UPDATED ENVIRONMENTAL MANAGEMENT PLAN (EMP)

FOR THE CONTINUED OPERATION AND MANAGEMENT OF THE EXISTING ORANJEMUND LANDFILL SITE, //KHARAS REGION

Prepared for

Oranjemund Town Council

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CBD:	Central Business District
DEA:	Department of Environmental Affairs
EAP:	Environmental Assessment Practitioner
ECC:	Environmental Clearance Certificate
ECO:	Environmental Control Officer
EHP:	Environmental Health Practitioner
EIA:	Environmental Impact Assessment
EMA:	Environmental Management Act
EMP:	Environmental Management Plan
GPS:	Global Positioning System
ISWMP:	Integrated Solid Waste Management Plan
MAWFLR:	Ministry of Agriculture, Water, Fisheries and Land Reform
MEFT:	Ministry of Environment, Forestry and Tourism
MoHSS:	Ministry of Health and Social Services
MURD:	Ministry of Urban and Rural Development
MWT:	Ministry of Works and Transport
NSWMS:	National Solid Waste Management Strategy
ORTC:	Oranjemund Town Council
PCWMP:	Pollution Control and Waste Management Policy
PPE:	Personal Protective Equipment

DEFINITIONS

Disposal:	the discharge, depositing, dumping, spilling, leaking, placing of waste on or at any premises or place set aside by the Council for such purposes, and “dispose” shall have a similar meaning.
Hazardous waste:	waste that is dangerous or potentially harmful to our health or the environment. Hazardous wastes can be liquids, solids, gases, or sludge.
Healthcare waste:	waste generated in a healthcare setting
Recyclable waste:	waste which has been separated from the waste stream, and set aside for purposes of recovery, reuse or recycling.
Recycling:	removal of items from the waste stream to be used as raw material to make something new from something used.
Reduce:	minimising the quantity of waste generation as far as possible.
Waste disposal site	any authorized facility or site which is designed/ demarcated to receives waste for treatment or disposal.
Waste generator	any person or organisation whose activities produce any waste and, if that person/organisation is not known the person who is in possession and/or control of that waste.
Waste Management:	Is the handling, storage, treatment, processing and disposal of waste through reducing or eliminating adverse impacts on the environment and human health and supports economic development to improved quality of life.
Waste:	material (s) that is no longer wanted or no longer useful. Sources of waste include households, industries, factories, schools, health facilities etc.

1. INTRODUCTION AND BACKGROUND

1.1 Introduction

The town of Oranjemund is served with a waste disposal is situated on the outskirts of the town, approximately 2.5 km northeast of the centre of Oranjemund.. The project site is in an undetermined townland of Oranjemund. The site was issued with an Environmental Clearance Certificate (ECC) No.02176, valid from 2021-09-06 and expires on 2025-09-06.

The Oranjemund Town Council (ORTC) intends to continue operating from the same site, thus has appointed Green Gain Consultants cc to apply for the renewal of the ECC to ensure compliance with the Environmental Management Act 07 of 2007 and other relevant legislations.

This EMP was prepared in line with the proponent's Terms of Reference which are inferred to the Environmental Impact Assessment (EIA) Regulations (GN 30 of February 2012). The EMP contains aspects of the proposed management and mitigation measures to be taken to address the negative environmental impacts and enhancement measures for the positive environmental impacts identified in the environmental scoping report. It also addresses the need for compliance monitoring of significant environmental impacts.

This EMP should be used as an on-site reference document for the operations and management of the disposal site. It should be considered as a legally bidding document, thus, any deviation or transgression from this EMP is punishable by law as per the Environmental Management Act, No. 07 of 2007. Parties responsible for transgressing of the EMP should be held responsible for any rehabilitation that may need to be undertaken.

1.2 Objectives of the EMP

The EMP has the following objectives:

- To provide information on the potential negative impacts associated with the operational and management activities of the disposal site.
- Present mitigation measures for the identified negative impacts and enhancement measures for the positive impacts.
- To provide guidelines for the management and compliance monitoring of the identified environmental issues.
- Define the roles and responsibilities for the implementation of environmental management and mitigation measures.
- Explain procedures for environmental reporting to the relevant competent and regulatory authorities.

1.3 Approach and Methodology

This EMP was prepared in line with the proponent's Terms of Reference which are inferred to the Environmental Impact Assessment (EIA) Regulations (GN 30 of February 2012). The process followed is aligned to the Namibia's Environmental Assessment process as depicted in Figure 1 below.

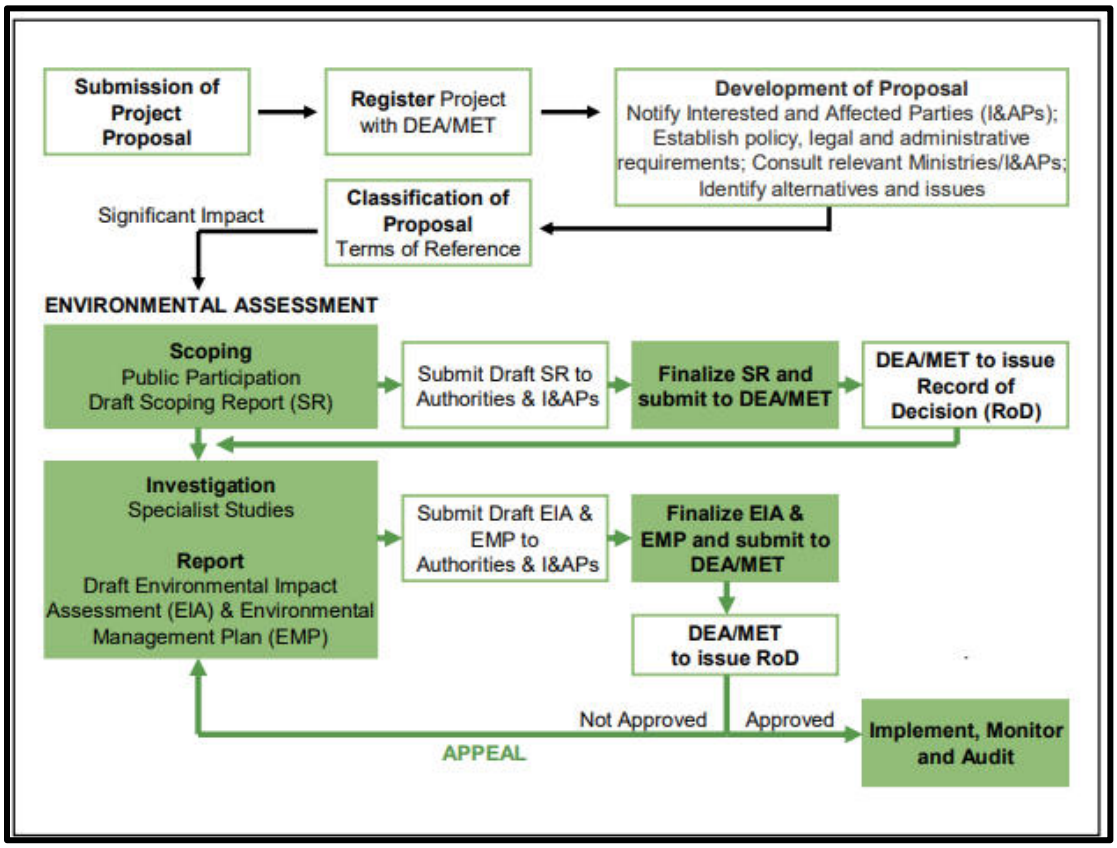

Figure 1: Namibia's EIA process

2. PROJECT DESCRIPTION

2.1 Locality

The new waste disposal site is situated on the outskirts of the town, approximately 2.5 km northeast of the centre the Oranjemund. The project site is located in undetermined townlands of Oranjemund on the following coordinates -28.53491°S; 16.40884°E.

