Tortoise Environmental Consultants(TEC)
One Step @ a time

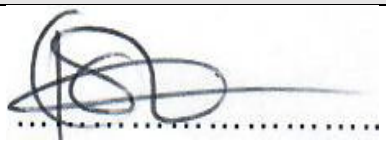
VAT Number: 5728293015
Company Reg: cc/2012/2523

ENVIRONMENTAL MANAGEMENT PLAN

FOR THE APPLICATION FOR AN ENVIRONMENTAL CLEARANCE CERTIFICATE FOR THE PROPOSED CONSTRUCTION OF EARTH DAMS, OSHANA REGION

DECEMBER 2023

+264 61 225 776 / +264 811 220 114
info@tec.com.na / www.tec.com.na
P.O.Box 35473, Kleine Kuppe, Windhoek
Unit 17, No. 40, Berg Street, Klein Windhoek, Windhoek, Namibia

DOCUMENT INFORMATION		
Title	Environmental Scoping and Environmental Management Plan for the proposed construction of earth dams in Oshana region	
ECC Application Reference number	APP-002393	
Listed Activity	**ACTIVITY 8: Water Resource Development:** • 8.5 Construction of dams, reservoirs, levees and weirs. • 8.8 Construction and other activities in water courses within flood lines. • 8.9 Construction and other activities within a catchment area.	
Location	Oshana Region	
Proponent	Oshana Regional Council Private Bag 5543, Oshakati	
Author:	**Signature**	**Date**
Mr. Ipeinge Mundjulu (EAP)[1]		04 December 2023
Reviewer: Mr. Jonas Heita (EAP)		04 December 2023
Copy Right: *"This document is the intellectual property of TEC and may only be used for the intended purpose. Unauthorized use, duplication, plagiarism or copying without referencing is prohibited"*		

1 EAP – Environmental Assessment Practitioner

TABLE OF CONTENTS

List of figures

List of tables

ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
ECC	Environmental Clearance Certificate
ECO	Environmental Compliance Officer
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
ESMP	Environmental Social Management Plan
GHG	Green House Gases
HIV	Human Immune Virus
MEFT	Ministry of Environment Forestry and Tourism
ORC	Oshana Regional Council
PPE	Personal Protective Equipment
SM	Site Manager

EXECUTIVE SUMMARY

The Environmental Scoping and Environmental Management Plan (EMP) presented herein pertains the proposed construction of earth dams in Oshana region, Namibia. Initiated by the Oshana Regional Council (ORC), this project aims to address the acute water scarcity in Namibia, aligned with the country's fundamental developmental goals outlined in the 5th National Development Plan (NDP5). With the severe climatic conditions characterized by limited rainfall and high evaporation rates, the construction of earth dams emerges as a strategic solution to enhance water harvesting for sustainable rural development.

This project is a listed activity mandatorily requiring an Environmental Clearance Certificate (ECC) under the Environmental Management Act of 2007 (EMA), complies with regulatory obligations and necessitates a robust Environmental Impact Assessment (EIA) to delineate potential impacts and mitigation strategies. The document particularly outlines the administrative, policy, and regulatory framework guiding the project, ensuring adherence to environmental preservation and sustainable resource utilization.

The Environmental Management Plan (EMP) outlines a comprehensive risk strategy, enlisting roles and responsibilities for effective implementation. The EMP, binding as per EMA provisions, emphasizes compliance, necessitating strict adherence to mitigate environmental impacts. Furthermore, the Environmental Social Management Plan (ESMP) embedded within the EMP outlines critical activities, objectives, proposed mitigation measures, and monitoring indicators. This encompasses aspects related to staff awareness, community engagement, health and safety, waste management, and biodiversity conservation.

Crucially, the Closure and Rehabilitation Plan clarifies the phased approach for site rehabilitation post-resource extraction, ensuring progressive rehabilitation to mitigate environmental hazards, safeguarding against soil erosion, and preserving biodiversity.

1. INTRODUCTION

1.1.Proponent

The project proponent is Oshana Regional Council (ORC). ORC was established with effect from 31 August 1992 under Section 2(1) of the Regional Councils Act, 1992 (Act of 1992). Its mandate is to plan, administer and manage the socio-economic development of Oshana region.

