

**EXISTING SOLID WASTE  
DISPOSAL SITE IN EHEKE  
SETTLEMENT,  
OSHANA REGION**



**ENVIRONMENTAL MANAGEMENT PLAN  
(OPERATION PHASE)**

**Date:** 19 May 2021

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## **1. INTRODUCTION**

### **1.1 Introduction**

In a letter dated 15 April 2016, the Environmental Commissioner of the Ministry of Environment and Tourism notified the Oshana Regional Council that the existing solid waste dump in Eheke settlement requires an application for environmental clearance, and that an Environmental Management Plan is required as part of the application. Later in 2016, Consulting Services Africa was appointed to prepare the Environmental Management Plan and assist the Oshana Regional Council in applying for environmental clearance.

### **1.2 Objectives**

In a letter dated 15 April 2016, the Environmental Commissioner of the Ministry of Environment and Tourism notified the Oshana Regional Council that the existing solid waste dump in Eheke settlement requires an environmental clearance certificate. Consulting Services Africa was later appointed by the Oshana Regional Council to update the Environmental clearance certificate. This Environmental Management Plan (EMP) is used as a basic tool to reduce the magnitude of potential impacts of the Eheke solid waste dump. In the future, this EMP will incorporate any conditions of the authorisation set by the Environmental Commissioner regarding operations and maintenance. It will also be used to measure compliance by the Oshana Regional Council and Eheke settlement.

The objectives of this EMP are to:

- Promote sustainable development by encouraging conservation and mitigation of negative significant impacts to the natural and social environments.
- Identify laws, regulations and standards that are applicable to the environmental management of the oxidation ponds.
- Identify actions and procedures to be taken by the Oshana Regional Council and Eheke settlement office staff to prevent or minimise negative impacts to the natural and social environments and ensure compliance with this EMP.

### 1.3 Relevant Listed Activities and Legislation

In Government Notice No. 29 of 2012, *List of Activities that May Not Be Undertaken Without an Environmental Clearance Certificate: Environmental Management Act, 2007*, the Eheke solid waste dump constitutes the following listed activities:

- i. 2.1 - The construction of facilities for waste sites, treatment of waste and disposal of waste.
- ii. 2.3 - The import, processing, use and recycling, temporary storage, transit or export of waste.
- iii. 8.6 - Construction of industrial and domestic wastewater treatment plants and related pipeline systems.
- iv. 9.1 - The manufacturing, storage, handling or processing of a hazardous substance defined in the Hazardous Substances Ordinance, 1974.

The environmental impacts associated with the operations of the Eheke solid waste dump are required to be managed in compliance with the EIA Regulations published in Government Notice No. 30 of 2012 read with Section 27 of the Environmental Management Act. There is also other legislation, policies and guidelines that need to be adhered to or consulted when operating solid waste dumps. See Table 1 below, which is not exhaustive.

**Table 1. Relevant legislation, policies and guidelines**

Title of legislation, policy or guideline	Implications for Eheke solid waste dump
The Namibian Constitution of 1990	The Constitution clearly indicates that the state shall actively promote and maintain the welfare of the people by adopting policies aimed at management of ecosystems, essential ecological processes and biological diversity of Namibia for the benefit of all Namibians, both present and future.
Water Resources Management Act No. 24 of 2004	This Act protects all water resources in Namibia. The Act also laid down conditions to ensure that proper wastewater treatment is provided, including requirement for wastewater discharge permit from the Directorate of Water Affairs.
Environmental Assessment Policy of Namibia (1995)	The Policy seeks to ensure that the environmental consequences of development projects and policies are considered, understood and incorporated into the planning process, and that the term ENVIRONMENT is broadly interpreted to include biophysical, social, economic, cultural, historical and political components.
Environmental Management Act No. 7 of 2007	The Act provides a list of projects requiring an Environmental assessment. It aims to promote the sustainable management of the environment and the use of natural resources and to provide for a process of assessment and control of activities which may have significant effects on the environment.

Public Health Act, No. 36 of 1919 and Amendments and Regulations	This Act makes provision for the prevention and control of infectious diseases and epidemics. It also regulates sanitation, food and public water supplies.
Hazardous Substances Ordinance No. 14 of 1974	The Ordinance applies to the manufacture, sale, use, disposal and dumping of hazardous substances, as well as their import and export. Its primary purpose is to prevent hazardous substances from causing injury, ill-health or the death of human beings.
Pollution Control and Waste Management Bill of 1999	The Bill promotes sustainable development and the establishment of the Pollution Control and Waste Management Unit: to prevent and regulate the discharge of pollutants to the air, water and land; to make provision for the establishment of an appropriate framework for integrated pollution prevention and control; to regulate noise, dust and odour pollution; to establish a system of waste planning and management; and to enable Namibia to comply with its obligations under international law in this regard.
National Waste Management Policy, 2010	This policy is focusing specifically on Waste Management and use of various technologies waste treatment and disposal to minimize health risks. It is also geared to have a unified waste management system country wide. This policy provides the necessary guidance on the processes related to waste management in the MOHSS, wider Namibia health and social welfare sectors, and other relevant stakeholders. It is taking into consideration the process of integrated waste management from generation to final disposal. This practice also focus on medical, household, mining, agricultural, and construction waste.
Minimum Requirements for Waste Disposal by Landfill, Department of Water Affairs and Forestry, Republic of South Africa, Second Edition 1998	This manual provides useful information on the classification, siting, design, operation, monitoring and closing of solid waste facilities.

## 1.4 Methodology

The input required to prepare this EMP was obtained by the following means:

- A site inspection performed by CSA staff;
- Meetings and discussions with Ekeke Settlement Office staff;
- Review of desktop literature;
- Previous experience with the preparation of EIAs and EMPs;
- Consultations with registered professional engineers regarding operation and maintenance practices.

Aspects of the solid waste dump that could impact the surrounding environment directly or indirectly were identified and analysed.

The impact analysis undertaken to forecast the characteristics of the main potential impacts included three sections:

- Identification - to specify the impacts associated with current and future oxidation pond activities,
- Prediction - to forecast the nature, magnitude, extent and duration of the main impacts, and
- Evaluation - to determine the significance of residual impacts i.e. after taking into account how mitigation will reduce a predicted impact.

Parameters that were taken into account during the impact analysis include:

- Nature of impact (positive, negative, direct, indirect, cumulative),
- Magnitude of impact (severe, moderate, low),
- Extent/location of impact (area/volume covered, distribution),
- Timing of impact (during construction, operation, decommissioning, immediate, delayed, rate of change),
- Duration of impact (short term, long term, intermittent, continuous),
- Reversibility/irreversibility of impact,
- Likelihood of impact (probability, uncertainty or confidence in the prediction), and
- Significance of impact (local, regional, global).

## **1.5 The Applicant**

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## 1.6 The Independent Environmental Assessment Practitioner (EAP)

Consulting Services Africa (CSA) is a multi-disciplinary consulting firm of engineers and environmental managers. CSA has been active in Namibia under several names since its establishment in 1963 as Wolhuter and Associates. CSA is 100% owned by a Namibian citizen: Mr. Evat Kandongo (CEO). CSA's head office is in Windhoek, and its regional offices in Ongwediva.

