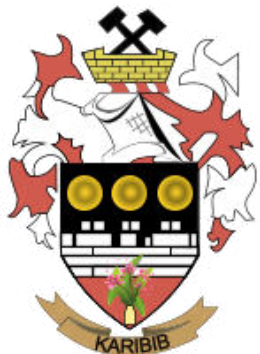




2022

# DRAFT ENVIRONMENTAL MANAGEMENT PLAN

Karibib New Municipal Waste Disposal Site



# DOCUMENT ISSUE STATUS

## PROJECT TITLE

DRAFT ENVIRONMENTAL MANAGEMENT PLAN: NEW MUNICIPAL WASTE DISPOSAL SITE AT KARIBIB, ERONGO REGION

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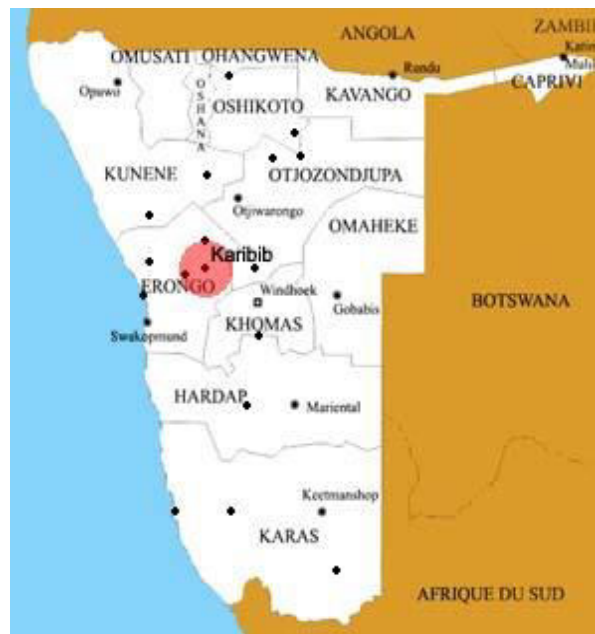
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# 1. BRIEF INTRODUCTION

## 1.1. Background Information

Karibib is a town in the Erongo Region of western Namibia. It is situated, halfway between Windhoek and Swakopmund on the B2 Main Road, See **Figure 1** below for the locality map of Karibib. Karibib is the district capital of the Karibib Constituency, which includes the urban area of Usakos and surrounding private commercial farms. The town comprises of some 9,800 hectares of land and is governed by the Karibib Town Council while the surrounding rural areas (farm land) are governed by the Erongo Region Council.

The discovery of gold, marble and granite in the vicinity of Karibib has contributed positively to the local economic development of the town. The Navachab Gold Mine owned by QKR Namibia is located 10 km from Karibib and is the major employer in the town. Pressure on the town is caused by the increasing town population, the economic activities of the people and their social interactions. The town has a relatively small economic base which is very much reliant on the gold mine and the farming activities.



**Figure 1:** Location of Karibib

There is hence a desperate need to diversify the economy of the town to attract investors and thus grow the town and the local economy.

The Karibib Town Council is in a fortunate position in that it has sufficient townlands available for future developments; accessibility and convenience to main centres and activities in Namibia. This accessibility combined with the availability of land makes the town a perfect destination for investment. The surrounding hinterland is also filled with tourism opportunities and natural attractions.

Urban and industrial developmental activities, however, disturb the natural ecosystem and have multiple direct and indirect environmental consequences. Waste management, being a prominent activity that accompanies any urban and industrial development, is a perpetual problem.

The storage, transportation, treatment and disposal of waste can be a very expensive exercise that requires a lot of input from all stakeholders. However, there is a call to reduce the costs associated with the management of waste. This can be done by implementing the Integrated Waste Management Hierarchy, which encourages all stakeholders to at best avoid the production of waste; were the avoidance of waste is not possible, the amount of waste produced be minimized; then to reuse; and recycle waste before disposal or landfilling is contemplated.

The Karibib Town Council (KTC) has resolved to initiate the process of identifying a new Municipal Waste Disposal Site, which will be formalised through an Environmental Impact Assessment and subsequent design and construction. The existing dumping site will then be closed. It is Council's intention to finalise the processes culminating into the new landfill site during the period of validity of the Environmental Clearance Certificate (ECC) for the existing dumping site. KTC has appointed Environam Consultants Trading (ECT) to carry out the assignment of conducting an Environmental Impact Assessment (EIA) for the selected site.

## 1.2. Terms of Reference and Scope of Project

The scope of this project is limited to conducting an environmental impact assessment and applying for an Environmental Clearance Certificate for the New Municipal Waste Disposal Site at Karibib, Erongo Region and associated infrastructure. This includes consultations with client; site investigations and analysis; stakeholder consultations including a public meeting; impact analysis; mitigation formulation; scoping report writing; and draft Environmental Management Plan.

## 1.3. Legal Requirements

The table below lists some of the main environmental and developmental legislations, policies, plans, programmes and clauses that are relevant to the operation of a waste disposal site.

**Table 1:** Policies, plans, programmes and legal framework relevant to the municipal waste dumpsite.

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
The Constitution of the Republic of Namibia as Amended	Article 91 (c) provides for duty to guard against “the degradation and destruction of ecosystems and failure to protect the beauty and character of Namibia.”  Article 95(1) deals with the “maintenance of ecosystems, essential ecological processes and biological diversity” and sustainable use of the country’s natural resources.	Sustainable development should be at the forefront of this development.
Environmental Management Act No. 7 of 2007 (EMA)	Section 2 outlines the objective of the Act and the means to achieve that.  Section 3 details the principles of Environmental Management	The development should be informed by the EMA.