1.2.Location

The dams will be constructed in Oshana region where one (1) dam will be constructed in each constituency Table 1 below

Table 1. Location of Earth Dams in Oshana Region

No.	Constituency	Site	Locations	Water Project Name / Discription	GPS coordinates	
					Longitude	Latitude
1	Uuvudhiya	A	Yinakulu yOmadhiya	Ondombe yomeya Omatoye	15.74636	-18.19458
		B	Oshaaleshoonime	Omupopo gwOmakilikili	15.68287	-18.31492
2	Ompundja	A	Iilunga Yeepa	Iilunga Yeepa Eath Dm	15.51949	-18.04103
		B	Mulunga		15.59216	-18.07096
3	Okatana	A	Andambo Mbali (Growth Centre)	Iitula Eath Dam	15.49712	-17.91739
		B	Oupumako & Omusheshe border	Ondombe yaNdjafa at Ohendjele No1	15.77527	-17.67913
4	Ondangwa Urban	A	Enkono Village	Ondangwa Youth Gardern	15.95067	-17.89640
		B	Onatsi 3 Village	Ekango Lyapya Earth Dam	15.93577	-17.93491
5	Ondangwa Rural	A	Omagongati No1 Village	Excavation of Earth Dam	15.82355	-17.86326
		B	Amusa Village	Excavation of Earth Dam	15.90834	-17.92249
6	Ongwediva	A	Oikango No1	Excavation of Earth Dam	15.82561	-17.77015
		B	Ehafo	Excavation of Earth Dam	15.89585	-17.81722
7	Oshakati West	A	Okaukamasheshe	Negumbo Ashilufu Earth Dam	15.55879	-17.86506
		B	Okamule Village	Oshana Shapemba Earthh Dam	15.66142	-17.89491
8	Oshakati East	A	Oshatumba Village	Excavation of Onagolo Earth Dam	15.71204	-17.9209
		B	Oshipumbu Village	Excavation of Olutha lwombiga Earth Dam	15.75262	-17.92052
9	Okaku	A	Oshikondiilongo Centre	Excavation of Oshikondiilongo Earth Dam	15.92429	-17.73756
		B		Excavation of Onyeka Earth Dam	15.98917	-17.69981
10	Uukwiyuushona	A	Omukandu Village	Excavation of Omukandu Earth Dam	15.87199	-18.04713
		B	Ehafo Village	Excavation of Ehafo Earth Dam	15.81067	-17.97496
11	Okatjali	A	Okuma	Excavation of Ehafo Earth Dam	15.95743	-18.47593
		B	Okatjali	Excavation of Okatjali Earth Dam	15.9602	-18.06905

2. REGULATORY REQUIREMENTS

The proposed construction of earth dams is a listed activity under Section 27 (2) of the Environmental Management Act 2007 (Act No 7 of 2007) (EMA) that may not be under taken without an Environmental Clearance Certificate (ECC) and its outlined in the Environmental Impact Assessment regulation as follows;

- 8.5 Construction of dams, reservoirs, levees and weirs.
- 8.8 Construction and other activities in water courses within flood lines.
- 8.9 Construction and other activities within a catchment area.

Accordingly, the EMA obliges Oshana Regional Council (ORC) to obtain an ECC for their proposed construction of earth dams. Against this statutory requirement, ORC appointed Tortoise Environmental Consultants Consulting CC to undertake an environmental impact assessment and develop an Environmental Management Plan (EMP) for the project.

3. PROJECT NEEDS AND DESIRABILITY

Namibia is the driest country in southern Africa. The country's climatic condition is characterized by high temperatures and periodic low rainfall. The country experiences high climatic variability in the form of persistent droughts, unpredictable and highly variable rainfall patterns, temperatures, and scarcity of water. High solar radiation, low humidity and high temperatures lead to very high evaporation rates, about five times greater than the average rainfall. Lack of water is one of the key limitation factors to Namibia's development.

Government has prioritised the construction of earth-dams for water harvesting. The 5th National Development Plan's (NDP5) Water strategies and Desired outcomes for the period 2017-2022 aims to amongst other "*maintain the current water infrastructure (Calueque-Oshakati and Etaka Canal Water Supply upgrade, up-grade and construct large earth dams (water harvesting for the rural areas and refurbish boreholes)"*. Thus water harvesting in a high priority.