CSA is primarily an engineering consulting firm, but also has significant project experience in: environmental impact assessments, socio-economic and baseline studies, renewable energy studies, climate change studies, water resource management, and training of SMEs.

Previous and current projects of similar nature or complexity include:

- EIAs and EMPs for the upgrading of two gravel roads, DR3608 and MR67 to bitumen standards, approximately 185 km in total length. Two separate EIA reports submitted. Ministry of Works and Transport
- Environmental Scoping and Environmental Management Plan (EMP) for the Osona Village development which is located just south of Okahandja and will involve the construction of hundreds of homes and new municipal infrastructure. Preferred Management Services
- Environmental Scoping and EMP for the City of Windhoek's Gammans Wastewater Treatment Works to produce commercial fertilizer by composting and pelletizing the treatment sludge. City of Windhoek
- EIAs and EMPs for the upgrade of two cattle quarantine camps in the Caprivi Region. Two separate EIA reports submitted. Millennium Challenge Account – Namibia.
- Environmental Scoping and EMP for a new wastewater treatment plant for Engela town. Helao Nafidi Town Council.
- Environmental Scoping and EMP for new wastewater treatment ponds for Groot Aub village. Khomas Regional Council.
- Supervision of the Environmental Monitoring and Auditing for the new wastewater treatment ponds for Engela town. Helao Nafidi Town Council.
- Supervision of the Environmental Monitoring and Auditing for the MR122 road upgrading from gravel road to bitumen standards. Roads Authority is Client.



- Environmental scoping and EMP for a new wastewater treatment plant (ponds) for Onesi Settlement, Omusati Regional Council.

Evat Kandongo, CSA, Environmental and Energy Consulting: Mr. Kandongo has been CSA's manager for the office in the north since 1997. He has a Bsc in Civil Engineering from the Tampere University of Technology, FINLAND. He has been involved in various EIA's and EMP's for various wastewater projects for CSA. He has also been a founder and member of the Sustainable energy, Environment and Livelihood (SEEL) division of CSA.

## 2. DESCRIPTION OF THE SOLID WASTE DUMP

### 2.1 Location and Population of Eheke

Eheke settlement is located in Oshana Region. Eheke is located approximately 15km west of Ondangwa. See Figure 1 below. The population of Eheke is approximately 1200 (ref 1).

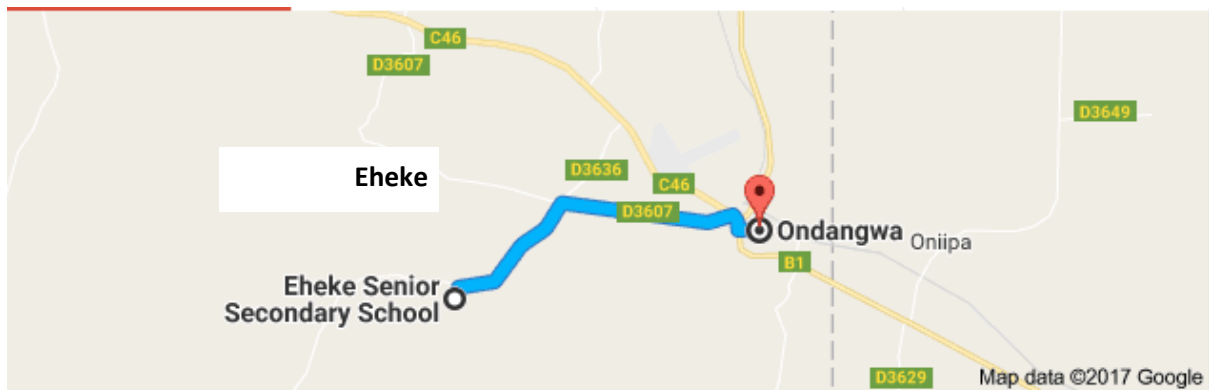
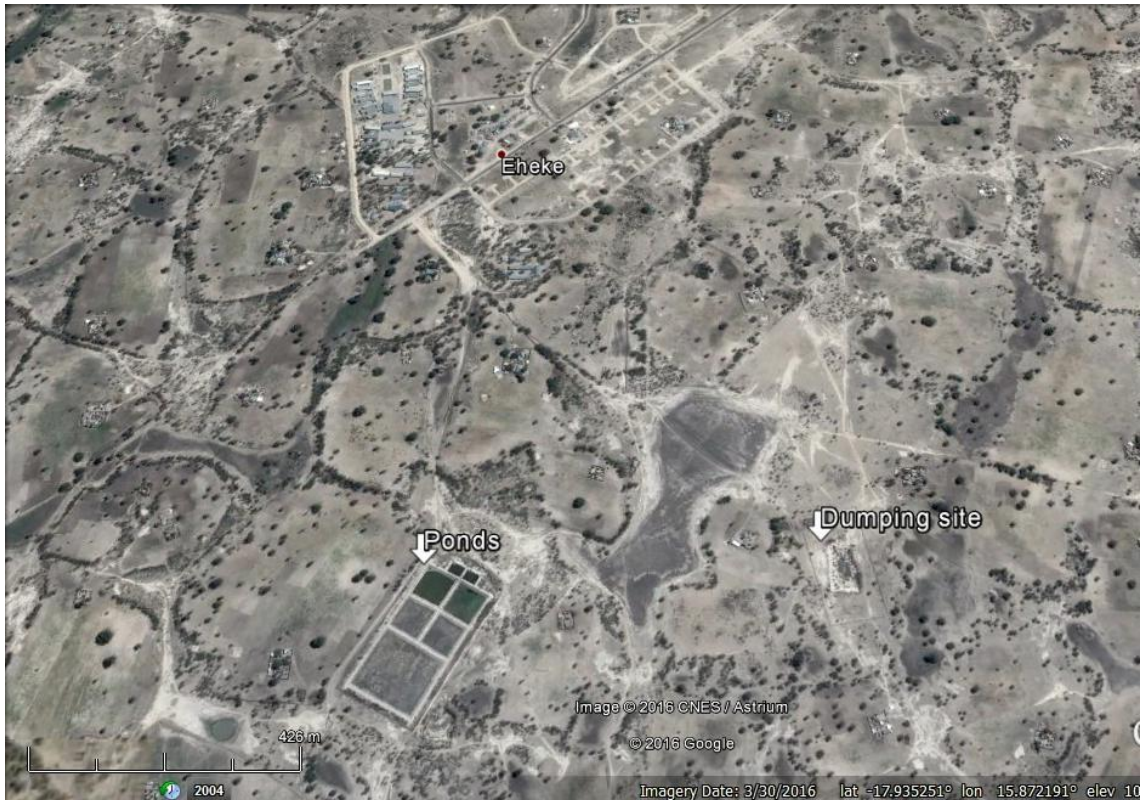


Figure 1 – Eheke settlement is approximately 15km west of Ondangwa

Within Eheke, the solid waste dump is located approximately 500m southeast of Eheke residential area. See Figure 2 below.



**Figure 2 – Aerial view of Eheke village and solid waste dump**

## **2.2 Operation and Layout of the Solid Waste Dump**

The Eheke solid waste dump was established in 2007, at the same time that the Eheke oxidation ponds were constructed (Ref. 1). The dump site initially served as a borrow pit to provide earth material needed to construct the oxidation pond embankments.

