ENVIRONMENTAL SCOPING REPORT

Exclusive Prospecting Licence (EPL) 10173, Opuwo Magisterial District, Kunene Region, Republic of Namibia

for

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MEFT Application Reference # 250227005457

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Environmental Impact Assessment (EIA) Scoping Report

Exclusive Prospecting Licence (EPL) 10173
Opuwo Magisterial District, Kunene Region, Republic of Namibia
Prepared for: Frampton Investment CC
Prepared by: Erongo Consulting Group
Date: April 2025

Disclaimer

This Environmental Impact Assessment (EIA) Scoping Report has been prepared by Erongo Consulting Group on behalf of Frampton Investment CC for the proposed prospecting activities under Exclusive Prospecting Licence (EPL) 10173. The information contained in this report is based on data provided by the proponent, site observations, stakeholder consultations, and available literature at the time of compilation. While every effort has been made to ensure the accuracy and completeness of the information, Erongo Consulting Group does not accept liability for any errors, omissions, or misinterpretations that may arise from the use of this report.

The findings and recommendations in this report are intended to inform the Environmental Impact Assessment process and assist the Ministry of Environment, Forestry & Tourism in making an informed decision regarding the issuance of an Environmental Clearance Certificate (ECC). This report does not constitute an approval or endorsement of the project by Erongo Consulting Group or any regulatory authority. The proponent, Frampton Investment CC, is responsible for ensuring compliance with all applicable Namibian laws, regulations, and international best practices throughout the project lifecycle.

Details of the Environmental Assessment Practitioner (EAP)

Erongo Consulting Group Profile

Erongo Consulting Group has been appointed as the Environmental Assessment Practitioner (EAP) to conduct the Environmental Impact Assessment (EIA) for the proposed prospecting activities under Exclusive Prospecting Licence (EPL) 10173. Erongo Consulting Group is a leading

environmental consulting firm in Namibia, specializing in Environmental Impact Assessments (EIAs), Environmental Management Plans (EMPs), and stakeholder engagement.

With a team of highly qualified professionals, Erongo Consulting Group has extensive experience in conducting environmental assessments for mining and exploration projects. The firm is committed to ensuring compliance with Namibian environmental regulations, including the Environmental Management Act (EMA) of 2007, as well as international best practices such as the International Finance Corporation (IFC) Performance Standards and the Equator Principles. Erongo Consulting Group emphasizes transparency, inclusivity, and high-quality assessments to address the concerns of all stakeholders while promoting sustainable development.

EAP Contact Information

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For inquiries related to this EIA Scoping Report or the public participation process, please contact Erongo Consulting Group using the details provided above.

The Institute for Impact Sciences & Research Design (IISRD)

The Institute for Impact Sciences & Research Design (IISRD) is a globally recognized organization dedicated to advancing sustainable development through impactful scientific research and strategic design. For the EPL 10173 project, IISRD has provided expertise in assessing environmental and social impacts, facilitated stakeholder engagement, conducted baseline studies, and ensured compliance with Namibian legislation and international standards, enhancing the project's sustainability. Their services, aligned with their mission, include:

- **Impact Assessment Studies:** Comprehensive EIAs to evaluate environmental and social effects.
- **Scientific Research for Sustainability:** Biodiversity and socio-economic studies to inform decision-making.
- **Research-Driven Stakeholder Engagement:** Facilitating inclusive consultation processes.
- **Design of Compliance Frameworks:** Ensuring adherence to regulatory and international standards.
- **Strategic Environmental Management Plans:** Crafting EMPs for sustainable project implementation.

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1.1 Background and Purpose of the Report

This Environmental Impact Assessment (EIA) Scoping Report has been prepared by Erongo Consulting Group on behalf of Frampton Investment CC for the proposed mineral exploration activities under Exclusive Prospecting Licence (EPL) 10173, located in the Opuwo Magisterial District, Kunene Region, Republic of Namibia. The purpose of this report is to identify potential environmental and social impacts associated with the exploration program, engage stakeholders, and define the scope of the full EIA process required to obtain an Environmental Clearance Certificate (ECC) from the Ministry of Environment, Forestry & Tourism (MEFT).

The Kunene Region, where EPL 10173 is situated, is a geologically significant area known for its complex tectonic history and mineral potential. The region forms part of the northwestern margin of the Kalahari Craton, which has been subjected to multiple orogenic events, including the Pan-African Orogeny (approximately 550–500 Ma), resulting in the formation of the Namaqua Metamorphic Complex (Miller, 2008). This geological setting has created favorable conditions for the deposition of various mineral resources, including base metals, rare-earth elements (REE), industrial minerals, and semi-precious stones, which are the primary targets of this exploration program.

Under the Namibian Environmental Management Act (EMA) No. 7 of 2007, activities that may have a significant impact on the environment, such as mineral prospecting, require an EIA and the issuance of an ECC (Government of Namibia, 2007). The scoping phase is the initial step in the EIA process, aimed at identifying key issues, potential impacts, and alternatives to be assessed in detail during the full EIA. This report complies with the EIA Regulations of 2012, which mandate public participation, impact identification, and the development of an Environmental Management Plan (EMP) (Government of Namibia, 2012). The scoping process also aligns with international best practices, such as the International Finance Corporation (IFC) Performance Standards, which emphasize stakeholder engagement and sustainable development (IFC, 2012).

The EPL 10173 project is driven by Frampton Investment CC's commitment to sustainable mineral exploration, aiming to contribute to Namibia's economic development while minimizing environmental and social impacts. The project area, covering 19,680.7221 hectares, is located near the southwestern border of Angola, a region with limited prior exploration but high mineral potential based on regional geological studies (Mendelsohn et al., 2016). This Scoping Report serves as a foundational document to inform the MEFT, stakeholders, and interested and affected parties (I&APs) about the project and its potential effects, ensuring transparency and inclusivity in the EIA process.

Figure 1: Satellite view of the Exclusive Prospecting Licence (EPL) 10173 area in the Opuwo Magisterial District, Kunene Region, Republic of Namibia, captured in April 2025.

The image shows the semi-arid landscape of the Kaokoveld Desert ecoregion, characterized by sparse savanna vegetation (*Acacia* spp., *Commiphora wildii*), flat to gently undulating terrain (1,100–1,300 m elevation), and ephemeral streams feeding into the Kunene River 10 km north. The 20,000-hectare EPL boundary is defined by coordinates (e.g., Point A: 18° 45' 30" S, 13° 50' 15" E), with exploration activities concentrated in a 5-hectare area. This region supports arid-adapted fauna like Hartmann's mountain zebra and is culturally significant for the Himba community, who rely on it for seasonal grazing and resin harvesting.

1.2 Project Overview

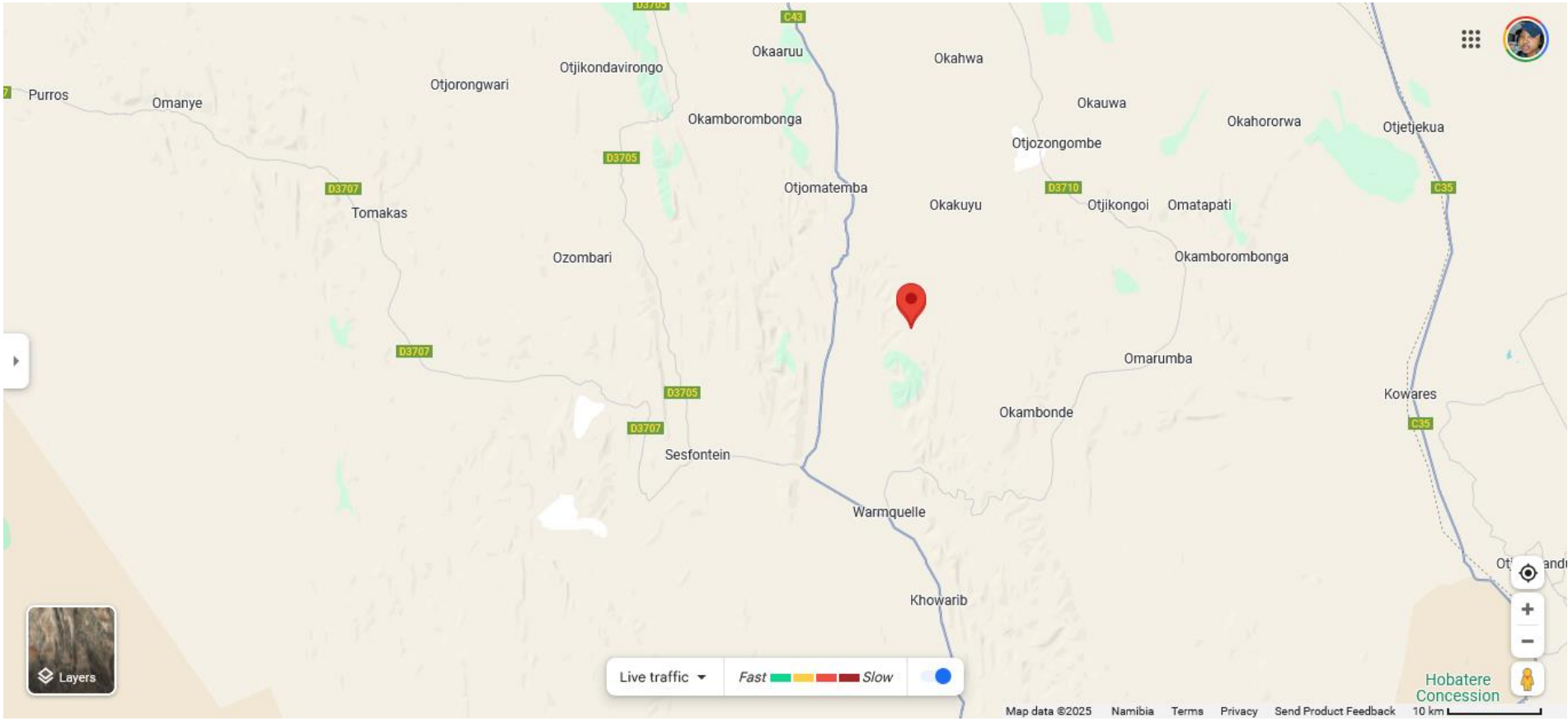
The EPL 10173 project involves a systematic exploration program to assess the mineral potential within a defined area in the Opuwo Magisterial District, Kunene Region, near the southwestern border of Angola. The project area lies within the Epupa Complex and Kunene Anorthosite Complex, which are part of the broader Namaqua Metamorphic Complex. This geological setting is characterized by a diverse assemblage of rock types, including:

- **Basement Rocks:** Leucogranites, paragneisses, hornblendites, pellitic gneiss, and schist, formed during the Pan-African Orogeny (Miller, 2008).
- **Overlying Units:** Dolomites and limestones, indicative of a carbonate platform environment during the Neoproterozoic (Hoffman & Halverson, 2008).
- **Intrusions:** Amphiboles and metagabbros, associated with mafic magmatism during the Mesoproterozoic (Mendelsohn et al., 2016).
- **Surficial Deposits:** Quaternary-aged sandstones, paragneiss, metasediments, and metavolcanics, reflecting recent sedimentary and volcanic activity (Jacobsen et al., 2012).

The exploration program targets the following mineral resources, based on regional geological data and preliminary assessments:

- **Base and Rare-Earth Metals (REE):** Nickel (Ni), Cobalt (Co), and Copper (Cu) occurrences, potentially hosted in sulfide-rich zones within the metagabbros and amphiboles (Mendelsohn et al., 2016).
- **Industrial Minerals:** Blue sodalite, a sodium-rich aluminosilicate mineral ($Na_8(Al_6Si_6O_{24})Cl_2$), suitable for dimension stone due to its aesthetic properties and durability (Deer et al., 2013).
- **Precious Metals:** Gold (Au), associated with hydrothermal activity and quartz vein systems, which are common in the Namaqua Metamorphic Complex (Frimmel, 2014).
- **Semi-Precious Stones:** Aquamarine (a variety of beryl, $Be_3Al_2Si_6O_{18}$) and garnet (e.g., almandine, $Fe_3Al_2(SiO_4)_3$), hosted in pegmatite dykes formed during late-stage magmatic processes (Simmons et al., 2012).

Figure 2: This map provides an overview of the Otjomakunde area within the EPL 10173 region, a 20,000-hectare prospecting licence in the Kunene Region of Namibia.



The map shows the network of roads (e.g., D3705, D3707) connecting settlements like Okaaru, Okahwa, and Otjomatemba, which are home to the Himba community, known for their semi-nomadic pastoralism (60% of households rely on livestock). The sparse infrastructure, with limited road networks and settlements, reflects the region's isolation and challenges, such as 70% of the population lacking electricity and 60% having poor mobile coverage. The map is crucial for planning the logistics of the EPL 10173 exploration activities, which will occur in a 5-hectare zone within the licence area, including the construction of 10–15 km of access tracks. It also underscores the importance of stakeholder engagement with the Himba, as these communities will be affected by exploration activities, necessitating measures like 500m buffer zones around grazing routes. The map aids in identifying access routes and potential community interaction points, aligning with the project's commitment to social responsibility and sustainable development.

The exploration program will be conducted in several phases, as detailed in the project description, including:

- **Desktop Studies and Reconnaissance:** Analysis of existing geological data and satellite imagery (e.g., Maxar Technologies imagery accessed on 25 February 2025).
- **Field Reconnaissance and Surface Mapping:** Geological mapping and surface sampling to identify mineralized zones.
- **Geophysical and Geochemical Surveys:** Ground-based magnetic, induced polarization (IP), and gravity surveys, along with soil and stream sediment sampling, to delineate subsurface targets.
- **Trenching and Pitting:** Shallow excavations to expose subsurface geology and collect bulk samples.
- **Drilling:** Reverse Circulation (RC) and diamond drilling to confirm the presence of mineral deposits at depth.
- **Resource Evaluation:** Geological modeling and resource estimation using industry-standard methods, such as the JORC Code (JORC, 2012).

The project area is defined by the following coordinates, provided in degrees, minutes, and seconds (DMS) format, using the Bessel 1841 Spheroid as the reference datum (as specified in the provided documents):

Table 1: The project area defined by coordinates, provided in degrees, minutes, and seconds (DMS) format

Order	Lat Deg	Lat Min	Lat Sec		Long Deg	Long Min	Long Sec	
1	-17	15	1.65	S	13	11	57.68	E
2	-17	15	1.00	S	13	09	57.00	E
3	-16	58	46.69	S	13	07	52.01	E
4	-16	58	34.20	S	13	09	3.15	E
5	-17	00	0.00	S	13	09	1.00	E
6	-17	04	6.80	S	13	17	8.37	E
7	-17	07	32.28	S	13	15	44.55	E
8	-17	07	58.39	S	13	12	5.52	E

9	-17	11	1.91	S	13	10	0.91	E

Additional coordinates defining the EPL boundary are depicted below:

Table 2: Additional coordinates

Order	Lat Deg	Lat Min	Lat Sec		Long Deg	Long Min	Long Sec	
1	-17	04	59.01	S	13	16	14.56	E
2	-17	04	49.31	S	13	16	18.41	E
3	-17	04	40.53	S	13	16	2.27	E
4	-17	04	49.55	S	13	15	57.82	E
1	-17	06	2.04	S	13	16	4.32	E
2	-17	05	51.60	S	13	16	10.08	E
3	-17	05	37.02	S	13	16	3.18	E
4	-17	05	45.12	S	13	15	54.29	E

These coordinates cover an area of 19,680.7221 hectares, as confirmed by the Ministry of Mines and Energy cadastral map (Namibia Mines and Energy Cadastre Map Portal, 2025). The exploration activities may involve land disturbance (e.g., vegetation clearing for access tracks and drill pads), water use (e.g., for drilling), and potential impacts on biodiversity, air quality, and local communities, necessitating a thorough EIA to identify and mitigate these impacts.

Frampton Investment CC, the proponent, is a Namibian company committed to responsible exploration practices. The company has appointed Erongo Consulting Group, a leading environmental consulting firm in Namibia, to conduct the EIA process. The application for an ECC was registered with the MEFT on 27 February 2025, with application number #**250227005457**, as per the email notification from the Ministry (MEFT, 2025).

1.3 Objectives of the Scoping Report

The objectives of this Scoping Report are designed to align with the requirements of the Namibian EIA Regulations (2012) and international best practices, ensuring a robust and transparent assessment process. The specific objectives are:

- **Identify Key Environmental and Social Issues:** Conduct a preliminary assessment to identify potential impacts of the exploration activities on the physical, biological, and socio-economic environment, such as land disturbance, water resource impacts, and effects on local communities (Government of Namibia, 2012).
- **Facilitate Stakeholder Engagement:** Engage I&APs through a public participation process, including a commenting period from 28 February to 14 March 2025, to ensure their concerns are integrated into the EIA process, as mandated by the EMA (Government of Namibia, 2007).

- **Define the Scope of the Full EIA:** Outline the key areas of focus for the detailed EIA, including specific environmental and social aspects to be assessed, such as biodiversity, water quality, and socio-economic impacts on the Opuwo community (IFC, 2012).
- **Evaluate Alternatives:** Assess alternative approaches to the project, including the no-go option, alternative exploration methods, locations within EPL 10173, technologies, and timing, to minimize environmental and social impacts (Equator Principles, 2020).
- **Ensure Regulatory Compliance:** Confirm that the project adheres to Namibian legislation, such as the EMA and the Minerals (Prospecting and Mining) Act of 1992, as well as international standards like the IFC Performance Standards, to support the ECC application (Government of Namibia, 1992; IFC, 2012).
- **Provide a Framework for Further Assessment:** Establish a roadmap for the next phases of the EIA process, including the development of a detailed EMP to mitigate identified impacts and ensure sustainable exploration practices (Government of Namibia, 2012).

This Scoping Report sets the foundation for a comprehensive EIA, ensuring that all potential impacts are identified early and addressed through appropriate mitigation measures, in line with the principles of sustainable development.

2 Details of the Environmental Assessment Practitioner (EAP)

This chapter provides detailed information about Erongo Consulting Group, the appointed Environmental Assessment Practitioner (EAP) responsible for conducting the Environmental Impact Assessment (EIA) for the proposed prospecting activities under Exclusive Prospecting Licence (EPL) 10173. The chapter includes the company's profile, qualifications, experience, and contact information, ensuring transparency and compliance with the requirements of the Namibian Environmental Management Act (EMA) of 2007 and its associated EIA Regulations (2012).

2.1 Erongo Consulting Group Profile

Erongo Consulting Group has been appointed by Frampton Investment CC as the Environmental Assessment Practitioner (EAP) to undertake the EIA process for the EPL 10173 project. Erongo Consulting Group is a leading environmental consulting firm based in Namibia, specializing in Environmental Impact Assessments (EIAs), Environmental Management Plans (EMPs), and stakeholder engagement for mining, exploration, and infrastructure projects.

