POWER STONE CC

ENVIRONMENTAL MANAGEMENT PLAN

For the proposed

Surface Extraction of Dune Sand, near Swakopmund, Erongo Region

EARTH ENVIRONMENTAL SERVICES

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1. Introduction

This Environmental Management Plan (EMP) provides the operational framework for managing, mitigating, monitoring, and rehabilitating environmental impacts associated with the proposed dune sand surface extraction project near Swakopmund in the Erongo Region. The EMP translates the findings and recommendations of the approved Environmental Impact Assessment (EIA) into clear and practical site-level management measures.

The EMP applies to the proponent, contractors, subcontractors, equipment operators, and all personnel involved in the planning, extraction, transport, and rehabilitation activities within the defined project footprint and along approved access routes. Compliance with the provisions of this EMP, as well as all conditions of the Environmental Clearance Certificate (ECC), is mandatory throughout the pre-operational, operational, and closure phases of the project.

2. Project Description (Operational Summary)

The proposed activity involves controlled surface skimming and extraction of loose dune sand from interdune areas and the lower flanks of selected dunes. The extraction method is designed to have low impact and will not involve blasting, deep excavation, or the establishment of permanent borrow pits. Sand removal will be limited to the loose surface layer in order to maintain natural dune morphology and support natural wind-driven restoration processes.

All extraction, vehicle movement, loading, and associated operational activities will be confined strictly to the surveyed and approved extraction footprint and authorised access routes. No stockpiling of material, establishment of temporary facilities, or movement of machinery outside the designated working area will be permitted.

2.1. Location, Site Description, Land Use and Infrastructure

2.1.1.Project Location

The proposed dune sand extraction site is located approximately 10–12 km east of Swakopmund within Dorob National Park in the Erongo Region. Access to the site will be via existing road infrastructure, including the C28 road, followed by established gravel tracks leading to the demarcated extraction area.

The approved extraction footprint covers approximately 4.72 hectares and occurs within a mobile coastal dune system characterized by loose aeolian sand deposits, sparse desert vegetation, and active wind-driven sediment movement processes.