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
EIA Regulations GN 28, 29, and 30 of EMA (2012)	<p>GN 29 Identifies and lists certain activities that cannot be undertaken without an environmental clearance certificate.</p> <p>GN 30 provides the regulations governing the environmental assessment (EA) process.</p>	<p><b>Activity 2.1</b> The construction of facilities for waste sites, treatment of waste and disposal of waste.</p> <p><b>Activity 2.3</b> The import, processing, use and recycling, temporary storage, transit or export of waste.</p> <p><b>Activity 9.2</b> Any process or activity which requires a permit, licence or other form of authorisation, or the modification of or changes to existing facilities for any process or activity which requires an amendment of an existing permit, licence or authorisation or which requires a new permit, licence or authorisation in terms of a law governing the generation or release of emissions, pollution, effluent or waste.</p>
Convention on Biological Diversity (1992)	Article 1 lists the conservation of biological diversity amongst the objectives of the convention.	The project should consider the impact it will have on the biodiversity of the area.
Draft Procedures and Guidelines for conducting EIAs and compiling EMPs (2008)	Part 1, Stage 8 of the guidelines states that if a proposal is likely to affect people, certain guidelines should be considered by the proponent in the scoping process.	The EA process should incorporate the aspects outlined in the guidelines.

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
Namibia Vision 2030	Vision 2030 states that the solitude, silence and natural beauty that many areas in Namibia provide are becoming sought after commodities and must be regarded as valuable natural assets.	Care should be taken that the development does not lead to the degradation of the natural beauty of the area.
Water Act No. 54 of 1956	Section 23(1) deals with the prohibition of pollution of underground and surface water bodies.	The pollution of water resources should be avoided during construction and operation of the development.
The Ministry of Environment and Tourism (MET) Policy on HIV & AIDS	MET has recently developed a policy on HIV and AIDS. In <i>addition</i> , it has also initiated a programme aimed at mainstreaming HIV and gender issues into environmental impact assessments.	The proponent and its contractor have to adhere to the guidelines provided to manage the aspects of HIV/AIDS. Experience with construction projects has shown that a significant risk is created when construction workers interact with local communities.
Township and Division of Land Ordinance 11 of 1963	The Townships and Division of Land Ordinance regulates subdivisions of portions of land falling within a proclaimed Local Authority area.	In terms of Section 19 such applications are to be submitted to the Townships Board
Local Authorities Act No. 23 of 1992	The Local Authorities Act prescribes the manner in which a town or municipality should be managed by the Town or Municipal Council.	The development has to comply with the provisions of the Local Authorities Act



<b>LEGISLATION/POLICIES</b>	<b>RELEVANT PROVISIONS</b>	<b>RELEVANCE TO PROJECT</b>
Labour Act no 11 of 2007	Chapter 2 details the fundamental rights and protections.  Chapter 3 deals with the basic conditions of employment.	Given the employment opportunities presented by the development, compliance with the labour law is essential.
Public Health Act no 36 of 1919	Section 119 prohibits persons from causing nuisance.	The proponent and contractors are to comply with these legal requirements.
Nature Conservation Ordinance no 4 of 1975	Chapter 6 provides for legislation regarding the protection of indigenous plants	Indigenous and protected plants have to be managed within the legal confines.
Atmospheric Pollution Prevention Ordinance (No. 11 of 1976).	The Ordinance objective is to provide for the prevention of the pollution of the atmosphere, and for matters incidental thereto.	All activities on the site will have to take due consideration of the provisions of this legislation.
Roads Ordinance 17 of 1972	This Ordinance consolidates the laws relating to roads.	The provisions of this legislation have to be taken into consideration in as far as access to the development site is concerned.
Roads Authority Act, 1999	Section 16(5) of this Act places a duty on the Roads Authority to ensure a safe road system.	Some functions of the Roads Ordinance 17 of 1972 have been assigned to the Roads Authority.
Pollution Control and Waste Management Bill	This bill aims to promote sustainable development and to prevent and regulate the discharge of pollutants into the environment.	Once this bill is enacted it will make provision for the establishment of an appropriate framework for integrated pollution prevention and control.
National Solid Waste Management Strategy	Objective 4 of Phase 2 requires the proper management of municipal waste disposal.	Task 2.4.1 specifically addresses the implementation of waste disposal standards at local authorities.

#### **1.4. The Draft EMP Objective**

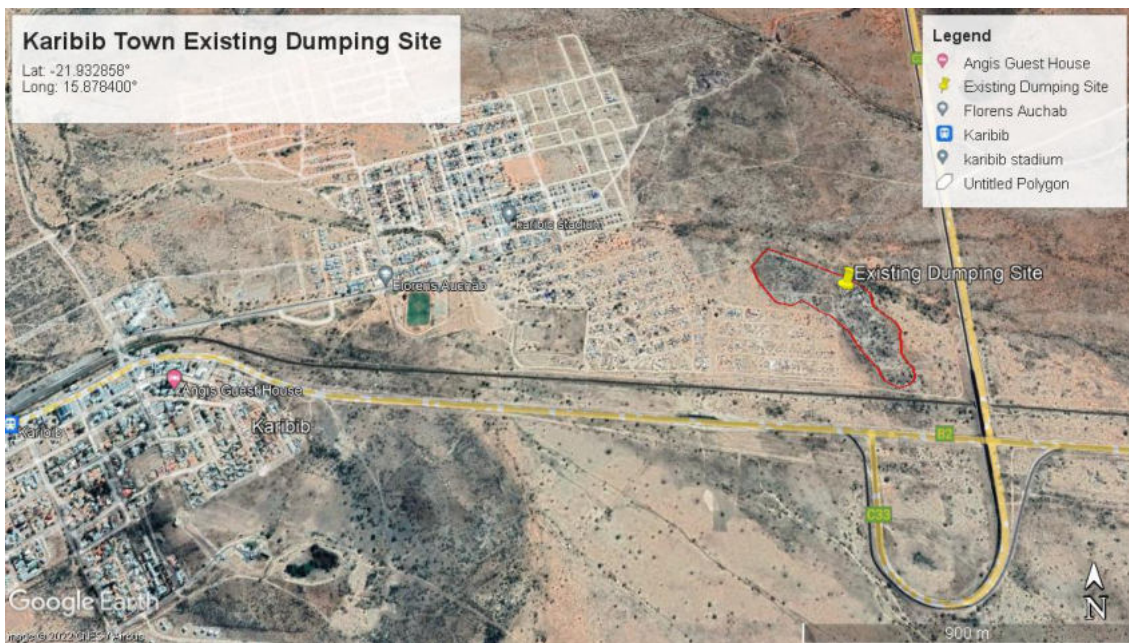
This Draft EMP describes the processes that the Karibib Town Council and associates are recommended to follow in order to maximise compliance and minimise harm and threat to human health and the environment as a result of the waste disposal site operations. This plan will also help the Karibib Town Council to map out progress toward achieving the recommended objectives.