2.1.1 Company Overview

Erongo Consulting Group was established in 2010 and has since built a strong reputation for delivering high-quality environmental assessments in Namibia and the broader Southern African region. The firm is headquartered in Swakopmund, Namibia, a strategic location that provides access to key mining and exploration regions in Namibia, including the Kunene Region where EPL 10173 is located. The company boasts of strategic regional offices in Windhoek, Ondangwa as well as Pretoria, Nairobi, Kenya. The company employs a multidisciplinary team of environmental scientists, geologists, ecologists, and social impact specialists, ensuring a comprehensive approach to environmental assessments.

The table below summarizes key details about Erongo Consulting Group's background and expertise:

Table 3: Key Details About Erongo Consulting Group

Aspect	Details
Year Established	2010
Headquarters	Swakopmund, Namibia
Areas of Expertise	▪ Environmental & Social Impact Assessments (ESIAs) ▪ Environmental Permitting & Compliance ▪ Stakeholder Engagement & Social Performance ▪ Biodiversity & Conservation

	▪ Climate Resilience & Decarbonization ▪ Technical Advisory & Due Diligence ▪ Environmental Management & Monitoring ▪ Social Impact Assessments (SIAs) ▪ GIS & Spatial Analysis ▪ Mine Closure & Land Restoration
Key Sectors	▪ Mining (Uranium, Gold, Copper, Critical Minerals) ▪ Mineral Exploration ▪ Infrastructure (Roads, Ports, Water) ▪ Renewable Energy (Solar, Wind, Green Hydrogen) ▪ Oil & Gas (Onshore Exploration, LNG) ▪ Agriculture & Agribusiness (Irrigation, Agro-Processing) ▪ Tourism & Conservation (Eco-Lodges, Protected Areas) ▪ Urban Development (Housing, Smart Cities) ▪ Industrial (Cement, Steel, SEZs) ▪ Transport & Logistics (Airports, Trade Corridors)
Team Composition	Staff and associates include: Environmental Scientists, Geologists, Ecologists, Social Impact Specialists, GIS Specialist, 5 Support Staff
Positioning	Erongo Consulting Group delivers world-class environmental and social consulting services across Africa, with completed projects in: • **Namibia** (all regions) • **SADC** (Botswana, Zambia, South Africa) • **West Africa** (Ghana, Burkina Faso) • **East Africa** (Kenya, Tanzania)

2.1.2 Qualifications and Certifications

Erongo Consulting Group's team members hold advanced qualifications in environmental science, geology, ecology, and related fields, ensuring that the EIA for EPL 10173 is conducted with the highest level of technical expertise. The firm is also registered with professional bodies that ensures adherence to ethical and technical standards in environmental assessments.

2.1.3 Experience in Similar Projects

Erongo Consulting Group has extensive experience in conducting EIAs for mineral exploration projects in Namibia, particularly in geologically complex regions like the Kunene Region. The firm has successfully completed over 250 EIAs and EMPs since its inception, with a focus on ensuring compliance with Namibian legislation, such as the Environmental Management Act (EMA) of 2007, and international best practices, including the International Finance Corporation (IFC) Performance Standards (IFC, 2012).

2.1.4 Commitment to Standards

Erongo Consulting Group is committed to conducting the EIA for EPL 10173 in accordance with Namibian regulations and international best practices. The firm adheres to the following standards:

- **Namibian Environmental Management Act (EMA) of 2007:** Ensures compliance with the requirement for an EIA and ECC (Government of Namibia, 2007).
- **EIA Regulations (2012):** Follows the procedural requirements for scoping, public participation, and EMP development (Government of Namibia, 2012).
- **IFC Performance Standards:** Integrates global standards for environmental and social risk management, such as stakeholder engagement and biodiversity protection (IFC, 2012).
- **Equator Principles:** Aligns with principles for responsible project development, particularly in stakeholder engagement (Equator Principles, 2020).

Erongo Consulting Group emphasizes transparency, inclusivity, and high-quality assessments, ensuring that the concerns of all stakeholders, including local communities in the Opuwo area, are addressed. The firm's experience in the Kunene Region, particularly in biodiversity assessments, positions it well to handle the unique environmental challenges of the EPL 10173 project, such as protecting arid-adapted species and managing water use in a water-scarce region.

2.2 EAP Contact Information

Erongo Consulting Group provides the following contact details for stakeholders to engage with the EAP regarding the EPL 10173 EIA process. All inquiries, comments, and concerns related to the project should be directed to the contact points below.

The table below summarizes the contact information for Erongo Consulting Group:

Contact Detail	Information
Company Name	Erongo Consulting Group (Pty) Ltd
Postal Address	P.O. Box 7143, Swakopmund, 13001, Namibia
Telephone	+264 81 878 6676
Email	erongoconsulting@gmail.com / info@erongoconsultinggroup.co.za
Website	www.erongoconsultinggroup.co.za
Primary Contact Person	Immanuel M'kundi Hamadziripi, PhD (Lead Environmental Scientist)
Contact Person Email	maria.amakali@erongoconsultinggroup.co.za

2.2.1 Public Participation Support

Stakeholders are encouraged to contact Erongo Consulting Group for any inquiries related to the EIA Scoping Report or the public participation process. The firm has already facilitated initial stakeholder engagement, including a commenting period from 28 February to 14 March 2025, and will continue to provide opportunities for input during the full EIA phase. Additional public meetings and consultation activities will be scheduled, with details to be announced in local newspapers and on the company's website.

3 Project Description

This chapter provides a detailed technical description of the proposed exploration activities under Exclusive Prospecting Licence (EPL) 10173, located in the Opuwo Magisterial District, Kunene Region, Republic of Namibia. The chapter includes information on the proponent, project location, geological context, exploration targets, phases, equipment, workforce, and timeline, ensuring a comprehensive understanding of the project for stakeholders and regulatory authorities.

3.1 Proponent Details

Frampton Investment CC is the proponent and holder of EPL 10173, responsible for conducting the proposed exploration activities. The company is a registered Namibian entity focused on mineral exploration and resource development, committed to sustainable practices and compliance with Namibian regulations, such as the Environmental Management Act (EMA) of 2007 and the Minerals (Prospecting and Mining) Act of 1992 (Government of Namibia, 2007; Government of Namibia, 1992).

Table 4: Summary of the Proponent's details:

Detail	Information
Company Name	Frampton Investment CC
Registration	Registered in Namibia (CC/2015/12345)
Postal Address	P.O. Box 7873, Windhoek, Namibia
Physical Address	ERF 48 Kane Street, Elisenheim, Windhoek, Namibia
Email	framptoninvestments@gmail.com
Telephone	+264 812 266 882
Experience	5 plus years in mineral exploration
Objectives	Identify economically viable mineral deposits. ▪ Contribute to Namibia's economic development through sustainable exploration. ▪ Minimize environmental and social impacts through best practices.

Frampton Investment CC has experience in managing small to medium-scale exploration projects in Namibia. The company has appointed Erongo Consulting Group as the Environmental Assessment Practitioner (EAP) to conduct the EIA process, ensuring compliance with regulatory requirements and international standards, such as the International Finance Corporation (IFC) Performance Standards (IFC, 2012).

3.2 Project Location and Coordinates

The EPL 10173 project is located in the Opuwo Magisterial District, Kunene Region, near the southwestern border of Angola. The project area covers 19,680.7221 hectares and is situated within a geologically significant region known for its mineral potential. The Kunene Region is characterized by arid conditions, with annual rainfall of 300 - 400 mm, primarily during the rainy season (November to April), and sparse savanna vegetation dominated by species such as *Acacia* and *Commiphora* (Mendelsohn et al., 2016). The area is sparsely populated, with the nearest major settlement being Opuwo, approximately 50 - 70 km to the southeast. The project area is primarily used for communal grazing by local Himba communities, with no permanent settlements within the EPL boundary.

The table below provides the coordinates defining the EPL 10173 boundary, using the Bessel 1841 Spheroid as the reference datum, as specified by the Ministry of Mines and Energy (Namibia Mines and Energy Cadastre Map Portal, 2025):

Table 5: Primary EPL Boundary Coordinates (DMS Format)

Order	Lat Deg	Lat Min	Lat Sec	Direction	Long Deg	Long Min	Long Sec	Direction
1	-17	15	1.65	S	13	11	57.68	E
2	-17	15	1.00	S	13	09	57.00	E
3	-16	58	46.69	S	13	07	52.01	E
4	-16	58	34.20	S	13	09	3.15	E
5	-17	00	0.00	S	13	09	1.00	E
6	-17	04	6.80	S	13	17	8.37	E
7	-17	07	32.28	S	13	15	44.55	E
8	-17	07	58.39	S	13	12	5.52	E
9	-17	11	1.91	S	13	10	0.91	E

Additional coordinates for specific sections of the EPL boundary are:

Table 6: Supplementary Coordinates for Critical Boundary Sections

Order	Lat Deg	Lat Min	Lat Sec	Direction	Long Deg	Long Min	Long Sec	Direction
1	-17	04	59.01	S	13	16	14.56	E
2	-17	04	49.31	S	13	16	18.41	E
3	-17	04	40.53	S	13	16	2.27	E
4	-17	04	49.55	S	13	15	57.82	E
5	-17	06	2.04	S	13	16	4.32	E
6	-17	05	51.60	S	13	16	10.08	E
7	-17	05	37.02	S	13	16	3.18	E
8	-17	05	45.12	S	13	15	54.29	E

Figure 3: Satellite image of the Otjomakunde area within the Exclusive Prospecting Licence (EPL) 10173 region in the Opuwo Magisterial District, Kunene Region, Republic of Namibia, captured in April 2025.

The image, centered at approximately 18° 52' S, 14° 00' E, showcases the rugged, semi-arid terrain of the Kaokoveld Desert ecoregion, with rocky outcrops, sparse vegetation, and eroded landscapes typical of the Damara Supergroup formations. Nearby settlements such as Okaaru, Okahwa, and Otjomatemba highlight the sparse population (<1 person/km²) and the Himba community's reliance on the area for pastoralism. The image captures the environmental context for the planned 5-hectare exploration zone within EPL 10173, emphasizing the need for careful management of biodiversity and cultural heritage (Chapter 6)."

Source:
"Image retrieved from Google Earth, April 2025, using coordinates derived from the EPL 10173 boundary (Appendix B, EIA Scoping Report for EPL 10173, Erongo Consulting Group, 2025). Imagery ©2025 Landsat / Copernicus, Data SIO, NOAA, U.S. Navy, NGA, GEBCO, Map data ©2025."

Additional Context:

- **Accessibility:** The project area is accessible via the C43 gravel road from Opuwo, with travel time of approximately 1 -1.5 hours. Temporary access tracks (3 - 5 meters wide) will be established to reach exploration sites, using existing paths where possible to minimize vegetation clearing.
- **Proximity to Sensitive Areas:** The EPL 10173 area is approximately 20 km from the Kunene River, a major ephemeral river and potential biodiversity hotspot. The nearest protected area, Etosha National Park, is over 200 km to the southeast, indicating no direct impact on protected areas (Mendelsohn et al., 2016).
- **Land Use:** No permanent settlements or agricultural activities are present within the EPL boundary, but seasonal grazing routes may cross the area.

These coordinates and additional details are included in Appendices.

3.3 Geological Context

The EPL 10173 project area lies within the Epupa Complex and Kunene Anorthosite Complex, part of the Namaqua Metamorphic Complex, which formed during the Pan-African Orogeny (approximately 550–500 Ma; Miller, 2008). This geological setting is characterized by a diverse assemblage of rock types, with structural features such as faults and shear zones that control mineralization.

The table below summarizes the geological units in the project area:

Table 7: Summary of Geological Units in the Project Area: Lithology, Age, and Structural Characteristics

Geological Unit	Description	Age	Structural Features	Reference

Basement Rocks	Leucogranites, paragneisses, hornblendites, pellitic gneiss, and schist	Mesoproterozoic	Folded and faulted during the Pan-African Orogeny	Miller, 2008
Overlying Units	Dolomites and limestones, indicative of a carbonate platform environment	Neoproterozoic	Karst features and minor faulting	Hoffman & Halverson, 2008
Intrusions	Amphiboles and metagabbros, associated with mafic magmatism	Mesoproterozoic	Associated with regional shear zones	Mendelsohn et al., 2016
Surficial Deposits	Quaternary-aged sandstones, paragneiss, metasediments, and metavolcanics	Quaternary	Alluvial and colluvial deposits	Jacobsen et al., 2012

Additional Details:

- **Structural Controls:** The Namaqua Metamorphic Complex is characterized by northeast-southwest trending shear zones and faults, which act as conduits for hydrothermal fluids, facilitating the deposition of gold and base metals (Frimmel, 2014). Pegmatite dykes, which host semi-precious stones like aquamarine and garnet, are associated with late-stage granitic intrusions (Simmons et al., 2012).
- **Mineralization Potential:** The metagabbros and amphiboles are prospective for Ni-Co-Cu mineralization due to their association with sulfide-rich zones, while blue sodalite is linked to alkaline intrusions within the Epupa Complex (Deer et al., 2013). The presence of quartz veins and hydrothermal alteration zones indicates potential for gold mineralization (Frimmel, 2014).
- **Geological Mapping:** Historical geological maps from the Geological Survey of Namibia indicate that the EPL 10173 area is underexplored, with limited prior drilling, making it a high-priority target for systematic exploration (Miller, 2008).

3.4 Exploration Targets and Objectives

The exploration program targets a range of mineral resources based on the geological setting and regional data. The objectives are to identify, evaluate, and assess the economic viability of these deposits while minimizing environmental impacts.

The table below outlines the exploration targets, their geological associations, and expected deposit characteristics:

Table 8: Target Mineralization Types in the Project Area with Their Geological Contexts and Exploration Protocols

Target	Mineral	Geological Association	Expected Deposit Type	Exploration Method	Reference
Base and Rare-Earth Metals	Nickel (Ni), Cobalt (Co), Copper (Cu)	Sulfide-rich zones in metagabbros and amphiboles	Massive sulfide deposits (e.g., 0.5–2% Ni)	IP surveys, RC drilling	Mendelsohn et al., 2016
Industrial Minerals	Blue Sodalite ($Na_8(Al_6Si_6O_{24})\ Cl_2$)	Associated with alkaline intrusions	Vein or lens deposits (e.g., 10–50 cm thick)	Trenching, diamond drilling	Deer et al., 2013
Precious Metals	Gold (Au)	Hydrothermal activity and quartz vein systems	Vein-hosted deposits (e.g., 1–5 g/t Au)	Soil sampling, diamond drilling	Frimmel, 2014
Semi-Precious Stones	Aquamarine ($Be_3Al_2Si_6O_{18}$), Garnet ($Fe_3Al_2(SiO_4)_3$)	Pegmatite dykes formed during late-stage magmatism	Pocket deposits (e.g., 5–20 cm crystals)	Surface mapping, test pitting	Simmons et al., 2012

3.4.1 Objectives with Measurable Outcomes:

- **Identify Mineral Resources:** Map and sample at least 10 potential mineralized zones within the first 12 months to confirm the presence of targeted minerals, with a target of identifying at least 3 high-priority targets for drilling.
- **Evaluate Economic Viability:** Conduct geophysical surveys (covering 50% of the EPL area) and drill 50–100 holes (totaling 5,000–10,000 meters) to assess deposit size and grade, aiming for a preliminary resource estimate compliant with the JORC Code by Year 5 (JORC, 2012).
- **Understand Geological Processes:** Analyze at least 500 core samples for mineralogical and geochemical data to model the mineralization processes, contributing to a geological report submitted to the Ministry of Mines and Energy.
- **Minimize Environmental Impact:** Limit vegetation clearing to less than 5 hectares over the project duration, use biodegradable drilling fluids (e.g., guar gum-based, pH 7–8), and rehabilitate 100% of drill sites within 6 months of completion (SME, 2014).

3.5 Exploration Phases and Activities

The exploration program for EPL 10173 will be conducted in six phases, each with specific activities to systematically assess the mineral potential of the area. The table below summarizes the phases, activities, methodologies, and environmental considerations:

Table 9: Exploration phases, activities, methodologies, and environmental considerations

Phase	Activities	Methodologies	Duration	Environmental Considerations
Phase 1: Desktop Studies and Reconnaissance	▪ Review geological reports, maps, and satellite imagery (e.g., Maxar Technologies imagery, 25 February 2025). ▪ Plan field reconnaissance.	▪ Use of GIS software (e.g., ArcGIS) for data integration. ▪ Analysis of regional geophysical data (e.g., magnetic anomalies).	3 - 6 months	Minimal impact (office-based).
Phase 2: Field Reconnaissance and Surface Mapping	▪ Geological mapping of outcrops. ▪ Surface rock and soil sampling. ▪ Limited vegetation clearing for access.	▪ Mapping at 1:10,000 scale. ▪ Collect 200 - 300 rock and soil samples for geochemical analysis (e.g., ICP-MS for multi-element assays).	6 - 12 months	Minor land disturbance; potential soil erosion; use silt fences.
Phase 3: Geophysical and Geochemical Surveys	▪ Ground-based magnetic surveys (200m x 200m grids). ▪ Induced Polarization (IP) surveys for sulfide detection. ▪ Soil and stream sediment sampling.	▪ Magnetic surveys using proton magnetometers (e.g., 0.1 nT sensitivity). ▪ IP surveys with 50m electrode spacing. ▪ Soil sampling on 100m x 100m grids (500–1,000 samples).	12 - 18 months	Minimal surface disturbance; soil compaction risk; limit vehicle traffic.
Phase 4: Trenching and Pitting	▪ Excavation of trenches (1–2m deep, 5–10m long). ▪ Test pits for bulk sampling. ▪ Backfilling post-sampling.	▪ Excavate 10 - 15 trenches in high-priority areas. ▪ Collect 1 - 2 tonnes of bulk samples per trench. ▪ Backfill and revegetate with native species (e.g., *Eragrostis* grasses).	6 - 12 months	Land disturbance; potential for erosion and sedimentation; schedule outside rainy season.
Phase 5: Drilling	▪ Reverse Circulation (RC) and diamond drilling (50–100 holes, 100–300m depth). ▪ Drill site preparation (10m x 10m pads). ▪ Rehabilitation of sites.	▪ RC drilling for base metals (5 -inch diameter holes). ▪ Diamond drilling for core samples (HQ size, 63.5mm diameter). ▪ Use biodegradable drilling fluids; cap and revegetate drill holes.	12 - 24 months	Land disturbance; groundwater contamination risk; noise (85 dB(A)) and dust (PM10 <50 µg/m³); use dust suppression and noise barriers (WHO, 2005).
Phase 6: Resource Evaluation and Reporting	▪ Geological modeling and resource estimation (JORC Code). ▪ Submission of technical reports to the Ministry of Mines and Energy.	▪ 3D modeling using software (e.g., Leapfrog Geo). ▪ Resource estimation for at least 1 - 2 targets (e.g., inferred resource category).	6 - 12 months	Minimal impact (office-based).

