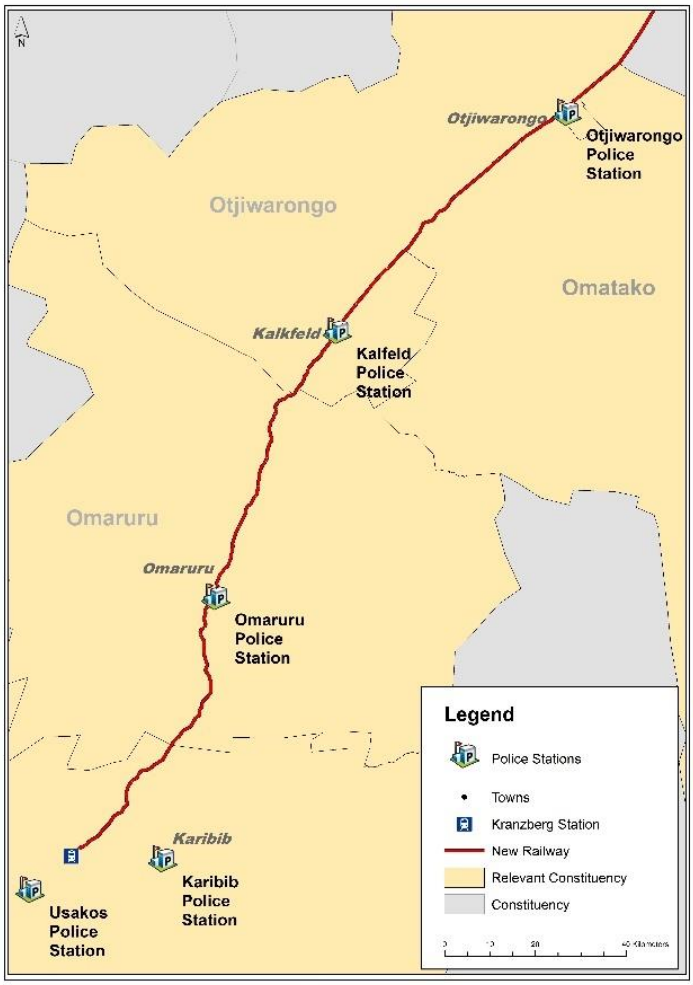


Figure 5.4.10.3-1 - Police station map

5.4.11 Indigenous People

According to the United Nations (UN), the definition of indigenous people is *"those who inhabited a country or geographical region at the time when different cultures or ethnic origins arrived. The new arrivals later became dominant through conquest, occupation, settlement and other means"* (UN Factsheet).

"While most people in Namibia can be characterised in a strict sense as indigenous to the area, the San, Himba, Ovatue, Ovatjimba, and Ovazemba are recognized by the Government of Namibia as particularly marginalized groups and have been identified in various Namibian laws and policies as groups that merit special attention and concern. The conditions of these groups, especially relative to other segments of the population of Namibia, can be identified as similar to those groups identified as indigenous worldwide" (Anaya, 2013).

Article 10 and Article 23 of the Namibian Constitution emphasise equality, freedom of discrimination and promotion of affirmative action to alleviate imbalances of social and

economic nature, yet no specific reference is made to indigenous peoples. Additionally, the Affirmative Action (Employment) Act 29 of 1998 is a set of measures to ensure that all Namibians have equal employment opportunities.

The rights of indigenous people are not specifically mentioned in the Constitution and no separate legislation is specifically dealing with the rights of indigenous people, but only general provisions are stated in the legislation. However, the Constitution "[…] prohibits discrimination on the grounds of ethnic or tribal affiliation but does not specifically recognise the rights of indigenous peoples or minorities". In policies the term 'marginalised' is preferred over 'indigenous' and provides for certain rights about access to land, leadership, management of natural resources and education.

Indigenous people in Namibia make up about 8% of the total population and reside in various regions throughout the country, including the Kalahari Desert, the Kunene region, and the southern part of Namibia. Having been dispossessed of their traditional lands, many Indigenous people of Namibia suffer from a lack of land rights and do not have access to lands that allow them to sustain their livelihood and traditional way of life. Furthermore, they are not recognized in the country's constitution and have little political representation, besides the appointment of traditional authorities, which has proven to be a slow and problematic process. There has been some intervention by the government and nongovernmental agencies, including the San Development Programme and several resettlement initiatives to address the discrimination and social and economic issues faced by Indigenous groups. Even still, Indigenous people face higher rates of health problems, such as HIV/AIDS and infant mortality, because of their remoteness from health services. Similarly, they have limited access to education, especially kinds that are culturally appropriate and that embrace traditional customs (Cultural Survival. 2016).

According to the Namibia 2011 census, Indigenous people, who include the San, the Nama, the Himba, Zemba, and Twa, constitute about 8% of the country's population of 2,044,147. The San include several groups, each with their own language, customs, and histories. Traditionally, they occupy the Kalahari Desert as hunters and gatherers and are thought to have been in the Namibian region for some 2,000 years. Forced out of their lands, they are now some of the poorest and most marginalized people in the country. The Himba, who number about 20,000, live throughout the Kunene region in the North West, where they subsist on livestock and some agricultural activity. The Zemba and Twa also reside in the North Western region of Namibia while the Nama, numbering about 80,000, can be found throughout the Southern part of the country as herders and pastoralists (Cultural Survival. 2016).

While various efforts have been made, the Indigenous people of Namibia have not seen many of the benefits promised since the country's independence from South Africa in 1990. Namibia has signed several of the international agreements upholding human and Indigenous rights, including the African Charter on Human and People's Rights, the International Convention on the Elimination of All Forms of Racial Discrimination, the International Covenant on Civil and Political Rights, and voted for the UN Declaration on the Rights of Indigenous Peoples (UNDRIP) in 2007 (Cultural Survival. 2016).

In line with these documents, the Namibian government has created programs to combat the discrimination and create a “just and equitable society”. One major program is the San Development Programme, which, since its establishment in 2005, has become the Division of San Development headed by the Deputy Prime Minister. Despite these advancements, Indigenous rights are still not directly addressed in the Constitution. Furthermore, the country has not ratified the ILO Convention No. 169. The Indigenous people of Namibia remain impoverished, discriminated against, and forced to live in remote regions of the country (Cultural Survival. 2016).

The marginalised communities (but not indigenous) in proximity to the railway line Project are predominantly Nama and few Herero’s clustered mainly in Kalkfeld settlement. They were resettled here during the SA colonial occupation of Namibia as per Odendaal Plan of 1964. They reside within the town planning scheme and are not affected by the railway line development.

As per the information obtained from the Ministry of Agriculture, Water and Land Reform, none of these communities’ own land (affected farmland) within the parameters of the existing railway servitude.

5.4.12 Vulnerable Groups & Social Organisations

Various organisations and institutions in both Regions exist providing support to the vulnerable residents of the communities. These fall under the Ministry of Gender Equality, Poverty Eradication and Social Welfare (MGEPESW); Ministry of Sport, Youth and National Services (MSYNS); Non-Governmental Organisations (NGO`s) and Civil Society Organisations (CSO`s).

They represent people with disabilities and the marginalized communities; which advocate and promote human rights issues related to Persons with Disabilities in order to improve their quality of life, enhance their dignity, well-being and empower them as well as strengthens the implementation of the National Disability Act and other regional and international instruments that relate to disability, such as United Nation Convention on the Rights of Persons with Disabilities (UNCRPD).

Youth development and empowerment programmes are provided to ensure that the youth participate and become active participants in the mainstream economy; Impart skills to school dropouts and unemployed young people, thereby making them employable, self-reliant and productive citizens.

Civil Society provides crucial services in the different sectors in society. They add value to the work of the public and private sector and thereby breathing life into our Constitution by addressing a wide range of concerns, including basic grassroots activism, faith-based organisations, community-based organisations, civic associations, development fora, media– print, radio, TV & social media, unions and NGOs, as well as trusts and foundations as stipulated by Article 17 of the Namibian Constitution that: All citizens have the right to participate in peaceful political activity intended to influence the composition and policies of

the Government. All citizens shall have the right to participate in the conduct of public affairs, whether directly or through freely chosen representatives.

The Vulnerable Groups that took part in this study are listed below:

- The National Disability Council of Namibia;
- The National Youth Council of Namibia;
- The Namibia Equal Rights Movement;
- The Namibia Institute for Democracy;
- The Omake Charity Organisation;
- The National Federation of People with Disabilities in Namibia;
- The Namibia Diverse Women`s Association;
- The Namibia Women Rural Assembly;
- The Regain Trust Organisation;
- The Sister Namibia Organisation;
- The Women`s Leadership Centre;
- Women`s Solidarity Namibia;
- The Young Feminist Movement Namibia Trust; and
- MPower Community Trust Namibia.

5.4.13 Archaeology and Cultural Heritage

The heritage assessment intended to satisfy the requirements of the National Heritage Act (No. 27. of 2004) and National Heritage Regulations (Government Notice 106 of 2005), in which the process of review and consent will be required to clear the project.

5.4.13.1 Preamble

The western central Namibia and its interior is physiologically characterized by inselberg topography of Damara metasediments and granites like Erongo mountain - the largest cretaceous granitic complex in north western Namibia formed more than 600 million year, many residual hills, high granite cliffs, granite outcrops, calcrete rocks sediments, ridges as well as isolated pockets of schist, dolomite, etjo sandstones, basalt, siltstones and limestone rocky outcrops (Hills & Porada, 1974; Roadside Geology of Namibia, MME publications) which intrudes this area. Elevation around these steeply inclined features ranges between 1600m and 1000m above sea level. Geologically, most of these features were formed as a result of tectonic and magmatic activity that eventually led to the opening of the South Atlantic Ocean separating the African and South American continents. According to (Miller, 1980), the granite dominated inner zone belongs to the Damara Orogen which is structurally linked to the Congo and Kalahari Craton. The belt is made up of faults and shear zone bounded zones of varying

structural style, ranging from north to south as a fold-thrust belt displaying complex fold interference and Damara Sequence basins that transposed schist belt.

In the landscape, these geological features are archaeologically important. In general, archaeological sites are simply material culture of past human populations who selected places to: live, carry out certain rituals, bury the dead, quarry raw material for making lithic artefacts (stone tools), ambush and hunt wild game for food, and to harvest/gather edible plants. Therefore, granite landscapes such as mountains, hills and outcrops and their surroundings, dolerite dykes and river systems were ideal places for prehistoric human settlement because they sheltered them from all weathering conditions and controlled the movement of animals (meaning food was readily available). Isolated outcrops sought material for stone tools productions and served as natural routes of movement across physical barriers such as mountain ranges or river gorges.

5.4.13.2 Regional Archaeological Settings

Namibia has a long and remarkably comprehensive archaeological record in southern Africa. Decades of detailed archaeological research and surveys has established a well archaeological sequence of human occupation. According to (Kinahan 2021), these range from Early Stone Age (ESA) sites dating from the last 800 000 years Before Present (BP); Middle Stone Age (MSA) sites, generally characterized by surface scatters of stone artefact debris and Holocene LSA (Later Stone Age) sites, often defined by natural shelters with rock art; recent pastoral, farming Common Era (CE) defined by Kinahan, (2017). These evidence are of both regional and global significance in understanding human history, significant human evolutionary and technological advances as well as specific adaptations to extremely arid climatic conditions as described by (Kinahan 2014).

A large number of these records are fundamentally attributed to the prehistoric Hunter-Gatherer (today ancestors of San people) and Herders and Nomadic Pastoralists communities. Erongo Region including central Namibia is one of paramount archaeological landscape in Namibia with high densest concentration of archaeological sites recorded in the Brandberg Mountains (see Pages 1989–2006; Lenssen-Erz 2001; Lenssen-Erz 1997; Gwasira 2011); Erongo Mountains and its immediate surrounding residual mountains, hills, granite outcrops (see Pleurdeau et al. 2012; Nankela 2013; 2017 and 2021); the Spitzkoppe Mountains (see Kinahan 1990; Nankela 2017; 2019) as well as those recorded in in Otjohorongo Granite Hill (Kinahan 1999 and Nankela 2021). However, archaeologically, the country in its entirety remains incompletely explored. For instance, very little archaeological research has been done on the margin of central eastern toward Otjiwarongo and northern parts of Namibia, hence limited information is available on heritage/archaeology in the general areas. Few available records have been harvested through field surveys that are routinely carried out for large developmental projects such as this and these have contributed to the documented heritage/archaeological record. Fortunately, many sites particularly with rock paintings and engravings as well as fossil sites (palaeontology) and historic sites (built monuments) have been uncovered and today serve as popular tourist attractions. Needless to say, regardless of little existing data in this area, such a stance does not translate to the absence of heritage/archaeology nor reduces their significance. In fact, it has increasingly

become possible for archaeologists to infer with some degrees of accuracy the likely localities with archaeological remains in the form of scatter of lithic artefacts (stone tools); stone features, hunting blinds, huts, rock shelter with stratified sediment deposits; rock art such as paintings and engravings as these features are conspicuous in the landscape and are often identifiable from various mappings. Other recent site typologies such as colonial battlefields, roadworks and historical mines, small shelters, lamb pens, pottery fragments, burial grounds such as unmarked graves, sacred sites associated with intangible heritage, ruins linked to early farming settlement from the first millennium AD as well as remains associated with exploitation of seed diggings are less obvious to some extent by an untrained eye.

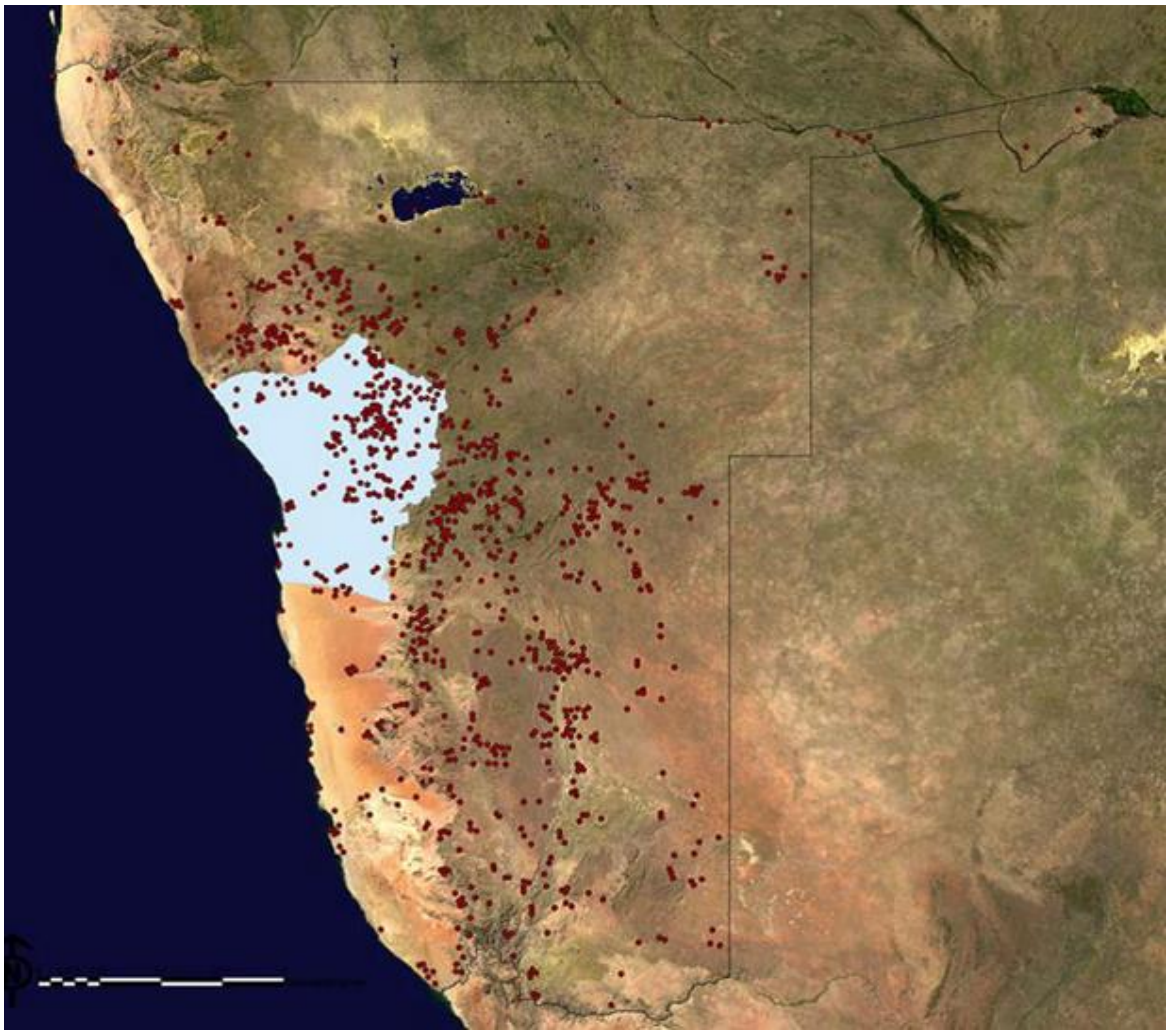


Figure 5.4.13.2-1 - General distribution of archaeological sites in Erongo Region (blue area) concerning sites in Namibia. Author: (Nankela 2021 *rfc.* Kinahan 2012).

5.4.13.3 Local Archaeological Settings (Otjiwarongo to Omaruru)

The desktop assessment has confirmed the existence and presence of paleontological and historical heritage sites located approximately 500m from the project receiving environment particularly between Otjiwarongo and Omaruru section. However, it is important to stress that these sites do not fall within the railway line itself and the service road within the servitude. This area has in fact disturbed for over a century as a result of railway constructions and its associated infrastructures including bridges. For instance, historical records indicate that the

Omaruru railway line via Kranzberg to Otavi was constructed between 1903 and 1906 during German colonial occupation of Namibia and with major upgrades by South Africa after World War I, which were later linked into the network of South Africa (Dierks 2012) as a result of mining rush in Namibia at a time. Some recent Holocene archaeological sequences dating over the last 5 000 years, are particularly suspected to be in existence in areas surrounding the project receiving environment (Figure 5.4.13.3-1).

Such probable records are said to provide background evidence for the development and recent history of the indigenous communities before the advent of written historical records during the colonial era. These includes according to Kinahan (2017), the highly likelihood of:

- Early colonial period relations to mining in the general area and a combination of trade, missionary activity and indigenous tribes' use of iron for various application;
- Holocene age archaeological sites, including rock art, associated with outcropping granites; late pre-colonial settlement sites throughout the entire tenement, especially in the vicinity of Kalkfeld settlement, springs and seepages, and
- Early colonial settlement remains relating to the historical occupation of areas that may be unknown or not recorded. During the site visit, some of these key geological features (granite rocky outcrops) were identified as potentially sensitive archaeological features. These fourteen (14) localities required detailed field surveys to establish their significance and vulnerabilities, devise management actions to avoid or reduce negative impacts, as part of the environmental assessment since they are located in the proposed new railway alignments within its servitude. This is critically important to inform possible change in the railway line design. The localities are reflected in (Table 4) and inform the possible affected communities and farmers to allow access to the site during detailed survey.

During the initial baseline assessment site visit, some of these key geological features (granite rocky outcrops) were identified as potentially sensitive archaeological features. These fourteen (14) localities were subjected to an on-site archaeological investigation and assessment, but found not to hold any archaeological significance, as presented in the Detailed Archaeological Assessment Report (see Appendix B3).

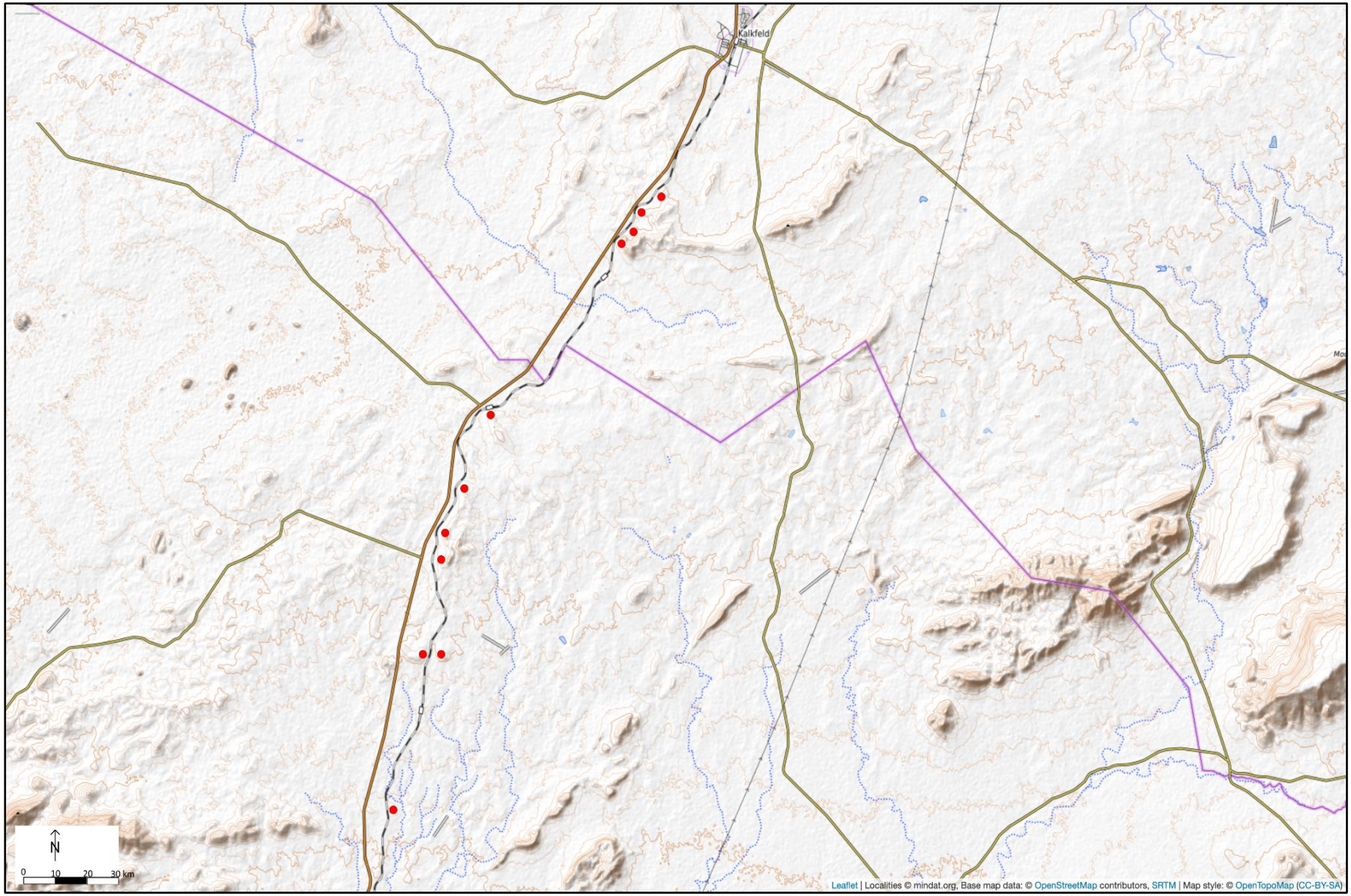


Figure 5.4.13.3-1 – Potential Archaeological Sites Investigated

5.4.13.4 Local Archaeological Settings (Omaruru to Kranzberg Station)

Several potential sites were identified during the preliminary investigation of the railway line between Kranzberg Station and Omaruru. These sites were recalled because of the critical geologic features associated with heritage in the Erongo region. During the preliminary site visit, this geologic feature near the railway became the site of interest. The geologic features are concentrated within the first 20 kilometres from Omaruru railway station heading south towards Kranzberg railway station.

These areas of interest from a heritage perspective necessitated a field survey to be carried out targeting those granite rock outcrops close to the area proposed for railway construction, mainly where significant deviations are apparent. A comprehensive study of the suspected geologic features to host heritage in the form of rock painting was surveyed comprehensively using the non-intrusive approach, which primarily involved surface observation among granite rock outcrops for indication of past human habitation in the form of caves and shelters or signs of human settlement and economic activities in the form of rock painting and engravings. Furthermore, contemporary human structures along the railway line were initially observed during the first site visit along the railway line in a motorised trolley.

As indicated, the area between Omaruru railway station and Kranzberg railway station was surveyed, and the fieldwork was restricted to within 100 meters east and west of the current railway line. Justification for this lies in that the proposed railway line will be limited to 100 meters in width, including deviations. Moreover, this implies that, beyond this 100-meter zone, no heritage assessment was conducted by the undersigned archaeologist; consequently, if the heritage council decide in favour of issuing consent against this report, it should reflect and restrict the contractor to within 100 meters in width throughout the current railway line between Omaruru and Kranzberg.

Based on the desktop study and field work survey undertaken, it is recommended that the project proponent or contractors should adopt the Chance Find Procedure (see Appendix A to the Archaeological and Cultural Impact Field Survey and Baseline Assessment Report, attached as Appendix B3b & Appendix B3d to this ESIA Report.

5.4.14 Development Plans

Most developments in Namibia take place in line with the country's Vision 2030, National Development Plan 5 (NDP5), the Harambee Prosperity Plan II, and Africa's Agenda 2063 and their respective goals and principles.

Several development programs by different ministries in Namibia have been included in the medium-term Development Budget for 2022/23 – 2024/25 for both the Erongo and Otjozondjupa regions. These developments include construction; renovation or upgrading of facilities/infrastructure (education, health, road and rail transport, mining, immigration, defence, IT, services); value chain development schemes in the agricultural and environmental sectors; and resource management (water, wildlife), etc. (NPC, 2022).

The Erongo Development Foundation (EDF) was established to promote and facilitate programmes and actions that will promote equitable and sustainable development in the Erongo region. The EDF aims to partner with the private sector and agencies promoting development to address both social and economic imbalances (see edf.org.na).

In the Otjozondjupa region, a Regional Forum was established in 2021 to boost economic growth, equitable benefit distribution and financial self-sustainability from tourism developments and to coordinate these. This is a crucial aspect to rebuilding the sector after the detrimental effects that the Covid-19 pandemic had which resulted in job loss and low business activities (see https://neweralive.na/posts/otjozondjupa-developing-the-heart-of-namibiaalive.na).

6 STAKEHOLDER ENGAGEMENT

6.1 INTRODUCTION AND OBJECTIVES

Stakeholder engagement or public consultation, as per the Namibian legislation, forms an integral and important part of an ESIA, as reflected in both the applicable Namibia legislation, IFC PS1 and the Equator Principle 5.

During public consultation, potential impacts that the proposed Project might have on the natural and/or socio-economic environments, were highlighted by the Interested and Affected Parties. Consultation with Interested and Affected Parties (I&APs) and relevant Authorities also enables transparent decision-making and continues communication of information relevant to the Project.

Stakeholder concerns and their feedback are valuable sources of information that are applied to improve Project design and outcomes, and help the Project Proponent identify and control external risks. It also forms a valuable basis for future collaboration and partnerships during the construction phase.

Aligned with the International Finance Corporation (IFC) Performance Standards (PS) on Environmental and Social Sustainability, 2012, relevant IFC Guidance Notes (GN), and by the Environmental Impact Assessment Regulations (GG. Notice 30 of 2012) of the Environmental Management Act (No. 7 of 2007), this chapter outlines the ESIA-Stakeholder Engagement Plan (SEP), which will evolve throughout the ESIA process. The Project's Stakeholder Engagement Plan is attached as Appendix D.

6.1.1 Objectives

As required by regulations 21 to 24 of the Environmental Impact Assessment Regulations (GG. Notice 30 of 2012) of the Environmental Management Act (No. 7 of 2007), IFC PS1 and P5, this stakeholder engagement plan (Appendix D) has the objective of consulting with the affected individual, community and/or authority to disclose information on the Project, but also to gather information/concerns/questions from the affected party/ies to be considered in project design, construction, and operation.

In accordance with the general objectives, the Study specific purposes are:

- Identify potentially Interested and Affected Parties (I&APs) or stakeholders as referred to by IFC;
- Inform I&APs of the proposed Project and activities and involve the I&AP in the identification of the socio-environmental risks and opportunities potentially associated with the Project, and the mitigations and measure that need to be taken to manage the anticipated impacts;
- Inform Indigenous communities of the Project and activities and involve the I&AP in the identification of the socio-environmental risks and opportunities potentially

associated with the Project, and the mitigations and measure that need to be taken to manage the anticipated impacts;

- Obtain environmental and social baseline information on the receiving environment that I&APs are usually aware of;
- Collect and document I&APs concerns, expectations, recommendations, and questions regarding the Project and its assessment process; and
- Present the ESIA report to I&APs and include their recommendations and concerns within the ESIA for consideration in project design, construction, and operation.

6.2 OVERVIEW OF ENGAGEMENT REQUIREMENTS

6.2.1 National Requirements

Public consultation is a mandatory requirement for proposed projects as listed under Part IX of the Environmental Management Act (No. 7 of 2012). Regulation 7(1)(a) of the Environmental Impact Assessment Regulations (GG. Notice 30 of 2012) requires that all ESIA Studies incorporate public consultation, with an aim to ensure all parties interested in a proposed project are informed of anticipated project impacts and benefits, and that their views, concerns, and recommendations are incorporated in project planning, design, construction, operation and decommissioning.

It is important to mention that given the COVID 19 pandemic situation, all national COVID 19 protocols and guidelines, as applicable at the time, were observed and respected during the various consultation activities.

6.2.2 International Requirements

As per the ToR (section 1.6), the ESIA and Project is to be developed and implemented according to the IFC Performance Standards on Environmental and Social Sustainability.

Stakeholder engagement as referred to by the IFC is a cross-cutting requirement throughout the Performance Standards, but its specifically highlighted Performance Standard 1: Assessment and Management of Social and Environmental Risks and Impacts, which states, *"Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management, and involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities), and where appropriate, other stakeholders."* The goal is *"to ensure that grievances from affected communities and external communications from other stakeholders are responded to and managed."*

As per Performance Standard 1, the stakeholder engagement section of the ESIA must highlight the following elements:

- Identification of I&APs and Engagement Plan:
    - Identify the I&APs considered to be of interest to and in the Project and consider proposed legal communications requirements (regulation 21 of EMA, 2012) according to which I&APs should be consulted; and
    - Develop and implement a Stakeholder Engagement Plan (Appendix D).

- Disclosure and Presentation of Project Information:
    - ‘’The client will provide Affected Communities with access to relevant information on: (i) the purpose, nature, and scale of the project; (ii) the duration of proposed project activities; (iii) any risks to and potential impacts on such communities and relevant mitigation measures; (iv) the envisaged stakeholder engagement process; and (v) the grievance mechanism. Disclosure of information must be done on an ongoing basis by communicating periodically with affected communities to inform them of project progress.’’

- Consultation:
    - ‘’When Affected Communities are subject to identified risks and adverse impacts from a project, the client will undertake a process of consultation in a manner that provides the Affected Communities with opportunities to express their views on project risks, impacts and mitigation measures, and allows the client to consider and respond to them. The extent and degree of engagement required by the consultation process should be commensurate with the project’s risks and adverse impacts and with the concerns raised by the Affected Communities.’’
    - “Effective consultation is a two-way process that should: (i) begin early identification of environmental and social risks and impacts and continue on an ongoing basis as risks and impacts arise; (ii) be based on the prior disclosure and dissemination of relevant, transparent, objective, meaningful and easily accessible information. This should be in a culturally appropriate local language(s) and format that is understandable to Affected Communities; (iii) focus on the inclusive engagement of those directly affected, as opposed to those not directly affected; (iv) be free of external manipulation, interference, coercion, or intimidation; (v) enable meaningful participation, where applicable; and (vi) be documented.”

- Informed Consultation and Participation:
    - For projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation (ICP) process that will build upon the steps outlined above in Consultation and will result in the Affected Communities’ informed participation.

- Indigenous Peoples:
    - Indigenous Peoples potentially impacted by a Project need to be engaged in an ICP process that is culturally appropriate, and in certain circumstances, the client is required to obtain their Free, Prior, and Informed Consent (FPIC). The requirements related to Indigenous Peoples and the definition of the special circumstances requiring FPIC are described in IFC Performance Standard 7.

It is also required by the EMA (2012) and IFC to implement and maintain a procedure and record of external communications that includes methods to: (i) receive and register external communications from the public; (ii) screen and assess the issues raised and determine how to address them; (iii) provide, track, and document responses, if any; and (iv) adjust the management program, as appropriate.

A Grievance Mechanism for Affected Communities to review and record complaints and concerns is requested by the IFC to facilitate the resolution of issues, which has been developed for this Project. It should aim to enable a quick resolution of issues using an understandable and transparent consultation process.

6.3 ENGAGEMENT APPROACH: AFFECTED COMMUNITIES AND OTHER STAKEHOLDERS

6.3.1 Stakeholder Identification

Considering the nature of the Project and the affected environment through which the existing railway passes, and proposed railway will pass, a detailed identification exercise was completed at the early stage of the Project to record potentially interested and affected parties.

As the public consultation process continued, the list of I&APs was updated to ensure the inclusion and participation of all I&APs having an interest in the Project. At this stage of the project, the methodology used for the stakeholders mapping was to identify the largest range of people affected directly or indirectly by the Project, keeping in mind Covid protocol.

The list of potentially I&APs included the following -:

- Farm adjacent to the railway servitude;
- Local Authority areas through which the railway passes;
- Bulk infrastructure supplier, which infrastructure passes over or under the railway servitude;
- Governmental and regulatory authorities including national and decentralized agencies;
- Community members of all age, sex, and origin;
- Special attention was given to identify vulnerable people, including Indigenous Peoples, women, and people living with disabilities (PLWD), elders and youth, that might be affected by the Project.

The list of Interested and Affected Parties for the Study and Project is presented by Appendix D1.

6.3.2 Consultation Activities Framework

The ESIA-SEP activities planned for the Study included (i) a notice in the printed media notifying the general public of the study and Project and request to register with the Environmental Assessment Practitioner as (EAP) as I&AP; (ii) direct email communication to identified I&APs informing them of the Study and Project, and request for registration and comment; (iii) distribution of the Background Information Document to pre-identified I&APs and calling for registration and submission of comments/questions/concerns, (iv) placing a series of notices in the printed media and radio reads informing the public of the study and proposed Project and calling for registration, and (v) conducting three public consultation meetings at places along the length of the Project area. They were all oriented around a participatory process that aimed to elaborate an ESIA and environmental and social management plan (ESMP) involving I&APs at each step.

It is important to note that I&APs were also invited to give their comments in writing during or after the meetings or using the email address provided on the written correspondence send via email and/or post, as well as presented in the printed media notices. All comments received are included in the section below.

6.3.3 Grievance Redress Mechanism

Grievance management is one of the important pillars of responsible and effective public consultation. A Grievance Redress Mechanism (GRM) provides for the reception, treatment, and documentation of I&APs grievances. The GRM applies to all stages of the Project: from preparation (ESIA) to construction and operation. GRM requirements to this Project for implementation by the Proponent and his/her Contractor is presented in section 10.8 of this ESMP.

During the first round of public consultations, grievances and opinions were collected and email addresses were provided for stakeholders to send additional comments or recommendations after the consultation activities.

6.3.4 Recording and Disclosure of Project Information and Minutes of Consultations

The SEP (and its GRM) core principle is that all communications and decisions that derived from meetings and community consultations are written down and recorded. During stakeholder engagement activities, minutes of the decisions were drafted, and an attendance register list was available for all the attendees to facilitate formal registration of interest (see section 6.4 below).

6.3.5 Integration of Consultation outcomes in the ESIA

Consultation outcomes are key inputs to any ESIA and were used to enhance the Study in various ways:

- Project design requests were collected and shared with the project design team for consideration. As demonstrated in sections 7.1 & 7.2 below, the potential conflicts identified where considered and alternatives proposed and accordingly approved, thereby avoiding many negative impacts and making the Project better adapted to its environment.
- Baseline data and information on the receiving environment was fed into chapter 5, which in turn fed the impact assessment and mitigation measures in chapter 8.
- Potential project impacts identified by Authorities and I&APs were considered and assessed in chapter 8, therefore also feeding the Project of mitigation measures.

6.4 ENGAGEMENT ACTIVITIES DESCRIPTION AND RESULTS: AFFECTED I&APs AND AUTHORITIES

6.4.1 First Round of Consultation

The first round of consultations took place from 28 April 2022 to 30 May 2022. During the first round of consultation, I&APs and authorities were given an opportunity to register and submit comments and/or concerns on the proposed Project for consideration and inclusion into the Project design, construction, and operation.

In addition to the distribution of information and request for comment via the printed media and direct email and post communication, a total of 3 public consultation meetings were held aimed at presenting the Project to the various I&APs, collecting their concerns, answering their questions, and explaining the ESIA process and its different steps. It was also an opportunity to collect contact details of I&APs, create relationships to allow an easy exchange of data, and invite I&APs to collaborate in upcoming discussions and distribute Project information to other persons/entities.