Solid waste is collected twice a week in Eheke (Tuesday & Thursday) by staff members from the Eheke settlement office and disposed of in the dumping pit. Bottles and cans are put aside within the site, for recycling purposes. Currently, there is no actual recycling programme; however, the settlement office does intend to start recycling in the near future (Ref. 2).

There is a large, rectangularly-shaped dumping pit within the dump site. This is where the refuse is ought to be dumped. Figure 3 below shows the inside of the dumping pit, against the surrounding of the dumping site enclosure.



**Figure 3a) - Inside of the dumping pit**



**Upper side of the dumping site (left) and on the lining of the pit (right).**

**Figure 3b) the surrounding of the dumping site enclosure**

CSA staff was welcomed by one of the employees of the Eheke Settlement office, who expressed that the waste is not dumped inside the pit, because there is no clear path for the vehicles to move into the pit. The potential path into the pit is as shown in figure 4 below.



**Figure 4 – un-cleared path for trucks to move into the pit**

There are improvements to be made in the tidiness of the dump site, as evidenced in the figures above. Vegetation has grown in most of the dump site, which could be a danger to people who have to enter the dump site.

Although burning of waste is a common practice that has been or is employed at small dump sites throughout Namibia, Eheke settlement office is said to have stopped the practice, since December 2020. Nevertheless, recommendations for improved dump site operation are described in Section 2.3 below and in Section 5 of this EMP.

An agreement was made between the Eheke Settlement office and Rent-A-Drum, to separate bottles, tins and plastic containers from the rest of the waste, for recycling purposes. They have been put aside, awaiting for pickup. Figure 5 illustrates that.



**Figure 5- Bottles, tins and plastic containers put aside for recycling**

### **2.3 Classification and Design & Operation Requirements According to the *Minimum Requirements for Waste Disposal by Landfill***

Currently, Namibia does not have its own design and operation guidelines document for landfills. Therefore, when new landfills are designed and constructed in Namibia, engineers and authorities refer to the comprehensive document, *Minimum Requirements for Waste Disposal by Landfill* by the South African Department of Water Affairs and Forestry (Ref. 3). This document was used to review whether there any aspects of design and operations of the Eheke solid waste dump that are not acceptable and need to be improved or changed.

In order to determine the design and operation requirements for a landfill, it is necessary to first determine its classification. The classification is determined by three primary factors: type of waste, size of waste stream, and potential for leachate generation (Ref. 3). Appendix 1 provides the supporting calculations that determine the classification of the Eheke solid waste dump. The classification is: **G:C:B-**. “G” indicates that type of waste that is disposed of at the dump site is classified as General, i.e. it is not hazardous. “C” indicates that the Eheke solid waste dump receives the smallest size classification, which is Communal. “B-” indicates that there is a negative water balance in Eheke, i.e. annual evaporation exceeds annual rainfall.

The *Minimum Requirements for Waste Disposal by Landfill* specify the following important design and operation requirements for the Eheke solid waste dump, based on the G:C:B-classification:

Regarding Design:

- 1) Section 8, Table 8.1 (pg. 8-16) indicates that the Eheke solid waste dump does not require a layer of material, called the “G layer”, to be installed at the bottom of the dumping pit. The current situation of dumping waste on top of natural soil at the bottom of the waste pit is acceptable.
- 2) Section 8, Table 8.1 (pg. 8-17) indicates that in the future, when the dump site is to be closed, a 200mm topsoil layer will need to be placed on top of the waste layer.
- 3) Section 8, Table 8 (pg. 8-14) indicates that groundwater monitoring is not required for this dump site.
- 4) Section 8, Table 8 (pg. 8-15) indicates that a leachate management system is not required.
- 5) Section 10, Table 10 (pg. 10-16) indicates that fencing around the dump site is required.

Regarding Operation:

- 6) Section 10, Table 10 (pg. 10-16) indicates that a dedicated site security person is not required.
- 7) Section 10, Table 10 (pg. 10-16) indicates that the waste does not need to be compacted. However, it should be noted that the lifetime of the dumping site will be significantly increased if the waste is compacted. Therefore, the Oshana Regional Council should consider how best to implement this practice.
- 8) Section 10, Table 10 (pg. 10-16) indicates that the need to cover waste daily with a layer of soil needs to be considered. To promote sanitary conditions and minimise the occurrence of undesirable insects and rodents at the dump site, this EMP requires that dumped waste be covered daily with a 150mm layer of soil.
- 9) Section 10, Table 10 (pg. 10-16) indicates that the practice of burning refuse at the dumping site is a concern and stopping the practice needs to be considered. Since the burning of refuse is harmful to the environment and very unhealthy for persons who inhale the toxic air emissions, this EMP requires that refuse not be burned at the dumping site.
- 10) Section 10, Table 10 (pg. 10-16) indicates that size of the open, available dumping area within the dumping pit needs to be large enough to receive a volume equivalent to two weeks of solid waste.

11) Section 10, Table 10 (pg. 10-16) indicates that staff working in the dump site need to wear protective clothing.

12) Section 10, Table 10 (pg. 10-16) indicates that general site maintenance is required.

### **3. GENERAL ENVIRONMENTAL DESCRIPTION**

Appropriate methods were used to learn about and describe the existing environment. These included a site visit, interviews with local authorities, and a review of relevant literature.

#### **3.1 Socio-Economic Environment**

##### **3.1.1 Staff Structure**

The proponent for this EMP is the Oshana Regional Council. All funding required for significant solid waste dump-related activities, such as this EMP, is approved and sourced by the Regional Council. The Eheke settlement office is responsible for providing the technical staff required to perform refuse collection and management of the dumping site.

##### **3.1.2 Infrastructure on Site**

The only infrastructure located in the fenced-off dump site area is the dumping pit.

##### **3.1.3 Site Economic Activities**

Recyclables are separated, then sold to Rent-A-Drum recycling company.

##### **3.1.4 Adjacent Development**

Eheke village is located approximately 500m from the refuse dump site. Within Eheke there are two secondary schools, one primary school, a church and a cemetery. There is also a small business area. And there are also three plots within the Eheke area.



## 3.2 Biophysical Environment

### 3.2.1 Climate

Eheke, just like the rest of Namibia, falls within the Subtropical High Pressure Zone, which is characterised by massive dry air. The presence of the Botswana Anticyclone and the South Atlantic Anticyclone makes Namibia the driest country in Sub-Sahara Africa. The Botswana Anticyclone is most prominent in winter and feeds dry air over Namibia and also obstructs the flow of moist air from the north.

Annual rainfall in Eheke is approximately 400mm on average.