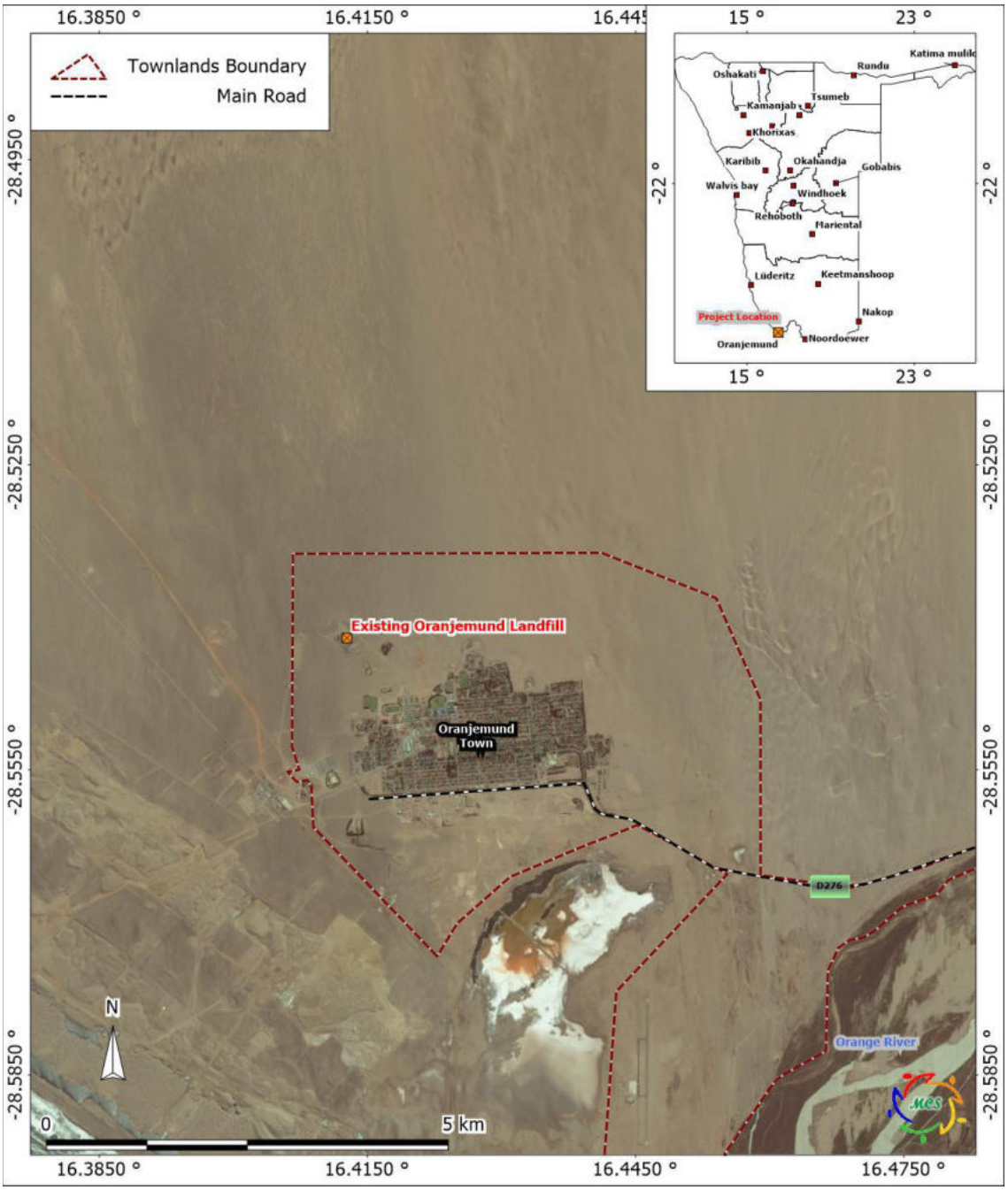

Figure 2: Site locality

2.2 Types and nature of waste

Based on observation, the waste stream at the disposal site is made up of a mixture of different types of waste. The stream consists of biodegradable waste such as paper and food items as well as non-biodegradable waste such as plastics, cans, glass, e-waste and batteries. Furthermore, some wastes are combustible (plastic, food, paper, textile, yard debris, disposable nappies), while others are non-combustible i.e., glass and batteries and remains visible even after burning.

Figure 3: Waste stream at dumpsite

Table 1: Waste stream composition

Material	Composition by percentage (estimated)
Organic (food waste)	4%
Paper, boxes, cartons	12%
Construction material	40%
Wood debris	5%
Plastics	10%
Cans and tins	10%
Metals	4%
Electronics	1%
Glass	11%
Electronics	2%
Residues (in a separate cell)	1%

2.3 Current solid waste management practices

2.3.1 Waste collection process

Collection and transportation of general domestic waste is done by the Council officials and cleaning contractors appointed by the Town Council. Waste collection vehicles include a compactor truck, skip loaders, open trucks with tipping mechanisms.

Waste is collected from formal and informal residential areas weekly. The collection is done per suburb using a curbside garbage collection method based on a waste collection schedule presented below.

Table 2: Waste removal calendar

Day	Area
Monday	Waste removal at all erven (residential, businesses, hospitals, offices, schools etc.)
Tuesday	Litter picking from streets, sidewalks & other public open spaces.
Wednesday	Waste removal critical erven (businesses, hospitals, and schools)
Thursday	Litter picking from streets, sidewalks & other public open spaces.
Friday	Waste removal at all erven (residential, businesses, hospitals, offices, schools etc.)

2.3.2 Waste generation and handling

Solid waste in Oranjemund originates primarily from household (domestic), business area/commercial/trade premises (such as restaurants, hotels, shops and markets), institutions (schools, offices and hospital), streets, parks, gardens, construction activities and as well as municipal services such as street cleaning, repairs and maintenance etc.

a) General household waste

Each household in formal townships is issued with a refuse bin for disposal of general domestic waste. Some households also make use of plastic bags for additional waste collection. The informal areas are served with skip containers that are used by several households. Business premises and institutions are served with skip containers, cages and wheelie bins for waste collection. Most of the institutions have waste collection bins in their offices and buildings for general domestic and office waste. Streets and public open spaces such as parks are served with pole bins for collection of litter i.e., food items etc.

b) Healthcare

Healthcare waste consists of general waste and infectious waste. This waste originates from the health center, general practitioners' rooms (private doctors), laboratories and pharmacies. Infectious waste is normally isolated in red-coloured refuse bags and stored separately from other types of waste. General healthcare waste is collected by the Town Council for disposal at the disposal site while the infectious waste such as needles, syringes, is incinerated at the district Hospital or transported to Keetmanshoop Hospital for incineration.

c) Hazardous waste

Hazardous waste is produced mainly from Vessels and industrial activities. This waste is produced in relatively small quantities and is collected and transported to Walvis Bay landfill site.

d) Garden refuse and special waste

Garden waste, building rubble and obsolete items, i.e., old fridges, machines from households are types of special waste produced in smaller quantity. These wastes are normally collected by the contractor responsible or by the town council and disposed of at the disposal site. Most of the building rubble is reused to fill sinkholes around town. Other types of special waste found in the town are scrap metals i.e., car wrecks and tyres. Scrap metals are often collected by local scrap dealers while tyres are used to make play equipment for school playgrounds.

2.3.3 Waste disposal method

The site is used for disposal of all municipal solid waste originating from the various sources in and around town. Currently, waste volume at the disposal site is reduced through open burning, burying organic waste, recycling and reuse of waste. After burning the residual is moved further to form a heap and make space for new waste disposal. Expired food items are condemned and burned or buried in the presence of the Environmental Health Practitioner (EHP).

