POWER STONE CC

Application for Environmental Clearance Certificate (ECC) for the proposed surface extraction of dune sand, near Swakopmund, Erongo Region

Proponent:

POWER STONE CC.
P.O Box 8279
Swakopmund

APP-007185

Project Name:

Application for Environmental Clearance Certificate (ECC) for the proposed surface extraction of dune sand, near Swakopmund, Erongo Region

Location, Coordinates:

Latitude: −22.7703, Longitude: 14.5783

Intended Use:

Supplement for construction material for road and infrastructure projects in the Erongo Region.

Regulatory Authority:

Ministry of Environment, Forestry, and Tourism

Consultant:

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NON-TECHNICAL SUMMARY

Power Stone CC proposes to undertake controlled surface extraction of dune sand within Dorob National Park near Swakopmund in the Erongo Region. Earth Environmental Services CC was appointed to conduct an Environmental Impact Assessment and prepare an Environmental Management Plan in support of an application for an Environmental Clearance Certificate. The extracted dune sand will be used as a construction material for road works, housing development and related infrastructure projects in the region.

The proposed activity will take place within a defined extraction area accessed via the C28 road and existing vehicle tracks. The operation will involve light surface skimming of loose sand from interdune areas and gently sloping dune flanks. No blasting, deep excavation, mineral processing or permanent infrastructure will be required. Extraction will follow a phased, low-impact approach that includes site demarcation, controlled sand removal, loading and transport of material, and progressive rehabilitation of disturbed surfaces. All equipment will remain mobile and will be removed from the site once operations are completed.

Baseline investigations indicate that the project area occurs within a typical central Namib coastal dune environment characterised by mobile sandy surfaces, sparse desert vegetation and strong wind-driven sand movement. No sensitive habitats, drainage features or well-developed lichen fields were identified within the extraction footprint. Plant species recorded are common to the region, and fauna is expected to consist mainly of mobile desert-adapted species. The activity will not involve excavation below natural ground level and will therefore not affect groundwater resources. No water abstraction or on-site fuel storage is proposed.

The surrounding socio-economic environment is centred on Swakopmund and Walvis Bay, which function as important regional hubs for tourism, logistics and infrastructure development. Due to the small scale, temporary nature and controlled footprint of the activity, the project is not expected to significantly interfere with tourism routes or conservation objectives, provided that operational controls are implemented.

Potential environmental impacts identified during the assessment include temporary disturbance of dune surfaces, localised dust generation during windy conditions, minor vegetation disturbance, visual presence of machinery and limited interaction with recreational users. These impacts are expected to be localised and largely reversible. Dust generation remains the most noticeable operational impact because of the naturally windy coastal environment. Appropriate mitigation measures such as limiting vehicle speeds, restricting activities to defined areas and suspending operations during extreme wind conditions will reduce overall impact significance.

The project is expected to provide positive socio-economic benefits including short-term employment opportunities, support to local contractors and improved availability of

construction materials required for regional infrastructure development. Local sources of sand may also reduce transport distances and associated costs.

Rehabilitation will be undertaken progressively throughout the operational period. Disturbed surfaces will be smoothed and shaped to follow natural dune contours, allowing natural wind-driven sand movement to gradually restore the landscape. After completion of extraction activities, all equipment and waste will be removed from the site.

The Environmental Impact Assessment concludes that the proposed dune sand surface extraction activity can be implemented with low residual environmental impacts if the Environmental Management Plan is fully implemented. The project is therefore considered environmentally manageable and compatible with the multi-use management objectives of Dorob National Park.

It is recommended that an Environmental Clearance Certificate be issued subject to compliance with approved environmental management measures, restriction of activities to the authorised extraction area, use of existing access routes, implementation of dust and operational controls and proper rehabilitation and site closure procedures.

1. INTRODUCTION

1.1. Background

Power Stone CC (hereafter referred to as the Proponent) proposes the surface extraction of dune sand from a designated area located within Dorob National Park near Swakopmund in the Erongo Region.

Earth Environmental Services CC (EES) has been appointed as the Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment (EIA) and prepare the Environmental Management Plan (EMP) in support of an application for an Environmental Clearance Certificate (ECC) from the Ministry of Environment, Forestry and Tourism (MEFT).

The proposed activity involves the controlled skimming of loose dune sand from interdune areas and gently sloping dune flanks. The extraction process will remove only the loose surface sand layer and will not involve excavation or the development of borrow pits.

This low-impact extraction method ensures that the main dune bodies remain intact and that natural dune morphology and wind-driven sand movement are not permanently altered.

The dune sand will be used to complement river sand in the production of specialized construction concrete and other construction materials required for infrastructure development in the Erongo Region.

1.2. Location, Site Description, Land Use and Infrastructure

1.2.1. Project Location

The proposed dune sand extraction site is located approximately 10–12 km from Swakopmund within Dorob National Park, Erongo Region. The proposed extraction area is defined by coordinates. The extraction polygon covers an area of approximately 4.72 hectares. Access to the site will be gained via existing tarred and gravel road networks from Swakopmund, followed by established tracks within the park. (Figures 1).

1.2.2. Current land use

The project area lies within Dorob National Park, which functions as a multiple-use conservation landscape that accommodates environmental protection, tourism, recreation, research activities, and carefully regulated resource use.

The surrounding landscape is characterised by coastal dune systems that are frequently used for tourism and recreational activities.

During the public consultation process, concerns were raised regarding the location of the originally proposed dune sand extraction site due to its proximity to tourism routes. As a result, an alternative extraction area was identified in consultation with representatives from the tourism sector, which is now assessed in this report.

1.2.3. Site Description

The proposed extraction area lies within the central Namib coastal dune belt, characterised by wind-formed aeolian sand dunes and interdune corridors.

The landscape is characterised by:

- mobile sand dunes
- loose aeolian sand deposits
- sparse desert vegetation
- strong wind-driven sand transport processes.

Extraction activities will focus primarily on interdune areas and the lower flanks of dunes, avoiding dune crests and major dune structures in order to maintain the natural dune landscape.

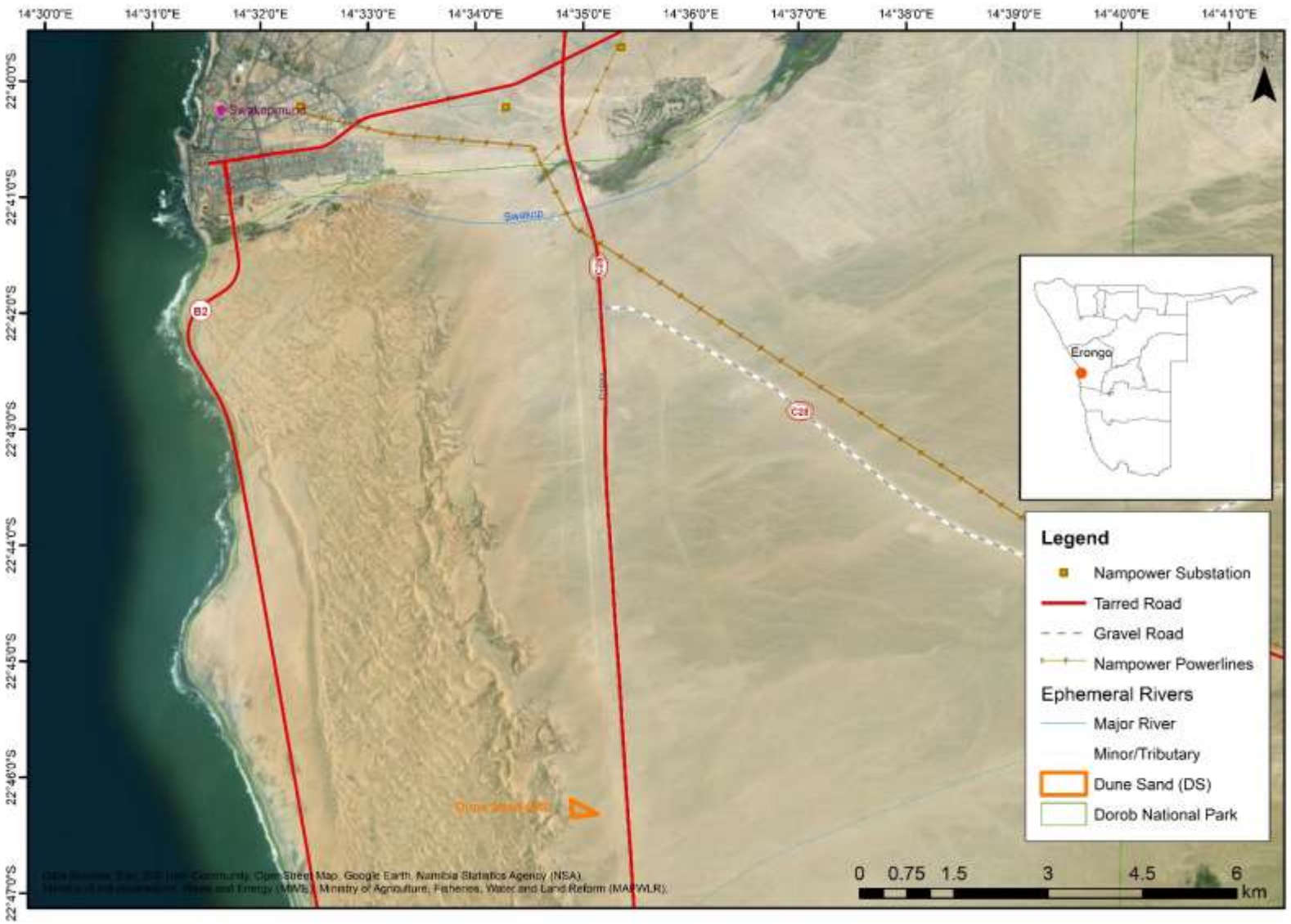


Figure 1: Locality map and infrastructure of the proposed project

2. PROPOSED PROJECT DESCRIPTION

2.1. Project Activities: Dune Sand Surface Extraction

The proposed project involves surface skimming extraction of loose dune sand from the designated area.

Site Preparation

Prior to extraction activities:

- the extraction area will be surveyed and demarcated
- existing access tracks will be used for site access
- safety signage will be installed around the operational area
- only minimal vegetation disturbance will occur within the approved footprint.