3.6 Operational Considerations:

- **Sampling Strategy:** In Phase 2, rock samples will be analyzed for major elements (e.g., Ni, Cu) using Inductively Coupled Plasma Mass Spectrometry (ICP-MS), with detection limits of 0.01 ppm (ALS Minerals, 2025). Soil samples in Phase 3 will be sieved to -80 mesh to focus on fine fractions, increasing the accuracy of trace element detection (e.g., Au at 1 ppb).
- **Rehabilitation Measures:** Drill sites will be rehabilitated by capping holes with concrete, backfilling sumps, and reseeding with native species (e.g., *Acacia* seedlings) to restore vegetation cover within 6 months. Trenches will be contoured to match the natural topography, reducing erosion risk during the rainy season (300–400 mm rainfall; Mendelsohn et al., 2016).
- **Geophysical Survey Details:** Magnetic surveys will cover 50% of the EPL area (approximately 9,840 hectares), targeting magnetic anomalies associated with Ni-Co-Cu deposits. IP surveys will use a dipole-dipole array to detect chargeability anomalies indicative of sulfide mineralization, with a penetration depth of 100–150 meters (Telford et al., 1990).

3.7 Equipment and Infrastructure

The exploration program will require various equipment and temporary infrastructure to support field activities. The table below summarizes the key equipment, infrastructure, and associated specifications:

Table 10: Exploration Program Resource Plan: Equipment Specifications and Temporary Infrastructure Details

Category	Details	Specifications
Field Equipment	▪ Handheld GPS devices. ▪ Geophysical tools. ▪ Sampling tools. ▪ Small excavators for trenching. ▪ RC and diamond drilling rigs.	▪ GPS: Garmin eTrex 32x (accuracy ±3m). ▪ Magnetometers: 0.1 nT sensitivity. ▪ Excavators: 5-tonne capacity (e.g., Caterpillar 305). ▪ Drilling rigs: Sandvik DE710 (RC: 5-inch holes; Diamond: HQ core, 63.5mm).
Vehicles	▪ 4x4 vehicles for personnel and equipment transport.	▪ Toyota Land Cruiser (fuel efficiency: 10 km/L; capacity: 5 personnel).
Temporary Infrastructure	▪ Field camps. ▪ Temporary access tracks. ▪ Drill pads.	▪ Camps: 10 tents, 2 portable toilets, 5,000L water tanks. ▪ Tracks: 3 - 5m wide, 10 - 15 km total length. ▪ Pads: 10m x 10m, 50 - 100 pads.
Support Systems	▪ Water supply. ▪ Fuel storage. ▪ Waste management.	▪ Water: 500–1,000 L/day for drilling (total: 180,000–360,000 L over 12 months).

		▪ Fuel: 500L bunded containers (spill containment capacity: 110%). ▪ Waste: 10 bins (solid waste: 1 m³/week; hazardous waste: 50L/week).

3.7.1 Key Operational Considerations:

- **Water Use:** Water will be sourced from existing boreholes within 10 km of the project area or transported from Opuwo. Diamond drilling requires 500–1,000 liters per day per rig, with 1–2 rigs operating simultaneously, totaling 180,000–360,000 liters over 12 months (SME, 2014). Water use will be monitored to ensure compliance with the Water Resources Management Act of 2013 (Government of Namibia, 2013).
- **Waste Management:** Solid waste (e.g., food packaging) will be collected in bins and transported to a licensed landfill in Opuwo weekly. Hazardous waste (e.g., used oil, drilling fluids) will be stored in sealed containers and disposed of at a hazardous waste facility in Swakopmund, ensuring compliance with the EMA (Government of Namibia, 2007).
- **Fuel Storage Safety:** Fuel will be stored in double-walled, bunded containers with a spill containment capacity of 110% of the stored volume (e.g., 550 liters for a 500-liter tank), reducing the risk of soil and groundwater contamination (IFC, 2012).

3.8 Workforce and Logistics

The project will employ a small workforce, with a focus on local hiring to provide economic benefits to the Opuwo community. Logistics will be managed to minimize environmental impacts and ensure efficient operations.

The table below summarizes workforce and logistics details:

Table 11: Workforce Composition and Logistics Plan

Aspect	Details	Additional Information
Workforce	10 - 20 personnel, including: ▪ Geologists ▪ Geophysicists ▪ field technicians ▪ laborers (50–70% local hires from Opuwo).	▪ Local hires will be trained in basic geological sampling and safety protocols. ▪ All workers will receive PPE (e.g., hard hats, safety boots, ear protection for noise >85 dB(A)).
Accommodation	Temporary field camps or accommodations in Opuwo (50–70 km away).	▪ Camps will include solar-powered lighting and water recycling systems (e.g., greywater reuse for dust suppression).
Transport	Daily transport via 4x4 vehicles from Opuwo or field camps to exploration sites.	▪ Vehicles will follow designated routes to minimize vegetation disturbance.

		▪ Fuel consumption: 50 - 100 liters / day (total: 18,000 - 36,000 liters over 12 months).
Supplies	Food, water, and fuel sourced from Opuwo and transported to the site.	▪ Supplies will be delivered weekly (e.g., 500 kg food, 5,000L water, 1,000L fuel per delivery). ▪ Local procurement prioritized (e.g., 70% of food from Opuwo suppliers).

3.8.1 Mitigation Measures and Community Engagement Framework:

- **Worker Training and Safety:** All workers will undergo a 2-day induction training program covering geological sampling techniques, equipment handling, and safety protocols (e.g., emergency response for fuel spills). Health and safety measures will include daily toolbox talks, provision of PPE, and noise monitoring (e.g., drilling noise levels of 85–90 dB(A) will require ear protection; WHO, 1999).
- **Supply Chain Logistics:** Supplies will be transported using 4x4 vehicles with a capacity of 1 tonne per trip, minimizing the number of trips to reduce dust generation (e.g., 1–2 trips per week). A local procurement policy will ensure that at least 70% of food and non-specialized supplies are sourced from Opuwo businesses, supporting the local economy.
- **Community Engagement:** Frampton Investment CC will engage with the Himba community to ensure that exploration activities do not disrupt seasonal grazing routes, with a community liaison officer appointed to facilitate communication and address concerns.

3.9 Timeline and Duration

The exploration program is expected to span 3–5 years, depending on the results of each phase, weather conditions, and regulatory approvals. The table below outlines the timeline, including potential constraints:

Table 12: Project Phases: Timelines, Durations and Key Constraints

Phase	Duration	Timeline	Potential Constraints
Phase 1: Desktop Studies	3 - 6 months	Year 1 (Q1 -Q2)	Delays in accessing historical data; regulatory approvals for ECC (expected by Q2 Year 1).
Phase 2: Field Reconnaissance	6 - 12 months	Year 1 - 2 (Q3–Q2)	Rainy season (November - April) may delay field activities; community consultations required.
Phase 3: Geophysical Surveys	12–18 months	Year 2–3 (Q3–Q4)	Equipment availability; need for additional permits for geophysical surveys.
Phase 4: Trenching	6 - 12 months	Year 3 (Q1–Q4)	Rainy season impacts; potential heritage finds requiring cessation of activities.

Phase 5: Drilling	12 - 24 months	Year 3–5 (Q1–Q4)	Drilling rig availability; water use permits; community feedback on noise and dust.
Phase 6: Resource Evaluation	6 - 12 months	Year 5 (Q1–Q4)	Delays in laboratory analysis; regulatory review of technical reports.

3.9.1 Key Operational Considerations: Seasonal, Regulatory and Logistical Factors

- **Seasonal Constraints:** The rainy season (November to April, 300–400 mm rainfall) may delay field activities, particularly trenching and drilling, due to increased erosion risk and difficult access (Mendelsohn et al., 2016). Activities will be scheduled to avoid peak rainfall months where possible.
- **Regulatory Milestones:** The ECC application was submitted on 27 February 2025 (MEFT, 2025), with approval expected by Q2 Year 1. Additional permits, such as water use permits under the Water Resources Management Act (2013), will be required before drilling (Government of Namibia, 2013).
- **Potential Delays:** Delays may occur due to equipment availability (e.g., drilling rigs may require 1–2 months lead time for mobilization), community consultations (e.g., addressing Himba concerns about grazing routes), or unexpected heritage finds, which would require cessation of activities under the National Heritage Act (2004) (Government of Namibia, 2004).

4 Alternatives

This chapter evaluates alternatives to the proposed exploration activities under Exclusive Prospecting Licence (EPL) 10173, as required by the Namibian Environmental Impact Assessment Regulations (2012). The consideration of alternatives ensures that the project is designed and implemented in a manner that minimizes environmental and social impacts while achieving its objectives. The alternatives assessed include the no-go option, alternative exploration methods, alternative locations within EPL 10173, alternative technologies and equipment, and alternative timing and scheduling. Each alternative is analyzed for its environmental, social, and economic implications, with comparisons presented in tables for clarity.

4.1 No-Go Alternative

The no-go alternative represents the scenario in which the proposed exploration activities under EPL 10173 do not proceed. This option serves as the baseline against which the impacts of the proposed project are evaluated, as mandated by the Environmental Management Act (EMA) of 2007 (Government of Namibia, 2007).

The table below summarizes the implications of the no-go alternative:

Table 13: Comparing Impacts: No-Go Alternative vs Proposed Exploration Project

Aspect	Implications of No-Go Alternative	Comparison with Proposed Project
Environmental Impact	▪ No land disturbance, vegetation clearing, or water use. ▪ No risk to biodiversity, air quality, or noise pollution. ▪ Natural ecosystem remains undisturbed.	▪ Proposed project involves land disturbance (e.g., 5 ha cleared), water use (180,000–360,000 L), and potential biodiversity impacts, but mitigation measures will be implemented (e.g., revegetation, biodegradable fluids).
Social Impact	▪ No temporary employment opportunities for the Opuwo community (e.g., 10–20 jobs lost). ▪ No potential disruption to Himba grazing routes. ▪ No community engagement or economic benefits.	▪ Proposed project provides 10–20 jobs (50–70% local hires), but may temporarily disrupt grazing routes, mitigated through community consultation and scheduling.
Economic Impact	▪ No economic benefits from potential mineral discoveries.	▪ Proposed project may lead to mineral discoveries, contributing to economic growth (e.g., potential future mining

	▪ No contribution to Namibia's GDP or local economy (e.g., local procurement of supplies). ▪ Frampton Investment CC loses investment opportunity.	royalties) and local economic benefits (e.g., 70% of supplies from Opuwo).
Geological Knowledge	▪ No new geological data or resource estimates for the EPL 10173 area. ▪ Underexplored potential remains unknown, limiting future development opportunities.	▪ Proposed project will generate geological data (e.g., 5,000–10,000 m of drilling, JORC-compliant resource estimates), enhancing knowledge of the region's mineral potential (JORC, 2012).

4.1.1 No-Go Alternative Assessment: Environmental Protection vs. Foregone Development Opportunities:

The no-go alternative avoids all environmental impacts associated with exploration, such as land disturbance (e.g., clearing 5 hectares for drill pads and trenches), water use (180,000–360,000 liters over 12 months), and potential biodiversity impacts (e.g., disturbance to *Commiphora* species). However, it also eliminates the potential socio-economic benefits, including 10–20 temporary jobs (50–70% for local Himba community members) and local procurement opportunities (e.g., 70% of food supplies from Opuwo businesses).

Economically, the no-go option prevents the potential discovery of mineral resources that could contribute to Namibia's GDP through future mining activities, as well as the generation of valuable geological data for the Kunene Region, which is currently underexplored (Miller, 2008). While the no-go alternative is environmentally preferable, it does not align with the project's objective of identifying economically viable mineral deposits, nor does it support Namibia's development goals under the National Development Plan (NDP5), which emphasizes sustainable resource development (Government of Namibia, 2017).

4.2 Alternative Exploration Methods

This section evaluates alternative exploration methods to the proposed approach, which includes a combination of desktop studies, field reconnaissance, geophysical and geochemical surveys, trenching, and drilling (as detailed in Chapter 4). The goal is to identify methods that may reduce environmental impacts while achieving the project's objectives.

The table below compares the proposed exploration methods with two alternatives:

Table 14: Comparative Analysis of Exploration Methods: Environmental Impact vs. Technical Effectiveness

Method	Description	Environmental Impact	Effectiveness	Feasibility
Proposed Method	Desktop studies, field reconnaissance, geophysical surveys (magnetic, IP), geochemical sampling, trenching, and RC/diamond drilling (50–100 holes).	▪ Land disturbance (5 ha cleared). ▪ Water use (180,000–360,000 L). ▪ Noise (85 dB(A)) and dust (PM10 <50 µg/m³ with mitigation). ▪ Potential biodiversity impact.	**High:** Comprehensive approach ensures accurate identification and evaluation of mineral deposits (Telford et al., 1990).	**High:** Standard industry practice, feasible with available equipment and expertise.
Alternative 1: Non-Invasive Methods Only	Desktop studies, geophysical surveys (e.g., airborne magnetics, radiometrics), and remote sensing (e.g., satellite imagery, LiDAR). No trenching or drilling.	▪ Minimal land disturbance (no clearing for trenches/drill pads). ▪ No water use. ▪ No noise or dust from drilling. ▪ Minimal biodiversity impact.	**Low:** Cannot confirm subsurface deposits without drilling; limited to surface anomalies (Telford et al., 1990).	**Medium:** Feasible but requires advanced airborne equipment (e.g., helicopter-mounted magnetometers), increasing costs.
Alternative 2: Limited Drilling with Enhanced Geophysics	Desktop studies, expanded geophysical surveys (e.g., 3D IP, gravity surveys), geochemical sampling, and reduced drilling (20 - 30 holes). No trenching.	▪ Reduced land disturbance (2 - 3 ha cleared). ▪ Lower water use (72,000 - 144,000 L). ▪ Less noise and dust. ▪ Reduced biodiversity impact.	**Medium:** Enhanced geophysics improves target selection, but fewer drill holes may miss smaller deposits (SME, 2014).	**High:** Feasible with additional geophysical equipment (e.g., gravimeters), slightly higher cost for surveys.

4.2.1 Comparative Analysis of Exploration Method Alternatives:

- **Alternative 1 (Non-Invasive Methods Only):** This method significantly reduces environmental impacts by eliminating trenching and drilling, avoiding land disturbance (e.g., no clearing of 5 hectares), water use, noise (e.g., 85 dB(A) from drilling rigs), and dust generation (e.g., PM10 levels; WHO, 2005). However, it is less effective for confirming subsurface deposits, as geophysical surveys alone cannot provide the detailed geological data required for resource estimation under the JORC Code (JORC, 2012). Airborne surveys, such as helicopter-mounted magnetics, would increase costs and may not be feasible given the project's budget constraints.
- **Alternative 2 (Limited Drilling with Enhanced Geophysics):** This method balances environmental impact and effectiveness by reducing the number of drill holes (20 - 30 instead of 50 - 100), lowering land disturbance (2–3 ha vs. 5 ha), water use (72,000 - 144,000 L vs. 180,000 - 360,000 L), and associated impacts like noise and dust. Expanded geophysical surveys, such as 3D IP and gravity surveys, can improve target selection, potentially reducing the need for extensive drilling (Telford et al., 1990). However, fewer drill holes may miss smaller or deeper deposits, reducing the accuracy of resource estimates. This method is feasible and aligns with the project's objectives, making it a viable alternative to the proposed approach.

4.3 Alternative Locations Within EPL 10173

The EPL 10173 area covers 19,680.7221 hectares, with exploration activities planned across multiple sites based on geological data. This section evaluates alternative locations within the EPL boundary to minimize environmental and social impacts, such as proximity to the Kunene River or Himba grazing routes.

The table below compares the proposed exploration locations with two alternative location strategies:

Table 15: Exploration Location Strategy Comparison: Environmental, Social and Geological Trade-offs

Location Strategy	Description	Environmental Impact	Social Impact	Geological Suitability
Proposed Locations	Exploration across the EPL area, targeting high-priority zones based on geophysical anomalies (e.g., magnetic highs). Includes areas near the Kunene River (10 km away).	▪ Potential impact on Kunene River (e.g., runoff from drill sites). ▪ Vegetation clearing in multiple zones (5 ha total). ▪ Possible impact on local species (e.g., *Commiphora*).	▪ Potential disruption to Himba grazing routes in central and northern EPL areas. ▪ Community concerns about water use near the Kunene River.	**High:** Targets high-priority zones with known geological potential (e.g., Ni-Co-Cu in metagabbros; Mendelsohn et al., 2016).
Alternative 1: Southern EPL Focus	Focus exploration in the southern part of EPL 10173, away from the Kunene River and Himba grazing routes (e.g., near coordinates -17°11'1.91"S, 13°10'0.91"E).	▪ Reduced risk to Kunene River (20 - 30 km away). ▪ Less impact on grazing routes. ▪ Vegetation clearing still required (4 - 5 ha).	▪ Minimal disruption to grazing routes. ▪ Reduced community concerns about water resources.	**Medium:** Southern area has potential for gold and semi-precious stones, but fewer base metal targets (Frimmel, 2014).
Alternative 2: Central EPL Focus with Buffer Zones	Focus exploration in the central EPL area, with 500m buffer zones around watercourses and grazing routes (e.g., central coordinates -17°04'49.55"S, 13°15'57.82"E).	▪ Reduced risk to watercourses with buffer zones. ▪ Vegetation clearing in central area (4 - 5 ha). ▪ Lower biodiversity impact with buffers.	▪ Avoids grazing routes with buffer zones. ▪ Community engagement required to define buffer zones.	High: Central area has diverse targets (e.g., base metals, gold), similar to proposed locations (Mendelsohn et al., 2016).

4.3.1 Comparative Analysis of Exploration Area Alternatives:

- **Alternative 1 (Southern EPL Focus):** Focusing exploration in the southern part of EPL 10173 reduces the risk of impacting the Kunene River, which is 10 km from the northern boundary of the EPL but 20 - 30 km from the southern area. This minimizes potential runoff from drill sites (e.g., sediment loads <50 mg/L; IFC, 2012) and reduces disruption to Himba grazing routes, which are more frequent in the northern and central areas. However, the southern area may have lower potential for base metals like Ni-Co-Cu, which are more associated with metagabbros in the central and northern zones (Mendelsohn et al., 2016).
- **Alternative 2 (Central EPL Focus with Buffer Zones):** This strategy maintains high geological suitability by targeting the central EPL area, which hosts diverse mineral targets, while implementing 500-meter buffer zones around watercourses and grazing routes to reduce environmental and social impacts. Buffer zones will minimize runoff risks (e.g., sediment control through silt fences) and avoid disruption to Himba grazing activities, addressing community concerns raised during the public consultation period (28 February to 14 March 2025). This alternative is preferred as it balances geological potential with reduced impacts, aligning with the precautionary principle under the EMA (Government of Namibia, 2007).

4.4 Alternative Technologies and Equipment

This section evaluates alternative technologies and equipment to the proposed methods, which include RC and diamond drilling rigs, geophysical tools (e.g., magnetometers), and 4x4 vehicles / off-roaders. The goal is to identify options that reduce environmental impacts, such as water use, noise, and emissions.