4. ADMINISTRATIVE, POLICY AND REGULATORY FRAMEWORK

Table 2. Policy, legal and administrative framework policy

Legislation	Summary	Applicability to Assessment
The Namibian Constitution	The State shall actively promote and maintain the welfare of the people by adopting policies aimed at … The maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future	Protection of the environment and biodiversity
Environmental Management Act No. 7 of 2007	This act aims to promote the sustainable management of the environment and the use of natural resources and to provides for a process of assessment and control of activities which may have significant effects on the environment; and to provide for incidental matters	The acts provides a list of activities that may not be undertake without an environmental clearance certificate to prevent environmental damages
Draft Pollution Control and Waste Management Bill	This Bill serves to regulate and prevent the discharge of pollutants to air and water as well as providing for general waste management	To protect the Environment from possible hydrocarbons and oil leaks from the machinery and vehicles
Environmental Policy framework (1995)	This policy subjects all developments and project to environmental assessment and provides guideline for the Environmental Assessment.	Consideration of all possible impacts and incorporate them in the development stages
The Occupational Safety and Health Act No. 11 of 2007	Promotes the Safety and Health of employees at the work place	Employees subjected to noise and dust

Legislation	Summary	Applicability to Assessment
Public Health Act No. 36 of 1919	To Protect the public from nuisance and states that no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health.	Application of proper mitigation measure to noise and dust
Labour Act No. 11 of 2007	This Act outlines the labour laws which encompass protection and safety of employees at work.	This project will require labour during its operational stage and decommissioning stage.
Water Act No, 54 of 1956	All water resources belongs to the State. It prevents pollution and promotes the sustainable utilization of the resource	Prevention of discharging contaminated water at unauthorised places
Soil Conservation Act No. 76 of 1969	To promotes the conservation of soil, prevention of soil erosion	Uncontrolled movement of heavy vehicles and truck at areas surrounding the site may cause land degradation
Water Resource Management Act No.11 of 2011	The Act stipulates the prevention of both Surface and Ground water sources.	Oil spillage coming from brick making machines and transporting vehicles need to minimised to avoid water contamination.
Public Health Act no. 36 of 1919	The Act gives provision for the protection for the health of all people.	The noise and dust level emanating from the project could affect the surrounding community.

Legislation	Summary	Applicability to Assessment
National Heritage Act No.27 of 2004	The Act gives provision of the protection and conservation of places and objects with heritage significance.	To ensure preservation of heritage resources
Local Authority Act No. 23 of 1992 Government Notice of No.116 of 1992.	This Act underlines the duties and functions of the	All stakeholders affected by the operations of the project have been informed of the developments including that of undertaking the EIA.

5. PROJECT DESCRIPTION

5.1. Earth Dam Engineering Designs

All earth dams will have the same design (Fig 2). The dams will be 3.7m deep with a compacted slope fall of 1:3 (Figure 3).