The Karibib Town Council can achieve this objective and minimize significant adverse activities that have the potential to impact negatively on the environment and public health. The Karibib Town Council will also be able to meet the requirements of relevant national and local sustainable development plans, programs and policies by implementing the detailed operational and management guidelines as outlined and recommended in this Draft EMP.

## 2. THE KARIBIB MUNICIPAL DUMPSITE

### 2.1. General Background

The present municipal dump site in Karibib, measuring around 8 hectares in size, is owned and operated by the Karibib Town Council for the past approximately 25 years. The site is located in the north-eastern part of Karibib about 2.5km east of the town's Central Business District (CBD) on the following coordinates, Lat: -21.932858°; Long: 15.878400°. The site sits on what is planned as Usab Extension 3 (See **Figure 3** below).



**Figure 2:** Location of the Karibib Municipal dumpsite (Google, 2022)

The municipal dumpsite, which accommodates all types of solid waste generated within the town of Karibib, was seemingly chosen on the then strategic distance from formal built-up residential areas and the CBD rather than on environmental, hydrological or related public health considerations as there is no background assessment information available on the establishment of the site. Illegal dumping is a challenge both in the residential areas as well as around the vicinity of the dumping site. Generally, residents start dumping along the path purposefully created to enter the dumping site. Kids and adults engage in scavenging and collection of recyclables, which is sold to a private

collector from Usakos area. However, there exist no official relationship between Council and recyclers.

From investigations the site was never fenced off. Access control is non-existent as scavengers scour the dumpsite for collection of discarded foodstuffs, materials for personal use and valuables such as recyclables and reusable items. Management and operations are minimal at this existing dumpsite as operating practices do not include coordinated waste placement or compaction or the application of daily cover, but is exposed to daily ad-hoc off loading, daily open illegal burning and exposure to disease vectors and safety risk conditions.

The Karibib Town Council waste disposal site is thus considered a designated **dumping site** rather than a designated **disposal site**, hence the objective of “*moving from a dump site to a **Municipal Solid Waste Disposal Site***” that will be located at a new more suitable site.

## 2.2. The Receiving Environment

**Climate:** The town of Karibib is situated in a semi-desert climate, with low rainfall, high evaporation and high day time temperatures. Evaporation rates are between 2,330 and 2,440mm per year, with frost being extremely rare in this area. Karibib has very hot summers and milder winters. The average annual temperature for Karibib is more than 22.3°C, with an average maximum temperature of between 34 and 36°C, and an average winter month minimum of between 25°C and 28°C (SPC, 2016). Wind in Karibib dominantly blows from the EW with an average wind speed of about 8km/h.

**Physical geography:** Like most part of the country, Karibib and the Erongo Region area have no surface water and rely on underground water. The town of Karibib, and a large part of the Erongo Region, falls within the Erongo water basin. The Erongo basin has two important water catchment areas, that is the Omaruru catchment and the Swakop catchment area into which the three major rivers drain. These are the Omaruru, the Khan and the Swakop Rivers, they are major ephemeral rivers that only flow in high rainy

seasons for a short duration. Karibib town falls within the Swakop catchment area (SPC, 2016).

The town of Karibib is located in an area which has a moderate productive aquifer. Water is supplied to Karibib by NamWater. Water is sourced from the Swakoppoort Dam and channeled with a pipeline to the water treatment plant at Karibib. The Swakoppoort Dam, situated approximately 50km west of Okahandja, has a capacity of 63.489Mm<sup>3</sup> and has a surface area of 7.80km<sup>2</sup> when it is full. The Karibib water treatment plant has a capacity of 216m<sup>3</sup>/ h and was constructed in 1989. Accessibility to water for households for cooking and drinking in the Karibib Constituency is lower than the regional average, with 89% of the households having access to safe water compared to the 96.3% of regional households (SPC, 2016).

**Plant and animals:** Karibib lies within the Tree-and-shrub Savanna Biome, the largest biome in Namibia characterised by large, open expanses of grasslands dotted with Acacia trees. It is specifically in the Acacia Tree-and-shrub Savanna sub-biome. The vegetation structure in the sub-biome consists of ‘large, open expanses of grasslands dotted with Acacia trees. The trees are tallest in areas of deeper sands in the east, with plant growth becoming progressively shrubby further west where the soils are shallower and the landscape is hillier and rockier.

The vegetation structure of the area is sparse shrubland that stretches from the south-east to the north-west of Namibia (Mendelsohn, et al, 2002). The vegetation in the proposed development area consists mainly of Acacia species and grasslands. **Table 2** below delineate the animal species diversity of the Karibib area.