Figure 4: Open burning of waste at the dumpsite

2.3.4 Recycling and reuse initiatives

About 80% of the waste found at the disposal site is either recyclable (papers, plastics, tins, bottles etc.) or reusable (food waste and construction materials). Due to poor waste segregation from the source, only about 40% of this waste is removed for recycling and reuse purposes. Thus, 40% of the recyclable and reusable waste remains part of the residual at the disposal site leaving the Town Council with a huge burden of waste to deal with.

Recycling activities at the disposal site are done by local dealers who recruit residents to collect recyclable items. There are also a number of scavengers who frequent the disposal site on a daily basis to collect reusable and recyclables items which they sell to local recycling companies. The ORTC currently does not have any formal contract with any recycling companies.

Figure 5: Recycling activities at the old Oranjemund dumpsite

3. DESCRIPTION OF THE RECEIVING ENVIRONMENT

3.1 Socio-economic settings

3.1.1 About the town

Oranjemund is a diamond mining town in the //Kharas Region of the extreme southwest of Namibia, on the northern bank of the Orange River mouth at the border with South Africa. Oranjemund has been a mystery for many years, everyone knows about it but very few have seen it. This was mainly due to the town being a restricted area, an accessory work built in 1936 to service the diamond mining industry. As such, only people working for the mine could live there, and visits from friends and family were strictly controlled.

The town was privately owned by its incumbent mine until 2011 when it was proclaimed a public town and became a municipal-governed town.As of 2023, the town's population was estimated at about 7,736people.

3.1.2 Social and Economic Development

The economy of Oranjemund depends heavily on its diamond mining industry. There is about 1 013 residential properties. There is a well established private hospital and a public healthcare clinic, providing access to public patients. There is one private and one public primary school, as well as a public secondary school. Various bed and breakfast establishments, a three-star hotel, tour operators and restaurants offer an attractive package of amenities, activities and luxury accommodation for tourists, visitors and travelers.

The town has good infrastructure and can provide water, power and other basic services to all residents, industries and new businesses. Financial, telecommunication, logistics, transport and services infrastructure are modern. Various supermarkets, commercial banks, insurance, hospitality and other service-driven business make-up the Oranjemund economy.

The main road, the MR118 is the primary route connecting Oranjemund to other towns e.g. Rosh Pinah and is situated near the mouth of the Orange River.

3.1.3 Surrouding land uses

The Oranjemund's land uses are evolving from the town's mining origin, with rezoning efforts focusing on diversifying land use to promote economic transformation and community development. Current land uses include general residential, office, local authority, institutional and business zones. There are various initiatives driving development in areas like Tourisms, Agriculture, and Property Development.

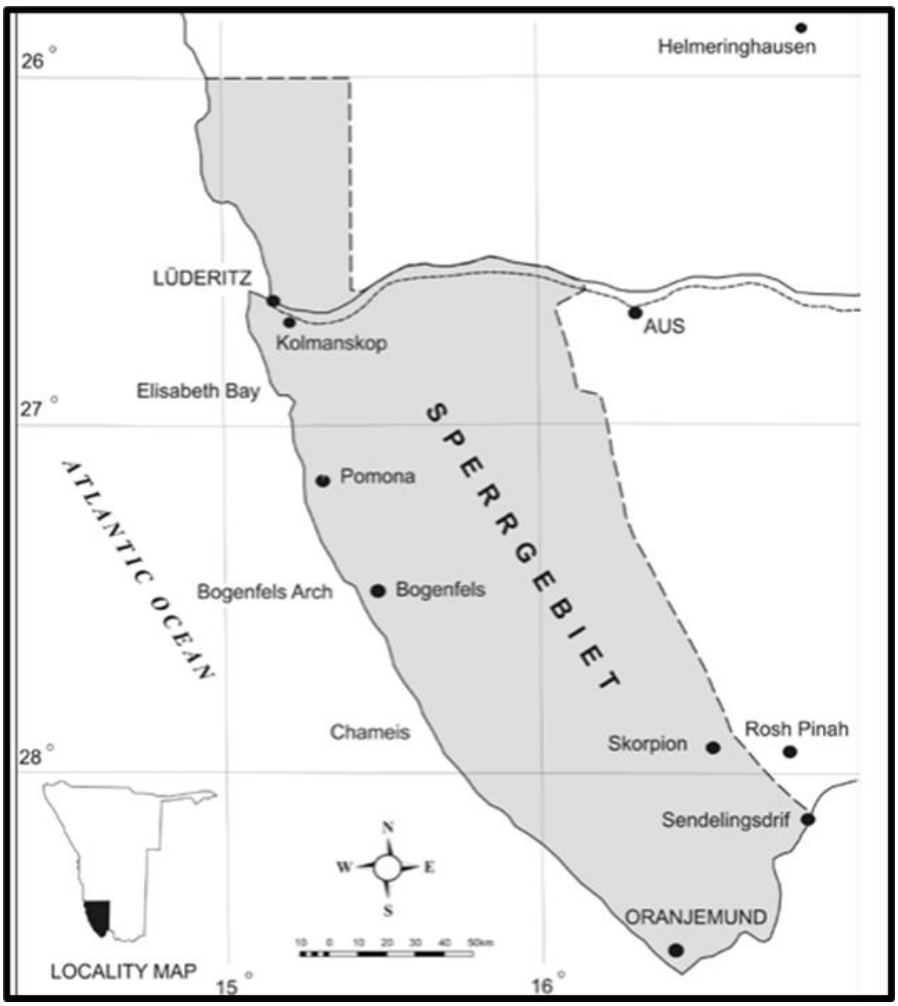

Figure 6: Map of Sperrgebiet National Park

The area surrounding the site is undeveloped land and the Sperrgebiet National Park (SNP). According to the new town planning layout of Oranjemund, the proposed land use in the immediate area is classified mainly as parks, mining area, light industrial and after a buffer of 500m is residential.

4. LEGAL FRAMEWORK

There are several international, national legislations which provide a broad range of principles related to pollution control and waste management that are applicable to ongoing operation and management of the disposal site. These are tabled below.

Table 3: Applicable international and national legislations

LEGISLATION	PROVISION AND REQUIREMENTS
Constitution of the Republic of Namibia (1990)	There are two clauses contained in the Namibian Constitution that are of relevance to sound environmental management practice, viz. articles 91(c) and 95(l). In giving effect to articles 91(c) and 95(l) of the Constitution of Namibia, general principles for sound management of the environment and natural resources in an integrated manner have been formulated. The formulation of these general principles resulted in the Namibia's Environmental Assessment Policy of 1994. To give statutory effect to this Policy, the Environmental Management Act was approved in 2007, and gazette as the Environmental Management Act (Act No. 7 of 2007) As the organ of state responsible for management and protection of its natural resources.
Local Authorities Act, No. 23 of 1992 as amended	Provide for the determination, for purposes of local government, of local authority councils; the establishment of such local authority councils; and to define the powers, duties and functions of local authority councils; and to provide for incidental matters. The collection and disposal of waste is the responsibility of local and regional authorities. The Act also gives power to the Local Authorities to establish by-laws to safeguard waste management within their jurisdictions.
General Environmental Standards Municipal Solid Waste Management Facilities / Systems	The Environmental standard for Municipal solid waste requires that The landfill site shall be 100 meters away from river, 200 metres from pond, 200 metres from Highways, Habitations, Public Parks and water parks and water supply wells, and 20 km away from Airports or Airbase. However, in a special case, landfill site may be set up within 8 km to 20 km away from the Airport/Airbase after obtaining No Objection Certificate from Civil Aviation Authority /Air force as the case maybe. The Landfill site shall not be permitted within the flood plains as recorded for the last 100 years, zone of coastal regulation, wetland, critical habitat areas, and sensitive eco fragile areas.
Pollution Control and Waste Management Policy, 2003	This policy serves to regulate and prevent the discharge of pollutants to air and water as well as providing for general waste management procedure. The bill provide framework for a multitude administration on pollution control and waste management in the country. Each authority identified by the bill shall play its respective roles.