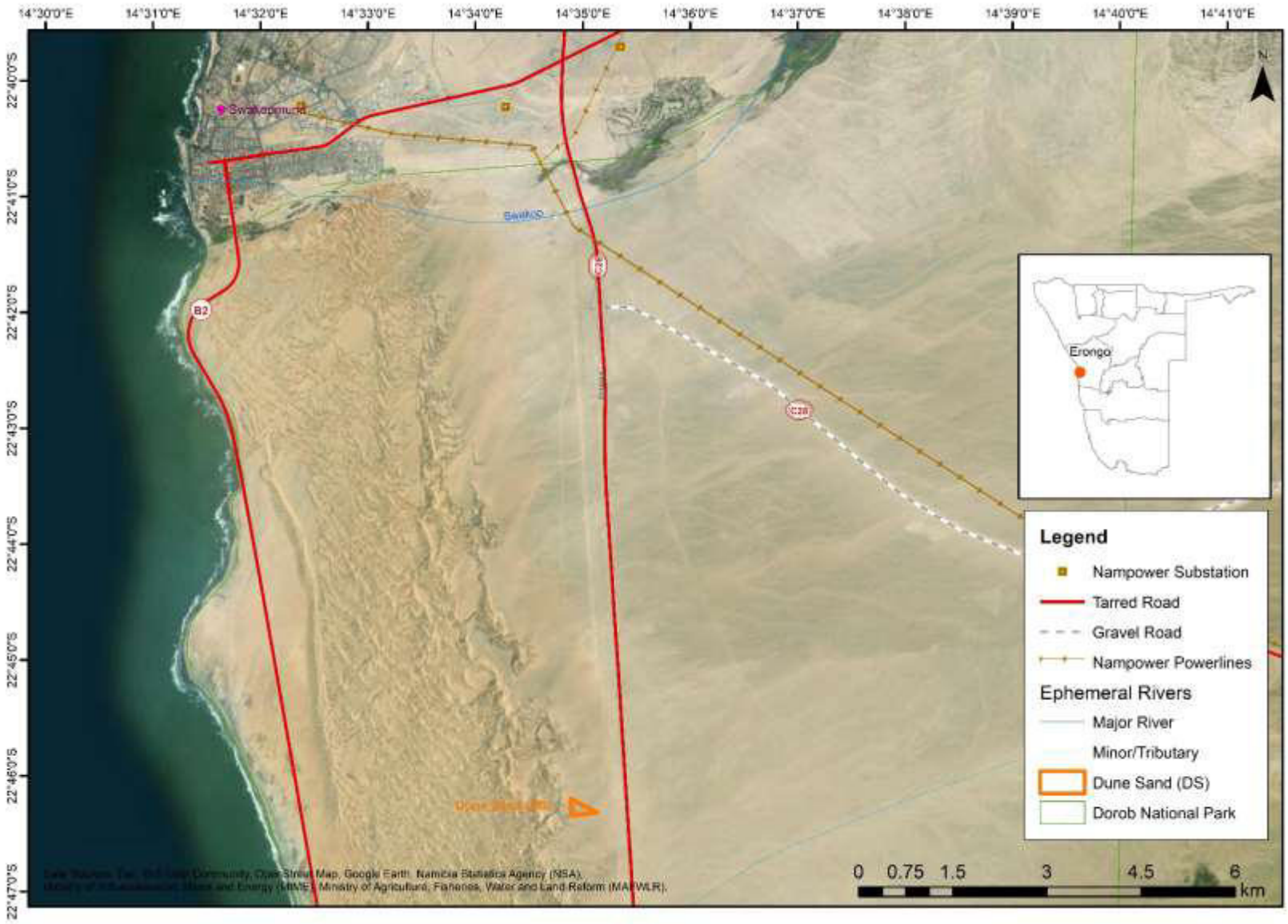

Figure 1: Locality map and infrastructure of the proposed project

3. Project Activities

3.1. Overview

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.

4. Compliance With Legal Requirements

The project is subject to national environmental and resource-use legislation. Key requirements include:

- Environmental Management Act, 2007 and EIA Regulations, 2012 – Environmental Clearance Certificate required
- Parks and Wildlife regulations applicable to Dorob National Park – Park access authorisation
- Minerals (Prospecting and Mining) Act, 1992 – Regulation of resource extraction
- Water Resources Management Act, 2013 – No abstraction proposed
- Hazardous Substances Ordinance, 1974 – Control of fuels and lubricants
- National Heritage Act, 2004 – Chance Finds Procedure

All permits and approvals must be obtained prior to commencement of activities

5. Key Environmental Risks Relevant to Management

Based on site conditions and EIA findings, the following risks require active management:

- Dust generation due to arid climate and wind conditions
- Visual disturbance within a tourism and conservation landscape
- Soil disturbance and slow natural recovery
- Uncontrolled vehicle movement and track proliferation
- Accidental spills from mobile machinery
- Inadequate rehabilitation leading to long-term scarring

No sensitive habitats, drainage lines or groundwater resources occur within the approved footprint.

6. Environmental Management Principles

To ensure sustainable exploration activities and regulatory compliance, the following environmental management principles will be adhered to:

Table 1: Project Goals and Descriptions

TERM	DESCRIPTION
Accountability and Commitment	Senior management and supervisors are responsible for ensuring the health and safety of personnel, and for preventing or minimising environmental impacts arising from borrow pit activities.
Competence	The proponent will maintain a trained and environmentally aware workforce through appropriate recruitment, induction, and ongoing training.