Sand Extraction

Dune sand will be obtained through light surface skimming of loose sand using front-end loaders.

The extraction process will involve:

- removing loose sand from interdune areas
- lightly skimming sand from gentle dune flanks
- avoiding dune crests and main dune bodies
- maintaining natural dune profiles.

Because the activity involves surface skimming rather than excavation, no permanent depressions or pits will be created.

Loading and Transport

The extracted sand will be loaded directly into tipper trucks and transported to construction sites within the Erongo Region.

All operations will take place during daytime hours to minimize environmental disturbance.

Rehabilitation

Given the nature of the activity, rehabilitation will largely occur through natural wind-driven sand redistribution.

Additional rehabilitation measures may include:

- smoothing disturbed sand surfaces
- closing temporary access tracks where necessary
- removing all equipment and waste from the site.

Over time, natural aeolian processes will restore the surface to conditions similar to the surrounding dune environment.

2.2. Supporting Infrastructure

Access and Transportation

The Proponent will utilise existing road networks for access to the extraction site. Access to the proposed dune sand surface extraction area will be via the C28 road, followed by existing gravel tracks leading to the demarcated extraction area.

Prior to accessing the site within Dorob National Park, the necessary authorisation will be obtained from the Parks Division of the Ministry of Environment, Forestry and Tourism (MEFT).

Should field operations continue over an extended period, the Proponent will coordinate with MEFT and other relevant land users to ensure that access arrangements, safety considerations, and environmental protection measures are clearly agreed upon. No new tracks will be created unless formally authorised.

Site Facilities and Worker Accommodation

No permanent or temporary site facilities will be established within the extraction area.

The operation will function as a fully mobile activity, with all personnel commuting daily from nearby towns such as Swakopmund. No worker accommodation, storage areas, maintenance yards, or service infrastructure will be established at the site.

All equipment will be brought to the site only for the duration of extraction activities and removed once daily operations are completed.

Utilities and Resource Supply

No water supply, electricity, or other utilities will be required at the extraction site.

Potable water required by personnel will be transported to the site as needed. Machinery will be refuelled in town prior to arriving at the site, and no fuel storage will occur within Dorob National

Park.

As a precautionary measure, spill kits will be carried in operational vehicles to address any accidental hydrocarbon spills. All waste generated during operations will be collected and removed from the site for disposal at approved municipal waste facilities. No waste will be buried, burned, or stored at the site.

Rehabilitation and Closure

Because the activity involves surface skimming of loose dune sand, disturbance to the dune landscape will be minimal and temporary.

Rehabilitation will occur progressively during operations and will include:

- Smoothing disturbed sand surfaces
- Recontouring lightly affected areas to follow natural dune profiles
- Removing any temporary vehicle tracks where necessary
- Removing all equipment and waste from the site

Natural wind-driven sand redistribution (aeolian processes) will assist in restoring the surface conditions of the disturbed areas.

Following completion of extraction activities, the area is expected to gradually return to a condition consistent with the surrounding dune environment, without the formation of permanent excavations or depressions.

3. PURPOSE OF THE REPORT

This report has been prepared in accordance with the Environmental Management Act (EMA), No. 7 of 2007, and the Environmental Impact Assessment (EIA) Regulations of 2012. The proposed dune sand extraction activity constitutes a listed activity and therefore requires an Environmental Clearance Certificate (ECC) before the project may proceed.

An application for an ECC will be submitted to the Ministry of Environment, Forestry and Tourism (MEFT), which serves as the competent authority responsible for reviewing and issuing environmental clearance decisions. No project activities may commence until MEFT has issued a decision.

The listed activities relevant to this project include the following:

MINING AND QUARRYING ACTIVITIES

3.1 The construction of facilities for any process or activity that requires a licence, right, or authorisation, including renewals, in terms of the Minerals (Prospecting and Mining) Act, 1992.
3.2 Any other form of mining or extraction of natural resources, whether regulated by law or not.

3.3 Resource extraction, manipulation, conservation, and related activities.

Applicability

The proposed development involves the surface extraction of dune sand through controlled skimming of loose sand deposits within a defined extraction area. Although the activity does not involve conventional mining methods such as blasting, deep excavation, or mineral processing, it constitutes a natural resource extraction activity.

As such, the proposed development triggers Listed Activities 3.1–3.3 under the EIA Regulations and therefore requires environmental assessment and authorisation prior to implementation.

4. LEGAL REQUIREMENTS

4.1. List of applicable laws and legislations

The proposed borrow pit project must comply with national environmental and resource-use legislation as summarised in table 1.

Table 1: List of applicable laws and legislations

LAW	SUMMARY DESCRIPTION	PERMITS & APPROVALS REQUIRED
Constitution of the Republic of Namibia, 1990	Establishes national governance principles. Article 95 promotes sustainable natural resource management and environmental protection.	No permit is required, but all project activities must comply with constitutional sustainability objectives.
Environmental Management Act, 2007 (Act No. 7 of 2007) and EIA Regulations, 2012 (MEFT)	Governs environmental protection, requiring EIAs and EMPs for listed activities including resource extraction. Ensures that environmental impacts are identified, assessed and managed.	Environmental Clearance Certificate (ECC) required before commencement of borrow pit operations.
Parks and Wildlife Management Act / Dorob National Park Regulations (MEFT)	Regulate activities inside national parks to ensure conservation of sensitive landscapes.	Park Access Authorisation required for personnel, vehicles and equipment entering Dorob NP.
Water Resources Management Act, 2013 (MAWLR)	Regulates abstraction, use and protection of Namibia's water resources.	Water Abstraction Permit (if water abstraction is proposed – not required if water is transported to site). Effluent Discharge Permit (if liquid waste is generated – not expected for this project).

LAW	SUMMARY DESCRIPTION	PERMITS & APPROVALS REQUIRED
Forest Act, 2001 (MEFT)	Protects indigenous vegetation, especially protected species and riparian habitats.	Tree Harvesting Permit required if protected vegetation must be removed (unlikely due to sparse vegetation in the project area).
Hazardous Substances Ordinance, 1974 (Ordinance 14 of 1974) (MoHSS)	Regulates storage, handling and disposal of hazardous substances such as diesel and lubricants.	Hazardous Substance Handling Permit for fuel storage and handling (if stored on site).
Atmospheric Pollution Prevention Ordinance, 1976 (MoHSS)	Controls dust and air emissions, especially from activities generating particulate matter.	Applicable if dust becomes excessive; must implement dust suppression and mitigation.
Nature Conservation Ordinance, 1975 (MEFT)	Protects wildlife and plant species in Namibia. Restricts disturbance or removal of protected flora and fauna.	Permit for Removal of Protected Plant Species (if applicable). Wildlife Handling Permit (if fauna relocation becomes necessary).
Soil Conservation Act, 1969 & Amendment Act, 1971 (MAWLR)	Prevents soil erosion, degradation, and unsustainable land use.	No permit is required, but compliance with soil protection and rehabilitation guidelines is mandatory.
Labour Act, 2007 (MLIREC)	Ensures fair labour practices, workplace safety and protection of workers.	Work Permits for any foreign employees (if applicable). Compliance with all occupational health and safety provisions.
Petroleum Products and Energy Act, 1990 (MME)	Regulates the storage, handling and transport of fuel.	Consumer Installation Certificate for fuel storage facilities. Fuel Transport Permit if transporting fuel in bulk.
National Heritage Act, 2004 (MEAC)	Protects archaeological and heritage resources. Requires reporting of heritage discoveries.	Heritage Impact Assessment (HIA) if heritage resources are identified. Immediate reporting of finds under the Chance Find Procedure.

5. SCOPE OF REFERENCE

The scope of this Environmental Impact Assessment (EIA) is to systematically identify, evaluate, and manage the potential environmental and social impacts associated with the proposed borrow pit operations east of Swakopmund. The assessment draws on multiple information sources, including a review of existing literature, data provided by the proponent, stakeholder engagement, and site visits undertaken within the project area.

The objectives of the Environmental Scoping Assessment are to:

1. Identify potential environmental and social impacts both positive and negative that may arise from the proposed borrow pit activities.
2. Assess the significance, nature and extent of the identified impacts, considering direct, indirect and cumulative effects on the surrounding biophysical and socio-economic environment.
3. Recommend practical and effective mitigation measures to avoid, minimise or rehabilitate adverse impacts, while enhancing potential project benefits.
4. Engage with relevant stakeholders including park authorities, neighbouring users, and other interested and affected parties to ensure transparency, participation and inclusiveness in the assessment process.
5. Develop an Environmental Management Plan (EMP) that sets out clear actions, responsibilities, and monitoring requirements to guide environmentally responsible project implementation.
6. Support informed decision-making by the Ministry of Environment, Forestry and Tourism (MEFT).

6. EIA APPROACH AND METHODOLOGY

Steps in the EIA Process in Namibia
1. Project Identification The proponent identifies a project that may have potential environmental impacts. The project must be screened to determine whether an EIA is required.
2. Screening The proponent submits a Background Information Document (BID) to the Ministry of Environment, Forestry, and Tourism (MEFT). The Environmental Commissioner determines if the project requires an EIA based on the listed activities in the Environmental Management Act (EMA) Regulations.
3. Scoping (Terms of Reference & Public Consultation) If an EIA is required, a scoping study is conducted. Baseline environmental studies and public participation are undertaken.
4. Impact Assessment Identification and analysis of potential environmental, social, and economic impacts. Specialists may be required to conduct detailed studies on biodiversity, water resources, land use, and socio-economic conditions. Mitigation measures are proposed to minimize negative impacts.
5. Public Participation The proponent must inform and involve stakeholders (communities, government agencies, NGOs, businesses, and other interested parties). Public meetings, notices, and consultation sessions are held. Stakeholder feedback is incorporated into the EIA report.
6. Compilation and Submission of the EIA Report The EIA Report (including the Scoping Report, Impact Assessment, and Environmental Management Plan (EMP)) is prepared. The final report is submitted to the Environmental Commissioner at MEFT for review.
7. Review and Decision-Making MEFT reviews the EIA report, considering: The quality of documentation. Stakeholder input. Compliance. MEFT may approve, reject, or request modifications.
8. Environmental Clearance Decision If approved, the project is issued an Environmental Clearance Certificate (ECC). If not approved, the proponent may revise and resubmit the EIA or appeal to the Minister.
9. Monitoring and Compliance Once the project begins, environmental monitoring ensures compliance with the EMP. Periodic audits are conducted by MEFT. If violations occur, MEFT can enforce corrective actions or revoke the ECC.