Environmental Management Act, No.07 of 2007	Ensuring that the significant effects of activities on the environment are considered carefully and in time. To promote the sustainable management of the environment and the use of natural resources by establishing principles for decision making on matters affecting the environment.
Water Resources Management Act of Namibia (2004)	This Act ensures that Namibia's water resources are managed, developed, protected, conserved and used in ways which are consistent with fundamental principles depicted in section 3 of this Act. Part IX regulates the control and protection of groundwater resources. Part XI, titled Water Pollution Control, regulates discharge of effluent by permit.
Public Health and Environmental Act, 2015	The objectives of the PHE Act are to; • Promote public health and wellbeing • Preventing injuries, diseases and disabilities • Protect individuals and communities from public health risks • Encourage community participation in order to create a healthy environment • Provide for early detection of diseases and public health risks Section 2 requires that a) "Every local authority must take necessary reasonably and applicably measures to maintain its local authority area at all times in a hygienic and clean condition" b) Prevent occurrence of a health nuisance, unhygienic condition, an offensive condition or any condition which could be harmful or dangerous to the health of a person within its local authority or the local authority area of another local authority"
Atmospheric Pollution Prevention Ordinance, no. 11 of 1976	To provide for the prevention of the pollution of the atmosphere, and for matters incidental thereto. The Ordinance deals with administrative appointments and their functions; the control of noxious or offensive gases; atmospheric pollution by smoke, dust control, motor vehicle emissions; and general provisions.
Hazardous Substances Ordinance 14 of 1974	This Ordinance provides for the control of toxic substance and thus also relevant for pollution control. It covers for the manufacturing, sale, use, disposal, dumping, importing and exporting of hazardous waste.
Labour Act (No 11 of 2007)	To establish a comprehensive labour law for all employers and employees; to entrench fundamental labour rights and protections. Regulate basic terms and conditions of employment; ensure the health, safety and welfare of employees; to protect employees from unfair labour practices; to regulate the registration of trade unions and employers' organisations; to regulate collective labour relations; to provide or the systematic prevention and resolution of labour disputes;
The Soil Conservation Act No.76 of 1969	This Act provides for the prevention and combating soil erosion, the conservation, improvement and manner of use of the soil and vegetation and the protection of water sources,
Medicine and Related Substances Control Act 13 of 2003	Enforces disposal of undesirable medicines.

Atomic Energy and Radiation Protection Act, 5 of 2005	License required for the disposal of radiation source or nuclear material Amended under hazardous substances ordinance Radioactive waste is presently transported across the borders as there is no disposal facility in Namibia.
Namibia Integrated Health Care Waste Management Plan, 2010	Provide the information to allow health care facilities to establish a good healthcare waste management system consistent with the regulatory requirements of Namibia.
National Solid Waste Management Strategy, 2018	Provides coordination for funding, regulations, action plan for proper solid waste management and facilitate stakeholder collaboration.
Basel and Rotterdam Convention, Framework Convention on Climate Change	Agreed to ensure environmentally sound management of hazardous waste and other wastes through the reduction of their movements, for the purpose of reducing their impacts on human health and environment. The Basel Convention makes specific reference to control of special HCW: sharps, pathological infectious waste, hazardous chemical waste, and pharmaceutical waste and includes the following waste categories: • Clinical wastes from hospitals, health centers, and clinics. • Wastes from the production and preparation of pharmaceutical products. • Pharmaceutical waste. • Waste from the production, formulation and use of biocides and phyto-pharmaceuticals Namibia has accepted the principal that the only legitimate transboundary shipments of hazardous waste are exported, where the country lacks the facilities or expertise to dispose of the waste categories. This is applicable to the transportation of radioactive waste from Namibia to South Africa. Because suitable facilities are not available in Namibia, provided that the radioactive waste is labelled, temporarily stored and transported according to the United Nations (UN) recommended standards.
Stockholm Convention on Persistent Organic Pollutants	Emphasizes the restriction and elimination of on persistent organic pollutants (POPs), especially the disposal of industrial and medical chemicals. It also provides information for future establishments to re-use, reduce and recycle waste with environmentally friendly technologies e.g. autoclaving. It was adopted in 2001 and entered into force on May 17, 2004.
Rotterdam Convention	Prescribes the Prior Informed Consent procedures for certain hazardous chemicals and pesticides in international trade. Adopted in 1998, entered into force on February 24, 2004.
International Atomic Energy Agency (IAEA)	The IAEA is an autonomous intergovernmental organization within the UN system. The organization provides advice to member states on nuclear power development, health and safety, radioactive waste management, legal aspects of atomic energy, and prospecting for and exploiting nuclear raw materials. The agency has developed safety standards in pre-disposal of hazardous waste, which includes collection, handling, treatment, conditioning, and storage of radioactive waste.

5. RESPONSIBILITIES

5.1 Proponent

It is the core responsibility of the ORTC to ensure the successful implementation of this EMP and any conditions to be imposed by the Ministry of Environment, Forestry and Tourism (MEFT). However, the implementation of this EMP also requires the involvement of various waste producers as well as other stakeholders, each with specific responsibilities to ensure that the project is operated in an environmentally sensible manner.

5.2 Waste generators (Institution, households, organization, etc.)

Waste generator refers to any person or organisation whose activities produce any waste and, if that person/organisation is not known, the person who is in possession and/or control of the waste. It is the duty of anyone who imports, produces, carries, keeps, treats, disposes of, or are a dealer or broker that has control of waste.

- Handle waste in a way that will bring no harm to the health of any individual or the environment
- All waste producers should make sure their waste collection bins are placed outside during the collection day or have their waste disposed of at the disposal site.
- Failure to comply with the above shall be liable to penalties or face legal action.

5.3 Proponent: Oranjemund Town Council

Responsibilities

a) Implement the final EMP after approval by DEA and ensure the project complies with the EMP and conditions therein.
b) Notify MEFT and EAP of any proposed changes to the solid waste disposal site
c) Appointing an Environmental Control Officer (ECO) to take on the following responsibilities:
    - Daily inspections and regular monitoring and review of the on-site environmental management and implementation of the EMP by the maintenance team or contractor.
    - Overall maintenance and control of the site (i.e., fences, gates, etc.).
    - Control the disposal and burning of waste, collection of windblown litter.
    - Keep environmental records, compile and submit quarterly reports to DEA.

- Provide Environmental training and awareness on the contents of the EMP to all contractors, sub-contractors and employees involved in the management of the solid waste disposal site.
- Ensure the review/update of this EMP as required and renewal of the ECC.

d) The above responsibilities could be shared among several officials as per their respective job descriptions. However, the overall responsibility should lie with the Environmental Health Practitioner.

e) The Town Council may also acquire the service of a Landfill Operator to manage the day-to-day operations of the disposal site.

5.4 Authorities (MoHSS, MEFT, MAWFLR etc.)

Various government ministries should provide supervisory and monitoring roles to ensure compliance with the relevant Acts and Regulations as outlined in Section 4. Of relevance to this project are the Ministry of Health and Social Services (MoHSS), Ministry of Environment, Forestry and Tourism (MEFT), Ministry of Works and Transport (MWT) and Ministry of Agriculture, Water and Land Reform (MAFWLR).

- **MoHSS** should provide monitoring of public health and safety issues at public places such as clinics, hospitals, and private doctor's rooms as well as ensuring port health services. Moreover, MoHSS is responsible for collecting and disposal of infectious healthcare waste in accordance with the National Healthcare Waste Management Plan.
- **MEFT** should conduct Environmental compliance monitoring, review progress reports and approve ECC applications and renewals.
- **MAWFLR** is responsible for the control of animal healthcare (veterinary) waste i.e., expired drugs, needles, infectious animal carcasses etc. These types of waste should be incinerated, and the ashes must be disposed of in an acceptable manner and in consultation with the Town Council.