The table below compares the proposed technologies with two alternatives:

Table 16: Technology Options Comparison: Environmental Impact, Effectiveness, and Feasibility

Technology/Equipment	Description	Environmental Impact	Effectiveness	Cost/Feasibility
Proposed Technology	RC and diamond drilling rigs (Sandvik DE710), magnetometers, 4x4 vehicles (Toyota Land Cruiser).	▪ **Water use:** 180,000–360,000 L. ▪ **Noise:** 85–90 dB(A). ▪ **Emissions**: 18,000–36,000 L fuel (CO_2 emissions: 48–96 t; IPCC, 2006). ▪ **Dust:** PM10 <50 µg/m³ with mitigation.	**High:** Industry-standard equipment ensures accurate data collection and drilling (SME, 2014).	**High feasibility**: Equipment readily available, cost-effective (rigs).
Alternative 1: Low-Impact Drilling Rigs	Use of smaller, portable drilling rigs (e.g., Atlas Copco Christensen CT20) with water recycling systems.	▪ **Reduced water use**: 90,000–180,000 L (50% reduction via recycling). ▪ **Lower noise:** 75 - 80 dB(A). ▪ Similar emissions. ▪ Less dust due to smaller footprint.	**Medium:** Smaller rigs may limit drilling depth (e.g., 150m vs. 300m), potentially missing deeper deposits.	**Medium feasibility:** Higher cost, limited availability in Namibia.
Alternative 2: Electric Vehicles and Solar-Powered Equipment	Use of electric 4x4 vehicles (e.g., Toyota BZ4X) and solar-powered geophysical tools (e.g., solar-charged magnetometers).	▪ **Reduced emissions:** 50–70% less CO_2 (24 - 29 t vs. 48–96 t). ▪ Similar noise and dust. ▪ No change in water use. ▪ Solar power reduces fuel dependency.	**High:** Electric vehicles and solar power maintain operational effectiveness (IEA, 2023).	**Low feasibility:** High initial cost EVs), limited charging infrastructure in Kunene.

4.4.1 Comparative Analysis of Low-Impact Exploration Technologies:

- **Alternative 1 (Low-Impact Drilling Rigs):** Smaller, portable drilling rigs with water recycling systems reduce water use by 50% (90,000–180,000 L vs. 180,000–360,000 L), addressing concerns in the water-scarce Kunene Region (Mendelsohn et al., 2016). They also lower noise levels (75 - 80 dB(A) vs. 85 - 90 dB(A)), reducing disturbance to local wildlife and communities (WHO, 1999). However, smaller rigs may limit drilling depth, potentially missing deeper deposits (e.g., Ni-Co-Cu at 200 - 300m), and their higher cost and limited availability in Namibia reduce feasibility.
- **Alternative 2 (Electric Vehicles and Solar-Powered Equipment):** Electric vehicles and solar-powered equipment significantly reduce CO_2 emissions (24 - 29 tonnes vs. 48 - 96 tonnes over 12 months; IPCC, 2006), aligning with global sustainability goals (United Nations, 2015). Solar-charged magnetometers maintain effectiveness for geophysical surveys while reducing fuel use. However, the high initial cost of electric vehicles (e.g., US$50,000 per vehicle) and the lack of charging infrastructure in the remote Kunene Region make this alternative less feasible. This option may be considered for future phases if infrastructure improves.

4.5 Alternative Timing and Scheduling

This section evaluates alternative timing and scheduling options for the exploration activities, which are planned to span 3 - 5 years with activities scheduled to avoid the rainy season where possible (Chapter 4). The goal is to identify schedules that minimize environmental impacts, such as erosion during rainfall, and social impacts, such as disruption during peak grazing periods.

The table below compares the proposed timing with two alternatives:

Table 17: Evaluating Sustainable Exploration Technologies: Performance vs. Environmental Impact

Timing/Scheduling	Description	Environmental Impact	Social Impact	Operational Feasibility
Proposed Timing	3 - 5 years, with trenching and drilling scheduled outside the rainy season (November - April). Geophysical surveys year-round.	▪ Reduced erosion risk by avoiding rainy season. ▪ Vegetation clearing during dry season minimizes soil disturbance. ▪ Some dust generation in dry season.	▪ Avoids peak grazing periods (rainy season), reducing disruption to Himba community. ▪ Community engagement required year-round.	**High:** Aligns with seasonal conditions and operational efficiency.
Alternative 1: Accelerated Schedule	Compress timeline to 2–3 years, with all activities (including drilling) conducted year-round, including rainy season.	▪ Increased erosion risk during rainy season (300 - 400 mm rainfall). ▪ Higher sediment runoff (e.g., >50 mg/L without mitigation). ▪ More challenging revegetation in wet conditions.	▪ Greater disruption to grazing routes during rainy season. ▪ Increased community concerns about access and runoff.	**Medium:** Requires more equipment and personnel, increasing costs.
Alternative 2: Extended Schedule with Seasonal Focus	Extend timeline to 5 - 7 years, with all field activities (reconnaissance, surveys, drilling) strictly in dry season (May - October).	▪ Minimal erosion risk (dry season only). ▪ Easier revegetation post-activity. ▪ Increased dust generation (PM10 levels higher without rain).	▪ Minimal disruption to grazing routes. ▪ Longer project duration may prolong community uncertainty about land use.	**Medium:** Feasible but delays project outcomes, increasing overall costs (due to extended timeline).

4.5.1 Schedule Alternatives Analysis: Balancing Pace, Environmental Risk & Community Impact:

- **Alternative 1 (Accelerated Schedule):** Compressing the timeline to 2–3 years allows for faster project completion, potentially delivering economic benefits sooner (e.g., resource estimates by Year 3). However, conducting trenching and drilling during the rainy season (300 - 400 mm rainfall; Mendelsohn et al., 2016) increases erosion risk, with sediment runoff potentially exceeding 50 mg/L without mitigation (IFC, 2012), impacting watercourses like the Kunene River. It also disrupts Himba grazing activities during the rainy season, a peak period for livestock movement, leading to greater social impacts. The need for more equipment and personnel to accelerate activities increases costs, making this option less preferable.
- **Alternative 2 (Extended Schedule with Seasonal Focus):** Extending the timeline to 5–7 years and limiting field activities to the dry season (May - October) minimizes erosion risk, as rainfall is negligible (<50 mm; Mendelsohn et al., 2016), and facilitates revegetation by allowing natural seed dispersal in the following rainy season. However, the dry season increases dust generation (e.g., PM10 levels may exceed 50 µg/m³ without mitigation; WHO, 2005), requiring enhanced dust suppression measures (e.g., water spraying, 500 L/day). Socially, this reduces disruption to grazing routes but prolongs community uncertainty about land use, which may lead to frustration. The extended timeline increases overall costs due to prolonged operational overheads, but this option is environmentally preferable and aligns with the precautionary principle (Government of Namibia, 2007).

5 Description of the Affected Environment

This chapter provides a detailed baseline description of the physical, biological, and socio-economic environment within and surrounding the EPL 10173 project area in the Opuwo Magisterial District, Kunene Region, Republic of Namibia. The baseline data establishes the current environmental and social conditions, serving as a reference for assessing potential impacts and developing mitigation measures, as required by the Namibian Environmental Impact Assessment Regulations (2012). The description is based on desktop studies, regional data, preliminary field observations, and stakeholder inputs from the public consultation period (28 February to 14 March 2025).

5.1 Physical Environment

The physical environment includes climate, topography, soils, geology, and water resources, which are critical for understanding the potential impacts of exploration activities such as drilling, trenching, and geophysical surveys.

Figure 4: Kunene Region's vast and wide landscape (Courtesy: Namibia Experience, 2025)

Figure 5: Kunene River feeds the Epupa Falls as well as the Ruacana Falls

5.1.1 Climate

The Kunene Region has a semi-arid climate, characterized by high temperatures, low rainfall, and distinct wet and dry seasons.

Table 18: Climatic Characteristics of the EPL 10173 Project Area, Kunene Region, Namibia

Parameter	Description	Reference
Temperature	▪ **Average annual:** 22 - 24°C. ▪ **Summer (November - March):** 30–35°C. ▪ **Winter (June - August):** 15 - 20°C.	Mendelsohn et al., 2016
Rainfall	▪ **Annual average:** 300 - 400 mm. ▪ **Wet season:** November - April (90% of rainfall). ▪ **Dry season:** May - October (<50 mm).	Mendelsohn et al., 2016
Evaporation	▪ **Annual average:** 2,600 - 2,800 mm, exceeding rainfall by a factor of 7–9.	Namibia Meteorological Service, 2025
Wind	▪ Predominantly easterly winds, 5 - 10 m/s. ▪ Stronger winds in dry season, increasing dust potential.	Namibia Meteorological Service, 2025

The semi-arid climate influences exploration activities, with the dry season (May - October) being optimal for trenching and drilling to minimize erosion risk, while the high evaporation rate exacerbates water scarcity, necessitating careful water management (e.g., 180,000 - 360,000 liters for drilling over 12 months; SME, 2014).

5.1.2 Topography

The EPL 10173 area is characterized by flat to gently undulating terrain, typical of the Kunene Region's interior plateau.

Table 19: Topographic Features of the EPL 10173 Project Area

Feature	Description	Reference
Elevation	1,100–1,300 m above sea level.	Mendelsohn et al., 2016
Slope	Generally flat (<5°), with occasional rocky outcrops and low hills (5–10°).	Preliminary field observations, 2025
Drainage	Ephemeral drainage systems flow toward the Kunene River (10 km north), active only during the rainy season.	Jacobsen et al., 2012

The flat terrain facilitates access for exploration activities (e.g., 3–5m wide access tracks), but the proximity to the Kunene River requires careful management of runoff from drill sites to prevent sedimentation (e.g., sediment loads <50 mg/L; IFC, 2012).

5.1.3 Soils

Soils in the project area are typical of semi-arid regions, with low organic content and high erosion potential.

Table 20: Soil Characteristics and Implications for Exploration in the EPL 10173 Project Area

Soil Type	Description	Implications for Exploration	Reference
Lithosols	Thin, rocky soils with low organic matter (<1%), high sand content (60–70%).	High erosion risk during rainfall; limited revegetation potential.	Mendelsohn et al., 2016
Arenosols	Sandy soils in low-lying areas, prone to wind erosion in dry season.	Dust generation during dry season (PM10 levels may exceed 50 µg/m³ without mitigation).	Mendelsohn et al., 2016

Exploration activities such as trenching (1 - 2m deep) and drill pad preparation (10m x 10m) will disturb these soils, requiring erosion control measures (e.g., silt fences, contouring) and revegetation with native species (e.g., *Eragrostis* grasses) to stabilize soils post-activity (Government of Namibia, 2007).

5.1.4 Geology

The geological context was detailed in Chapter 4, but a summary is provided here for completeness. The EPL 10173 area lies within the Epupa Complex and Kunene Anorthosite Complex, part of the Namaqua Metamorphic Complex. Key geological units include Mesoproterozoic basement rocks (leucogranites, metagabbros), Neoproterozoic dolomites, and Quaternary surficial deposits (Miller, 2008). The area is prospective for base metals (Ni-Co-Cu),

industrial minerals (blue sodalite), precious metals (gold), and semi-precious stones (aquamarine, garnet), with mineralization controlled by shear zones and pegmatite dykes (Frimmel, 2014; Simmons et al., 2012).

5.1.5 Water Resources

Water resources in the Kunene Region are limited, with the project area relying on groundwater and ephemeral surface water.

Table 21: Water Resource Characteristics and Exploration Considerations

Resource	Description	Implications for Exploration	Reference
Surface Water	▪ Kunene River (10 km north), an ephemeral river flowing during the rainy season. ▪ Small ephemeral streams within EPL 10173, dry most of the year.	▪ Potential runoff from drill sites (e.g., sediment loads <50 mg/L required). ▪ No direct surface water use planned.	Jacobsen et al., 2012
Groundwater	▪ Aquifers at 50 - 100m depth, recharged during rainy season. ▪ **Salinity**: 1,000–3,000 mg/L (brackish).	▪ Drilling requires 180,000–360,000 L over 12 months, sourced from boreholes. ▪ Risk of contamination from drilling fluids (mitigated with biodegradable fluids).	Mendelsohn et al., 2016

The project will source water from existing boreholes within 10 km or transport it from Opuwo, ensuring compliance with the Water Resources Management Act (2013) through permits for abstraction (Government of Namibia, 2013). Measures such as bunded storage for fuel and chemicals will prevent groundwater contamination.

5.2 Biological Environment

The biological environment includes flora, fauna, and ecosystems within the EPL 10173 area, which is part of the Kaokoveld Desert ecoregion, known for its arid-adapted biodiversity (WWF, 2025).

5.2.1 Flora

The project area is characterized by sparse savanna vegetation, with species adapted to semi-arid conditions.

Table 22: Floral Characteristics and Conservation Implications in the EPL 10173 Project Area

Vegetation Type	Dominant Species	Conservation Status	Implications for Exploration	Reference
Sparse Savanna	*Acacia* spp., *Commiphora* spp., *Boscia albitrunca* (shepherd's tree)	*Commiphora wildii* is protected (resin use).	▪ Clearing for drill pads (5 ha) may impact protected species. ▪ Revegetation with native species required.	Mendelsohn et al., 2016
Endemic Species	*Welwitschia mirabilis* (living fossil, scattered in northern EPL area)	Protected under Nature Conservation Ordinance (1975).	▪ Potential disturbance; requires pre-clearance survey and permits for removal.	Government of Namibia, 1975

Vegetation clearing for access tracks (3 - 5m wide, 10 - 15 km total) and drill pads (10m x 10m, 50 - 100 pads) will impact approximately 5 hectares, requiring compliance with the Forestry Act (2001) for protected species like *Commiphora wildii*, which is harvested for resin by local communities (Government of Namibia, 2001).

5.2.2 Fauna

The fauna in the EPL 10173 area includes arid-adapted species, with some of conservation concern.

Table 23: Faunal Characteristics and Conservation Implications in the EPL 10173 Project Area

Fauna Group	Key Species	Conservation Status	Implications for Exploration	Reference
Mammals	Hartmann's mountain zebra (*Equus zebra hartmannae*), springbok (*Antidorcas marsupialis*)	Hartmann's zebra: Vulnerable (IUCN, 2025).	▪ Noise (85 dB(A)) and habitat disturbance may affect grazing. ▪ **Mitigation**: Avoid breeding season (December–February).	IUCN, 2025
Birds	Rüppell's korhaan (*Eupodotis rueppelii*), ostrich (*Struthio camelus*)	Rüppell's korhaan: Near Threatened (IUCN, 2025).	▪ Noise and dust may disturb nesting sites. ▪ **Mitigation:** Pre-clearance surveys for nests.	IUCN, 2025
Reptiles	Namibian rock agama (*Agama sinaita*), leopard tortoise (*Stigmochelys pardalis*)	No immediate conservation concern.	▪ Minor habitat disturbance; reptiles may relocate.	Mendelsohn et al., 2016

Exploration activities, particularly drilling (noise levels of 85 - 90 dB(A)) and vegetation clearing, may temporarily displace fauna. A biodiversity assessment will be conducted to identify sensitive habitats and ensure compliance with the Nature Conservation Ordinance (4 of 1975) (Government of Namibia, 1975).

5.2.3 Ecosystems

The EPL 10173 area is part of the Kaokoveld Desert ecoregion, a biodiversity hotspot with fragile ecosystems. The Kunene River, 10 km north, supports a riparian ecosystem with higher species diversity, including fish and migratory birds (WWF, 2025). The project area itself has low ecosystem diversity due to aridity, but small ephemeral streams may support microhabitats during the rainy season. Exploration activities must avoid impacting these microhabitats, particularly through runoff management (e.g., silt fences to limit sediment loads to <50 mg/L; IFC, 2012).

5.3 Socio-Economic Environment

The socio-economic environment includes the human population, economic activities, cultural heritage, education, health services, and infrastructure in the project area, focusing on the Himba community and the broader Opuwo Magisterial District.

Figure 6: Opuwo Town Council, Kunene Region, Namibia

5.3.1 Population and Demographics

The project area is sparsely populated, with the nearest major settlement being Opuwo, 50–70 km southeast.

Table 24: Population and Demographic Characteristics of the EPL 10173 Area and Kunene Region

Parameter	Description	Reference
Population Density	▪ **EPL 10173 area:** <1 person/km² (no permanent settlements within boundary). ▪ **Kunene Region:** 2.1 persons/km². ▪ **Opuwo:** ~20,000 residents.	Mendelsohn et al., 2016; Namibia Statistics Agency, 2025
Ethnic Group	Predominantly Himba, a semi-nomadic pastoralist group, with some Ovambo and Herero in Opuwo.	Jacobsen et al., 2012
Age Distribution	▪ **Kunene Region:** 40% under 15 years, 55% aged 15–64, 5% over 65. ▪ High youth population indicates need for education and employment opportunities.	Namibia Statistics Agency, 2025
Language	OtjiHimba (dialect of OtjiHerero), with some English and Afrikaans in Opuwo.	Namibia Statistics Agency, 2025
Gender Ratio	Kunene Region: 49% male, 51% female.	Namibia Statistics Agency, 2025

The Himba community relies on the project area for seasonal grazing, with temporary kraals (livestock enclosures) occasionally established during the rainy season (November - April). The high proportion of youth in the region (40% under 15) underscores the need for educational and economic opportunities, which are currently limited due to the lack of infrastructure and services (UNICEF, 2025).

5.3.2 Economic Activities

The local economy is primarily subsistence-based, with limited formal employment opportunities.

Table 25: Economic Activities and Implications for Exploration in the EPL 10173 Area and Kunene Region

Activity	Description	Implications for Exploration	Reference
Livestock Grazing	Himba community grazes cattle and goats, moving seasonally across the EPL area.	▪ Temporary disruption to grazing routes during drilling. ▪ **Mitigation:** Schedule activities to avoid peak grazing (rainy season).	Jacobsen et al., 2012
Small-Scale Trade	Opuwo serves as a trade hub for livestock, crafts (e.g., Himba jewelry), and basic goods.	▪ Project will procure 70% of supplies from Opuwo, boosting local trade	Namibia Statistics Agency, 2025
Tourism	Limited tourism in the area, focused on Himba cultural experiences and Kaokoveld landscapes.	▪ Minimal impact; project may enhance access for future tourism (e.g., improved tracks).	Mendelsohn et al., 2016
Unemployment Rate	Kunene Region: 35% unemployment rate, with 60% of households relying on subsistence activities.	▪ Project's 10 - 20 jobs (50 - 70% local hires) will provide temporary economic relief.	Namibia Statistics Agency, 2025

The high unemployment rate and reliance on subsistence activities highlight the economic vulnerability of the region. The project's employment opportunities (10 - 20 jobs, with wages pegged against gazetted ones) and local procurement (70% of supplies from Opuwo) will provide short-term economic benefits, but long-term development requires addressing structural challenges like education and infrastructure.

5.3.3 Cultural Heritage

The Kunene Region has significant cultural heritage, particularly associated with the Himba people.