TERM	DESCRIPTION
Risk Assessment, Prevention and Control	Environmental risks will be identified, assessed, and prioritised so that appropriate control measures can be planned, resourced, and implemented. Prompt corrective action will be taken if impacts occur.
Performance and Evaluation	Clear environmental objectives and performance indicators will be set. Compliance with relevant laws, permit conditions, and internal standards will be monitored and reported.
Stakeholder Consultation	The proponent will maintain open communication with authorities, neighbouring land users, and other interested parties, ensuring transparency and mutual understanding.
Continual Improvement	Performance will be reviewed regularly to identify opportunities for improvement in environmental protection and social well-being.
Financial Provisions	In line with the polluter pay principle, the proponent will make the necessary financial provisions to implement and maintain the EMP, including rehabilitation obligations.

7. Environmental Performance Management

Environmental performance will be managed through routine observation, simple record keeping and immediate corrective action, appropriate to the short-term and intermittent

nature of the borrow pit operations. The objective is to ensure that environmental control remains effective during active work periods and that any emerging issues are addressed without delay.

The following performance aspects will be monitored:

7.1. Waste Management Plan

No waste storage or accumulation will be permitted within the extraction area as no site establishment or fixed facilities will occur. All personnel will follow a strict carry-in carry-out approach. Any waste generated during daily operations will be kept within operational vehicles and removed from the site at the end of each working day for disposal at approved municipal or recycling facilities. No dumping, burning, or burial of waste will be allowed, and the working area will be visually checked before demobilisation each day.

7.2. Hazardous Substances and Fuel Management Plan

No hazardous substances or fuel will be stored within the extraction footprint. All refuelling, servicing and maintenance of machinery will take place off site prior to arrival. Equipment will carry only normal operational fluids. Spill kits will be available in all operational vehicles and operators will be trained in spill response. In the event of a spill, the source will be stopped immediately, contaminated sand will be removed for disposal at an approved facility, and the incident will be recorded.

7.3. Visual Impact Mitigation

To protect the natural dune landscape and minimise visual disturbance to tourism and recreational users, all activities will remain confined to the demarcated extraction footprint and approved access routes. Operations will be kept compact and orderly, and no stockpiling or placement of materials outside the working area will occur. Disturbed sand surfaces will be progressively smoothed to match surrounding dune contours so that the area can blend naturally into the surrounding landscape through wind-driven processes.

7.4. Dust Management

Dust will be controlled through operational measures such as speed limits and work scheduling. Visible dust emissions will be checked during active operations, particularly during windy conditions. Where excessive dust is observed, activities will be adjusted or temporarily suspended until conditions improve.

7.5. Noise Management

Noise will be managed by restricting operations to daylight hours and maintaining equipment in good working condition. Noise levels will be monitored through worker observation to ensure that equipment operation does not cause unnecessary disturbance or unsafe exposure.

7.6. Soil Stability and Erosion Control

Disturbed surfaces and access routes will be inspected to confirm that soil remains stable and that no rutting, gullying or uncontrolled erosion is occurring. Where instability is observed, surfaces will be reshaped and stabilised as soon as practicable.

7.7. Emergency Preparedness and Response Plan

Emergency preparedness measures will include the presence of first aid kits, communication devices, fire extinguishers and spill response materials in operational vehicles. At least one trained first aider will be present during activities. Open flames will be prohibited. In the event of injury, fire, spill or other incident, work will stop immediately, and appropriate response procedures and emergency contacts will be activated.

7.8. Rehabilitation Performance

Rehabilitation will be implemented progressively as extraction advances. Worked sections will be smoothed and recontoured to restore natural dune surface form and texture. Temporary vehicle tracks will be softened where practicable. Final visual inspection will

confirm that disturbed areas are able to reintegrate naturally into the surrounding dune environment.

7.9. Compliance Management

Compliance with the EMP and Environmental Clearance Certificate conditions will be monitored continuously. Any non-compliance will be corrected immediately and recorded. Follow-up inspections will be undertaken to ensure that corrective actions have been effectively implemented.