6. PROPOSED IMPROVEMENT MEASURES

Given the current state of the solid waste management practices in Oranjemund, the Town Council needs to implement an Integrated Solid Waste Management Plan (ISWMP) to promote effective waste management systems and ensure wise waste disposal practices.

The ISWMP will include several strategies such as waste management education and awareness, inventory management, waste hierarchy and minimisation initiatives i.e., recycling and resource recovery, improve standards on waste collection, transportation and disposal as well as general maintenance of the disposal site as outlined below.

6.1 Waste Management Education

Awareness raising campaigns are a key component to ensure effective solid waste management, disseminate information and educate the community. These can be addressed in the following ways.

a) **a). Educational postcards and general guides**

The Town Council may consider developing postcards and general guides to provide information and educate the community about solid waste management practices. Information to be provided on postcards can include the following information.

- Types of wastes to be recycled.
- Waste collection schedule
- Waste collection points
- Local recycling companies (addresses and contacts)
- Clean-up days, etc.

b) Community clean-up and anti-littering campaigns

The ORTC in collaboration with other local stakeholders should organise annual clean-up and anti-littering campaigns to cultivate a culture of cleanness in the town. The clean-up campaigns can be done during annual National Clean-up Day (18 September) as established by the President in 2018. Existing community gatherings can also be used as a platform to raise awareness and educate the community on solid waste management in town.

Figure 7: National Clean-up logo

6.2 Waste inventory management

It is difficult to achieve effective solid waste management without a good data base. It is recommended that the Town Council develop an integrated register of all types and quantity of waste generated in the town as well as where and how they are used and how the residues or out-dated materials are stored or disposed. Furthermore, there should be an up-to-date filing system for the disposal site, whereby method statements, environmental incidents report, training records, audit reports and public complaints register are kept.

6.3 Waste management hierarchy

The waste hierarchy remains the cornerstone of most waste minimization strategies. The aim of the waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste. This will save costs of solid waste management services and will save landfill space and create opportunities for the community.

The waste management hierarchy classifies waste management strategies according to their desirability in terms of waste minimization. According to the hierarchy, waste avoidance at source is to be considered as highly preferable, followed by the popular 4Rs namely, *Reduce, Re-use, Recycle and Recovery, whereas Treatment and Disposal* should only be considered as last resorts.

Figure 12: Waste management hierarchy

The waste management hierarchy process is outlined below.

6.3.1 Waste avoidance

The process of waste avoidance should be the primary focus for the waste management strategy. It begins with an examination of what you are using i.e., paper, plastic etc. and what it is used for. A key action in minimising waste is influencing community behaviour regarding waste production.

The waste avoidance can be achieved in the following ways:

- Adopting a green procurement approach by purchasing environmentally preferred products.
- Establish a green team for the town that promotes and actively seeks opportunities to reduce waste and increase recycling in day-to-day operations e.g., re-using old recycling crates and used tyres as planting boxes for plants and fruit trees.
- Participating in local programs, festivals and working with local business groups on waste minimisation initiatives e.g., Local retail programs for alternatives to disposable plastic bags, food waste recovery etc.

6.3.2 4Rs (Reduce, Re-use, Recycle and Recover)

Waste reduction is the practice of using less material and energy to minimize waste generation. The main objective of waste reduction is to prevent materials from ending up as waste before they reach the recycling stage and to preserve natural resources. Rather than using the traditional cradle-to-grave approach, the waste reduction applies a cradle-to-cradle system. The cradle-tocradle system implies that instead of disposing of a product after a single use, the product or component is passed on within the organisation or between organisations for further uses.

Waste such as tyres, woods, marine ropes can be reused in many ways to create play park equipment at schools and community playgrounds. About 80% of waste found at the disposal site i.e., plastic, boxes, cartons, tins, bottles, cans, electronics, car parts & scraps are recyclables. The Town Council in collaboration with recycling local companies and residents should establish recycling projects to minimise the amount of waste going to the disposal site.

Recoverable materials that are organic in nature such as plant material, food scraps, and paper products can be recovered through composting and digestion processes to decompose the organic matter. This can be done by designating a site or cell within the disposal site for decomposing organic waste separately from other wastes. The resulting organic material can be recovered as mulch or to be used as compost for agricultural or landscaping purposes.

6.3.3 Treatment and disposal

Only after exploring the above options that the remaining waste can be treated and disposed of. The Town of Oranjemund is transitioning from the current “Open dumpsite system” to a Controlled dumpsite system. This will enable the Town Council to achieve minimal disposal objectives as follows.

- Creating ample space for dumping
- Prevent risks to human health and the environment.
- Reduce littering.
- Vector control i.e., flies, rodents, stray animals etc.
- Control dust, noise, and odor.
- Reduce the cost of disposal.
- Extend service life span of the disposal.

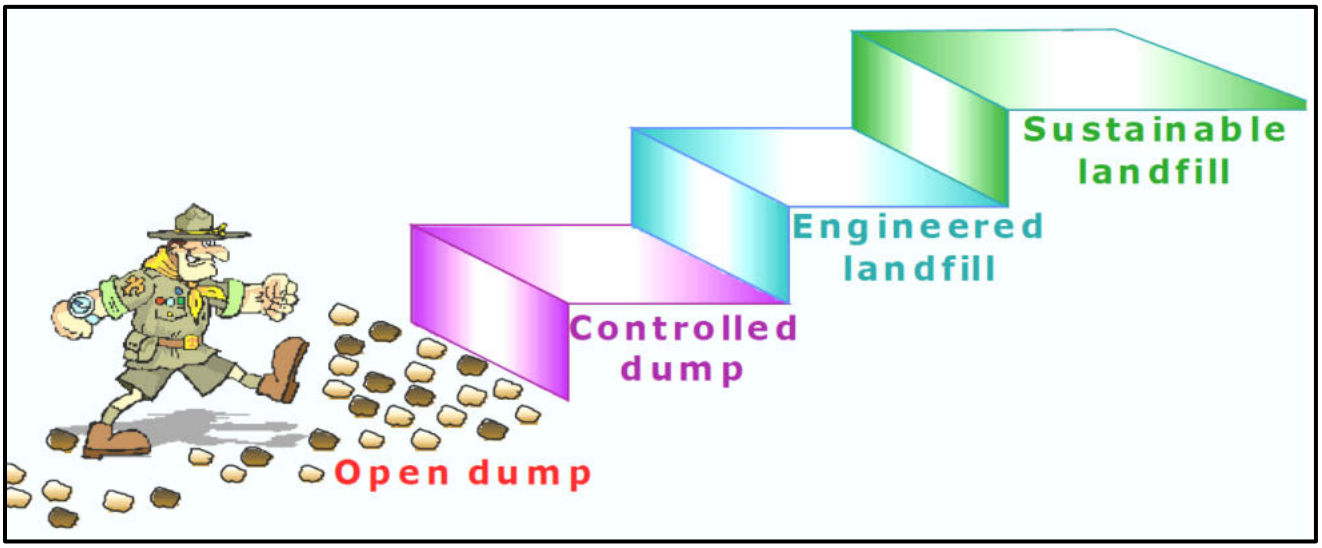

Figure 8 Waste disposal objectives for local authorities

The controlled dumping system is an acceptable waste management method, with controlled emissions and limited health and environmental impacts. Under the controlled dumping system, waste can be treated and disposed of in two ways, depending on the available space, permeability of soil, nature of underlying aquifer and financial capability of the ORTC. There are a number of landfilling methods under the controlled dumping system are explained in detail here below.

a) Area Landfill

The area landfill method is sometimes referred to as above ground landfill method where waste is placed on the land without any excavation. A bulldozer or similar equipment spreads and compacts the waste; then the waste is covered with a layer of earth; and finally, the earth cover is compacted. The area method is best suited for flat areas or gently sloping land, and is also used in quarries, ravines, pits, or where other suitable land depressions exist. Normally the earth cover material is hauled in or obtained from adjacent areas.