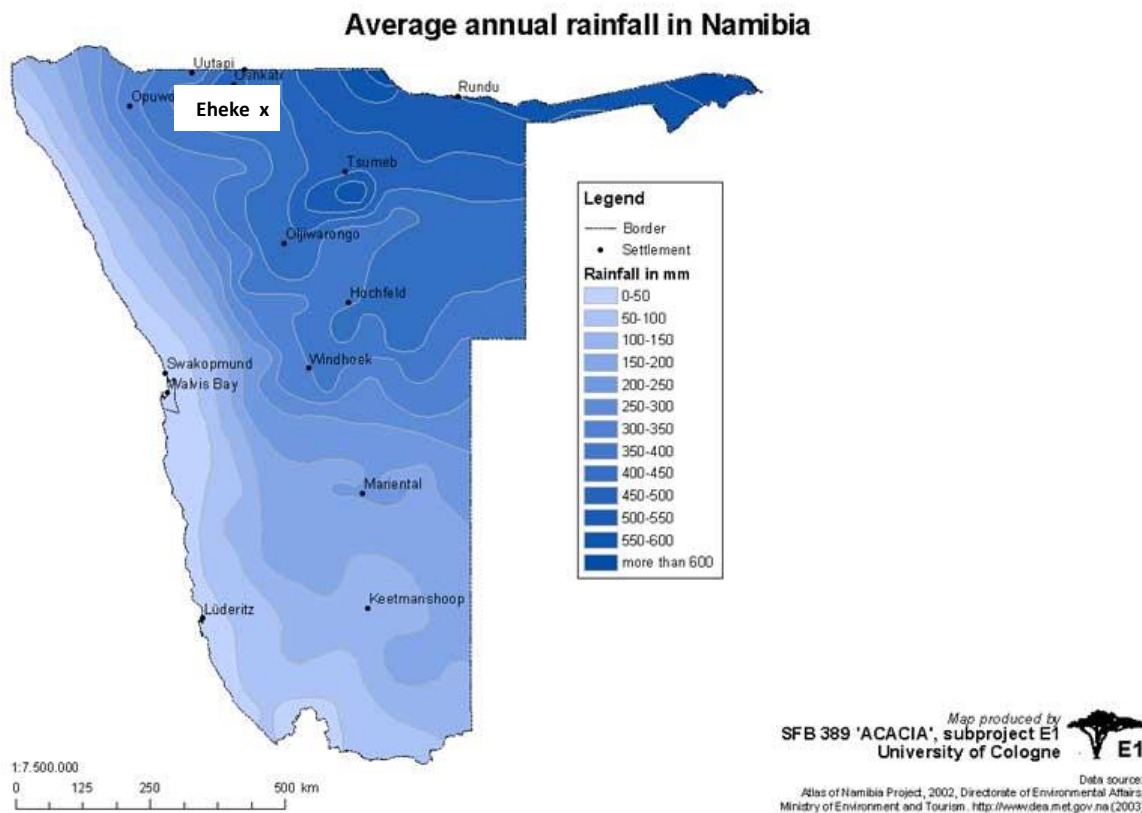
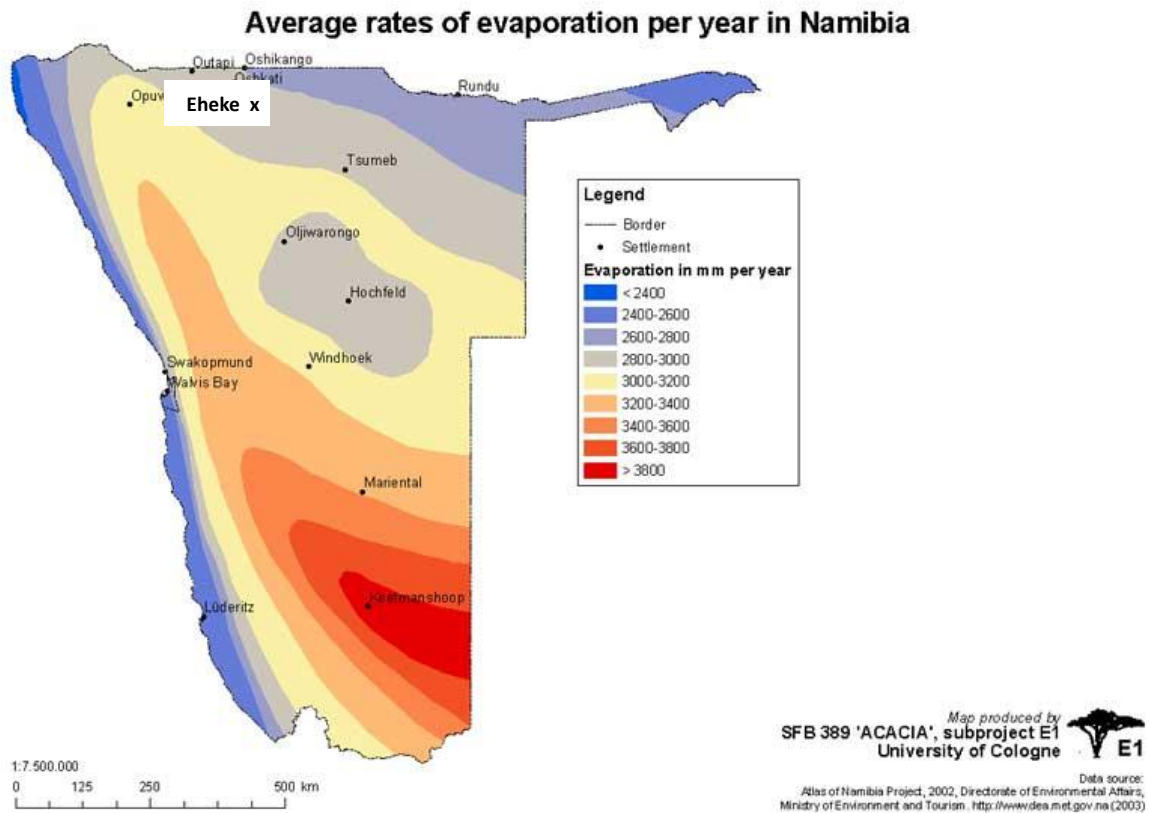


Figure 6 – Average annual rainfall (Ref. 4)

Average annual evaporation in Eheke is approximately 2800mm, as indicated in Fig. 7 below.



**Figure 7 – Average annual rates of evaporation (Ref. 4)**

As indicated in Fig. 8 below, the average annual temperature in Eheke is greater than 22° C.