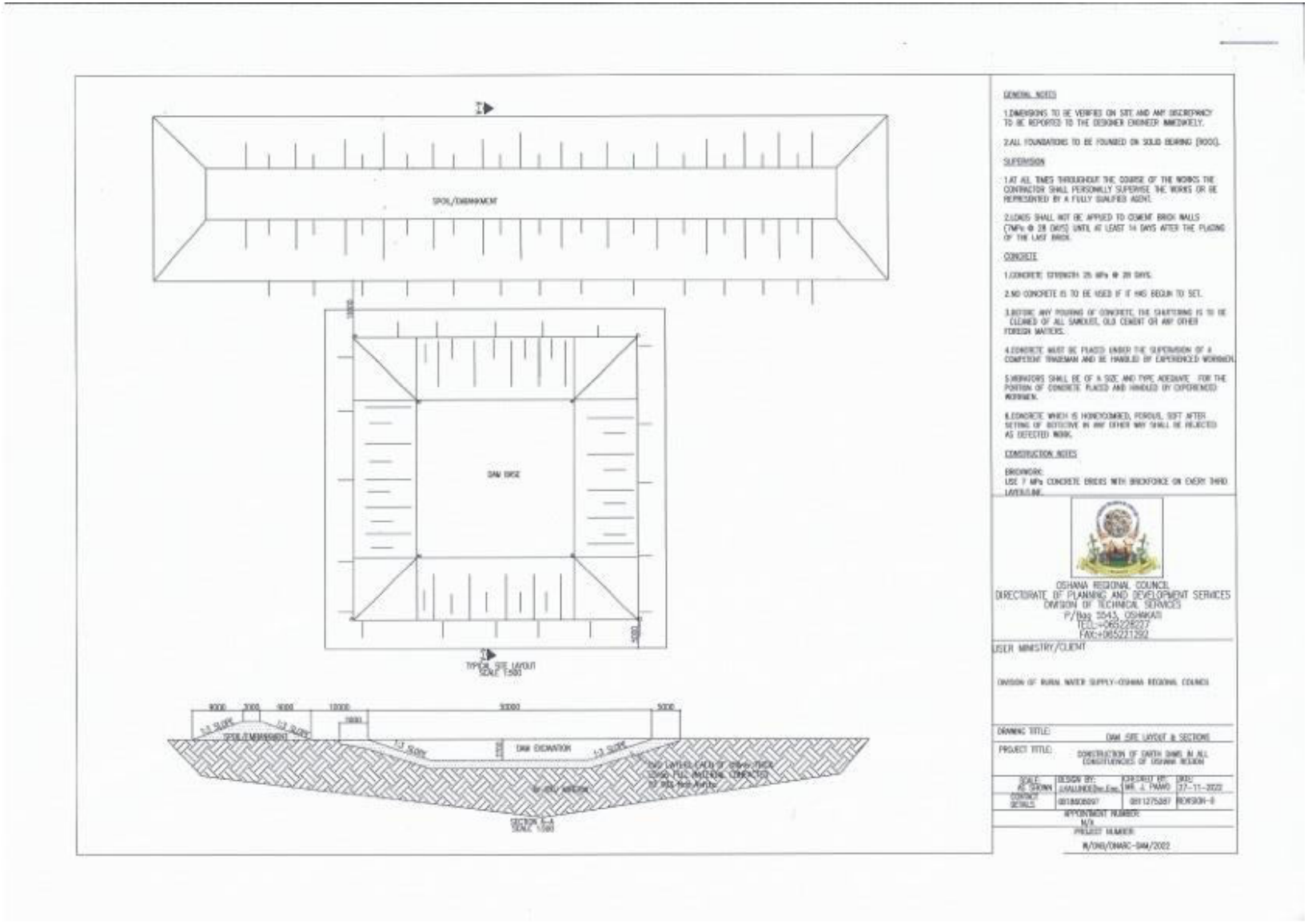


Figure 1. Earth Dam design

Figure 2. Illustration of the 1:3 slope fall

1. Overall, the earth dams will be constructed as per the following guidelines;
   i. The walls will be trimmed to a slope of 1:3 and compacted. This slope enables smooth water run-off that prevents rilly erosion and reduce risk of wall collapse.
   ii. The base will be compacted to achieve high degree of impermeability that will prevent water loss through leaching.
   iii. The mouth of the dam will face the drainage direction to enable smooth inflows.
   iv. A permanent drainage structure, such as rock buttress (Figure 4) will be constructed to enhance smooth inflows which will not cause soil erosion and formation of gullies.
   v. A shallow entry point will be constructed for safe water collection and an entry point for animals.

Figure 3. Rock buttress illustration

5.2.Digging, Excavation, Transportation, and compaction

An Excavator will be used to dig and load the sand on the tipping trucks. In some instance, front loader would be used to load the sand. The tipper trucks will be used for transporting sand. Rollers and compacter will be used to compact the walls and the base of the dam to create an impermeable layer that will prevent losing of water through leaching as well the compacting the ridges to withstand soil erosion from run offs.

6. DESCRIPTION OF THE AFFECTED ENVIRONMENT

6.1. Climate

Oshana is one of the warmest regions in Namibia with average daily maximum temperatures of 33°C. It falls within a zone characterized by the highest solar radiation, measuring between 6.2-6.4 kWh/m3/day, primarily due to the region's elevated position in north-central Namibia (TEC, 2023). Classified as semi-arid, Oshana receives an average annual rainfall ranging from 300 to 450mm. However, rainfall in this region is notably erratic, leading to both occasional floods and frequent droughts in recent times. The period between 2013 to 2016 marked one of the most severe droughts of the past decade, significantly impacting food security (TEC, 2023).

6.2. Geology and soil

The area displays a predominantly flat terrain, lacking mountain ranges or deep canyons. Its soil composition belongs to the Kalahari Group, consisting of deposits comprising sands, clays, and calcretes, as identified by Mendelsohn et al. (2003). This particular soil type exhibits low fertility owing to its limited capacity to retain nutrients, consequently resulting in restricted potential for cultivating crops (TEC, 2023). To enhance the fertility of such soil, the common practice involves the application of fertilizers or manure to enhance crop production.

6.3. Topography and Hydrology

The northern central of Namibia is referred to as the Cuvelai-Etosha Basin. A significant portion of the region boasts an exceptionally level landscape, gradually descending from an elevation of approximately 1150 meters above sea level. The expansive Cuvelai wetland spans from southern Angola into the north-central parts of Namibia, ultimately ending at the Etosha Pan, which serves as the lowest point for the water drainage network within this basin (Green Gain Consultants, 2021).