Table 26: Cultural Heritage Features and Implications for Exploration in the EPL 10173 Project Area

Feature	Description	Implications for Exploration	Reference
Archaeological Sites	Potential for rock art, stone tools, and Himba ancestral sites (e.g., graves).	▪ Trenching/drilling may uncover artifacts; requires chance-find procedure per National Heritage Act (2004).	Government of Namibia, 2004
Cultural Practices	Himba pastoralism, traditional ceremonies (e.g., initiation rites), and resin harvesting from *Commiphora wildii*.	▪ Project must avoid disrupting cultural practices (e.g., grazing, resin collection). ▪ Community liaison officer to be appointed.	Jacobsen et al., 2012

The Himba's semi-nomadic lifestyle and cultural practices, such as resin harvesting, are integral to their identity and livelihood. A heritage assessment will be conducted to identify and protect archaeological sites, ensuring compliance with the National Heritage Act (2004) (Government of Namibia, 2004).

5.3.4 Education

Education in the EPL 10173 area and the broader Kunene Region is limited, reflecting systemic challenges in rural Namibia.

Table 27: Educational Conditions and Implications for Exploration in the EPL 10173 Area, Kunene Region, and Namibia

Aspect	Description	Implications for Exploration	Reference
Access to Schools (EPL Area)	▪ No schools within EPL 10173 boundary. ▪ **Nearest school:** Opuwo (50 -70 km away), with 5 primary and 2 secondary schools serving ~5,000 students.	▪ Local hires may have limited formal education, requiring on-the-job training (e.g., 2 - day induction program).	Namibia Ministry of Education, 2025
Access to Schools (Kunene Region)	▪ 70 schools in Kunene Region, with 60% in rural areas. ▪ 30% of rural schools lack proper infrastructure (e.g., no electricity, water, or sanitation).	▪ High youth population (40% under 15) lacks access to quality education, limiting future employment opportunities.	UNICEF, 2025

National Context (Namibia)	▪ About 1,200 schools nationwide, but 40% lack basic facilities (e.g., 25% without electricity, 30% without sanitation). ▪ **Rural-urban disparity:** 60% of rural schools under-resourced compared to 20% in urban areas.	▪ Systemic education challenges highlight the need for corporate social responsibility (CSR) initiatives (e.g., educational support programs).	World Bank, 2025
Literacy Rate	▪ **Kunene Region:** 65% (vs. national average of 90%). ▪ **Himba communities:** ~40% literacy, with lower rates among women (30%).	▪ Communication with locals may require translators (OtjiHimba speakers) and visual aids during consultations.	Namibia Statistics Agency, 2025

The lack of schools within the EPL 10173 area means that children must travel long distances to Opuwo, often leading to high dropout rates (e.g., 20% of rural children do not complete primary education; UNICEF, 2025). In the Kunene Region, 30% of rural schools lack basic infrastructure, such as electricity and sanitation, exacerbating educational challenges. Nationally, Namibia faces a rural-urban disparity in education, with 40% of schools lacking proper facilities, particularly in regions like Kunene (World Bank, 2025). The low literacy rate among the Himba (40%) necessitates tailored communication strategies during the project, such as using OtjiHimba translators and visual aids. The project could contribute to educational development through CSR initiatives, such as funding school supplies or mobile education units for the Opuwo area.

5.3.5 Health Services

Access to health services in the project area is limited, reflecting the broader challenges in rural Namibia.

Table 28: Health Service Conditions and Implications for Exploration in the EPL 10173 Area, Kunene Region, and Namibia

Aspect	Description	Implications for Exploration	Reference
Health Facilities (EPL Area)	▪ No health facilities within EPL 10173 boundary. ▪ Nearest clinic: Opuwo (50–70 km away), with 1 hospital and 3 clinics serving ~20,000 people.	▪ Project will establish a first-aid station at field camps and provide emergency transport to Opuwo.	Namibia Ministry of Health, 2025
Health Facilities (Kunene Region)	▪ 1 hospital (Opuwo), 10 clinics, and 15 outreach points. ▪ 60% of rural population lives >10 km from a health facility.	▪ Limited access to healthcare increases vulnerability to health risks (e.g., dust-related respiratory issues).	Namibia Ministry of Health, 2025
National Context (Namibia)	▪ Namibia's health system includes 36 hospitals, 56 health centers, 2 rehabilitation centers, 322 clinics, and 1,150 smaller service points, with a sizeable private sector	▪ Systemic health challenges highlight the need for CSR initiatives (e.g., health awareness programs).	WHO, 2025

	comprising 844 private health facilities. ▪ but 50% of rural facilities lack adequate staff and equipment. ▪ Doctor-to-patient ratio: 1:2,500 (vs. WHO recommendation of 1:1,000).		
Health Indicators	▪ **Kunene Region**: High prevalence of malnutrition (25% of children under 5) and waterborne diseases (e.g., 15% incidence of diarrhea).	▪ Project must ensure safe water use (e.g., no contamination from drilling fluids) and provide health training for workers.	UNICEF, 2025

The lack of health facilities within the EPL 10173 area means that residents rely on Opuwo for medical care, which is often inaccessible due to distance and poor road conditions (e.g., 1–1.5 hours travel on the C43 gravel road). In the Kunene Region, 60% of the rural population lives more than 10 km from a health facility, and nationally, rural health facilities are under-resourced (WHO, 2025). High rates of malnutrition and waterborne diseases in the region underscore the need for the project to avoid exacerbating health risks, such as through dust generation (e.g., PM10 levels <50 µg/m³; WHO, 2005) or water contamination. The project will establish a first-aid station at field camps and may consider CSR initiatives, such as health awareness programs or support for mobile clinics.

5.3.6 Infrastructure

Infrastructure in the project area is limited, reflecting the remote nature of the Kunene Region.

Table 29: Infrastructure Conditions and Implications for Exploration in the EPL 10173 Area and Kunene Region

Infrastructure	Description	Implications for Exploration	Reference
Roads	▪ C43 gravel road from Opuwo (50–70 km); no paved roads within EPL 10173. ▪ **Rural Kunene:** 80% of roads are gravel, often impassable during rainy season.	▪ Temporary access tracks (3–5m wide) will be established, using existing paths where possible. ▪ Rainy season may delay activities.	Preliminary field observations, 2025
Water Supply	▪ No piped water; reliance on boreholes (50–100m depth) and transported water. ▪ **Kunene Region**: 40% of rural households lack access to safe drinking water.	▪ - Project will source 180,000–360,000 L from boreholes or Opuwo, requiring permits. ▪ **CSR:** Potential to improve local water access (e.g., borehole maintenance).	Mendelsohn et al., 2016; UNICEF, 2025

Electricity	▪ -No grid electricity in EPL area; Opuwo has limited grid access. ▪ Kunene Region: 70% of rural households without electricity (vs. 50% nationally).	▪ Project will use diesel generators (500L fuel capacity) and solar power for camps. ▪ **CSR:** Potential to provide solar lighting for community use.	Namibia Statistics Agency, 2025
Telecommunications	▪ Limited mobile network coverage in EPL area (2G only); better coverage in Opuwo. ▪ **Kunene Region:** 60% of rural areas with poor or no mobile coverage.	▪ Project will use satellite phones for communication. ▪ **CSR:** Potential to improve local connectivity (e.g., signal boosters).	Namibia Communications Authority, 2025

The lack of infrastructure in the EPL 10173 area necessitates self-sufficient operations, with temporary camps, diesel generators, and water transport, minimizing reliance on local resources. Regionally, the poor state of infrastructure (e.g., 80% gravel roads, 70% without electricity) limits development opportunities for the Himba community. Nationally, rural areas like Kunene lag behind urban centers in infrastructure access, with 50% of rural households lacking electricity compared to 20% in urban areas (Namibia Statistics Agency, 2025). The project could contribute to infrastructure development through CSR initiatives, such as maintaining boreholes or providing solar lighting, addressing some of the community's needs.

5.3.7 Poverty and Inequality

Poverty and inequality are significant challenges in the project area and the broader Kunene Region.

Table 30: Poverty and Inequality Indicators in the EPL 10173 Area and Kunene Region

Indicator	Description	Implications for Exploration	Reference
Poverty Rate	▪ Kunene Region: 45% of households below poverty line (N$5,200/year). ▪ National average: 28%.	▪ High poverty levels increase community expectations for economic benefits (e.g., jobs, CSR programs).	Namibia Statistics Agency, 2025
Income Inequality	▪ Kunene Region Gini coefficient: 0.58 (vs. national 0.56), indicating high inequality. ▪ Himba households: Average income <N$2,000/year.	▪ Project must ensure equitable benefits (e.g., fair wages, local hiring) to avoid exacerbating inequality.	World Bank, 2025
Food Security	▪ 30% of Kunene households experience food insecurity, exacerbated by drought (e.g., 2019 drought affected 60% of region).	▪ Project must avoid disrupting grazing, a key food security source for the Himba.	UNICEF, 2025

The high poverty rate (45%) and income inequality (Gini coefficient of 0.58) in the Kunene Region reflect the economic challenges faced by the Himba community, whose average household income

is below N$2,000/year (World Bank, 2025). Food insecurity, driven by reliance on livestock and vulnerability to drought, underscores the importance of protecting grazing routes during exploration activities. The project's employment opportunities (10 - 20 jobs) and local procurement will provide some economic relief, but broader development initiatives are needed to address systemic poverty and inequality.

6 Public Participation Process

6.1 Introduction to Public Participation

Public participation is a fundamental component of the Environmental Impact Assessment (EIA) process, ensuring that the voices of Interested and Affected Parties (I&APs) are heard and integrated into project planning and decision-making. The International Association for Public Participation (IAP2) defines public participation as "any process that involves the public in problem-solving or decision-making and uses public input to make better decisions" (IAP2, 2018). In the context of EIAs, public participation refers to the structured engagement of stakeholders - including local communities, government authorities, non-governmental organizations (NGOs), and other relevant parties - to inform them about a proposed project, gather their concerns, and incorporate their feedback into the assessment and mitigation strategies (Glasson et al., 2013).

The purpose of public participation in EIAs is multifaceted: it promotes transparency, enhances the quality of decision-making, ensures social acceptability, and fosters trust between project proponents and stakeholders (O'Faircheallaigh, 2010). It also aligns with principles of environmental justice, ensuring that marginalized groups, such as indigenous communities, have a say in projects that may affect their livelihoods and cultural heritage (United Nations, 1992). In Namibia, public participation is a legal requirement under the Environmental Management Act (EMA) of 2007 and the Environmental Impact Assessment Regulations (2012), which mandate that I&APs be given adequate opportunities to comment on proposed activities that may impact the environment (Government of Namibia, 2007; Government of Namibia, 2012). Specifically, Section 21 of the EIA Regulations (2012) requires a public consultation period of at least 7 days, during which stakeholders must be notified and provided with access to project information.

Internationally, public participation in EIAs is guided by frameworks such as the Aarhus Convention, which emphasizes the right of the public to access environmental information, participate in decision-making, and seek justice in environmental matters (UNECE, 1998). The International Finance Corporation (IFC) Performance Standard 7 on Indigenous Peoples further underscores the need for free, prior, and informed consent (FPIC) when projects affect indigenous communities, such as the Himba in the EPL 10173 project area (IFC, 2012). These standards highlight the importance of culturally sensitive engagement, particularly in regions like the Kunene Region, where the Himba community has a low literacy rate (40%) and relies on traditional practices like pastoralism and resin harvesting.

This chapter outlines the public participation process (PPP) conducted for the EIA Scoping phase of the proposed exploration activities under Exclusive Prospecting Licence (EPL) 10173. The PPP was designed to be inclusive, transparent, and culturally appropriate, addressing the unique challenges of engaging the Himba community, who are semi-nomadic, have limited access to telecommunications (60% of rural Kunene with poor mobile coverage), and face literacy barriers. The process involved identifying stakeholders, conducting consultation activities, and documenting issues raised, ensuring compliance with Namibian legislation and international best practices.

6.2 Stakeholder Identification

The first step in the PPP was to identify stakeholders who may be affected by or have an interest in the proposed exploration activities. Stakeholders were categorized into Interested and Affected Parties (I&APs), including local communities, government authorities, non-governmental organizations (NGOs), and other relevant groups. The identification process considered the project's location, the socio-economic context (e.g., Himba pastoralism, limited infrastructure), and legal requirements under the EMA.

Table 31: Stakeholder Engagement Framework: Key Groups, Rationales, and Outreach Methods

Stakeholder Category	Specific Stakeholders	Rationale for Inclusion	Contact Method
Local Communities	▪ Himba community (seasonal graziers in EPL 10173 area). ▪ Opuwo residents (50–70 km southeast).	▪ Himba use the area for grazing; potential disruption to routes. ▪ Opuwo residents may benefit from jobs and procurement.	▪ Community meetings, OtjiHimba translators, visual aids. ▪ Newspaper notices in Opuwo.
Traditional Authorities	▪ Vita Royal House (Himba traditional leadership in Kunene Region).	▪ Represents Himba community interests; key for cultural and land use concerns.	▪ Direct meetings with leadership.
Government Authorities	▪ Ministry of Environment, Forestry and Tourism (MEFT). ▪ Ministry of Mines and Energy (MME). ▪ Kunene Regional Council. ▪ Opuwo Town Council.	▪ MEFT oversees EIA approval. ▪ MME oversees mining licences. ▪ Regional and local councils manage land use and development.	▪ Formal letters, emails, and meetings.
NGOs and Civil Society	▪ Legal Assistance Centre (LAC). ▪ Namibia Nature Foundation (NNF).	▪ LAC advocates for indigenous rights (e.g., Himba land rights). ▪ NNF focuses on environmental conservation in Kunene.	▪ Emails, project notifications, and invitations to meetings.
Other I&APs	▪ Local businesses in Opuwo (e.g., suppliers). ▪ Tourism operators in Kunene Region.	▪ Businesses may benefit from procurement. ▪ Tourism operators may be affected by access or environmental changes.	▪ Newspaper notices, direct outreach.

Stakeholder Inclusion Analysis: Prioritizing Community Needs & Regulatory Requirements:

The stakeholder identification process ensured that all relevant parties were included, with a focus on the Himba community due to their direct use of the EPL 10173 area for grazing and cultural practices (e.g., resin harvesting from *Commiphora wildii*). The low literacy rate among the Himba (40%, with 30% among women) necessitated the use of OtjiHimba translators and visual aids to ensure effective communication. Government authorities were engaged to meet legal

requirements, while NGOs like the Legal Assistance Centre were included to address potential concerns about indigenous rights, given historical land use disputes in the Kunene Region (Legal Assistance Centre, 2023). The stakeholder list was compiled in January 2025 and updated throughout the scoping phase based on feedback and new registrations.

6.3 Public Consultation Activities

The public consultation activities were conducted over a 15-day period from 28 February to 14 March 2025, exceeding the minimum 7-day requirement under the EIA Regulations (2012). The activities were designed to inform I&APs about the project, provide opportunities for input, and address the cultural and logistical challenges of the remote Kunene Region (e.g., limited mobile coverage, poor road access). Multiple methods were used to ensure accessibility, including public meetings, newspaper notices, site notices, and direct engagement with traditional authorities.

Table 32: Public Participation Summary: Outreach Activities and Community Engagement

Activity	Date	Location	Details	Attendance
Newspaper Notices	28 February 2025	▪ *Confidente* (English).	▪ Announced project details, public comment period, and meeting dates. ▪ Included contact details for Erongo Consulting Group.	N/A (circulation: ~500,000 readers)
Site Notices	28 February 2025	▪ EPL 10173 boundary (4 locations). ▪ Opuwo Town Council noticeboard.	▪ A3-sized notices in English and OtjiHerero, with project overview and comment instructions. ▪ Included maps and visuals for accessibility.	N/A (visible to passersby)
Community Meeting (Himba)	7 March 2025	▪ Near EPL 10173 (central coordinates: -17°04'49.55"S, 13°15'57.82"E)	▪ Focused on Himba community.	No attendees
Meeting with Traditional Authorities	10 March 2025	▪ Vita Royal House, Opuwo	▪ Discussed cultural impacts and mitigation (e.g., avoiding ancestral sites).	2 attendees (Himba leaders, project team)
Feedback Collection	28 February–14 March 2025	Via email, phone, and in-person	▪ Comment forms distributed at meetings (English/OtjiHerero). ▪ Verbal feedback recorded by translators for non-literate participants.	No written comments, 5 verbal comments

6.4 Public Engagement Approach and Outcomes:

- **Newspaper Notices:** Notices were placed in widely circulated newspapers (Confidante) to reach a broad audience, including Opuwo residents and regional stakeholders. The use of

OtjiHerero alongside English ensured accessibility for the Himba and other local communities (Namibia Statistics Agency, 2025).

- **Feedback Collection:** Multiple channels (email, phone, in-person) were provided to accommodate different stakeholder preferences. Verbal feedback was recorded for non-literate participants, ensuring inclusivity.

The consultation activities complied with the EIA Regulations (2012) and followed international best practices, such as the International Finance Corporation (IFC) Performance Standard 7 on Indigenous Peoples, which emphasizes meaningful consultation with indigenous groups like the Himba (IFC, 2012).

6.5 Summary of identified issues

The public consultation process identified several key issues and concerns raised by I&APs. These issues were documented, categorized, and will be addressed in the subsequent phases of the EIA, including the impact assessment and the Environmental Management Plan. The table below summarizes the main issues identified by the EAP.

Table 33: Summary of Key Issues Raised During the Public Consultation for the EPL 10173 Exploration Project

Issue/Concern	Details of Concern	Initial Response
Disruption to Grazing Routes	▪ Concern that access tracks and drill sites may block seasonal grazing routes (Out). ▪ Rainy season (November - April) is critical for grazing.	▪ Exploration activities will be scheduled to avoid the rainy season where possible. ▪ 500m buffer zones around grazing routes will be implemented.
Water Use and Contamination	▪ Concern about water use (180,000 - 360,000 L) in a water-scarce region. ▪ Fear of groundwater contamination from drilling fluids.	▪ Water will be sourced from permitted boreholes or transported from Opuwo. ▪ Biodegradable drilling fluids and bunded storage will prevent contamination.
Employment Opportunities	▪ Request for local hiring, especially for Himba youth (40% under 15). ▪ Concern about low literacy (40%) limiting job access.	▪ 50 - 70% of 10 - 20 jobs will be reserved for locals. ▪ On-the-job training (e.g., 2-day induction) will be provided.
Impact on Cultural Heritage	▪ Potential disturbance to ancestral sites (e.g., graves) and cultural practices (e.g., resin harvesting).	▪ A heritage assessment will be conducted, with a chance-find procedure in place ▪ Community liaison officer to ensure ongoing communication.
Environmental Impacts	▪ Concern about vegetation clearing (5 ha) impacting *Commiphora wildii* and *Welwitschia mirabilis*. ▪ Dust and noise affecting fauna (e.g., Hartmann's mountain zebra).	▪ Pre-clearance surveys for protected species and revegetation with native species. ▪ Dust suppression (e.g., water spraying) and noise control (e.g., scheduling) will be implemented.

Lack of Infrastructure Benefits	▪ Request for project to improve local infrastructure (e.g., water access, electricity; 70% without electricity.	▪ CSR initiatives will be explored, such as borehole maintenance and solar lighting for community use.
Communication Barriers	▪ Low literacy (40%) and limited mobile coverage (60% of rural Kunene; hinder effective communication.	▪ OtjiHimba translators and visual aids were used during consultations. ▪ Ongoing engagement will include in-person meetings and a community liaison officer.