To ensure the involvement of vulnerable communities (i.e., women, people living with disabilities, elders, and youth), email correspondence was directly sent to the identified organisations/individuals to inform them of the study and proposed Project and request their comment on expected impacts/concerns/etc. to be addressed as part of the Study. This email correspondence was followed-up with telephone communications to ensure receipt of the email communication with information and to provide further explanation.

6.4.1.1 Activities of Stakeholder engagement

Activities undertaken to date to ensure effective and adequate I&AP involvement, are as follows:

- Compilation of Pre-Determined Interested and Affected Parties List, and List of vulnerable communities, as well as the continues update thereof as I&APs registered to the study (Appendixes D1a & D1b);

- Notification email (Appendix D2) with Background Information Document (Appendix D3) and public notice (Appendix D4) distributed to I&APs and Authorities on 6 May 2022;
- Notification email (Appendix D5) with Background Information Document (BID) (Appendix D3) and copy of letter addressed to Farm owners (Appendix D6) distributed to farm owners on 23 May 2022;
- Notification letter (Appendix D7) with BID (Appendix D3) and request to register as an I&AP was send via courier (Appendix D8) to Regional and Local Authorities outside Windhoek on 05 May 2022;
- Notification letter (Appendix D9) with BID (Appendix D3) and request to register as an I&AP was hand delivered (Appendix D10) to line Ministries and State-Owned Enterprises in Windhoek on 06 May 2022;
- Notification letters (Appendix D11) were sent via registered post (Appendix D12) to neighbouring Farm owners between Kranzberg Station and Omaruru on 03 May 2022;
- Notification letters (Appendix D13) were sent via registered post (Appendix D14) to neighbouring Farm owners between Omaruru and Otjiwarongo on 05 May 2022;
- Public Notices (Appendix D15) announcing the commencement of the ESIA and an invitation to register as an I&AP and to attend public meetings were placed in 'Die Republikein'; 'Namibian Sun'; 'Allgemeine Zeitung' Market Watch pages and 'The Namibian' newspapers on the 29th of April 2022; the 06th of May 2022 and the 13th of May 2022;
- Notice Boards were couriered to and placed at the Karibib Municipality office; the Karibib Rural Constituency office; the Usakos Municipality office; the Omaruru Municipality office; the Omaruru Constituency office; the Otjiwarongo Municipality office; the Otjozondjupa Regional Council; the Otjiwarongo Constituency office and the Kalkfeld Settlement office (Appendix D16) on 28 April 2022 and displayed for the duration of the 1st round of public consultation;
- Radio live reads were broadcasted twice per day on the 3rd of May 2022; the 5th of May 2022 and the 9th of May 2022, on the NBC National FM in the English language; Kanaal 7 in the Afrikaans language and Hit Radio Namibia in the German language (Appendix D17);
- Public meetings were held at 09:00 at the Karibib Municipality Usab Hall on Tuesday, 10 May 2022; at the Omaruru Rest Camp Conference Hall at 09:00 on Wednesday, 11 May 2022 and at the Otjiwarongo C`Est Si Bon Hotel Conference venue at 09:00 on Thursday, 12 May 2022. The attendance register, power point presentation and minutes of the meeting of each of the mentioned meetings are attached as Appendix D18;
- The Karibib, Omaruru and Otjiwarongo meetings' power point presentations, attendance registers and minutes of the meeting (Appendix D18) were distributed via email (Appendix D19) to all attendees on 16 May 2022 for comment;

- A notification email (Appendix D20) with a Survey Questionnaire (Appendix D21), as well as BID (Appendix G3) and Stakeholder Engagement Meeting Presentation (Appendix D19b) was sent to neighbouring farm owners on 12 October 2022;
- A notification email (Appendix D22) with a Survey Questionnaire (D23), as well as BID (Appendix G3) and Stakeholder Engagement Meeting Presentation (Appendix D19b) was sent to the businesses making use of bulk transportation along the proposed railway upgrade sections on 12 October 2022;
- An email (Appendix D24) with BID (Appendix D3), as well as Stakeholder Engagement Meeting Presentation (Appendix D19b) was sent on 8 November 2022 to various vulnerable communities, providing information on the Study and proposed Project and requesting for comment/input and concerns to be considered as part of the Study; and
- A register (Appendix D25) was opened and maintained and included all registered I&APs who submitted comments or raised their concerns during the consultation process submitted.

All comments, questions, concerns, and feedback received from I&APs and Authorities are summarised in Tables 6.4.1.2-1 and 6.4.1.2-1 below, while a copy of the original correspondence is attached as Appendix D27.

6.4.1.2 Main Concerns and Observations

The main concerns and recommendations raised during the first round are summarized in Tables 6.4.1.2-1 and 6.4.1.2-2 below. They have been grouped into categories of relevance.

Table 6.4.1.2-1 – Summary of Main Concerns raised by I&APs during the 1st Round of Consultation

CONCERN	COMMENTS	REQUESTS / MITIGATION	STAKEHOLDER
WATER USAGE FROM BOREHOLES	The availability of ground water is scares and water levels have dropped due to the drought over the past few years. Abstraction of water for purpose of the construction will have a negative impact on water levels and volumes available, which might result in a shortage of water for farmers with devastating socio-economic implications.	All alternative available sources, NAMWATER pipelines and semi-purified water from various urban areas` sewage works should be considered and made use of to alleviate pressure on the scares underground water source. Available water from the Otjibonde project, which has 'red water', should also be investigated, and considered. A construction water management plan should form part of the Project. Daily abstraction of water from the scares underground water source should be determined and monitored not to result in water levels dropping.	E.H. Höpfner, Owner of Farm San-Remo No. 26; Lorainne Mouton, CEO Assistant | M Trading CC & AGP Tracing, Farm Kakombo 90D, Kakombo 90F, Kakombo 90C, Kakombo 90E; Mr. M. Seelig (Farm Otjipaue No. 112)
NUISANCES	Many of the farms accommodate different types of tourist facilities and attractions, which are sensitive towards any nuisance and disturbances, i.e., noise, dust, visual, etc.	The ESMP should include the necessary mitigation to be applied by the contractor, i.e., screening of activities; notify farm owners of any expected loud construction activities; all activities to remain within railway servitude; no overnight accommodation within servitude; required sanitation; etc. No overnight accommodation is allowed within the railway servitude. Strict control over activities and workers to ensure compliance to best practises compulsory.	Constantine S. Soultos, Owner of Farms: Epako 38, Tjirundu 91 & remainder of Tjirundu 91; Kai-Uwe Denker, Owner of Ameib Guesthouse

CONCERN	COMMENTS	REQUESTS / MITIGATION	STAKEHOLDER
		A grievance mechanism will be in place according to which farm/tourism owners can lodge complaints to the appointed and independent environmental practitioner, which has the responsibility to investigate and resolve the matter. Penalties will be applied as determined by the ESMP.	
HUMAN WASTE POLLUTION	Current poor practises in ablution facilities, in specific a lack of toilets, have resulted in an increasing number of animals diagnosed with beef measles from farmers along the railway line. An increasing number of workers over a longer period during construction will substantially increase the spread of measles as a result of poor sanitation practises.	The provision of toilets and management thereof is compulsory and should be implemented by the contractor with high efficiency. Penalties will be applied to transgressions and will as a result of the possible negative impact be very high (N$ 10,000.00/per incident). A grievance mechanism will be in place according to which farm/tourism owners can lodge complaints to the appointed and independent environmental practitioner, which has the responsibility to investigate and resolve the matter. Penalties will be applied as determined by the ESMP.	Constantine S. Soultos, Owner of Farms: Epako 38, Tjirundu 91 & remainder of Tjirundu 91; Kai-Uwe Denker, Owner of Ameib Guesthouse; Mr. K.P. Clausen (Farm Okosongoro No. 45 & 209);
SECURITY / THEFT / POACHING / WOOD COLLECTION & LOSS OF	Theft, poaching and illegal access to farms from the side of the railway line is currently a huge problem, with resulting economic losses to the farmers. Many of the farms accommodate exotic game and breading animals which are extremely expensive	The control of workers during daytime and no access to adjacent farms is compulsory and should be implemented by the contractor with high efficiency. Penalties will be applied to transgressions and will as a result of the possible negative impact be very high (N$	E.H. Höpfner, Owner of Farm San-Remo No. 26; Constantine S. Soultos, Owner of Farms: Epako 38, Tjirundu 91 & remainder of Tjirundu 91; Kai-Uwe Denker, Owner of Ameib

CONCERN	COMMENTS	REQUESTS / MITIGATION	STAKEHOLDER
CATTLE / WILDLIFE	and economic losses are very high as a result of poaching. The current uncontrolled access to the railway servitude and lack of vegetation control is making it very easy for poachers and other to access farms. A large number of construction workers that will enter the area and be working along the farms, will further increase the risk and losses.	20,000.00/per incident and/or the value of the animal). All workers should wear clothing that can be identified to the particular project and be recorded for at evenings before leaving for their accommodation in the nearby towns. No overnight accommodation is allowed within the railway servitude. Compensation should be paid out to farmer where the construction activities has resulted in the loss of game, cattle, etc. and loss of grazing as a result of veld fires. A grievance mechanism will be in place according to which farm/tourism owners can lodge complaints to the appointed and independent environmental practitioner, which has the responsibility to investigate and resolve the matter. Penalties will be applied as determined by the ESMP. Increased security would be required, and the construction period should be reduced to the shortest possible time. Access to the railway servitude should be locked and controlled during the time of the construction period so as to not allow any other person into the servitude apart from the contractor and workers.	Guesthouse; Mr. K.P. Clausen (Farm Okosongoro No. 45 & 209); Mr. F. Badenhorst (Die Poort No. 298); Mr. D. Kaiser (Walterhagen No. 135 & Kuhworder No. 114); Mr. D. Kaiser (Walterhagen No. 135 & Kuhworder No. 114);

CONCERN	COMMENTS	REQUESTS / MITIGATION	STAKEHOLDER
BORROW-PITS	Borrow pits dating from the previous railway upgrade, conducted by the former SA railway company, was never rehabilitated and holds danger to farm animals. If new borrow pits are not rehabilitated this situation will worsen.	Existing borrow pits should be used for purpose of the proposed project and rehabilitated afterwards, before new borrow pits are opened up. This requirement should be part of the Geotechnical Team's ToR. All new borrow pits or old borrow pits that are reused will be rehabilitated as per the requirements of the ESMP.	Lorainne Mouton, CEO Assistant | M Trading CC & AGP Tracing, Farm Kakombo 90D, Kakombo 90F, Kakombo 90C, Kakombo 90E; Eddy Piechazek, Owner of Farm Kakombo 90D, Kakombo 90F, Kakombo 90C, Kakombo 90E; Mr. M. Seelig (Farm Otjipaue No. 112)
FREE AND UNCONTROLLED ACCESS TO RAILWAY SERVITUDE	Many of the sections of the railway reserve bordering the adjacent farms are uncontrolled providing easy and free access to thieves and poachers. The railway servitude is used to gain access to farms, which is difficult to be controlled.	Access to the railway servitude should be locked and controlled during the time of the construction period so as to not allow any other person into the servitude apart from the contractor and workers. No overnight accommodation is allowed within the railway servitude. All workers should wear clothing that can be identified to the particular project and be recorded for at evenings before leaving for their accommodation in the nearby towns. The control of workers during daytime and no access to adjacent farms is compulsory and should be implemented by the contractor with high efficiency. Penalties will be applied to transgressions and will as a result of the possible negative impact be very high (N$	E.H. Höpfner, Owner of Farm San-Remo No. 26; Constantine S. Soultos, Owner of Farms: Epako 38, Tjirundu 91 & remainder of Tjirundu 91; Kai-Uwe Denker, Owner of Ameib Guesthouse; Mr. K.P. Clausen (Farm Okosongoro No. 45 & 209); Mr. F. Badenhorst (Die Poort No. 298) Mr. D. Kaiser (Walterhagen No. 135 & Kuhworder No. 114);

CONCERN	COMMENTS	REQUESTS / MITIGATION	STAKEHOLDER
		20,000.00/per incident and/or the value of the animal). A grievance mechanism will be in place according to which farm/tourism owners can lodge complaints to the appointed and independent environmental practitioner, which has the responsibility to investigate and resolve the matter. Penalties will be applied as determined by the ESMP.	
RISK OF FELD FIRES	Un-rehabilitated borrow pits next to the railway servitude complicates the removal of grasses for purpose of fire breaks, which again increase the risk of feld fires spreading from the one farm to the other. A lack of vegetation control within the railway servitude increases the risk of feld fires and spreading from the one farm to the other. Construction activities are associated with a variety of activities that might result in sparks or fires, which can cause great damage to grazing and loss of animals. Fires for cooking and as a result of irresponsible smoking are all causes of feld fires, which with an increase in the number of workers will increase the risk.	Existing borrow pits should be used for purpose of the proposed project and rehabilitated afterwards, to enable better fire breaks in between farms. This requirement should be part of the Geotechnical Team's ToR. All new borrow pits or old borrow pits that are reused will be rehabilitated as per the requirements of the ESMP and in accordance with the Roads Authority's Guidelines for Borrow Pit Rehabilitation (Appendix H). Vegetation control during and after construction is a requirement to be applied by the contractor (for construction period) and Proponent (during operation. Fire breaks should be provided to both sides of the railway reserve and maintained by the Contractor for the remainder of the construction	Constantine S. Soultos, Owner of Farms: Epako 38, Tjirundu 91 & remainder of Tjirundu 91; Kai-Uwe Denker, Owner of Ameib Guesthouse; Eddy Piechazek, Owner of Farm Kakombo 90D, Kakombo 90F, Kakombo 90C, Kakombo 90E; Mr. K.P. Clausen (Farm Okosongoro No. 45 & 209); Mr. G. Steckel (Farm Ondombo West); Mr. F. Badenhorst (Die Poort No. 298); Mr. D. Kaiser (Walterhagen No. 135 & Kuhworder No. 114)

CONCERN	COMMENTS	REQUESTS / MITIGATION	STAKEHOLDER
		period and by TransNamib for the remainder of the operational phase. Open fires within undedicated areas are prohibited and will be penalised. Dedicated mobile cooking areas should be provided, which provide effective protected. A grievance mechanism will be in place according to which farm/tourism owners can lodge complaints to the appointed and independent environmental practitioner, which has the responsibility to investigate and resolve the matter. Penalties will be applied as determined by the ESMP.	
LOSS OF LAND	The changes to the railway alignment since the German period to that of the current railway has resulted in small portions of land (i.e., previously railway) not being used for railway purposes anymore. The new railway alignment with servitude will equally result in pockets of land not being required for railway anymore, but will remain fenced as is with no benefit to any party. Prices for land required for the new railway line should be determined at commercial farmlands value.	Pockets of land that becomes available as a result of the change of the servitude should be made available to the applicable farmer. Fences should be relocated to open-up these areas and be for the cost of the developer.	Constantine S. Soultos, Owner of Farms: Epako 38, Tjirundu 91 & remainder of Tjirundu 91; Kai-Uwe Denker, Owner of Ameib Guesthouse; Lorainne Mouton, CEO Assistant | M Trading CC & AGP Tracing, Farm Kakombo 90D, Kakombo 90F, Kakombo 90C, Kakombo 90E; Mr. K.P. Clausen (Farm Okosongoro No. 45 & 209); Mr. M. Hoffmann (Farm Goodhope)

CONCERN	COMMENTS	REQUESTS / MITIGATION	STAKEHOLDER
	The new railway line with servitude, if constructed to the east of the existing railway line will infringe into the Goodhope development at Otjiwarongo, as well as south of Omaruru. These infringements will result not only in a loss of land, but would result in being contradictory to the applicable town planning scheme. These portions becoming smaller will result in the affected portions becoming less economical.	The mentioned developments should be avoided, and the railway alignment be amended.	
FENCE AND SERVITUDE MAINTENANCE	Maintenance of the current fence is not being done as stipulated by the Fencing Proclamation No. 57 of 1921, resulting in that farmers are exclusively responsible for the up keeping and cost.	The Proponent should take notice of the Fencing Proclamation No. 57 of 1921 and attend to their part of the agreement. A grievance mechanism will be in place according to which farm/tourism owners can lodge complaints to the appointed and independent environmental practitioner, which has the responsibility to investigate and resolve the matter. Penalties will be applied as determined by the ESMP. Fences to be erected as a result of the new servitude should be done by making use of old steel sleepers to act as poles. This will ensure a long-term solution compared to wooden poles which deteriorate over time and is easily damaged during fires.	Eddy Piechazek, Owner of Farm Kakombo 90D, Kakombo 90F, Kakombo 90C, Kakombo 90E; Mr. K.P. Clausen (Farm Okosongoro No. 45 & 209); Mr. G. Steckel (Farm Ondombo West); Mr. M. Seelig (Farm Otjipaue No. 112); Mr. F. Badenhorst (Die Poort No. 298) Mr. D. Kaiser (Walterhagen No. 135 & Kuhworder No. 114);

CONCERN	COMMENTS	REQUESTS / MITIGATION	STAKEHOLDER
	Maintenance of the servitude area is not attended too, which increase the risk of feld fires spreading from the one farm to the other. The lack of maintenance to grasses, shrubs and bushes increases the risk of poaching, theft, etc., as intruders are not visible within the servitude.	Fire breaks should be provided to both sides of the railway reserve and maintained by the contractor. Open fires within undedicated areas are prohibited and will be penalised. Dedicated mobile cooking areas should be provided, which provide effective protected. Vegetation maintenance within the servitude will be responsibility of the contractor for the remainder of the construction period, while for the operational period that will become the responsibility of the Proponent. A grievance mechanism will be in place according to which farm/tourism owners can lodge complaints to the appointed and independent environmental practitioner, which has the responsibility to investigate and resolve the matter. Penalties will be applied as determined by the ESMP.	
SAFETY AND SECURITY	Safety and security of the farmers and their workers is becoming an increasing concern, which will further be compromised by the increasing number of workers and activities along the railway servitude. Access to borrow pits for purpose of gravel and soil open-ups farms to potential criminal activities, which again compromise safety and security.	Access to the railway servitude should be locked and controlled during the time of the construction period so as to not allow any other person into the servitude apart from the contractor and workers. No overnight accommodation is allowed within the railway servitude.	E.H. Höpfner, Owner of Farm San-Remo No. 26; Constantine S. Soultos, Owner of Farms: Epako 38, Tjirundu 91 & remainder of Tjirundu 91; Kai-Uwe Denker, Owner of Ameib Guesthouse; Mr. K.P. Clausen (Farm Okosongoro No. 45 & 209);

CONCERN	COMMENTS	REQUESTS / MITIGATION	STAKEHOLDER
	Overnight accommodation camps are a concern as this compromise safety and security of the farms. Uncontrolled and free access along the railway servitude is resulting in increasing crime and theft, and compromise safety.	All workers should wear clothing that can be identified to the particular project and be recorded for at evenings before leaving for their accommodation in the nearby towns. The control of workers during daytime and no access to adjacent farms is compulsory and should be implemented by the contractor with high efficiency. Penalties will be applied to transgressions and will as a result of the possible negative impact be very high (N$ 20,000.00/per incident and/or the value of the animal). Access to and from borrow pits during daytime should be controlled and the necessary fencing should be provided to restrict unauthorised access. A grievance mechanism will be in place according to which farm/tourism owners can lodge complaints to the appointed and independent environmental practitioner, which has the responsibility to investigate and resolve the matter. Penalties will be applied as determined by the ESMP.	Mr. G. Steckel (Farm Ondombo West); Mr. F. Badenhorst (Die Poort No. 298); Mr. D. Kaiser (Walterhagen No. 135 & Kuhworder No. 114); Mr. D. Kaiser (Walterhagen No. 135 & Kuhworder No. 114);
SAFE CROSSINGS	Road over rail crossings should be safe and accessible for smaller sedan vehicles as well. Some ramps over the rails are problematic for lower sedan vehicles due to too steep gradients.	All road over rail accesses should be designed as to provide gradual gradients to enable smaller sedan vehicles to pass over rails without getting stuck or cause damage to bottom of sedan vehicles.	Eddy Piechazek, Owner of Farm Kakombo 90D, Kakombo 90F, Kakombo 90C, Kakombo 90E

CONCERN	COMMENTS	REQUESTS / MITIGATION	STAKEHOLDER
INSTITUTIONAL CAPACITY AND KNOWHOW	Current state of affairs with respect to service provision, management and upkeep of infrastructure is extremely poor and almost non-existing. TransNamib and responsible Ministerial Departments/Divisions are not qualified and experienced to manage such important infrastructure and service. Upgrading of infrastructure alone will not resolve poor management and service.	Privatisation and restructuring of the NGO, TransNamib, is required. Well qualified and experienced personnel need to be appointed and upgrading of all train stations, stock yards, rolling stock and support equipment/infrastructure is required. The investment of billions of N$ would not bring a change in the management and service of TransNamib, which again would serve no long-term financial benefit and/or achievement of becoming a trade hub.	Eddy Piechazek, Owner of Farm Kakombo 90D, Kakombo 90F, Kakombo 90C, Kakombo 90E E.H. Höpfner, Owner of Farm San-Remo No. 26; Constantine S. Soultos, Owner of Farms: Epako 38, Tjirundu 91 & remainder of Tjirundu 91; Kai-Uwe Denker, Owner of Ameib Guesthouse; Mr. K.P. Clausen (Farm Okosongoro No. 45 & 209); Mr. G. Steckel (Farm Ondombo West); Mr. F. Badenhorst (Die Poort No. 298); Mr. D. Kaiser (Walterhagen No. 135 & Kuhworder No. 114); Mr. D. Kaiser (Walterhagen No. 135 & Kuhworder No. 114) Eddy Piechazek, Owner of Farm Kakombo 90D, Kakombo 90F, Kakombo 90C, Kakombo 90E; Mr. K.P. Clausen (Farm Okosongoro No. 45 & 209); Mr. G. Steckel (Farm Ondombo West); Mr. M. Seelig (Farm Otjipaue No. 112); Mr. F. Badenhorst (Die Poort No. 298) Mr. D. Kaiser

CONCERN	COMMENTS	REQUESTS / MITIGATION	STAKEHOLDER
			(Walterhagen No. 135 & Kuhworder No. 114);

Table 6.4.1.2-2 – Summary of Main Concerns raised by Vulnerable Groups during the 1st Round of Consultation

CONCERN	COMMENTS	REQUESTS / MITIGATION	STAKEHOLDER NAME
SAFE TRAIN STATION ACCESSIBILITY FOR PEOPLE WITH DISABILITIES'	The project only seeks to upgrade the railway lines between the respective towns and does not include the railway stations at each town or any trains. Therefore, the National Disability Council of Namibia (NDCN) does not have any feedback or objections. If the railways stations and trains were to be upgraded or replaced, then the NCDN would have to look at the accessibility and accommodation of persons with disability within this infrastructure.	Where not in place, provision should be made for infrastructure to enable easy accessibility and accommodation of people with disabilities at all train stations. Although this does not form part of this proposed Project, the concern and request should be included in the future plans for upgrading of all stations. The upgrading of the railway line itself would serve no benefit to the disabled if stations are not upgraded to be sensitive and supportive to the disabled.	National Disability Council of Namibia / Regain-Trust NGO
COMPENSATION	Certain sections of the proposed railway alignment deviates onto adjacent farmlands, which would be 'expropriated' for railway use, which directly results in a loss of agricultural land to the farmer having an economic value.	All land 'expropriated' for railway use should be financially compensated at market related economic values. The extent of the impact will be personally discussed with the identified affected Farm Owners to enable fair compensation.	Regain-Trust NGO

6.4.2 Second Round of Consultation

Engagement with the public and authorities as part of the second round of public consultation commenced on the 21st of June 2022 and concluded on the 28th of June 2022. During the second round of consultation, I&APs and authorities were given an opportunity to submit comments on the Draft ESIA Report for consideration and inclusion into the Final ESIA Report (content of this report).

6.4.2.1 Activities of Stakeholder engagement

Activities undertaken to date to ensure effective and adequate I&AP involvement, are as follows:

- A notification email (Appendix D26) informing all affected authorities and registered I&APs of the availability of the Draft ESIA Report and request for comment was distributed on 21 June 2022.

6.4.2.2 Comments Received and Responses Provided

The comments and/or concerns raised during the second round of public consultation is presented in Table 6.4.2.2-1 below. Copies of the correspondence with I&APs are attached as Appendix D27.

Table 6.4.2.2-1 - Comments received during the second round of public consultation

NO.	NAME	COMMENTS	NAME	RESPONSE
1.	NAMWATER Jolanda Kamburona (30 June 2022)	Dear Brand, NAMWATER has reviewed the ESIA report and is in agreement with the content of the report. Of particular interest to NAMWATER is the mitigations and management actions pertaining to hydrology-water resource quantity. NAMWATER is in agreement with the mitigation measures presented in the report. On section 8.2.17 Bulk Infrastructure (Sewage), the report mentions that coordination is required with NAMWATER, however this is not the case, as coordination with NAMWATER is only needed in the case of Water Bulk Infrastructure.	Urban Green cc Brand van Zyl (4 July 2022)	Dear Jolanda, Your email below refers. Thank you, I take note.

6.4.3 Social Acceptability Assessment

Although stakeholders have indicated their support for development projects, a general concern about the successful operation of the new infrastructure, once construction has been completed, remains and as a result, this project is met with hesitation and concern. These arise from the consideration of the number of recent well documented derailments and accidents involving the railway transportation sector, as well as current poor management and service delivery.

Information about the project was communicated to stakeholders via various means during the stakeholder engagement phase (see Chapter 6). Social acceptability of a project generally increases as the project progresses, and expectations of stakeholders are met.

In the absence of a socio-economic survey and site visit, detailed information and individual opinions could not be considered, but rather comments and concerns expressed at the public consultation meetings were taken into consideration.

A questionnaire survey was undertaken to obtain more detailed information and opinion from the side of the farm owners residing adjacent to the railway line and those businesses currently making use of bulk transportation via road. Following the survey period of 16 days (12 to 28 October 2022) only two completed questionnaires were received (see Appendix D21a).

Due to the limited number of questionnaires received back (two), which represents only 1.75% of the total questionnaires send out, no representative opinion can be formed.

7 PROJECT ALTERNATIVES AND RESULTS OF COMPARISON

7.1 OVERVIEW

The Phase 1 part of the Project entails the upgrading of the railway section in between Kranzberg Station to Otjiwarongo Station, as presented in Chapter 4. The larger part of the railway line passes through predominantly commercial farmlands, with a few urban areas along the way, i.e., Omaruru, Kalkfeld and Otjiwarongo.

The proposed railway line alignment will follow the existing railway line for most of the length between Kranzberg Station and Otjiwarongo Station, with some deviations to ensure that rail curvature is in accordance with safety standards (taking into consideration the design speed and load). For the section in between Kranzberg Station to Omaruru, a total of 79 deviations are planned, with 16 of these deviations extending onto neighbouring portions of land (see Appendix E). For the section in-between Omaruru and Otjiwarongo, a total of 88 deviations are planned, with 13 of these deviations extending onto neighbouring portions of land (see Appendix E). The engineering drawings indicating the deviations onto adjacent portions of land are attached as Appendix F.

From the 167 proposed deviations 5 deviations are considered problematic for various reasons and alternative alignments were accordingly proposed and accepted.

The site-specific impact of borrow pits has yet to be determined. Currently, borrow pits are planned for every 5 km interval, but geotechnical investigations could determine otherwise. Once the geotechnical surveys have been completed this component of the study will be investigated, assessed and included into the updated ESIA.

7.2 PROBLEM LOCALITY & REASON/S

Following the field survey (i.e., trolley inspection) and evaluation of the overlay data (i.e., engineering horizontal and vertical sections, the following areas were identified as potentially problematic justifying consideration of alternative alignment.

7.2.1 Goodhope Development Otjiwarongo

The Goodhope residential-agricultural estate is located south of Otjiwarongo, east of the Kalkfeld-Otjiwarongo main road (T0204). The existing railway line and proposed railway line passes the Goodhope development to the north side. The railway servitude is located in-between the Goodhope development and the Kalkfeld-Otjiwarongo T0204 main road (see Figure 7.2.1-1).

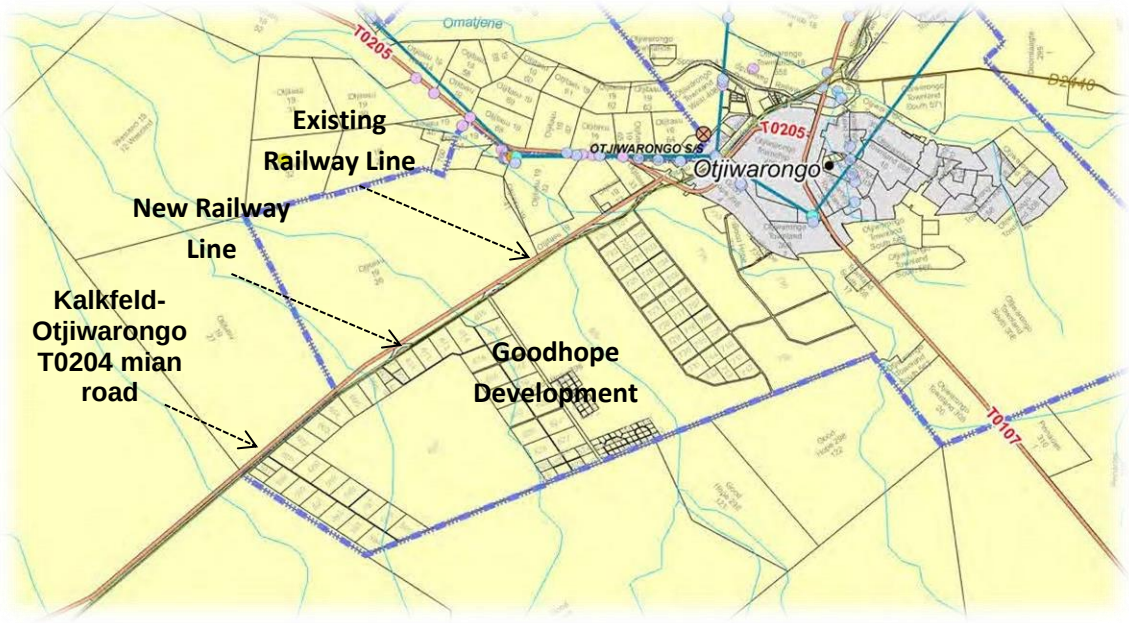


Figure 7.2.1-1 – Goodhope Development

The layout of the Goodhope development was prepared considering the existing railway line's 'servitude' or fenced area, which is currently being disputed by TransNamib as the legal boundary. TransNamib is considering the initial railway boundary as the legal boundary.

The current dispute regarding legal boundaries between the Goodhope development and TransNamib may cause a delay in implementation of the Project, and it is thus accordingly recommended to move the new railway alignment to the northern side of the existing railway line. The proposed new railway line will thus be located on available land in between the existing railway line and the Kalkfeld-Otjiwarongo T0204 main road, as presented in section 7.2 below.

7.2.2 Erongo Park Estate

The Erongo Park estate is located south-west of Omaruru, obtaining access of the T0203 (C33) via the D2315. The existing railway line and proposed railway line passes the Erongo Park development to the east. The proposed straighter railway line will affect 4 adjacent land portions. The impact will affect the usable area of these rather small agricultural portions of land and might have an impact on densities that need to be changed as provided for by the Omaruru Town Planning Scheme.

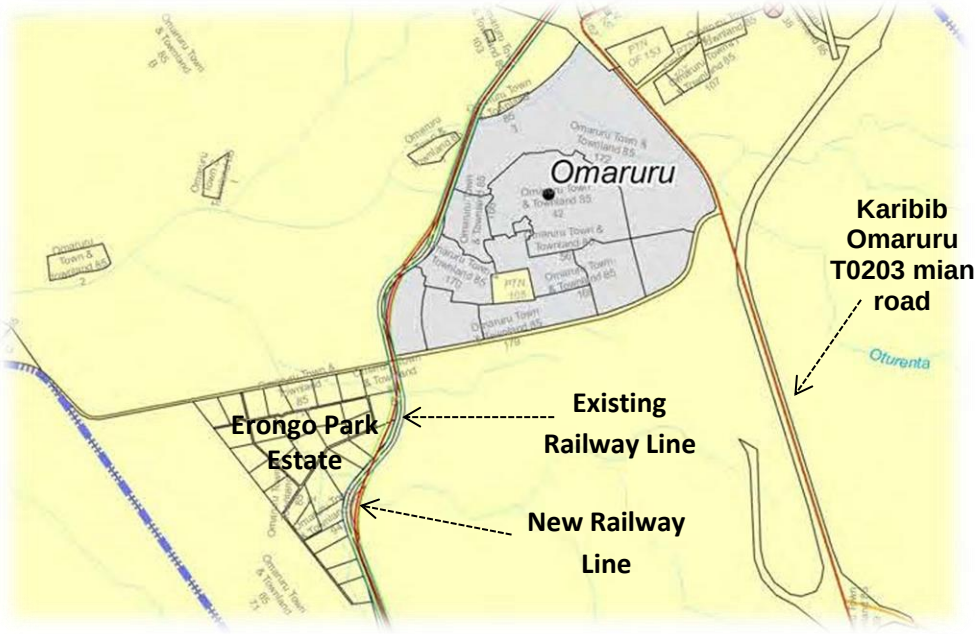


Figure 7.2.2-1 – Erongo Park Estate

Considering the potential loss of land from already small agricultural portions of land and the legal implications to change land densities, it is recommended to realign the new railway line not to affect these portions of land, but move eastwards onto the larger available portion of land (i.e., Omaruru Townlands) owned by the Omaruru Municipality.

7.2.3 Omaruru Unproclaimed Township

The unproclaimed township is located to the south-western parts of Omaruru, as indicated by Figure 7.2.3-1 below. The existing railway line and proposed railway line passes the township to the west. The proposed straighter railway line will affect the western part of this unproclaimed township as it extends into the township.

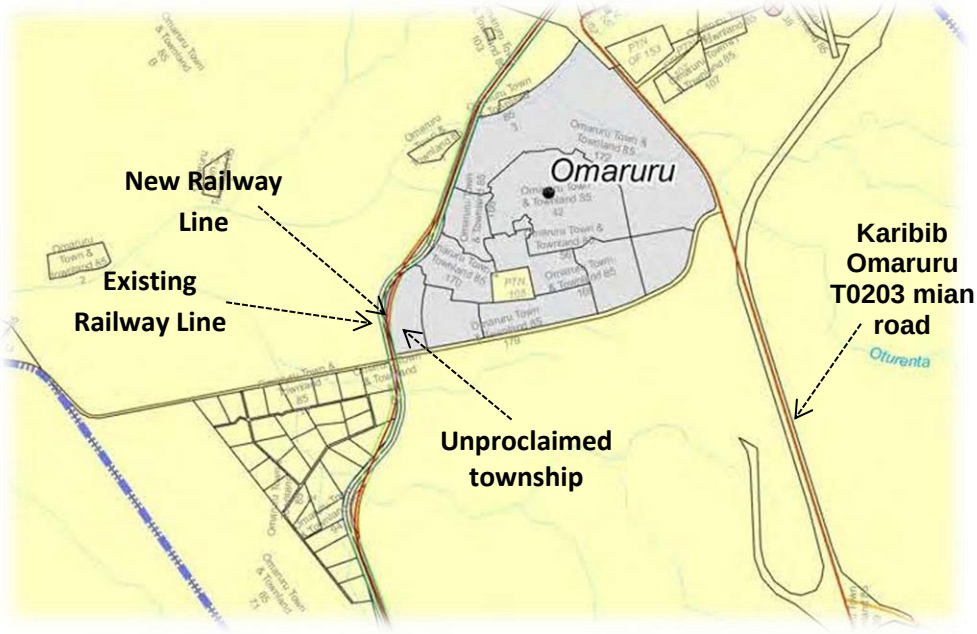


Figure 7.2.3-1 – Omaruru Unproclaimed Township

Considering the potential loss of planned urban land already occupied, it is recommended to realign the new railway line not to affect the mentioned township, but move westwards onto the larger available portion of land (i.e., Omaruru Townlands) owned by the Omaruru Municipality.

7.2.4 Farm Infrastructure

Section 2 Phase 1, between Omaruru Station and Kakombo Siding, a deviation of the proposed railway line to the west goes over an existing wind pump, dam, and cattle kraal (Appendix F1 –PW1040).

Section 1 Phase 1, between Norman Siding and Omaruru Station, a deviation of the proposed railway line to the west will go through an electrified game fence of an estate south of Omaruru (Appendix F1 –PW1034).