Figure 2: Summary EIA Flow Chart

7. PROJECT MOTIVATION/RATIONALE

The Erongo Region is undergoing significant urban growth and rapid infrastructure development, with increasing demand for reliable construction materials to support roads, housing, and public works. Gravel, calcrete, river sand, and dune sand are critical inputs for these projects, and the availability of such materials directly affects the pace and cost of development in the region.

The establishment of the borrow pit will ensure that construction materials can be sourced locally rather than transported over long distances. This will not only reduce transport costs for contractors. By locating borrow pit closer to areas of high demand, the project will contribute to both economic and environmental efficiency.

Beyond cost savings, the borrow pit will play a vital role in supporting public infrastructure initiatives, including the construction and maintenance of regional and national roads. Importantly, the project will create opportunities for local employment during both the operational and rehabilitation phases. This includes skilled and semi-skilled jobs in excavation, haulage, site management, and environmental monitoring. Local communities will also benefit from skills transfer, which can improve long-term employability in the construction and mining sectors.

In the longer term, it will contribute to sustainable regional economic growth by unlocking infrastructure potential and improving service delivery to residents and businesses.

8. ALTERNATIVES CONSIDERED

An assessment of alternatives is undertaken to ensure that potential environmental impacts, technical considerations, and socio-economic implications are evaluated before selecting the most suitable development option. Considering alternatives assists in identifying the environmentally preferable and practically feasible approach for the proposed dune sand surface extraction activity.

8.1. Site / Location Alternatives

Dune sand deposits suitable for construction use occur naturally within specific areas of the coastal dune system near Swakopmund. These deposits are influenced by wind-driven sediment transport and are therefore not evenly distributed across the broader landscape.

The selected extraction area was identified based on the presence of suitable sand deposits and its accessibility via existing road networks. During the public participation process, stakeholders from the tourism sector raised concerns regarding the proximity of the originally

proposed dune sand site to popular tourism routes. Following these discussions, an alternative extraction site was identified in consultation with tourism representatives.

The revised site is located approximately 10 km from Swakopmund and was selected to reduce potential conflicts with tourism activities and recreational use of the dune environment.

In selecting the preferred location, the following considerations were taken into account:

- Presence of suitable dune sand deposits for construction use
- Accessibility via existing roads and tracks
- Minimisation of disturbance to tourism routes and recreational areas
- Avoidance of environmentally sensitive features where possible
- Limiting the need for new access routes or additional disturbance.

Considering these factors, the selected location represents the most practical and environmentally manageable option for the proposed dune sand extraction activity.

8.2. Resources and Operational Alternatives

Energy

The extraction activities will rely on diesel-powered machinery such as front-end loaders and tipper trucks. This is standard practice for small-scale sand extraction operations and remains the most practical option in remote desert environments where electricity infrastructure is not available.

Although renewable energy technologies continue to develop, solar-powered heavy machinery is not yet viable for mobile extraction operations of this nature. Furthermore, the proposed activity does not require fixed power infrastructure.

Access Roads

Access to the site will utilise existing road networks, including the C34, C28, and D1984 roads, followed by established gravel tracks within Dorob National Park. No new access tracks will be created unless specifically authorised by the relevant authorities.

Using existing access routes reduces environmental disturbance and limits impacts on the surrounding desert landscape.

Equipment and Operational Approach

Standard earthmoving equipment such as front-end loaders and tipper trucks will be used to skim loose dune sand from the surface.

The proposed extraction method involves light surface skimming of loose sand from interdune

areas and gentle dune flanks, avoiding dune crests and major dune structures. This approach minimises disturbance to dune morphology and allows natural wind-driven sand movement to restore lightly disturbed areas over time.

Alternative extraction methods that involve excavation or deeper removal of sand were not considered appropriate due to the potential for greater environmental disturbance.

8.3. No-Go Alternative

The No-Go Alternative considers the scenario in which the proposed dune sand surface extraction activities do not proceed.

Under this option, no disturbance would occur within the designated extraction area and the dune landscape within Dorob National Park would remain unchanged. Natural sand movement processes and ecological conditions would continue without human intervention.

However, the No-Go Alternative would also mean that dune sand would not be supplied from this location. As a result, construction projects within the Erongo Region would need to source sand from more distant locations. This could increase transportation distances, fuel consumption, and associated emissions.

In addition, the No-Go Alternative would forego potential socio-economic benefits associated with the project, including local employment opportunities, procurement of services, and the availability of construction materials required for infrastructure development in the region.

For these reasons, although environmentally neutral, the No-Go Alternative may not represent the most practical option when considering the broader infrastructure and development needs of the Erongo Region. Controlled and carefully managed dune sand surface extraction, implemented with appropriate environmental mitigation measures, is therefore considered a feasible and manageable development option.

9. BASELINE ENVIRONMENT/ STUDY AREA

9.1. Biophysical Environment

9.1.1. Climate

Swakopmund is located in the Erongo Region and experiences a subtropical dry arid climate. Average annual temperatures typically range between 14°C and 21°C, rarely exceeding 25°C or dropping below 13°C. Seasonal cloud cover results in variation throughout the year, with generally clear conditions from early March to mid-December and the cloudiest period occurring around January (Spriggs & Amy, 2011).

Rainfall along the western coast of Namibia is extremely limited, averaging approximately 0–50 mm per year. Rainfall events are sporadic and typically occur between January and April, although several consecutive years may pass without measurable rainfall. Humidity levels remain low throughout the year, averaging around 5%.

Wind plays an important role in shaping the coastal desert environment. Average wind speeds range from approximately 11 km/h in March to 14 km/h during July, with prevailing winds predominantly originating from the south (Spriggs & Amy, 2011). These winds contribute significantly to the movement and formation of coastal dune systems.

Four major regional features influence the coastal climate of the central Namib:

- The Benguela Upwelling System
- The Great Escarpment
- The South Atlantic Anticyclone
- The absence of major topographic barriers across the coastal plains.

The project area located approximately 10–20 km from Swakopmund, falls within the Interior Fog Zone, which extends approximately 20–60 km inland from the coastline. In this zone, fog provides a critical source of moisture, often exceeding rainfall in ecological importance. Evaporation rates significantly exceed

Table 4 - Regional Climate Data

Average annual rainfall (mm/a)	0-50
Variation in annual rainfall (%)	> 100
Average annual evaporation (mm/a)	2800-3000
Average annual temperatures (°C)	16-17
Average daily sunlight hours	8 – 9
Foggy days per year	75- 100

9.2. Fauna

Plant and animal communities in the central Namib Desert are strongly influenced by climate, soil characteristics, and habitat availability. In coastal desert ecosystems, fog plays a critical role as a moisture source, supporting a range of specially adapted organisms.

The broader Dorob National Park is recognised as an ecologically important coastal desert ecosystem and forms part of an internationally recognised Important Bird Area (IBA) due to the presence of numerous coastal and migratory bird species.

One of the most notable species associated with this region is the Damara Tern (Sternula balaenarum), a breeding seabird endemic to Namibia that nests on sandy and gravel surfaces along the central Namib coastline.

During the site visit, no fauna was directly observed within the proposed extraction area. This is not uncommon in desert environments where many species are nocturnal, burrowing, or seasonally inactive. The sandy substrate and climatic conditions of the area are suitable for various desert-adapted reptiles and invertebrates.

Desktop studies of the broader Walvis Bay–Swakopmund region indicate that the central coastal zone has relatively low overall terrestrial species diversity, although levels of endemism remain moderate to high (Mendelsohn et al., 2002).

The diversity of large herbivorous mammals is considered low to medium, with one to two species likely to occur occasionally in the area. Large carnivorous mammals are represented by approximately four species, with the Brown Hyena (Hyaena brunnea) being the most notable predator expected in the region (Mendelsohn et al., 2002).

It is estimated that the broader Walvis Bay–Swakopmund area may support approximately: 54 reptile species, 7 amphibian species,42 mammal species, 182 bird species

A high proportion of these species are endemic to Namibia.

Reptile diversity is particularly significant, with approximately 50% of species considered endemic to the region. Species of concern include the thread snakes (*Leptotyphlops occidentalis* and *L. labialis*), as well as sand-adapted reptiles such as Peringuey's Adder (*Bitis peringueyi*). The area also supports a high diversity of endemic gecko species (*Pachydactylus*), many of which remain poorly studied.

Although amphibians are generally limited in saline coastal environments, several species may occur further inland in association with ephemeral water sources such as the Swakop and Kuiseb River systems.

Endemic mammal species of conservation interest include the Namib Dune Mole (*Eremitalpa granti*), as well as the bats *Laephotis namibensis* and *Cistugo seabrai*. Small mammals such as hairy-footed gerbils (*Gerbillurus* species) are also typical of sandy desert habitats.

9.2.1.1. Birds

The high proportion of endemic birds of which 50% (7 of 14 species) are endemic to Namibia and which are known and/or expected to occur in the general Walvis Bay/Swakopmund area is important and should be taken into consideration regarding development in the area. Species of greatest concern include all the endemics (e.g. Dune and Gray‟s Larks) as well as *Morus capensis* (Vulnerable – IUCN 2010), *Phalacrocorax capensis* (Near threatened – IUCN 2010), *Phalacrocorax neglectus* (Endangered – IUCN 2010), *Phalacrocorax coronatus* (Near threatened – IUCN 2010), *Phoenicopterus minor* (Endangered – IUCN 2010), *Haematopus*

moquini (Near threatened – IUCN 2010), *Charadrius pallidus* (Near threatened – IUCN 2010) and *Sterna balaenarum* (Near threatened – IUCN 2010). Furthermore, the Damara Tern (Sterna balaenarum) which breeds in the gravel plain and sandy beach areas in the general area is the species possibly most threatened by development in the immediate Walvis Bay/Swakopmund area.