**Table 2:** Species diversity (Mendelsohn et al., 2003)

Fauna	No. of Species (Country Total)	No. of Species (Karibib Area)	Remarks
Bird	658	171-200	The diversity of habitats is important to bird diversity.

Fauna	No. of Species (Country Total)	No. of Species (Karibib Area)	Remarks
Frog	50	8-11	The diversity of frogs follows patterns of rainfall.
Mammal	217	61-75	
Reptile	258	71-80	Namibia has one of the richest lizard faunas in Africa
Scorpion	56	18-21	

### 2.3. Public Health, Safety and Nuisance

As per the description of the current operations of the dumpsite in Section 2.1 above, the key environmental and public health impacts emanating from the dumpsite are summarised below:

#### ○ **Public health and safety threats**

Current operations at the site can seriously affect the health of those residing at properties close to the site as well as people operating at the site such as personnel, recyclers and scavengers. There is currently no access control at the site and this implies that anyone can access the site. This can be dangerous as even children with no parental guidance were observed at the site and can be injured by sharp objects such as broken bottles and uncontrolled vehicular traffic. The health of recyclers and scavengers on the site are also at risk as they are able to collect and consume food products that could be trapped within general household wastes. The site can also lead to an outbreak of diseases as the current conditions on the site are conducive to the breeding of vectors such as rodents.

#### ○ **Air pollution**

Currently waste at the site is burned indiscriminately and illegally by community members, scavengers as well as Council personnel. This smoke affects the air quality and

well-being of nearby residents, site users and recyclers as well as scavengers. Numerous complaints continue to be received from residents in the surrounding areas. Organic waste usually produces bad rotting smells because waste is not systematically buried and covered.

- **Visual impacts**

The current operations at the dumpsite affect the aesthetic value of the surrounding area. This is mainly due to the unorganised manner in which the waste is dumped at the site. Another issue that is negatively contributing to the aesthetic value of the surrounding is the non-existence of the fence around the site resulting in waste such as papers and plastics being blown into the surrounding environment.

- **Pollution of underground water resources**

The dumpsite has a significant potential of polluting underground water resources in the same catchment area and downstream. The surface run-off water from the landfill site and its drainage path may pollute the area and this may pose significant risks and should be investigated further. Installation of monitoring borehole is therefore recommended.

- **Socio-economic impacts**

It is a common trend nowadays to promote economic activities at a disposal site. Such activities include the recycling of waste and creation of employment opportunities (e.g., security, caretakers, recyclers etc.) as a result. Currently there are informal small scale recycling activities taking place on site and thus not maximising the full potential economic benefits of recycling as detailed under Section 3.2.5 of the Draft EMP. In addition, formalised and controlled recycling at the site will ensure that the recyclers are not subjected to conditions that threaten their health and safety. The Karibib Town Council can also generate income from the site (e.g., establishment of waste disposal tariffs for businesses) which can help to sustain the Municipality's operational and maintenance measures.

### 3. RECOMMENDED MANAGEMENT ACTIONS

#### 3.1. Disposal Site Infrastructure Layout Plan

The site infrastructure layout plan below is recommended in order to meet the Karibib Municipality’s organizational effectiveness, namely suitability of the layout to the current situation; acceptability of the layout by the majority of stakeholders and feasibility to the Karibib Municipality and its social economic-base in constructing and maintaining the infrastructure. This proposed layout plan will serve as a major mitigation measure in addressing the negative environmental and public health impacts emanating from the disposal site.

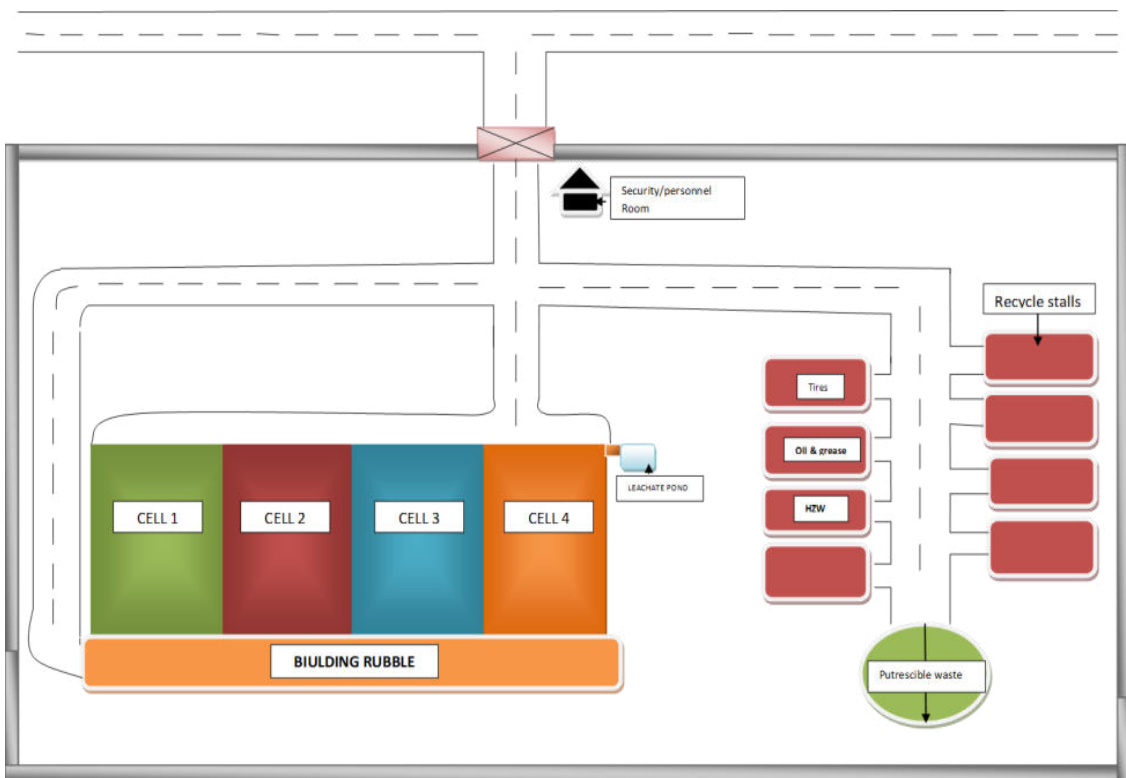


Figure 3: Simplified sketch of the disposal site layout

#### 3.1.1. Buffer and Access Road

*Signage* should be placed such as to provide direction to customers and the public to the public entrance of the disposal site. A *two-way access road* to the disposal site must be constructed and maintained through regular grading for all-weather conditions to ensure