Considering the cost implication and impact to the agricultural activity affected, it is recommended to consider realigning the proposed railway line not to affect this infrastructure.

7.2.5 Outcrop

Section 2 Phase 1, between Kaalkop Siding and Kalkfeld Station a deviation of the railway line to the east means that probable blasting must take place in outcrop area. The problem area is between Km 128.307 and 140.274 on the railway line. It is recommended to keep the same alignment passing through the outcrop and amend the curvatures before and after the outcrop.

7.3 ALTERNATIVE ALIGNMENT OPTIONS (RESULTS OF COMPARISON)

The alternative alignment options proposed and agreed, for the above-mentioned problematic areas (section 7.2), are presented below.

7.3.1 Goodhope Development Otjiwarongo

The proposed new railway line will thus be located on available land in between the existing railway line and the Kalkfeld-Otjiwarongo T0204 main road, as presented by Figure 7.3.1-1 below.

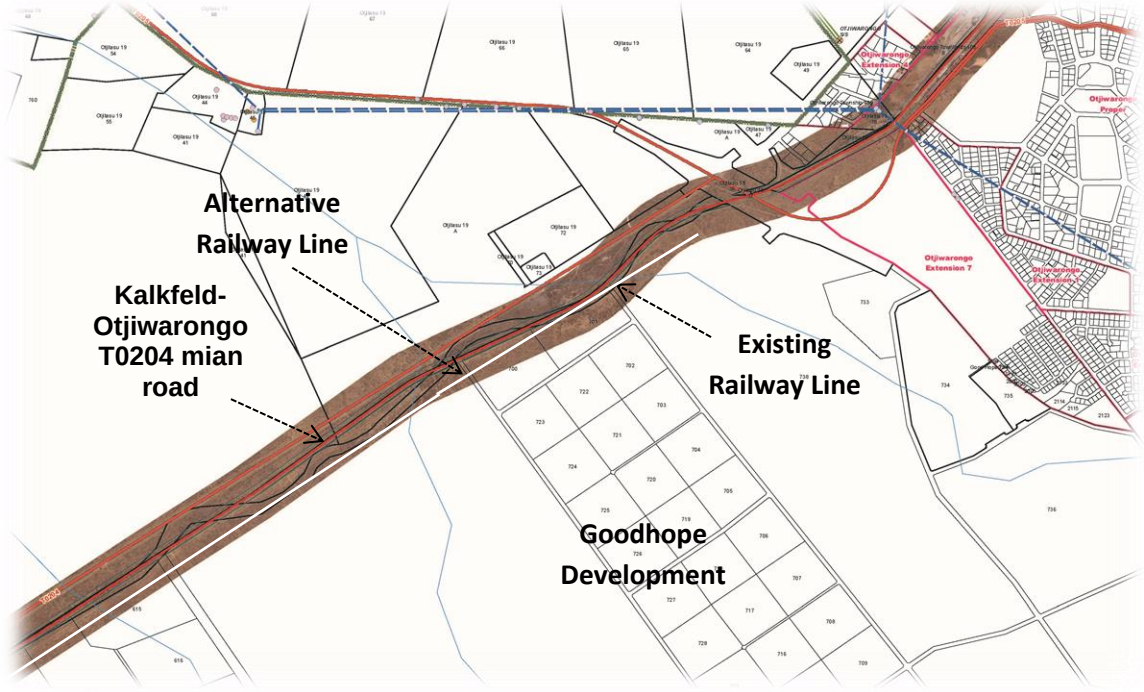


Figure 7.3.1-1 – Alternative Railway Alignment at Goodhope Development

7.3.2 Erongo Park Estate

Considering the potential loss of land from already small agricultural portions of land and the legal implications to change land densities, it is recommended to realign the new railway line not to affect these portions of land, but move eastwards onto the larger available portion of land (i.e., Omaruru Townlands) owned by the Omaruru Municipality.

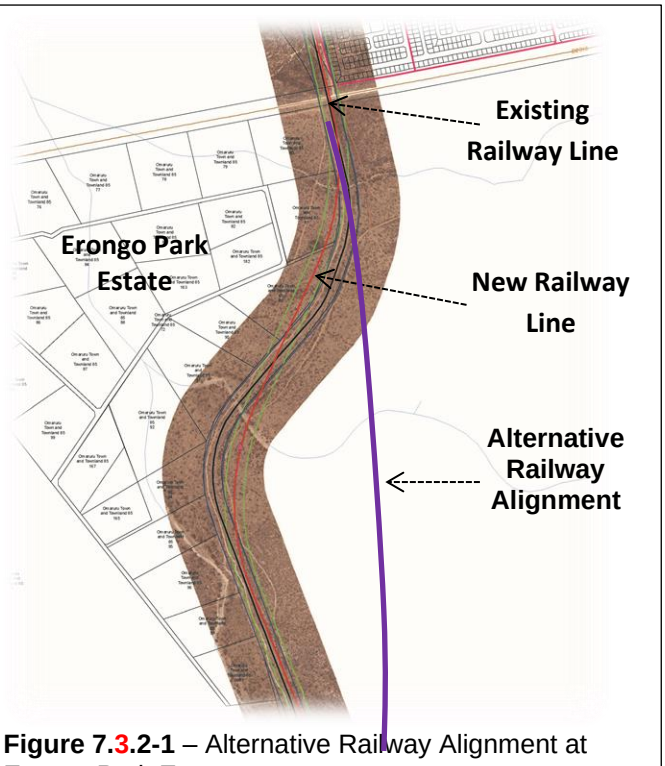


Figure 7.3.2-1 – Alternative Railway Alignment at Erongo Park Estate

7.3.3 Omaruru Unproclaimed Township

Considering the potential loss of planned urban land already occupied, it is recommended to realign the new railway line not to affect the mentioned township, but move westwards onto the larger available portion of land (i.e., Omaruru Townlands) owned by the Omaruru Municipality.

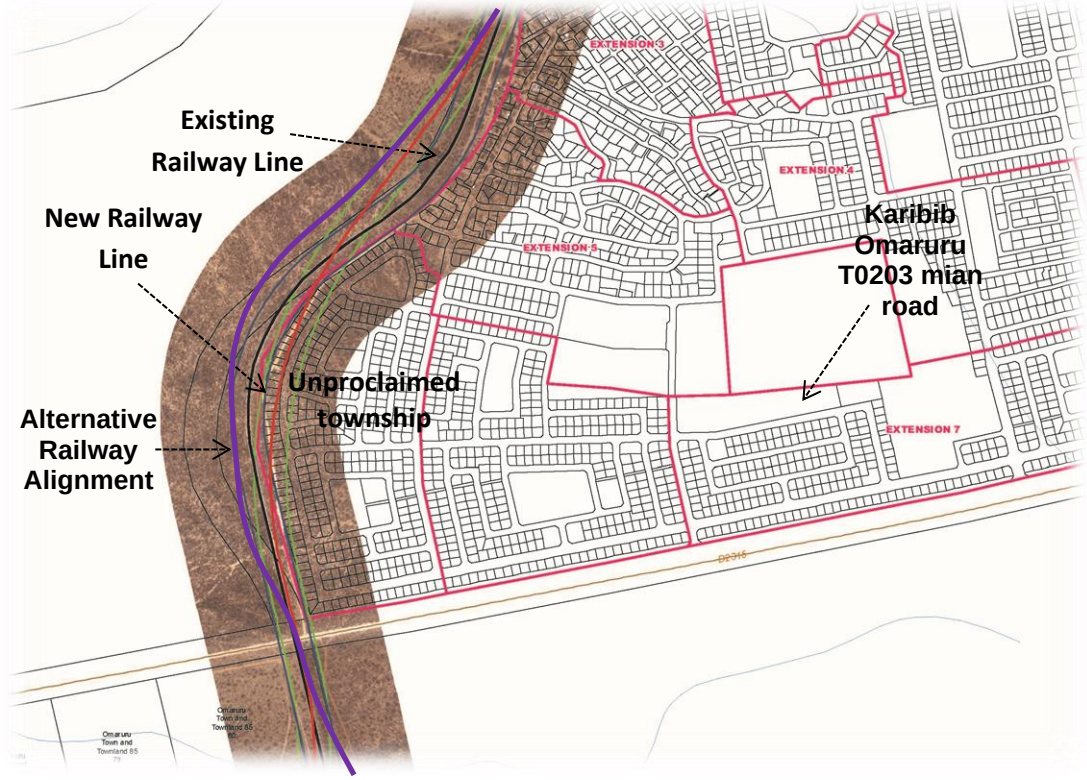


Figure 7.3.3-1 – Alternative Railway Alignment at Omaruru Unproclaimed Township

7.3.4 Farm Infrastructure

Considering the cost implication and impact to the agricultural activity affected, it is recommended to consider realigning the proposed railway line not to affect this infrastructure.

7.3.5 Outcrop

It is recommended to keep the same alignment passing through the outcrop and amend the curvatures before and after the outcrop.

7.4 GENERAL CONSTRUCTION-RELATED ALTERNATIVES

7.4.1 Overnight Accommodation Camps

Considering the expected socio-economic impact of having overnight accommodation camps along railway within the servitude, no overnight accommodation should be allowed, and workers should be accommodated within accommodation camps within the nearest urban centre. Effective control and management of these accommodation camps are essential.

7.4.2 Existing Borrow Pits

Preference should be given to existing borrow pits before new borrow pits are opened-up. Existing old borrow pits previously used for purpose of railway construction should be rehabilitated, as per the Roads Authority's Guidelines for Borrow Pit Rehabilitation Plan (Appendix H).

7.4.3 Mode of Transport

Most of the construction equipment, goods and material required for construction along the railway line should be transported via rail.

Only sand and stone from borrow pits to the construction site should be done with trucks, as well as workers from the urban centres to the construction site with busses.

7.4.4 Construction Camps

Construction camps should preferably be placed at existing sidings for easy off-loading and on-loading of construction equipment, goods, and materials.

8 IMPACT ASSESSMENT AND MITIGATIONS

This chapter presents a description and assessment of the key issues of concern and potential impacts expected as a result of the proposed project as assessed by the environmental impact assessment practitioners and Specialists. Mitigation measures relevant to the planning and design, construction, and operational phases of the proposed project, as appropriate, are recommended. These measures are aimed at avoiding, minimising or rehabilitating negative impacts or enhancing potential benefits. The significance of potential impacts without and with mitigation is also provided.

Given the nature of the proposed Project (see Chapter 4), evaluated against the sensitivity of the receiving environment (see Chapter 5), various impacts on the immediate and surrounding receiving socio-economic and biophysical environments can be expected. An understanding of these expected impacts together with active control measures and mitigating factors can minimise such impacts, even avoid impacts in certain cases, as presented in Chapter 7.

The spatial boundaries and assessment conducted in this chapter is based on the methodology presented in Chapter 2.

Note that the implementation of the mitigation measures proposed in this chapter will be enforced through on-site monitoring and follow-up actions as presented in chapter 10. In addition, the measures will be integrated in various management/action plans composing the Engineering, Procurement and Construction (EPC) Contractor's and the Operation & Maintenance (O&M) Contractor's Environmental and Social Management Plan (ESMP), supported by an Environmental and Social Management System (ESMS). The ESMP and ESMS are presented separately from the ESIA, but briefly presented in Chapter 10.

For this assessment's purpose, the issues and impacts identified are grouped according to the main project phases – i.e., the planning phase, the construction phase, the operational phase and decommissioning and closure phase. Sections 8.1, 8.2 and 8.3 give a broad overview of each potential impact expected during the three phases, while a comprehensive assessment outcome with mitigations is presented for each potential impact.

8.1 PROJECT PLANNING & DESIGN PHASE

The planning phase is the current phase within which the proposed Project is, the phase where conceptual designs and plans are drafted for discussion and evaluation, which will result in the final designs and plans for implementation. Issues to be considered during the planning phase are not necessarily assessed according to the assessment criteria as explained in section 2.4 of Chapter 2: Approach and Methodology.

Some of the issues raised as part of this phase could have just as well been grouped under the construction- or operational phases of the proposed project, but is regarded of such importance that it be considered during the planning phase already.

8.1.1 Conflict Areas Requiring Realignment

(i) Overview

The proposed railway line alignment will follow the existing railway line for the majority of the length between Kranzberg Station and Otjiwarongo Station, with some deviations to ensure that rail curvature is in accordance with safety standards (taking into consideration the design speed and load). For the section in between Kranzberg Station to Omaruru, a total of 79 deviations are planned, with 16 of these deviations extending onto neighbouring portions of land (see Appendix E1). For the section in-between Omaruru and Otjiwarongo, a total of 88 deviations are planned, with 13 of these deviations extending onto neighbouring portions of land (see Appendix E2). The engineering drawings indicating the deviations onto adjacent portions of land are attached as Appendix F.

From the 167 proposed deviations 5 deviations are considered problematic for various reasons and alternative alignments were accordingly proposed and accepted, as presented in Chapter 7.

The site-specific impact of borrow pits has yet to be determined. Currently, borrow pits are planned for every 5 km interval, but geotechnical investigations could determine otherwise. Once the geotechnical surveys have been completed this component of the study will be investigated, assessed and included into the updated ESIA.

(ii) Potential Impact

The impacts expected are presented in section 7.2 above.

(iii) Recommendation

The proposed realignment of the new railway line to avoid the identified conflict areas are presented in section 7.3 above.

8.1.2 Railway Servitude

(i) Overview

The current 60m railway servitude was never surveyed and registered with the office of the Surveyor General with the Ministry of Agriculture, Water and Land Reform.

(ii) Potential Impact

This ‘unsurveyed and registered state’ has resulted in disputed between adjacent landowners and TransNamib, i.e., the Goodhope Development at Otjiwarongo.

(iii) Recommendation

The final servitude following the implementation of the Project should be surveyed and registered with the office of the Surveyor General with the Ministry of Agriculture, Water and Land Reform, as per the applicable legislation.

8.2 CONSTRUCTION PHASE

The construction activities, which have been considered, include those activities based on the information provided by the Proponent and commonly associated with such activity (i.e., construction of infrastructure).

The physical construction activity in itself is mostly temporary in nature, but may result in permanent damage if not properly planned, mitigated and managed.

8.2.1 Air Quality & GHG Emissions

Air quality and GHG emissions will be affected by activities associated with the pre-construction, construction, and operational phases. Information relating to the ambient air quality and the GHG emissions baseline conditions is presented in section 5.2.1 of Chapter 5: Baseline Conditions.

Dust and gaseous emissions are associated with construction activities, with dust generation being the main concern of which the severity is directly related to the extent of the construction activity and the nature of the receiving environment. In certain parts where more groundwork is required, the effect of dust generation will be greater.

The air quality of the larger sections of the immediate study area (PPA) is considered to be of a very good quality considering the predominant agricultural nature, while the urban areas affected does not have any large-scale industrial activities. Air quality within the urban areas can be expected to be more affected by emissions from the larger volumes of vehicles, open fires, and some light industrial activities.

Air quality, as a result of the construction activities, will affect visibility (i.e., safety) and cleanness (health) of both the construction personnel and nearby receptors. The significance depends on the extent of the construction activity, natural conditions (i.e., dry windy months compared to rainy season) and the distance to the closest receptor.

The proposed Project includes several pre-construction and construction activities that may affect air quality and GHG emissions:

- Open areas cleared of vegetation;
- operation of mechanical equipment and machinery that will contribute to the release of emissions;
- transportation of equipment (either truck or rail), workers and truck traffic required to move soil, gravel, concrete, etc. to the site and unsuitable excavated material from the site will contribute to the emissions;
- operations at borrow pits and base preparations, which will generate dust;
- handling large quantities of soil and sand on the site for filling/embankment works, which will generate dust;

- trucks leaving the work site with muddy tires may transfer this mud to local roads which, once dried, could generate dust from regular traffic; and
- The manufacturing of cement used in concrete for structural work will contribute to the emission of GHGs.

Table 8.2.1-1 below presents the assessment outcome for air quality.

Table 8.2.1-1: Impact assessment pertaining to air quality

CRITERIA	DESCRIPTION	
Nature	Dust pollution	CO^2 emissions
Status (+ or -)	Negative to workers' safety and health Negative to by passers (i.e., local people and tourists)	Negative to workers' safety and health Negative to by passers (i.e., local people and tourists)
Extent	Site specific (PPA)	Site specific (PPA)
Duration	Medium	Medium
Intensity	Low	Low
Probability	Probable	Probable
Significance (no mitigation)	**Medium**	**Medium**
Mitigation	See table 10.2-1	See table 10.2-1
Significance (with mitigation)	**Low**	**Low**
Confidence level	High	High

Given the expected scale of the construction activities, the distance to the nearest permanent receptors, the prevailing wind direction (south-westerly winds) and wind speeds, dust from construction activities are expected to be temporary in nature and have a ***medium*** pre-mitigation impact significance rating and ***low*** post-mitigation significance rating. The reduction in the impact significance rating relates mostly to occupational dust impacts.

Implementation of the proposed mitigation measures has the capacity to reduce impacts, resulting in the overall lowering of dust and particle emissions within the Project area and by

limiting air emissions through proper maintenance and good operating practices of equipment and machinery, therefore minimizing adverse impacts on human health and the environment by minimizing air pollution from project activities as required by IFC PS3 and PS4, thereby preventing pollution (OS4) and climate change (OS1). The intensity of the residual impact associated with the Project is thus considered low. However, residual impacts will still be felt at the scale of the PPA and for the duration of the Project (medium-term duration).

8.2.2 Noise & Vibrations

Noise & vibrations will be affected by activities associated with the pre-construction, construction, and operational phases. Information relating to the Noise & vibrations baseline conditions is presented in section 5.2.2 of Chapter 5: Baseline Conditions.

Construction activities are associated with noises and vibrations, of which differs in intensity pending the type of construction taking place. The effect of noises during the construction phase is experienced by the surrounding receptors and/or the on-site construction personnel.

The nature of the construction activities is not associated with any large scale or high intensity noise activities. Blasting will be restricted to the minimum and only in those places where no alternative means exists. The preparation and grading of the base, i.e., construction truck and machinery, is expected to have the highest possible impact in this respect, while the laying of aggregate and sleepers, as well as fixing of the rails would have the least possible impact.

The proposed Project includes pre-construction and construction phase activities that may affect ambient noise:

- Movement and operation of heavy vehicles and machinery used to implement temporary construction facilities, for site preparation and other construction work requirements;
- Operation of borrow pits; and
- Construction of structural work including bridges, culverts, interchanges, underpasses, foot over-bridges, over passes, viaducts, underpasses, and flyover sections.

The significance of this impact is directly related to the duration of the construction period, length of the particular section being constructed and distance to the closest receptor.

Table 8.2.2-1 below presents the assessment outcome.

Table 8.2.2-1: Impact assessment pertaining to noise and vibration

CRITERIA	DESCRIPTION
Nature	Noises and vibrations
Status (+ or -)	Negative
Extent	Site specific (PPA)
Duration	Short
Intensity	Low
Probability	Probable
Significance (no mitigation)	**Low**
Mitigation	See table 10.2-1
Significance (with mitigation)	**Low**
Confidence level	High

The noise from the pre-construction and construction works should only be perceptible locally around the railway servitude and borrow pits. Construction noise sources will not be felt for the entire duration of the construction period, as the activity will be moving as progress is made along the highway. The same applies to the borrow pits, which will be in full operation at early stages of construction to supply required gravel and soil, but will gradually switch to intermittent activities as the base layer is set and required volumes are made available. The proposed mitigation measures will reduce adverse impacts on human health and the environment by minimizing noise from project activities as required by IFC PS3 and PS4, as well as OS5.

Given the nature, scale of the construction activities, as well as the duration and distance between the proposed project site and the nearest receptor, the potential impact is regarded as having ***low***.

8.2.3 Hydrology - Water Resource Sustainability

Groundwater quantity will be impacted during the pre-construction and construction phases. Construction activities of this nature, extent and duration are expected to require large volumes of water for daily construction activities. The required volumes of water for

construction and construction period are at this stage not known. Water resource sustainability will be impacted at the construction phase. Information relating to the hydrology baseline conditions is presented in section 5.2.5 of Chapter 5: Baseline Conditions.

The Project is located within the Omaruru River Basin, located on a watershed and as a result has limited underground water available. Underground water is supplemented mainly by rainfall confirming that contamination from construction or operation activities are of concern.

Water within the area, predominantly obtained via boreholes, is extensively used for domestic, agricultural, and industrial uses. Additional use of groundwater for the Project is expected to influence groundwater volumes and sustainability thereof.

To provide some insight into the status of groundwater within the study area, i.e., in between Kranzberg Station and Otjiwarongo, and an indication of possible groundwater sources, a Hydrological Desktop Study was undertaken by Dynamic Water Resources Management. The Hydrological Desktop Study is attached as Appendix B1.

The aspect of possible over abstraction from the aquifer for construction water has been raised as a serious concern having the potential to negatively affect the source (i.e., quality and sustainability), which in effect will have a serious negative socio-economic effect on the receiving community directly dependent on the water source. This is more so for the area in between Kranzberg Station to Kalkfeld, with a stronger underground occurrence within the area closer to Otjiwarongo.

The activity expected to affect groundwater quantity is:

- The use of underground water source for construction activities (dust suppression, compaction of embankment and other requirements) is expected to affect groundwater quantity, which is particularly relevant in the section between Kranzberg Station to Kalkfeld for which the groundwater availability is already low and may have significant impact on groundwater availability for other local users (domestic, agricultural, industrial).

According to the Hydrological Desktop Study, increased abstraction **may** therefore pose significant threats to the groundwater source. The exact significance' is at this stage not known as the volume of water required and construction period is not known, nor is such information available from other studies, resulting in this concern not being able to be assessed in detail and to such extent to state a confident conclusion.

The significance of this impact is directly related to the sensitivity of the receiving source compared to the daily demand and construction duration.

Table 8.2.3-1 below presents the assessment outcome.

Table 8.2.3-1: Impact assessment pertaining to underground water source

CRITERIA	DESCRIPTION
Nature	Abstraction of underground water
Status (+ or -)	Negative
Extent	Regional (RPA)
Duration	Medium
Intensity	High
Probability	Probable
Significance (no mitigation)	**High**
Mitigation	Unless a groundwater balance is established, thus providing an accurate estimation of the surplus volume of groundwater available for abstraction, managing groundwater's sustainable use is reactionary, i.e., one will only realise over-abstraction occurs once the rest water levels start deepening. Therefore, in order to properly manage the groundwater abstraction to ensure sustainable use, the following measures must be implemented: • A Groundwater Monitoring Program whereby water levels and abstraction volumes and rates are measured and recorded frequently; • Manage demand and abstraction; • Reduce abstraction if over-abstraction becomes evident; • Implement water conservation measures; • Limit groundwater use to essential needs and improve efficiency in the use of groundwater to minimise effect on local availability; • Implement water conservation measures; • Regularly inspect all installations associated with groundwater abstraction and distribution to eliminate leaks which are wasting water; • Identify and use alternative sources (i.e., Construction Water Demand Management Plan), such as – o NAMWATER points located at Karibib and at Kalkfeld; o Existing earth dams along the alignment of the railway line; o Plan new earth dams at strategic points to capture water for reuse; and

	○ Semi-purified wastewater from the respective urban areas' sewage reclamation plants and oxidation ponds. • Investigate alternative groundwater sources further from the Project site having a much larger volume at sustainable capacity, which can be transported via rail to the site. It is further recommended that the transport of water from the NAMWATER points and that of the respective urban area's sewage works be done via rail. See table 10.2-1
Significance (with mitigation)	**Medium**
Confidence level	High

Without knowing the required construction volume and limited information available on the groundwater availability, the significance of the impact is thus considered ***high***. Water abstraction at each borehole will be felt locally and for medium-term duration as it will take place during the entire pre-construction/construction period.

By applying the proposed mitigation measures it can be expected to reduce the impact significance to ***medium***, which is however subject to further investigation and assessment. The proposed mitigation measures therefore may contribute to reduced adverse impacts on human health and the environment by reducing groundwater abstraction, as required by IFC PS3 and PS4.

8.2.4 Hydrology – Water Resource Quality

Construction activities are associated with a variety of potential pollution sources, either as a result of the construction process (i.e., cement, lubricants, chemicals, diesel, wastewater, solid waste) or from the human element involved in the process (i.e., human waste), either having a direct, indirect, short lived- or long-term impact/s.

Water quality, surface and/or underground, will be impacted at the pre-construction and construction phases. Information relating to the hydrology baseline conditions is presented in section 5.2.5 of Chapter 5: Baseline Conditions.

The Project crosses various river and tributaries flowing from the east, which includes the Khan-, Omaruru- and Omatjene Rivers. Considering the high permeability of the alluvium, pollutants from construction activities will easily and quickly find its way into the aquifer and will have an impact on water quality, of which the significance of the impact is directly related to the nature and volumes of the particular pollutant.

The significance that pollution holds is in a certain respect directly related to the construction time, i.e., the longer the construction period the higher the risk for pollution, but also the type of infrastructure being constructed (i.e. type and volume of wastes created).

The expected pre-construction and construction activities that may directly affect surface and underground water quality are -

- The removal of existing vegetation close to rivers and drainage channels will encourage soil run-off to watercourses, thus affecting the surface water quality;
- Movement of heavy vehicles and construction equipment will disturb surface soils that could be transported during rains to rivers and drainage channels, contributing to the modification of surface water quality;
- Work conducted in rivers and drainage channels, construction of bridges and culverts or other infrastructure may encourage soil runoff to rivers and drainage channels and the resuspension of sediments, thus affecting the surface water quality;
- The cleaning of concrete trucks at work sites and spillages during refuelling of construction machinery may cause the release of contaminants that can be carried by surface water run-off to watercourses;
- Wastewater generated by the concrete mixing plant may cause the degradation of surface water quality;
- Accidental spills or leaks of contaminants potentially directly or indirectly (carried by surface water runoff) reaching surface and underground water, resulting from:
    - improper installation of fuel distribution and storage facilities;
    - improper installation of storage sites for hazardous products and waste, including storage of cement;
    - inadequate maintenance of trucks, vehicles and machinery; and
    - Inappropriate fuelling practices and location for vehicles and machinery.

Overall, the pre-construction and construction activities could essentially affect water quality through the introduction of suspended particles and some chemical contaminants mainly petroleum based. Taking into consideration the above, Table 8.2.4-1 presents the anticipated impacts and presents the impact assessment for surface water and underground water quality.

Table 8.2.4-1: Impact assessment pertaining to hydrology (surface and groundwater quality)

CRITERIA	DESCRIPTION
Nature	Surface and groundwater pollution
Status (+ or -)	Negative
Extent	Local (SPA)
Duration	Long
Intensity	Medium
Probability	Probable
Significance (no mitigation)	**High**
Mitigation	See table 10.2-1
Significance (with mitigation)	**Low**
Confidence level	High

The shortage of water, high infiltration through alluvial rivers and the fact that groundwater is an important source for the local population's socio-economic existence, results in a ***high*** significance without any mitigation. Impacts will be of regional (RPA) extent, as contaminants entering groundwater are likely to migrate. If contamination reaches groundwater, repercussions may be felt for the full construction phase and longer, thus duration is considered long-term. The overall significance of the impact is considered ***high***.

By applying caution and the proposed mitigations the risk of contaminants reaching surface water and groundwater within the Project area will be significantly reduced. The intensity of the post-mitigation impact is thus considered ***low***. However, residual impacts will still be felt at the scale of the PPA and will occur during the full operation period and therefore would be characterized as having a long-term duration. Adverse impacts on human health and the environment will therefore be minimized by reducing surface water and groundwater pollution from project activities, as required by IFC PS3 and PS4, as well as OS4.

8.2.5 Hydrology – Water Flow & Flooding

Water flow and flooding will be impacted at the construction and operation phases. Information relating to the hydrology baseline conditions is presented in section 5.2.5 of Chapter 5: Baseline Conditions.

The Project crosses various river and tributaries flowing from the east, which includes the Khan-, Omaruru- and Omatjene Rivers, within which construction activities are expected. Construction activities are further associated with the removal of surface vegetation and loosening of soil (i.e. trenches; roads), which all contributes to increased water velocity and resulting erosion and sedimentation, as well as potential flood damages.

There have been cases of localised flooding with associated damage to infrastructure. Part of the problem seems to be related with inefficient drainage systems including inexistent or blocked culverts or undersized culverts.

The potential impact during the construction phase relates directly to construction within the rivers and watercourses during the rainy season. The activities that might be subject to flooding are:

- The temporary earthworks and construction associated with bridges and culverts are located with the prominent rivers and water courses. These works may also modify existing surface water flow patterns causing flooding with the PPA and possibly the RPA; and
- Large areas where vegetation has been removed located at steep gradients.

The study area extends through the central western plains of Namibia. From Kranzberg station northwards, the railroad winds through relative flat plains that pass residual hills, occasionally passing the Khan-, Omaruru- and Omatjene Rivers and drainage channels. The mentioned Rivers (ephemeral) are dry for most of the year, and often even for many years, and will overruns the study area only if the volume of run-off generated is enough. Flash floods are relatively short lived and highly variable in magnitude, duration and frequency.

Given the locality of the majority of the study area within relative flatter areas and few rivers, flooding and resulting impacts are limited. Works within the rivers during the rainy season can have devastating consequences on human life and should thus be done by considering seasonal floods. Flooding during construction may also result in damages to construction vehicles and equipment.

Table 8.2.5-1 summarizes the anticipated impacts and presents the impact assessment for hydrology – water flow and flooding.

Table 8.2.5-1: Impact assessment pertaining to hydrology (water flow & flooding)

CRITERIA	DESCRIPTION
Nature	Water flow and flooding
Status (+ or -)	Negative
Extent	Local
Duration	Short
Intensity	Medium
Probability	High probable
Significance (no mitigation)	**None** (flat plans) **High** (rivers)
Mitigation	See table 10.2-1
Significance (with mitigation)	**None**
Confidence level	High

Considering the topographical conditions of the study area, high significance of flooding is restricted to the Khan-, Omaruru- and Omatjene Rivers and tributaries, with less significant impacts expected on the flatter plans. The impact of flooding will occur during the rainy season and at specific work, i.e., within the river courses and therefore would be characterized as having a short-term duration. Given the potential loss of human life, the magnitude of the impact is considered ***high*** for the river areas.

By considering seasonal floods and applying the recommended mitigations, the significance of the impact can be reduced to ***none.***

8.2.6 Soil Stability and Erosion

Soil stability/erosion, soil quality and sediment quality will be affected during pre-construction and construction phases. Information relating to soils and sediment is presented in section 5.2.6 of Chapter 5: Baseline Conditions.

Construction activities are associated with the removal of surface vegetation and loosening of soil (i.e., trenches; roads), which all contributes to increased water velocity and resulting erosion and sedimentation. The activities that will affect soil stability and erosion are:

- Site preparation (e.g., clearing of vegetation).
- Modification of slopes (cut and fill operations).
- Direct and indirect soil disturbance.
- Concentrating rainwater flows prior to adequate stormwater system creation.
- Creation of borrow pits.

The study area extends through the central western plains of Namibia. From Kranzberg station northwards, the railroad winds through relative flat plains that pass residual hills, occasionally passing the Khan-, Omaruru- and Omatjene Rivers and drainage channels. Flash floods are relatively short lived and highly variable in magnitude, duration and frequency.

The significance that flooding (and related delays) holds to the expected impact on soil erosion and sedimentation is directly related to the distance and area (plains or steep riverine or mountainous areas), as well as the time of year (i.e., rainy season or not). Given the locality of the majority of the study area within relative flatter areas and few rivers, flooding and resulting impacts on soil stability are limited to the areas listed in bullet format above.

Table 8.2.6-1 summarizes the anticipated impacts and presents the impact assessment for hydrology – water flow and flooding.

Table 8.2.6-1: Impact assessment pertaining to soil stability and erosion

CRITERIA	DESCRIPTION
Nature	Soil stability and erosion
Status (+ or -)	Negative
Extent	Local
Duration	Short
Intensity	High
Probability	Probable
Significance (no mitigation)	**Moderate**
Mitigation	See table 10.2-1
Significance (with mitigation)	**Low**

Confidence level	High

Soil erosion and stability impacts are irreversible (even if stopped) and as such are considered to have a high significance, but as the impact will remain within the railway reserve (PPA), the extent is considered site specific. This, combined with limited areas of potential erosion, the significance is expected to be ***moderate*** at the point of impact.

By applying the proposed mitigation measures the impacts would be reduced and even avoided, resulting in the post-mitigation significance reducing to ***low***. Adverse impacts on biodiversity and the environment will therefore be minimized as required by IFC PS6 and OS3.

8.2.7 Flora (Habitat)

Construction activities are associated with the removal and destruction of natural habitats, which directly affects the flora. Construction activities are associated with the removal and destruction of natural habitats, as listed below.

- Temporary construction facilities;
- Site preparation;
- Transportation and circulation;
- Use of borrow pits and quarries;
- Waste and hazardous materials and liquids.

The site preparation works will involve removal of vegetation and felling of trees present within the proposed railway alignment (i.e., PPA). Temporary construction facilities and possible new borrow pits will also lead to vegetation loss within the SPA. Soil compaction and sealing of soil surface will also reduce the 'availability' of land for revegetation.

Considering the different constriction activities, the clearance for the embankment is expected to have the greatest impact owning to the footprint and lasting nature thereof. The fact that the new railway alignment will follow the existing railway alignment considered as a brownfield site mitigates the impact significance in comparison to a Greenfield site.

The biodiversity within the Secondary Project Area (SPA) and Primary Project Area (PPA) are composed of a mixture of natural and modified habitats. Information relating to habitats and flora is presented in section 5.3 of Chapter 5: Baseline Conditions, with some qualify as critical habitats for various biodiversity features (i.e., riverine areas and rocky outcrops). The sensitive areas are presented by Figure 5.3.9. The area within the existing railway reserve is considered as modified habitat.

Apart from private conservancies, no protected areas and/or internationally recognised areas are found along the Project.

The most important species are viewed as *Commiphora dinteri*, *Commiphora saxicola*, *Commiphora virgata*, *Cyphostemma bainesii*, *Cyphostemma currorii, Cyphostemma juttae*, and *Erythrina decora* (e.g. most often associated with rocky substrate). Important plant species known and/or expected from the general Kranzberg-Omaruru area and included in the Red Data Book for Namibia include at least 16 species of which 1 species is listed as rare (*Diclis tenuissima*), 1 species as vulnerable (*Lithops werneri*) and 1 species as near threatened (*Adenia pechuelii*) (Table 5.3.8.5.-1) (Loots 2005). Important plant species known and/or expected from the general Omaruru-Otjiwarongo area and included in the Red Data Book for Namibia include at least 10 species of which 2 species is listed as rare (*Eriospermum citrinum*, *Eriospermum flexum*), and 2 species as near threatened (*Ceropegia mafekingensis*, *Dintera pterocaulis*) (Table 5.3.8.5-2) (Loots 2005).

Although not known at this stage, it is not expected that any of the project activities apart from the drilling of boreholes and borrow pits might exceed the railway reserve. To ensure avoidance or limited impacts on natural habitats, a vegetation clearing procedure need to be followed and will be enforced. The general procedure for location of areas to be cleared will need to be informed by detailed maps of presence of endangered/protected natural habitats and include ground-truthing by walk over surveys, marking the specific areas and/or species.

Considering that the PPA and SPA are both modified habitats, the overall habitat loss is expected to be low, with selective clusters of sensitive habitats. No direct impacts on protected or internationally designated areas are anticipated, seeing as construction and operation activities will remain within the railway reserve and adjacent farms.

Particular attention should be given to indigenous, protected and/or endangered tree species located within the PPA (i.e., railway reserve) and SPA (i.e., borrow pits and boreholes) and that clearance should be limited to the required minimum. The felling of trees should try to be avoided or appropriately compensated.

Furthermore, the rocky outcrops along the railway (see Figure 5.3.9), as well as the rivers and drainage channels with alluvium soils have been flagged as sensitive areas, which should be avoided by the implementation of temporary construction facilities. Construction traffic, earthworks and management of hazardous waste material can also have an indirect impact on vegetation from dust, particles; oil/fuel, etc. Impacts will however be predominantly limited to a narrow buffer zone on each side of the railway alignment within the 60m railway reserve, with short-term impacts.

Construction activities of this nature and scale can promote the spread of invasive species in a number of ways, e.g., by providing them a foothold in disturbed ground where they tend to flourish, by bringing in seeds or propagules with building materials, or by moving them to new sites through earth-moving operations. The use of earth-moving equipment and other transport vehicles during construction activities can result in the dispersal of alien plant material to other localities. As the project area already exhibits levels of undesirable alien plant species typically associated with disturbance and agriculture, care will need to be taken as alien plant material is not inadvertently transported along with construction equipment, machinery or material.

Table 8.2.7-1 summarizes the anticipated impacts and presents the impact assessment for habitat and flora.