9.3. Flora

Vegetation type as well as land coverage changes inland, land coverage decreases between 1% to 5% depending on the distance from the coastal zone. Vegetation that occurs simultaneously on the coastal saline adapt to halophytic conditions such as semi-deserts, the Inland Foggy Zone which includes the project area, contains shrub communities (*Arthaerua leubnitiziae)* and lichen fields (*Caloplaca elegantissima-Xanthoparmelia walteri), p*lants like Fensteralgen are more common under transparent stones such as quartz which also has a distinctive role in the fixation of minerals and soil formation (Cunningham, 2010). The vegetation in the area includes the pencil bush, dollar bush, and shepherd tree, along with some of the lichen fields, supporting the wildlife residing in the national park borders.

The site falls within the desert biome, which is characterized by central and southern desert vegetation type (Figure 3). The Namib Desert Biome makes up a large proportion (32%) of the land area with parks in this biome making up 69% of the protected area network or 29.7% of the biome (Barnard, 1998). The vegetation in the Desert Biome is characterized by the dominance of therophytes which persist in the form of seeds during unfavorable conditions (UCCB, 2011).

According to Mendelsohn et al. (2002) the dominant vegetation structure in the Southern Desert is grassland and dwarf shrubland. These Namib grasslands, mainly annual species are very sparse, but nevertheless still dominate the little vegetation that grows around the area. The average plant production is low with 0-5% variation in green vegetation biomass. The overall plant diversity (all species) in the general Walvis Bay/Swakopmund area is estimated as <50 species (Mendelsohn et al. 2002). Burke (2003) estimates that over 400 species – 10% of the flora of Namibia occur in the central Namib and although it has not been identified as a center of endemism, it is dominated by endemics such as *Arthraerua leubnitziae*. The greatest variants affecting the diversity of plants are habitat and climate. Plant endemism is viewed as "medium" with between 1-15 endemics expected from the general Walvis/Swakopmund area (Mendelsohn et al. 2002).

Literature further reveals that the eastern inland sections pro-Namib are dominated by *Stipagrostis obtusa* and *Stipagrostis ciliata* after rains while the plains closer towards the coast are dominated by *Mesembryanthemum cryptanthum* (Giess 1971). An interesting feature of the coastal areas is the extensive formation of gypsum crusts in the soil as a result of sulphur releases during upwelling events in the ocean in the past. These substrates support the most divers lichen fields in the world (Burke 2003). The lichen fields are the areas of concern and specific species e.g., endemics (*Arthraerua leubnitziae* etc.). The under protected Welwitschia mirabilis and economically important species such as *Acanthosicyos horridus*

(Burke 2003).

9.3.1. Lichen

Dorob National Park supports an exceptionally high diversity of lichens. At least 65 lichen species representing 33 genera are expected to occur across the broader park landscape. Approximately 34% of these species are endemic to Namibia, while a further 10% are near-endemic and occur only within the Namib Desert.

However, the proposed dune sand extraction area occurs within mobile dune systems where lichen development is generally limited, as lichens typically establish on stable gravel surfaces rather than shifting sand substrates. During the site visit, no well-developed lichen fields or sensitive lichen mats were observed within or adjacent to the proposed extraction area.

9.4. Key Biodiversity Areas and Ecological Considerations Near the Borrow Pit

Although Dorob National Park contains several ecologically sensitive zones, none of the major biodiversity hotspots occur directly within the proposed extraction area.

a. Coastal Dune Ecosystem

The proposed extraction area lies within a coastal dune ecosystem, characterised by mobile aeolian sand dunes and interdune corridors. Vegetation cover is sparse and dominated by hardy desert-adapted species. The habitat is widespread throughout the coastal Namib and is generally resilient to light surface disturbance, particularly where dune morphology remains intact.

b. Ephemeral Drainage Features

Ephemeral drainage features associated with the Swakop River system occur in the broader region but do not intersect the proposed extraction area. The site was selected to avoid drainage channels and minimise any disruption to natural hydrological processes.

c. Lichen Fields

Sensitive lichen fields are known to occur on stable gravel plains in parts of Dorob National Park. These areas are considered ecologically sensitive and require protection. No such lichen fields were identified within the proposed extraction area.

d. Heritage and Archaeological Considerations

No archaeological or heritage features were identified within the proposed extraction area during

the site visit. However, the Erongo Region is known to contain significant archaeological resources. A Chance Finds Procedure will therefore be implemented to ensure that any unexpected heritage discoveries are reported and managed in accordance with the National Heritage Act (2004).

Overall, the baseline assessment indicates that the proposed development is unlikely to affect habitats of high ecological importance, provided that extraction activities remain limited to controlled surface skimming and appropriate mitigation measures are implemented.

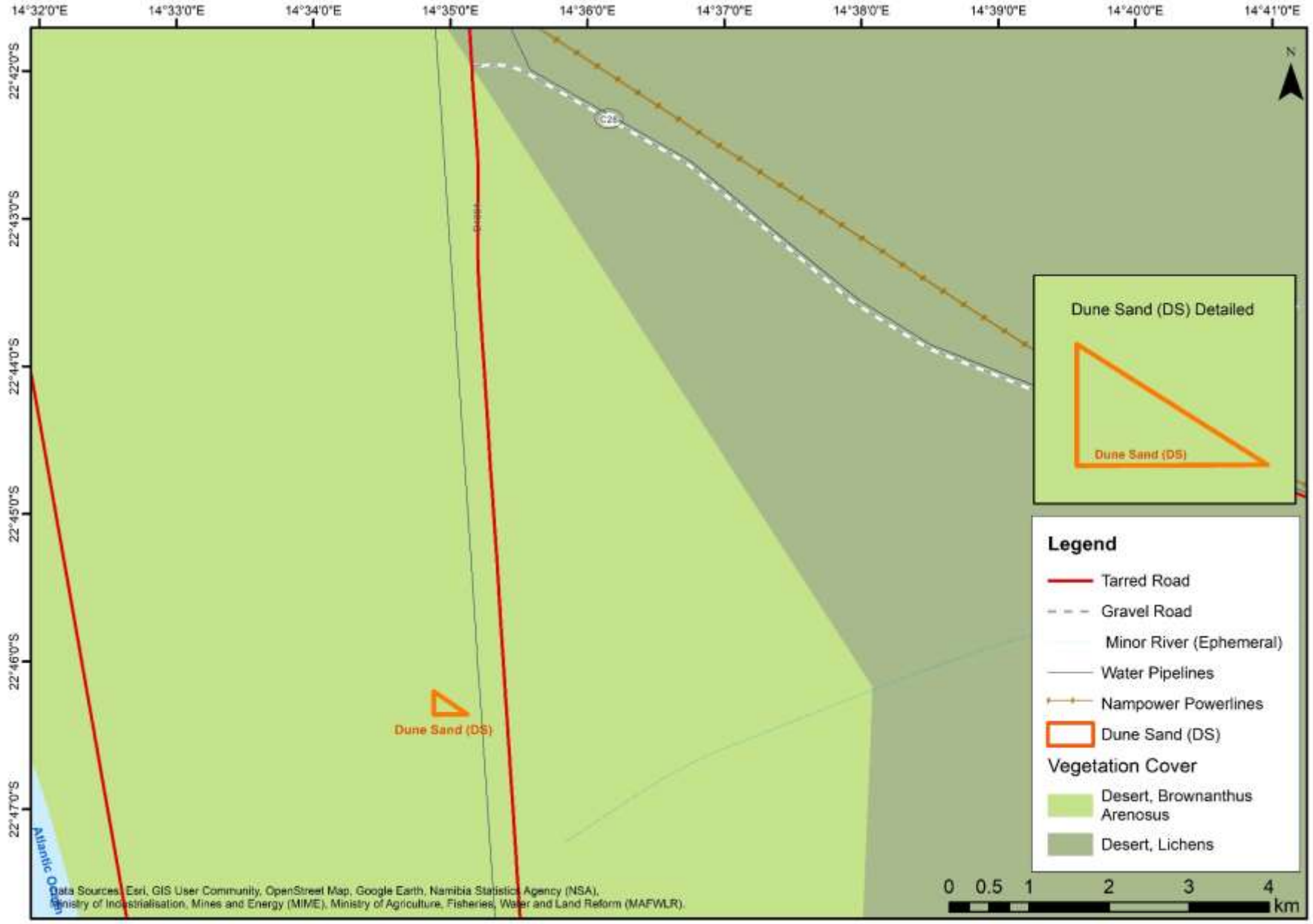


Figure 3: Vegetation type of the proposed area

9.5. Hydrogeology and Geology

The project area lies within the Erongo Basin, which supplies water to key coastal towns such as Swakopmund. Groundwater remains an important resource in this basin and is supported by several piped distribution schemes that transfer both surface and groundwater to surrounding settlements. Pipelines associated with these schemes are visible within the broader project area. Water requirements for the proposed activity are minimal and will be limited to potable water transported from Swakopmund for personnel use.

Hydrogeologically, the coastal plain is characterised by low-yield aquifers and generally poor-quality or saline groundwater, a condition common across much of Namibia's coastal fringe (Christelis & Struckmeier, 2001/2011). The shallow geological formations in the area do not support significant groundwater storage.

Because the proposed activity involves surface skimming of loose dune sand, there is no excavation below natural ground levels, and therefore no risk of intersecting groundwater resources.

The regional geology is dominated by formations associated with the Damara Sequence, with surface materials consisting largely of Cenozoic superficial deposits, including colluvium, alluvium, and fluvial–marine sediments. Beneath these deposits lie Damara granite intrusions, which are locally overlain by sediments associated with the Kalahari Group.

Within the immediate project area, the dominant surface material consists primarily of loose aeolian dune sand, with occasional occurrences of calcrete and weathered granitic material in the surrounding landscape. These materials occur at shallow depths and are typical of the coastal Namib dune environment (Figure 4).

Coastal environments around Swakopmund are also known for their corrosive atmospheric conditions, influenced by fog moisture, airborne salts, high chloride concentrations, and elevated humidity levels. While these conditions may influence equipment maintenance and material durability, they do not affect the proposed surface sand extraction activities.

The geology of the area supports the presence of naturally occurring sand deposits that are widely used as construction materials in the region. High-quality sands from the Swakop River system are commonly utilised for concrete production and brick manufacturing, while coastal dune sands may be used for specific construction applications where suitable.