that waste trucks and site vehicles will drive over *hard-surfaced* roads to the working site. The ends of the internal roads must be constructed *relatively wide* to allow waste trucks and site vehicles enough maneuvering space when turning around. A buffer zone to the property boundary should be at least 100 meters from the centre of the C32 road of which the 5-15 meters closest to the property boundary must be reserved for natural or landscaped screening (berms or vegetative screens).

### **3.1.2. Entrance Control Facilities**

Controlled access should be constructed together with a new fence, security gate and lifting barrier as well as a “non-authorized entrance” signage. The name and contact details of the disposal site operator as well as operation hours should be displayed at the site entrance. A site office for the site contractor/security should be positioned such that vehicles approaching, leaving and using the site are able to speak to the security officer. The operator/security should control traffic entering by means of a lifting barrier. It is also recommended that water and electricity be available to the security/contractor’s office and all other site’s facilities where possible.

### **3.1.3. Weighbridge**

An accurate record of waste inputs is essential for effective waste management and the installation of an on-site weighbridge, as a long-term option, will be the best means of providing such data. However, due to the importance of waste quantification, it is recommended that the “Typical Daily Waste Composition Recording Sheet” – note Appendix B - be used as a template to be completed by site contractor/security at the access control point/site office. Further note Section 6.2.3 on Measuring and Recordkeeping.

### **3.1.4. Emplacement Cells**

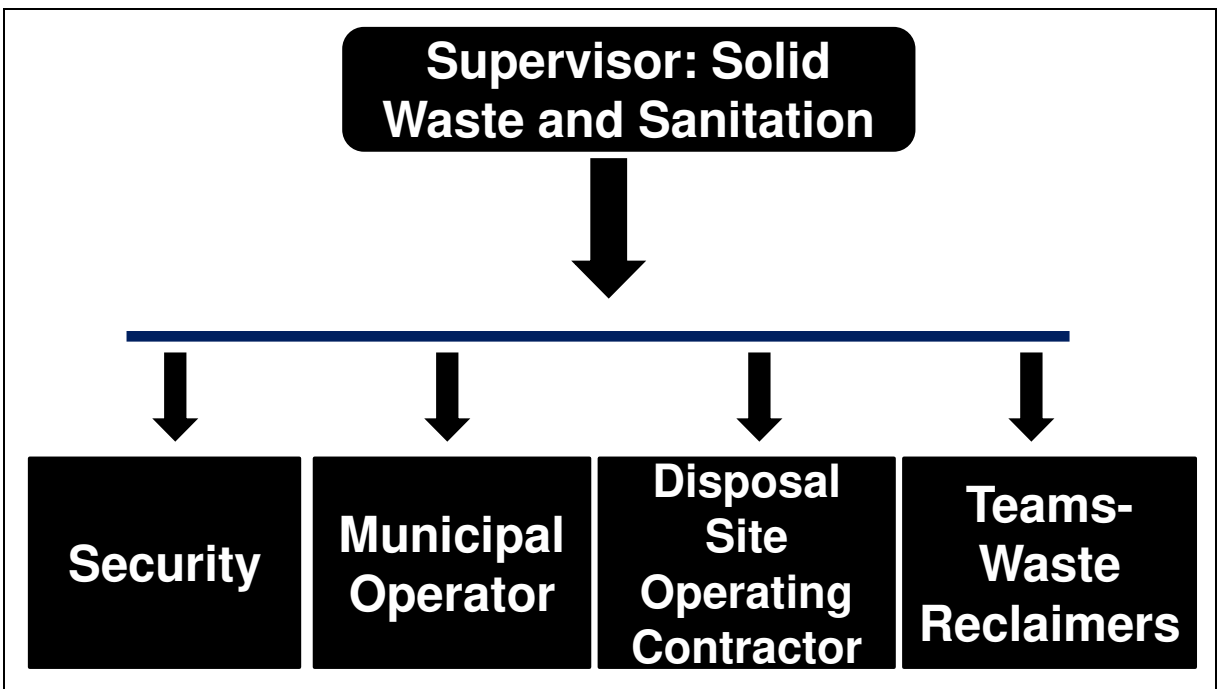
Approximately 4 emplacement cell types are recommended for logistical and practical emplacement, compaction and possible daily covering of waste, where this waste is stockpiled and compacted into a one 2-3 meters high cell for storage and coverage. Signage within the facility should provide the public with direction to the respective offloading working areas.

### 3.1.5. Recycling Stalls

Three to four (3-4) shaded recycling stalls should be constructed to enable litter pickers/recyclers to sort through the waste without interfering with the waste offloading operation in a safer and more hygienic set-up. Income can be generated for the lease of these stalls. Signage within the facility will provide direction for public to the reuse - recycling stalls. This will increase the lifespan of the disposal site.