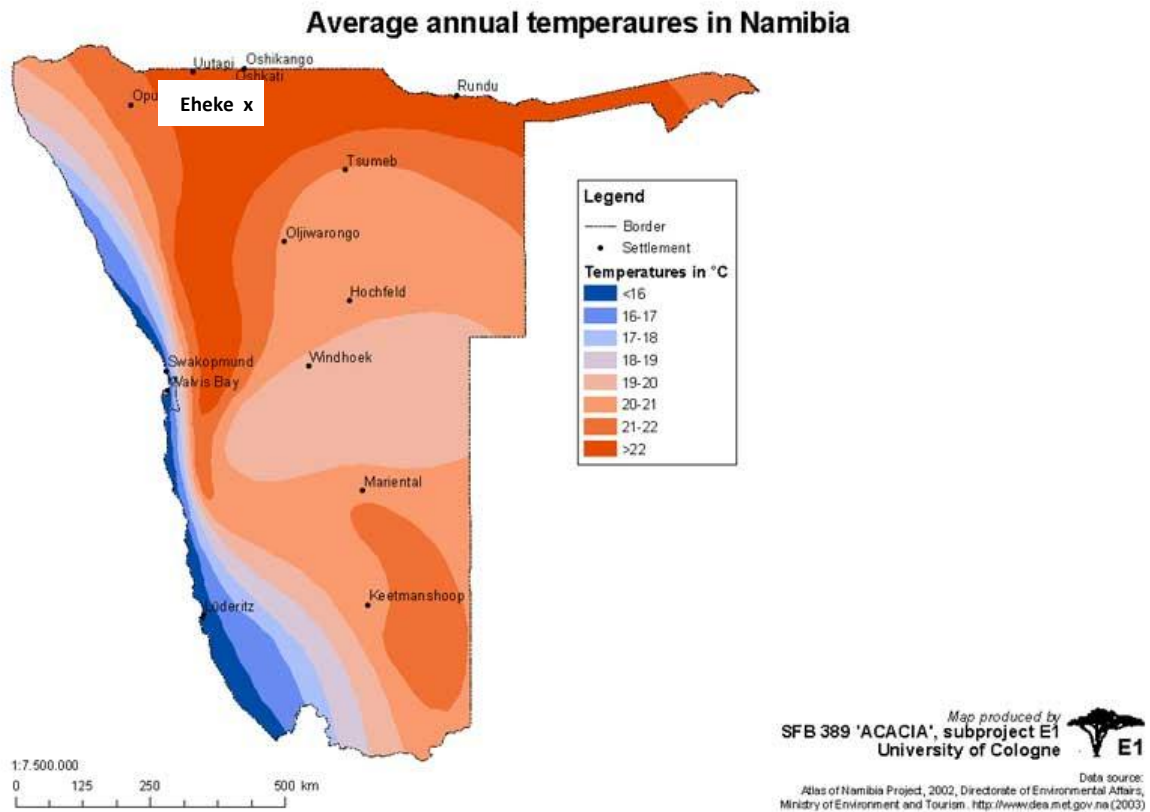
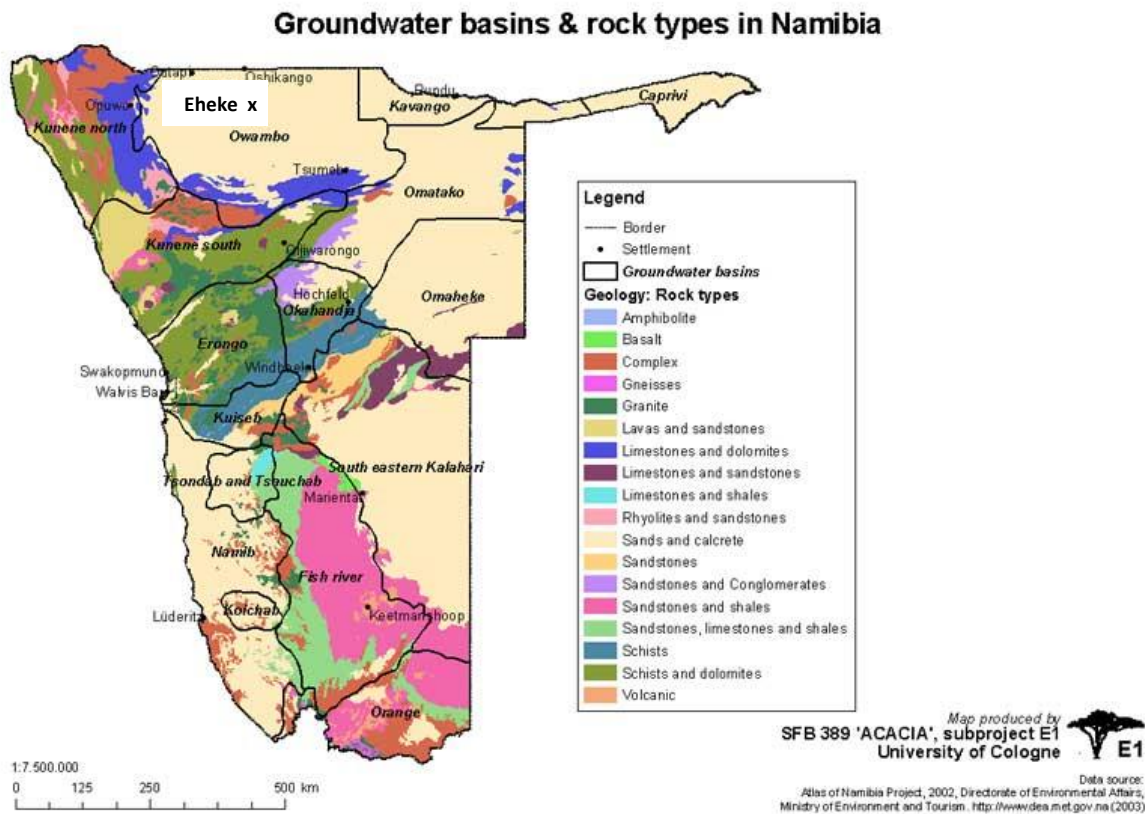


Figure 8 – Average annual temperature (Ref. 4)

### 3.2.2 Hydrogeology and Hydrology

As indicated in Figures 9 & 10 below, Eheke is located within the Owambo groundwater basin and is located on the eastern edge of the area where there are oshanas. The general direction of the overland flow of stormwater is from north to south.