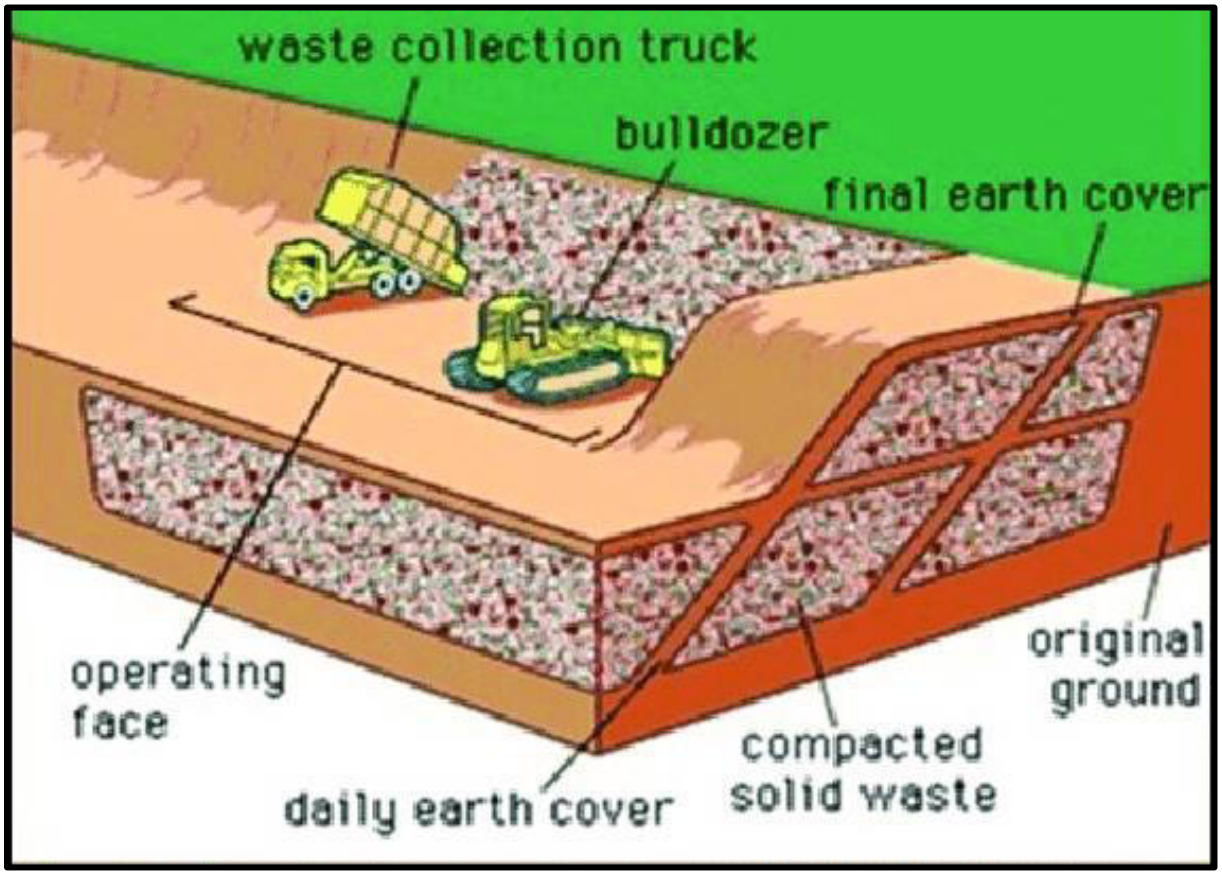

Figure 9: Area method

b) Trench Landfill

A trench is a hole dug in the ground and the solid waste placed in it. The waste collection truck deposits the load into the trench. The waste is then spread in thin layers, compacted, and covered with earth excavated from the trench. At the end of the day the dragline excavates soil from the future trench; this soil is used as the daily cover material. Trenches can also be excavated with a front-end loader, bulldozer, or scraper.

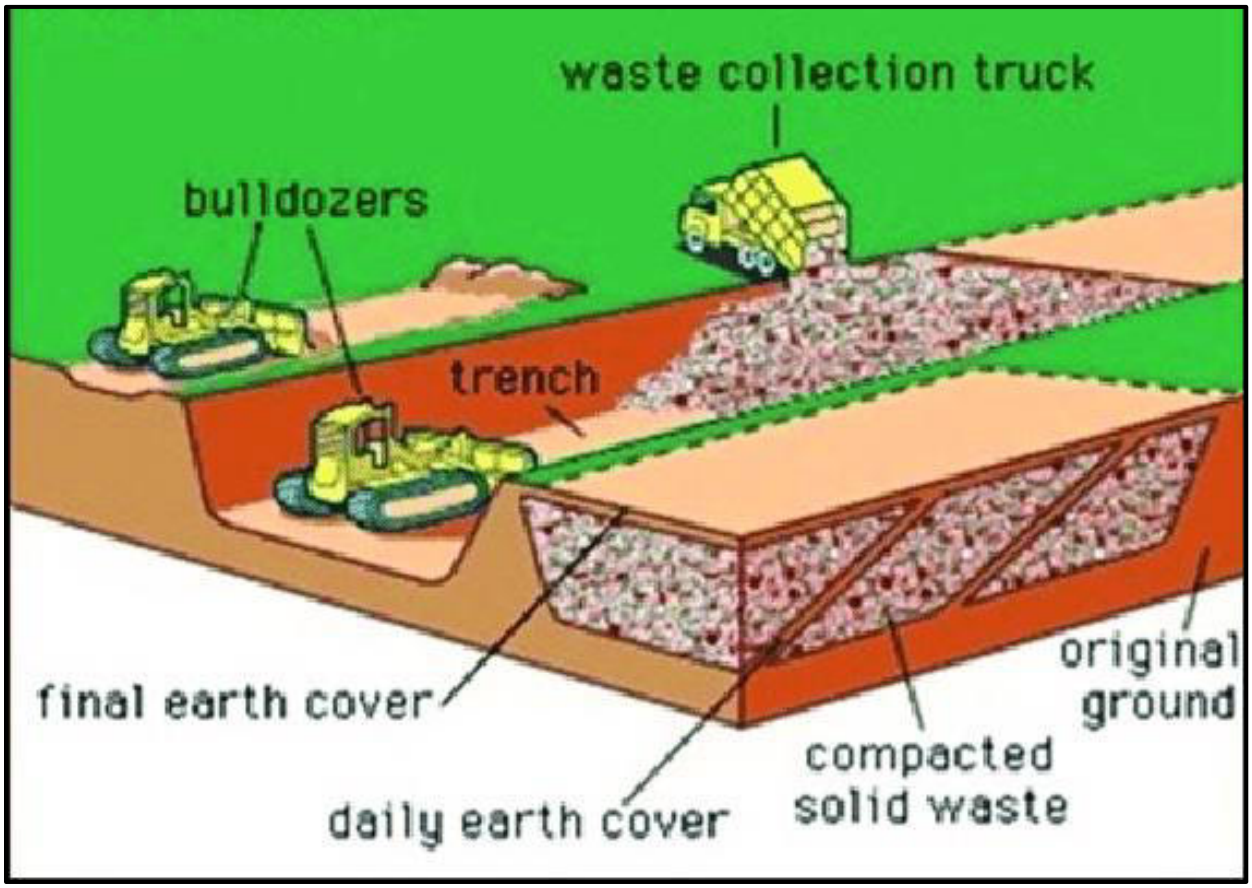

Figure 10: Trench method

This method can be very expensive and time-consuming thus only suitable for large cities.