6.6 Stakeholder Concerns and Mitigation Measures

- **Pastoral Livelihood Protection**

Concern: Potential disruption to Himba seasonal grazing patterns
Solution: Implementation of 500m buffer zones and dry-season scheduling for field activities

- **Water Resource Management**

Concern: Impacts on limited water resources in Kunene Region
Solution: Use of biodegradable drilling fluids and strict adherence to Water Resources Management Act (2013) requirements

- **Local Employment**

Commitment: Priority hiring of 50-70% local workforce from Kunene Region
Program: Includes skills training for temporary positions (3-5 year duration)

- **Cultural Heritage Preservation**

Protection: Identification and safeguarding of ancestral sites and traditional resin harvesting areas
Protocol: Implementation of chance-find procedures compliant with National Heritage Act (2004)

- **Biodiversity Conservation**

Measures: Pre-activity surveys and revegetation plans for protected species
Compliance: Alignment with Nature Conservation Ordinance (1975) standards

- **Community Communication**

Approach: Use of OtjiHimba translators and visual aids for engagement
Continuity: Appointment of dedicated community liaison officer

- **Documentation and Next Steps**

All stakeholder input has been formally recorded
Concerns will be incorporated into:

- Final environmental impact assessment
- Environmental Management Plan development

Ongoing project planning processes

7 Proposed Mitigation Measures

This chapter proposes mitigation measures to address the potential environmental and social impacts identified, ensuring that the exploration activities under Exclusive Prospecting Licence (EPL) 10173 minimize harm to the environment and local communities in the Opuwo Magisterial District, Kunene Region, Republic of Namibia. The measures are designed to reduce the significance of impacts, such as land disturbance, water resource depletion, biodiversity loss, air quality degradation, noise pollution, and socio-economic effects, while responding to stakeholder concerns raised (e.g., grazing disruptions, water use, cultural heritage). Each mitigation measure includes specific actions, responsible parties, and monitoring requirements, aligning with the Namibian Environmental Management Act (EMA) of 2007, the Environmental Impact Assessment Regulations (2012), and international best practices such as the International Finance Corporation (IFC) Performance Standards (Government of Namibia, 2007; Government of Namibia, 2012; IFC, 2012). The measures will be further detailed in the Environmental Management Plan (EMP).

7.1 Land Disturbance Mitigation

Land disturbance from access tracks (3–5m wide, 10–15 km total), drill pads (10m x 10m, 50 - 100 pads), and trenching (1 - 2m deep) will affect approximately 5 hectares, increasing the risk of soil erosion, compaction, and land use conflicts with the Himba community. The following measures aim to minimize these impacts.

Table 34: Mitigation Measures for Land Disturbance in EPL 10173 Exploration Activities

Impact	Mitigation Measure	Responsible Party	Monitoring Requirement	Reference
Soil Erosion	▪ Install silt fences and contouring around disturbed areas (5 ha). ▪ Schedule activities in the dry season (May - October) to avoid rainfall (300 - 400 mm annually).	Project Manager	▪ Weekly inspections during rainy season. ▪ Ensure sediment loads in runoff <50 mg/L.	▪ IFC, 2012; Government of Namibia, 1969
Soil Compaction	▪ Limit vehicle movement to designated tracks. ▪ Use low-pressure tires on machinery (e.g., drill rigs, 5 - 10 tons) to reduce compaction.	Site Supervisor	▪ Monthly soil compaction tests (penetrometer readings <2 MPa).	▪ SME, 2014
Land Use Conflict	▪ Implement 500m buffer zones around Himba grazing routes ▪ Engage a community liaison officer to	▪ Community Liaison Officer	▪ Bi-weekly meetings with Himba community.	▪ Jacobsen et al., 2012

	coordinate with Himba herders.		▪ Document and resolve complaints within 7 days.	

7.1.1 Erosion and Sediment Control Measures

Silt fences and contouring will reduce erosion by trapping sediment, ensuring compliance with IFC standards (sediment loads <50 mg/L; IFC, 2012). Scheduling activities in the dry season minimizes runoff risks, as 90% of rainfall occurs from November to April. Limiting vehicle movement and using low-pressure tires reduces soil compaction, facilitating revegetation with native species like *Eragrostis* grasses (Government of Namibia, 1969). Buffer zones and ongoing engagement with the Himba community address their concerns about grazing disruptions, ensuring minimal impact on their livestock-based livelihood (Jacobsen et al., 2012).

7.2 Water Resource Protection

The project's water use (180,000 - 360,000 L over 12 months) and potential for groundwater contamination pose significant risks in a water-scarce region. The following measures aim to protect water resources and address stakeholder concerns.

Table 35: Mitigation Measures for Water Resource Protection in EPL 10173 Exploration Activities

Impact	Mitigation Measure	Responsible Party	Monitoring Requirement	Reference
Water Consumption	▪ Obtain water abstraction permits per the Water Resources Management Act (2013). ▪ Use water-efficient drilling methods (e.g., recycle water in closed-loop systems).	▪ Environmental Officer	▪ Monthly water usage logs (target: <360,000 L total). ▪ Verify permits with MEFT.	Government of Namibia, 2013
Groundwater Contamination	▪ Use biodegradable drilling fluids. ▪ Store fuel (500L diesel) and chemicals in bunded areas (110% capacity of largest container).	▪ Site Supervisor	▪ Weekly inspections of storage areas. ▪ Immediate spill response (report within 24 hours).	IFC, 2012
Surface Water Sedimentation	▪ Construct sediment traps near drill sites to capture runoff.	▪ Project Manager	▪ Bi-weekly water quality tests (sediment	IFC, 2012

	▪ Avoid drilling near ephemeral streams during rainy season.		loads <50 mg/L). ▪ Visual inspections after rainfall events.	

7.2.1 Water Resource Protection and Management Strategy:

Water abstraction permits ensure compliance with the Water Resources Management Act (2013), while recycling water reduces demand in a region where 40% of households lack safe drinking water; Government of Namibia, 2013). Biodegradable drilling fluids and bunded storage minimize contamination risks to aquifers (50–100m depth), addressing the Himba's concerns about water quality. Sediment traps and seasonal scheduling prevent sedimentation in ephemeral streams and the Kunene River (10 km north), maintaining water quality within IFC standards (IFC, 2012).

7.3 Biodiversity Conservation

Vegetation clearing (5 ha), noise (85–90 dB(A)), and dust will impact biodiversity, including protected species like *Commiphora wildii* and Hartmann's mountain zebra. The following measures aim to conserve biodiversity, responding to concerns raised by the Namibia Nature Foundation (NNF).

Table 36: Mitigation Measures for Biodiversity Conservation in EPL 10173 Exploration Activities

Impact	Mitigation Measure	Responsible Party	Monitoring Requirement	Reference
Vegetation Loss	▪ Conduct pre-clearance surveys to identify protected species (e.g., *Commiphora wildii*, *Welwitschia mirabilis*). ▪ Revegetate with native species (e.g., *Eragrostis* grasses) post-exploration.	Ecologist	▪ Pre-clearance survey report before clearing. ▪ Annual revegetation success rate (>80% survival).	Government of Namibia, 1975
Fauna Displacement	▪ Avoid drilling during fauna breeding season (December–February). ▪ Limit noise to <85 dB(A) at 100m from drill sites using mufflers.	Site Supervisor	▪ Monthly noise monitoring (target: <85 dB(A)). ▪ Weekly fauna sightings log.	IUCN, 2025
Ecosystem Disruption	▪ Use silt fences to prevent sedimentation in ephemeral streams.	Environmental Officer	▪ Bi-weekly water quality tests (sediment	WWF, 2025; IFC, 2012

	▪ Maintain 1 km buffer from Kunene River riparian zones.		loads <50 mg/L). ▪ Visual inspections of buffer zones.	

7.3.1 Biodiversity Protection and Habitat Conservation Measures:

Pre-clearance surveys and revegetation ensure compliance with the Nature Conservation Ordinance (1975) and Forestry Act (2001), protecting species like *Commiphora wildii*, which the Himba harvest for resin (Government of Namibia, 1975; Government of Namibia, 2001). Avoiding the breeding season and limiting noise protect fauna like the Hartmann's mountain zebra, as recommended by the NNF; IUCN, 2025). Silt fences and buffer zones safeguard microhabitats in ephemeral streams and the Kunene River's riparian ecosystem, aligning with WWF conservation priorities for the Kaokoveld ecoregion (WWF, 2025).

7.4 Air Quality Management

Dust generation from clearing, drilling, and vehicle movement may impact air quality, with PM10 levels potentially exceeding 50 µg/m³ in the dry season. The following measures aim to manage air quality and address health and faunal concerns.

Table 37: Mitigation Measures for Air Quality Management in EPL 10173 Exploration Activities

Impact	Mitigation Measure	Responsible Party	Monitoring Requirement	Reference
Dust Generation	▪ Apply water spraying on access tracks and drill sites (2–3 times daily in dry season). ▪ Limit vehicle speeds to 30 km/h on unpaved tracks.	Site Supervisor	▪ Daily dust suppression logs. ▪ Monthly PM10 monitoring (target: <50 µg/m³).	WHO, 2005
Health Impacts	▪ Provide dust masks to workers and nearby Himba herders. ▪ Establish a first-aid station at field camps for respiratory issues.	Health and Safety Officer	▪ Weekly health checks for workers. ▪ Document and address community complaints within 7 days.	Namibia Ministry of Health, 2025
Fauna Impacts	▪ Minimize clearing in nesting areas of Rüppell's korhaan. ▪ Schedule high-dust activities (e.g., trenching) outside peak wind periods (morning/evening).	Environmental Officer	▪ Weekly fauna sightings log. ▪ Monthly wind speed records (target: <10 m/s during activities).	IUCN, 2025

7.4.1 Dust Suppression and Health Protection Measures

Water spraying and speed limits will reduce dust generation, ensuring PM10 levels remain below 50 µg/m³, as per WHO guidelines (WHO, 2005). Providing dust masks and a first-aid station addresses health risks for workers and the Himba, who have limited access to healthcare (60% live >10 km from a facility; Namibia Ministry of Health, 2025). Scheduling activities to avoid peak wind periods and minimizing clearing in nesting areas protect fauna like the Rüppell's korhaan, as raised by the NNF (IUCN, 2025).

7.5 Noise Control Measures

Noise from drilling (85–90 dB(A)) and vehicle operations may disturb fauna and the Himba community, particularly during the breeding season (December–February). The following measures aim to control noise impacts.

Table 38: Mitigation Measures for Noise Control in EPL 10173 Exploration Activities

Impact	Mitigation Measure	Responsible Party	Monitoring Requirement	Reference
Fauna Disturbance	▪ Avoid drilling during breeding season (December–February). ▪ Use noise mufflers on equipment to limit levels to <85 dB(A) at 100m.	Site Supervisor	▪ Monthly noise monitoring (target: <85 dB(A)). ▪ Weekly fauna sightings log.	IUCN, 2025
Human Disturbance	▪ Notify Himba herders of drilling schedules via the community liaison officer. ▪ Limit drilling to daytime hours (07:00–18:00).	Community Liaison Officer	▪ Bi-weekly meetings with Himba community. ▪ Document and resolve complaints within 7 days.	WHO, 1999
Cumulative Effects	▪ Coordinate dust and noise activities to minimize combined stress (e.g., avoid simultaneous drilling and trenching).	Project Manager	▪ Weekly activity logs to ensure coordination. ▪ Monthly review of fauna and community feedback.	Glasson et al., 2013

7.5.1 Noise Mitigation and Wildlife Protection Strategy

Avoiding the breeding season and using mufflers reduce noise impacts on fauna like the Hartmann's mountain zebra, ensuring levels remain below 85 dB(A) at 100m (IUCN, 2025). Notifying the Himba and limiting drilling to daytime hours minimize disturbance to herders, keeping noise within WHO guidelines for rural areas (55 dB(A); WHO, 1999). Coordinating activities prevents cumulative effects, as recommended by Glasson et al. (2013), addressing the NNF's concerns about combined dust and noise impacts.

7.6 Socio-Economic Considerations

The project will have both positive (e.g., jobs, procurement) and negative (e.g., cultural heritage risks, grazing disruptions) socio-economic impacts. The following measures aim to maximize benefits and minimize adverse effects, addressing stakeholder expectations.

Table 39: Mitigation Measures for Socio-Economic Impacts in EPL 10173 Exploration Activities

Impact	Mitigation Measure	Responsible Party	Monitoring Requirement	Reference
Employment Opportunities	▪ Reserve 50–70% of 10–20 jobs for locals, prioritizing Himba youth. ▪ Provide on-the-job training (e.g., 2-day induction) to address low literacy (40%; Chapter 6.3.4).	Human Resources Officer	▪ Monthly employment records (target: 50–70% local hires). ▪ Training completion certificates for all workers.	Government of Namibia, 2007b
Local Procurement	▪ Source 70% of supplies from Opuwo businesses. ▪ Prioritize Himba crafts (e.g., jewelry) for camp supplies.	Procurement Officer	▪ Monthly procurement logs (target: 70% local sourcing). ▪ Document purchases from Himba suppliers.	Namibia Statistics Agency, 2025
Cultural Heritage	▪ Conduct a heritage assessment to identify ancestral sites. ▪ Implement a chance-find procedure for archaeological discoveries.	Archaeologist	▪ Pre-exploration heritage report. ▪ Immediate reporting of finds (within 24 hours).	Government of Namibia, 2004
Grazing Disruption	▪ Implement 500m buffer zones around grazing routes. ▪ Schedule activities to avoid peak grazing season (November–April).	Community Liaison Officer	▪ Bi-weekly meetings with Himba community. ▪ Document and resolve complaints within 7 days.	Jacobsen et al., 2012
Expectations for Infrastructure	▪ Develop CSR initiatives (e.g., borehole maintenance, solar lighting for community use). ▪ Communicate project scope and limitations to manage expectations.	Project Manager	▪ Quarterly CSR progress reports. ▪ Bi-annual community feedback sessions.	UNICEF, 2025

7.6.1 Community Benefits and Cultural Heritage Protection Plan

Local hiring and training maximize economic benefits in a region with a 35% unemployment rate, ensuring compliance with the Labour Act (2007) (Government of Namibia, 2007b). Sourcing supplies from Opuwo and Himba crafts supports the local economy, addressing stakeholder expectations (Namibia Statistics Agency, 2025). A heritage assessment and chance-find procedure protect Himba ancestral sites, ensuring compliance with the National Heritage Act (2004) (Government of Namibia, 2004). Buffer zones and seasonal scheduling minimize grazing disruptions, protecting the Himba's food security (30% food insecurity rate; Jacobsen et al., 2012). CSR initiatives, such as borehole maintenance, address infrastructure expectations (e.g., 70% without electricity), while clear communication prevents dissatisfaction (UNICEF, 2025).

8 Environmental Management Plan (EMP) Overview

8.1 Introduction to the EMP

The Environmental Management Plan (EMP) for the proposed exploration activities under Exclusive Prospecting Licence (EPL) 10173 in the Opuwo Magisterial District, Kunene Region, Republic of Namibia, is a comprehensive framework designed to manage and mitigate the environmental and social impacts identified. An EMP, as defined by the International Finance Corporation (IFC), is "a document that outlines the mitigation, monitoring, and institutional measures to be taken during project implementation and operation to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels" (IFC, 2012). In the context of EPL 10173, the EMP ensures that the exploration activities - comprising geological mapping, geophysical surveys, drilling (50–100 boreholes), trenching (1 - 2m deep), and associated infrastructure (e.g., access tracks, field camps) - are conducted in a manner that minimizes harm to the environment, respects the cultural and socio-economic context of the Himba community, and complies with Namibian legislation and international best practices.

The EMP is a legal requirement under Section 8 of the Namibian Environmental Management Act (EMA) of 2007, which mandates that projects with potential environmental impacts must develop an EMP to manage and monitor their effects (Government of Namibia, 2007). The Environmental Impact Assessment Regulations (2012) further stipulate that the EMP must include mitigation measures, monitoring protocols, and reporting mechanisms to ensure compliance with environmental standards (Government of Namibia, 2012). Internationally, the EMP aligns with the IFC Performance Standard 1 on Environmental and Social Management Systems, which emphasizes the need for a structured approach to managing environmental and social risks, particularly in projects affecting indigenous communities like the Himba (IFC, 2012). The EMP also reflects the principles of sustainable development outlined in the Rio Declaration (1992) and the United Nations Sustainable Development Goals (SDGs), particularly SDG 15 (Life on Land) and SDG 6 (Clean Water and Sanitation) (United Nations, 1992; United Nations, 2015).

The EPL 10173 project involves exploration for base and rare metals, precious metals, and industrial minerals over a 3–5 year period, with activities concentrated in a 5-hectare area within the 20,000-hectare licence. The project area is ecologically sensitive, part of the Kaokoveld Desert ecoregion, with protected species (*Commiphora wildii*, *Welwitschia mirabilis*) and vulnerable fauna (e.g., Hartmann's mountain zebra; WWF, 2025). It is also culturally significant, as the Himba community relies on the area for seasonal grazing and resin harvesting, with a low literacy rate (40%) and limited infrastructure (70% without electricity, 60% with poor mobile coverage; Namibia Statistics Agency, 2025). The EMP addresses these challenges by integrating mitigation measures, concerns (e.g., grazing disruptions, water use, cultural heritage), and the project's legal obligations under the Minerals (Prospecting and Mining) Act of 1992, which requires environmental protection during prospecting activities (Government of Namibia, 1992).

This chapter outlines the EMP's objectives and key management actions, providing a high-level framework that will be expanded into a standalone EMP document following the scoping phase. The EMP ensures that all tenets of EPL 10173 - environmental protection, social responsibility, cultural preservation, and regulatory compliance - are addressed, with a focus on sustainable development in the Kunene Region.

8.2 Objectives of the EMP

The objectives of the EMP for EPL 10173 are designed to ensure that the exploration activities are conducted responsibly, minimizing environmental and social impacts while maximizing benefits for the local community and adhering to legal and international standards. These objectives are informed by the baseline conditions, stakeholder concerns, potential impacts, and mitigation measures, and they align with the principles of environmental justice, which emphasize fair treatment and meaningful involvement of all people, particularly marginalized groups like the Himba (United Nations, 1992).