**Figure 9 – Groundwater basins and rock types (Ref. 4)**

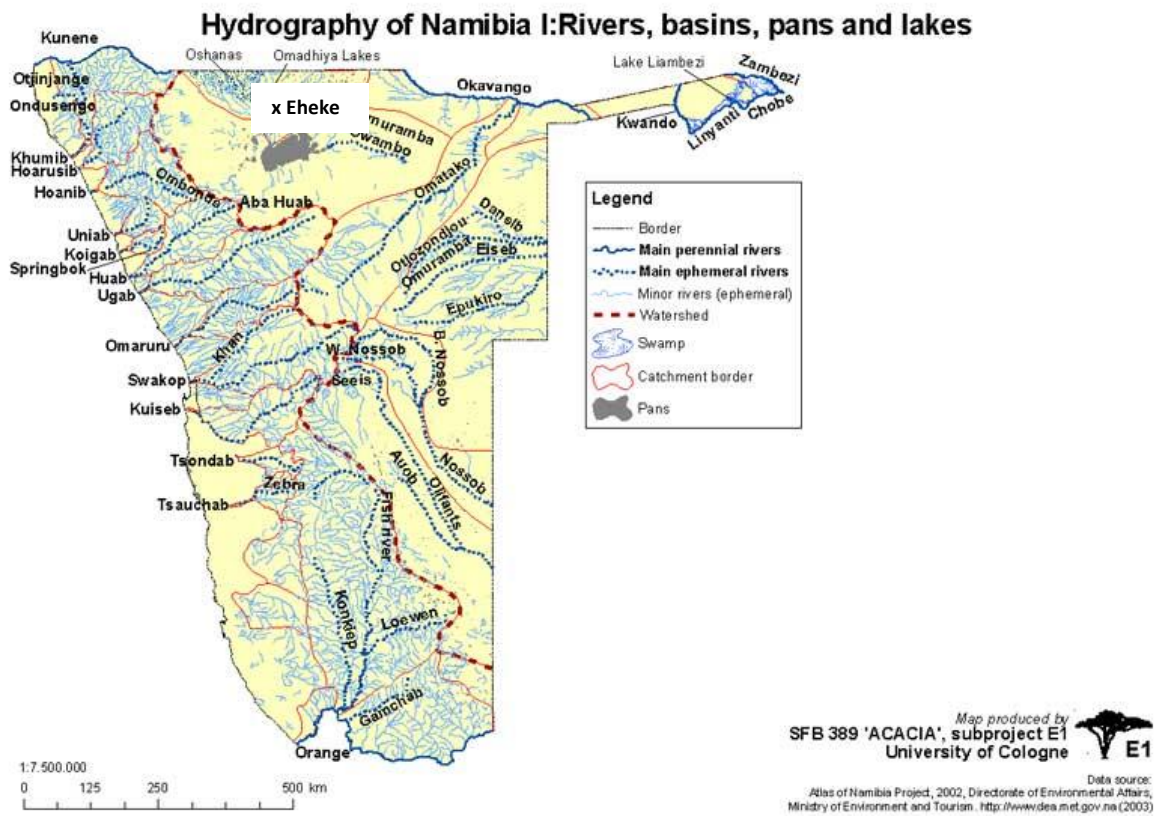
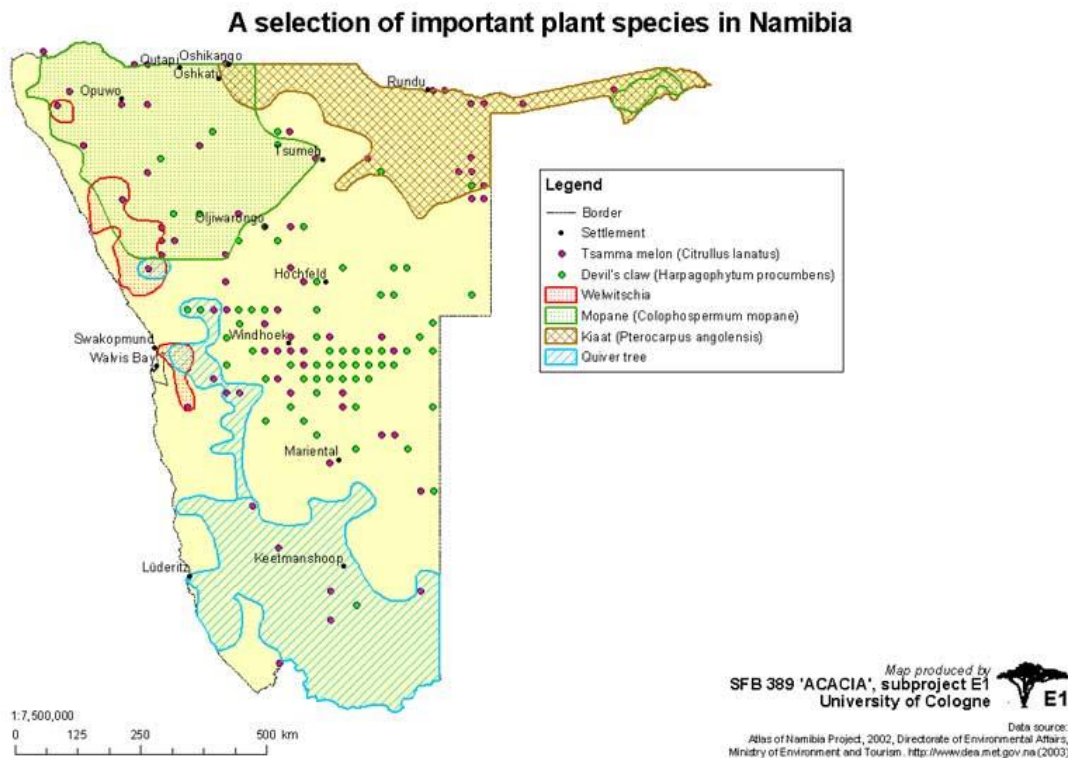


Figure 10 – Rivers, basins, pans and lakes (Ref. 4)

### 3.2.3 Flora and Fauna

Eheke is located within the greater Tree-and-Shrub Savanna Biome. The natural vegetation structure of the area is identified as *woodland* (Ref. 4). In terms of plant species in the area, Eheke is located on the western edge of the area where the tree species, *Pterocarpus angolensis* (Kiaat), grows. See Fig. 11 below.



**Figure 11 – Important plant species (Ref. 4)**

A study of animal species occurring in the project area has not been performed. As the Eheke solid waste dump has existed at the current site for several years, this EMP does not include a study of what animal species could be impacted by the location of the solid waste dump at its current site. It is reasonably expected that small terrestrial animal and birds visit the dump site. Larger animals, however, are prevented from entering the site by the perimeter security fence.

### 3.2.4 State of the On-Site Environment

With a little rearrangement of the solid waste

As noted in Section 2, there are some untidy areas that need to be cleaned up.

## 4. POTENTIAL ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

### 4.1 General Considerations

The objective of assessing the potential impacts of the Eheke solid waste dump is to make it possible to identify and plan actions that would avoid or reduce any undesirable impacts. This section of the EMP addresses the impacts of the solid waste dump on the natural and socio-economic resources in and around it, under both existing condition and future conditions when this EMP is implemented. The impacts can be divided into two groups: direct (or primary) impacts that result from direct interaction of some components of the solid waste dump with one or more environmental resources; and indirect (or secondary) impacts that occur because of the direct impacts. Note that a classification of a negative impact does not necessarily imply a long-term adverse impact on the environment.

### 4.2 Impact Criteria and Classification

A number of impacts (positive and negative) have been identified, under both existing operating conditions and future operating conditions when this EMP is implemented. Criteria and classification of impacts are highlighted in Table 2 below.

**Table 2: Criteria and Classification of Impacts**

Assessment Evaluation Criteria	Rating (Severity)	
Impact Type	-	Negative
	=	No Impact or Negligible Impact
	+	Positive
Extent of impact	I	Immediate (site specific)
	L	Local
	R	Regional
	N	National
	IT	International
Duration of impact	ST	Short term (0-5 years)
	MT	Medium term (5-15 years)
	LT	Long term (lifetime of the development)
Intensity of impact	L	Low (where natural, cultural and social functions and processes are not affected)
	M	Medium (where the affected environment is altered but natural, cultural and social functions and processes can continue)
	H	High (where the affected environment is altered to the extent that natural, cultural and social functions and processes will temporarily or permanently cease)
Probability of impact	LP	Low probability (possibility of impact occurring is low)
	P	Probable (where there is a distinct possibility that it will occur)
	HP	Highly probable (where the impact is most likely to occur)
	D	Definite (where the impact will occur)

<b>Significance</b> of impact	<b>L</b>	Low (where natural, cultural and social and economic functions and processes are not affected). In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means of achieving this benefit are likely to be easier, cheaper, more effective and less time-consuming
	<b>M</b>	Medium (where the affected environment is altered but natural, cultural, social and economic functions and processes can continue). An impact exists but is not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of beneficial impacts, other means of achieving this benefit are about equal in time, cost and effort.
	<b>H</b>	High (where the affected environment is altered to the extent that natural, cultural, social and economic functions and processes will temporarily or permanently cease). In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time consuming or a combination of these. In the case of beneficial impacts, the impact is of a Substantial order within the bounds of impacts that could occur.