6.3.4 Dumpsite infrastructure

The following maintenance services must be ensured

a) Fencing

The previous fence is submerged by dune sand; hence it should be upgraded to control access, contain wind-blown waste and keep animals and scavengers away from the site. To protect the fence from vandalism, OTC should explore other alternative fencing options i.e., brick wall, precast fence other than the barbed wire mesh fence that was previously used. Moreover, the fence must have the following specifications.

- Materials suitable for the local weather conditions
- Height: 1.2m or higher
- The fence should be jackal proof
- The fence should cover the entire site
- Cemented in the ground

b) Lockable gates and security

The disposal site should be served with a lockable gate. Swing gates are probably best, instead of a sliding or cantilevered gate, because they require the least maintenance. To ensure access control, a temporary guardhouse at the entrance should be constructed. The Town Council should also explore the possibility of having at least a guard on a daily basis to control access and provide directions to vehicles to the appropriate disposal units. The gate guard should also inspect the loads inside certain vehicles if deemed necessary. This will prevent illegal dumping of unauthorized waste and ensure public safety of the dumpsite users.

c) Signage, rules, and restrictions

An information noticeboard which displays information to the users regarding the various operations and hours, details of operators, contact numbers, etc., should be placed at the entrance of the site. Only general municipal waste such as *household, garden refuse, building rubble, some industrial i.e., tires, scraps, and wrecks must be allowed.* Infectious waste and hazardous use, i.e., used oil, asbestos, healthcare etc., must NOT be allowed at the disposal site. Unauthorized open burning, scavenging, smoking and hazardous activities should be totally prohibited on site.

7. PROPOSED MITIGATION MEASURES DURING OPERATIONAL PHASE

The following mitigation measures must be enforced on a daily basis to prevent, avoid, and lessen negative environmental and public health risks that are associated with the operation of the disposal site.

Table 4: Proposed mitigation measures during the operational phase

RISK	OBJECTIVE	RECOMMENDED MITIGATION MEASURES	RESPONSIBILITY
1 General Waste Management			
1.1 Littering -Wind-blown waste can easily pollute or be an eyesore to the surrounding area.	Reduce pollution	• Encourage recycling of papers, plastics at sources to reduce amount going to the disposal site. • Litter that can be blown by wind must be covered with sand or building rubble to prevent it from being blown away. Control burning should be used to contain this waste. • Erect and maintain fence around the site • Assign a team to collect all wind-blown waste around the disposal site on regular basis. • Organise regular clean-up campaigns around town and encourage residents to take part. • Discourage use of plastic in town through campaigns and awareness	ECO
1.2 Danger of expired food -Expired food may attract scavengers at the disposal site. This may pose serious public health risks.	Ensure Public safety	• All expired food items must be condemned at the disposal site as soon as possible. This should be done in the presence of the EHP/ECO. If such official is not available on site, any other authorized qualified council official must assist. • Control entry to the disposa site.	ECO

1.3 Unauthorized dumping i.e., dumping at unauthorized sites, dumping of hazardous waste etc. can lead to serious public health.	Proper use of the disposal site	• Create public awareness through campaign, meetings, etc. • Erect No-dumping signs around town and conduct regular inspection • Install an Information Notice Board at the disposal site entrance depicting all rules and regulations to the users. • Enforce penalties for illegal dumping and non-compliance.	ECO
1.4 Risks of fire from burning of waste which could spread to nearby residents or vegetation.	Ensure public safety and prevent damage to properties	• Only authorized burning by the municipal official or authorized person • Do not leave active fires unattended • Avoid burning when its windy • Waste should be burned in the trench/excavation • Provide fire cuts around the disposal site	ECO
1.5 Dust and fumes from vehicle may generate noise, dust, vibration which mighty be a nuisance to the residents.	Ensure public safety and health	• Avoid hauling of waste stream when its windy • Provide dust suppression when it's necessary • All persons operating at the disposal site must be provided with appropriate Personal Protective Equipment (PPE)	ECO
2 Public Health and Safety Risks			
2.1 Smoke -Burning of waste could generate smoke which is associated with several public health risks such as: a) Respiratory abnormalities b) Abdominal problems c) Ear infection d) Central nervous system e) Blood disorder	Ensure public safety and health	• Only burn a certain amount of waste at a time. • Employees must be always be provided with PPE. • No development should be allowed with 500 m from the disposal site.	ECO

-These can occur because of inhalation of smoke, ingestion of contaminated items or absorption through skin cells. -Smoke can also cause health problems to animals and other living organisms in the area -Smoke in the surrounding may obstruct traffic flow within the surrounding area. **2.2 Smell/odours.** -Biodegradable organic material emits obnoxious odors that cause illness to people living in and around them. Since they ferment, they could create favorable conditions for survival and growth of microbial pathogen.		• Burning of waste should be done in a controlled environment by an authorized person • No burning of waste should be done on windy days. • Large volume of organic waste should be buried or covered with sand. • Dead animals must be burned or buried. • Apply chemicals to avoid infestation of flies and rodents (when required). • All organic wastes that could attract pets must be discarded • Ensure proper maintenance of fence to keep animal away	ECO ECO ECO

2.3 Disease transmission -Unattended wastes lying around attract flies, rats, and other animals that in return spread diseases. -Disposal sites areas are mostly feeding places for dogs and cats. These pets, together with rodents, carry diseases to nearby homesteads. **2.4 Contamination and infections** -The disposal site may become the children's source of contamination due to the incubation and proliferation of flies, mosquitoes, and rodents. -Due to poor waste segregation, some medical waste maybe found mixed up with domestic waste and end up at the site. This poses a serious risk of infection with different diseases.		• Expired food which may attract scavengers should be destroyed immediately • No unauthorized entry. • Apply chemicals to avoid infestation of flies and rodents (when required). • Infectious medical waste should not be disposed of on site • Ensure waste proper segregation at the sources • Provide training to the waste collection team especially those collecting waste from health centres.	ECO ECO

2.5 Occupational health risks -Direct handling of solid waste can result in various types of infectious and chronic diseases with the waste workers and rag pickers being the most vulnerable. These include skin or blood, eye and respiratory and intestinal infections as well as cancer resulting from exposure to dust or hazardous compounds. -Direct exposure to municipal waste can lead to diseases through chemical exposure as the release of chemical waste into the environment leads to chemical poisoning and radioactive hazard. Many studies have established that there is a strong connection between exposure to waste and diseases. -Employees/workers can also be at risk of injuries from sharp objects at the dumpsite if they are not properly protected.		• Hospital and other health centres employees must also be well informed about segregation of waste domestic and medical waste. • All persons involved in waste management should be equipped with PPE. (See above)	

-Employees are also at risk of accidents during waste handling, i.e., muscle disorders from lifting heavy containers, infectious wounds from contact with sharp objects or poisoning and chemical burns from chemical waste mixed with general waste.			
3 Soil contamination			
3.1 Contamination of soil with heavy metals from tins, cans etc.	Prevent soil contamination	• Promote and encourage recycling of tins, cans • Avoid burying waste that contains lead i.e. tins, cans scrap metals. • Waste such as tins, cans which contains heavy metals should be collected as recyclables and sent to scrap yards.	ECO
3.2 Oil leakage from vehicle, machinery could contaminate the soil	Prevent contamination of soil and groundwater	• Clean up the contaminated soil and dispose of in an environmentally friendly manner. • Ensure proper and frequent servicing of vehicle and equipment used at the site • Waste oil should be collected and sent to recycling companies	ECO
3.3 Soil erosion from disturbed areas during waste disposal	Ensure soil conservation	• No excavation will be done; hence an area landfill method is recommended. • Do not extract soil from slope areas. • Provide erosion barrier to prevent soil from carrying away. • Building rubble should be used as cover material	ECO