## 3.2. Daily Operations and Maintenance

Again, suitability, acceptability and feasibility were the main guiding principles that were considered in order for the Karibib Town Council to meet its organizational effectiveness in implementing this EMP. The recommended human resources organogram depicted in Figure 6-2 and respective responsibilities; the daily operational and maintenance plan below will serve as mitigation measures in addressing potential negative environmental and public health impacts emanating from the site.



**Figure 4:** Minimum recommended human resource requirement

### **3.2.1. Manpower and Key Performance Areas**

The minimum manpower recommended for a well-managed site is:

**Solid Waste Officer (SWO)** - The present municipal employed SWO will have the overall responsibility in ensuring the implementation and adherence to this Draft EMP and in accordance with the required legal requirements and relevant national policies, plans and programmes. The SWO will thus be accountable to the Council, through established reporting lines, for the effective and efficient management and operation of the site in terms of the SWO job description.

**Disposal Site Operating Contractor (DSOC)** - The DSOC will be coordinating and supervising the overall operations at the disposal site. This will include activities such as regulating and controlling gate access into and out of site; recording and keeping records of waste types and quantities entering and leaving the disposal site; cleaning, inspecting and reporting defects and conditions of the disposal site fence; reporting non-compliances and making improvement suggestions to the SWO. The DSOC will directly be accounting and reporting to the SWO. *Currently there are no formal arrangement in existence between Council and any entity for these activities. It is recommended that caretaking arrangements with an identified service provider be considered and utilised adding the above mentioned DSOC requirements as part of a contract agreement with such service provider.*

**Security Guard and Traffic Controller (SGTC)** - The SGTC will be controlling legal and illegal access/entries to the disposal site; patrolling the disposal site and fence; directing and guiding vehicles to respective disposal areas and cells; prevention (and where possible regulation) of waste burning, and reporting any non-conformities or defects to the DSOC but mainly to the SWO. The SGTC will directly be accounting and reporting to the SWO. *It is recommended that security services arrangements with the Waste Recyclers/Reclaimers be considered and utilized.*

**Operator Driver (OD)** - The establishment, maintenance and covering of emplacement cells will be performed by the OD on instructions of the SWO as per present arrangements and OD job description. The OD will thus directly be accounting and reporting to the SWO.

**Waste Recyclers/Reclaimers (WR)** – It is recommended that the Karibib Town Council assist the present scavengers on site to organize themselves into recognized Waste Recyclers/Reclaimers and to create a conducive environment for these WR to trade with recycling companies in town. The WR will aid Council in guarding, controlling and reporting irregularities in order to safeguard their socio-economic interests. The WR will be performing recycling activities on site on instructions of the SWO and will thus directly be accounting and reporting to the SWO. **Note 3.2.5.** on “*Reuse and Recycling*” below.

### **3.2.2. Access Control and Maintenance**

Access should be controlled to minimize unauthorised human and animal presence, and vehicular traffic as well as unauthorised and illegal dumping and burning within the disposal site by:

- Preventing unauthorized entrance. The site should have dedicated and trained staff on-site during and after operating hours. The gates are to be locked to prevent unauthorised access during non-operating hours. Properly designed and maintained public waste disposal and/or recyclable material bins situated outside the main gate may be provided for after-hours use.
- Visually inspecting and recording types and quantities of waste loads entering and leaving the site.
- Directing vehicles to respective emplacement and offloading areas.
- Inspecting perimeter fence and gates for damages. Reporting and or making repairs were necessary.
- Inspecting access roads, entrance areas and perimeter fence for loose trash, and weekly clean-ups as necessary.

- Inspecting site access road for damage from vehicular traffic, erosion, or excessive mud accumulation. Maintaining entrance and internal roads as needed by grading at least on a monthly basis.
- Scavenging of food waste is to be prevented. The salvaging/reclaiming of recyclable or re-usable wastes should be encouraged by providing areas and facilities for separation of recyclable or reusable materials.
- Open burning of typical domestic garbage and waste at the disposal site is strictly prohibited. Open burning of other combustibles should generally be discouraged. Controlled burning may be allowed in consultation and approval by the SWO.

### **3.2.3. Measuring and Recordkeeping**

It is good practice to accurately record the quantities of waste both on entry and exit from the site, recording and keeping of waste inputs is essential for effective waste management. It should be noted that quantities of waste being generated in any developing town such as Karibib is expected to grow. It is thus important to measure daily and seasonal waste streams data variations as well as the generation rate of municipal solid waste at varying points in the chain through representative surveys of households and at any transfer, recycling, treatment and disposal sites. This will enable the Karibib Town Council's solid waste management services to cope with all situations and to feed data into the current municipal Draft Waste Management Plan.

Records of waste deliveries to the site should be kept, showing who delivered the waste, of what type, how much, and when. These records are particularly important if the municipality decides to charge waste generators for their waste services and such records will equally be vital to the re-design or upgrading of the existing site or for the design of a new landfill site when required. Manual waste estimations and recording is recommended (note **Appendix B** for a typical daily waste recording sheet for appropriate editing and usage) while a decision on the construction of the weighbridge is been considered and planned for as a long-term option.

### **3.2.4. Emplacement and Co-Disposal**

It is recommended that operations at the working face be conducted in a manner that allows the prompt and efficient emplacement and or offloading of waste through measures such as:

- Vehicles transporting solid waste arriving at the waste disposal working face will be directed to an offloading area by on-site personnel and or signage.
- The approach to the offloading area will be wide enough to safely offload at least two vehicles side-by-side.
- Two emplacement cells will be utilized daily – one for offloading and collection of recyclables while the second cell is being maintained for proper placement, thickness compaction and coverage.
- Waste should be disposed of and compacted at the end of the cell.
- Compacted waste should be covered with excavated soil or similar inert material (alternatives such as construction and demolition material and ash) to deter flies and other insects from breeding in waste; to reduce the attraction of birds to wastes; to suppress odours and dust as well as reducing wind-blown waste and improving the surface roads for waste vehicles.
- Inspection of all site signs for damage, general location, and accuracy of posted information and correcting on date of discovery were possible.
- Inspecting for proper placement, thickness, slope, settlement, erosion and compaction. Emplacement cells' maintenance will be ongoing throughout the site rehabilitation period.
- Deliberate and controlled co-disposal of a range of industrial/hazardous waste and municipal/household waste is recommended where the State Hospital incineration cannot be utilized.