There are no perennial rivers in Oshana, “iishana” are the main surface water sources. These water channels remain dry for most of the year but are susceptible to significant flooding (efundja) during the rainy season, largely attributed to the region's flat topography, as noted by TEC (2023). The flooding is not solely a result of local rainfall; it also stems from substantial rainfall in higher rainfall zones upstream in Angola.

6.4. Biodiversity

The proposed sites are in flood plains with mainly glass and not trees. Some sites are silted, old earth dam or natural ponds with no biodiversity. Land use in communal area is mainly for communal farming which involves farming with domestic animals such as Goats, Cattle and Donkeys and cultivating Omahangu crops. Thus, the impact of the project on biodiversity is negligible.

6.4.1. Flora

The presence and varieties of plants within a region are shaped by the soil type, geological features, and the prevailing rainfall patterns. In Oshana, the vegetation biome predominantly falls under the Tree-and-shrub Savannah category, characterized by the Cuvelai drainage and Mopane shrubland. However, the northern areas of Oshana exhibit notably low plant biomass production. This region's vegetation also suffers degradation due to its dense population concentration and widespread subsistence farming practices.
Several species of plants occurring in Oshana are categorised as Protected Plant species of Namibia. Amongst these include:

- *Colophospermum mopane* (Omusati)
- *Berchemia discolor (*Bird plum, Eembe*)*
- *Acacia erioloba (*Camethorn, Omuthiya*)*
- *Ziziphus mucronate (*Omusheshete*)*
- *Diospyros mespiliformis (*Jackalberry, Eenyandi*)*
- *Sclerocarya birrea (*Marula, Omugongo*)*
- *Hyphaene petersiana (*Makalani palm, Omulunga*)*
- *Commpiphora Africana (*Hairy corkwood*)*
- *Devil's claw (*omalyata*)*

6.4.2. Fauna

The local fauna primarily consists of domestic animals like cattle, sheep, goats, and donkeys. Additionally, there's a seasonal presence of freshwater fish, frogs, reptiles, various bird species, and numerous aquatic animals that often emerge during the rainy seasons.

7. THE ENVIRONMENTAL MANAGEMENT PLAN

7.1. Purpose of the EMP

This Environmental Management Plan (EMP) is a risk strategy that contains logical framework, monitoring programs, mitigation measures, and management control strategies to minimize potential environmental impacts to insignificant level. It further stipulates the roles and responsibility of persons involved in the project.

7.2. Compliance To the EMP

This EMP is a legally binding document as given under the provisions of the Environmental Management Act, 2007 (Act No. 7 of 2007). The project proponent and its contractors must therefore adhere to the framework of this document.

8. ROLES & RESPONSIBILITIES

8.1. Environmental Compliance Officer (ECO)

This is an individual that represent the governing authority (MEFT). Depending on his/her work schedule, the ECO shall visit the site at any time for environmental inspection and monitoring.

8.2. The Proponent

Oshana RC hereinafter as the "proponent" shall assume overall responsibility to ensure full implementation of the EMP.
Further the proponent must ensure to;

- Appoint a site Manager
- Ensuring that all workers are inducted on safety
- Safer working environment
- Provide workers with Personal Protective Clothing
- Monitor the employees works with regard to safety
- Ensure employees understand the guidelines of the Environmental Management Plan (EMP)
- Ensure the environment is protected and
- Maintain healthy relationship with the neighbours

8.3. Site Manager (SM)

The Site Manager will be responsible for the monitoring of daily operations and ensure adequate adherence to the EMP. The Site Manager should ensure that a copy of the EMP is

available at project premises at all times. Further, an induction should be conducted with all employees and be made understand the provision of this EMP.

8.4.Employees

- Adhere to the EMP
- Ensure to wear personal protective clothing at all time when working
- Report worn out PPE and request for replacement
- Adhere to the Company rules and policies

8.5.Disciplinary Action

The EMP is a legally binding document. Non-compliance to the EMP may result in punitive measure to be taken against the proponent such as;

- Legal action, fines, and/or
- Suspension of work (Through issuance of compliance order as per the EMA),
- Financial penalties.

9. THE ENVIRONMENTAL SOCIAL MANAGEMENT PLAN (ESMP) TABLE

The EMP is developed to address critical activities involved in water resource development construction activities. The construction of earth dams involves land clearing, removal of top soil, digging, excavation and pilling of sand.