Table 8.2.7-1: Impact assessment pertaining to flora (habitat)

CRITERIA	DESCRIPTION
Nature	Destruction of flora (habitats)
Status (+ or -)	Negative
Extent	Site specific
Duration	Permanent
Intensity	Moderate
Probability	Definite
Significance (no mitigation)	**Moderate**
Mitigation	See table 10.2-1
Significance (with mitigation)	**Low**
Confidence level	High

Considering the existing modified condition of vegetation and habitats within the PPA and adjacent SPA, the intensity of the impact is considered medium. Since most of the impacts on habitat and related vegetation will be within the existing railway reserve and borrow pits, the geographical extent is considered limited. Vegetation loss will last throughout the project lifetime and is thus long term. Consequently, the significance of the impact is considered ***moderate***.

The proposed mitigation measures will ensure that indigenous/protected/endangered species remain within the railway reserve and at borrow pits, with limit loss of sensitive habitats, reducing the intensity of the impact to ***low***. Adverse impacts on biodiversity and the environment will therefore be minimized, as required by IFC PS6 and OS3.

8.2.8 Fauna

Construction activities are associated with the removal and destruction of natural habitats, which directly affects the flora. The sources of impacts are:

- Temporary construction facilities;
- Transportation and circulation;
- Site preparation; drainage and stormwater;
- Structural and civil works;
- Presence of workers and influx of job seekers;
- Creation and use of borrow pits.

The general impacts of transport infrastructure on fauna are as follows:

- restricting movement and reducing accessibility to food and shelter on a daily basis, and preventing or limiting dispersal and annual migrations over longer periods;
- increased mortality and injury due to collision;
- loss of habitat due to clearing for construction activities and maintenance;
- habitat fragmentation as patches of habitat is divided into smaller patches; and
- degradation of habitat due to noise and vibration, light and chemical pollution, weed and alien plant invasion, altered hydrological regimes, etc.

The amount of habitat expected to be cleared is high, although the significance is considered low (post-mitigation) as the majority of the habitat disturbance is taking place within the existing railway reserve considered to be a modified habitat (i.e., degraded state). Some pockets of habitat features (i.e., rocky outcrops, rivers, trees, bush clumps) that are of ecological value exists and is being used by reptiles, amphibians, mammals, birds, despite being situated immediately adjacent to a railway reserve. Vegetation removal within the railway reserve is required; however, this is often low-quality regrowth. Some additional clearing outside the railway reserve is required for bridges and borrow pits. Assessment of fauna considers four VECs, birds, reptiles and amphibians, as well as small and large mammals.

Information relating to fauna is presented in section 5.3 of Chapter 5: Baseline Conditions, also indicating some critical habitats for various biodiversity features (i.e., riverine areas and rock outcrops). The sensitive areas are presented by Figure 5.3.9. The area within the existing railway reserve is considered as modified habitat.

The general impacts and mitigation measures for fauna are presented in Table 10.2-1. The sections below present the detailed assessment of impacts for each fauna VEC.

a) Reptiles

The most important species expected to occur in the section between Kranzberg Station and Omaruru are viewed as the tortoises *Stigmochelys pardalis* and *Psammobates oculiferus*; pythons – *P. anchietae* and *P. natalensis*; Namibian wolf snake (*Lycophidion namibianum*) – *Varanus albigularis* and some of the endemic and little-known gecko species – e.g., *Pachydactylus* species. Tortoises, snakes and monitor lizards are routinely killed for food or as perceived threats. Other important species are those viewed as "rare" – i.e., *Rhinotyphlops lalandei*, *Mehelya vernayi* and *Afroedura africana* – although very little is known about these species.

The most important species expected to occur in the section between Omaruru and Otjiwarongo are viewed as the tortoises *Stigmochelys pardalis* and *Psammobates oculiferus* pythons – *P. anchietae* and *P. natalensis* – and *Varanus albigularis*. All the above-mentioned species are either consumed as food or indiscriminately killed when encountered – e.g. *Python natalensis*.

None of the reptile species known/expected to occur in the general Kranzberg-Omaruru-Otjiwarongo area are however exclusively associated with the proposed Project area.

Reptiles located within the footprint of the embankment, roads, construction camp, etc. is expected to be directly affected and most probably killed, although reptiles are known to move away from areas of noise and vibration. Not all reptiles will however be able to move a way in time and it can thus be expected that mortalities will occur.

The intensity of the impact is judged as ***medium,*** and the extent is limited to the directly affected area (i.e. site specific). Although some losses will be permanent, most impacts will be limited to the construction period; hence the duration is medium-term. Consequently, the significance of the pre-mitigation impact is considered ***moderate***. The protection of some of the existing habitats within the railway reserve and after construction rehabilitation will reduce the significance of the impact to ***low***.

The proposed mitigations (see Table 10.2-1 below) should be followed to minimise the overall impact on reptiles in the area.

b) Amphibians

The most important species are the endemic *Poyntonophrynus hoeschi* and *Phrynomantis annectens* although they are widespread in Namibia and not exclusively associated with the Kranzberg-Omaruru and Otjiwarongo areas in particular. Permanent water bodies viewed as amphibian habitat in the area include the ephemeral Khan, Omaruru and Omatjene Rivers and their tributaries, Otjiwarongo sewage works. Other potential habitats in the area include rocky pool areas in the Erongo Mountains, farm reservoirs and earth dams although the latter are also dependant on localised showers and temporary of nature.

None of the reptile species known/expected to occur in the general Kranzberg-Omaruru-Otjiwarongo area are however exclusively associated with the proposed Project area.

The intensity of the impact is judged as ***medium,*** and the extent is limited to the directly affected area (i.e. site specific). Although some losses will be permanent, most impacts will be limited to the construction period; hence the duration is medium-term. Consequently, the significance of the pre-mitigation impact is considered ***moderate***. The protection of some of the existing habitats within the railway reserve and after construction rehabilitation will reduce the significance of the impact to ***low***.

The proposed mitigations (see Table 10.2-1 below) should be followed to minimise the overall impact on reptiles in the area.

c) Mammals

The most important species from the general area are probably all those classified as vulnerable (cheetah, leopard, Hartmann's Mountain zebra, giraffe) and near threatened (African straw-coloured fruit bat, Commerson's roundleaf bat, striped leaf-nosed bat, brown hyena) by the IUCN (2021) and rare (Namibian wing-gland bat and Southern African hedgehog) under Namibian legislation. Another important and unique species known to occur in the general area is the endemic Kaokoland slender or black mongoose (See: Cowley and Cunningham 2004, Warren *et al.* 2009).

None of the mammal species known/expected to occur in the general Kranzberg-Omaruru-Otjiwarongo area are however exclusively associated with the proposed Project area, but occur widespread in suitable habitat throughout Namibia.

For large mammals, particular attention should be given to adjacent wildlife game reserves and conservation farms. Noise and vibration from construction activities will cause some large mammals to move away and avoid the areas near construction work, which could be beneficial as well. The noise from construction activities can be stressful, eliciting a physiological stress response, with some animals temporarily or permanently moving away from the noise. Machinery and vehicle collisions with fauna during construction could lead to occasional mortality of mammals, and may occur during vehicle movements within the study area. This is unlikely to be a substantial risk as construction speed limits would be low and activities remain within the railway reserve. Special attention is required during the transportation of gravel and soil from borrow pits to the construction site. The presence of workers and influx of job seekers will increase poaching on large mammal species. The loss of large mammal habitat from construction is considered minimal, however, some species will be disturbed by construction noise. For this reason, the intensity of impact is ***medium,*** and the extent is local. The impacts will be mostly limited to the construction period; hence the duration is short-term. Consequently, the significance of the impact is considered ***moderate*** before mitigation. The mitigation measures (Table 10.2-1) will reduce disturbance of large mammals and protect them from collisions during construction. The significance post-mitigation can be reduced to ***low***.

Small mammals could suffer mortality from construction traffic and earthwork activities. Also, the presence of workers and influx of job seekers may increase hunting pressure on some small mammal species. Noise and vibration from construction activities will cause some small

mammals to move away and avoid the areas near construction work. The noise from construction activities can be stressful, eliciting a physiological stress response, with some animals temporarily or permanently moving away from the noise. Construction work within the rail reserve will lead to the permanent and temporary loss of some small mammal habitat. The intensity of the impact is judged ***medium***. The extent is however limited. Although some losses will be permanent, most impacts will be limited to the construction period, hence the duration is medium-term. Consequently, the significance of the pre-mitigated impact is considered ***moderate***. The mitigation measures will avoid some small mammal habitat loss, although not all can be avoided. The significance of the impact can be reduced to ***low***.

d) Birds

The most important endemic species known/expected to occur in the general area are viewed as Monteiro's hornbill, Damara hornbill, Gray's lark, Herero chat, Rüppell's korhaan and Rüppell's parrot. The species listed as critically endangered (Cape vulture), endangered (violet wood-hoopoe, Ludwig's bustard, white-backed vulture, bateleur, black harrier, tawny eagle, booted eagle, martial eagle, black stork, saddle-billed stork), vulnerable (lappet-faced vulture, white-headed vulture, African fish eagle, Secretarybird) and near threatened (European roller; Rűppel's parrot, kori bustard, pallid harrier, Verreaux's eagle, red-footed falcon, peregrine falcon, marabou stork) by Simmons *et al.* (2015) as well as those species classified by the IUCN (2021) as critically endangered (white-backed vulture), endangered (Ludwig's bustard, lappet-faced vulture, bateleur, black harrier, martial eagle, Secretarybird), vulnerable (Cape vulture, tawny eagle, red-footed falcon) and near threatened (kori bustard, pallied harrier). The Cape vulture is a cliff breeder and although the last remnants are known to occur in the Waterberg Area (i.e., greater Otjiwarongo area).

The loss of bird habitat as a result of the expected construction activities is minimal, however, some species will be disturbed by construction noise and vibration and by the loss of water. For this reason, the intensity of impact is ***medium,*** and the extent expected to be local. The impacts will be mostly limited to the construction period; hence the duration is short-term. Consequently, the significance of the impact is considered ***moderate***.

The proposed mitigation measures will reduce the level of disturbance of birds during construction and avoid important impacts on breading. The significance can be reduced to ***low*** by applying the proposed mitigations.

Table 8.2.8-1 below presents the assessment outcome for all faunal species.

Table 8.2.8-1: Impact assessment pertaining to faunal species

CRITERIA	DESCRIPTION
Nature	Destruction of faunal habitats and fauna themselves
Status (+ or -)	Negative
Extent	Site Specific
Duration	Permanent
Intensity	Medium
Probability	Probable
Significance (no mitigation)	**Moderate**
Mitigation	See table 10.2-1
Significance (with mitigation)	**Low**
Confidence level	High

Adverse impacts on biodiversity and the environment will therefore be minimized, as required by IFC PS6 and OS3.

8.2.9 Local Livelihood and Economic Activities – Land-Based Livelihood Activities (Land Use and Occupation)

The study area is predominantly confined to the 60m railway reserve with some deviations into adjacent commercial farmlands, of limited extent. In addition, the railway line passes through the towns of Omaruru, Kalkfeld and Otjiwarongo. Land use along the larger part of the railway line is 'commercial agriculture', which includes cattle farming and game farming, as well as tourism with conservation. Information relating to land use and economic activities is presented in section 5.4 of Chapter 5: Baseline Conditions.

Commercial agriculture, game farming, conservation and tourism play a very important role within the area and larger Region's economy. The proposed Project will have direct and indirect effects on the mentioned activities during construction through the loss of land, nuisances and criminal activities. Poaching, theft and feld fires, either as a direct or indirect result of construction activities is currently of great concern and was raised by the I&APs as of great concern considering the increase in number of outsiders and duration of the

construction period. Loss of cattle and game, either through poaching and/or feld fires results in huge financial losses within the area per year.

The Project, as presented in Chapter 4 of this ESIA, is expected to have very little effect and/or change on the development potential and land use of the affected area. Almost all activities associated with the pre-construction and construction phases will be held inside the existing servitude, which is already used for railway. Small pockets of land, where the railway line deviate onto adjacent private commercial land, will result in a permanent change from 'agriculture' to 'railways', but is in use and extent negligent (less than 0.1% of the land). Borrow pits will also result in a change in land use, from 'agriculture' to 'borrow pits' to eventually becoming a gravel dam after rehabilitation.

Table 8.2.9-1 summarizes the anticipated impacts and presents the impact assessment for land use and occupation.

Table 8.2.9-1: Impact assessment pertaining to land use and loss of income

CRITERIA	DESCRIPTION	
Nature	Change in land use and loss in income	Loss of cattle and/or game
Status (+ or -)	Negative	Negative
Extent	Site Specific	Local
Duration	Permanent	Permanent
Intensity	Low	Moderate
Probability	Definite	Definite
Significance (no mitigation)	**Medium**	**Medium**
Mitigation	See table 10.2-1	See table 10.2-1
Significance (with mitigation)	**Low**	**Medium**
Confidence level	High	High

Given that very little land will permanently be loss to railway use and that borrow pits will change to gravel dam use, while these are located adjacent to and in close proximity to the railway servitude, it will be easily compensated and avoid land fragmentation (i.e., creating uneconomical agricultural land). The anticipated impact intensity is considered low for the loss of land. The extent will be on land around and near the existing railway servitude so it

will be local, while duration will be permanent. The pre-mitigated significance of the impact and in specific relating to the loss of land would be ***low***, while the significance to loss of animals would be ***medium***. Rehabilitation of borrow pits as per agreement with owner and/or regulatory requirements and reuse as ground dams will ensure the impact significance reducing to ***low***.

Of potential ***medium*** significance is the impact/s as a result of poaching, theft, trespassing and feld fires, as a result of increased construction activities and workers into the area. Poaching, theft, trespassing and feld fires are already a huge problem within the community, which is either a direct result of the current railway upgrading activities or an indirect result. Many of the farms include farming with exotic and protected wildlife, as well as breeding with stud animals. Poaching and death as a result of feld fires result in a huge loss of income to these farmers. Safety of farmers and their workers are increasingly threatened as more and more people trespass with the purpose to steal and poach. Increased activities and workers into the area will provide the opportunity for organised crime and poaching in the area.

Considering the duration of the construction activities and the extent of the area to be policed, the remaining impact as a result of poaching and feld fires would remain ***medium.***

8.2.10 General Health, Safety and Security

The existing railway in its current state is generally considered as a safety risk due to various derailments that has taken place in the past. Although one of the Project's core objectives is to increase safety and reliability, it also carries some health and safety risks for the surrounding communities, all of which are presented below. Avoidance and mitigation measures to minimize these potential health and safety risks are presented in Table 10.2-1.

The surrounding community, i.e., farmers, is already subject to various forms of crimes (i.e. animal theft, poaching, trespassing and illegal wood collection; etc.) and is concerned about an increase in activities and workers that is expected to further escalate the situation.

This section addresses the overall well-being of the residents and communities affected, i.e. aspects to health, safety and security.

The pre-construction and construction activities expected to potentially affect general health, safety and security are:

- Dust and resulting nuisance generated during the construction phase may affect the health of residents and/or local communities depending on the locality, especially if they are vulnerable to respiratory issues;
- The residents in the vicinity of the Project will be negatively affected by nuisance (such as noise, dust, vibrations);
- Increased transportation and circulation, traffic management and the presence of temporary construction facilities and construction work sites may represent a safety risk for work site employees and local workers and residents through the following:
    - increase safety risk for pedestrians (civil or employees) and road users;

- increase risk of collision between construction vehicles and wildlife/cattle; and
- Increase risk of traffic accidents on highways. Traffic safety prevention is an important element to be managed according to IFC EHS Guidelines.

- Impacts on individual well-being and in specific those considered vulnerable such as women and Indigenous People (covered in Sections 8.2.14 and 8.2.15 respectively).
- The influx of workers and job seekers can bring the following risks to the communities and people:
  - Increased crime in surrounding communities, either through crimes directly perpetrated by newcomers (e.g., assault, theft, poaching, etc.) or indirectly through their engagement in illegal activities such as drug use and prostitution;
  - Increased transmission of sexually transmitted infections (STIs) and HIV/AIDS. Prevention of these infections need to be managed, as per the IFC EHS Guidelines;
  - Possible tensions and conflicts with local communities, as these people will be considered outsiders competing for employment;
  - Increased waste generation and sanitation problems, having health implications to farm and wild animals, as well as communities; and
  - Increased pressure on local natural resources and services (e.g., social, health, etc.).

Table 8.2.10-1 summarizes the anticipated impacts and presents the impact assessment for community health and safety.

Table 8.2.10-1: Impact assessment pertaining to general health, safety and security

CRITERIA	DESCRIPTION
Nature	Health, safety and security impacts of a variety of sorts
Status (+ or -)	Negative
Extent	Local
Duration	Medium
Intensity	Medium
Probability	Probable
Significance (no mitigation)	**Medium** to **high**

Mitigation	See table 10.2-1
Significance (with mitigation)	**Low to medium**
Confidence level	High

Impacts on livelihoods (such as job creation), gender aspects, Indigenous Peoples, and labour conditions are covered in other sections and are therefore not assessed here.

The impact intensity of nuisances and health (i.e., dust and noise) will vary from medium to high, depending on the distance between the source and receptor. The impact is expected to be local in extent, and short-term as construction progresses along the railway line. Respiratory problems caused by increased dust and contaminants could be of medium intensity (for urban centres); these will be of local extent, and last throughout the construction phase (medium-term). For rural areas this impact is expected to be ***low*** in significance, due to the distances between the source and receptors[3].

The risk caused by the influx of workers of increased crime (i.e., theft; poaching; illegal collection of wood; veld fires), and prevalence of HIV/AIDS and STIs is of high intensity. The risk that workers become a source of transmittable diseases is considered to be of medium intensity as they will not be established in isolated worker camps. The extent of these impacts will be regional as workers may interact with communities and individuals throughout the larger surrounding communities and social and health problems such as crime and HIV/AIDS and STIs. These increased risks posed by the Project will last during the construction phase and are thus considered to be medium-term with ***high*** significance.

Of potential ***high*** significance is peoples' safety and security as a result of poaching, theft, trespassing and feld fires, all associated with construction activities. Safety of farmers and their workers are increasingly threatened as more and more people trespass with the purpose to steal and poach.

Community relations and cohesion are likely to be most impacted by benefit distribution, especially by those related to employment and compensation.

The overall pre-mitigation impact significance for this VEC is considered to be ***medium*** to ***high***.

Traffic mitigation measures will reduce traffic disruptions and accidents, which can bring down the intensity to medium. The duration of these disruptions and extent will remain unchanged, as they will last for the duration of the Project (medium-term).

[3] Not applicable to borrow oits, as the locality and extent of borrow pits are not known at this stage.

Limiting dust and contamination as much as possible will reduce the intensity of the impact to low intensity, with the extent and duration remaining local and medium-term.

Mitigation measures addressing pedestrian safety, reducing the risk of increased crime, of workers becoming a source of transmittable diseases, and increased prevalence of STIs and HIV/AIDS will reduce the risk and seriousness of these impacts, resulting in a reduced impact intensity of medium. The extent will remain limited to the PPA and SPA and the impact will last for the duration of construction (medium-term).

The Project will require more strict management of workers during daytime activities and no overnight accommodation along or within the railway servitude. Increased security and maintenance of fences and access control will have to be done and managed from the side of both the Project and the Community. Setting-up of a combined security entity between the Project and the Community should be considered and a security strategy be compiled. This particular risk remains high given the risk of financial loss or even loss of life or injury.

Ensuring equitable distribution of benefits, including favouring local labour, should avoid the creation of many tensions and conflicts within communities and between communities and outsiders. As a result, the intensity of the impact will be reduced and could vary from low to medium.

Overall, the post-mitigation impacts will range from ***low*** to ***medium*** and even ***high*** (in the instance of loss of life) in significance.

Adverse impacts on health, safety and security will therefore be minimized, as required by IFC PS4 and OS5.

8.2.11 Local Livelihood and Economic Activities – Self-Employed and Business Based Livelihood

This section addresses the overall well-being of the residents and communities affected from the perspective of their living conditions and economic status.

Except for those that may be resettled, which at this stage of the Project are none, the Project will not directly impact housing conditions and or economic activities of the self-employed. Compensation for the loss of land and for boreholes and borrow pits are addressed in the Resettlement Action Plan, managed by the Ministry of Agriculture, Water and Land Reform, and is excluded from the scope of the ESIA.

There are no community assets located along the railway reserve. Schools, health centres, and religious and public spaces are located away from the railway line and are accordingly not affected by the Project.

Existing roads, within the urban centres and rural area, will remain as is and accordingly be respected.

Given that no deviations are planned and expected within the urban centres, no self-employed and business-based livelihoods, shop, business, small and/or medium enterprises will be affected as a result of the Project. The main impacts of pre-construction and construction

activities on self-employed and business-based livelihoods relate to moving and non-moving street vendors or informal traders selling opposite the railway reserve dependent on free access over the railway line.

Pre-construction and construction activities have the potential to generate positive impacts in terms of local employment. The influx of workers and job seekers may boost the sales of local businesses, but traffic disruptions (increased travel time and diversion roads) may at the same time reduce sales from motorists which represent a significant proportion of their clients. Traffic disruptions may also affect the connections between suppliers, local businesses, and economic outlets.

Table 8.2.11 summarizes the anticipated impacts and presents the impact assessment for self-employed and business-based livelihood.

Table 8.2.11-1: Impact assessment pertaining to self-employed and business-based livelihoods

CRITERIA	DESCRIPTION
Nature	Impact on socio-economics pertaining to people self-employed and/or business within the area
Status (+ or -)	Negative & positive
Extent	Local
Duration	Temporary
Intensity	Low
Probability	Definite
Significance (no mitigation)	**Low**
Mitigation	See table 10.2-1
Significance (with mitigation)	**Low (negative)** **High (positive)**
Confidence level	High

Impacts on self-employed and business-based livelihoods are likely to have a low intensity impact on economic returns of affected people. It will be of a medium-term as it will last for the duration of construction period and will be of local extent. Temporary displacement of

small business activities (i.e., informal traders) has the potential to have a high intensity impact on their income and livelihood as most of them rely on this activity as their only source of income. However, there are no small business activities (i.e., informal traders) affected by the Project. The Project will not only bring employment opportunity to the self-employed, but will bring increasing number of workers which will make use of these smaller informal traders as a source of food and refreshments. This impact will be short-term and of local extent. The resulting overall negative significance of impacts will be ***low***, while the positive impact (i.e., employment and increased income through sales) is considered to be ***high*** within these communities.

Measures to employ local people and support local business activities will have a huge economic benefit to the community. By relocating those informal traders (if any) considered in danger of the construction activities and not closing down their activities will ensure economic benefits, which will be of short-term. It will reduce the significance from negative to positive and will have a ***high*** to ***medium*** effect. Adverse impacts on self-employed and business-based livelihoods will therefore be minimized, as required by IFC PS5 and OS2.

8.2.12 Local Livelihood and Economic Activities – Tourism & Conservation Activities

There are several tourist facilities and conservation facilities located along the railway reserve, which may be affected by the pre-construction and construction activities. Information relating to tourism activities is presented in section 5.4.5 of Chapter 5: Baseline Conditions.

Pre-construction and construction activities that may affect tourism and conservation facilities are:

- Dust and resulting nuisance generated during the construction phase may affect the health of tourists, especially if they are vulnerable to respiratory issues;
- The activities in the vicinity of the Project will be negatively affected by nuisance (such as noise, dust, vibrations);
- Fauna and flora along the railway alignment and at borrow pits may be negatively affected by dust, particles and pollution generated by the construction activities (i.e., temporary construction facilities; transportation of goods and material; site preparation and clearances; borrow pit activities; structural and civil work; waste and hazardous materials management);
- Possible disruption of traffic by temporarily slowing down traffic at road-rail intersections, which will increase travel time to reach tourist facilities; and by diverting traffic, when necessary, which may complicate access to certain facilities;
- The influx of workers and job seekers can bring the following risks to the tourism and conservation activities:
    - Increased crime in surrounding communities, either through crimes directly perpetrated by newcomers (e.g., assault, theft, poaching, etc.) or indirectly through their engagement in illegal activities such as drug use and prostitution;

- Increased transmission of sexually transmitted infections (STIs) and HIV/AIDS. Prevention of these infections need to be managed, as per the IFC EHS Guidelines; and
- Increased waste generation and sanitation problems, having health implications to farm and wild animals, as well as communities.

Table 2.12-1 summarizes the anticipated impacts and presents the impact assessment for tourism and conservation activities.

Table 8.2.12-1: Impact assessment pertaining to tourism and conservation activities

CRITERIA	DESCRIPTION
Nature	Impacts on tourism and conservation activities
Status (+ or -)	Negative
Extent	Local
Duration	Medium
Intensity	Medium
Probability	Probable
Significance (no mitigation)	**High**
Mitigation	See table 10.2-1
Significance (with mitigation)	**Low**
Confidence level	High

Considering that the tourism sector was badly affected by the COVID pandemic, this sector is particularly economically vulnerable and still recovering. Any activity that may negatively affect tourists' experience has the potential to have a medium intensity impact. The duration of this impact is expected to be medium term as it will last throughout the pre-construction and construction phase, while the extent will be local. As a result, the impact significance on tourism and recreation is considered potentially ***high***.

Mitigation measures such as reducing noise, dust and other forms of pollution, as well as little disruption to traveling time and distance would result in the significance of the impact reducing to ***low*** of short-term duration.

8.2.13 Labour Conditions

Based on the complaints received from residents within the Project having relevance to labour conditions and from a past monitoring visit (April 2021) to a section of the Project area, labour conditions and in specific the provision of proper basic services (i.e., toilets and eating areas) are not up to standard. The Project has the potential to have the following impacts on labourers during the pre-construction and construction phases:

- Poor health and safety conditions can create a dangerous work environment that will increase workers' risk of injuries, as well as physical and mental illnesses. Worker health and safety is an important aspect to be managed according to IFC EHS Guidelines;
- Risk of abuse by contractors hiring underage workers (child labour);
- High levels of casualization (informality) can lead to violation of workers' rights (e.g., in terms of work schedule and conditions);
- Lack of oversight of contractors, subcontractors, and suppliers of goods and services in the supply chain can lead to abuse of workers in those positions, including hiring of underage workers;
- Poor labour conditions can generate insecurity, fatigue, and stress, among others. These can have a ripple effect at the household and community levels, by increasing conflict and potentially act as triggers for social problems such as drug and alcohol abuse and GBV;
- The influx of workers and job seekers may negatively affect the social acceptability of the Project as surrounding communities have high expectations regarding the Project's role in promoting local employment and stimulating the local economy.

Table 8.2-13 summarizes the anticipated impacts and presents the impact assessment for labour conditions.

Table 8.2.13-1: Impact assessment pertaining to labour conditions

CRITERIA	DESCRIPTION
Nature	Labour conditions
Status (+ or -)	Negative
Extent	Local
Duration	Temporary
Intensity	Medium
Probability	Probable
Significance (no mitigation)	**Medium**
Mitigation	See table 10.2-1
Significance (with mitigation)	**Low**
Confidence level	High

Considering the legacy of less than internationally required standards of labour conditions in Namibia, the Project has the potential to negatively affect workers' physical and mental health, lead to abuse of workers, and trigger social problems such as drug and alcohol abuse and GBV – all of which are impacts of high intensity. The intensity of impacts created by the influx of workers and job seekers on the social acceptability of the Project considered medium. The extent will be local as workers (both local and non-local) will most probably be settled within the closest urban centre. Most impacts will last throughout the pre-construction and construction phase (medium term), but social problems may persist and be long-term. Overall, the impact significance on labour conditions is considered to be ***medium***.

By providing good working conditions, the Project will provide positive benefits to workers and surrounding communities and avoid becoming an important trigger to social problems in the area. Mitigation measures proposed will ensure workers' rights are respected, avoid worker abuse, and create a safe working environment. Maximizing local employment and providing local training will also reduce impacts. The post-mitigation impact significance can be reduced to ***low***. Adverse impacts on self-employed and business-based livelihoods will therefore be minimized, as required by IFC PS2 and OS5.

8.2.14 Vulnerable and Marginalized Groups (VMGs)

As presented in section 5.4.11 of Chapter 5 of the ESIA, there are two vulnerable communities in this part of Namibia, the indigenous people (San people) the descendants of Hunter-Gatherers who have left extensive archaeological footprints across vast expansive land in Namibia and the Berg Damara, the descendants of Herding Communities who have also created rock art. As per the information obtained from the Ministry of Agriculture, Water and Land Reform, none of these communities' own land (affected farmland) within the parameters of the existing railway servitude.

The marginalised communities (but not indigenous) in proximity to the railway line Project are predominantly Nama and few Herero's clustered mainly in Kalkfeld settlement. They were resettled here during the SA colonial occupation of Namibia as per Odendaal Plan of 1964. They reside within the town planning scheme and are not affected by the railway line development.

The main sources of impacts that might affect the indigenous people and marginalized during the pre-construction and construction time are:

- employment opportunities to unskilled and semi-skilled people will provide positive benefits to surrounding communities, especially the youth;
- degradation of cultural values and lifestyle;
- increase the risk of sexually transmitted infections (STI) and HIV/AIDS in these communities; and
- Increase the risk of gender-based violence (GBV), including sexual abuse (addressed below).

Table 8.2.14-1 summarizes the anticipated impacts and presents the impact assessment for vulnerable and marginalized groups (VMGs).

Table 8.2.14-1: Impact assessment pertaining to vulnerable and marginalized groups

CRITERIA	DESCRIPTION
Nature	Impact on vulnerable and marginalized groups
Status (+ or -)	Negative
Extent	Local
Duration	Temporary
Intensity	Medium

Probability	Probable
Significance (no mitigation)	**Medium**
Mitigation	See table 10.2-1
Significance (with mitigation)	**Low**
Confidence level	High

Pre-construction and construction activities have the potential to generate positive impacts for VMGs in terms of employment and increase sales of local Indigenous businesses.

The risk brought by the influx of construction workers and employment seekers is most probably the most negative, as the consequences of GBV for victims and for people infected with HIV/AIDs would be long-term. These impacts will be felt by local communities and will thus be of local extent, which can further spread over time as local people infected move around. Overall, the impact significance will range from ***medium*** to ***high***, for both the positive and negative impacts.

Enhancement measures will maximize employment benefits for the indigenous peoples and marginalised communities. The extent will remain local and the duration short-term. The proposed mitigations will greatly reduce the risk of increased GBV and alleviate its consequences. Nevertheless, there remains a possibility that the influx of workers and job seekers will increase the risk of GBV and of STIs and HIV/AIDS in surrounding communities. The development and implementation of a Code of Conduct (CoC) will ensure that risk of cultural decay is kept at a minimum and is considered to be low and of local extent after mitigation. This increased risk after mitigation is considered to range from ***low*** to ***medium*** in significance. Adverse impacts on vulnerable and marginalized groups will therefore be minimized, as required by IFC PS7 and OS2.

8.2.15 Gender Aspects

The Project will require an estimated 150 unskilled and semi-skilled workers and 50 skilled workers of which the majority of the unskilled and semi-skilled workers should come from the local communities. By favouring employment of local people, the risk of sexual harassment and violence caused by foreigners will be reduced. Information relating to gender is presented in section 5.4.10 of Chapter 5: Baseline Conditions.

The construction workers will not be accommodated at camps along the railway servitude, but rather be accommodated in nearby urban centres. Even though this strategy will encourage integration of workers into communities, the presence of many newcomers still involves significant risks. Gender-based violence and women economic dependency are major issues of concern.

The proposed Project includes several pre-construction and construction activities that may affect gender aspects, as presented below:

- Both short-term and long-term employment opportunities will be generated, which are mostly taken up by men, despite some deliberate efforts to hire women. Such imbalances can contribute and will further increase women economic dependency.
- influx of workers and job seekers increases the risk of gender-based violence and sexual abuse in communities, which includes the following:
    - Physical and sexual violence towards especially women and girls, who are mostly at risk.
    - Statutory rape and pregnancies resulting from relationships between labourers and underage girls.
    - Prostitution in general, especially those from poor families.
    - Increased crime in surrounding communities either through crimes directly perpetrated by newcomers (e.g., assault, theft, poaching, etc.) or indirectly through their engagement in illicit activities such as drug use and prostitution.

Table 8.2.15-1 summarizes the anticipated impacts and presents the impact assessment for gender aspects.

Table 8.2.15-1: Impact assessment pertaining to gender aspects

CRITERIA	DESCRIPTION
Nature	Gender imbalance and neglect
Status (+ or -)	Negative
Extent	Local
Duration	Temporary
Intensity	High
Probability	Probable
Significance (no mitigation)	**Medium** to **high**
Mitigation	See table 10.2-1
Significance (with mitigation)	**Medium**

Confidence level	High

Considering standard practises within the construction industry, the Project is expected to have a negative impact on gender, which should be prevented by applying specific mitigations whereby woman is considered for employment and sufficiently protected against any GBV or related crimes against woman.

Considering the known facts of gender aspects, the Project is likely to contribute to an increase in risk of GBV and of STIs and HIV/AIDs. This increased risk is considered to be of high significance, while the consequences of GBV for victims and for people infected with HIV/AIDs would be long-term, although the time frame of exposure would be medium-term. The impacts are expected to be limited to the communities living adjacent to the railway alignment, specifically within the urban centres. As a result, the impact significance ranges from ***medium*** to ***high***.

The proposed mitigation measures can greatly reduce the risk of the most intense impacts as a result of GBV and provide equal opportunity is socio-economic advancement by employing woman. Nevertheless, there always remains a possibility that the influx of workers and job seekers will increase the risk of GBV and of STIs and HIV/AIDS in surrounding communities. This increased risk after mitigation is considered to be of ***medium*** intensity.

8.2.16 Archaeology and Cultural Heritage

All existing archaeology and cultural heritage sites identified during the baseline surveys, as well as the sites investigated for possible remains, were all found to be located outside of the railway servitude and having no remains of any archaeology and cultural heritage. Information relating to archaeology is presented in section 5.4.13 of Chapter 5: Baseline Conditions.

As the locality and extent of the borrow pits and boreholes are not known at this stage, the archaeological on-site investigation and verification was limited to the railway servitude and proposed deviations outside of the railway servitude onto the adjacent farms.

The proposed Project includes the following pre-construction and construction activities that may affect archaeology and cultural heritage:

- excavation and movement of construction vehicles within the railway servitude could destroy artefacts from currently unregistered sites; and
- The opening and activities at borrow pits could also affect artefacts from currently unregistered sites.

Although it is not expected to find any cultural heritage artefacts, precautionary and mitigation measures need to be applied.

Table 8.2.16-1 summarizes the anticipated impacts and presents the impact assessment for archaeology and cultural heritage.

Table 8.2.16-1: Impact assessment pertaining to archaeology and cultural heritage

Given that no known archaeological or cultural components are expected within the Project's

CRITERIA	DESCRIPTION
Nature	Destruction of unknown archaeology and cultural heritage
Status (+ or -)	Negative
Extent	Site specific
Duration	Temporary
Intensity	Low
Probability	Improbable
Significance (no mitigation)	**Low**
Mitigation	See table 10.2-1
Significance (with mitigation)	**None**
Confidence level	High

servitude or adjacent to it, the intensity of the impact is considered low. The extent of any findings will be limited to the railway servitude and the borrow pits, while the impact before mitigation would have a long-term duration. Thus, the significance of the impact will be ***low***.

By applying the precautionary principle and mitigation measures, the significance of the impact can be reduced to ***none***. Adverse impacts on archaeology and cultural heritage will therefore be minimized, as required by IFC PS8.

8.2.17 Bulk Infrastructure

The bulk infrastructure and services assessed are roads, rail, electricity, water and sewage, which are presented in Section 5.4.7.

Roads

The majority of construction activities will remain within railway servitude and will therefore not directly affect the surrounding road network, apart from being used for transportation of goods and materials. Direct impacts can be expected at the road-rail crossings appearing along the railway line, but is limited in extent.

The main impacts on roads will therefore come from the transport of material, equipment, and goods, as well as temporary work at under and overpasses. Considering that the majority of goods, i.e., aggregate, sleepers, ballast and rails will be transported via the existing railway line, only gravel and soil from borrow pits and workers will be transported via road. Of the two mentioned, it is expected that gravel and soil transport from borrow pits will be limited. The greatest impact is expected from the transportation of workers to and from the site, which is considered minor.

The extent of the impact will be local as only roads in close vicinity to the Project will be affected, while the impact will be felt throughout the construction phase (i.e. (medium-term). The impact on existing roads is considered to be of ***low*** significance. The proposed mitigation measures will ensure that impact significance is further reduced, but expected to remain at ***low***. Ensuring regular maintenance and repair of gravel roads used during construction will ensure that the duration of impact is reduced.