7.10. Compliance and Reporting Framework

Environmental compliance will be monitored throughout the project by the designated environmental officer or responsible site supervisor. A project environmental file will be maintained and kept available for inspection by the relevant authorities. This file will include monitoring records, environmental awareness training registers, incident and corrective action records, and rehabilitation inspection reports.

Biannual compliance reports will be prepared and submitted to the Ministry of Environment, Forestry and Tourism in accordance with Environmental Clearance Certificate requirements. These reports will demonstrate the status of environmental performance, implementation of mitigation measures, and any incidents or complaints recorded during the reporting period.

Any non-conformances identified during routine inspections will require corrective action within a defined and reasonable timeframe. Serious environmental incidents or regulatory breaches will be reported immediately to the relevant authorities and appropriate response measures will be implemented.

8. Environmental Human Resources

Environmental Human Resources ensure that personnel working on the project comply with environmental regulations, safety procedures, and sustainability practices. Properly trained

and informed staff are essential to minimise impacts, maintain compliance, and implement corrective measures when necessary.

8.1. Roles and Responsibilities for Environmental Management

Table 2: Roles and Responsibilities for Environmental Management

Role	Responsibilities (Adapted for Borrow Pit Operations)
Project Manager (PM)	• Overall responsibility for EMP implementation and environmental compliance. • Allocates resources for environmental monitoring, rehabilitation, and waste management. • Appoints and supervises the Environmental Officer (EO). • Issues corrective actions and ensures compliance with regulatory conditions and the Environmental Clearance Certificate (ECC).
Contractor's Site Manager (CSM)	• Oversees daily operations including excavation, stockpiling, loading, and hauling. • Ensures borrow pit activities remain within demarcated areas. • Conducts routine inspections to identify dust, erosion, waste, or spill risks. • Enforces speed limits, safe driving, and traffic control measures. • Reports environmental risks or incidents to the EO and PM.
Environmental Officer (EO) / HSE Officer	• Monitors and enforces EMP implementation on-site. • Keeps a copy of the EMP and ECC available at the borrow pit. • Conducts daily environmental monitoring, including: – Dust control – Waste handling – Stockpile management – Noise levels – Spill prevention. • Maintains compliance registers, daily site logs, and incident reports. • Coordinates clean-up actions after spills or non-compliance events.

Role	Responsibilities (Adapted for Borrow Pit Operations)
	• Conducts toolbox talks on dust control, biodiversity protection, and safe working practices.
Environmental Control Officer (ECO)	• Conducts periodic independent site inspections to verify compliance. • Reviews weekly monitoring reports submitted by the EO. • Provides guidance on rehabilitation methods and regulatory expectations. • Reviews corrective actions and advise on updates to the EMP where necessary.
Contractors and Subcontractors	• Comply with all provisions of the EMP and environmental legislation. • Attend environmental awareness and safety training sessions. • Report incidents such as spills, wildlife encounters, or equipment leaks. • Implement best practices for waste management, dust suppression, and safe vehicle operation.

9. Environmental Training and Awareness

Environmental training and awareness are fundamental to ensuring that all personnel involved in borrow pit operations understand their responsibilities and apply environmentally responsible practices at all times. The purpose of the training programme is to ensure that every worker, contractor and subcontractor:

- Understand the environmental controls applicable to the dune sand extraction activity

- Comply with relevant environmental legislation, permit conditions and EMP requirements
- Contribute to pollution prevention and operational risk reduction
- Apply good practices in biodiversity protection, waste management and site discipline
- Are prepared to respond appropriately in the event of environmental incidents or emergencies.

9.1. Training and Induction Programme

All personnel accessing the extraction site will receive a compulsory environmental induction before commencing work. The induction will be practical and focused on the specific operational controls associated with a mobile, short duration dune sand extraction activity. Topics will include site boundaries, access control, dust management, spill response, waste removal requirements, emergency procedures and rehabilitation expectations.