Environmental / Social Impact	Objective	Proposes Mitigation Measures	Monitoring Indicator	Party responsible
Conversant with the EMP	To ensure that all staff / employees are familiar with the requirements of the EMP	1. All employees must attended a comprehensive induction course of health and safety 2. The EMP must be well explained to employees. 3. Staff operating specialised equipment and heavy vehicle must be properly trained and informed of the potential risks associated with their tasks	Induction Minutes and Attendance Register, Signed by each and every staff member Training certificate for machine operators	Management or Site Manager
	Disciplinary	1. Company must adopt a disciplinary system to discipline staff for non-compliance with the EMP, such as driving heavy vehicle indiscriminately outside demarcated areas.	Disciplinary meetings and actions	Management or Site Manager
	Availability of the EMP on site for ease of reference	1. Ensure that a copy of the EMP is kept on site and accessible	Physical view of the EMP	Management or Site Manager
Site Demarcation	All project activities, movement of vehicles must	1. Securely fence off the area to control movement of vehicles as well as to restrict animal access	Visible Fence	Management or Site Manager

Environmental / Social Impact	Objective	Proposes Mitigation Measures	Monitoring Indicator	Party responsible
	coordinated and be within the site			
Communication	To ensure effective communication throughout	1. Develop a communication strategy 2. Correspondences must be in writing 3. The contact numbers for the Site Manager must be available and displayed onsite in case of emergencies.	Communication Strategy Letters, e-mail, Notices, Minutes	Management or Site Manager
Environmental / Social Impact	Objectives	Proposed Mitigation Measures	Monitoring Indicator	Party Responsible

Environmental / Social Impact	Objective	Proposes Mitigation Measures	Monitoring Indicator	Party responsible
Employment opportunities for Locals	Promote benefits to the local community	1. Recruit locals for unskilled labour 2. Keep good working relation in accordance with the law	Employee structure and proportion of local employment	Management or Site Manager
HIV / AIDS	Provide HIV / AIDS awareness to employees	1. Provide HIV / AIDS awareness at induction 2. Avail Condoms at site	Availability of condoms at construction site	Management or Site Manager
Alcohol and Drug use	Prevent alcohol and drug use at the site	1. Ban and warn the employees against the use of alcohol and drug at work 2. Provide awareness on the dangers and health impacts of alcohol and drug use 3. All employees must be screened with the breathalyser to avoid intoxicated personnel on site	Drunk / Misbehaving employees Breathalyser report Monitor presence of alcohol at the construction site	Management or Site Manager

Environmental / Social Impact	Objective	Proposes Mitigation Measures	Monitoring Indicator	Party responsible
Security	Orientation of workers about security for equipment and themselves	1. Orientate all staff about the security of equipment and themselves & provide contact numbers for Police and other emergency services e.g. Ambulance	Proof of security orientation and emergency contact numbers	Management or Site Manager

Environmental Social Impact	Objective	Proposed Mitigation Measures	Monitoring Indicator	Party responsible
Health and Safety	Ensure safety of workers	1. Develop a Health and safety Plan 2. Occupational health and safety measures must be implemented in accordance to the Health and Safety Regulations Government Notice 156/1997 (GG 1617) and other relevant laws and legislation 3. Train employees on personal safety and how to handle equipment and machinery 4. Provide protective eye glasses, dust masks and ear muffs to all employees operating in a dusty or noisy environment 5. Provide sufficient fire extinguishers and train staff on how to use them and their applications thereof and must be well inspected at all time 6. Provide an adequate first aid kid to well-trained employees 7. No employees must be exposed to noise levels above the 85dB (A) limit over a period of 8 hours.	Health and Safety included and reflected in the Induction Minutes Adequate protective gear for all staff Availability of fire extinguishers and evidence training (e.g. minutes, training pictures etc. Availability of the first aid kit onsite	Management or Site Manager

Environmental Social Impact	Objective	Proposed Mitigation Measures	Monitoring Indicator	Party responsible
		8. Should the noise level be higher than 85dB (A), the employer must implement a hearing conservation program such noise monitoring, and a four hour shift 9. Supply safe drinking water 10. Provide an ablution facility on site	Mobile Toilet on site	
Community Health and Safety Dust		1. Avoid operation during strong windy times 2. Trucks transporting sand must be covered during transportation 3. Use dust suppression measures such as water spraying to mitigate dust impacts. 4. Adhere to the Labour act, non-toxic human dust exposure levels may not exceed 5mg/m3 for respiratory dust and 15mg/m3 for total dust. 5. Avoid working during extreme windy times 6. Avoid unnecessary movement of vehicles on site	Records of community complaints Accident records	Management or Site Manager

Environmental Social Impact	Objective	Proposed Mitigation Measures	Monitoring Indicator	Party responsible
Safety		7. Keep records of complaints to monitor community dissatisfaction 8. Operation must be limited to day hours only, from 05H00-18H00 9. Adequate safety signs must be put at designated places.		