Given the surface-level nature of the activity, the absence of groundwater interaction, and the non-aquifer characteristics of the shallow geological formations, the proposed

dune sand extraction is not expected to pose any significant hydrogeological risk (Figure 5).

9.6. Soil

Soil within the coastal Namib Desert is characterised by extremely low organic matter content, low nutrient levels and limited biological productivity. Soil formation processes are slow due to very low rainfall, high evaporation rates and limited chemical weathering. Consequently, surface materials are weakly developed and strongly influenced by wind-driven sediment movement.

As illustrated in Figure 6, the proposed extraction area is located predominantly within a dune sand soil unit, while surrounding areas are mapped as gypsiferous soils typical of the central Namib coastal zone. Dune soils in the project area consist mainly of unconsolidated aeolian sand that is continuously reshaped by prevailing winds. These sandy substrates have very low cohesion, minimal profile development and limited capacity to retain moisture or nutrients.

Gypsiferous soils occurring in the wider landscape are generally more stable and may form harder surface crusts that can support specialised vegetation such as lichens. However, such features were not observed within the defined extraction polygon during site investigations.

The proposed activity involves light surface skimming of loose sand rather than excavation. Disturbance will therefore be shallow and confined to the uppermost sand layer, with no removal of subsoil horizons or alteration of underlying geological formations. Due to the naturally dynamic nature of dune systems, natural wind-driven sediment transport processes will assist in redistributing sand over disturbed areas following extraction.

Overall, and with reference to Figure X, the soils within the project footprint are considered resilient to controlled surface disturbance. With progressive rehabilitation and implementation of the Environmental Management Plan, significant long-term soil degradation is not expected.