### **3.2.5. Reuse and Recycling**

Waste burning should not be permitted. In General fires can cause hollows in the waste, encouraging instability, and could ignite pockets of landfill gas, causing explosions. If not quickly extinguished, fires can become deep seated and smolder for many years. It is thus recommended to reuse or recycle waste instead of burning.

**Marketable recyclables:** A waste recycler from Usakos is currently involved in the collection of recyclables such as *plastic bottles, glass bottles and tins*. It is thus recommended for the Karibib Town Council to consider entering into a formal arrangement/agreement with this company and or other recycling companies with unemployed individuals or groups of waste pickers to provide formal collection services in search for the recovery of such recyclables at source and at the disposal site as a job creation venture. The present unemployed waste recyclers/reclaimers should be organized into specialized groups with a permit to operate at the disposal site. They can sell their bottles, plastics, cardboard, and paper to the company (and other recycling companies) at their assigned recycling stalls - at the disposal site and or other council allocated areas. The extent to which these transactions occur will depend on the availability of marketable end uses for the materials.

**Special waste:** such as *tyres* should be recycled as retreads, for use on carts, to make shoes, flower pots, gardening, road demarcation, playground equipment, animal feeding troughs and for a number of other domestic, farming, agricultural and industrial articles. **Construction and Demolition Debris (CDD)** should be reused as covering material during waste emplacement, and for the filling of low-lying areas subject to regular flooding. **Wood, nails, bricks, and other materials of direct use** should also be reclaimed from CDD for use in a number of minor DIY construction projects. The rate of recycling of CDD, especially bricks and wood (for the manufacturing of furniture and as firewood), has already been established country-wide. Similarly, to the marketable recyclables, unemployed community members should be organized into “tyres” and “CDD” specialized groups with a permit to operate at the disposal site as job creation ventures. **Used oil and grease** should be recycled as an industrial lubricant or fuel through the establishment of a deposit system to increase the rate of oil recycling.

It is suggested to identify companies, within the Erongo Region such as Wesco Group, a factory for the regeneration of used oil operating in Walvis Bay, that are collecting used oil for refining and reuse purposes. Again, the establishment of agreements with such

companies will promote the recycling of used oil across and within the entire Karibib district. It is worth considering to provide waste reclaimers with rag-pulling equipment to shred, clean, and re-knit *fabrics and textiles* as all-purpose utility clothes for resale. This is equally applicable to *repairable waste items* such as electrical equipment, utensils, bicycles, radios and many other items at designated recycling centers/stations.

**Composting:** Urban demand for compost has not been established. Additionally, the technology works better with a well-segregated MSW stream, which may be the case with garden refuse in Karibib. In general, even though the organic content of the MSW in Karibib may exceed 40% (wet basis), centralized composting is encouraged in the short to medium term consideration.

**Incineration:** The construction of an incinerator by Council should remain a non-option at the existing site, for the short to medium term taking into consideration the availability of the Usakos State Hospital incinerator, which Council should be able to utilize when the need arises. In addition, high costs relative to other municipal solid waste management options, a limited infrastructure, human, mechanical and institutional resources, and the composition of the waste stream itself, suggest that incineration is an inappropriate technology for Council for the short to medium term. However, we propose that an organisation with the right know-how such as the *African Expert Federation* should be approached to assess the feasibility of establishing a *Waste-to-Energy facility* in Karibib in respect of the new disposal site to be identified by Council.

### **3.2.6. Continuous Site Rehabilitation**

**Weekly or monthly cover application** is essential and required in every disposal site operation. The weekly cover application will minimize negative effects of the site operation such as odours, nuisance, wind-blown waste and vector populations. It might also avoid landfill fires, minimize contamination of surface runoff, and improve aesthetics of the site. The availability of soil or other inert matter as cover material is of importance for the weekly coverage of the waste. Instead of transporting soil or other inert material to the disposal site over longer distances (which is expensive), unutilized compost or demolition waste should be used as alternative daily cover material. This can



be considered as “*best available practice*” to operate the site, especially when insufficient soil cover material or lack of financial resources is experienced.

**Final cover application:** The Karibib Municipality is recommended that after a single emplacement cell has reached its final capacity the waste need to be covered first by an intermediate cover layer, which is sensitive to settlements of the disposal site surface. The functions of this intermediate cover layer (e.g., 50 cm of soil or compost) are the prevention of erosion by wind and water; the reduction of water infiltration, and gas emissions (at least partial oxidation of methane generated); to promote vegetation, and for aesthetic issues. The intensive natural dense vegetation cover (in order to prevent erosion) will servers as the final capping of the disposal site.

**Ground water monitoring boreholes:** It is important to monitor the potential for groundwater pollution by drilling monitoring boreholes for the collection of samples to analyse water quality. This should be done on a regular basis, i.e., a minimum of 6 months or less.

**Post-closure care:** The site needs to be managed and controlled in order to avoid adverse effects on humans and the environment after the closure of this disposal site. This post-closure care (or site aftercare) has to be prolonged as long as landfill emissions present a hazard to human health and the environment, which post-closure care is estimated to be in the range of several decades to centuries. In addition, the status of different elements should also be observed, such as final cover integrity, natural drainage system - monitoring boreholes, vegetation growth, slope, etc. Post-closure care may not be necessary taking into consideration national efforts in the establishment of Waste-to-Energy facilities in all in the 14 regions in Namibia.