Rail

The existing railway line will remain in place for the duration of the Project construction period and will only be decommissioned once the construction phase has been completed. At this stage it is not known if the Project will be done in sections and commissioned and/or as one complete project.

The majority of the new railway alignment will be along the existing railway line, with some crossings at strategic localities to ensure longer curvatures. The existing railway will be used to transport the bulk of goods to the site.

The Project is not expected to have a direct impact on the existing infrastructure per say, but will have an impact on the current operations as the daily schedules will have to provide for transportation of material, equipment and goods within the existing daily schedules. Making use of the existing railway to transport material, equipment and goods might cause interruptions and delays to other scheduled deliveries. The extent of such impact is expected to be National and of medium-term duration. The intensity thereof is expected to be ***high*** and requires proper planning with TransNamib not to cause delays to other deliveries. However, given the low frequency of trains per day, the significance is considered ***low.***

Commissioning of the new railway and decommissioning of the old railway, either in sections or in its entirety, will have to be planned and close monitored not to cause delays in the current schedules and services of TransNamib.

Electricity

A network of high-tension electricity lines (rural areas) and low-tension (urban areas) electricity transmission lines exists along the Project alignment. High elevation high-tension electrical lines (NamPower & CENORED) cross the Project servitude. There is also a network of

municipal distribution lines along the railway servitude within the urban centres, with some crossings of the railway servitude.

None of the electricity lines either within the urban centres or rural parts will be affected by the Project as the railway alignment within the urban centres will not deviate and existing rural crossings are sufficient and do not require adjustment. Accidental damage and power outages will have a ***high*** intensity as it will affect the regional area, but be of short duration.

The direct impact is considered to be of ***low*** significance, while the impact as a result of damage and power outage is considered ***medium***. Coordination with NamPower, CENORED and the applicable municipality is required during construction works close to electrical infrastructure and notification of affected users of planned power interruptions ahead of time will reduce the intensity of the impact from medium to ***low***.

Water

Bulk water infrastructure from NAMWATER do exists, but limited to a few places along the railway line and crossings of the railway servitude. None of the infrastructure will be directly affected by the proposed railway alignment, i.e., requiring relocation. Accidental damage and water interruptions will have a ***high*** intensity as it will affect the regional area, but be of short duration.

Water infrastructure within the urban centres exists, although not located along within the railway servitude. Water infrastructure is expected to cross the railway servitude and thus require consultation with the authorities and caution during construction activities. Given that no deviation is expected within the urban centres, no excavations are planned, i.e., little change of damage to water infrastructure is expected.

The direct impact is considered to be of ***low*** significance, while the impact as a result of damage and interruptions considered ***medium***. Coordination with NAMWATER and the applicable municipality is required during construction works close to water infrastructure and notification of affected users of planned water supply interruptions ahead of time will reduce the intensity of the impact from medium to ***low***.

Sewage

Sewage infrastructure is limited to the urban centres. Sewage infrastructure within the urban centres exists, although not located along within the railway servitude. It can be expected that there will be sewage infrastructure crossing the railway servitude and thus require consultation with the authorities and caution during construction activities. Given that no deviation is expected within the urban centres, no excavations are planned, i.e. little change of damage to water infrastructure is expected.

The direct impact is considered to be of ***low*** significance, while the impact as a result of damage and interruptions considered ***medium***. Coordination with NAMWATER and the applicable municipality is required during construction works close to water infrastructure and notification of affected users of planned water supply interruptions ahead of time will reduce the intensity of the impact from medium to ***low***.

Table 8.2.17-1 summarizes the anticipated impacts and presents the impact assessment for bulk infrastructure.

Table 8.2.17-1: Impact assessment pertaining to bulk infrastructure

CRITERIA	DESCRIPTION
Nature	Damage to infrastructure and interruptions to supply
Status (+ or -)	Negative
Extent	Regional
Duration	Temporary
Intensity	High
Probability	Improbable
Significance (no mitigation)	**Medium**
Mitigation	See table 10.2-1
Significance (with mitigation)	**Low**
Confidence level	High

8.2.18 Visual Environment & Sense of Place

The existing railway line and servitude, considered a modified environment, is already having a certain impact on the visual aesthetics and sense of place of the receiving environment. The significance of this impact differs depending on the existence of other bulk infrastructure, closeness to the urban centres, elevation of the surroundings and natural vegetation growth.

Certain parts of the railway servitude is totally hidden by natural vegetation, while other sections becomes visible close to the main road or locality lower down from the surrounding mountainous areas.

Construction activities are associated with large construction vehicles, which generates noise and dust, which has a direct effect on the visual appearance and sense of place.

The proposed Project includes the following construction activities that will have a visual impact:

- vehicles and machinery within the railway servitude and borrow pits;
- clearing of vegetation and felling of trees within the railway servitude and at borrow pits;
- the presence of borrow pits; and
- Construction and laydown areas.

With the majority of the Project activities to occur within the existing railway servitude, which is for the majority of the alignment hidden from surrounding receptors, the visual impact for the larger part is expected to be ***low.*** There are however certain sections that becomes visible as it moves closer to the highway or is located below certain receptors. One such sensitive receptor located higher up at a distance to the railway line, is the Epako Safari Lodge & Spa. Sensitivity of tourism was addressed in section 8.2.12.

Table 8.2.18-1 summarizes the anticipated impacts and presents the impact assessment for visual environment and sense of place.

Table 8.2.18-1: Impact assessment pertaining to visual environment and sense of place

CRITERIA	DESCRIPTION
Nature	Impact on visual environment and sense of place
Status (+ or -)	Negative
Extent	Local
Duration	Temporary
Intensity	High
Probability	Probable
Significance (no mitigation)	**Low for the majority with sections of high**
Mitigation	See table 10.2-1
Significance (with mitigation)	**Medium**
Confidence level	High

As described, existing railway servitude already pose a visual impact to the receiving environment, which can expect to largely remain as is given the limited habitat to be removed. The presence of vehicles, machinery, borrow pits and people during construction and resulting impact thereof will vary depending on the location and closeness to the receptor. Certain sections of the railway servitude are totally hidden from any receptors, while other parts become visible due to no vegetation and being located in line of sight. The impact where visible, will last for the duration of construction (medium-term) and local in extent, affecting only the Project's footprint and adjacent observers. The significance of impact thus varies from ***low*** to ***high***.

Mitigation measures such as limiting vegetation clearance and avoid locating borrow pits within highly visible areas to sensitive receptors (i.e., tourism facilities) will reduce their impact intensity on the visual environment from high to ***medium***.

8.3 SOCIAL ACCEPTABILITY

Social acceptability of the proposed Project plays a crucial role within the overall success of both the assessment process, implementation during construction and long-term operation thereof. Continues interaction, communication and distribution of information on a regular basis, throughout the different project phases, are instrumental to social acceptability.

In line with the above various consultations of different means took place since project inception and throughout the ESIA process, whereby I&APs provided comment on the proposed Project. Details of the stakeholder engagement and comments received are presented in Chapter 6.

To date not a single objection against the proposed Project has been received from any I&AP or authority. Various comments and concerns were raised for consideration and attention to mitigate impacts, as addressed in this ESIA Report. Nationally, it can be argued that the proposed Project has a positive reception among the authorities and communities. The Project's social acceptance is primarily based on the need and desirability of the proposed Project build on the various socio-economic benefits expected over the short and long term.

As mentioned in section 2.6 of this ESIA Report, although stakeholders have not indicated any objection to the proposed Projects, a general concern about the successful operation of the new infrastructure, once construction has been completed, has been raised. This concern is based on various difficulties and challenges experienced by the neighbouring farm owners, as a result of the current ongoing upgrade activities, as well as the applicable authorities' inability to keep to agreements with respect to maintenance of fences and the railway servitude.

The main concern raised during the 1st round of consultation with regards the new railway alignment is that it affected certain existing urban developments and potentially some agricultural infrastructure, as presented in section 7.1 of this ESIA Report. In terms of social acceptability, the MWT has demonstrated their willingness to adapt the Project to the needs identified by I&APs. The alternative to the proposed have been discussed and accepted, as

presented in section 7.2 of this ESIA Report. Concerns applicable to the construction phase that were raised by the community relates to community health, safety and security. Very strong concern was raised towards expected increase in crime, especially theft, trespassing onto private property, poaching and veld fires. Insufficient ablutions and poor management thereof were another concern that affects the health of cattle and quality of meat. Noise and visual nuisances were raised from the side of the tourism operators, which is considered a very fragile sector of the economy slowly recovering from the COVID restrictions.

During the second round of consultation, no specific request and/or concern has been raised by I&APs and/or authorities.

Considering the involvement and communication from the side of I&APs it can be argued that I&APs and authorities agree to the proposed Project, as long as it responds to the needs of the communities affected, i.e., do not result in short and/or long-term negative impacts. In addition to addressing the raised concerns, it is important to ensure that the needs of the communities are met and that continues consultation and distribution of information takes place. A grievance mechanism (see section 10.8) will be put in place, as well as the appointment of an independent environmental consultant responsible to oversee the construction phase and monitor compliance with the ESMP. Continues consultation and communication through the proposed Stakeholder Engagement Plan (Appendix D) is required for implementation from the side of the appointed contractor.

Apart from contributing to increased cross-border trade and increased rail transport to the Walvis Bay Port from surrounding land-locked countries, with associated socio-economic benefits, the Project is seen as an opportunity to improve rail safety, which has been a huge concern and economic restriction. Employment creation is an important matter, as job opportunities are scares, especially for young adults and women.

I&APs clearly stated that they want to be actively involved throughout the implementation of the Project. A transparent and continuous communication with authorities and I&APs should provide social acceptability or at least, social acceptance.

8.4 CUMULATIVE IMPACTS ON VALUED ENVIRONMENTAL AND SOCIAL COMPONENTS

Considering the gap in available information on past and future projects of similar nature and/or of similar source of impact and impact itself within the RPA, the expected cumulative impacts were identified based on the logical assumptions by professional judgement from the specialists.

The selection of the particular impacts was based on their biophysical and/or socio-economic importance and their capacity to contribute to a cumulative negative impact, as listed below:

- Water resource / surface water quality, groundwater quality and quantity: construction activities of a variety of sorts will have an impact on surface and ground water quality and quantity;

- Flora & habitat: loss of flora and habitat through project facilities and activities and induced local land use changes;
- Fauna (birds, reptiles and amphibians, mammals): injuries or death;
- General community well-being: land tenure, housing conditions, livelihood and economic aspects, and health and safety (road users, residents and workers);
- Gender aspects, vulnerable and marginalized groups (VMGs), and community tensions and conflicts (equitable distribution of benefits); and
- Nuisances / Air quality, noise and vibration: increase noise/vibration levels and alteration to local air quality (dust and particulate emissions) may negatively affect nearby receptors.

8.4.1 Water Resource (Quantity & Quality)

Impacts that can contribute to cumulative impacts affecting this VEC will be caused during the construction phase as a result of:

- Flow of exposed or disturbed soils towards rivers and water courses during rain events;
- Accidental spills and leaks from construction vehicles and machinery or inadequate management of hazardous liquids and products, as well as human and construction wastes; and
- Groundwater extraction for construction purpose.

From the available baseline information and specialist studies conducted, the cumulative impact on groundwater resource quantity is of concern and will have a significant impact on existing socio-economic activities within the RPA. This requires a detailed Construction Water Demand Management Plan considering ALL available water sources (locally and regional) for use during the construction process.

With such a Plan in place and other proposed mitigation measures (section 10.2), the resulting impacts are considered of medium term (period of construction) with a ***medium*** (ground water quantity) to ***low*** (ground water quality) significance.

8.4.2 Flora & Habitat

The potential impacts associated with the Project that will have an effect on this VEC are essentially associated with pre-construction and construction phases, which are:

- Loss of non-critical habitat (i.e., altered habitat) within the existing railway servitude as a result of vegetation clearance and/or movement of construction vehicles; and
- Loss of habitat and flora at new borrow pits and deviations onto adjacent farmlands;

- Potential spread of invasive species and alteration of local conditions.

Considering the limited loss of vegetation within the railway reserve of non-critical value and small portions of farmlands required, with the implementation of the mitigation measures identified (section 10.2), the cumulative impact significance is concluded as ***low***.

8.4.3 Fauna

This VEC includes impacts on birds, reptiles and amphibians, mammals within the PPA and SPA during the pre-construction and construction phases. Potential impacts are:

- Habitat degradation and disturbance through construction work and presence of construction workers;
- Increase in mortality from vehicle collisions and poaching; and
- Behaviour changes because of noise and vibrations.

Fauna within the PPA is already affected by past activities and is limited to smaller mammals, reptiles and amphibians able to move within the area and through the area. Considering the remaining fauna and the limited extend of habitat to be disturbed of non-critical value, along with the mitigation measures (section 10.2), the cumulative impact significance is identified as ***low***.

8.4.4 General Community Well Being

This VEC includes effects on land tenure and land use, livelihoods and economic activities, as well as health and safety. These include:

- Temporary increases in dust, particles, pollution during pre-construction and construction activities, theft and poaching, and noise potentially affecting livelihoods (agricultural activities), and human health (sections 8.5.1 and 8.5.7);
- Loss of land, change in use and resettlement to provide for railway deviations onto adjacent private land, borrow pits and boreholes;
- Temporary restriction to informal traders;
- Increased travel time to tourism locations caused by traffic disruptions;
- Negative impacts on health and safety including:
    - Poor labour conditions resulting in increased fatigue, stress, mental illnesses and injuries;
    - Influx of outsiders increasing the risk of gender-based violence and sexual abuse, HIV/AIDS and sexually transmitted infections (STIs);
    - Increased crime in surrounding communities either through theft, poaching or indirectly through their engagement in illicit activities such as drug use and prostitution.

Considering the total ha of land that will be permanently lost as agricultural land to railways, per farm affected, the agricultural economic value is negligent. The cumulative impact on the loss of agricultural land to railways and resulting socio-economic impact is considered as of ***low*** significance. The temporary loss of land as a result of borrow pits during construction and resulting added value as gravel dam and/or recharge point post-construction, results in the impact to have a ***low*** significance on this VEC. As no resettlement is envisage as a result of the Project, this impact will not affect any landowner, indigenous or marginalised group, i.e. have no significance to this VEC.

Restrictions to informal traders within the urban centres and access restrictions to tourists are expected to be of very short duration as pedestrian and traffic movement will be regulated to ensure continues access and movement. This impact is accordingly expected to have a ***low*** cumulative significance.

While the proposed mitigation measures do not reduce the intensity of health consequences for affected individuals, it is expected to greatly reduce the risk posed by the Project to health and safety impacts. As a result, the cumulative impact significance to health and safety is assessed as ***medium***.

Increased number of people, i.e., job seekers and/or construction personnel will result in an increase in the occurrence of crimes, either by the newcomers or existing residents. While the proposed mitigation measures do not reduce the intensity of an incident, it is expected to reduce the risk. As a result, the cumulative impact significance is ***medium***.

8.4.5 Gender Aspects, Vulnerable and Marginalized Groups (VMGs)

As presented in Chapter 8, the potential impacts of the proposed Project on the receiving community associated with the construction activities are as follows:

- Increased crime in surrounding communities either through crimes directly perpetrated by newcomers (e.g., assault, theft, poaching, etc.) or indirectly through their engagement in illicit activities such as drug use and prostitution;
- Increased gender-based violence (including sexual abuse) caused by outside workers and job seekers or by local workers triggered by poor labour conditions. Indigenous women and girls are especially vulnerable;
- Gender imbalance in employment, which contributes to increasing economic dependency for woman;
- Increased risk of HIV/AIDS and sexually transmitted infections (STIs) following the influx of workers and job seekers;
- Tensions and conflicts over employment; and
- Degraded community relations caused by inadequate communication with I&APs and stakeholders.

This Project is expected to have a cumulative effect on gender relations, vulnerable and marginalized groups (VMGs), which requires the implementation of the proposed mitigation measures (sections 8.2.14 and 8.2.15). These include a Code of Conduct for workers and measures favouring women, indigenous and local employment. While the implementation the mitigation measures will not reduce the consequences for victims, it will decrease the risks. The cumulative impact significance is considered as of ***medium*** significance.

9 CLIMATE CHANGE RISK ASSESSMENT

9.1 APPROACH AND METHODOLOGY

To initiate the Climate Change Risk Assessment (CCRA), the status quo of the Country was studied to determine Namibia's general vulnerability towards Climate Change within the African context. The CCRA for the Project was then undertaken, taking into consideration the findings of the ESIA and of previous studies conducted on Climate Change in Namibia.

The Climate Change Risk Assessment was carried out in the following manner:

- Information on climate change in Namibia and in the Project Area specifically were studied to determine the current status quo;
- Risks, that Namibia and the relevant Project regions could be exposed to, were identified to determine who/what might be harmed and how;
- Vulnerability and the adaptive capacity to the identified risks were evaluated to determine the severity of the predicted scenario;
- Recommendations and mitigations were based on the above findings, which will be incorporated into the ESMP to be implemented during Project Planning, Construction Phase and Project Life; and
- The CCRA will be an ongoing process during Project life and the ESMP must make provision for re-evaluation to review implementation of mitigation measures as Climate Change evolves. The aim is to build resilience to the potential risks in an on-going process.

9.2 BACKGROUND

9.2.1 Context of Climate Change in Namibia

Although climates across Africa have always been erratic, the continent is expected to face even greater droughts, floods, rising sea-levels, food insecurity, loss of biodiversity and depletion in the water supply (*Dirkx et al., 2008*). Being the country with the most arid climate in Southern Africa, Namibia's economy is already exposed to difficult and harsh conditions, with water accessibility a serious threat. Prolonged droughts, although considered "normal" to some extent, have devastating impacts on livelihoods, food availability, health and wellbeing in many of the country's rural communities.

Maximum temperatures have increased over the past 40 years, as observed in the frequency of days exceeding 35°C. Frequencies of days with temperatures below 5°C have been decreasing, suggesting an overall warming. Based on the projections, winters are expected to have fewer cold days, while summers are expected to get hotter. According to General circulation model's projections, coastal areas of Namibia are projected to get warmer compared to inland regions (*MET, 2011*). Fig. 9.2.1-1 shows the Climate Change forecast for Namibia that was drawn up for the National Climate Change Strategy and Action Plan 2013 – 2020.

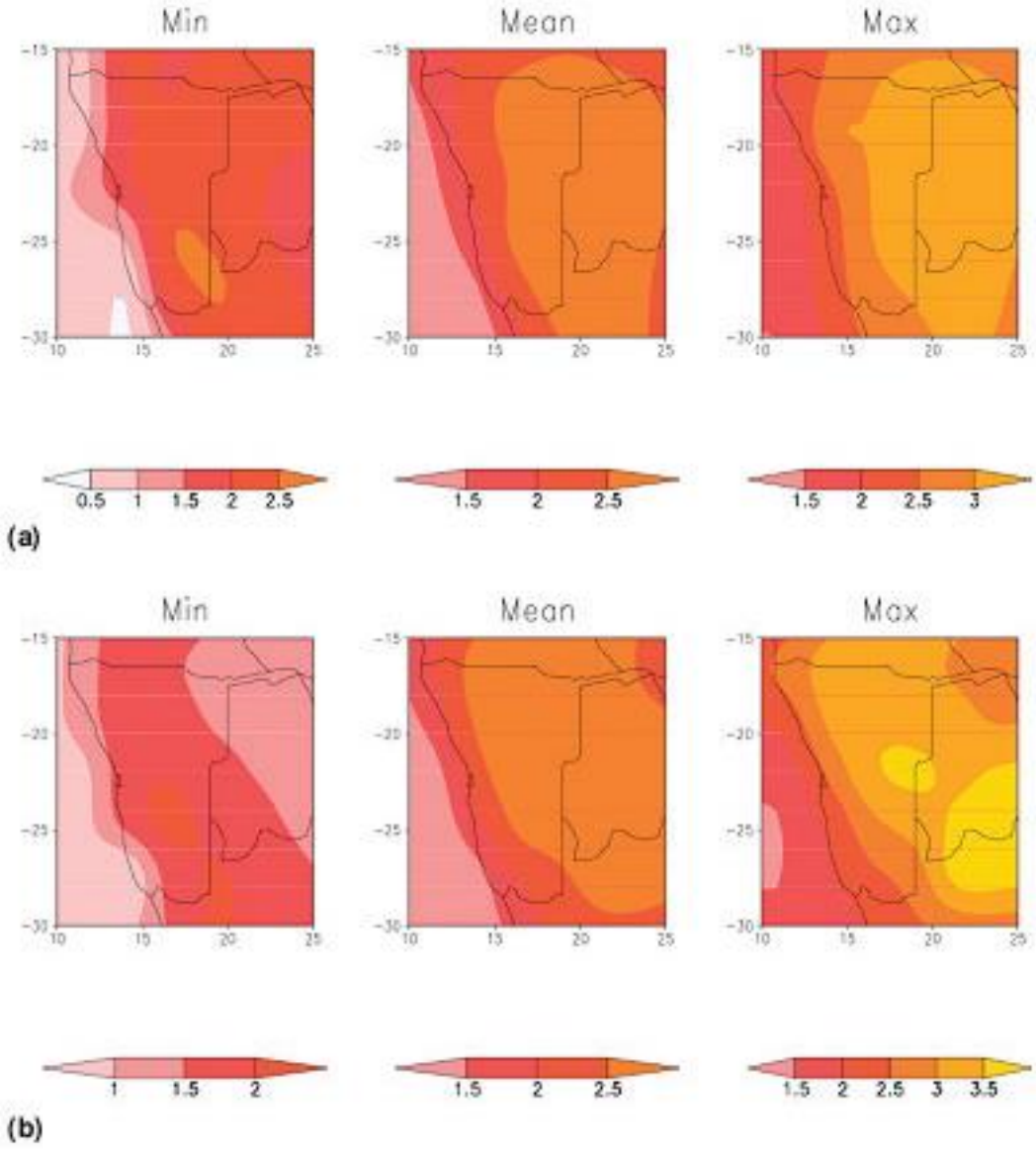


Figure 9.2.1-1 – Climate Change forecast for Namibia
Minimum (left), mean (middle) and maximum (right) projected change in
(a) January-March and (b) July-September mean surface air temperature (°C) from 13 GCMS. (Source: Dirkx et al., 2008 as displayed in the NCCSAP, 2013-2020)

9.2.2 Namibia's Vulnerability towards Climate Change

The United Nations Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (4AR, 2007) suggests African countries are most vulnerable, especially those which are already arid to semi-arid. Namibia, in particular, has been classified as one of the most vulnerable countries to the impacts of climate change.

Namibia's vulnerability is due to the arid nature and variability in climatic patterns of the country. Drought events have the potential to devastate Namibia's fragile ecosystems and the livelihoods of people who depend thereon. Shifts in the distribution patterns of rainfall, evaporation and temperature are likely to affect the distribution and range of animals and

plants. Vertebrate fauna and flora with specific habitat requirements (i.e., range restricted species – e.g., tortoises, amphibians, etc.) and less adaptable to environmental change, would be affected most while ecosystems dependent on regular rainfall with low variation – i.e. aquatic – are expected to be adversely affected over time.

The Country's vulnerability is further attributed to the Country's natural-resource-based economy as well as socio-economic factors, such a poverty and high divergence of income levels, which limit the adaptive capacity of its population (GRN, 2002; Dirkx et al., 2008; MET, 2011). Additionally, natural resources such as forest products and rain fed agriculture on which people depend are vulnerable and sensitive to climate change (*Reid et al., 2007; GRN, 2002*).

Many key sectors such as human health, water resources, agriculture (crop and livestock production), biodiversity, ecotourism, coastal zone management, infrastructure and energy have been identified as vulnerable to climate change. Climate change could reverse the Country's development goals.

Moreover, climate change can have severe effects on agricultural production, food security, fishing, tourism and health. Water scarcity is already a challenge in Namibia, and water is one of the sectors identified to be most vulnerable to climate change. Even without the threat of climate change, Namibia faces absolute water scarcity in the near future (*GRN, 2002; MET, 2011*). Overall Namibia's economy already has marked boundaries to expansion due to water limitations – which is likely to worsen under climate change scenarios for the region.

9.3 CLIMATE CHANGE SCENARIO IN THE PROJECT AREA

Historic climate data for three locations along the railway line Phase 1 (south, centre and north) were investigated. The following graphs display mean annual temperature and rainfall over a period of 30 years from 1979 – 2022, which indicates a steady rise (i.e., rising blue dotted line).

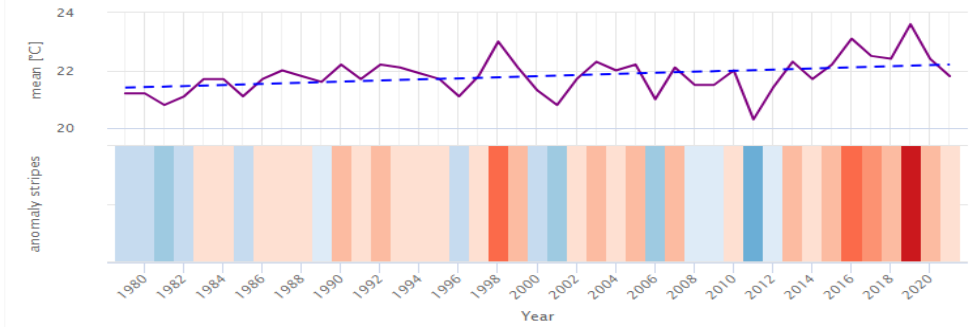


Figure 9.3-1 – Mean annual temperature, trend and anomaly for Karibib (1979-2022)

Karibib

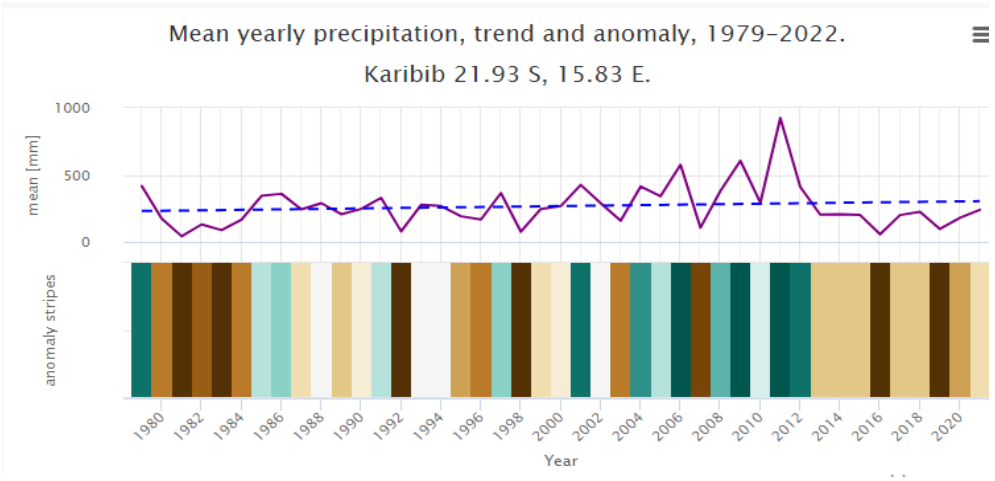


Figure 9.3-2 – Mean annual precipitation, trend and anomaly for Karibib (1979-2022)

Omaruru

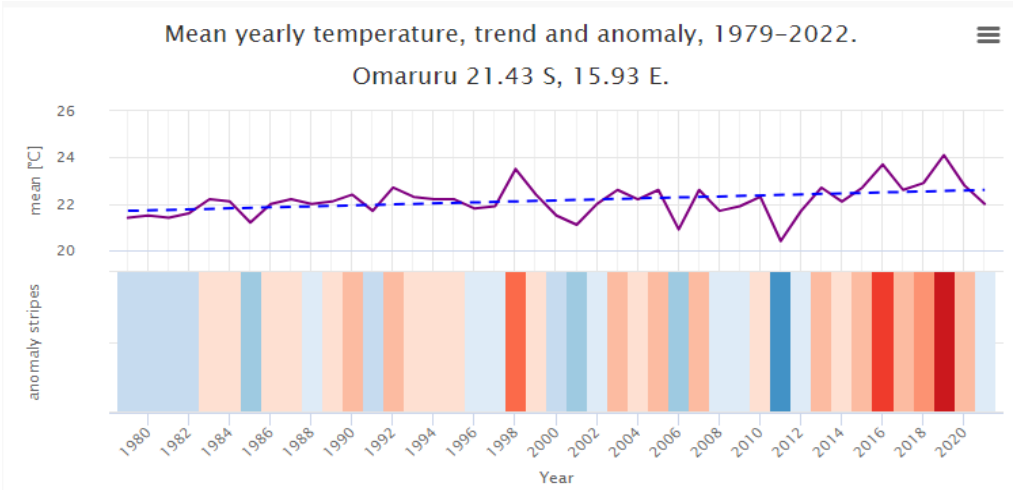


Figure 9.3-3 – Mean annual temperature, trend and anomaly for Omaruru (1979-2022)

Omaruru

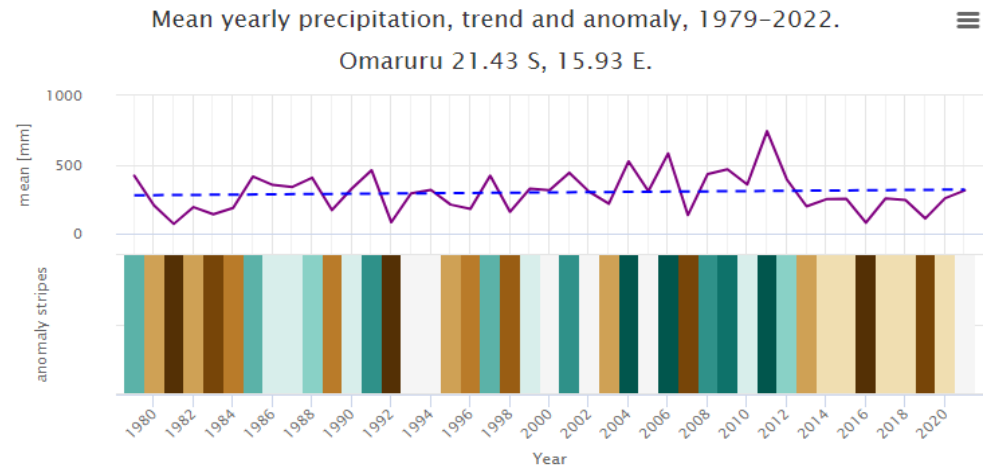


Figure 9.3-4 – Mean annual precipitation, trend and anomaly for Omaruru (1979-2022)

Otjiwarongo

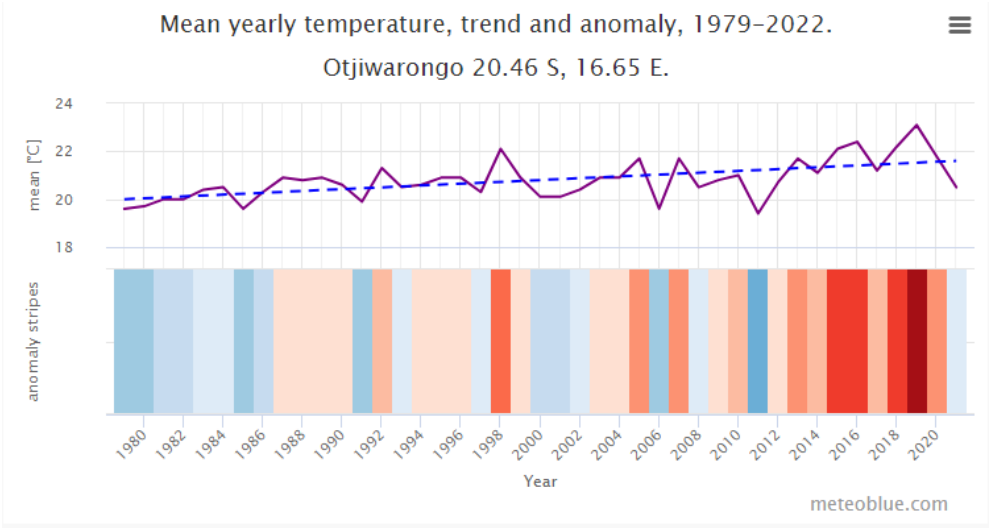


Figure 9.3-5 – Mean annual temperature, trend and anomaly for Otjiwarongo (1979-2022)

Otjiwarongo

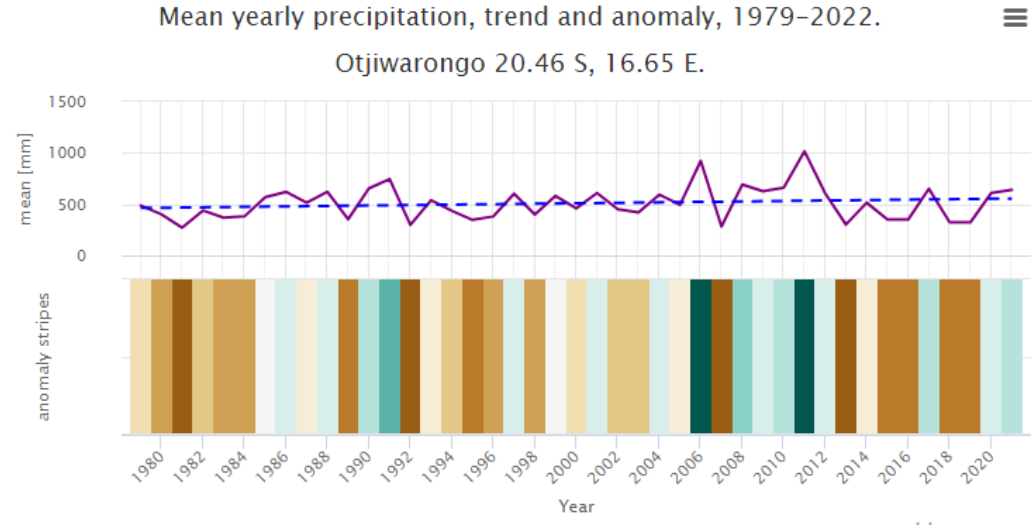


Figure 9.3-6 – Mean annual precipitation, trend and anomaly for Otjiwarongo (1979-2022)

It is projected that there will be an increase in the number of days exhibiting extreme day time temperatures; as well as the number and duration of heat wave events. Furthermore, a greater number of warm nights will increase general discomfort and reduce overnight frost and morning dew.

The rainfall parameters are more complex, but there is general agreement that in areas where either increasing or decreasing rainfall volumes are expected, rainfall will be focused into a shorter timeframe. Some areas are exhibiting a shifting in the rainfall onset and session timing. The rain season is decreasing in length; in the frontal areas of the western and southern areas of the country, winter rainfall is compressed, and the dry summer is extended;

to the east and north, the convective rainfall is clustered into fewer summer months and the shoulder seasons of autumn and spring exhibit more summer-like temperatures and reduced rainfall. While it is generally expected that there will be a decrease in the number of rainfall days each year, it's highly likely that there will be an increase in precipitation intensity and the occurrence of more extreme events when it does rain. This is particularly true in the summer convective rainfall areas. There will also be an increase in dry spell duration between rainfall events.

The future climate change scenarios presented above to inform the project, generally highlights a number of patterns which could, and are currently affecting, the baseline environment.

9.4 IDENTIFICATION OF CLIMATE CHANGE HAZARDS FOR THE PROJECT AREA

9.4.1 Increase in Temperature / Heat Waves:

The Inter-governmental Panel on Climate Change (IPCC) Third Assessment Report suggests that by 2050, temperatures over southern Africa will be 2-4 °C higher compared to the 1961-90 baselines (*IPCC, 2001*). It has been predicted with a high degree of certainty, that Namibia will become hotter throughout the year (with an expected increase in temperatures of between 1°C and 3, 5°C in summer and 1°C to 4°C in winter in the period 2046-2065) (*Dirkx et al., 2008*).

9.4.2 Water Scarcity / Droughts

With the already extreme high temperatures and the dry climate of Namibia, evaporation rates in the country are very high. Ground water, which can be exploited through boreholes, is often of poor quality and extremely saline. Even without climate change, arid Namibia is expected to face severe water scarcity in the near future.

Predicted impacts on the water sector in Namibia include decreased water availability, quantity and quality, low groundwater recharge, increased variability of rainfall, prolonged and more severe droughts, floods, declining soil moisture, and increased evapotranspiration. (*MET, 2011: GRN, 2002*).

9.4.3 Floods

Although droughts and floods are generally considered normal in a highly variable climate, such as Namibia, it had to deal with an increasing number of flood and drought related extreme events in the past decade. Climate change is likely to exacerbate the impact and frequency of these extreme events. It is further predicted that flood events are to become more aggressive with the potential to be destructive. Sea level rise may inundate coastal towns including Walvis Bay, leaving the harbour extremely vulnerable.