### 4.3 Operation Phase-Related Impacts

#### 4.3.1 Socio-Economic Impacts

Impact: Employment Opportunities

The Eheke solid waste dump does contribute positively towards direct job opportunities for the technical staff of the Eheke settlement office. The solid waste dump requires daily maintenance procedures to ensure it continues operate effectively and is safe for the staff, and surrounding population and environment. Such maintenance activities contribute to the continued employment of the technical staff.

Impact: Human well-being

The solid waste dump safely retains waste generated by the Eheke settlement population, and allows it to naturally degrade over time without adversely impacting the residents of Eheke. Without the dump site, health risks and nuisances would arise due to the waste being exposed to insects, rodents and the natural weather elements. The solid waste dump represents an important positive impact on human well-being of Eheke residents.

Currently, solid waste is burned at the Eheke dump, which results in toxic emissions for staff working in dump and anyone else who might be near the dump. This EMP requires that the practice of burning refuse cease to eliminate such toxic emissions and the associated negative impacts on human well-being and the environment.



#### Impact: Safety

The solid waste dump poses a potential safety risk to individuals who enter the fenced off site. The safety risks include: contact with unsanitary waste materials, and contact with dangerous objects such as broken glass and other sharp objects. This represents a potential negative impact, but one that is being properly managed due to the installation of security fence and warning signs.

#### Impact: Unsanitary conditions due to the breeding of insects and rodents

The solid waste dump can serve as breeding grounds and habitat for mosquitos, flies and rodents, especially if the raw waste is not covered with soil. This poses a potentially negative impact of the solid waste dump, but one that can be managed by the daily practice of covering the fresh waste with a 150mm layer of soil.

#### Impact: Smell

The solid waste dump can generate unpleasant smells, particularly if the raw waste is left uncovered. This a potentially negative impact of the solid waste dump, but one that can be managed by the daily practice of covering the fresh waste with a 150mm layer of soil.

#### Impact: Cost savings

Having a solid waste dump located near Eheke settlement is the least expensive way to handle the waste disposal requirements of the settlement. Additional cost savings can be achieved if a recycling programme is implemented by the Oshana Regional Council and settlement staff. This represents a positive impact.

### 4.3.2 Environmental Impacts

#### Impact: Contamination of groundwater resources

It is possible that groundwater resources are contaminated as a result of leachate developed by the solid waste dump. The evaluation procedures of the *Minimum Requirements for Waste Disposal by Landfill* that were performed in Section 2 and Appendix 1 of this EMP indicate that the risk for groundwater contamination is very low, since impermeable layer at the bottom of the dumping pit was not deemed to be necessary.

Impact: Spreading of solid waste onto adjacent land areas

A common site near solid waste dumps is lots of plastic bags strewn on the ground and vegetation after having been blown out of the solid waste dump. This was not the case when the Eheke solid waste dump was visited, however. This may be due to the efforts of technical staff to keep the area surrounding the dump site clean; or it may be due to technical staff burning the collected refuse before it is put into the dumping pit.

Once the practice of burning refuse has been stopped in Eheke, it will be important that newly dumped refuse is covered daily with a layer of soil. It will also be important that technical staff not only attend to the tidiness of the dump site, but that they also collect any plastic bags or other refuse that has been blown away from the dumping pit area or refuse vehicle. This issue represents a potential negative impact that requires mitigation.

Impact: Wildlife Habitat, Indigenous Flora and Fauna

The solid waste dump may pose potential negative health and safety risks to wildlife that enter dumping pit to rummage through the solid waste which is unsanitary and dangerous. The risk for negative impacts is greater if the raw waste is not covered daily with a layer of soil.

Tables 3a and 3b below provide impact evaluation summaries for two scenarios:

- 1) under current operation conditions, and;
- 2) under future operation conditions when this EMP is being fully implemented.

**Table 3a - Eheke Solid Waste Dump Impacts Evaluation**  
**Operational Phase - Current Operation & Management Conditions**

OPERATIONAL PHASE							
	Identified Impact	Impact Type	Extent	Duration	Intensity	Probability	Significance
1	Surface water pollution	-	I	ST	M	LP	L
2	Groundwater pollution	-	L	LT	M	LP	L
3	Soil erosion	-	I	ST	L	LP	L
4	Soil pollution	-	I	MT	L	HP	M
5	Air pollution (burning refuse)	-	L	ST	M	HP	M
6	Land use development potential	-	I	LT	M	D	M
7	Habitat transformation	-	I	LT	L	D	L
8	Fauna displacement	=					
9	Damage to Flora	=					
10	Traffic impacts	=					
11	Visual & aesthetic impacts (smell & unsightliness)	-	L	LT	M	HP	L
12	Social (health & employment)	+	L	LT	H	D	H
13	Economic (costs benefits)	+	R	LT	M	D	H

**Table 3b - Eheke Solid Waste Dump Impacts Evaluation**  
**Operational Phase - When this EMP is Fully Implemented**

OPERATIONAL PHASE							
	Identified Impact	Impact Type	Extent	Duration	Intensity	Probability	Significance
1	Surface water pollution	-	I	ST	L	LP	L
2	Groundwater pollution	-	L	LT	L	LP	L
3	Soil erosion	=					
4	Soil pollution	-	I	MT	L	P	M
5	Air pollution	-	L	ST	L	LP	L
6	Land use development potential	-	I	LT	M	D	M
7	Habitat transformation	-	I	LT	L	D	L
8	Fauna displacement	=					
9	Damage to Flora	=					
10	Traffic impacts	=					
11	Visual & aesthetic impacts (smell & unsightliness)	-	L	LT	L	L	L
12	Social (health & employment)	+	L	LT	H	D	H
13	Economic (costs benefits)	+	R	LT	M	D	H

## **5. EHEKE SOLID WASTE DUMP MANAGEMENT PLAN**

This EMP requires the involvement of the Oshana Regional Council and local Eheke settlement office technical staff.

### **5.1 General Responsibilities of the Oshana Regional Council and Eheke Settlement Office**

The following are the responsibilities of the Oshana Regional Council:

- Familiarity with all aspects of the EMP;
- Regularly monitor the implementation of the EMP to ensure full compliance for the entire duration of the solid waste dump's lifecycle;
- Continual budgeting and resource allocation for maintenance and repair of the solid waste dump.

The following are the responsibilities of the Eheke settlement office staff:

- Continual maintenance and repair of the solid waste dump;
- Training of staff on how to maintain and repair the solid waste dump and comply with the EMP;
- Monitor the performance of any contractors that are hired to perform maintenance and/or repairs;
- Notification of relevant authorities if a significant pollution incident occurs;
- Receive, record and respond to any complaints and input provided by Eheke residents related to the operation or performance of the solid waste dump;
- Maintain records of all maintenance and repairs that are performed on the solid waste dump.