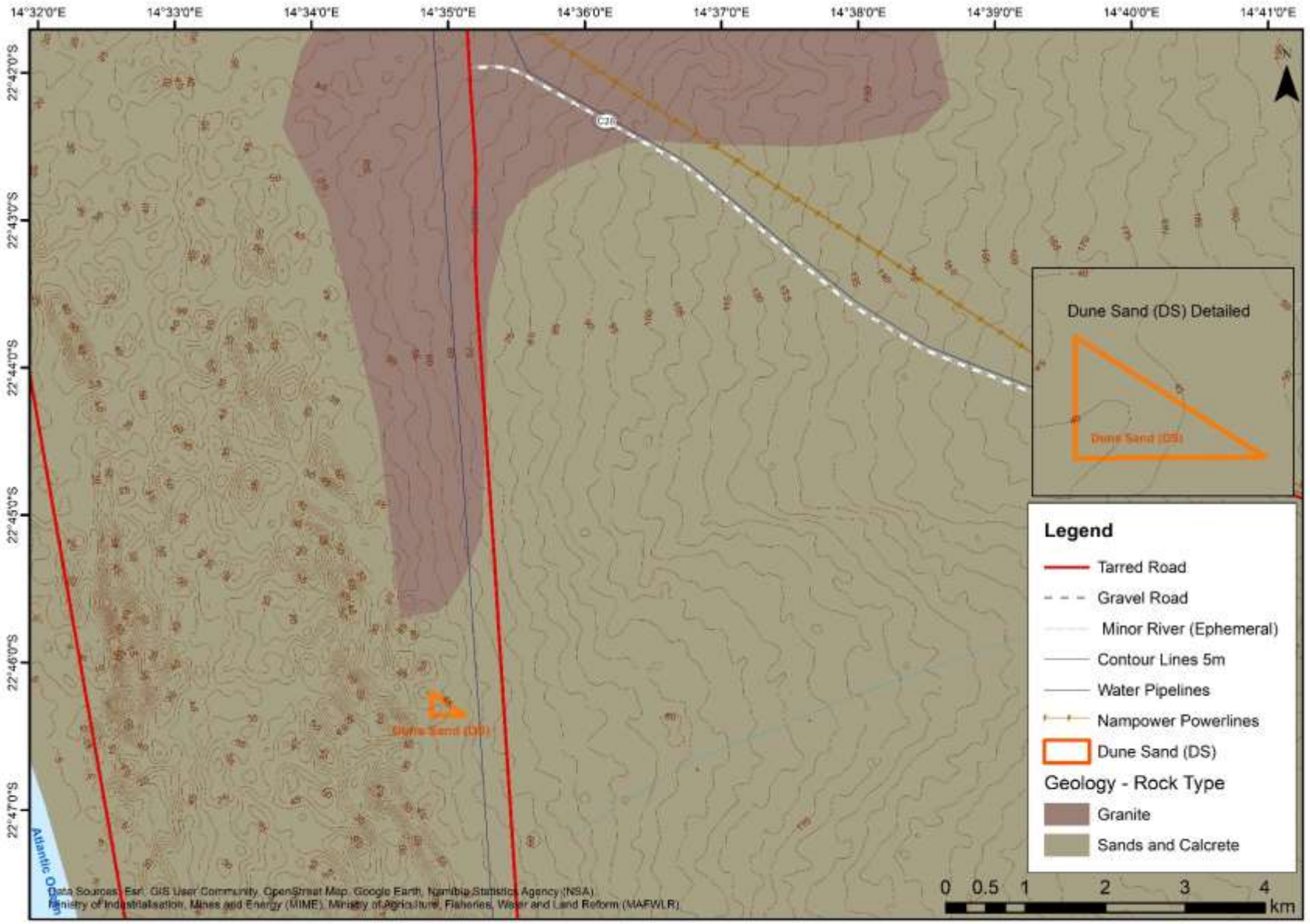


Figure 4: Geology of the proposed area

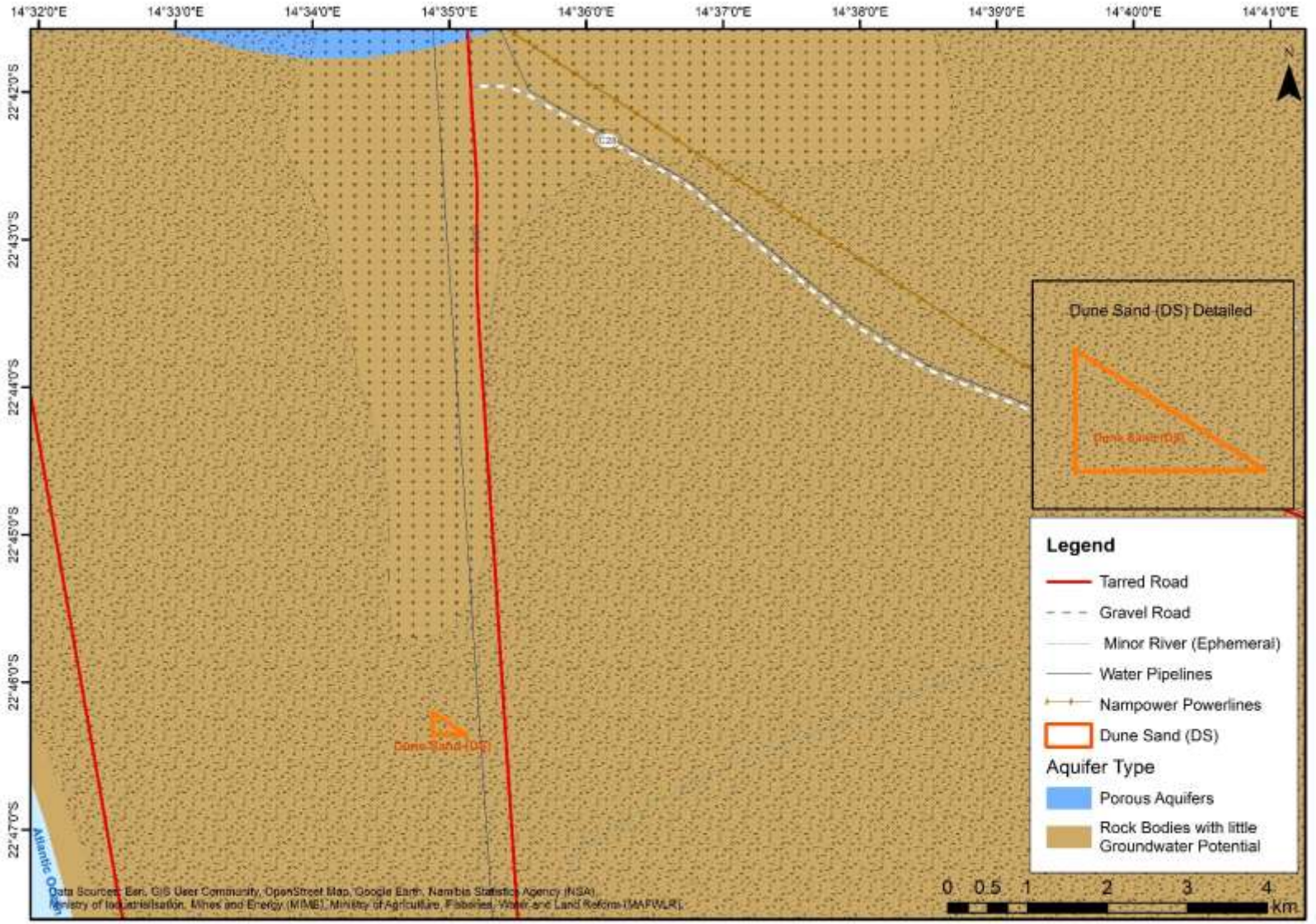


Figure 5: Hydrology of the proposed area

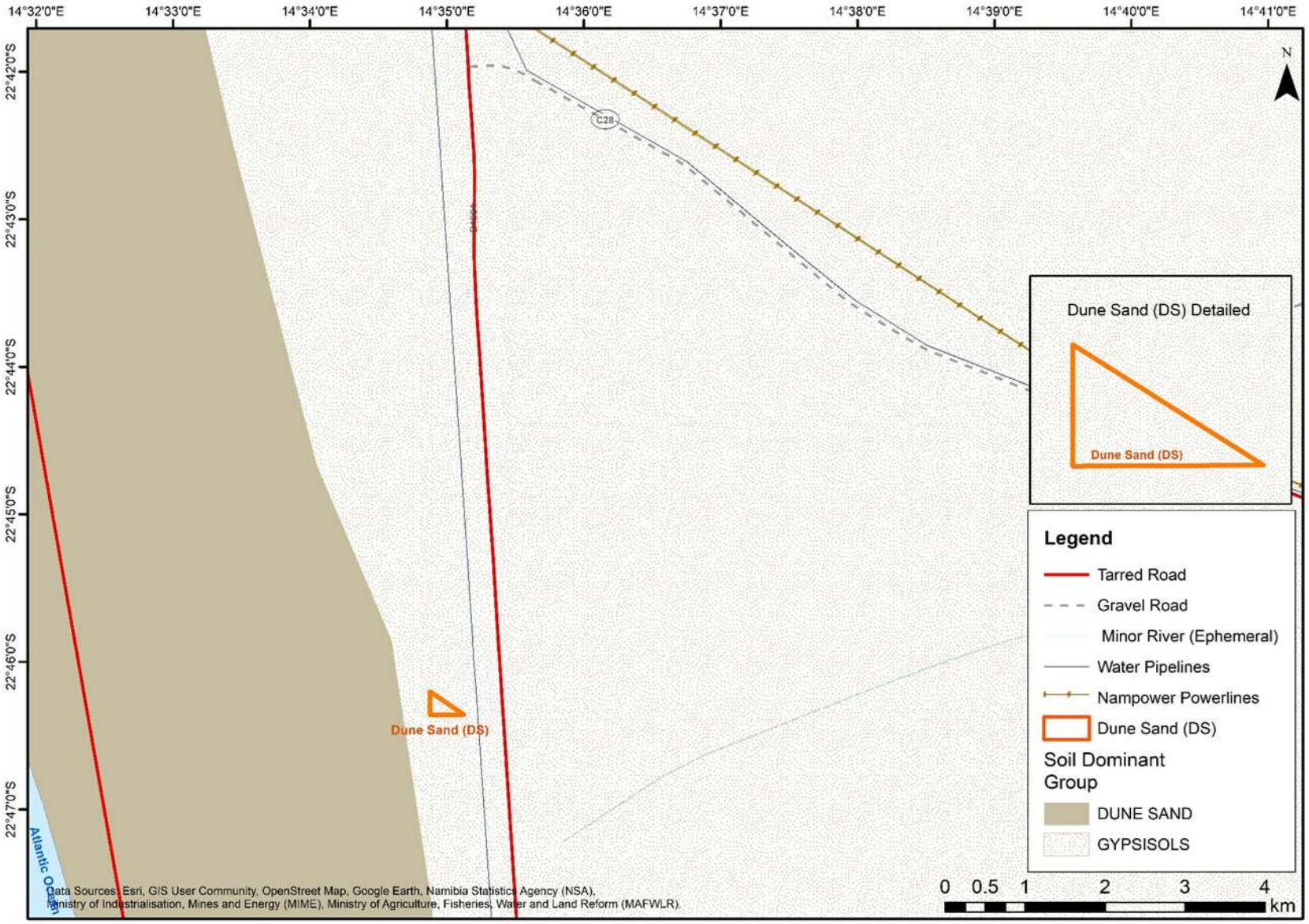


Figure 6: Dominant soil type in the proposed project area.

9.7. Socio-Economic setting

9.7.1. Regional Profile

Swakopmund is one of Namibia's principal coastal towns and a major tourism destination, known for its historic architecture, recreational activities, and unique setting between the Namib Desert and the Atlantic Ocean. It serves as the administrative capital of the Erongo Region and is well connected through the B2 national road, rail links to Windhoek, and the Swakopmund Airport. Together with Walvis Bay, the town forms an important economic and logistics hub, supported by well-developed transport infrastructure, reliable telecommunications, and established utility networks.

The local economy is driven mainly by tourism, fishing, and service industries, with additional support from mining activities in the wider region. Socioeconomic indicators show that the Erongo Region is one of the more affluent regions in Namibia, with relatively high per capita income levels and a low proportion of households experiencing severe food expenditure stress compared to national averages (NSA, 2011).

A review of the National Heritage Council and environmental information service databases indicates that no known heritage or archaeological sites occur within the proposed project area. Should any heritage resources be encountered during project activities, chance find procedures will be implemented in accordance with the National Heritage Act, 2004.

The proposed project area shows evidence of prior disturbance, which reduces the likelihood of impacts on undisturbed environmental or cultural resources.

9.7.2. Tourism and Stakeholder Activities in the Area

The project area lies within a broader landscape that supports various forms of outdoor recreation, adventure tourism, and conservation-based activities typical of the central Namib. Dorob National Park is one of Namibia's most visited coastal protected areas, attracting both local and international tourists. Tourism activities contribute significantly to the local economy of Swakopmund and rely on the region's open desert scenery, accessible dune systems, and unique biodiversity.

A range of tourism operators and recreational stakeholders conduct activities in the wider region, including:

- Guided desert tours and ecological interpretation trips
- Quad biking and off-road recreational driving in designated use zones
- Sandboarding and Dune Adventure Sports
- Photographic tours focusing on landscapes, birds, and desert wildlife
- Stargazing and space science tourism due to excellent night sky conditions

- Commercial events, filming, and small group excursions
- Cultural and historical tours linked to Swakopmund's heritage

These activities generally take place along established tourism corridors, recreational zones, and designated dune areas closer to Swakopmund and the coastal road network.

During the public participation process, tourism stakeholders highlighted the importance of maintaining the visual and recreational value of the dune landscape. Concerns were raised regarding the proximity of the initially proposed extraction area to tourism routes. As a result, an alternative dune sand extraction site was identified in consultation with representatives from the tourism sector, located further away from commonly used tourism routes.

The proposed surface skimming extraction of loose dune sand is small in scale and will occur within a clearly defined polygon. The activity will focus on interdune areas and gentle dune flanks, avoiding prominent dune features and areas commonly used for tourism activities such as sandboarding and guided tours.

Access to the site will utilise existing tracks, ensuring that disturbance to recreational areas and tourism landscapes remains minimal.

Given the limited scale of the activity, the use of existing access routes, and the relocation of the extraction site away from key tourism corridors, the proposed development is unlikely to significantly affect tourism activities or the scenic value of the surrounding desert environment.

10. STAKEHOLDER ENGAGEMENT

10.1. Public participation

The public participation process was undertaken in accordance with the Environmental Management Act (2007) and the EIA Regulations (2012). Its purpose is to ensure that Interested and Affected Parties (I&APs) have an opportunity to receive information about the proposed project, raise concerns, and contribute constructively to the assessment.

A formal comment period of 21 days was provided, running from Monday, 24 November 2025 to Monday, 15 December 2025. During this period, several methods were used to notify stakeholders and invite participation.

10.1.1. Newspaper Adverts

Public notices were published once per week for two consecutive weeks in widely circulated national newspapers. The first advertisement appeared in the Market Watch section, which

covers the Allgemeine Zeitung, Namibian Sun, and Republikein. The second advertisement was scheduled for publication on Monday, 1 December 2025.

10.1.2. Site notice

Site notices were placed at strategic, publicly accessible locations around Swakopmund and the project area, including:

- Swakopmund Municipality notice board
- Erongo Regional Council notice board
- Goanikontes
- Nonidas
- Project site boundaries

These notices remained in place for the duration of the comment period.

10.1.3. Public Meeting

A public meeting was held on 16 December 2025 to provide stakeholders with an opportunity to express their interests and raise any concerns or issues requiring in person discussion. As attached EIA report.

10.1.4. Stakeholder participation and recommendation

Stakeholder participation during the public meeting held on 16 December 2025 was constructive and outcome-oriented. Interested and Affected Parties representing the tourism sector, environmental and biodiversity organisations, cultural and heritage specialists, and members of the local community participated in discussions regarding the proposed dune sand extraction activity.

Key concerns raised during the meeting focused on the potential impacts of dune sand extraction on tourism routes, landscape aesthetics, and the sense of place within Dorob National Park. Stakeholders indicated that the initially proposed dune sand extraction location was situated close to popular tourism routes and recreational areas.

Following the meeting, the consultant, the proponent, and representatives from the tourism sector worked collaboratively to identify an alternative dune sand extraction site that would reduce potential conflicts with tourism activities and recreational use of the dune landscape.

Additional written comments were also received after the meeting, including submissions from the Municipality of Swakopmund. These comments highlighted the need to consider cumulative impacts, tourism sensitivity, and alignment with existing environmental management

frameworks applicable to Dorob National Park.

All stakeholder inputs have been formally recorded and have been incorporated into the Environmental Impact Assessment (EIA) and the Environmental Management Plan (EMP) to ensure that the identified concerns are appropriately addressed through mitigation and monitoring measures.

11. Evaluation of Impacts

11.1. Assessment procedure

This section evaluates the potential environmental and social impacts associated with the proposed dune sand surface extraction activity within Dorob National Park. The assessment considers the planning and site selection phase, operational phase, and closure phase, and includes direct, indirect, and cumulative impacts in relation to other land uses in the area such as tourism routes, recreational activities, existing vehicle tracks, and historic disturbances.

Impact identification is based on:

- Establishing baseline environmental conditions of the coastal dune environment near Swakopmund
- Understanding potential landscape changes associated with surface skimming of loose dune sand
- Analysing the operational footprint and vehicle movement patterns to predict environmental consequences
- Identifying potentially significant impacts and proposing feasible mitigation measures.

11.2. Sources of Impacts

11.2.1. Likely Sources of Positive Impacts

Although the proposed dune sand extraction activity is small in scale, it can contribute several positive socio-economic outcomes at both local and regional levels. Key positive impacts include:

- Supporting road and infrastructure development in Swakopmund and the wider Erongo Region
- Reducing transport distances, fuel consumption, and associated emissions through local sourcing of construction sand
- Creating short- to medium-term employment opportunities for local workers
- Providing opportunities for skills development in equipment operation, safety, and environmental management

- Supporting local contractors and service providers
- Demonstrating a low-impact sand extraction approach compatible with Dorob National Park management objectives.

11.2.2. Likely Sources of Negative Impacts

Table 1: The key sources of potential negative impacts associated with the proposed borrow pit and its supporting activities, by project phase.