9.4.4 Damage to Infrastructure

Consequently, flood events are predicted to have strong potential for increased damage to infrastructure. Predicted impacts of climate change could severely affect public infrastructure in Namibia such as housing, roads, railway lines, water facilities, electricity transmission, communication systems, and sewerage and drainage systems.

9.4.5 Public Health

An even hotter and more arid climate for Namibia, with more extreme weather events such as droughts and floods, would clearly have implications for the health of inhabitants. Water-borne diseases will become a threat in years of flooding, with diarrhoea, cholera and malaria becoming particularly severe. Areas in Namibia that are currently considered to be malaria free may in future become areas in which the disease is prevalent. In drought years, respiratory infections and under-nutrition with associated side effects may cause serious health problems.

9.5 ADAPTIVE CAPACITY

Climate Change Adaptation (CCA) refers to the capacity to deal with climate change challenges by making the necessary changes and adaptations to address the expected disasters. CCA aims to reduce vulnerability and improve the capacity to adapt even under the difficult climatic conditions predicted.

9.5.1 National Mitigation Measures towards GHG emissions

Namibia has set up measures to respond to climate change, because it presents a real threat to the achievements of its development objectives and Vision 2030. The strategy aims to address and plan for action against climate change, both through mitigation and adaptation actions. One of Namibia's actions to reduce current and future GHG emissions, include using renewable energy sources and energy efficient technology. (*IPCC, 2001*). Overall mitigation is thus rooted in the transition to move toward a low-carbon development path taking into consideration Namibia's long-term Vision 2030, which focus on:

- Sustainable energy and low-carbon development; and
- Transport.
    - The Project to upgrade the railway line will contribute to this national mitigation measure, since it will reduce transport via freight trucks on the road. This will have a positive impact on GHG emissions in the area, since rail freight results in much less CO^2 emissions than road freight via trucks (*Fiege, 2020*).
    - If the railway line service can be expanded to passenger carriages, the development of the Project will provide another source of transportation, that have less GHG emissions, by introducing an improved public transportation system.

- Promote the fuel efficiency in construction vehicle transport system toward low GHG emission.

Sustainable Water Use

Water storage can reduce dependence from climate variations and from the effects of climate change, such as higher rainfall variability and longer dry spells. Water storage and reuse is thus recommended for the Project.

- Small-scale water storage can be realised by harvesting rain and floodwater along the Project Site. Strategies for harvesting and capturing water during the Project Life in rainy seasons must be formulated and implemented.
- Water storage and reuse, together with agricultural production, show cross-sectoral benefits in national interest. It is thus recommended that borrow pits be constructed in consultation with landowners to create long-term water storage facilities that can be used by farmers after excavation of borrow pits.
- Monitoring and data collecting of surface and underground water must be implemented during the construction phase.
- During the Construction Phase and Project Life conservation and sustainable utilisation of water resources must be promoted. Guidelines for more efficient water use by contractors, construction labourers and project staff must be provided.

Mitigation for Infrastructure

Predictions show that infrastructure will be at risk during future climate change disasters. This must be taken into consideration from the outset of the Project design, construction and Project Life. This will also require financial planning and management (see below).

- Adopt project planning and development standards and principles toward climate change resilience.
- Improve and enforce standards for railway line development and culverts- and bridge designs that are more resilient to climate events, and integrate climate change disasters into design and development planning strategies.
- Adjust designs to environmentally sensitive construction and maintenance methods.

Mitigation for Human Health

Strengthen disease prevention and treatment for those diseases expected to increase due to climate change.

Emergency procedures must be developed and put in place to ensure that there will be an appropriate response to unexpected or accidental actions or incidents that will cause health impacts, throughout the Construction Period and Project Life. This must be implemented by the Contractors to provide a co-ordinated and professional response in an emergency to maintain a safe workplace.

Disaster and Risk Management

An Emergency Preparedness and Response Action Plan must address climate risk induced disaster management with timely disaster response mechanisms, forecasting and Early Warning Systems (EWS).

Financial Resource Mobilisation and Management

Adaptation is not an easy or cost-free option, because it often involves the residual damages of climate change. Although it is cumbersome to estimate precisely the adaptation cost or future pricing of adaptation efforts, sustainable financing mechanism should be developed to address climate change during Project Life. Adaptation itself will bear a cost, however, in the medium- to long-term, the cost of adaptation is much lower than the cost of not adapting (*Jones, 2010*).

9.5.2 Governance for Climate Change

The Ministry of Environment, Forestry and Tourism (MET) has been designated as the government agency responsible for the coordination and implementation of climate policies and measures that will have an effective response to climate change in the interest of the country to protect present and future development gains and with respect to the fulfilment of the country's obligations under the UNFCCC. However, the Office of the Prime Minister (OPM) is envisaged to take on a coordinating role in the future. The Namibia Climate Change Committee (NCCC), a broad-based multi-stakeholder committee that was established in 2001, following work of an ad hoc committee (the Climate Change Advisory Committee) led by the Directorate of Environmental Affairs (DEA) in the MET. The NCCC was tasked to advise the government with respect to its roles and responsibilities under the UNFCCC as well as to coordinate the overall national climate change program. The current NCCC membership includes institutions such as MET, UNAM, NPC, METEONA, MME, MTI, UNDP, MAWF, MFMR, NAMWATER and NAMPOWER (*MET, 2002*).

Sector- specific initiatives like the Namibia Renewable Energy Programme (NAMREP) have managed to eliminate some of the barriers to the adoption and nationwide promotion of renewable energy, particularly solar.

10 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The Environmental and Social Management Plan (ESMP) is a presentation of the required mitigation and monitoring measures for the impacts identified and assessed in Chapter 8, while indicating the implementation and supervision responsibilities for both the mitigation and monitoring measures, as well as estimated costs. The ESMP is applicable to the construction phase, but is applicable to any maintenance works that include construction activities during the Operational phase. The internal monitoring measures indicated in the ESMP tables refer to measures to be taken on a regular basis by the appointed contractor, independent environmental consultant and the Proponent to ensure the correct implementation of impact mitigation measures.

As per the AfDB's ISS, mid-term and project completion E&S compliance and performance Audits should be conducted by the project management unit through a contracted independent environmental Consultant. As required, Projects which have been effectively implemented for at least one year is due for an Environmental and Social Compliance Audit in order to ensure that the projects are being implemented in compliance with the loan conditions/agreements; applicable national regulations and AfDB's Integrated Safeguard System operational safeguard policies and their requirements. As such the E&S Compliance and Performance Audits will have to be undertaken before the end of the second year and each following year afterwards.

This chapter of the ESIA presents an outline of the Environmental and Social Management Plan (ESMP) proposed for the construction and operation activities of the Kranzberg Station to Otjiwarongo Railway upgrade project. A detailed and standalone ESMP has been compiled for this Project.

10.1 OBJECTIVES

The ESMP set-out the mitigation-, monitoring- and institutional measures to be taken by the Proponent and appointed consultants or sub-consultants to eliminate adverse impacts, offset them, or reduce impacts to acceptable levels.

The objectives of this ESMP can be highlighted as:

- Present all standards and specific mitigation measures applicable to the proposed Project, which should form part of the appointed Contractor's contract and construction procedures;
- States the financial responsibilities applicable to the implementation of the ESMP; and
- Indicate and describe monitoring activities that need to be implemented during and after construction activities to measure adequate implementation of mitigation measures and efficiency.

10.2 SUMMARY OF IMPACTS AND MITIGATION MEASURES

The various impacts and mitigation measures identified as applicable to the Project is summarised in Table 10.2-1 below, which provides a tool to facilitate the contractors ESMP.

Table 10.2-1 presents six columns based on the initial identified VECs for the construction activities of the Project:

- Column 1 lists the identified VECs (see Table 2.5-1);
- Column 2 list the sources of impact relating to the VECs;
- Column 3 list the potential impacts to the VECs;
- Column 4 presents the proposed mitigation measures; and
- Columns 5 and 6 list the responsibility for implementing the mitigation measures and monitoring of compliance.

Table 10.2-1 – Environmental and Social Management Plan (Summary of Impacts and Mitigations)

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
Hydrology – Water Resource Quantity	Extraction of groundwater for construction requirements.	Depletion of scares water resource.	Prepare and implement a Construction Water Demand Management Plan, considering the findings of the Hydrogeological Assessment (Appendix B1), which should include the use of semi-purified wastewater collected from nearby urban areas' wastewater treatment facilities, as well as NAMWATER supply. Other available sources within the larger region should be considered as part of the Construction Water Demand Management Plan. Limit groundwater use to essential needs and aim at continually improve efficiency in the use of groundwater to minimise effect on local availability. Regularly inspect all installations associated with groundwater extraction and distribution to eliminate leaks which are wasting the resource. Regularly maintain the equipment used to spray water for dust abatement to eliminate leaks and minimise losses. Consider the installation of systems to collect and store rainwater to minimise dependency on groundwater within the work sites.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	600,000.00 – 800,000.00
			As part of the mentioned Construction Water Demand Management Plan, an Underground Water Monitoring Plan should be drafted whereby the water levels and quality is monitored.			400,000.00 – 600,000.00
Hydrology – Water Resource Quality	Temporary construction facilities, transportation of hazardous liquids and materials, site preparation, borrow pit activities, drainage and stormwater management, structural work, waste and hazardous material management, operation and routine maintenance.	Use of contaminants & hazardous materials & construction waste & solid waste from toilets (suspended solids and others). Potential contamination of ground- and surface water through accidental spills and leaks during construction activities.	Prepare and implement a Hazardous Waste and Materials Management Plan, a Wastewater Management and Disposal Plan, and a General Waste Management Plan which include arrangements for managing solid and liquid hazardous and non-hazardous waste (to be approved by the supervising consultant and the environmental department before the start of the construction). Ensure the development of a strong Environmental & Social Management Plan, including but not limited to, strong measures to improve efficiency in the use of water, a Spill Prevention and Response Plan and a Waste Management Plan that should consider the following recommendations: ▪ Hazardous waste and hazardous material (including cement bags) storage facilities should be built on an impermeable surface offering confinement capacity in the event of a spill or release. These storage facilities should offer protection against weather conditions, have access control and secured. ▪ Store all waste in distinct closed containers to allow for some segregation (recyclables and waste) and adequate confinement. ▪ The fuel trucks that will ensure fuelling of machinery at the work sites should carry a spill kit. Except for fixed water works equipment that cannot be	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	500,000.00 – 600,000.00

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			moved, all machinery should be moved away from water side before fuelling (at least 30 m). All fuel storage tanks should be equipped with adequate and required confinement capacity. ▪ Ensure some of the personnel trained are available to intervene in the event of accidental spills or leaks. ▪ Contacts of firms (names and phone numbers) specialized in spill intervention must be kept on-site in the event of a spill or leak that cannot be handled with on-site spill kits alone. ▪ Ensure material used for construction comes from known clean sources to avoid chemical contamination. If soils from a non-certified site are accepted, characterization prior to use is recommended. Waste minimisation and prevention hierarchy. Identification of the types and dimensions of storage means at source for hazardous and non-hazardous wastes. Design and construct a central waste storage area for non-hazardous wastes which accommodate for the received segregated streams/or any alternative solution proposed by the contractor. Identify the nearest landfill for the disposal of the non-recycled items. Identify a recycling contractor preferably from the nearby villages. Waste contractors' certifications and compliance assurance. All waste streams should be transported and disposed of by certified service providers and disposed of in licensed landfills/dump sites. Training for workers on sound environmental practices to manage solid wastes. Storage used oils in sealed drums sheltered from the sun and rain until collection. Record keeping (waste inventory, waste disposal registers and consignment notes). Complete prohibition dumping of solid and liquid waste in any river, stream, and drainage line or water body. When using diesel generators, place the generator on an impermeable protective base layer or drip tray. Ensure vehicles, equipment and machinery is in good working order to minimize the leak of contaminants. Ensure dedicating a specific area for the cleaning of concrete trucks. Capture the resulting wastewater and proceed to adequate treatment or disposal.			

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			Install terrestrial silt screens, where practically possible, between work areas and water's edge to limit transport of fines in water run-off. In case of accidental spills of hydrocarbons, isolate and collect the contaminated soil and store as hazardous waste to be disposed of in hazardous waste landfills. For the contractors' temporary offices, use intact septic tanks, free of any leaks and to be regularly emptied before reaching its maximum capacity or on-site wastewater treatment to be done to achieve general standards.			
			Development and implementation of a Hazardous Substances' Management Procedure, to form part of the Spill Prevention and Response Plan. The procedure should at minimum address the following aspects: operational procedures, procurement, prohibited substances, inventory, risk assessments, labelling, storage, Safety Data Sheets and control measures. The procedure should mention specific measures for the control of risks associated with the use of the diesel fuel for power generation. The management plans and procedures can be standalone documents or part of an overall construction environmental, health and safety management plan. This shall also include a note on accidental spills of hydrocarbons, and methods of isolation and collection of the contaminated soil and storage as hazardous waste to be disposed of in hazardous waste landfills. Inspection of the site for existing contamination from previous work/activities. Where inspection results were positive, carefully collect and isolate all the contaminated soil in sealed bags to be disposed in the nearest hazardous waste landfill/treatment facility.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	150,000.00 – 200,000.00
			As part of the mentioned Construction Water Demand Management Plan, an Underground Water Monitoring Plan should be drafted whereby the water levels and quality is monitored.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	400,000.00 – 600,000.00
Hydrology – Water Flow & Flooding	Temporary construction facilities, transportation of goods and materials, site preparation, borrow pit activities, drainage and stormwater management, structural works, waste and hazardous material management, operational activities and maintenance.	Temporary obstruction of surface water flow during construction and maintenance activities.	The following mitigations should be presented in a Water Run-off and Flooding Management Plan. Define vehicle and machinery movement routes within the work site and ensure they are respected to limit the creation of erosion. Where possible, run-off water from the work area and adjacent lands should be captured through ditches and redirected appropriately.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	100,000.00 – 150,000.00

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			As much as possible, conduct work that may impact local hydrology during the dry seasons (from June to November) to minimize the risks associated with watercourse obstruction or encroachment. Avoid construction activities within rivers, water courses and drainage lines during rain seasons (from December to May). Except where specifically required (i.e., for bridge construction), avoid storage of granular or any other material within, on the shore of or near (less than 30 m) a water course to limit the risks of such material impeding water flow. Continues monitoring of up-stream conditions to detect any flow in advance. Installation of infrastructure should provide for the necessary design and avoidance measures to protect infrastructure from flood damages. Conduct regular inspection and cleaning of culverts to remove encumbrances and maintain the efficiency of the drainage system.			
Flora (Habitat)	Temporary construction facilities, transportation of goods and materials, site preparation, borrow pit activities, drainage and stormwater management, structural works, waste and hazardous material management, operational activities and maintenance.	Loss of vegetation cover through site clearing for variety of purposes (i.e., new embankment; construction site & laydown areas, storage areas, etc.) and temporary roads.	During the planning phase of the construction period, the appointed contractor should identify areas for lay down areas and construction vehicle sites within areas that are already cleared or disturbed, to be captured in a Pre-Construction Site Assessment & Laydown Plan. Only prominent gravel tracks should be utilised during the construction phase, to avoid track proliferation. Off-road driving should be strictly prohibited. Permits should be obtained for protected plant species that unavoidably need to be removed.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	400,000.00 – 600,000.00
		Spreading of invasive species and alteration of local vegetation conditions.	The below mentioned should be included into the Pre-Construction Site Assessment & Laydown Plan. Prevent and discourage the collecting of firewood, as dead wood has an important ecological role. Such collecting of firewood, especially for economic reasons, often leads to abuses – e.g., chopping down of live and/or protected tree species such as *Acacia erioloba* which is a good quality wood. Avoid the removal and damage of bigger trees (especially protected species – i.e., *Acacia erioloba* [camel thorn], *Faidherbia albida* [Anna tree], *Tamarisk usneoides* [wild tamarisk] and *Acanthosicyos horridus* [!nara] plants [See Tables 5 and 6; Forest Act No. 12 of 2001]) – during developments – including the development of access routes – as these serve as habitat for a myriad of fauna. Implement a policy of "no tolerance" towards the existing invasive alien plant species (i.e., *Argemone ochroleuca*, *Datura* spp., *Eucalyptus* spp., *Nicotiana glauca*, *Prosopis* spp. and *Ricinus communis*) in the area. This should			

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			include the removal and destruction of these species throughout the proposed development areas. Such activity would be beneficial to the overall ecology of the area, especially the Kuiseb River area where most of these aliens currently occur. Rehabilitation of the disturbed areas – i.e., initial development access route "scars" and associated tracks, as well as temporary construction sites. Workers should be transported in/out to the construction sites on a daily basis to avoid excess damage to the local environment (e.g., wood collection, poaching, etc.). Such rehabilitation would not only confirm the various development companies' environmental integrity, but also show true local commitment to the environment. Educate/inform contractors on protected species to avoid and the consequences of damaging such species. Liaise with DRFN and/or MET to provide this service. Investigate the idea of employing a qualified environmental officer (EO) during the construction phase to ensure appropriate conduct by contractor(s). Avoid the use of herbicides for plant/weed control along the pipeline/power line route(s). Employ an ecologist for advice on the best route(s) prior to construction – i.e., assist with the final alignment. Avoid unnecessary clearance of vegetation and keep to the minimum required. Preserve existing vegetation where no construction activity is planned and mark areas as no-go areas. These areas must be designated as sensitive, and staff and contractors must be formally made aware that these areas are not to be destroyed. Remove and keep topsoil to be reused in the same area for revegetation needs. Revegetate temporally disturbed areas once the work is completed with indigenous flora species. In order to limit the spread and propagation of invasive species, all such invasive species within the corridor of impact and/or right of way should be removed/cleared. Inspect construction vehicles and heavy machinery before first mobilization on site to ensure they are free of soil or viable segments of invasive alien species. Do not use soils potentially contaminated with invasive alien species as a covering material on site or elsewhere.			

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			Rehabilitate burrow pits using indigenous vegetation when works are completed, or in accordance with landowner agreement. Implement a construction closure plan in which rehabilitation measures are defined and budgeted. All construction material and waste must be removed from the construction sites and the area rehabilitated once works are completed. Avoid project activities (e.g., camps, laydown yards, topsoil storage etc.) within remaining natural habitats, which should be placed within already disturbed areas. Undertake a pre-construction walkover survey within the railway reserve, quarry sites and other temporary construction facilities to identify the areas of natural habitat and priority plant species. Mark and leave undisturbed to the extent feasible, or relocate if feasible.			
Fauna	Temporary construction facilities, transportation of goods and materials, site preparation, borrow pit activities, drainage and stormwater management, structural works, waste and hazardous material management, operational activities and maintenance.	Habitat loss, degradation or modification through construction work. Increase in mortality from poaching and killing. Behaviour disturbances because of construction noise.	The below-mentioned mitigations should be presented in a Pre-Construction Site Survey and No-go Plan. Implement and maintain track discipline limited to existing tracks and/or certain tracks with maximum speed limits (e.g., 30 km/h) as this would result in fewer faunal road mortalities and associated dust pollution problems. Avoid off road driving. Nocturnal driving should also be avoided as this result in the destruction of slow-moving fauna – e.g., various reptiles and other nocturnal species. Restore shores and riverbeds to their pre-existing condition once works are completed. Ensure culvert and drainage structures' dimensions allows for connectivity of aquatic habitat. Avoid and/or limit the use of lights during nocturnal activities as this influence and/or affects various nocturnal species – e.g., bats and owls, etc. and contribute to "light pollution". Use focused lighting for least effect. Prevent overnight activities during the construction phase(s). This could result in pollution; killing of perceived dangerous nocturnal species (e.g., snakes, bats, etc.); illegal collection of species for the pet industry (e.g., chameleon), etc. Prevent and discourage the setting of snares (poaching), illegal collecting of veld foods (e.g., ostrich eggs, etc.), indiscriminate killing of perceived dangerous species (e.g., snakes, etc.), and the collection of wood as this would diminish and negatively affect the local fauna – especially during the construction phase(s).	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	650,000.00 – 750,000.00

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			No hunting by the contractor's workers shall be allowed. Possession, transport, collection, fishing, hunting or purchase of IUCN Red-listed species, CITES listed species, and any species protected by national law by the contractor's workers will not be permitted. Initiate a suitable and appropriate refuse removal policy during the construction phase(s) as littering could result in certain animals becoming accustomed to humans and associated activity and result in typical problem animal scenarios – e.g., black-backed jackal, crows, etc. Avoid the removal and damage of bigger trees (especially protected species – i.e., *Acacia erioloba* (camel thorn), *Faidherbia albida* (Anna tree) and *Tamarix usneoides* (wild tamarisk) plants [See Tables 5 and 6; Forest Act No. 12 of 2001]) – during developments – including the development of access routes – as these serve as habitat for a myriad of fauna. Rehabilitation of the disturbed areas – i.e., initial development access route "scars" and associated tracks, as well as temporary construction sites. Preferably workers should be transported in/out to the construction sites on a daily basis to avoid excess damage to the local environment (e.g., wood collection, poaching, etc.). Such rehabilitation would not only confirm the various development companies' environmental integrity, but also show true local commitment to the environment. Prevent (do not allow) domestic pets – e.g., cats and dogs – accompanying the workers during the construction phase as pets can cause considerable damage to the local fauna. Cats also interbreed and transmit diseases to the indigenous African wildcat found in the area. The indiscriminate and wanton killing of the local fauna (including domestic stock) by such pets should be avoided at all costs. Initiate a policy of capture and removal of fauna (e.g., slow moving species such as chameleon, snakes, etc.) encountered serendipitously within the construction areas. Such fauna should be removed to other areas of similar habitat in the area. Ensure that mobile ablution facilities are used and frequently serviced on site during the construction phase(s) to avoid pollution in the area. Educate/inform contractors on dangerous and protected species to avoid and the consequences of illegal collection of such species. Liaise with DRFN and/or MET to provide this service. Undertake a pre-construction walkover survey within the railway reserve, burrow pit sites and other temporary construction sites to identify any active nests. If a threatened bird species is nesting, consult a local avifauna specialist for guidance on actions to be taken.			

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			Investigate the idea of employing a qualified environmental officer (EO) during the construction phase to ensure appropriate conduct by contractor(s).			
Air Quality	Temporary construction facilities, transportation of goods and materials, site preparation, borrow pit activities, structural works, base & embankment preparation, routine maintenance of servitude.	Release of dust and atmospheric contaminants (GHG emissions).	The below mitigations should be presented within a Construction Air Pollution Prevention Plan. Avoid leaving mechanical equipment, machinery, trucks, and vehicles idling unnecessarily. Ensure all vehicles; equipment and machinery are in good working order. Limit vehicle and machinery speed within the work site to minimize dust generation. Authorized speeds on the work site should be specified and enforced by the contractor. Use water bowsers as dust abatement to limit excessive dust emissions from granular material handling and piling, and vehicle movements. All vehicles used by the contractor to deliver construction materials and/or collect waste materials to and from the site should be completely covered to avoid material spillage. Drop granular material as close to the ground possible to reduce the generation of airborne particles. Implement an Eco-driving attitude program that will help better manage heavy equipment and fuel consumption. All construction vehicles used on-site should be within a perfect state and not result in higher CO^2 emissions than what he particular vehicle's allowable CO^2 emissions levels. When practically possible, use alternative technologies, energy sources and materials. All vehicles used by the contractor to deliver construction materials and/or collect waste materials to and from the site should be completely covered to avoid material spillage. Regular maintenance and inspection of equipment and vehicles used on site. Promote the purchase of low-sulphur diesel. As much as practically possible, construction material and waste should be transported to and from construction sites using cargo trains. Vehicles uploading material should maintain the lowest possible fall height to reduce noise and dust generation. Apply dust suppression making use of semi-purified wastewater. Avoid construction activities during times of strong winds.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	700,000.00 – 800,000.00

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			Farm owners and nearby residents should be informed of the construction activities and period, and requested to avoid the particular area during this time.			
Soil and Sediment – Soil stability/erosion	Temporary construction facilities, transportation of goods and materials, site preparation, borrow pit activities, structural works, and base & embankment preparation.	Soil erosion and loss of topsoil.	Develop and implement an appropriate Soil Stability Management Plan, including but not limited to, site assessment requirements prior to disturbances and availability of soil erosion protection systems. Slope stability assessments should be done where required for in areas of cut and or fill operations within the final route alignment. Final designs are to include suitable mitigation measures based on the findings of such studies. Soil stability and erosion should be monitored prior to the installation of such final mitigation measures. Areas disturbed indirectly as part of construction activities (e.g., temporary access routes, temporary vegetation clearing) should be protected from erosion and rehabilitated to a protected state after disturbing activity are done. Temporary run-off and erosion control management should be included into the Soil Stability and Management Plan and implemented during construction phases. This should identify construction stages during which assessments and measures should be applied for each section of road as well as all temporary construction areas.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	450,000.00 – 500,000.00
Soil and Sediment – Soil & sediment quality	Temporary construction facilities, transportation of goods and materials, site preparation, borrow pit activities, drainage and stormwater management, structural works, waste and hazardous material management, base & embankment preparation, operational activities and maintenance.	Contamination of surface soils through accidental leaks or spills of contaminants during construction and maintenance activities.	Ensure all vehicles; equipment and machinery are in good working order with a particular attention to fuel/oil pipes, tanks and sumps, hydraulic hoses, etc. Keep spill kits at the work site to accelerate intervention in the event of a spill or leak. Ensure the development of a strong Environmental and Social Management Plan, including but not limited to, a Spill Prevention and Response Plan and a Hazardous Waste and Materials Management Plan that should consider the following recommendations: ▪ Hazardous waste and hazardous material storage facilities should be built on an impermeable surface offering confinement capacity in the event of a spill or release. These storage facilities should offer protection against weather conditions, have controlled access and be secured.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	350,000.00 – 400,000.00

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			▪ Store all waste in distinct closed containers to allow for segregation (recyclables and waste) and adequate confinement. ▪ The fuel trucks that will ensure fuelling of machinery at the work sites should carry a spill kit. All fuel storage tanks should be equipped with adequate and required confinement capacity. ▪ Ensure personnel trained are available to intervene in the event of accidental spills or leaks are available. ▪ Contacts of firms (names and phone numbers) specialised in spill intervention must be kept on-site in the event of a spill or leak that cannot be handled with on-site spill kits alone. ▪ Ensure material used for construction comes from known clean sources to avoid chemical contamination. If soils from a non-certified site are accepted, characterisation prior to use is recommended. All waste should be properly disposed off-site by certified companies.			
Local Livelihood and Economic Activities – Land-Based Livelihood Activities	Land acquisition for railway, resettlement and compensation. Use of borrow pits and access to land.	Temporary (borrow pits) or permanent (railway) loss of land. Reduction of agricultural production by loss of land. Potential loss of income for the same reasons.	Update and implement the provided Stakeholder Engagement Plan, which should include the below mentioned mitigations and procedures. Develop Compensation Strategy and Finance Plan, as per the applicable Policies. Undertake a survey of affected portions of land, determine land values and engage affected landowners for compensation. Ensure that agreements are in place to access private land and for compensation of land according to market related values. Relocation and compensation guided by applicable Namibian legislation. Apply all herein mentioned mitigation measures applying to fauna and flora, as well as social health and safety for the duration of the construction and operational phases. Avoid locating borrow pits on valuable agricultural lands and in forested areas and respect the official agreement with the landowner with regards to site rehabilitation once work is completed. Land accommodating agricultural infrastructure (i.e., pens, windmills, gravel dams, etc.) should be excluded from being used for borrowing pits and/or railway realignment. Project to apply and maintain their avoidance strategy for any land with any uses as a priority action. All efforts must be made to allow for harvesting of crops prior to any land-related impacts, if applicable. Involve relevant authorities and stakeholders where conflicts could occur, not only in the urban areas, but also on commercial land.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	5,000,000.00 – 10,000,000.00

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			A robust and multi-channels project level Grievance Redress Mechanism to be developed and used.			
Local Livelihood and Economic Activities – Self-Employed and Business Based Livelihood	Temporary construction activities, transportation of goods and materials, site preparation, borrow pit activities, operation and routine maintenance.	Restriction and/or reduction of business activities as a result of dust, particles and pollution and by restriction of access to business. Effect on supply and distribution of goods and delivery of services. Effect on supply and distribution of goods.	Ensure the development and implementation of a Construction Traffic Management Plan that considers the distinctive features of the Project area in order to provide maximum traffic flow and accessibility during the construction phase. To maximize the project's positive impacts on the creation of jobs, the following enhancement measures are recommended: ▪ Apply human resource policies favouring local labour. ▪ Implement training programs to build local capacity. ▪ Disclose information on newly created business opportunities. Ensure to include self-employed and business-based livelihood as part of the stakeholder engagement plan, namely those having a direct interaction with the railway line. If diversion of traffic is necessary, which might result in restricted access to local businesses, consider effective alternatives and reduce the time of access restriction. Ensure as far as possible continued access to industries/business located along the railway. If diversion of traffic is necessary, take into account the location of industries/business and their access to suppliers and economic outlets in planning alternate routes.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	250,000.00 – 350,000.00
Local Livelihood and Economic Activities – Tourism & Conservation Activities	Land acquisition for railway, resettlement and compensation for loss of land, temporary construction activities, transportation of goods and materials, site preparation, borrow pit activities, drainage and stormwater management, base & embankment, waste and hazardous materials management, purchase of materials, goods and services, presence of workers and influx of job seekers, operation and routine maintenance.	Potential loss of ecological components that form part of the attraction for tourists. Effect on transport efficiency of tourists. Release of dust and atmospheric contaminants. Increased noise levels as a result of construction activities.	Implement the following aforementioned mitigation measures to reduce pollution and environmental degradation of touristic natural areas: ▪ Flora & fauna (restrict removal). ▪ Soil management (dust reduction and contamination). ▪ Atmospheric environment (dust reduction and contamination). ▪ Surface and groundwater quality mitigation measures. Ensure the development of a strong Environmental and Social Management Plan, including but not limited to, site assessment requirements prior to disturbances, a spill prevention and response plan and a waste management plan. Ensure the development of a Construction Traffic Management Plan that considers the distinctive features of the Project area in order to provide maximum traffic flow and that includes, among others, the following measures:	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	150,000.00 – 250,000.00

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			▪ Control access to work areas to ensure that only necessary personnel and machinery is present. ▪ Optimize transport routes to reduce travel distances by vehicles and machinery and avoid tourist routes. If diversion of traffic is necessary, take into account key location of major tourists' sites in planning of alternate route.			
			Develop and implement a noise management procedure as a standalone document or as a part of an occupational health and social plan.			150,000.00 – 250,000.00
Noise levels & vibrations	Temporary construction facilities, transportation goods and materials, site preparation, borrow pit activities, structural works, base & embankment preparation, routine maintenance of servitude.	Release of dust and atmospheric contaminants.	Develop and implement a Noise Management Procedure Plan as a standalone document or as a part of an occupational health and social plan. The following measures as a minimum should be covered: Optimise the use of equipment and turn off any equipment when not in use. Use of modern, well-maintained equipment fitted with abatement devices (e.g., mufflers, noise enclosures). Control exposure to hand-arm vibration from equipment such as hand and power tools, or whole-body vibrations from surfaces on which the worker stands or sits, through choice of equipment, installation of vibration dampening pads or devices, and limiting the duration of exposure. Stop all noisy work at night (before 6 am after 6pm) Maintain equipment and machinery including brakes, mufflers, catalysers and silencers in good running condition, clean (power washed), free of leaks, excess oil and grease. Prohibit idling of vehicles on the site or near sensitive receptors. Generators and machinery should be shut down when not in use. Inform drivers to limit speed in sensitive areas and to limit noise from the rear panel of dumpster truck. Drivers should be sensitized on noise reduction measures through an Eco-driving attitude program. Equip the compressors and generators used on site with an acoustic enclosure, a noise barrier or placing them in a soundproof box. This is particularly important in areas with sensitive receptors. If blasting is required, ensure noise and vibration mapping has been realized, limit load of explosives accordingly and advise local population in advance to prevent nuisances.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	80,000.00 – 120,000.00
Community Health, Safety and Security	Temporary construction facilities, transportation of goods and materials, site preparation, borrow		As required by IFC Performance 1, update and implement a Stakeholder Engagement Plan (SEP) to keep communities informed of work site	Proponent / MET	Contractor's E&S Officer (daily basis); Independent	80,000.00 – 100,000.00

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
(including traffic and accessibility)	pit activities, drainage and stormwater management, structural works, waste and hazardous material management, base & embankment preparation, presence of workers and influx of job seekers, operational activities and maintenance.	Increased crime in surrounding communities with associated safety and security risks. Increased risk of health problems due to influx of job seekers and construction workers.	evolution, planned activities and any potential risk that may arise from the work site. The SEP should include, among others, the following components: ▪ A list of Project stakeholders derived from the present ESIA, the RAP, information from RAP implementation as well as any other relevant information. ▪ Analysis of stakeholder engagement to date. ▪ Identification of methods of communication and information disclosure for specific groups; and ▪ Action plan for stakeholder information and engagement during project construction. Plan and conduct at least one yearly stakeholder engagement session to inform, in one session, all interested and influential stakeholders on the construction activities. Subjects to be covered include a summary of activities held during the last year, upcoming projects, ESMP implementation results, HSE aspects, and a discussion pertaining to the main grievances received and how to resolve them. Sometime should be allowed for questions and exchanges. Inform community members and crime response units of construction activities within their vicinity and provide effective means of communication. Clearly placed signs should be displayed at strategic localities stating the objective of the project, duration of the work and the phone number to receive grievances for both the contractor and community. Draft a Construction Safety & Security Conduct Plan to be enforced on-site by the contractor towards all appointed construction staff. Prominent signs at the contractor's office and construction site should be displayed warning not to cross the fence boundaries onto adjacent farmlands. Construction workers should also be informed and continuously reminded not to access adjacent farms for any reason. Trespassers will be prosecuted, and heavy fines applied to the contractor. The bulk of materials and goods should be transported to the site making use of rail transport. All construction workers should be issued with identifiable clothing to ensure easy identification of unauthorised people within the workforce. Public awareness and sensitization campaign should be undertaken. This should include railway safety. Implement a health management system for the construction workforce, to ensure through medical check-ups and that they will not introduce disease into local communities.		Environmental Consultant (3 monthly)	

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			Instruct all vehicles drivers contracted by the project on safe driving guidelines.			
			Implement an Emergency Preparedness and Response Plan (EPRP) to manage major incidents if they should occur in the vicinity of the construction site. Prepare and implement a project and Workers Grievance Redress Mechanism (GRM). Ongoing identification, evaluation and monitoring of potential community health and safety risks. Establish partnerships with social and health services at project level. Storage of track units or construction material should not affect traffic or pose any risk to communities adjacent to the railway reserve. Develop and implement a strong Contractor Code of Conduct detailing the guidelines on expected engagement with local communities and penalties for failure to adhere to regulations, and closely monitor its application and effectiveness. The Code of Conduct should include among others: ▪ A strict prohibition of GBV (including harassment, exploitation and abuse) and sexual intercourse with partners younger than 18 years of age (underage sex). ▪ The requirement to immediately report any suspected case of GBV or underage sex to construction supervising engineer. ▪ Train all workers on GBV risks and related sanctions. Ensure that management and security staff are adequately trained to identify and eradicate all forms pertaining to GBV and gender-based discrimination. Introduction of strict sanctions (e.g., dismissal) for workers involved in any form of abuse, inappropriate behaviour or GBV. ▪ A strict prohibition for engaging in illicit or criminal activities. ▪ Migrant workers must undergo a pre-hiring and annual medical check-up and should be treated if sick. They should be trained on disease prevention and recognition to avoid spreading. Organize education campaigns, including a STI and HIV/AIDS prevention program, for the workers and surrounding communities to facilitate interactions between workers and communities. The contractor to avoid hiring “at the gate” to discourage spontaneous influx of job seekers. Implement above mentioned soil management mitigations to avoid nuisances (dust and contamination).	Proponent / MET	Contractor’s E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	250,000.00 – 300,000.00

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			Ensure the development of a Traffic Management Plan that considers the distinctive features of the Project area in order to provide maximum safety and traffic flow and that includes, among others, the following measures: ▪ Control access to work areas to ensure that only necessary personnel and machinery is present.			
			▪ Develop and implement specific access routes to and within the work site that are optimized to reduce travel distances by vehicles and machinery and ensure all drivers working for the project are aware of the established routes. ▪ Verify with the Ministry of Works and Transport the existing authorized load limits on the various sections of the road network to be used, if any, and enforce compliance. ▪ Provide safe and convenient pedestrian paths and crossing points along the road alignment and construction areas, including under and over passes. ▪ Ensure installation and maintenance of speed control and traffic control systems at pedestrian crossing areas. ▪ Ensure installation and maintenance of appropriate road signs, signals, markings, and other traffic regulation devices related to pedestrian facilities and vehicular traffic. ▪ Ensure implementing the Traffic Management Plan for the transportation of material from borrow pits to the work site. This Plan should include a map highlighting sensitive receptors in relation with access routes to be used. The map should be updated regularly with access route changes. ▪ Provide Project drivers with awareness sessions on the Traffic Management Plan and keep records of the trainings. ▪ Conduct a regular mandatory drug and alcohol testing for drivers working on the construction sites. Ensure all drivers working for the project have a valid driver's license, are certified for driving the vehicle they are responsible for, and have successfully followed a recognized driving course covering road safety measures and the importance of sharing the road with pedestrians and other types of vehicles. Control driver activities to avoid exceeding normal work shifts and to ensure they have enough rest periods. Avoid as much possible the use of chemicals for clearing vegetation. Favour manual or mechanical clearing methods. If diversion of traffic is necessary, take into account key location livelihoods, health and safety services and sociocultural activities in planning alternate routes.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			Avoid the formation of open holes, or ensure these are covered as much as possible, especially within the urban areas. Design safety awareness campaign in collaboration with local authorities and governmental agencies aimed at local residents. Monitor the use of pedestrian crossings and conduct specific awareness campaign to encourage their use.			
			Limit work activities to normal work hours (8 h to 18 h) as much as possible, especially within the urban areas and those areas close to any receptor (i.e., tourism activities on farms). Ensure the development and implementation of a Waste Management Plan that should allow for safe and quick disposal of waste, as not to result in any form of pollution or spread of diseases. All waste should be properly stored on site in appropriate containers and regularly disposed off-site by certified companies. Effective storage and/or treatment of sewage on site and removal there-off are compulsory and should be done in accordance with a Wastewater Management and Disposal Plan to be developed by the contractor. All workers should be informed and trained not to use the feld and that heavy fines will be applied to the contractor if any human waste is found on-site or any other adjacent area. Extend the stakeholder engagement plan into the operation phase to cover the entire Project lifecycle as required by IFC PS1.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	450,000.00 – 800,000.00

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
Labour & Working Conditions	Temporary construction facilities, transportation of goods and materials, site preparation, borrow pit activities, drainage and stormwater management, structural works, waste and hazardous material management, base & embankment preparation, presence of workers and influx of job seekers, operational activities and maintenance.	Risk of injuries and physical and mental illnesses, risk of abuse by contractors hiring underage workers (child labour, violation of workers' rights, worker insecurity, fatigue and stress generating conflict at the household and community levels and potentially act as a trigger for social problems such as drug and alcohol abuse and GBV influx of workers and job seekers may negatively affect the social acceptability of the Project.	The Contractor is responsible to prepare and implement an Occupational Health and Safety Plan (OHS) and an Emergency Preparedness and Response Plan (EPRP) to include fire and medical emergencies during the construction phase and addressing the following aspects as minimum: Hire an accredited Health & Safety professional. Identify hazardous sources to workers and identify mitigating measures to eliminate dangers. Workers must be trained to recognise potential hazards including electrical hazards, use proper work practices and procedures, recognise adverse health effects, understand the physical signs and reactions related to exposures, and are familiar with appropriate emergency evacuation procedures. They must also be trained to how to use the Personal Protective Equipment (PPE). Inspection and testing of all equipment and machines should be regularly undertaken by experienced and qualified person. Prepare an Emergency Response Plan (ERP) and have trained personnel on-site to action and management ERP. Ensure that appropriate and enough first aid equipment, fire extinguishers in good working conditions and sand buckets are available on-site. Overall no-smoking is allowed on the site, except within the dedicated smoking room, which should be provided and equipped with necessary bucket and fire extinguisher. Follow latest WHO and national measures on Covid-19 as relevant.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	500,000.00 – 700,000.00
			Regular inspection of workers against pathogenic agents and provision of immunization when needed. Identify and provide contacts of closest authorities and emergency services to contact in case of emergencies, especially with reference to feld fires. Provision of full PPE including suitable footwear to avoid slippage and to protect workers from injuries. Workers exposed to noise exceeding permissible levels (e.g., ballast uploading) should wear hearing protection. Develop and implement hiring guidelines that meet or exceed relevant national regulations and international standards, including: ▪ Public and Environmental Health Act No. 1 of 2015; ▪ Labour Act (No. 11 of 2007); and			200,000.00 – 250,000.00

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			▪ International Finance Corporation (IFC) Performance Standard 2: Labour and Working Conditions. Contractually require all contractors, subcontractors, and suppliers to adopt and comply with policies and procedures that comply with national regulations and international standard and address all aspects of labour standards relevant to the project. Develop and implement a Health and Safety Management Plan that meets or exceeds national regulations and international standards to protect every worker involved in construction activities, including temporary workers. Specific provisions must be included for: ▪ Supply of drinking water of adequate quantity and quality. ▪ Provision of adequate and gender-separated sanitation at construction sites. ▪ Declaration of accidents through an accident reporting mechanism. ▪ Handling of domestic and specialized waste, as well as dangerous goods. ▪ Procedures in case of injuries and accidents. ▪ Provision and use of personal protective equipment (e.g., helmets, gloves, safety glasses, etc.) ▪ Securing of equipment and demarcation of any excavation work areas; and ▪ Deployment of signs and fences in construction areas, where necessary. Develop and implement an Emergency Response Plan and employ experienced person to manage response.			