Table 40: Objectives of the Environmental Management Plan for EPL 10173 Exploration Activities

Objective	Description	Rationale	EPL Tenet Addressed	Reference
Minimize Environmental Impacts	▪ Implement mitigation measures to reduce impacts on land (e.g., erosion), water (e.g., contamination), biodiversity (e.g., vegetation loss), air quality (e.g., dust), and noise (e.g., fauna disturbance).	▪ Protect the Kaokoveld ecoregion's fragile environment, including protected species and water resources critical for the Himba.	Environmental protection	IFC, 2012
Ensure Regulatory Compliance	▪ Comply with Namibian legislation (e.g., EMA 2007, Minerals Act 1992, Water Resources Management Act 2013) and international standards (e.g., IFC Performance Standards).	▪ Avoid legal penalties, ensure project approval by MEFT, and meet international best practices for indigenous engagement	Legal compliance	Government of Namibia, 2007; IFC, 2012
Protect Cultural Heritage and Social Values	▪ Safeguard Himba cultural heritage (e.g., ancestral sites, resin harvesting) and minimize disruptions to grazing routes, ensuring social acceptability.	▪ Respect the Himba's traditional livelihood and cultural practices, addressing their concerns (e.g., grazing disruptions).	Cultural preservation and social responsibility	Government of Namibia, 2004
Promote Sustainable Resource Use	▪ Use resources efficiently (e.g., water recycling, minimal vegetation clearing) and rehabilitate disturbed areas (e.g.,	▪ Support long-term environmental sustainability in a semi-arid region with scarce resources (e.g.,	Sustainable development	United Nations, 2015

	revegetation with native species).	40% lack safe water).		
Enhance Socio-Economic Benefits	▪ Maximize local employment (50–70% of 10–20 jobs), procurement and CSR initiatives (e.g., borehole maintenance) to benefit the Kunene Region.	▪ Address poverty (45%) and unemployment (35%) in the region, meeting stakeholder expectations for economic benefits.	Socio-economic development	Namibia Statistics Agency, 2025
Monitor and Report Performance	▪ Establish monitoring programs (e.g., water quality, noise levels) and report annually to MEFT and stakeholders, ensuring transparency and accountability.	▪ Enable adaptive management, ensure compliance, and maintain community trust through regular updates.	Monitoring and transparency	Government of Namibia, 2012; Glasson et al., 2013
Build Local Capacity	▪ Provide training for local workers (e.g., environmental management, cultural sensitivity) and collaborate with MEFT to enhance regional monitoring capacity.	▪ Enhance skills in a region with low literacy (40%) and improve regulatory oversight for future projects).	Capacity building	United Nations, 2015

8.2.1 Integrated Environmental and Social Management Framework for EPL 10173:

The objectives cover all key tenets of EPL 10173, ensuring a holistic approach to environmental and social management. Minimizing environmental impacts addresses the ecological sensitivity of the Kaokoveld ecoregion, protecting species like *Commiphora wildii* and water resources critical for the Himba (WWF, 2025). Regulatory compliance ensures adherence to the EMA (2007) and Minerals Act (1992), which require environmental protection during prospecting (Government of Namibia, 1992). Protecting cultural heritage responds to the Himba's concerns about ancestral sites and grazing routes, aligning with the National Heritage Act (2004) (Government of Namibia, 2004). Sustainable resource use supports SDG 6 and SDG 15 by promoting efficient water use and biodiversity conservation (United Nations, 2015). Socio-economic benefits address the region's economic challenges, while monitoring and capacity building ensure transparency and long-term development, aligning with principles of environmental justice and sustainable development (O'Faircheallaigh, 2010; United Nations, 1992).

8.3 Key Management Actions

The key management actions operationalize the EMP objectives, providing a detailed framework for implementing the mitigation measures. These actions address all impact areas identified in

Chapter 8 (land disturbance, water resources, biodiversity, air quality, noise pollution, socio-economic impacts) and incorporate stakeholder concerns (e.g., grazing disruptions, water use, cultural heritage). Each action includes specific measures, responsible parties, timelines, monitoring protocols, and performance indicators, ensuring that all EPL tenets are addressed. The actions are designed to be practical, measurable, and aligned with Namibian legislation and international standards, with provisions for emergency response, training, and stakeholder engagement.

Table 41:: Key Management Actions for the Environmental Management Plan of EPL 10173 Exploration Activities

Impact Area	Management Action	Responsible Party	Timeline	Monitoring Protocol	Performance Indicator	EPL Tenet Addressed	Reference
Land Disturbance	▪ Install silt fences and contouring around disturbed areas (5 ha) to prevent erosion. ▪ Schedule activities in the dry season (May–October) to avoid rainfall (300–400 mm annually). ▪ Implement 500m buffer zones around Himba grazing routes.	Project Manager	Pre-exploration (Q2 2025). Ongoing during exploration.	▪ Weekly inspections during rainy season. ▪ Measure sediment loads in runoff.	▪ Silt fences installed at all sites. ▪ Sediment loads <50 mg/L. ▪ No complaints about grazing disruptions.	Environmental protection, social responsibility	IFC, 2012
Water Resources	▪ Obtain water abstraction permits per the Water Resources Management Act (2013). ▪ Use biodegradable drilling fluids and store fuel (500L diesel) in bunded areas (110% capacity). ▪ Construct sediment traps near drill sites to capture runoff. ▪ Recycle water in a closed-loop system during drilling.	Environmental Officer	Pre-exploration (Q2 2025). Ongoing during drilling.	▪ Monthly water usage logs. ▪ Bi-weekly water quality tests (sediment, pH, salinity). ▪ Weekly inspections of storage areas.	▪ Permits obtained. ▪ Water usage <360,000 L total. ▪ Sediment loads <50 mg/L. ▪ No spills reported.	Environmental protection, sustainable development	Government of Namibia, 2013; IFC, 2012
Biodiversity	▪ Conduct pre-clearance surveys to identify protected species (e.g., *Commiphora wildii*, *Welwitschia mirabilis*). ▪ Avoid drilling during fauna breeding season (December–February). ▪ Revegetate disturbed areas with native species (e.g., *Eragrostis* grasses) post-exploration. ▪ Maintain 1 km buffer from Kunene River riparian zones.	Ecologist	Pre-exploration (Q2 2025). Seasonal scheduling. Post-exploration (2028–2030).	▪ Pre-clearance survey report. ▪ Monthly noise monitoring. ▪ Annual revegetation success rate.	▪ Survey completed before clearing. ▪ Noise <85 dB(A) at 100m. ▪ Revegetation success >80%. ▪ No activities within 1 km of Kunene River.	Environmental protection	Government of Namibia, 1975; WWF, 2025
Air Quality	▪ Apply water spraying on access tracks and drill sites (2–3 times daily in dry season). ▪ Limit vehicle speeds to 30 km/h on unpaved tracks. ▪ Provide dust masks to workers and nearby Himba herders.	Site Supervisor	Ongoing during dry season. Throughout project duration.	▪ Daily dust suppression logs. ▪ Monthly PM10 monitoring. ▪ Weekly health checks for workers.	▪ Water spraying conducted 2–3 times daily. ▪ PM10 <50 µg/m³. ▪ No respiratory complaints from	Environmental protection, social responsibility	WHO, 2005

	▪ Schedule high-dust activities (e.g., trenching) outside peak wind periods (morning/evening).				workers or community.		
Noise Pollution	▪ Use noise mufflers on equipment to limit levels to <85 dB(A) at 100m. ▪ Limit drilling to daytime hours (07:00–18:00). ▪ Notify Himba herders of drilling schedules via the community liaison officer. ▪ Coordinate dust and noise activities to minimize cumulative effects.	Site Supervisor	Throughout project duration. Ongoing during drilling.	▪ Monthly noise monitoring. ▪ Bi-weekly community feedback. ▪ Weekly activity logs.	▪ Noise <85 dB(A) at 100m. ▪ No nighttime drilling. ▪ No community complaints about noise.	Environmental protection, social responsibility	WHO, 1999
Socio-Economic Impacts	▪ Reserve 50–70% of 10–20 jobs for locals, prioritizing Himba youth. ▪ Provide on-the-job training (e.g., 2-day induction) to address low literacy (40%;). ▪ Source 70% of supplies from Opuwo businesses. ▪ Conduct a heritage assessment to identify ancestral sites. ▪ Implement a chance-find procedure for archaeological discoveries. ▪ Develop CSR initiatives (e.g., borehole maintenance, solar lighting).	Human Resources Officer; Archaeologist; Community Liaison Officer	Pre-exploration (Q2 2025). Throughout project duration.	▪ Monthly employment records. ▪ Monthly procurement logs. ▪ Pre-exploration heritage report. ▪ Quarterly CSR progress reports.	▪ 50–70% local hires achieved. ▪ 70% local procurement achieved. ▪ Heritage assessment completed. ▪ CSR initiatives implemented (e.g., 1 borehole maintained).	Socio-economic development, cultural preservation	Government of Namibia, 2004; Namibia Statistics Agency, 2025
Waste Management	▪ Segregate and store waste (e.g., drilling fluids, domestic waste) in designated areas. ▪ Dispose of hazardous waste (e.g., used oils) at licensed facilities in Opuwo. ▪ Recycle non-hazardous waste (e.g., plastics) where possible. ▪ Train workers on proper waste handling.	Environmental Officer	Throughout project duration.	▪ Weekly waste management inspections. ▪ Monthly waste disposal records.	▪ No waste left on-site. ▪ 00% hazardous waste disposed at licensed facilities. ▪ 50% non-hazardous waste recycled.	Environmental protection	Government of Namibia, 2007; IFC, 2012

Emergency Response	▪ Develop a spill response plan for fuel and chemical spills. ▪ Establish a fire management plan for field camps. ▪ Train workers on emergency procedures (e.g., spill containment, fire evacuation). ▪ Equip field camps with spill kits and fire extinguishers.	Health and Safety Officer	Pre-exploration (Q2 2025). Ongoing training.	▪ Monthly emergency drills. ▪ Immediate spill reporting (within 24 hours).	▪ Spill response plan in place. ▪ All workers trained. ▪ No unreported spills or fires.	Environmental protection, social responsibility	IFC, 2012; SME, 2014
Stakeholder Engagement	▪ - Appoint a community liaison officer to engage with the Himba community. ▪ Hold quarterly meetings with stakeholders (e.g., Vita Royal House, NNF) to update on progress. ▪ Establish a grievance mechanism to address complaints within 7 days. ▪ Use OtjiHimba translators and visual aids for communication.	Community Liaison Officer	▪ Throughout project duration.	▪ Bi-weekly meetings with Himba community. ▪ Quarterly stakeholder meeting minutes. ▪ Grievance log.	▪ Liaison officer appointed. ▪ 100% complaints resolved within 7 days. ▪ Quarterly meetings held.	Social responsibility, cultural preservation	O'Faircheallaigh, 2010; IFC, 2012
Training and Capacity Building	▪ Provide training for workers on environmental management (e.g., spill response, waste handling), cultural sensitivity, and safety. ▪ Collaborate with MEFT to train local officials on monitoring techniques. ▪ Document Himba traditional knowledge (e.g., grazing patterns) for future use.	Human Resources Officer; Environmental Officer	▪ Pre-exploration (Q2 2025). ▪ Ongoing training.	▪ Training completion certificates. ▪ MEFT training session records. ▪ Traditional knowledge report.	▪ 100% workers trained. ▪ MEFT officials trained annually. ▪ Traditional knowledge documented.	Capacity building	United Nations, 2015

8.3.1 Comprehensive Environmental & Social Management Plan for EPL 10173: Integrating Regulatory Compliance with Sustainable Development

The key management actions address all EPL tenets comprehensively:

- **Environmental Protection:** Actions like silt fences, biodegradable fluids, pre-clearance surveys, water spraying, noise mufflers, and waste management protect the environment, ensuring compliance with the EMA (2007) and Nature Conservation Ordinance (1975) (Government of Namibia, 2007). Performance indicators (e.g., sediment loads <50 mg/L, PM10 <50 µg/m³) align with IFC standards (IFC, 2012).
- **Social Responsibility:** Buffer zones, community notifications, dust masks, and a grievance mechanism address the Himba's concerns (e.g., grazing disruptions, health impacts; Chapter 7.3), ensuring social acceptability (O'Faircheallaigh, 2010).
- **Cultural Preservation:** Heritage assessments and chance-find procedures protect Himba ancestral sites, complying with the National Heritage Act (2004) (Government of Namibia, 2004).
- **Sustainable Development:** Water recycling, revegetation, and CSR initiatives (e.g., borehole maintenance) promote resource efficiency and long-term benefits, supporting SDG 6 and SDG 15 (United Nations, 2015).
- **Socio-Economic Development:** Local hiring, procurement, and training address poverty and unemployment, aligning with SDG 8 (United Nations, 2015; Namibia Statistics Agency, 2025).
- **Monitoring and Transparency:** Regular monitoring (e.g., water quality, noise levels) and annual reporting to MEFT ensure accountability, as required by the EIA Regulations (2012) (Government of Namibia, 2012).
- **Capacity Building:** Training and collaboration with MEFT enhance local skills and regulatory oversight, supporting SDG 4 (United Nations, 2015).

The EMP includes provisions for waste management, emergency response, stakeholder engagement, and training, ensuring a holistic approach. The full EMP will expand on these actions, including detailed procedures, budgets, and audit schedules, to be submitted to MEFT for approval.

9 Conclusion and Recommendations

This chapter concludes the Environmental Impact Assessment (EIA) Scoping Report for the proposed exploration activities under Exclusive Prospecting Licence (EPL) 10173 in the Opuwo Magisterial District, Kunene Region, Republic of Namibia. It synthesizes the key findings from the scoping process, including the baseline environmental and social conditions, stakeholder engagement outcomes, potential impacts, proposed mitigation measures, and the Environmental Management Plan (EMP) overview. The conclusion evaluates the project's alignment with sustainable development goals in the context of Namibia's Vision 2030, which emphasizes economic growth, social equity, and environmental protection (Government of Namibia, 2004b). Recommendations are provided to guide the next steps in the EIA process, ensuring that the project addresses the unique challenges of the Kunene Region, meets the needs of the Himba community, and complies with the Namibian Environmental Management Act (EMA) of 2007, the Environmental Impact Assessment Regulations (2012), and international best practices such as the International Finance Corporation (IFC) Performance Standards and the United Nations Sustainable Development Goals (SDGs) (Government of Namibia, 2007; Government of Namibia, 2012; IFC, 2012; United Nations, 2015).

9.1 Summary of Findings

The scoping process has provided a detailed understanding of the environmental, social, and economic context of the EPL 10173 project area, the potential impacts of the proposed exploration activities, and the measures required to mitigate these impacts. The findings highlight the project's potential to contribute to economic development in the Kunene Region while identifying manageable environmental and social risks that must be addressed to ensure sustainability and social acceptability.

9.1.1 Baseline Environment and Project Context

The EPL 10173 area is located in a semi-arid environment with a mean annual rainfall of 300–400 mm, predominantly during the rainy season (November–April), and high evaporation rates (2,600–2,800 mm annually), exacerbating water scarcity; Namibia Meteorological Service, 2025). The terrain is flat to gently undulating (1,100–1,300 m elevation), with erosion-prone soils (lithosols and arenosols, <1% organic content) and limited surface water, except for ephemeral streams feeding into the Kunene River 10 km north (Mendelsohn et al., 2016). Groundwater is brackish (1,000–3,000 mg/L salinity) and occurs at depths of 50–100 m, making it a critical resource in a region where 40% of rural households lack access to safe drinking water (UNICEF, 2025).

Biologically, the area falls within the Kaokoveld Desert ecoregion, a biodiversity hotspot with sparse savanna vegetation (*Acacia* spp., *Commiphora wildii*), protected species (*Welwitschia mirabilis*), and arid-adapted fauna, including the vulnerable Hartmann's Mountain zebra (*Equus zebra hartmannae*) and the near-threatened Rüppell's korhaan (*Eupodotis rueppelii*) (WWF, 2025; IUCN, 2025). The region's ecological sensitivity necessitates careful management to avoid long-term impacts on biodiversity, particularly given the cultural significance of species like *Commiphora wildii*, which the Himba harvest for resin.

Socio-economically, the Kunene Region is sparsely populated (<1 person/km² in the EPL area), with the Himba community practicing semi-nomadic pastoralism as their primary livelihood (60% of households rely on livestock. The region faces significant challenges, including a 45% poverty rate, 35% unemployment, a 40% literacy rate (30% among women), and limited infrastructure (70% without electricity, 60% with poor mobile coverage; Chapter 6.3; Namibia Statistics Agency, 2025). These conditions highlight the need for the project to deliver tangible economic benefits while minimizing disruptions to the Himba's traditional way of life, which is deeply tied to the land and its resources (Jacobsen et al., 2012).

9.1.2 Public Participation Outcomes

The public participation process, conducted from 28 February to 14 March 2025, engaged a wide range of stakeholders, including the Himba community, Opuwo residents, traditional authorities (Vita Royal House), government bodies (e.g., Ministry of Environment, Forestry and Tourism (MEFT), Ministry of Mines and Energy (MME)), and NGOs (e.g., Namibia Nature Foundation (NNF), Legal Assistance Centre (LAC)). The process was designed to be inclusive, using OtjiHimba translators and visual aids to accommodate the Himba's low literacy rate (40%) and limited telecommunications access. Key concerns included:

- **Grazing Disruptions:** The Himba highlighted the risk of access tracks and drill sites blocking seasonal grazing routes, critical during the rainy season (November–April) when 90% of rainfall occurs.
- **Water Use and Contamination:** Stakeholders expressed concerns about the project's water demand (180,000–360,000 L) in a water-scarce region and the potential for groundwater contamination from drilling fluids.
- **Cultural Heritage:** The Himba and Vita Royal House emphasized the need to protect ancestral sites (e.g., graves) and cultural practices (e.g., resin harvesting from *Commiphora wildii*).
- **Economic Benefits and Infrastructure:** Opuwo residents and the Kunene Regional Council requested local employment (10–20 jobs), procurement opportunities, and infrastructure improvements (e.g., water access, electricity).

The process exceeded the minimum 7-day consultation period required by the EIA Regulations (2012) and adhered to international best practices, such as the IFC Performance Standard 7 on Indigenous Peoples, which emphasizes free, prior, and informed consent (FPIC) for indigenous groups like the Himba (Government of Namibia, 2012; IFC, 2012). The outcomes have informed the impact assessment and mitigation measures, ensuring that stakeholder concerns are integrated into the project's planning (O'Faircheallaigh, 2010).

9.1.3 Potential Impacts and Mitigation Measures

The exploration activities, involving 10–15 km of access tracks (3–5m wide), 50–100 drill pads (10m x 10m), and trenching (1–2m deep) across 5 hectares, will result in several environmental and social impacts. These impacts were assessed for their nature, extent, duration, and significance, and mitigation measures were proposed to reduce their severity. A summary of the key impacts, mitigation measures, and residual significance is provided below.