4 Groundwater and freshwater contamination			
4.1 Dumping of waste may pose serious risks of groundwater contamination by leachate.	Prevent groundwater contamination	• No hazardous waste allowed to be disposed on site • Waste containing heavy metals may not be buried, unless a linear system is provided • No burying of waste next to drainage line • Flows which contain leachate should be contained and disposed of as hazardous waste	ECO
4.2 Contamination of nearby watercourse	Prevent contamination of freshwater	• The area receives limited rainfall • There is no major watercourse in the proximity of the site • However, in case if rainfall, storm water that is mixed with waste must be contained and disposed of as hazardous waste • Water flows which is mixed with waste stream should be contained and disposed of as hazardous waste	ECO
5 Operational management and maintenance			
5.1 Inadequate management if site operator is ill/on leave/resigns	Ensure effective and efficient management of the plant	• At least two site operators must be fully trained in the operation of the site, so that one can stand in for the other in case of illness, leave, etc. • Ensure regular training of the operators • The Town Council may seek a service of a landfill site operate to operate the disposal site on its behalf • The landfill operator should also be training on waste management and Environmental requirements as outlined in this EMP.	ECO

5.2 Lack of skills on the part of the site operator	Ensure effective and efficient management of the site.	• The existing system requires only a moderate level of skill and technical expertise. • Drivers and site operators must have appropriate skilled and experienced for the task at hand • Site operators must receive continuous training in all aspects of daily management of the site (technical or administrative) • Technical support must be available to the site operator	ECO
5.3 Lack of proper and timely maintenance of vehicles, plant, structures may compromise the functionality of the site	Ensure smooth operation	• The fence and other site structures must be maintained regularly by replacing key components, when required. • A maintenance plan must be in place to ensure that planning, such as budget allocation or procurement of service providers, can be put into motion sufficiently ahead of time.	ECO
5.4 Document control and access to information	Readily available of records and information about the site	• Ensure that all reports are available and easily accessible	ECO
6 Legislation requirement			
6.1 Lack of compliance with relevant legislations may cause transgression or conflicts with the law	Operating within the requirements of the law	• This EMP must be reviewed every three years, concurrent with the renewal of the ECC • Compile Biannual report on the operation and management of the dumpsite • Any upgrading of the disposal site should be done in accordance with relevant legislations as outlined in this document.	ECO

8. ENVIRONMENTAL COMPLIANCE MONITORING

The ORTC as the proponent is required by the Environmental Management Act 07 2007 to conduct regular monitoring to ensure due diligence and compliance to relevant legislations as outlined on Section 4 of this document. Monitoring activities should be conducted by the ECO at different intervals as indicated in the table below throughout the project life span. The monitoring report should be prepared and submitted to the Environmental Commissioner biannually. Reporting will be based on the key performance indicators (KPI) such as:

- Quantity of waste collected.
- Quantity of waste disposed.
- Quantity of waste recycled.
- Total number of households that exists in the local authority.
- Number of households receiving waste collection services.
- Number of households paying waste management fees.
- Total number of commercial enterprises receiving waste collection services.
- Number of commercial enterprises paying waste management fees.
- Costs of waste management services.

8.1 Monitoring

Periodic environmental monitoring must be taken on a regular basis. Monitoring should be done in order to ensure compliance with all aspects of the EMP. Findings should be liaised with to all responsible officers as chain command.

Table 5: Monitoring Schedule

Issues to be monitored	What needs to be monitored	Monitoring frequency	By who?
General cleanness of town	Presence of litter in and around town and dumpsite	Monthly	ECO
Waste generation	Quantity of waste collected and disposed of at disposal site.	Monthly	ECO
Waste minimization	Quantity of recyclables collected	Monthly	ECO
General operation of the disposal site	Condition of fences, gates of the disposal site. Complaints registered	Monthly	Foreman/Team leader
Quarterly Report	Key activities/actions implemented as EMP	Quarterly	ECO

8.2 Site Environmental Monitoring Checklist

The checklist below should be used during the monitoring program. The checklist will enable the Town Council to cope with new circumstances and/or requirements of the community or the authorities as they may rise. The checklist should be filled in regularly as per the monitoring schedule outlined on the table above. This is only an example; the Town Council shall prepare a detailed checklist outlining all environmental parameters which need to be monitored as depicted on Table 5.

Table 6: Site inspection Checklist (Example)

	KEPT AT STANDARD LEVEL?		***Quantity (where applicable)***	
Issue to be monitored	***YES***	***NO***		***Comments/Remark***
i.e. Littering, Dust, Fire etc.				

This information is true and correct to the best of my knowledge.

Name of person inspecting site: _____

Inspection period: _____

Signature: _____

9. CONCLUSION AND RECOMMENDATIONS

9.1 Conclusion

In summary, the baseline information provided indicates that the existing Oranjemund d is best situated in line with the Waste Disposal Sitting Guidelines of the MEFT. It is anticipated that site can still be operated and maintained in an environmentally acceptable manner, provided that ISWMP as outlined on Section 6 as well mitigation measures on Section 7 of this report are fully implemented.

The implementation of this EMP requires a multitude of administration as outlined on Section 5. However, the proponent should play a pivotal role in the implementation of this EMP as outlined in this report. The EMP, once approved by MEFT should be considered a legally bidding document, thus, any deviation or transgression from this EMP is punishable by law as per the Environmental Management Act, No. 07 of 2007.

9.2 Recommendations

Recommendations to the proponent

It is recommended that the ORTC

- Implement the ISWMP outlined on Section 6 to transition from the current open dumping system to a more desirable controlled dumping system.
- Construct new infrastructure outlined in Section 6.3.4 to meet the minimum disposal objectives and ensure safe operation of the disposal site.
- Appoint the ECO to perform to oversee the implementation of the EMP and conduct compliance monitoring as outlined on Section 8 during the operation and management of the dumpsite and
- The ECO should also submit biannual environmental reports to the MEFT and ensure renewal of the project's ECC.

Recommendation to the Authority (MEFT)

It is recommended for the Environmental Commissioner to accept this EMP and consider issuing an Environmental Clearance Certificate for the operation and management of the existing Lüderitz dumpsite, //Khara's region.

10. REFERENCES

- Christelis G and Struckmeier W (Editors). 2001 (2011).Groundwater in Namibia: an explanation to the Hydrogeological Map. Ministry of Agriculture, Water and Rural Development, Namibia. (First edition December 2001; unrevised second edition January 2011.
- Department of Water Affairs and Forestry, 2001. Groundwater in Namibia: An explanation to the hydrogeological map. MAWRD, Windhoek.
- Garrad, S., Heyns, P., Pfaffenthaler, M. & Schneider, G. (2017). Environmental Awareness for Sustainable Development. A Resource Book for Namibia. Hanns Seidel Foundation. Windhoek. Namibia.
- Geological Survey of Namibia, 1999. Regional geological map of Namibia. Ministry of Mines and Energy, Windhoek, Namibia.
- Integrated Solid Waste Management Policy. Ministry of Environment and Tourism (MET), 2018
- Matrix Consulting Services. 2021. Environmental Management Plan (EMP) for the new Oranjemund Landfill: Oranjemund Town Council.
- Mendelsohn, J., Jarvis, A., Roberts, C. & Robertson, T. 2003. Atlas of Namibia. David Philips Publisher. Cape Town.
- Mendelsohn, J., Jarvis, A., Roberts, C. & Robertson, T. (2009). Atlas of Namibia. A Portrait of the Land and its People. Sunbird Publishers. Cape Town. South Africa.
- Namibia Statistics Agency (2014). 2011 Housing and Population Census Regional Profile
- Namibia Statistics Agency. (2011). National Census 2011.
- Namibian Environmental Management Act Regulations, Ministry of Environment and Tourism, 2007
- Namibia Integrated Health Care Waste Management Plan., Ministry of Health and Social Services, 2010.