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			Develop and implement a monitoring system for the application of the above plans, regulations, and standards by all levels involved in the Project, including contractors, subcontractors, and suppliers of goods and services. Develop and implement a grievance redress mechanism for workers and residents and establish a safe and ethical reporting environment that allows for anonymous reporting. Implement a long-term training program throughout the construction phase to ensure adequate training and qualification of all staff employed for the project. Provide medical facilities throughout the construction phase for the use of workers where required. Ensure reasonable working hours, wages and other benefits. Provide suitable and safe amenities and sanitation facilities, including available drinking water and latrines. Implement measures for supporting the recruitment and retainment of female workers outlined in Section 8.2.15. Maximize the hiring of local labour through the following measures: ▪ Apply human resource policies favouring local labour including, but not limited to, local hiring targets. ▪ Implement training programs to build local capacity; and ▪ Disclose information on newly created business opportunities. Establish partnerships with social and health services at project level. Prepare a list of relevant medical and social resources and services for workers and ensure all relevant staff (e.g., human resources, supervisory staff, grievance redress mechanism staff, etc.) have access to and are familiar with this document.			150,000.00 – 200,000.00
Genders Equality	Temporary construction facilities, transportation of goods and materials, site preparation, borrow pit activities, drainage and stormwater management, structural works, waste and hazardous material management, base & embankment preparation, presence	Risk of Gender Based Violence, increase abandonment of wives and children and of prevalence of sexually transmitted infections because of influx of construction workers and job seekers.	A Gender and Social Inclusion (GSI) Policy should be prepared and include the below mentioned. Encourage the recruitment of female workers, with equal payment for male and female workers, for equivalent jobs. This can be achieved through the following potential measures: ▪ Set targets for women employment. ▪ Recruit and train women to be integrated in existing work teams.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	50,000.00 – 100,000.00

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
	of workers and influx of job seekers, operational activities and maintenance.		▪ Offer equal salaries for the same work to all employees with the same level of experience and skills, whether they are men, women or people with a disability.			
			Develop and implement a Family Health & Safety Training Programme including the below mentioned. ▪ Implement family-friendly measures such as health coverage and time-off for the birth of a new child. Ensure these measures are in line with Namibian regulation. ▪ Provide civic and employee education on sexual harassment in the workplace. ▪ Ensure adequate amenities in field-based work such as segregated toilets, adequate waste disposal facilities, water for personal hygiene, etc. ▪ Develop and implement gender and issue sensitive staff grievance redress mechanisms and establish a safe and ethical reporting environment that allows for anonymous reporting. Develop a Gender and Social Inclusion (GSI) Policy for the Project's activities. Develop and conduct GSI information/ awareness sessions with all staff. Develop and implement a strong Code of Conduct that protects women, girls, boys and men from gender-based violence (physical, sexual, and psychological) and closely monitor its application and effectiveness. The Code of Conduct should include among others: ▪ A strict prohibition of GBV and sexual intercourse with partners younger than 18 years of age (underage sex). ▪ The requirement to immediately report any suspected case of GBV or underage sex to construction supervising engineer. Develop and implement internal grievance and support that is accessible to all employees, pays special attention to the different realities of female and male victims of GBV, and includes the possibility of denouncing any form of harassment or intimidation. Ensure proper actions are taken according to the Namibian legislation in cases of harassment. Develop and implement an external gender-sensitive grievance redress mechanism that is accessible to all segments of the general population, pays special attention to the different realities of female and male victims of GBV, and includes the possibility of denouncing any form of harassment or intimidation. Ensure proper actions are taken according to the Namibian legislation in cases of harassment.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	150,000.00 – 200,000.00

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			Implement and follow-up on gender-sensitive grievance redress mechanisms, paying special attention to the different realities of female and male victims of GBV. Organize education campaigns, including a STI and HIV/AIDS prevention program, for the workers and surrounding communities to facilitate workers and communities' interactions. Ensure that the Project offers some procurement opportunities for women, youth and persons with disabilities as required by Namibian legislation and policies. This can be facilitated by: ▪ Establishing a system for tracking bidders and awardees from women-headed or majority women-owned firms. ▪ Setting up a mechanism to promote bid-readiness support for women-owned or majority women-owned small firms and businesses. ▪ Maintaining vigilance for opportunities which could be offered to women groups. Provide, if possible, additional income generating opportunities to women during construction (e.g., provision of catering services, selling local products).			
Archaeology and Cultural Heritage	Site preparation, excavations, preparation of embankment, and borrow pit activities.	Possibility of destroying undiscovered and/or unidentified artefact during construction activities.	An Archaeological Find Action & Preparedness Plan should be drafted, including the below mentioned. Caution should be exercised during the construction phase in the event that archaeological/heritage remains are discovered during the excavations. The change find method should be applied and caution is required at all times, which should include the following- • Record keeping; • Expert verification; • A chain of custody instructions for movable finds; • Cultural heritage awareness raising sessions for the construction workforce; • Clear criteria for potential temporary work stoppages that could be required for rapid resolution of issues related to the finds. In the event of a suspected chance finding of an unknown or undocumented cultural artefact, the following actions must be taken by the contractor: ▪ Stop the work at the particular site. ▪ Contact the National Heritage Council of Namibia and request that a representative be sent to evaluate the finding.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	350,000.00 – 400,000.00

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
			▪ Work may resume if the suspected artefact does not have cultural interest. Further investigation work must be initiated if the item is of cultural interest. ▪ Once the site has been fully investigated and National Heritage Council of Namibia has provided clearance, work may resume. The direct responsibility for implementing and managing the change find method resides with the on-site environmental officer appointed by the contractor. It is important that the environmental officer clearly outlines the roles and responsibilities and the response times required from both project staff, and any relevant heritage authority, as well as any agreed consultation procedures.			
Bulk Infrastructure (roads; electricity; telecommunication; water)	Temporary construction facilities, transportation of goods and materials, site preparation, borrow pit activities, drainage and stormwater management, structural works, waste and hazardous material management, base & embankment preparation, presence of workers and influx of job seekers, operational activities and maintenance.	Potential degradation of public roads due to increase in heavy traffic movement (i.e., construction vehicles and trucks).	A Pre-Construction Infrastructure Survey and Status Report should be compiled to record infrastructure within the project area and the status thereof, with clear management and mitigation principles on how to maintain the pre-construction status of all infrastructure affected. Identify transport methods best suited to the existing transport infrastructure. Consider transportation of the bulk of material and goods via rail instead of road. Frequently perform inspections on local roads used by construction activities and accesses used for material transport and perform maintenance work and repair where and if necessary. Establish adequate signage on roads used by construction activities to ensure road user and pedestrian security. Ensure the development of a Traffic Management Plan that considers the distinctive features of the Project area in order to minimize road damage flow and that includes, among others, the following measures: ▪ Identify roads that can sustain heavy machinery and those that are particularly vulnerable to wear and tear. ▪ Control access to work areas to ensure that only necessary personnel and machinery is present. ▪ Optimize transport routes to reduce travel distances by vehicles and machinery.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	450,000.00 – 500,000.00
			Impose a speed limit for various vehicles, put a stricter limit on roads in poor conditions. In the case unpaved roads need to be used during periods of heavy rainfall, conduct maintenance and repairs as quickly as possible to limit impact on local traffic movement.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	25,000,00.00 – 30,000,000.00

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
		Temporary interruption to rail traffic to allow for specific construction activity.	Contact and maintain communication with TransNamib to avoid service interruptions by planning construction work around the train schedule, which should be presented in a Railway Interruption Schedule. In the unlikely case of accidental service interruptions, coordinate with TransNamib to minimize the duration of interruption and quickly inform users. Negotiate construction schedule with TransNamib to minimise train delays and associated adverse impacts.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	20,000.00 – 25,000.00
		Relocation or reconnection of electricity or telecommunication line to allow for construction work or new alignment.	A pre-construction identification and survey of bulk electricity and telecommunication lines from NamPower, CENORED and the applicable local authorities, as well as Telecom should be undertaken by the contractor to identify possible impact. Discussions with affected authority and mitigation plan should be discussed and approved by applicable authority. This should be presented within the Pre-Construction Infrastructure Survey and Status Report. Contact and maintain communication with the applicable authorities to minimize the risk of accidental breakage. Ensure the presence of applicable authorities' specialists at key stages of work in the vicinity of the bulk infrastructure. Inform users of planned service interruptions sufficiently ahead of time for them to put in place strategies to mitigate the consequences of power interruptions. Re-establish power and telecommunication as quickly as possible when interruptions are unavoidable.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	250,000.00 – 300,000.00
		Potential damages and service interruption to underground bulk pipelines crossing the railway line.	A Pre-Construction Infrastructure Survey and Status Report should be undertaken by the contractor to identify possible impacts. Discussions with affected authority and mitigation plan should be discussed and approved by applicable authority. Install signage clearly indicating the location of pipelines to ensure that construction personnel are aware of the bulk infrastructure. Implement spill prevention and response measures for groundwater quality, soil quality and sediment quality outlined above in this table. Contact and maintain communication with the applicable authorities to minimize the risk of accidental breakage. Ensure the presence of applicable authorities' specialists at key stages of work such as during any excavation work in the vicinity of the bulk infrastructure.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	

Valued Environmental Component	Source of Impacts	Potential Impacts	Mitigation and Monitoring Measure	Responsibilities		Costs (N$)
				Implementation	Monitoring and Evaluation	
Bulk Infrastructure (roads; electricity; telecommunication; water) *(continue)*	Temporary construction facilities, transportation of goods and materials, site preparation, borrow pit activities, drainage and stormwater management, structural works, waste and hazardous material management, base & embankment preparation, presence of workers and influx of job seekers, operational activities and maintenance. *(continue)*	Potential damages and service interruption to underground bulk pipelines crossing the railway line. *(continue)*	In the case of accidental breakage: ▪ Rapidly implement the Spill Response Plan. ▪ Conduct repairs as quickly as possible in coordination with the applicable authority; and ▪ Inform users of service interruption.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent Environmental Consultant (3 monthly)	1,000,000.00 – 1,500,000.00
		Impact on visual quality and sense of place.	A Pre-construction Visual Impact Plan should be compiled identifying potential receptors and appropriate locality of facilities having a potential negative visual impact to the surrounding receptors. Avoid, when and if possible, locating borrow pits within areas visually exposed to tourist facilities. The contractor's site should be located as far as possible from main access roads and tourism spots within the area and screened in such a way that it minimises, as far as practicably possible, the visual effect. The appointed contractor should ensure that adequate temporary disposal facilities are available on-site and that all waste are properly stored not resulting in any littering or visual disturbances. Waste should be disposed of regularly and at appropriate facilities as per the Waste Management Plan.	Proponent / MET	Contractor's E&S Officer (daily basis); Independent E&S Officer (6 monthly);	180,000.00 – 200,000.00

10.3 GOVERNANCE

This section describes the overall organisation of environmental and social management for implementation of the ESMP. Detailed roles and responsibilities are clarified in the ESMP table (see Table 10.3-1).

Details of the management structure are presented below in Figure 10.3-1. All official communication and reporting lines including instructions, directives and information shall be channelled according to the organisational structure presented below.

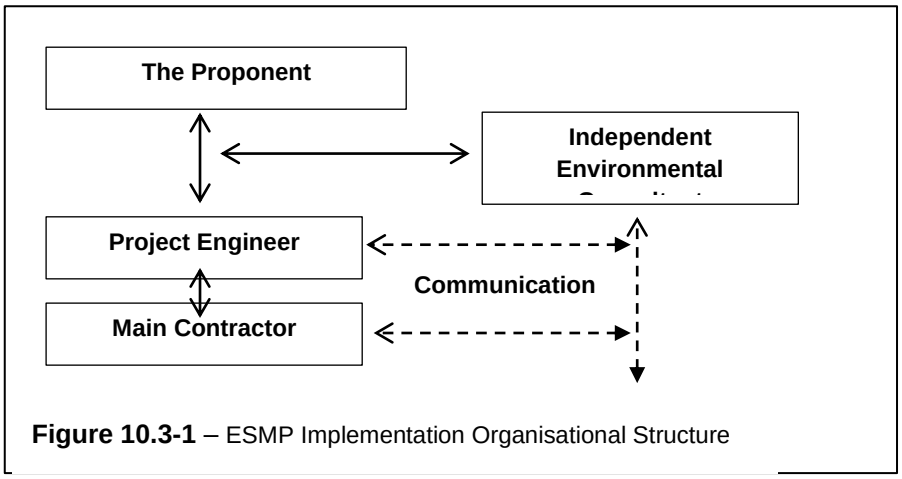


Figure 10.3-1 – ESMP Implementation Organisational Structure

10.3.1 Project Owner / Implementing Agency / Proponent

The Proponent is ultimately responsible for the implementation of the ESMP and the financial cost of all environmental and social control measures. The Proponent must ensure that any person acting on his/her behalf complies with the conditions/specifications contained in this ESMP. The Proponent is also responsible for the appointment of a Project Engineer, Contractor/s and Independent Environmental Consultant (IEC).

As the Project implementing agency, the Ministry of Works and Transport will take overall responsibility for correct application of the ESMP and provision of necessary resources for its implementation via its relevant Division with the Department Transport. During the construction phase, the Department Transport will be responsible for the supervision of the correct implementation of the ESMP, as per the AfDBs ISS requirements and national regulations and conditions. The mentioned Department shall be responsible to appoint an independent Environmental Consultant, with at least 10 years of experience demonstrating sufficient level of expertise to oversee independent construction monitoring and compliance, as per the AfDB's ISS requirements and national regulations and conditions, which would include conducting site visits where required and preparing reports to the Proponent, lending institutions or regulatory authorities as required.

The assigned Division within the Department of Transport will be responsible for –

- Implementing and monitoring the ESMP;

- Coordinating and leading awareness campaigns and capacity building within the Division if required;
- Coordinating with the main contractor and independent Environmental Consultant with regard to ESMP requirements;
- Responding to the results of internal and external monitoring visits/ inspections;
- Supervising the reception, registration and correct processing of any complaints/ grievances received from any stakeholders; and
- Prepare and deliver reports on the ESMP and EHS performance as required.

Given the required responsibilities, it is recommended that the assigned person/s within the Division of the Department Transport undergo capacity building and training on the AfDB safeguards and national legal requirements. It is further recommended that training be given to the appointed contractor as well, which should focus on the implementation and monitoring of the ESMP. The appointed contractor is again responsible to train his workers on the ESMP implementation including EHS requirements during the induction session or by conducting additional sessions. This shall be performed before the commencement of any work to prevent exposure to construction activities associated risks.

Examples of training that should be provided as a minimum include:

- Understanding significant risks and activities associated with the Project;
- Awareness of the requirements of this ESMP and associated plans/procedures;
- Roles, responsibilities and accountabilities, including who to contact with any questions or concerns;
- Project's Grievance Redress Mechanism;
- Incident management and reporting requirements;
- Worker's code of conduct; and
- Emergency response procedures.

Training shall be delivered by experienced trainers, based on the competency requirements and in the relevant language of the attendee, or else translation shall be provided.

10.3.2 Project Engineer

The Project Engineer is responsible for the engineering design of the Project and management of the on-site construction activities from the side of the appointed contractor/s.

The Project Engineer shall as part of his duties address any site problems pertaining to the environment at the request of the Proponent and/or the Independent Environmental Consultant (IEC). The Project Engineer shall have the responsibility to ensure that the Proponent's responsibilities are executed in compliance with the ESMP and/or any other

documentation proposed from the Proponent and/or IEC. Any on-site decisions with the appointed contractors having relevance to environmental matters are ultimately the responsibility of the Project Engineer.

The Project Engineer shall assist the IEC where necessary and shall have the following responsibilities in terms of the implementation of this ESMP:

- The Engineer, along with the IEC and Resident Engineer, must obtain, examine and approve all required plans.
- Promptly issuing instructions requested by the IEC and Resident Engineer to the Contractor/s.
- Deduct environmental penalties from certificate payments as agreed and instructed by the IEC.
- Assisting the IEC in making decisions and finding solutions to environmental and social problems that may arise during the construction phase.
- Oversee the responsibilities of the Resident Engineer and Contractor/s, and assist in all required matters.
- Monitor and verify that the ESMP are always adhered to and act if specifications are not followed.
- Order the removal of person(s) and/or equipment not complying with the ESMP specifications.
- Provide input into the IEC's on-going review of the ESMP.
- Communicate environmental issues to the IEC.

10.3.3 Independent Environmental Consultant (IEC)

The Independent Environmental Consultant (IEC) is acting on behalf of the Proponent and shall communicate directly with the Project Engineer and/or Proponent. The IEC shall be responsible for monitoring, reviewing, and verifying the Contractor's compliance with the ESMP during the construction phase. The IEC shall have the right to investigate the site at any time during the project phases and unexpected visits will be allowed.

The IEC's duties shall include, inter alia, the following:

- The IEC shall make recommendations independent of the Project Engineer; take immediate action on Site when (i) prescriptive conditions are violated, or in danger of being violated, and to inform the Project Engineer, Resident Engineer/s and Contractor/s immediately of the occurrence and to take action, e.g. issuing of penalties; and (ii) where clearly defined and agreed 'no go' areas are violated, or in danger of being violated, and to inform the Project Engineer, Resident Engineer/s and Contractor/s of the occurrence and action taken.
- Advise the Contractor and/or the Project Engineer on environmental issues within the project area.

- Undertake regular site visits to ensure compliance with the ESMP and verify that environmental impacts are kept to a minimum throughout the construction phase (i.e. construction monitoring).
- Keep a photographic record of progress on site from an environmental perspective.
- Assist the Contractor and/or the Project Engineer in finding environmentally acceptable solutions to construction problems as and if any arise.
- Recommend additional environmental protection measures should this become necessary.
- Keep a register of complaints and dealing with any community issues or comments.
- Report any incidents to the Proponent and Project Engineer that may or have caused damage to the environment or which is in breach of the ESMP.
- Prepare an environmental audit report at the conclusion of the construction phase.
- The IEC, along with the Project Engineer and Resident Engineer, must obtain, examine and approve all plans.
- Ordering the removal of, or issuing penalties for person/s and/or equipment not complying with the specifications of the ESMP.
- Involve specialists to advise on environmental management issues as they emerge during the construction phase.

The IEC must have:

- a good working knowledge of all relevant National and International environmental policies, legislation, guidelines and standards, inclusive of the AfDB ISS;
- the ability to conduct inspections and audits and to produce thorough and informative reports;
- the ability to manage public communication and complaints;
- the ability to think holistically about the structure, functioning and performance of environmental systems; and
- proven competence in the application of the following integrated environmental management tools:
    - ESIAs.
    - ESMPs.
    - Environmental auditing.
    - Mitigation and optimisation of impacts.
    - Monitoring and evaluation of impacts.

10.3.4 Main Contractor

The Main Contractor shall have the following responsibilities:

- Implement and monitoring that all provisions of the ESMP are always adhered to and acting if specifications are not followed. If the Contractor encounters difficulties with the specifications, he/she must discuss alternative approaches with the IEC and/or the Project Engineer prior to proceeding.
- Monitor and verify that the environmental impacts are kept to a minimum and mitigations proposed are applied throughout the construction phase.
- Make and keep construction personnel aware of environmental issues and to ensure they show adequate consideration to the environmental sensitivities.
- Report any incidents of non-compliance with the ESMP to the Project Engineer and/or the IEC.
- Keep a register of complaints on-site and record community comments and issues, and the actions taken in response to these complaints.
- Rehabilitate any sensitive environments damaged due to his/her negligence. This shall be done in accordance with the IEC and Project Engineer's specifications and instructions.
- The Contractor shall ensure that no damage whatsoever is caused because of his operations or otherwise by his workers in the areas adjacent to the construction sites.
- The Contractor shall ensure that his workmen are properly instructed and carry out the requirements of this ESMP.
- The Contractor will be held liable for all unauthorised damage caused by him or any of his workmen or Sub-Contractors.

Failure to comply with the ESMP from the side of the contractor will result in penalties (to be defined in consultation with Project Engineer) and reported non-compliance may result in the suspension of work or termination of the contract by the Project Engineer on instruction from the Proponent.

10.4 ESMP MONITORING RESPONSIBILITIES

The day-to-day monitoring and verification that the ESMP is being adhered to shall be undertaken by the appointed Contractor/s.

The IEC shall visit and inspect the site at least once every three months (or as determined by the Project Engineer) to ensure that correct operational procedures are being implemented and that the Contractor is complying with the environmental specifications of the ESMP.

Additional site inspections by the IEC may be required during the initial and final stages of the construction phase. The IEC shall address any queries to the Project Engineer. If the queries cannot be resolved at this level, they shall be referred to the Proponent, if necessary.

The IEC will carry the responsibility of monitoring the implementation of the ESMP on Site, assisted by the Project Engineer. In this regard, the IEC will submit monitoring reports to the authorities until after all rehabilitation work has been completed.

Regular meetings will be held between the Project Engineer, RE, Contractor and the IEC. The purposes of the meetings shall be:

- To establish the suitability of the Contractor's methods and machinery to lower the risk involved for the environment.
- To discuss possible non-conformance to ESMP guidelines or environmental legislation.
- To assess the general state of the environment on site and discuss any environmental problems which may have materialised.

Any non-compliance with the agreed procedures of the ESMP is a transgression of the various statutes and laws that define how the environment is managed. Non-conformance identified during monitoring must be recorded. Non-conformance reports will describe, in detail, the cause, nature and effects of any environmental non-conformance by the Contractor and could stand as evidence should legal action be required. If possible, photographs should also be included as evidence to substantiate the report. This report will also suggest mitigation measures to correct the non-conformance (if necessary) and contemplate revisions to any of the strategies used in the construction phase, whether they pertain to monitoring or to construction methods used on site. The non-conformance shall be documented and reported as part of the Monitoring Report.

10.5 NON-COMPLIANCE AND PENALTIES

The IEC shall issue the Contractor a notice of non-compliance whenever transgressions are observed. The Contractor/s shall act immediately when such notice of non-compliance is received and correct whatever is the cause for the issuing of the notice. Complaints received regarding activities on the Project site pertaining to the environment and social conditions shall be recorded in a dedicated register and the response noted with the date and action taken.

The Contractor is deemed not to have complied with the ESMP if, inter alia:

- There is evidence of contravention of the ESMP specifications within the boundaries of the project site, site extensions and roads;
- There is contravention of the ESMP specifications which relate to activities outside the boundaries of the construction site;
- Environmental damage caused due to negligence;
- Construction activities take place outside the defined boundaries of the site;
- The Contractor fails to comply with corrective or other instructions issued by the IEC and/or Engineer within a specific time; and/or

- The Contractor fails to respond adequately to complaints from the public.

A system of penalties shall be implemented to ensure compliance with the ESMP. Where the Contractor inflicts irreparable damage upon the environment or fails to comply with any of the environmental and/or social specifications of the ESMP (within 10 days) this would constitute a breach of Contract for which the Contractor may be liable to pay a penalty.

The system of penalties shall be implemented in the following way:

- Penalties shall be issued per incident and individual at the discretion of the IEC;
- Penalties shall be issued in addition to any remedial costs incurred as a result of non-compliance with the environmental and/or social specifications; and
- The IEC shall not collect the penalties from individuals, but shall inform the Project Engineer and Contractor of the contravention, the individual's identity, and the amount of the penalty/ies.

Failure by any employee of the Contractor or their sub-contractors to show adequate consideration to the environmental and/or social aspects of the contract shall be considered sufficient cause for the Project Engineer to have that employee of the Contractor, or their sub-contractors removed from the site. The IEC may, through the Project Engineer, also order the removal of equipment that is causing continual environmental damage.

It is recommended that penalties be instituted for the following violations and any others determined during work as detailed below:

- Littering on site or in general areas.
- Lighting of illegal fires on site and outside of dedicated areas.
- Hazardous chemical/oil spill and/or dumping in non-approved sites and persistent or un-repaired fuel and oil leaks.
- Any persons, vehicles or equipment related to the Contractor's operations found within the designated "no-go" areas.
- Excess dust or excess noise emanating from the construction site.
- Any vehicles being driven at a speed more than designated speed limits.
- Any vehicles driven off demarcated tracks.
- Damage to sensitive environments.
- Uncontrolled/unmanaged erosion.
- Unauthorised removal and/or damage to fauna, flora or cultural or heritage objects on site.
- Possession or use of intoxicating substances on site.
- Urination and defecation anywhere except at designated facilities.

- Poaching and/or killing of any wildlife, mammal, bird, reptile, amphibian and/or bird.
- Trespassing onto neighbouring private farmlands without authorisation.
- Found in possession of any wildlife and/or animal remains.
- Where environmental damage is caused or a pollution incident, and/or failure to comply with any of the environmental specifications contained in the ESMP, the Contractor shall be liable.

10.6 ENVIRONMENTAL AWARENESS TRAINING

Contractors shall ensure that its employees and any third party who carries out all or part of the Contractor's obligations are adequately trained about the implementation of the ESMP, as well as regarding environmental legal requirements and obligations. Training shall be conducted by the Contractor's Health and Safety Officer and/or Environmental Officer where necessary.

The purpose of this environmental training is to provide a general explanation of sustainable environmental and social practises, but also to explain the content of the ESMP, the relevance thereof and how it will be implemented through monitoring. The environmental specifications of this ESMP should clearly be explained to all the Contractors and their site staff, as well as non-compliance to it and related penalties.

Environment and health awareness training programmes should be targeted at three distinct levels of employment, i.e., the executive, middle management and labour. The Contractor shall ensure that adequate environmental training takes place. All employees shall have been given an induction presentation on environmental awareness and the content of the ESMP. The presentation needs to be conducted in the language of the employees to ensure it is understood.

The environmental training shall, as a minimum, include the following:

- The mitigation measures required to be implemented when carrying out their work activities.
- Environmental legal requirements and obligations.
- Details regarding flora/faunal species of special concern and protected species, and the procedures to be followed should these be encountered during the construction.
- Details regarding archaeological and/or historical sites which may be unearthed during construction and the procedures to be followed should these be encountered.
- No trespassing or movement outside of the dedicated Project site (i.e., railway servitude).
- No poaching and/or being in possession of any animal remains.
- The importance of always wearing suitable clothing to be identified as a project worker.
- The importance of not littering and/or making of fires for whatever reason.

- The importance of using supplied toilet facilities.
- The need to use water sparingly.
- Details of and encouragement to minimise the production of waste and re-use, recover and recycle waste where possible.

10.7 INFORMATION BOARD(S)

The Contractor shall be responsible for erecting information boards on site. The number and locations of these boards shall be agreed by the Project Engineer and IEC.

Information boards should be placed at conspicuous locations at the entrance to the Project site. The contents of the information board shall be provided by the Project Engineer and will essentially be to advise the public of the construction operation and the prohibition on entering certain areas. The information board shall apart from the details of the contractor also provide the name and contact number of the Project Engineer and that of the Independent Environmental Consultant to ensure that the public has access to the Project Engineer and/or Independent Environmental Consultant to ask for information and/or to lodge any complaints.

10.8 GRIEVANCE MECHANISM

As previously stated, social acceptance of the proposed Project plays a crucial role within the overall success of both the assessment process, implementation during construction and long-term operation thereof. Continues interaction, communication and distribution of information on a regular basis, throughout the different project phases, are instrumental to social acceptability.

In this regard, there are two main tools through which this can be achieved: (i) raising public awareness and carrying out mandatory public displays (i.e., Stakeholder Engagement Plan); and (ii) establishment of a viable grievance redress mechanism (GRM).

Stakeholder Engagement Plan: Information about the grievance handling system described below should be distributed at an early stage of the Project implementation (i.e., pre-construction stage) to all project affected people as presented in Appendix D1 and D25 of the ESIA (as a minimum) through regular information channels used by the Project. This should include initiating meetings at the start of the Project where feasible, public meetings during Project implementation, notices in the printed media, radio broadcasts, email notifications, posting on notice boards at authorities and online. The process of raising a complaint should be explained by reaching out to the community or by conducting a meeting with community representatives. It is important that community representatives include women at all times.

For this purpose, a Stakeholder Engagement Plan was drafted, attached as Appendix D to the ESIA Report.

Grievance Redress Mechanism (GRM): Transparency and accountability should be core elements of the Project. A comprehensive GRM should be set up to account for all potential complaints arising from the Project's potential impacts. In addition to the main project GRM,

two additional GRMs should be developed by the Contractor; one for the community and the second for the workers.

The goal of the GRM in general is to increase transparency and accountability and to reduce the risk of the Project affecting communities and serves as important feedback and learning mechanism that can help improve Project mitigation success. The objective will be to provide channels for I&APs to provide feedback on Project activities via a mechanism that allows for the identification and resolution of issues affecting the Project, promptly and effectively in an appropriate manner and at no cost to the community. This includes safeguards-related complaints pertaining to this ESIA and the AfDB safeguards policies as a whole.

As a minimum, the Project should establish the following channels through which the Identified, Interested and Affected Parties (I&APs) and Authorities can provide their grievances, comments and or feedback regarding Project activities:

- A dedicated email address;
- A dedicated phone and facsimile line;
- A dedicated postal address to send written letters;
- A dedicated physical address that can be visited;
- Feedback via community representatives and/or local authority offices; and
- Periodic community meetings, each of which shall include women.

The above-mentioned channels should as a minimum include that of the Contractor, Project Engineer and the Independent Environmental Consultant. A pro-forma complaint sheet should be drafted and made available at various platforms.

The GRM should include the following set of operating procedures to ensure successful implementation and transparency:

- Receive and register complaints;
- Grievance’s document verification;
- Conduct field inspections in order to verify and confirm the authenticity and eligibility of the reported grievance. The field inspection could include interviews with different parties involved;
- Referring cases to other GRMs, if necessary and/or to the courts;
- Referring cases to a third party; and
- Track, and evaluate the process and results.

In the event that an agreement could not be reached, the borrower could play the role of a mediator via well-trained voluntary mediators following a pre-set time frame.

For the community GRM, a multi-stage mechanism will be used comprising of but not necessarily limited to the steps listed below:

- Step 1, any person aggrieved by any aspect can lodge a grievance to the Contractor and/or Project Engineer and/or Independent Environmental Consultant, which in turn should provide resolution within 10 calendar days.
- Step 2, if the aggrieved person is not satisfied with the decision of the Contractor and/or Project Engineer during Step 1, he/she can present the case to the supervising company to resolve within 10 calendar days.
- Step 3, if the complainant is still dissatisfied with the outcome of step 2, he/she can escalate the complaint to the Directorate of Environmental Affairs with the Ministry of Environment, Forestry and Tourism to resolve the issue within 30 calendar days.

10.9 ESMS AND ASSOCIATED MANAGEMENT / ACTION PLANS

The Proponent is also responsible to preparing an Environmental and Social Management System (ESMS) and a series of associated Management/Action Plans to ensure the adequate management of all environmental and social aspects relating to the Project. The ESMS is being developed in compliance with IFC Performance Standard 1 requirements, and its effective use will promote improved environmental and social performance. An independent ESMP is being prepared separate from this ESIA.

10.9.1 Environmental and Social Management System

An ESMS should integrate environmental and social impact and risk management into the Proponent's business processes so that the Proponent can manage potential environmental and social impacts of subprojects by ensuring the conduct of environmental and social due diligence prior to financing subprojects and adequate monitoring during the term of the loan agreement.

The ESMS is thus system designed to ensure compliance with law and regulations relating to the Project's sustainable development, which includes the natural environment, the affected community, and workers' occupational health and safety. The main objectives of the ESMS can be summarised as:

- To ensure compliance with all applicable laws and regulations, procedures, and policies applicable to the Project of relevance within the country and of international level;
- Ensure that corrective measures and actions are taken in the event of non-compliance to the ESMP and ESMS;
- Clearly define the responsibilities of the applicable people for compliance matters;
- Communicate the environmental and social commitments undertaken by the Proponent to all; and
- Provide managers and staff with a clear framework for ESMS implementation.