Project Phase	Project Activity	Likely Impact
Planning and Site Selection	Selection of dune sand extraction area	Localised land-use change within Dorob National Park; temporary disturbance of loose dune sand surfaces and sparse vegetation
	Identification of access routes using existing tracks	Potential visual or traffic impacts if access is not confined to approved routes
Operational Phase – Extraction	Surface skimming of loose dune sand from interdune areas and gentle dune flanks	Temporary disturbance of dune surfaces; minor displacement of small fauna and invertebrates
	Movement of machinery and tipper trucks within the extraction area	Dust generation, noise, and localised disturbance to nearby recreational users if not properly managed
	Transport of sand along existing access routes and the C28 road	Increased vehicle movement and dust along established routes; potential safety concerns if speed limits are not controlled
	Presence of machinery within the dune landscape	Temporary visual disturbance within the surrounding desert environment
Operational Phase – Human Activities	Personnel operating within the extraction area	Risk of littering or disturbance if site discipline and environmental controls are not maintained
	Interaction with tourism and recreational users	Possible perception of conflict with tourism activities if noise, dust, or vehicle movement are not managed appropriately
Closure Phase	Removal of machinery and equipment from the site	Temporary disturbance associated with vehicle movement during decommissioning
	Final smoothing of disturbed sand surfaces	Short-term dust generation during surface levelling
	Post-operation landscape condition	Minor surface disturbances may remain temporarily but will gradually be softened through natural wind-driven sand movement

The following methodology is applied to the predication and assessment of impacts and risks. Potential impacts and risks have been rated in terms of the direct, indirect, and cumulative where:

	Whether the impact/risk on the overall environment will be

Status	• **Positive -** Environment overall will benefit from the impact/risk; • **Negative -** Environment overall will be adversely affected by the impact/risk; • **Neutral -** Environment overall not be affected.

Direct impacts	Impacts are directly caused by the activity and usually occur at the same time and place of the activity. These impacts are often related to the construction, operation or maintenance of an operation and are often obvious and quantifiable.
Indirect impacts	These types of impacts include all the potential impacts that are not evident immediately when the activity is carried out, or which occur at a different place due to the activity.
Cumulative impacts	Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present, or reasonably foreseeable future activities.

In addition to the above, the impact assessment methodology includes the following aspects:

Spatial Extent	The size of the area that will be affected by the impact: **Site specific -** Only within the site boundaries **Local -** limited to within 15 km of the area **Regional -** limited to ~100 km radius **National -** limited to within the borders of Namibia **International -** extending beyond Namibia's borders

Consequence	The anticipated consequence of the impact: • **Extreme -** Environmental functions and processes are altered such that they permanently cease); • **Severe -** Environmental functions and processes are altered such that they temporarily or permanently cease); • **Substantial -** environmental functions and processes are altered such that they temporarily or permanently cease); • **Moderate -** Environment continues to function but in a modified manner); or • **Slight -** No natural systems/environmental functions, patterns, or processes are affected.

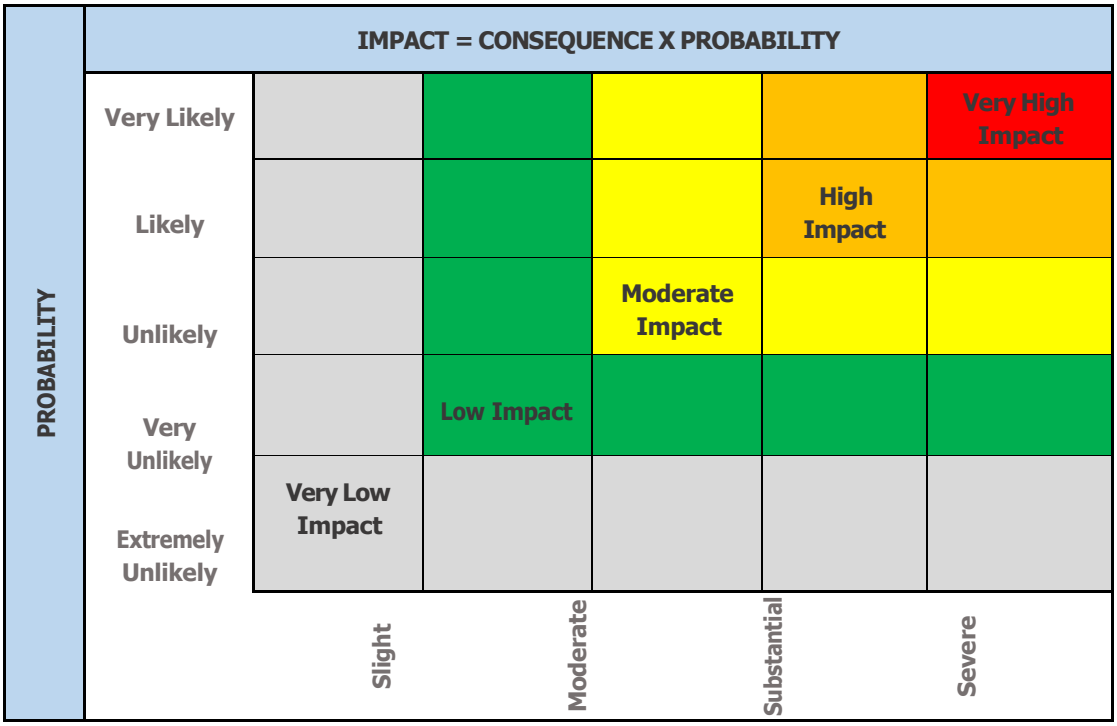
Duration	The timeframe during which the impact/risk will be experienced
	• **Very short term** - instantaneous; • **Short term** - less than 1 year; • **Medium term** - 1 to 10 years; • **Long term** - The impact will occur for the project duration • **Permanent -** The impact will occur beyond the project decommissioning.

Reversibility of the Impacts	The extent to which the impacts/risks are reversible assuming that the project has reached the end of its life cycle (decommissioning phase)
	• **Yes** - High reversibility of impacts (impact is highly reversible at end of project life); • **Partially -** Moderate reversibility of impacts; or • **No -** Impacts are non-reversible (impact is permanent).

Using the criteria above, the impacts will further be assessed in terms of the following:

Probability	The probability of the impact/risk occurring
	• Very likely; • Likely; • Unlikely; • Very unlikely; and • Extremely unlikely.

To determine the significance of the identified impact/risk, the consequence is multiplied by probability. This approach incorporates internationally recognized methods from the IPCC (2014) assessment of the effects of climate change and is based on an interpretation of existing information in relation to the proposed activity. The significance is then rated qualitatively as follows against a predefined set of criteria (i.e., probability and consequence) as indicated below:



Where:

Significance	Will the impact cause a notable alteration of the environment? • **Very low (5) -** The risk/impact may result in very minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures and will not have an influence on decision-making. • **Low (4) -** The risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision making; • **Moderate (3) -** The risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated; • **High (2) -** The risk/impact will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision making); and • **Very high (1) -** The risk/impact will result in very major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision making.

Confidence	The degree of confidence in predictions based on available information and specialist knowledge
	• **Low -** Based on the availability of specialist knowledge and other information • **Medium -** Based on the availability of specialist knowledge and other information • **High -** Based on the availability of specialist knowledge and other information

Impacts are evaluated for the construction and operation phases of the development. The assessment of impacts for the decommissioning phase is not presented in detail this document, as there is limited understanding at this stage of what this might entail. Impacts have been evaluated with and without mitigation in order to determine the effectiveness of mitigation measures on reducing the significance of a particular impact. The Assessment is presented in the following section and further in the Environmental Management Plan (EMP).

12. IMPACTS ASSESSMENT

12.1. Pre-Operation Phase (Planning and Site Preparation)

Table 2: Assessment of potential impacts during the planning and site preparation phase

Impact Pathway	Nature of Impact	Spatial Extent	Duration	Consequence	Probability	Reversibility	Significance Before Mitigation	Mitigation Measures	Significance After Mitigation	Confidence
Footprint demarcation	Local disturbance of loose dune surface and sparse vegetation	Site-specific	Short-term	Slight	Likely	Yes	Low–Moderate	Restrict activities to approved footprint; brief workers on sensitive desert surfaces	Low	High
Use of existing access tracks	Localised sand compaction from vehicles	Local	Short-term	Slight	Likely	Yes	Low	Strict use of existing tracks; no creation of new routes	Very Low	High
Worker presence	Risk of littering or minor disturbance	Site-specific	Short-term	Slight	Possible	Yes	Low	Implement strict take-in take-out policy	Very Low	High
Temporary visual presence	Workers and vehicles visible in dune landscape	Local	Very short-term	Slight	Likely	Yes	Low	Keep operational footprint compact	Very Low	High

Local employment	Short-term job opportunities	Local	Short-term	Slight	Very Likely	Yes	Low Positive	Priorities local labour where feasible	Moderate Positive	Medium

12.2. Operation Phase (Extraction, Loading, Hauling)

Table 3: Assessment of potential impacts during the operational phase, including surface skimming, loading and transport activities.

Impact Pathway	Nature of Impact	Spatial Extent	Duration	Consequence	Probability	Reversibility	Significance Before Mitigation	Mitigation Measures	Significance After Mitigation	Confidence
Surface skimming of dune sand	Temporary disturbance of dune surface and sparse vegetation	Site-specific	Medium-term	Moderate	Likely	Yes	Moderate	Restrict activity to defined extraction area; avoid dune crests; maintain natural dune profiles	Low	High
Vehicle movement	Localised compaction and disturbance of loose sand	Local	Medium-term	Moderate	Likely	Yes	Moderate	Restrict vehicles to working area; avoid unnecessary driving	Low	High
Dust generation	Wind-blown dust from vehicles and loading	Local	Medium-term	Moderate	Very Likely	Partial	High	Reduce vehicle speeds; suspend operations during strong winds; PPE for workers	Moderate	High
Noise from machinery	Short-term noise disturbance	Local	Short-term	Slight	Likely	Yes	Low	Maintain equipment; limit operations to daylight hours	Very Low	Medium

Interaction with aeolian processes	Temporary alteration of surface texture and sand redistribution	Site-specific	Short- to medium-term	Low–Moderate	Likely	Yes	Moderate	Maintain shallow surface profiles; avoid abrupt edges; allow natural wind processes to smooth surfaces	Low	Medium
Tourism interaction	Perceived disturbance to recreational users	Local	Short-term	Slight–Moderate	Possible	Yes	Moderate	Maintain orderly operations; avoid peak tourism areas where feasible	Low	Medium
Waste generation	Minor pollution risk from worker activities	Site-specific	Short-term	Slight	Possible	Yes	Low	Strict take-in take-out waste policy	Very Low	High
Local employment	Job creation for operators and drivers	Regional	Medium-term	Moderate	Very Likely	Yes	Moderate Positive	Employ local workers where possible	High Positive	Medium

12.3. Rehabilitation and Closure Phase

Table 4: Assessment of potential impacts during the rehabilitation and closure phase of the proposed project.