## 5.2 Proposed Mitigation Measures to be Performed

Table 4 – EMP Mitigation Measures

EMP MITIGATION MEASURES					
EMP Ref:	Aspect / Impact	Action	Phase	Frequency of Action	Responsibility
1	Maintain available dumping space	Maintain an open, available dumping space within the dumping pit that is large enough to receive a volume equivalent to two weeks of solid waste.	Operational	Weekly	Eheke Settlement Office Technical Staff
2	Covering of dumped solid waste	Cover solid waste that has been dumped into the dumping pit with a 150mm layer of soil.	Operational	Daily, or whenever waste is dumped into the dumping pit	Eheke Settlement Office Technical Staff
3	Waste compaction (optional, but recommended)	Compact the collected solid waste to reduce its volume, so that the lifetime of the solid waste dump may be maximised. The method of compaction, whether within a compacting refuse truck or on site with a heavy excavation vehicle, is to be investigated and decided upon by the Oshana Regional Council and Eheke settlement office.	Operational	Daily, or whenever waste is collected and brought to the dumping pit	Eheke Settlement Office Technical Staff and Oshana Regional Council
4	Practice of refuse burning to stop.	Stop burning refuse as this practice has serious negative impacts to people and the environment.	Operational	Immediately	Eheke Settlement Office Technical Staff
5	Site maintenance	Collect any refuse that is loose inside the dump site or outside the dump site and dispose of it into the dumping pit. This action is important to keep the dump site area from becoming unsightly and to keep potential disturbances of adjacent land areas to a minimum.	Operational	Weekly	Eheke Settlement Office Technical Staff

EMP Ref:	Aspect / Impact	Action	Phase	Frequency of Action	Responsibility
6	Safety and health risks for unauthorised persons entering the dump site	Check the entire length of the perimeter security fence and repair immediately if there is a breach.	Operational	Weekly	Eheke Settlement Office Technical Staff
7	Soil Erosion	Inspect the dump site, particularly the dumping pit area, for soil erosion and repair eroded areas accordingly.  Ensure that the flow path of stormwater is not towards and into the dumping pit.	Operational	Monthly, or whenever soil erosion is identified	Eheke Settlement Office Technical Staff
8	Personal protective clothing	All technical staff who work in the dump site are to be provided with personal protective clothing and are responsible for wearing it at all times when working inside the dump site. Such clothing shall include but not be limited to: <ul style="list-style-type: none"> <li>• Protective and waterproof gloves</li> <li>• Protective and waterproof boots</li> <li>• A full-body, long-sleeved workers uniform</li> <li>• Protective eyewear</li> <li>• Respiratory protection</li> </ul>	Operational	To be provided to staff immediately and worn by staff at all times when working inside the dump site	Eheke Settlement Office
9	Recycling programme	Investigate viable options and opportunities for initiating and managing a recycling programme in Eheke, either by requesting residents to pre-sort recyclables and/or separating recyclables from refuse at the dump site. Communicate with MET-DEA and municipalities/towns that have already established recycling programmes to learn about viable options and best practices.  Begin implementation as soon as possible after the recycling programme has been finalised and approved by the Eheke settlement office and Oshana Regional Council.	Operational	Investigate viable options and opportunities as soon as possible.  Implement on a daily basis, once the recycling programme has been finalised, approved and initiated.	Eheke Settlement Office and Oshana Regional Council

EMP Ref:	Aspect / Impact	Action	Phase	Frequency of Action	Responsibility
10	Record keeping	<p>Establish and maintain a record book to keep track of the following:</p> <ul style="list-style-type: none"> <li>• Input and/or complaints from Eheke residents and technical staff regarding the performance of the oxidation ponds, noting issues such as bad smell, mosquitos, dead animals found on site, etc.</li> <li>• Significant incidents that impact the environment or persons; for example: spill-overs from any of the ponds onto adjacent land areas, unauthorised entrance by any persons, etc.</li> <li>• Maintenance and repairs performed on the oxidation pond site. Details should be provided, such as the method used to effectively remove vegetation.</li> </ul>	Operational	As required	Oshana Regional Council Technical Staff
11	Reporting of significant safety & environmental incidents	Any significant safety or environmental incidents involving, for example, unauthorised entrance to the pond site, potential contamination of groundwater resources, spill-over or leakage of wastewater onto adjacent land area should be immediately reported to the relevant authority, such as the police, MAWF Division of Water Resources, MET Directorate of Environmental Affairs, etc.	Operational	As required	Oshana Regional Council Technical Staff
12	Monitor EMP Implementation	<p>Oshana Regional Council staff to visit the oxidation ponds twice a year accompanied by Eheke settlement office staff to monitor the implementation of, and compliance with, the EMP.</p> <p>A summary of the visit should be recorded, and any issues of non-compliance should be communicated to the Eheke settlement office with a request for immediate action to re-establish compliance.</p>	Operational	Semi-annually	Oshana Regional Council



## 6. CONCLUSION

This Environmental Management Plan (EMP) is a practical tool for the Oshana Regional Council and Eheke settlement office to implement to reduce the magnitude and frequency of potential negative impacts. It is also a tool for the Competent Authority, the Environmental Commissioner of the Ministry of Environment and Tourism, to measure compliance by the Oshana Regional Council and Eheke settlement office. Any conditions of the Environmental Clearance Certificate granted by the Competent Authority should be incorporated into this EMP and implemented by the Oshana Regional Council.

## 7. REFERENCES

1. Per communication with Mr. Simon of the Eheke Settlement office on 18<sup>th</sup> of May 2021.
2. Minimum Requirements for Waste Disposal by Landfill, 2<sup>nd</sup> Edition, 1998, South African Department of Water Affairs and Forestry.
3. University of Cologne / Atlas of Namibia; J. Mendelsohn, A. Jarvis, C. Roberts, and T. Robertson; published by David Phillip in 2002. Website: [http://www.uni-koeln.de/sfb389/e/e1/download/atlas\\_namibia/main\\_namibia\\_atlas.html](http://www.uni-koeln.de/sfb389/e/e1/download/atlas_namibia/main_namibia_atlas.html)
4. "Waste Stabilisation Ponds"; EAWAG (Swiss Federal Institute of Aquatic Science and Technology), Dorothee Spuhler (SEECON International gmbh); 2014; webpage: <http://www.sswm.info/category/implementation-tools/wastewater-treatment/hardware/semi-centralised-wastewater-treatments/w>

# Appendix 1 - Eheke Solid Waste Dump Calculations

## 1. Landfill Size Classification

Population in 2021 =	1200
Approx population growth rate =	5%
Assume year 2032 population for calculations: Calculated, estimated population in 2032 =	2495
Assumed per capita waste generation in Eheke =	1 kg per capita per day

Calculate the maximum rate of deposition of refuse (MRD) T/day:

$$\text{MRD} = 2495 \times 1.0 \text{ kg/day} \times 1 \text{ tonne}/1000\text{kg} = 2.5 \text{ T/day}$$

Based on MRD & Table 3 (pg 3-5) of the Min. Req's, the Landfill Classification Size =

**C**

## 2. Climatic Water Balance Classification

B = climatic water balance

R = annual rainfall

E = evaporation

$$B = R - E$$

Values for Eheke per Atlas of Namibia:

R =	400 mm per year
E =	2800 mm per year
B =	-2400 mm per year

Based on B & section 3.4.2 (pg 3-7) of the Min. Req's, the water balance classification =

**B-**

## 3. Classification of Eheke's solid waste dump

The type of waste to be disposed of in the dump is classified as General since it is not hazardous waste

**G**

Based on the above, the classification of Eheke's solid waste dump =

**G : C : B-**