Environmental / Social Impact	Objective	Proposed Mitigation Measures	Monitoring Indicator	Party Responsible
Vehicle emissions	Reduce greenhouse gas (GHG) emissions from worn out equipment / vehicles / machinery	1. All vehicles and equipment must be kept in good working condition and serviced frequently to prevent leakage and emission of poisonous smoke etc. 2. Switch off engines when vehicle is not operations	Vehicle servicing records Reports of smoke emissions from machinery	Management or Site Manager
Oil Leakages	Manage hydrocarbons, oils and lubricants leakages from construction vehicles and machinery to prevent pollution	1. Servicing of vehicles must be at designated site 2. Soils contaminated with grease, oils and hydrocarbons must be collected and disposed of at approved site; 3. Vehicle must be well serviced to prevent oil leakages 4. All stationary vehicles and machinery must have drip trays under to collect oils and lubricant leakages 5. If fuelling is to be done on site, it must be done at designated place with a proper structure that would prevent spillage to the ground	Physical verification and routine monitoring	Management or Site Manager

Environmental / Social Impact	Objective	Proposed Mitigation Measures	Monitoring Indicator	Party Responsible
		6. If an oil leak occur, collect the contaminated soil, store in appropriate container and dispose of at appropriate waste disposal site		
Solid Waste	To manage solid waste To prevent littering, pollution, contamination of water and general environmental health hazards	1. Domestic Waste (Litter – cans, plastics, tissue, plastics etc.) must be disposed of at an appropriate site. 2. No onsite burying, dumping or burning of waste material shall be permitted.	Scattered waste, Littering and any other unsightly waste at the site (eyesore)	Management or Site Manager

Environmental / Social Impact	Objective	Proposed Mitigation Measure	Monitoring Indicator	Party responsible
Water	To avoid possible water contamination	1. Contaminated soils must be removed immediately and stored at a bunded designated area and only be disposed of at the approved dumpsite. 2. No washing of vehicles and machinery on site 3. Vehicle must be well serviced to prevent oil leakages	Visual inspection	Management or Site Manager

Environmental / Social Impact	Objective	Proposed Mitigation Measure	Monitoring Indicator	Party responsible
		4. All stationary vehicles and machinery must have drip trays under to collect oils and lubricant leakages 5. If fuelling is to be done on site, it must be done at designated place with a proper structure that would prevent spillage to the ground		
Land Degradation **Soil Erosion**	To prevent soil degradation and erosion	1. Movement of heavy vehicles must be coordinated and restricted to be within the site and on access roads 2. Continuous rehabilitation of the burrow pit must be conducted by proper profiling and smoothing of the slopes to be less than 1 to 3 to improve slope safety by allowing easy access of animals into the pit (after use) and to allow smooth runoff of storm water hence preventing soil erosion.	Visual Monitoring	Management or Site Manager

Environmental / Social Impact	Objective	Proposed Mitigation Measure	Monitoring Indicator	Party responsible
Biodiversity **Flora** **Fauna**	To protect trees	1. Vehicles movement must be confined within the construction site premises and on access roads only 2. Tree and bushes that are nesting places for the birds must not be cut down. (This would not be necessary as the area is does not have nesting places) 3. The area must be fenced off adequately to prevent animals from accessing the pit during operation 4. Bigger tree that are on Site must not be cut down 5. Do not plant alien trees	Inspection report	Management or Site Manager

Aspect	Objective	Action Required	Monitoring Indicator	Party responsible
Heritage Resources / artefacts	To preserve archaeological and heritage materials	1. Workers must be go through an induction course of the possible archaeological find possible in the area 2. Establish a "Chance Find Procedure" where if any archaeological finding (Heritage, human remains or artefacts) during site activities is encountered; a. The activity must be stopped immediately and the operation manager of that activity be informed b. The manager must oversee the cordoning off the area with a danger tape and take appropriate records and picture c. The manager must immediately report the findings to the National Museum (+264 61 276800) or	Sighting report/s of heritage resources / artefacts	Management or Site Manager