Impact Pathway	Nature of Impact	Spatial Extent	Duration	Consequence	Probability	Reversibility	Significance Before Mitigation	Mitigation Measures	Significance After Mitigation	Confidence
Surface smoothing	Restoration of disturbed sand surfaces	Site-specific	Medium-term	Moderate	Likely	Yes	Moderate Positive	Smooth disturbed areas to match natural dune profiles	High Positive	High

Removal of equipment	Elimination of visual disturbance	Site-specific	Short-term	Slight	Likely	Yes	Low Positive	Remove all machinery and waste	Moderate Positive	High
Aeolian restoration	Natural wind redistribution of sand	Local	Long-term	Moderate	Very Likely	Yes	Moderate Positive	Allow natural wind processes to restore surface	High Positive	High
Residual compaction	Localised slower recovery in some areas	Site-specific	Short- to medium-term	Slight	Possible	Yes	Low	Minimise vehicle movement; smooth compacted areas	Very Low	Medium

13. Assessment of the Overall Significant Impacts

13.1. Pre-Operation (Planning and Site Preparation)

This phase consists of site demarcation, minimal disturbance of the sand surface, and accessing the site using existing tracks from the C28. No infrastructure will be established on site, and the activity will operate as a mobile extraction operation.

The baseline assessment indicates that the extraction area occurs within a sparsely vegetated desert environment with loose sand surfaces and scattered vehicle tracks typical of the broader Swakopmund–Dorob landscape. No sensitive habitats, lichen fields, drainage lines, or key biodiversity features were identified within the extraction footprint during the site assessment.

Because disturbance during this phase is limited to brief vehicle access and the demarcation of the extraction area, impacts are expected to be **localised, temporary, and reversible**. Typical impacts include minor surface disturbance, light dust from vehicle movement, and short-term visual presence of workers and equipment.

Mitigation Measures

- Restrict activities to the approved extraction area and avoid unnecessary vehicle movement.
- Clearly demarcate the operational footprint to prevent encroachment into undisturbed areas.
- Implement a strict housekeeping approach, ensuring that no waste or materials remain on site.
- Use existing access tracks from the C28 and avoid creating new vehicle routes.

With these measures in place, no significant ecological or social impacts are expected during this phase, and all minor disturbances are expected to recover naturally.

Residual impact significance: **Low**

13.2. Operation Phase (Extraction, Loading and Hauling)

The operational phase is the period during which most project-related impacts may occur. The proposed activity involves surface skimming of loose dune sand using loaders and tipper trucks. The process does not involve blasting, chemical processing, deep excavation, or water abstraction.

Habitat and Biodiversity

The extraction area supports sparse desert vegetation and common desert fauna typical of the central Namib environment. No sensitive habitats or protected plant species were identified during the site assessment.

Potential impacts include temporary disturbance of surface habitats and displacement of small desert fauna such as reptiles, insects, and burrowing invertebrates. These impacts are expected to be localised because the footprint of the operation is small and disturbance occurs only within the defined extraction area.

Mitigation Measures

- Restrict operations to the demarcated extraction area.
- Conduct visual checks for fauna before commencing activities in new sections.
- Avoid unnecessary vehicle movement outside the operational footprint.

Residual impact significance: **Low**

Sand Surface Disturbance and Aeolian Processes

Wind-driven (aeolian) processes are a defining characteristic of the Namib Desert and play an important role in shaping dune morphology and sand movement. Surface skimming activities may temporarily alter the texture of the sand surface and create shallow disturbances that could influence local wind patterns.

If unmanaged, disturbance of loose sand surfaces may result in localised redistribution of sand or small-scale surface irregularities.

Mitigation Measures

- Maintain shallow and even working surfaces.
- Avoid creating steep edges or artificial depressions.
- Allow natural wind-driven sand movement to gradually smooth disturbed surfaces.

With these measures in place, disturbance to natural sand movement processes is expected to be temporary and reversible.

Residual impact significance: Low

Dust and Air Quality

Dust generation from vehicle movement and loading activities represents the most noticeable operational impact. Strong winds are common in the Namib Desert and may increase dust dispersion during dry conditions.

Although the surrounding environment has few sensitive receptors, dust may temporarily affect workers and nearby recreational users.

Mitigation Measures

- Reduce vehicle speeds within the extraction area.
- Suspend operations during periods of extreme wind.
- Provide appropriate personal protective equipment (PPE) to workers.

Residual impact significance: Moderate

Dust remains the most significant operational impact due to the naturally windy conditions typical of the coastal Namib.

Noise

Noise will be generated by loaders and trucks operating within the extraction area. However, the site is located within a remote desert environment with limited permanent receptors.

Mitigation Measures

- Limit operations to daytime hours.
- Maintain machinery to reduce excessive noise emissions.

Residual impact significance: **Very Low**

Waste and Pollution Risks

Waste generation will be minimal and limited primarily to domestic waste produced by workers. No fuel storage, workshops, or maintenance activities will occur on site.

Mitigation Measures

- Implement a strict take-in take-out waste management system.
- Ensure spill kits are available in operational vehicles.
- Dispose of all waste at the approved Swakopmund municipal disposal facility.

Residual impact significance: **Low**

Visual Impact

Operational vehicles and machinery may be visible within the desert landscape during active extraction periods. This may temporarily affect the visual experience of tourists or recreational users within the area.

However, the activity is small in scale, temporary, and confined to a defined operational footprint.

Mitigation Measures

- Keep the operational area compact and orderly.
- Avoid unnecessary equipment or materials on site.
- Remove all equipment once operations are completed.

Residual impact significance: **Low**

13.3. Cumulative Impacts

Cumulative impacts were assessed in relation to other sand and aggregate extraction activities occurring within the broader Swakopmund–Dorob region. While individual extraction activities are generally small and temporary, cumulative impacts may include:

• incremental landscape disturbance
• increased dust along shared access routes
• visual disturbance within a protected landscape.

Because the proposed operation is small in scale, mobile, and temporary, its contribution to cumulative impacts is expected to remain limited.

Residual cumulative impact significance: Low

13.4. Overall Impact Significance

Overall, the proposed dune sand surface skimming activity is expected to result in low residual environmental impacts, with the exception of dust generation which may remain moderate under windy conditions.

The activity is:

- small in scale
- temporary
- mobile with no permanent infrastructure
- reversible through natural wind-driven sand redistribution.

With the implementation of the proposed mitigation measures, disturbed areas are expected to gradually reintegrate into the surrounding desert landscape with minimal long-term environmental effects.

The proposed activity is therefore considered environmentally manageable and compatible with the multi-use management framework of Dorob National Park.

14. REHABILITATION

14.1. Progressive Rehabilitation

Progressive rehabilitation will be implemented throughout the operational period to minimise the extent and duration of environmental disturbance. Because the proposed activity involves surface skimming of loose dune sand rather than excavation, rehabilitation will focus primarily on restoring the natural surface profile of disturbed areas as operations progress.

Extraction will occur in small working sections, allowing lightly disturbed areas to be smoothed and re-levelled once sand removal in that section is completed. This approach reduces the area of exposed disturbance at any given time and allows natural wind-driven processes to begin restoring the surface conditions.

Progressive rehabilitation measures will include:

- Smoothing disturbed sand surfaces to match surrounding dune contours
- Avoiding the creation of steep edges or artificial depressions
- Limiting vehicle movement outside the operational footprint
- Removing any waste or materials from the site.

Because dune systems are dynamic environments shaped by wind-driven sediment movement, natural aeolian processes will gradually redistribute sand and soften any temporary surface disturbances.

14.2. Rehabilitation

Closure rehabilitation will focus on restoring the disturbed areas to a condition that blends naturally with the surrounding desert landscape and does not pose long-term environmental or safety risks.

At the completion of extraction activities:

- All machinery and operational equipment will be removed from the site
- Any waste or foreign materials will be collected and disposed of at approved facilities
- Disturbed sand surfaces will be smoothed to match the surrounding dune

morphology
- Temporary vehicle tracks will be softened where feasible to reduce visual disturbance.

Following closure, natural wind-driven sand movement will continue to redistribute loose sand across the disturbed areas, gradually restoring the natural appearance of the landscape.

The rehabilitation approach therefore relies primarily on natural recovery processes typical of the Namib Desert, supported by minimal surface shaping where necessary.

15. CONCLUSION AND RECOMMENDATION

The objective of this Environmental Impact Assessment was to identify and evaluate the potential environmental impacts associated with the proposed dune sand surface extraction activity, assess their significance, and recommend practical mitigation measures.
The assessment indicates that the proposed activity is small in scale, temporary, and mobile, and does not involve permanent infrastructure, deep excavation, blasting, or water abstraction. The main environmental impacts identified include temporary disturbance of sand surfaces, dust generation from vehicle movement, and minor visual disturbance during operations.
With the implementation of appropriate mitigation measures and environmental management controls, the majority of impacts are expected to remain low in significance, with dust generation potentially remaining moderate under windy conditions typical of the coastal Namib environment.
The disturbed areas are expected to recover naturally over time through wind-driven sand redistribution and natural desert processes, allowing the landscape to gradually reintegrate with the surrounding dune environment.
Based on the findings of this assessment, it is recommended that an Environmental Clearance Certificate (ECC) be issued for the proposed project, subject to compliance with the Environmental Management Plan (EMP) and any conditions imposed by the competent authority.
In implementing the project, the Proponent shall:

- Obtain all additional permits or approvals that may be required
- Fully implement all mitigation and management measures contained in the EMP
- Ensure that disturbed areas are progressively smoothed and restored during operations
- Coordinate and communicate with relevant stakeholders throughout the project lifecycle, including responding to enquiries and addressing any site-related concerns.

With these measures in place, the proposed dune sand surface skimming activity is considered environmentally manageable and compatible with the surrounding environment and the multi-use management framework of Dorob National Park.

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