The ESMS brings together all the measures to avoid, mitigate and compensate potential impacts resulting from the Project on the natural and social environments.

10.9.2 Management & Action Plans

The appointed contractor is as part of his/her Environmental and Social Management Plan also responsible to develop other management and action plans to ensure avoidance and or minimization of identified impacts, as defined in this ESIA.

Following the ESIA, the following list of plans (and procedures) should be developed by the appointed contractor in order to effectively implement the ESMP during the construction phase.

- Construction Water Demand Management Plan;
- Underground Water Monitoring Plan;
- Hazardous Waste and Materials Management Plan;
- Wastewater Management and Disposal Plan;
- General Waste Management Plan;
- Spill Prevention and Response Plan;
- Water Run-off and Flooding Management Plan;
- Pre-Construction Site Assessment & Laydown Plan;
- Pre-Construction Site Survey and No-go Plan;
- Construction Air Pollution Prevention Plan;
- Soil Stability Management Plan;
- Spill Prevention and Response Plan and a Waste Management Plan;
- Emergency Preparedness and Response Plan (to include fire, medical, accidents, security emergencies and environmental incidents);
- Pre-Construction Infrastructure Survey and Status Report;
- Railway Interruption Schedule;
- Pre-construction Visual Impact Plan;
- Biodiversity Management Plan with Protected Plants Permit Application Plan;
- Occupational Health and Safety Plan;
- Gender and Social Inclusion (GSI) Policy;
- Workers Grievance Redress Mechanism (GRM);
- Contractor Code of Conduct;
- Construction Safety & Security Conduct Plan;

- Project and Workers Grievance Redress Mechanism;
- Construction Traffic Management Plan;
- Archaeological Find Action & Preparedness Plan;
- Stakeholders Engagement Plan;
- Compensation Strategy and Finance Plan; and
- Construction Closure and Rehabilitation Plan.

Guidance on the content of the different plans and procedure is given in relevant sections within the ESMP tables. IFC Performance standards should also be reviewed for inclusion into these Plans. All plans should at minimum specify the following in addition to the management requirements: applicable local and international legal standards, roles & responsibilities of the plan/ implementation procedures, non-conformity management, review and monitoring and training requirements where applicable.

10.10 ENVIRONMENTAL AND SOCIAL MONITORING

This section of the ESIA presents the environmental and social (E&S) monitoring to be implemented to ensure general and specific mitigation measures applied during the construction activities are adequate in avoiding and/or minimizing project impacts.

Monitoring is aimed at ensuring that all recommended mitigation measures and the Contractor' Environmental and Social Management Plan (CESMP) are implemented, and goals are achieved, all activities are documented, and any insufficiency identified and amended. An important aspect is that monitoring allows for the evaluation of effectiveness of mitigation measures and amendment thereof to ensure proper mitigation of anticipated impacts. As a result, the monitoring plan will evolve and adapt as the Project proceeds.

As explained in section 10.4, monitoring is done by all involved in the Project at different time frames. This monitoring to be done includes -

- On-site inspections;
- Confirmation of the effectiveness of mitigation measures; and
- Reviews and updates, as required, based on observations and potential changes.

Table 10.10-1 lists the main environmental and social monitoring measures to be applied. It is important to note that the responsibility for the collection of baseline condition data, prior to commencement of works, rest with the appointed Contractor. This is required to ensure that baseline conditions to which monitoring results will be compared are site-specific, recent, and reflect the true situation on the ground prior to construction work. Baseline data collection should be conducted at various sites within the PPA and the SPA, where disturbances are expected.

Table 10.10-1 – Environmental and Social Monitoring Activities

Valued Environmental Component	Monitoring Method	Objective	Locality	Frequency	Mitigation and Monitoring Responsibility	Compliance Monitoring
Hydrology – Water Resource Quantity	Inspect boreholes within the SPA and determine water levels in comparison to baseline levels.	Avoid depletion of underground water source. Implement project as per the proposed Construction Water Demand Management Plan and apply mitigations (Table 10.2-1).	Entire footprint of the construction site	Continues on-site monitoring as activities take place (savings) and monthly water level inspections at monitoring boreholes.	Contractor or HSE Representative Implementation of mitigation measures, internal monitoring and reporting to Proponent.	Project Engineer and Independent Environmental Consultant Ensuring the correct implementation of the mitigation and monitoring. Review and assurance of Contractor's reports.
Hydrology – Water Resource Quality	Conduct visual inspection of water quality around the activities near watercourses or water bodies. Dated photo records of the site conditions. Compare with baseline condition.	Avoid significant degradation of baseline conditions. Visual inspection of the site, workers, equipment and vehicles. Dated photo record of the site conditions. Apply the stated mitigation measures (Table 10.2-1) and Contractor Plans (i.e. Hazardous Waste and Materials Management Plan; Waste Water Management and Disposal Plan; Waste Management Plan; Stormwater Management Plan; Construction Activity Pollution Prevention Plan; Spill Prevention and Response Plan. Approved waste management plans covering at minimum all the aspects detailed in this ESMP. Approved Hazardous Waste and Materials Management Plan covering at minimum all the aspects detailed in this ESMP. Complete a compliance checklist for mitigation actions and measures. Valid certificates for all waste contractors.	At those places of the construction site close to water bodies or drainage channels.	Daily basis for as long as construction activity at particular sensitive area continues	Resident Engineer and HSE Representative Development of the required plans (section 10.9.2) Implementation of plans, internal monitoring and reporting to Project Engineer.	Project Engineer and Independent Environmental Consultant Reviewing Contractor's plans to ensure their compliance to ESMP requirements. Ensuring the correct implementation of the mitigation and monitoring measures Review and assurance of Contractors reports.
Hydrology – Water Flow & Flooding	Inspect construction site, culverts and drainage structures for material or debris accumulations.	Ensure effective stormwater flow on-site and that no damming of water or local flooding appears. Apply proposed mitigations (Table 10.2-1) and actions as per the Contractor's Storm Water Management Plan.	At the work site (PPA) and surroundings (SPA)	Continues	Contractor or HSE Representative Implementation of mitigation measures, internal monitoring and reporting to Proponent.	Project Engineer and Independent Environmental Consultant Ensuring the correct implementation of the mitigation and monitoring. Review and assurance of Contractor's reports.

Valued Environmental Component	Monitoring Method	Objective	Locality	Frequency	Mitigation and Monitoring Responsibility	Compliance Monitoring
Flora (Habitat)	Vegetation clearance to be done following an on-site walk over and identification of species to be protected and if not able to protect relocate or removed with permit approval. Minimal vegetation removal. Dated photo records of the site conditions. Compare with baseline condition.	Protect sensitive habitats and protected and/or endangered species. Apply mitigations proposed (Table 10.2-1) and contractor's Biodiversity Management Plan. All sensitive areas should be earmarked as no-go areas. Complete a compliance checklist for mitigation actions and measures.	Within the railway reserve and at borrow pits or boreholes.	Before construction commences	Contractor or HSE Representative Implementation of mitigation measures, internal monitoring and reporting to Proponent.	Project Engineer and Independent Environmental Consultant Ensuring the correct implementation of the mitigation and monitoring. Review and assurance of Contractor's reports.
Fauna	Undertake a pre-construction walkover to identify sensitive fauna habitats to be avoided and protected.	Protect sensitive habitats and protected and/or endangered species. Apply mitigations proposed (Table 10.2-1) and contractor's Biodiversity Management Plan. All sensitive areas should be earmarked as no-go areas.	Within the railway reserve and at borrow pits or boreholes.	Before construction commences	Contractor or HSE Representative Implementation of mitigation measures, internal monitoring and reporting to Proponent.	Project Engineer and Independent Environmental Consultant Ensuring the correct implementation of the mitigation and monitoring. Review and assurance of Contractor's reports.
Air Quality	Undertake regular visual inspection of construction sites and access roads. During periods of intense construction work and high winds with significant amount of dust generated in close proximity to any receptor, apply the proposed mitigation measures (Table 10.2-1). Dated photo record with documentation of the site conditions. In the event of excessive dust pollution undertakes sampling for analysis.	Avoid excessive dust generation and minimise idling of equipment, machinery and vehicles. Approved Construction Activity Pollution Prevention Plan. All mitigation measures have been implemented.	At the particular construction activity wherever on-site	Continues	Contractor or HSE Representative Implementation of mitigation measures, internal monitoring and reporting to Proponent.	Project Engineer and Independent Environmental Consultant Ensuring the correct implementation of the mitigation and monitoring. Review and assurance of Contractor's reports.
Local Livelihood and Economic Activities – Tourism & Conservation Activities	Ensure continues access to tourism activities	Diversion roads should not block access to tourism activities and facilities.	Access roads to tourism activities and facilities	Continues for duration of construction period	Contractor or HSE Representative Implementation of mitigation measures, internal monitoring and reporting to Proponent.	Project Engineer and Independent Environmental Consultant Ensuring the correct implementation of the mitigation and monitoring. Review and assurance of Contractor's reports.

Valued Environmental Component	Monitoring Method	Objective	Locality	Frequency	Mitigation and Monitoring Responsibility	Compliance Monitoring
Local Livelihood and Economic Activities	Ensure continues access to local business and informal business activities	Diversion roads should not block access to formal and informal businesses, health facilities and cultural sites and facilities	Access roads to formal and informal businesses, health facilities and cultural sites and facilities	Continues for duration of construction period	Contractor or HSE Representative Implementation of mitigation measures, internal monitoring and reporting to Proponent.	Project Engineer and Independent Environmental Consultant Ensuring the correct implementation of the mitigation and monitoring. Review and assurance of Contractor's reports.
Noise levels & vibrations	Conduct regular inspections to construction activities known for excessive noise levels and ensure proper mitigation (Table 10.2-1) has been applied. Confirm that workers use protective gear during the use of machinery generating excessive noise. Undertake noise inspections on regular bases to determine level of noise 100m from the activity.	Respect the ambient noise levels and restrict excessive noise to a minimum. Workers should make use of protective gear when working with machinery generating excessive noise. Visual Inspection of the site, workers, equipment and vehicles to ensure compliance to noise mitigation. Complete a compliance checklist for mitigation actions and measures.	At the place where the particular activity is taking place	Continues during the construction period, especially in the case of in close proximity to receptor (i.e., within 100m)	Contractor or HSE Representative Implementation of mitigation measures, internal monitoring and reporting to Proponent.	Project Engineer and Independent Environmental Consultant Ensuring the correct implementation of the mitigation and monitoring. Review and assurance of Contractor's reports.
Labour & Working Conditions	Approved Occupational Health and Safety Plan (OHS) and an Emergency Preparedness and Response Plan. Ensure contractor, subcontractor and suppliers provide healthy and safe working environment and conditions of work. Keep record and assess number of accidents and incidents and determine cause.	Healthy and save working and living conditions for workers. Provide training to workers on healthy and save working and living conditions and requirements.	Project site where workers are accommodated and working	Continues for construction period	Contractor or HSE Representative Implementation of mitigation measures, internal monitoring and reporting to Proponent.	Project Engineer and Independent Environmental Consultant Ensuring the correct implementation of the mitigation and monitoring. Review and assurance of Contractor's reports.
Marginalised Groups	Maintain communication with marginalised groups. Favour employment of indigenous people.	Inclusion of Marginalised Groups onto the Project.	Entire construction workforce	Continues for the duration of the construction period.	Contractor or HSE Representative Implementation of mitigation measures, internal monitoring and reporting to Proponent.	Project Engineer and Independent Environmental Consultant Ensuring the correct implementation of the mitigation and monitoring. Review and assurance of Contractor's reports.

Valued Environmental Component	Monitoring Method	Objective	Locality	Frequency	Mitigation and Monitoring Responsibility	Compliance Monitoring
Community Health, Safety and Security	Approved Waste Management Plan, a Wastewater Management and Disposal Plan, Construction Activity Pollution Prevention Plan. Approved Stakeholder Engagement Plan (Appendix D). Ensure that all identified impacts are avoided and/or mitigated, as per Table 10.2-1 and the various plans to be drafted by the contractor. All recorded grievances should be sufficiently addressed. Maintain continues communication with affected community and request input and feedback. Visually inspect all working areas of construction during routine site visits and evaluate the state of measures implemented to ensure local community health, safety and security.	Avoid and minimise impacts. Solve grievances submitted by community. All work areas should be clearly indicated for no unauthorised access; provide safe and convenient pedestrian paths and crossing points along the railway alignment and construction areas within the urban centres; apply speed control and traffic control systems at pedestrian crossing areas and vehicle crossings; implement and maintain appropriate road signs, signals, markings, and other traffic regulation; erect barriers and buffers around critical work areas where interactions with pedestrians are possible. Complete a compliance checklist for mitigation actions and measures.	Entire project area.	Continues for the duration of the construction period.	Contractor or HSE Representative Implementation of mitigation measures, internal monitoring and reporting to Proponent.	Project Engineer and Independent Environmental Consultant Ensuring the correct implementation of the mitigation and monitoring. Review and assurance of Contractor's reports.
Gender Equality	Favour the employment of woman. Achieve equal payment for male and female workers of equivalent experience and qualification. Provide certain percentage of work for women, youth and persons with disabilities.	Aim at employing women in as many as possible fields of construction.	Contractor and sub-contractor, as well as entire supply chain	Continues for construction period	Contractor or HSE Representative Implementation of mitigation measures, internal monitoring and reporting to Proponent.	Project Engineer and Independent Environmental Consultant Ensuring the correct implementation of the mitigation and monitoring. Review and assurance of Contractor's reports.
Gender Relations	Ensure healthy relations between different genders of the construction team.	Equal respect to all. No GBV towards women.	Contractor and sub-contractor, as well as entire supply chain	Continues for construction period	Contractor or HSE Representative Implementation of mitigation measures, internal monitoring and reporting to Proponent.	Project Engineer and Independent Environmental Consultant Ensuring the correct implementation of the mitigation and monitoring. Review and assurance of Contractor's reports.

Valued Environmental Component	**Monitoring Method**	**Objective**	**Locality**	**Frequency**	**Mitigation and Monitoring Responsibility**	**Compliance Monitoring**
Archaeology and Cultural Heritage (chance finds)	Ensure protection of unknown archaeological finds during construction activities.	Have a knowledgably person on-site to identify and act according to required Heritage Act.	At areas where disturbance is expected, i.e., embankment, borrow pits and boreholes.	Continues for the duration of the construction period.	Contractor or HSE Representative Implementation of mitigation measures, internal monitoring and reporting to Proponent.	Project Engineer and Independent Environmental Consultant Ensuring the correct implementation of the mitigation and monitoring. Review and assurance of Contractor's reports.
Bulk Infrastructure (roads; electricity; telecommunication; water)	Inspect public and local roads used by construction vehicles and accesses condition to ensure continues safety.	Public roads and local roads are maintained at baseline condition.	All roads used by construction vehicles and machinery working on the Project.	Continues for the duration of the construction period.	Contractor or HSE Representative Implementation of mitigation measures, internal monitoring and reporting to Proponent.	Project Engineer and Independent Environmental Consultant Ensuring the correct implementation of the mitigation and monitoring. Review and assurance of Contractor's reports.
Reduced energy efficiency and increased GHGs.	Visual Inspection of the site, workers, equipment and vehicles to ensure compliance to reduced energy consumption. Complete a compliance checklist for mitigation actions and measures. Record daily fuel consumption and apply mitigations.	Reduce total volume of fuel used on site.	Entire project area.	Continues for the duration of the construction period.	Contractor or HSE Representative Implementation of mitigation measures, internal monitoring and reporting to Proponent.	Project Engineer and Independent Environmental Consultant Ensuring the correct implementation of the mitigation and monitoring. Review and assurance of Contractor's reports.

11 CONCLUSION

Considering the nature and scale of the proposed Project against the sensitivity of both the natural and social receiving environments this ESIA concludes that there are both positive and negative impacts of different nature and scale, which can be avoided and/or mitigated to different levels of acceptability.

The proposed Project holds extensive socio-economic benefits and potential to enhance Namibia's strategy of becoming an International Logistics Hub for SADC Countries. Positive impacts are expected to be experienced from grassroot level and beyond the Project's study area, directly and indirectly contributing to socio-economic upliftment. The Project will contribute to the Government of Namibia's (GoN) vision to transform Namibia into a prosperous and an industrialized nation by the year 2030 by improving and expanding its regional transportation and trade links as expressed in national Development Plans (NDP4 and NDP5) and Vision 2030. Namibia´s National Development Plan 4 propagated the vision of transforming Namibia as a whole nation into an international logistics hub for SADC region by 2025.

Impacts of different scale, nature and duration has been identified, assessed and mitigations proposed, so as to avoid or minimise the negatives on the receiving natural and social environments. Of greatest concern is without a doubt the impact on the underground water resource, both from a demand (construction waters) and quality point of view. For purpose of avoiding and/or mitigating any potential negative impact to the receiving community with negative socio-economic consequences, it has been recommended that a Groundwater Monitoring Program be implemented and monitored by a qualified and well experienced Hydrogeologist. Other negatives identified to be mitigated and monitored are general health, safety and security of the community, as well as the health and wellbeing of marginalised groups.

Institutional challenges expected relates to limited capacity with the Directorate of Environmental Affairs with the Ministry of Environment, Forestry and Tourism to monitor construction Implementation on-site. For this reason, it is recommended that the Ministry of Environment, Forestry and Tourism appoint or relocate a staff member to an office within Otjiwarongo, located halfway in between the entire Project length. The staff member should be equipped with supporting equipment to become a satellite office of the Directorate of Environmental Affairs and primarily be responsible for this Project.

Based on the project information as provided by the Proponent, Consulting Engineers and specialist inputs, the nature and extend of the Project, setting the sensitivity of the receiving environment, the ESIA study concludes that there is currently no evidence indicating that any of the impacts identified are of such significance that it cannot be reasonably mitigated and that the proposed Project, as presented in this report, should not be allowed to continue. It is however required that the mitigations and recommendations as presented in the ESIA Report and this ESMP be implemented by the Proponent and appointed Contractors, along with the required management and monitoring plans.

Given this, it is not to say that there will be no further impact/s and potential threats as highlighted by the ESIA study. Construction, operations and decommissioning and closure activities need to be strictly controlled by the Proponent and Contractor/s, and monitored by the appointed specialist and applicable Competent Authority to ensure that all potential impacts identified in this study and other impacts that might arise during implementation are properly identified in time and addressed in an effective manner.

11 REFERENCES

Africa Development Bank Group, September 2012. African Development Bank's Integrated Safeguard System. Policy Statement and Operational Safeguards.

Anaya. J. 2013. Report of the Special Rapporteur on the rights of indigenous peoples. 21pp.

Barnard, P. 1998. Under protected habitats. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.

Bester, B. 1996. Bush encroachment – A thorny problem. Namibia Environment 1: 175-177.

Branch, B. 1998. Field guide to snakes and other reptiles of southern Africa. Struik Publishers, Cape Town, RSA.

Branch, B. 2008. Tortoises, terrapins and turtles of Africa. Struik Publishers, Cape Town, RSA.

Bonin, F., Devaux, B. and Dupré, A. 2006. Turtles of the world. John Hopkins University Press, Baltimore, USA.

Boycott, R. C. and Bourquin, O. 2000. The Southern African Tortoise Book. O Bourquin, Hilton, RSA.

Broadley, D.G. 1983. Fitzsimons' Snakes of southern Africa. Jonathan Ball and AD. Donker Publishers, Parklands, RSA.

Brown, C.J., Jarvis, A., Robertson, T. and Simmons, R. 1998. Bird diversity. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.

Buys, P.J. and Buys, P.J.C. 1983. Snakes of Namibia. Gamsberg Macmillan Publishers, Windhoek, Namibia.

Carruthers, V.C. 2001. Frogs and frogging in southern Africa. Struik Publishers, Cape Town, RSA.

Chamber of Mines (CoM). 2021. Annual Review 2021. 108 pp.

Channing, A. 2001. Amphibians of Central and Southern Africa. Protea Bookhouse, Pretoria, RSA.

Channing, A. and Griffin, M. 1993. An annotated checklist of the frogs of Namibia. Madoqua 18(2): 101-116.

Christians F. Country profile – Primary healthcare and family medicine in Namibia. Afr J Prm Health Care Fam Med. 2020;12(1), a2242. https://doi.org/10.4102/phcfm.v12i1.2242. 3pp.

Coats Palgrave, K. 1983. Trees of Southern Africa. Struik Publishers, Cape Town, RSA, 959pp.

Cole, D.T. and Cole, N.A. 2005. Lithops Flowering Stones. Cactus and Co. Libri

Cowley, T. and Cunningham, P.L. 2004. Agama planiceps Peters, 1862 as prey item for Black Mongoose Garella (sanguinea) nigrata. Herpetozoa 17(1/2): 86.

Craven, P. 1998. Lichen diversity in Namibia. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.

Crouch, N.R., Klopper, R.R., Burrows, J.E. and Burrows, S.M. 2011. Ferns of southern Africa – a comprehensive guide. Struik Nature, Cape Town, RSA.

Cultural Survival. 2016. The State of Indigenous Human Rights in Namibia.

Cunningham, P.L.1998. Potential Wood Biomass Suitable for Charcoal Production in Namibia. Agri-Info 4(5): 4-8.

Cunningham, P.L. 2006. A Guide to the Tortoises of Namibia. Polytechnic of Namibia, Windhoek, 19pp.

Curtis, B. and Barnard, P. 1998. Sites and species of ecological, economic or archaeological importance. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.

Curtis, B. and Mannheimer, C. 2005. Tree Atlas of Namibia. National Botanical Research Institute, Windhoek, Namibia.

Davies, T.J., Freeman, R., Hall, J., Stegmann, F., African Journal of Health Sciences Volume 34, Issue no. 4, July – August 2021. 14pp.

Dr. C. Treeger, May 2004. Legal analysis of farmland expropriation in Namibia. Published by Konrad-Adenauer Stiftung.

De Graaff, G. 1981. The rodents of southern Africa. Buterworths, RSA.

Dirkx E., Seely, M. Hager C., Klintenberg P., Roberts C., von Oertzen D. (2008) Advances in Desertification and Climate Change Research: Are they accessible for application to enhance adaptive capacity? Desert Research Foundation of Namibia, Windhoek, Namibia

Earle, R. and Round, J. n.d. Lithops of Namibia. www.lithopsfoundation.com

Estes, R.D. 1995. The behaviour guide to African mammals. Russel Friedman Books, Halfway House, RSA.

Fiege, D. 2020 Allinaz pro Schiene Germany www.railfreight.com

Giess, W. 1971. A preliminary vegetation map of South West Africa. Dinteria 4: 1 – 114.

Government of the Republic of Namibia (GRN, 2011). Vision 2030 Government of Namibia Windhoek Namibia

Government of the Republic of Namibia (GRN). 2015. Master Plan for the Development of an International Logistics Hub for SADC Countries in Namibia: Final Report Summary. 73pp.

Griffin, M. 1998a. Reptile diversity. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.

Griffin, M. 1998b. Amphibian diversity. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.

Griffin, M. 1998c. Mammal diversity. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.

Griffin, M. 2003. Annotated checklist and provisional national conservation status of Namibian reptiles. Ministry of Environment and Tourism, Windhoek.

Griffin, M. and Coetzee, C.G. 2005. Annotated checklist and provisional national conservation status of Namibian mammals. Ministry of Environment and Tourism, Windhoek.

Harper-Simmonds, L., Mendelsohn, J., Roux, J.P., Pallet, J., Brown, C., Middleton, A. and Kruse, J. n.d. Development of an inventory of ecosystem services in Namibia. Ministry of Environment and Tourism, Windhoek.

Hebbard, S. n.d. A close-up view of the Namib and some of its fascinating reptiles. ST Promotions,Swakopmund, Namibia.

Hockey, P.A.R, Dean, W.R.J. and Ryan, P.G. (eds). 2005. Roberts – Birds of Southern Africa, VIIth ed. The Trusrees of the John Voelker Bird Book Fund, Cape Town.

Institute for Public Policy Research IPPR. 2022. Democracy Report Namibia's National Budget 2022/23: Slow but Steady wins the race. 8pp.

Institute for Public Policy Research IPPR. 2022. Namibia Quarterly Economic Review Q1 2022. 15pp.

International Finance Corporation, January 2012. IFC Performance Standards on Environmental and Social Sustainability

IPCC, 2001 The Inter-governmental Panel on Climate Change (IPCC) Third Assessment Report Cambridge University Press The Edinburgh Building Cambridge UK

ISOE 2015 Policy Brief No. 1/2015: Water security and climate adaptation through storage and reuse Institute for Social-Ecological Research www.isoe.de

IUCN 2021. IUCN Red List of Threatened Species. <www.iucnredlist.org>.

Joint United Nations Programme on HIV/AIDS (UNAIDS). 2011. A new investment framework for the global HIV response. 9pp.

Joubert, E. and Mostert, P.M.K. 1975. Distribution patterns and status of some mammals in South West Africa. Madoqua 9(1): 5-44.

Komen, L. n.d. The Owls of Namibia – Identification and General Information. NARREC, Windhoek, 16pp.

Konrad-Adenauer-Stiftung, Dr. C. Treeger, May 2004.

Legal Assistance Centre (LAC). 2016. Domestic Violence in Namibia. 28pp.

Little, R., and Crowe, T. 2011. Gamebirds of southern Africa. Struik, Cape Town, RSA.

Loots, S. 2005. Red data book of Namibian plants. Southern African Botanical Diversity Network Report No. 38. SABONET, Pretoria and Windhoek.

Maclean, G.L. 1985. Robert's birds of southern Africa. John Voelcker Bird Book Fund.

Marais, J. 1992. A complete guide to the snakes of southern Africa. Southern Book Publishers, Witwatersrand University Press, Johannesburg, RSA.

Mannheimer, C. and Curtis, B. (eds) 2009. Le Roux and Müller's field guide to the trees and shrubs of Namibia. 1st edition, Namibia Publishing House, Windhoek.

Mannheimer, C. and Curtis, B. (eds) 2018. Le Roux and Müller's field guide to the trees and shrubs of Namibia. 2nd edition, Namibia Publishing House, Windhoek.

Mendelsohn, J., Jarvis, A., Roberts, C. and Robertson, T. 2004. Atlas of Namibia – a portrait of the land and its people. David Philip Publishers, Cape Town.

Ministry of Education, Arts and Culture. 2020. Education Management Information System (EMIS) Education Statistics 2019. 116pp.

Ministry of Education, Arts and Culture. 2017. Education Management Information System (EMIS) Education Statistics 2017. 112pp.

MET 2011 Let's Act to Adapt – Dealing with Climate Change – A community information toolkit on adaptation – Erongo, Hardap, Karas and Khomas Regions Namibia

MET 2011 Let's Act to Adapt – Dealing with Climate Change – A community information toolkit on adaptation – Omaheke and Otjozondjupa Regions Namibia

MET 2011 Let's Act to Adapt – Dealing with Climate Change – A community information toolkit on adaptation – Ohangwena, Oshana and Oshikoto Namibia

MET 2015 National Climate Change Strategy and Action Plan 2013-2020 Government of Namibia, Windhoek, Namibia

MEFT/NACSO 2021. The state of community conservation in Namibia (annual report 2020). MEFT/NACSO, Windhoek.

Ministry of Agriculture, Water and Rural Development. August 2000. Policy Framework for Equitable, Efficient, and Sustainable Water Resources Management and Water Services.

Ministry of Environment and Tourism (MET), 2011. National Climate Change Policy for Namibia. Windhoek, Namibia.

Ministry of Finance (MoF). 2022. Estimates of Revenue, Income & Expenditure 2022/23 – 2024/25. 544pp.

Ministry of Gender Equality and Child Welfare (MGECW). 2010. National Plan of Action on Gender-Based Violence 2012-2016. 68pp.

Ministry of Gender Equality, Poverty Eradication and Social Welfare. 2020. Violence against Children and Youth in Namibia: Findings from the Violence Against Children and Youth Survey, 2019. 176pp.

Ministry of Gender Equality and Child Welfare (MGECW). 2010. National Gender Policy 2010 – 2020. 56pp.

Ministry of Health and Social Services (MoHSS). 2017. Namibia Population-Based HIV Impact Assessment. 6pp.

Ministry of Health and Social Services (MoHSS). 2017. National Strategic Framework for HIV and AIDS Response in Namibia 2017/18 to 2021/22. 116pp.

Ministry of Health and Social Services (MoHSS). 2016. Surveillance Report of the 2016 National HIV Sentinel Survey. 77pp.

Ministry of Health and Social Services (MoHSS) and ICF International. 2014. The Namibia

Demographic and Health Survey 2013. Windhoek, Namibia, and Rockville, Maryland, USA: MoHSS and ICF International. 530pp.

Ministry of Health and Social Services (MoHSS). 2019b. National Tuberculosis and Leprosy Programme Annual Report: 2019-2020. 128pp.

Ministry of Health and Social Services (MoHSS). 2016. Namibia National WISN Report 2015. 155pp.

Ministry of Health and Social Services (MoHSS). 2019a. Namibia Tuberculosis Disease Prevalence Survey Report 2019.

Ministry of Health and Social Services (MoHSS) 2020. National eHealth Strategy 2021-2025. 105pp.

Ministry of Mines and Energy (MME). Licences, Rights and Permits Application Guidelines and Assessment Procedures (MME)

Ministry of Works and Transport (MWT), Consulting Services Africa (CSA) & Windhoek Consulting Engineers (WCE). 2017. Upgrade of Railway Line between Kranzberg Station and Tsumeb Station – Environmental Scoping Report. 54pp.

Möller, A. and Becker, R. 2019. Field guide to the succulent Euphorbias of southern Africa. Briza Publications, Pretoria.

M R Technofin Consultants Ltd. 2022. Feasibility Study for the Trans-Zambezi Railway Extension Grootfontein-Rundu-Katima Mulilo Final Feasibility Study Report Vol II. – Project Feasibility. 111pp.

Müller, M.A.N. 2007. Grasses of Namibia. John Meinert Publishers (Pty) Ltd, Windhoek, Namibia.

Miskinyte, A., Dedele, A. and Keblyte M. 2021 The Evaluation of Noise Pollution from Railways International Society for Environmental Epidemiology

Namibia Civil Aviation Authority (NCAA). 2019. Aeronautical Information Publication - Part 2: Aerodrome (AD). 291pp.

Namibia Civil Aviation Authority (NCAA). 2019. Aeronautical Information Publication - Part 2: En-route (ENR). 194pp.

Namibia Statistics Agency (NSA). 2013. Namibia 2011 Population & Housing Census Main Report. 214 pp.

Namibia Statistics Agency (NSA). 2014a. Erongo 2011 Census Regional Profile. 146pp.

Namibia Statistics Agency (NSA). 2014b. Otjozondjupa 2011 Census Regional Profile. 124pp.

Namibia Statistics Agency (NSA). 2014c. Population Projections 2011 – 2041. 68pp.

Namibia Statistics Agency (NSA). 2017a. Namibia Inter-censal Demographic Survey (NIDS) 2016 Report. 134 pp.

Namibia Statistics Agency (NSA). 2018a. Namibia Household & Expenditure Survey NHIES 2015/2016. 130pp.

Namibia Statistics Agency (NSA). 2018b. Namibia Land Statistics Booklet September 2018. 48pp.

Namibia Statistics Agency (NSA). 2019. The Namibia Labour Force Survey 2018 Report. 116 pp

Namibia Statistics Agency (NSA). 2019. Sustainable Development Goals Baseline Report Namibia 2019. 258pp.

Namibia Statistics Agency. 2015. Namibia Census of Agriculture 2013/2014 Commercial, Leasehold and Resettlement Farms. 116pp.

Namibia Statistics Agency (NSA). 2021. A year living with Covid-19: Covid-19 Households and Job Tracker Survey 2021. 32pp.

Namibia Tourism Board (NTB). 2015. Namibia Tourism Satellite Account 5th Edition. 24pp.

Nampower (Nampower). 2021. Annual Report 2021. 260pp.

NamWater (NamWater). 2020. Integrated Annual Report 2019/2020. 160pp.

National Planning Commission (NPC). 2021. The Impact of Mining Sector to the Namibia Economy: Assessing socio-economic and environmental effects. 68pp.

Nott, K. and Curtis, B. 2006. Aromatic resins from Commiphora trees. Roan News Special Anniversary Edition 2006: 22-24.

ORYCS – Wildlife-based management strategies in Namibia Institute for Social-Ecological Research www.isoe.de

Passmore, N.I. and Carruthers, V.C. 1995. South African Frogs - A complete guide. Southern Book Publishers, Witwatersrand University Press, Johannesburg, RSA.

Peacock, F. 2015. The definitive guide to southern Africa's little brown jobs. CTP Book Printers, Cape Town, South Africa.

Picker, M. and Griffiths, C. 2011. Alien and invasive animals – a South African perspective. Struik Nature, Cape Town, RSA.

Republic of Namibia and World Health Organisation (WHO). 2022. Namibia Covid-19 Situation Report No. 781. 4pp.

Republic of Namibia, March 2007. National Policy on HIV/AIDS.

Roads Authority of Namibia (RA). 2018. Road Referencing System – Surface Summaries Road Network 11. 1pp.

Roads Authority of Namibia (RA). 2017. Road Referencing System – Area Surface Summaries Road Network 11. 1pp.

Roads Authority 2014 Materials Manual Windhoek Namibia

Rothmann, S. 2004. Aloes, aristocrats of Namibian flora. ST Promotions, Swakopmund, Namibia.

SARDB, 2004. CBSG Southern Africa. In: Griffin, M. 2005. Annotated checklist and provisional national conservation status of Namibian mammals. Ministry of Environment and Tourism, Windhoek.

Schleicher, A. 2020. Reptiles of Namibia. Kuiseb Publishers, Windhoek.

Schultz, M. and Rambold, G. 2007. Diversity shifts and ecology of soil lichens in central Namibia. Talk, Ecological Society of Germany, Austria and Switzerland (GfÖ), 37th Annual Meeting, Marburg: 12/9/2007 to 15/9/2007.

Schultz, M., Zedda, L. and Rambold, G. 2009. New records of lichen taxa from Namibia and South Africa. Bibliotheca Lichenologica 99: 315-354.

Simmons, R. E. 1998a. Important Bird Areas (IBA's) in Namibia. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.

Simmons, R. E. 1998b. Areas of high species endemism. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.

Simmons R.E., Brown, C.J. and Kemper, J. 2015. Birds to watch in Namibia: red, rare and endemic species. Ministry of Environment and Tourism and Namibia Nature Foundation, Windhoek, Namibia.

Skinner, J.D. and Smithers, R.H.N. 1990. The mammals of the southern African subregion. University of Pretoria, RSA.

Skinner, J.D. and Chimimba, C.T. 2005. The mammals of the southern African subregion. Cambridge University Press, Cape Town, RSA.

Steyn, M. 2003. Southern Africa Commiphora. Polokwane, South Africa.

Tarboton, W. 2001. A guide to the nests and eggs of southern African birds. Struik Publishers, Cape Town, RSA.

Taylor, P.J. 2000. Bats of southern Africa. University of Natal Press, RSA.

The Equator Principles, July 2020. www.equator-principles.com

TransNamib (TransNamib). 2020. Integrated Annual Report 2019/2020. 162pp.

United Nations (UN). Factsheet. Indigenous people, indigenous voices factsheet. 2pp.

Urban Dynamics Africa, December 2006. Preliminary Environmental and Social Assessment, Volume 1. Proposed Railway Line from Katima Mulilo to Cape Fria/Angra Fria.

Urban Green. 2020. Upgrade of the Railway line in between Kranzberg Station to Tsumeb and Otavi to Grootfontein Phase 1 – Railway line between Kranzberg Station and Otjiwarongo Town – Background Information Document. 16pp.

Van der Merwe, J.H. 1983. National atlas of South West Africa (Namibia). National Book Printers, Cape Town, South Africa, 92pp.

Van Oudtshoorn, F. 2012. Guide to grasses of southern Africa. Briza Publications, Pretoria, South Africa.

Van Wyk, B. and Van Wyk, P. 1997. Field guide to trees of Southern Africa. Cape Town: Struik Publisher.

Warren, Y., Cunningham, P.L., Mbangu, A. & Tujavi, V. 2009. Preliminary observations of the diet of the black mongoose (Galerella nigrata, Thomas, 1928) in the Erongo Mountains, Namibia. African Journal of Ecology [DOI 10.1111/j.1365-2028.2008.10128.x]

Wirth, V. 2010. Lichens of the Namib Desert. Klaus Hess Verlag, Windhoek/ Göttingen.