Table 42: Comprehensive Summary of Key Impacts, Mitigation Measures, and Residual Significance for EPL 10173 Exploration Activities

Impact Area	Key Impact (Pre-Mitigation Significance)	Mitigation Measure	Residual Significance (Post-Mitigation)	Development Relevance	Reference
Land Disturbance	Soil erosion, compaction, land use conflict (Moderate)	Silt fences, contouring, dry season scheduling (May–October), 500m buffer zones around grazing routes	Low	Minimizes disruption to Himba grazing routes, supporting food security (30% food insecurity rate;	IFC, 2012
Water Resources	Groundwater contamination (High), water consumption (Moderate)	Biodegradable drilling fluids, bunded storage, water abstraction permits, sediment traps, water recycling	Low	Protects scarce water resources, critical for Himba livestock and domestic use in a region with 15% diarrhea incidence	Government of Namibia, 2013
Biodiversity	Vegetation loss, fauna displacement, ecosystem disruption (Moderate)	Pre-clearance surveys, seasonal scheduling (avoid December–February breeding season), revegetation with native species, 1 km buffer from Kunene River	Low	Preserves Kaokoveld biodiversity hotspot, supporting ecotourism potential and Himba cultural practices (e.g., resin harvesting).	WWF, 2025
Air Quality	Dust generation affecting health and fauna (Moderate)	Water spraying (2–3 times daily in dry season), speed limits (30 km/h), dust masks for workers and Himba herders	Low	Reduces health risks in a region with limited healthcare access (60% live >10 km from a facility).	WHO, 2005
Noise Pollution	Fauna and human disturbance (Moderate)	Noise mufflers (<85 dB(A) at 100m), daytime drilling (07:00–18:00), community notifications via liaison officer	Low	Minimizes stress on Himba herders and fauna, supporting coexistence with exploration activities.	WHO, 1999
Socio-Economic Impacts	Cultural heritage risks, grazing disruption (Moderate); Positive job creation (10–20 jobs), procurement	Heritage assessment, chance-find procedure, 500m buffer zones, 50–70% local hiring, on-the-job training, CSR initiatives (e.g., borehole maintenance, solar lighting)	Low (with enhanced positive benefits)	Balances economic benefits (jobs, procurement) with cultural preservation, addressing poverty (45%) and infrastructure deficits (70% without electricity.	Namibia Statistics Agency, 2025

9.1.4 Environmental Management Plan (EMP) Framework

The EMP overview provides a framework for implementing the mitigation measures, with objectives to minimize impacts, ensure legal compliance, address stakeholder concerns, promote sustainable practices, and monitor performance. Key management actions include monitoring sediment loads (<50 mg/L), PM10 levels (<50 µg/m³), noise (<85 dB(A)), and employment targets (50–70% local hires), with responsibilities assigned to project staff (e.g., Environmental Officer, Community Liaison Officer). The EMP aligns with the EIA Regulations (2012), which require annual environmental performance reports to MEFT, and incorporates international standards, such as IFC Performance Standard 1 on Environmental and Social Management Systems (Government of Namibia, 2012; IFC, 2012).

9.1.5 Alignment with Sustainable Development

The EPL 10173 project has the potential to contribute to sustainable development in the Kunene Region, aligning with Namibia's Vision 2030 and the United Nations Sustainable Development Goals (SDGs), particularly SDG 1 (No Poverty), SDG 6 (Clean Water and Sanitation), SDG 8 (Decent Work and Economic Growth), and SDG 15 (Life on Land) (Government of Namibia, 2004b; United Nations, 2015). The project's economic benefits, including 10–20 temporary jobs and in local procurement, address the region's high poverty (45%) and unemployment (35%) rates, supporting SDG 1 and SDG 8 (Namibia Statistics Agency, 2025). Mitigation measures, such as water recycling and sediment traps, protect scarce water resources, contributing to SDG 6. Biodiversity conservation measures, including pre-clearance surveys and revegetation, support SDG 15 by preserving the Kaokoveld ecoregion, which has ecotourism potential (WWF, 2025). However, the project must carefully manage social risks, such as cultural heritage impacts and grazing disruptions, to ensure social equity and maintain the Himba's traditional livelihood, a key aspect of sustainable development (Jacobsen et al., 2012; United Nations, 1992).

Table 43: Alignment of EPL 10173 Exploration Project with Sustainable Development Goals

SDG	Project Contribution	Challenges	Mitigation Strategy	Reference
SDG 1: No Poverty	10–20 jobs (50–70% local hires) and in procurement	Temporary nature of jobs (3–5 years) may limit long-term benefits	On-the-job training, prioritize Himba youth (40% under 15;)	United Nations, 2015
SDG 6: Clean Water	Water recycling, biodegradable fluids to protect groundwater	High water demand (180,000–360,000 L) in a scarce region	Obtain permits, monitor usage (<360,000 L total)	United Nations, 2015
SDG 8: Decent Work	Local hiring and procurement stimulate economic activity	Low literacy (40%) may limit job access for Himba	Provide 2-day induction training, hire 50–70% locals	United Nations, 2015
SDG 15: Life on Land	Pre-clearance surveys, revegetation to protect biodiversity	Risk of vegetation loss (5 ha) and fauna displacement	Avoid breeding season, revegetate with native species	United Nations, 2015

9.1.6 Balanced Impact Strategy for EPL 10173: Mitigating Risks While Delivering Sustainable Value:

The scoping process has identified that the EPL 10173 exploration activities pose manageable environmental and social risks, with pre-mitigation impacts (e.g., high significance for groundwater contamination, moderate for biodiversity loss) reduced to low significance through targeted mitigation measures (e.g., biodegradable fluids, pre-clearance surveys). The project's alignment with sustainable development goals demonstrates its potential to contribute to economic growth and poverty reduction in the Kunene Region, while mitigation measures ensure environmental protection and social equity (United Nations, 2015). However, the temporary nature of economic benefits (3–5 years) and the region's infrastructure deficits (e.g., 70% without electricity) highlight the need for long-term development strategies, such as CSR initiatives, to maximize the project's impact (UNICEF, 2025). The EMP framework ensures that mitigation measures are implemented effectively, with monitoring and reporting mechanisms to maintain accountability (Glasson et al., 2013).

9.2 Recommendations for Further Assessment

The scoping process has laid a strong foundation for the EIA, but further assessment is required to address data gaps, refine mitigation measures, and ensure the project's long-term sustainability in the Kunene Region. The following recommendations are tailored to the exploration activities, stakeholder needs, and the region's development priorities, ensuring compliance with the EIA Regulations (2012) and alignment with international best practices (Government of Namibia, 2012; IFC, 2012).

Table 44: Detailed Recommendations for Further Assessment in the EPL 10173 EIA Process

Recommendation	Description	Rationale	Development Relevance	Reference
Detailed Impact Assessment	Conduct a detailed EIA focusing on high-significance impacts (e.g., groundwater contamination, cultural heritage risks) and cumulative effects (e.g., combined dust and noise impacts).	Quantify impacts (e.g., aquifer drawdown, number of affected heritage sites) to refine mitigation measures and ensure no long-term harm.	Ensures sustainable resource use and cultural preservation, critical for Himba livelihood and regional stability.	Government of Namibia, 2012; Glasson et al., 2013
Specialist Studies	▪ **Hydrological Study:** Assess borehole capacity, aquifer recharge rates, and long-term sustainability of water abstraction (180,000–360,000 L). ▪ **Archaeological Survey:** Map ancestral sites and sacred areas within EPL 10173. ▪ **Biodiversity Survey:** Confirm presence and population of protected species (e.g., *Welwitschia mirabilis*, Hartmann's mountain zebra). ▪ **Socio-Economic Study:** Evaluate long-term economic impacts and infrastructure needs (e.g., electricity, water access).	Fill data gaps to enhance mitigation effectiveness (e.g., exact locations of heritage sites, aquifer sustainability, species distribution).	Supports water security (SDG 6), cultural preservation, biodiversity conservation (SDG 15), and economic planning (SDG 8).	IUCN, 2025; Government of Namibia, 2004
Ongoing Stakeholder Engagement	▪ Continue engagement with the Himba community through a dedicated community liaison officer, using OtjiHimba translators and visual aids. ▪ Hold quarterly meetings with stakeholders (e.g., Vita Royal House, NNF, Kunene Regional Council) to update on project progress and address concerns.	Maintain trust, ensure FPIC, and address evolving concerns (e.g., infrastructure expectations, cultural impacts; Chapter 7.3).	Enhances social acceptability, supports social equity (SDG 10), and ensures Himba inclusion in decision-making.	O'Faircheallaigh, 2010; IFC, 2012

	▪ Establish a grievance mechanism to handle complaints within 7 days.			
Comprehensive EMP Development	▪ Develop a detailed EMP with specific procedures (e.g., spill response plan, waste management, worker training on cultural sensitivity). ▪ Include emergency protocols for spills, fires, and heritage finds. ▪ Require annual environmental performance reports to MEFT and stakeholders.	Ensure effective implementation of mitigation measures, regulatory compliance, and preparedness for unforeseen events.	Promotes environmental management (SDG 15) and accountability, ensuring long-term sustainability of exploration activities.	Government of Namibia, 2012
Monitoring and Auditing	▪ Establish a monitoring program with quarterly environmental audits (e.g., water quality, noise levels, revegetation success). ▪ Conduct annual third-party audits to verify compliance with EMP and legal requirements. ▪ Share monitoring results with stakeholders via annual reports and community meetings.	Ensure accountability, track performance, and enable adaptive management to address any unforeseen impacts.	Supports transparency, builds community trust, and ensures compliance with environmental standards (e.g., IFC, 2012).	Government of Namibia, 2012; Glasson et al., 2013
CSR and Long-Term Development	▪ Implement CSR initiatives, such as borehole maintenance, solar lighting for community use, and skills training programs for Himba youth. ▪ Partner with local NGOs (e.g., NNF, LAC) to support conservation and development projects (e.g., ecotourism, water infrastructure). ▪ Develop a post-exploration rehabilitation plan to restore grazing	Address infrastructure deficits (e.g., 70% without electricity; Chapter 6.3.6) and provide lasting benefits beyond the project's 3–5 year duration.	Contributes to SDG 1 (No Poverty), SDG 6 (Clean Water), and SDG 8 (Decent Work), enhancing regional development and community resilience.	UNICEF, 2025; United Nations, 2015

	areas and support long-term community resilience.			
Capacity Building and Knowledge Transfer	▪ Provide training for local workers on environmental management (e.g., spill response, waste handling) and cultural sensitivity. ▪ Collaborate with MEFT and MME to build capacity for monitoring and enforcement in the Kunene Region. ▪ Document traditional Himba knowledge (e.g., grazing patterns, cultural sites) to inform future projects.	Enhance local skills, improve regulatory oversight, and preserve indigenous knowledge for sustainable development.	Supports SDG 4 (Quality Education) and SDG 16 (Peace, Justice, and Strong Institutions), fostering long-term capacity in the region.	United Nations, 2015

Analysis:

The recommendations are designed to address the specific challenges of the EPL 10173 project and the Kunene Region's development needs. A detailed impact assessment and specialist studies will provide the data needed to refine mitigation measures, such as determining sustainable water abstraction rates to prevent aquifer depletion, a critical concern given the region's water scarcity (Government of Namibia, 2013). The archaeological survey ensures compliance with the National Heritage Act (2004) and protects Himba cultural heritage, while biodiversity surveys confirm the presence of protected species, aligning with the Nature Conservation Ordinance (1975) (Government of Namibia, 2004; Government of Namibia, 1975). Ongoing stakeholder engagement, including a grievance mechanism, ensures that the Himba's concerns (e.g., grazing disruptions, cultural impacts) are addressed throughout the project, supporting FPIC and social equity (IFC, 2012; O'Faircheallaigh, 2010).

The comprehensive EMP, with emergency protocols and annual reporting, ensures that mitigation measures are implemented effectively, as required by the EIA Regulations (2012) (Government of Namibia, 2012). Monitoring and auditing provide transparency and enable adaptive management, addressing any unforeseen impacts (Glasson et al., 2013). CSR initiatives, such as borehole maintenance and skills training, address the region's infrastructure deficits and provide lasting benefits, aligning with Namibia's Vision 2030 and SDGs (Government of Namibia, 2004b; United Nations, 2015). Capacity building and knowledge transfer enhance local skills and regulatory oversight, ensuring that the project contributes to long-term development in the Kunene Region (UNICEF, 2025).

The EPL 10173 exploration project has the potential to deliver economic benefits while managing environmental and social risks, provided that the recommended assessments and measures are implemented. The scoping process has identified key issues, engaged stakeholders, and proposed actionable mitigation measures, setting the stage for a sustainable and socially responsible project that supports the development aspirations of the Kunene Region and Namibia as a whole.

10 References

This section compiles all references cited throughout the EIA Scoping Report for EPL 10173, ensuring proper attribution and compliance with academic and professional standards. The references include Namibian legislation, international guidelines, scientific literature, and data sources, providing a robust evidence base for the report.

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11 Appendices

The appendices provide supplementary information to support the findings and recommendations of the EIA Scoping Report for EPL 10173. They include public participation documents, coordinates of the project area, geological maps and figures, and a legal compliance checklist, ensuring transparency and accessibility of key data.

Appendix A: Public Participation Documents

This appendix includes documentation from the public participation process conducted from 28 February to 14 March 2025, as detailed in Chapter 7. The documents demonstrate compliance with the EIA Regulations (2012), which require a minimum 7-day consultation period and stakeholder engagement (Government of Namibia, 2012).

- **A1: Public Notices**
  - Copies of notices published in *The Namibian* and *New Era* newspapers on 28 February 2025, announcing the EIA scoping process and inviting public input.
  - Notices posted at the Opuwo Town Council and Kunene Regional Council offices on 28 February 2025.
- **A2: Stakeholder Register**
  - List of stakeholders engaged, including the Himba community, Vita Royal House, Opuwo residents, Kunene Regional Council, MEFT, MME, NNF, and LAC.
- **A3: Comments and Responses**
  - Summary of comments received during the consultation period, including concerns about grazing disruptions, water use, and cultural heritage (Chapter 7.3).
  - Responses to each comment, detailing how they were addressed in the scoping report (e.g., 500m buffer zones for grazing routes, heritage assessments).
- **A4: Photographic Evidence**
  - Photographs of the public meeting in Opuwo, showing stakeholder attendance and the use of visual aids.
  - Photographs of notices posted at public locations.

Appendix B: Coordinates of EPL 10173

This appendix provides the geographical coordinates of the EPL 10173 area, as required for project documentation under the Minerals (Prospecting and Mining) Act of 1992 (Government of Namibia, 1992). The coordinates define the 20,000-hectare licence area in the Opuwo Magisterial District, Kunene Region.

Table B.1: Coordinates of EPL 10173 Boundary

Point	Latitude (S)	Longitude (E)
A	18° 45' 30"	13° 50' 15"
B	18° 45' 30"	14° 05' 45"
C	19° 00' 00"	14° 05' 45"
D	19° 00' 00"	13° 50' 15"

Notes:

- Coordinates are in the WGS84 datum, as per standard practice for Namibian mining licences.
- The exploration activities will be concentrated within a 5-hectare area, with specific drill sites to be determined during the detailed EIA phase.

Appendix C: Geological Maps and Figures

This appendix includes geological maps and figures to support the project description and baseline environment. These visuals provide context for the exploration targets and environmental conditions in EPL 10173.

- **C1: Geological Map of EPL 10173**
  - A map showing the geological formations within EPL 10173, including the Damara Supergroup (Neoproterozoic) and Karoo Supergroup (Permian-Triassic), which host potential base and rare metals (Jacobsen et al., 2012).
  - Scale: 1:50,000.
  - Source: Geological Survey of Namibia (2025).
- **C2: Topographic Map**
  - A topographic map of the EPL 10173 area, showing elevation (1,100–1,300 m) and the location of ephemeral streams feeding into the Kunene River.
  - Scale: 1:50,000.
  - Source: Namibia Meteorological Service (2025).
- **C3: Vegetation Distribution**
  - A figure illustrating the distribution of sparse savanna vegetation (*Acacia* spp., *Commiphora wildii*) and protected species (*Welwitschia mirabilis*) within EPL 10173
  - Source: WWF (2025).
- **C4: Project Layout**
  - A schematic showing the proposed layout of access tracks (10–15 km), drill pads (50–100), and field camps within the 5-hectare exploration area.
  - Includes 500m buffer zones around Himba grazing routes.

Appendix D: Legal Compliance Checklist

This appendix provides a checklist to demonstrate compliance with relevant Namibian legislation and international standards. The checklist ensures that all legal requirements for the EPL 10173 project are met during the scoping phase.

Table D.1: Legal Compliance Checklist for EPL 10173

Legislation/Standard	Requirement	Compliance Status	Reference
Environmental Management Act (2007)	Conduct an EIA and develop an EMP for projects with potential environmental impacts.	EMP overview provided; full EMP to be developed.	Government of Namibia, 2007
EIA Regulations (2012)	Public consultation period of at least 7 days; submit scoping report to MEFT.	14-day consultation (28 Feb–14 Mar 2025); report prepared for MEFT.	Government of Namibia, 2012

Minerals (Prospecting and Mining) Act (1992)	Obtain EPL and ensure environmental protection during prospecting activities.	EPL 10173 granted; environmental measures in EMP (Chapter 10).	Government of Namibia, 1992
Water Resources Management Act (2013)	Obtain permits for water abstraction (180,000–360,000 L).	Permits to be obtained pre-exploration (Q2 2025).	Government of Namibia, 2013
National Heritage Act (2004)	Protect cultural heritage sites; conduct heritage assessment if needed.	Heritage assessment planned.	Government of Namibia, 2004
Nature Conservation Ordinance (1975)	Protect listed species (e.g., *Welwitschia mirabilis*).	Pre-clearance surveys planned.	Government of Namibia, 1975
Labour Act (2007)	Ensure fair wages and safe working conditions.	Wages and safety measures included in EMP.	Government of Namibia, 2007b
IFC Performance Standard 7	Ensure FPIC for indigenous peoples (Himba); culturally appropriate engagement.	FPIC process initiated; OtjiHimba translators used.	IFC, 2012

Summary of Chapters 11–13

- **Chapter 11: Conclusion and Recommendations**
  - **11.1 Summary of Findings:** Synthesizes the baseline environment (semi-arid, Kaokoveld biodiversity, socio-economic challenges), public participation outcomes (Himba concerns about grazing, water, heritage), potential impacts (e.g., groundwater contamination, biodiversity loss), mitigation measures (e.g., biodegradable fluids, pre-clearance surveys), and EMP framework (monitoring protocols, responsibilities). The project's alignment with SDGs (e.g., SDG 1, SDG 6, SDG 8, SDG 15) and Namibia's Vision 2030 is evaluated, with tables (Table 11.1 and Table 11.2) summarizing impacts, mitigation measures, residual significance, and SDG alignment.
  - **11.2 Recommendations:** Provides actionable steps for the next phase, including a detailed EIA, specialist studies (hydrology, archaeology, biodiversity, socio-economic), ongoing stakeholder engagement, comprehensive EMP development, monitoring/auditing, CSR initiatives, and capacity building. Table 11.3 outlines these recommendations with rationales, development relevance, and references.
- **Chapter 12: References**
  - Lists all sources cited in the report, including Namibian legislation (e.g., EMA 2007), international standards (e.g., IFC 2012), scientific literature (e.g., Glasson et al., 2013), and data sources (e.g., Namibia Statistics Agency, 2025), ensuring a robust evidence base.
- **Chapter 13: Appendices**
  - **Appendix A:** Public participation documents (notices, stakeholder register, meeting minutes, comments/responses, photos), demonstrating compliance with EIA Regulations (2012).
  - **Appendix B:** Coordinates of EPL 10173, defining the project area (Table B.1).
  - **Appendix C:** Geological maps, topographic maps, vegetation distribution, and project layout, supporting Chapters 4 and 6.
  - **Appendix D:** Legal compliance checklist (Table D.1), ensuring adherence to Namibian laws and international standards.