Aspect	Objective	Action Required	Monitoring Indicator	Party responsible
		the National Forensic Laboratory (+264 61 240461). 3. No artefacts must be removed or be interfered with prior to authorisation from the Namibian National Heritage Council (NNHC)		

10.CLOSURE AND REHABILITATION PLAN

The closure of an earth dam can be triggered by factors such as structural instability, safety concerns, changes in land usage, or the end of the dam's intended purpose., hence a need for a closure plan. A closure plan is a detailed document that forms part of the Environmental Management Plan. This plan is a guiding framework for the provisions of rehabilitation and for long term management and monitoring and maintenance of the pit. The closure plan for this project was formulated through the consideration of closure objectives and the implementation of proposed mitigation measure for identified risks. As explained in the earlier, it is recommended that the rehabilitation process must be progressive, which considers rehabilitation at depleted site as it is suitable due to following reasons:

- Reduces health and safety risk.
- Reduces risk of soil erosion.
- Improves topsoil conservation.
- Reduces an eye sore of pit.

Therefore, the closure plan for this operation must include the following;

1. Staff awareness of the closure plan
    - Staff must be well inducted of the closure plan during operation and implement progressive rehabilitation.
2. Fencing of the area
    - During operation the earth dam must be fenced off to prevent health and safety risk
3. Site Clean up
    - All foreign material brought during the operation must be removed. There must not be burying of waste material in the pit. All contaminated soils must be removed and disposed of to appropriate site.
4. Process of water harvesting and avoiding pill ups
    - Provision must be made, such as cut-off drain for the permanent drainage to ensure smooth run-off. The cut off drain would be appropriate for each dam, where a deliberate drainage structure would be designed to collect storm water flow into the pit and block out all other materials and waste that comes with the water.
5. Waste material / Overburden
    - Some waste may result from the construction activities but not to produce huge amount of excess overburden. However, those that are produced must be used for construction or given to the community in case they have use for it as most of it will be sand and rocks.
6. Compaction of disturbed surrounding
    - The surrounding disturbed area from the movement of heavy vehicle must be compacted to prevent run off and wind erosion. The compacted soil must be shallowly ripped to allow regrowth of vegetation.

7. Access roads
    - As described above, all access road that were made for this operation and are no longer necessary, must be rehabilitated. The surface of these roads must be ripped to enable regrowth of vegetation.
8. Safety
    - The above-mentioned rehabilitation may not be adequate to eliminate safety risks. Hence after the removal of the fence, it is recommended that an earth bund of at least 1m high on the periphery of the earth dam must be constructed. This would also aid in preventing soil erosion.

11.CONCLUSION AND RECOMMENDATIONS

11.1. Conclusions

The scope of this project was guided by site visit information, and comprehensive literature review to determine possible environmental impacts and the possible mitigation measure to the impacts concerning this project. Tortoise Environmental Consultants believes that analysis based on the collected information sufficiently addresses the environment and socio-economic aspects of the project. Further the project is expected to positively contribute to the socio-economic development for Oshana region as well as at National level through contribution to the GDP.

While analysis of the no project alternative showed that, the adverse impacts will be negative especially on the socio-economic aspects. Threats to biodiversity, and other physical environment showed negligible threat with the go-ahead project" given that the proposed mitigation measure to possible social and environmental threats are adequately implemented. The Environmental Management Plan must be the logical framework for the project to mitigate environmental risks.

11.2. Recommendations

- **Adherence to EMP:** The successful execution of this project hinges upon unwavering adherence to the Environmental Management Plan (EMP). It is imperative that the Oshana Regional Council (ORC) and all involved parties meticulously follow the guidelines, protocols, and responsibilities outlined in the EMP. This entails strict compliance with mitigation measures, regular monitoring, and comprehensive reporting to ensure effective environmental risk mitigation throughout all project phases.
- **Continuous Monitoring and Evaluation:** the ORC should implement and ensure a robust system for ongoing monitoring and evaluation.

REFERENCES

Mendelsohn, J., Jarvis, A., Roberts, C., & Robertson, T. (2003b). *TheAtlasofNamibia-fullversion.pdf*. David Philip Publishers.

Tortoise Environmental Consultants. (2023). *Strategic Environmental Assessment (SEA) of the Integrated Land-use Plan for the Oshana Region, Namibia.*

Green Gain Consultants. (2021). Environmental Impact Assessment (EIA) for the proposed Las Vegas City Centre at Onashiku shaLaban village, Oshana Region