9.1.1. Training Frequency

Given the short-term and intermittent nature of operations:

- Environmental induction will be conducted once per mobilisation period and for all new personnel before site access
- Refresher training will only be provided if operations extend beyond three months or if there are changes in work activities or personnel
- Toolbox talks will be conducted on an as-needed basis, particularly at mobilisation, after incidents, or during high-risk activities

Attendance registers and brief induction records will be maintained by the Site Supervisor or Environmental Officer and made available for inspection if required.

10. Monitoring and Compliance

A structured monitoring programme will be implemented to ensure compliance with mitigation measures and to identify emerging impacts. Key monitoring components include:

- **Dust levels:** Daily visual inspection during operations and increased monitoring during high wind conditions
- **Off-track driving:** Daily site inspections and weekly photographic monitoring
- **Rehabilitation progress:** Weekly assessment of disturbed versus rehabilitated areas
- **Visual condition:** Fortnightly photo-point monitoring from agreed viewpoints
- **Complaints and stakeholder queries:** Continuous logging and response within 24 hours

Monitoring will be conducted by the Site Supervisor and Environmental Control Officer, with records maintained in a monitoring register. Findings will be reported weekly during operations and summarised in monthly environmental compliance reports.

10.1. Compliance Mechanisms

Table 3: Compliance Mechanisms

Monitoring Aspect	Description of Monitoring Activities	Frequency
Air Quality and Dust Control	Visually inspect dust generated from extraction and vehicle movement within the approved footprint and access routes. Confirm implementation of speed control and suspension of work during strong winds.	Daily during operations and intensified during windy conditions
Noise Monitoring	Observe noise from loaders and haul trucks and confirm that equipment is maintained and operations are limited to daylight hours.	As required or when concerns are raised

Monitoring Aspect	Description of Monitoring Activities	Frequency
Surface Stability and Access Control	Inspect disturbed sand surfaces and access tracks for excessive rutting, compaction or unsafe conditions. Confirm that smoothing and contouring measures are implemented where necessary.	Weekly during active operations
Waste and Spill Prevention	Confirm that all waste is removed daily using a carry-in carry-out approach and that spill kits are available in operational vehicles. Verify that no fuel storage or refuelling occurs on site.	Weekly during operations
Biodiversity and Wildlife Checks	Observe the extraction footprint for disturbance to vegetation or fauna and confirm that activities remain within the demarcated area.	Periodically during operations
Health and Safety Compliance	Confirm use of appropriate PPE, adherence to traffic controls and safe working procedures. Check availability of first aid kits, fire extinguishers and communication devices.	Daily during operations
Rehabilitation Progress	Assess effectiveness of progressive smoothing and recontouring of disturbed sand surfaces to support natural wind-driven recovery.	During operations and at site closure

10.2. Reporting & Documentation

To maintain transparency and regulatory compliance, all environmental monitoring activities must be documented and reported.

Table 4: Reporting requirements

Report Type	Contents	Submission Frequency
Operational Environmental Record	Daily records of dust observations, access control inspections, waste removal confirmation, spill incidents, rehabilitation actions and corrective measures.	Maintained continuously during operations
Biannual EMP Compliance Report	Summary of monitoring results, incidents, corrective actions, stakeholder concerns and overall compliance with ECC conditions.	Twice per year to the Ministry of Environment, Forestry and Tourism
Incident and Emergency Report	Detailed account of any spill, fire, injury, significant dust event or environmental incident, including response measures implemented.	As soon as practicable after the incident
Closure Rehabilitation Record	Verification that disturbed area	

11. Mitigation Measures

The following table provides an overview of all the major environmental management aspects.