### **3.2.7. Draft EMP Database System and Review Process**

The database system is a critical component of this Draft EMP, as the management plan refers to any operational records and reports, design information and monitoring reports, which are the site records for the disposal site. The site records should be referenced on a regular basis. The format of the database system should facilitate ease of reference to

the site records and incorporate a process for identifying documents, and should include the provision for document identification numbers and provision for issue dates and authors as a minimum. Daily recording sheets and monthly site inspection reporting and reports will be included in the database system to identify the process to be used in reviewing the Draft EMP. The system should be used to clearly demonstrate that the identified actions and outcomes at site operation stage, are met or not met.

The review period for the Draft EMP for this disposal site shall be each year or as otherwise specified in the Environmental Clearance Certificate (ECC). Given the ongoing records keeping, monitoring and reporting associated with the disposal site, the review of the Draft EMP should demonstrate that the sufficiency of the operational, layout design and daily monitoring and reporting systems for the current development stage of the site has been addressed. The review process should be established to ensure continual improvement in the management and operation of the disposal site.

Upon approval of the Environmental Clearance Certificate for this activity, bi-annual reports have to be submitted to the Environmental Commissioner.

The Draft EMP review process (for example, a checklist system) will assist in identifying the outcomes from site investigations, operational reporting and/or monitoring programs and so on, for incorporation in upcoming management plan as appropriate. This could take the form of regular monitoring exercises/inspection once every quarter. As a result, the outcome of the Draft EMP review process is that only specific sections of the management plan may be subject to revision and submission to the Environmental Commissioner for approval in terms of Part VI of the Environmental Management Act, No 7 of 2007.

#### 4. CONCLUSION

*The Karibib Town Council should take the overall responsibility to ensure that all recommended actions within this Draft EMP are properly implemented, monitored, evaluated, recorded and accordingly reported. All key role players such as the Council staff involved in the day-to-day operations of the waste disposal site; all waste contractors and service providers, and recyclers on site should be informed about the content of this Draft EMP and activities to be undertaken.*

*The Karibib Town Council should ensure compliance to Section 5 and Part VI of the EMA that deals with Waste and Environmental Plans respectively. Apart from legal compliance, adherence to this Draft EMP will result in a well-managed designated disposal site, which in turn will minimize operational costs and future potential negative impacts and threats to the environment and public.*

## 5. REFERENCES

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**Appendix 2: A Typical Daily Waste Composition Recording Sheet**

<b>WASTE COMPOSITION</b>	<b>DATE</b>	<b>LOAD 1</b>	<b>LOAD 2</b>	<b>LOAD 3</b>	<b>LOAD 4</b>	<b>LOAD 5</b>	<b>TOTAL</b>
<b>GENERAL HOUSEHOLD WASTE</b> in m <sup>3</sup>							
<b>GLASS BOTTLES</b> in m <sup>3</sup>							
<b>PLASTIC BOTTLES</b> in m <sup>3</sup>							
<b>PLASTICS</b> in m <sup>3</sup>							
<b>WHITEPAPER</b> in m <sup>3</sup>							
<b>NEWS PAPER</b> in m <sup>3</sup>							
<b>BOXES/CARTONS</b> in m <sup>3</sup>							
<b>CANS</b> in m <sup>3</sup>							
<b>STEEL/METALS</b> in m <sup>3</sup>							
<b>GARDEN/PUTRESCIBLE</b> in m <sup>3</sup>							
<b>TYRES</b> in numbers or m <sup>3</sup>							
<b>OILS/SLUDGES</b> in m <sup>3</sup>							
<b>BUILDING RUBBLE</b> in m <sup>3</sup>							
<b>INDUSTRIAL/HAZARDOUS</b> in m <sup>3</sup>							
<b>OTHER WASTE</b> in m <sup>3</sup>							

Computation:

\* Estimated Load in m<sup>3</sup>

\* Depending on the open pick-up truck load-box capacity: L X B X H = m<sup>3</sup>

In **RED** – Not compulsory- ONLY IF IN SIGNIFICANT QUANTITIES

*Electronic version of this recording and inspection sheets will be made available to the Karibib Town Council for appropriate amendments and usage purposes accordingly.*

### Appendix 3: A Typical Site Inspection Report Structure for Ensuring Best Practice

<b>SITE INSPECTION REPORT</b>							
Site Name .....							
Ref No .....							
Date of Inspection ..... Time in .....							
Inspector's Name .....							
Reason for Inspection ..... Time out .....							
Weather .....							
Site: Open/Closed							
Status at Time of Inspection	Satisfactory = S Partial Satisfactory = PS Unsatisfactory = US		S	PS	UP	Not Checked Inapplicable	Comments
Environ. Man. Plan Compliance							
Types of Waste							
Layering/Compaction of Waste							
Covering of Waste							
Litter Screens & Litter Control							
Liner/Protective Layer							
Condition of Site Roads							
Condition of Site Entrance							
Access Road Cleaning							
Site Tidiness							
Fires and smoke							
Insects/Vermin/Birds							
Surface Water							
Leachate (on-site)							
Landfill Gas							
Odours							
Noise							
Dust							
Gate/Fencing/Security							
Office/Site Notice Board							
Manning & Supervision							
Site Record Keeping							
Cover Stockpile							
Site	Litter						
Environs	Leachate						
Other Observations/Actions Required:							
<b>IMMEDIATE ACTION IS REQUIRED ON:</b>							
Site Operator's Comments:							
Samples Taken: Yes/No	Inspector's Signature:			Received by& When:			
Photographs Taken: Yes/No							