Table 5: EMP Mitigation Measures

Project Phase	Project Activity	Impact	Management Details / Mitigation Measures	Responsible Persons	Frequency
Pre-Operation	Site selection and footprint demarcation	Localised disturbance of loose sand and sparse vegetation	Restrict activities strictly to the surveyed extraction footprint. Avoid dune crests, drainage features and any sensitive habitats. Brief workers on environmental sensitivities.	Project Manager, Environmental Officer	Once-off, verify weekly
	Access using existing tracks	Surface disturbance and localised compaction	Use only existing access routes. No creation of new tracks without authorisation. Monitor for unnecessary disturbance and smooth surfaces where required.	Site Supervisor, Environmental Officer	Weekly
	Worker presence and mobilisation	Littering or minor disturbance	Implement strict carry-in carry-out waste policy. Maintain compact operational footprint and orderly site discipline.	Site Supervisor	During mobilisation

Project Phase	Project Activity	Impact	Management Details / Mitigation Measures	Responsible Persons	Frequency
	Temporary presence of machinery	Visual disturbance	Keep equipment clustered within demarcated working area. Avoid positioning machinery on prominent dune features.	Site Supervisor	During mobilisation
Operation	Surface skimming of dune sand	Temporary disturbance of dune morphology and vegetation	Restrict extraction to interdune areas and gentle dune flanks. Maintain shallow working surfaces and natural dune profiles.	Site Supervisor, Environmental Officer	Daily
	Movement of machinery and trucks	Sand compaction and disturbance	Limit vehicle movement to operational area. Avoid unnecessary driving and turning. Smooth disturbed areas progressively.	Site Supervisor	Daily
	Extraction and loading activities	Dust generation	Maintain low vehicle speeds. Suspend work during strong wind conditions. Provide PPE to exposed workers.	Site Supervisor, Environmental Officer	Daily
	Operation of machinery	Noise disturbance	Restrict activities to daylight hours. Maintain equipment in good condition to minimise excessive noise.	Site Supervisor	As required
	Interaction with tourism users	Perceived visual and nuisance impacts	Maintain orderly and compact operations. Avoid unnecessary activity near	Project Manager, Environmental Officer	Ongoing

Project Phase	Project Activity	Impact	Management Details / Mitigation Measures	Responsible Persons	Frequency
			commonly used recreational areas.		
	Worker activities	Waste generation and minor pollution risk	Ensure all waste is removed daily from site. No burning, burial or on-site storage permitted.	Site Supervisor	Daily
	Hydrocarbon use in machinery	Soil contamination risk	No fuel storage or refuelling on site. Carry spill kits in vehicles. Immediately contain and remove contaminated sand if spills occur.	Site Supervisor, Environmental Officer	Daily
	Progressive working of extraction sections	Extended surface disturbance	Smooth and recontour disturbed sand surfaces as extraction advances to support natural wind-driven recovery.	Site Supervisor	Ongoing
Rehabilitation and Closure	Final surface shaping	Residual surface disturbance	Smooth and contour disturbed areas to match surrounding dune morphology. Avoid steep edges or artificial depressions.	Site Supervisor, Environmental Officer	At closure

Project Phase	Project Activity	Impact	Management Details / Mitigation Measures	Responsible Persons	Frequency
	Removal of machinery and waste	Visual disturbance and site contamination	Remove all equipment, materials and waste from the site. Conduct final inspection to confirm clean closure.	Environmental Officer	Once-off
	Natural aeolian restoration	Temporary alteration of surface texture	Allow natural wind processes to redistribute sand and restore surface conditions. Limit post-closure vehicle access.	Environmental Officer	Post-closure monitoring
All Phases	Environmental compliance	Non-compliance with permit conditions	Maintain environmental records, conduct routine inspections and implement corrective actions where required.	Environmental Officer, Project Manager	Ongoing
	Heritage protection	Disturbance of unknown heritage resources	Apply Chance Finds Procedure. Stop work immediately and notify relevant authority if artefacts are discovered.	Environmental Officer	As required
	Stakeholder interaction	Concerns from tourism or other land users	Maintain communication with stakeholders and respond to concerns. Manage dust and operational boundaries to minimise disturbance.	Project Manager	Ongoing

11.1. Cumulative Impacts

Cumulative impacts were considered in relation to existing and potential future sand extraction activities within the wider Swakopmund–Dorob coastal dune system. Although individual dune sand surface skimming operations are generally small in scale, temporary in nature and spatially confined, cumulative effects may arise over time through incremental disturbance of dune surfaces, increased dust along shared access routes and temporary visual intrusion within a sensitive desert landscape.

While cumulative environmental change cannot be addressed by a single project alone, the mitigation measures presented in Table 5 have been designed to minimise the project's contribution to broader environmental pressures. These measures include strict limitation of all activities to the approved extraction footprint, exclusive use of existing access tracks, control of vehicle speeds and dust emissions, avoidance of unnecessary vehicle movement, implementation of progressive surface smoothing and rehabilitation, and ongoing communication with park authorities, neighbouring land users and tourism stakeholders.

Effective implementation of these measures will ensure that the project's incremental contribution to cumulative impacts remains localised, low in significance and largely reversible through natural wind-driven sand redistribution processes. The activity is therefore not expected to undermine the conservation value, landscape character or tourism appeal of Dorob National Park when managed in accordance with the Environmental Management Plan.

12. Rehabilitation

Rehabilitation is a key requirement of this Environmental Management Plan. Because the proposed activity involves shallow surface skimming of loose dune sand and temporary disturbance, rehabilitation will focus on restoring natural dune surface form and allowing natural wind driven processes to facilitate recovery. Rehabilitation will commence early, continue progressively during operations and be completed at closure to prevent long term environmental degradation.

12.1. **Rehabilitation Measures**

12.2. Pre-Operation

Prior to commencement of extraction activities:

- Select the extraction footprint within interdune areas or lower dune flanks where vegetation cover is sparse and environmental sensitivity is low
- Avoid dune crests, drainage features, quartz patches with specialised flora and any observed lichen fields
- Clearly demarcate operational boundaries to prevent unnecessary disturbance outside the approved working areaBefore excavation begins:

12.3. During Extraction Operations

During active surface skimming and hauling:

- Work in defined sections to limit the extent of exposed disturbed sand at any one time
- Maintain shallow and even working surfaces to preserve natural dune morphology
- Smooth and recontour disturbed areas progressively as extraction advances
- Limit unnecessary vehicle movement and avoid surface compaction outside the operational footprint
- Control dust through operational measures such as speed reduction and suspension of work during strong winds
- Ensure all waste is removed daily using a carry in carry out approach
- Immediately address any localised surface instability by reshaping affected areas

12.4. Post-Operation (Closure Phase)

Upon completion of extraction activities:

- Smooth and re shape disturbed sand surfaces to blend with surrounding dune contours

- Remove all machinery, equipment, materials and waste from the site
- Soften temporary vehicle tracks where practicable to reduce visual disturbance
- Allow natural aeolian processes to redistribute sand and restore surface texture
- Conduct a final environmental inspection to confirm that the site is safe, stable and capable of natural recovery

13. Conclusion

This Environmental Management Plan provides a comprehensive framework for implementing the dune sand surface extraction activity in a responsible and environmentally sustainable manner. The EMP guides all project phases from site preparation through operation and final rehabilitation, ensuring that environmental risks are effectively minimised and managed.

Key commitments include:

- Compliance with the Environmental Management Act and all Environmental Clearance Certificate conditions
- Prevention of pollution and responsible use of natural resources
- Implementation of operational controls for dust management, biodiversity protection, waste removal and spill response
- Ongoing communication with relevant stakeholders and authorities
- Regular environmental monitoring and reporting to support adaptive management Progressive rehabilitation to restore disturbed areas to a stable and natural condition

Successful implementation of the EMP depends on coordinated action by the proponent, contractors, site supervisors and environmental personnel. The EMP will remain a dynamic management tool and may be refined if operational conditions change or new environmental information becomes available.

Through adherence to this EMP, the project can proceed with low and largely reversible environmental impacts while supporting regional infrastructure development needs.